DOT/FAA/AR-07/51

Air Traffic Organization
Operations Planning
Office of Airport Safety & Standards
Office of Aviation Research
and Development
Washington, DC 20591

Helicopter Visual Segment Evaluation Phase II: Subject Pilot Performance and Assessment

January 2008

Final Report

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U.S. Department of Transportation
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Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT/FAA/AR-07/51		

4. Title and Subtitle	5. Report Date
HELICOPTER VISUAL SEGMENT EVALUATION PHASE II: SUBJECT PILOT PERFORMANCE AND ASSESSMENT	January 2008
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Stephen M. Hickok and Edwin D. McConkey	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Hickok & Associates 32910 Marlin Key Boulevard Orange Beach, Alabama 36561	11. Contract or Grant No.
12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
U.S. Department of Transportation Federal Aviation Administration Air Traffic Organization Operations Planning Office of Aviation Research and Development Washington, DC 20591	Final Report
	14. Sponsoring Agency Code AFS-400

15. Supplementary Notes

The Federal Aviation Administration Airport and Aircraft Safety R&D Division Technical monitor was Ken Knopp.

16. Abstract

The primary goal of the Helicopter Visual Segment Evaluation Phase II (HVSE II) project was to assess the feasibility of changing the policy and/or provide guidance for approval of special Point-in-Space (PinS) visual segment descent angle (VSDA) from a maximum of 7.5 degrees to 8.13 degrees. Flight tests were used to perform the feasibility assessment. Current Federal Aviation Administration (FAA) PinS policy allows a maximum VSDA of 7.5 degrees. For VSDA in excess of 7.5 degrees, a special assessment requiring Flight Standards Service approval considering specific helicopter equipment and capabilities, pilot training, and demonstrated capability is required.

The FAA S76A helicopter was used for the flight tests. HVSE II testing included 16 industry subject pilots who completed 186 data collection flights conducted at the FAA heliport. Three approach procedures were designed specifically for this project. The approach procedures were designed to allow testing at specified VSDA values (8.13 degrees) and missed approach point (MAP) to heliport distances (0.55 and 0.65 nautical miles (nm)). The target ground speed for testing was 80 knots (70 knots airspeed plus 10 knots tailwind).

Test data were collected using subject pilot questionnaires, data logs prepared by the flight test engineer, and the FAA global positioning system-based time-space position indication system (TSPI). Aircraft system data were collected using an FAA airborne data collection system. Key test parameters used in the performance evaluation were altitude above heliport, ground speed, rate of descent, deceleration, and pitch attitude.

Key findings from the HVSE II tests were a VSDA of 8.13 degrees permits safe, acceptable approaches if the MAP is located at least 0.55 nm from the heliport; the minimum MAP to heliport distance for nonprecision approaches should be 0.55 nm to allow the aircraft adequate time to decelerate to a hover; training specific to flying steep approaches is recommended for VSDA values of over 7.5 degrees; and the vertical profile of helicopters approaching a heliport (altitude vs. distance to heliport) is a curved path with increasing slope as the helicopter nears the heliport. The vertical path overshoots the VSDA by a significant margin.

17. Key Words	18. Distribution Statement
Helicopter, TERPS, Flight test, Visual segment, Instrument approach, Training, Terminal instrument procedures	This document is available to the U.S. public through the National Technical Information Service (NTIS) Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	697	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

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LIST OF ACRONYMS

AC	Advisory Circular
AFS	FAA Flight Standards Service
ATD	Along-track distance
baro	Barometric altitude
CFR	Code of Federal Regulations
FAA	Federal Aviation Administration
FAF	Final approach fix
FATO	Final approach and takeoff area
FMS	Flight management system
GPS	Global positioning system
HAL	Height above landing
HCH	Heliport crossing height
HRP	Heliport reference point
HVSE	Helicopter visual segment evaluation
HVSE I	HVSE Phase I
HVSE II	HVSE Phase II
H&A	Hickok & Associates, Inc.
IAP	Instrument approach procedure
IFR	Instrument flight rules
KIAS	Knots indicated airspeed
MAP	Missed approach point
MDA	Minimum descent altitude
MSL	Mean sea level
nm	Nautical miles
OIS	Obstacle identification surface
Ops Specs	Operational specifications
PinS	Point-in-Space
RNAV	Area of navigation
ROC	Required obstacle clearance
ROD	Rate of descent
sm	Statute miles
Specials	Special IAP
TERPS	Terminal instrument approach procedures
TSPI	Time-space-position information
VDP	Visual descent point
VFR	Visual flight rules
VSDA	Visual segment descent angle
VSDA-1	1 degree less than the VSDA
WAAS	Wide Area Augmentation System

EXECUTIVE SUMMARY

The primary goal of the Helicopter Visual Segment Evaluation Phase II (HVSE II) project was to assess the feasibility of changing the policy and/or provide guidance for approval of special Point-in-Space (PinS) visual segment descent angle (VSDA) from a maximum of 7.5 degrees to 8.13 degrees. Flight testing was used to perform the feasibility assessment. Current Federal Aviation Administration (FAA) PinS policy allows VSDA to 7.5 degrees. For VSDA in excess of 7.5 degrees, a special assessment requiring Flight Standards Service approval considering specific helicopter equipment and capabilities, pilot training, and demonstrated capability is required.

In the visual segment, helicopters approaching a heliport descend and decelerate to a hover over the heliport. This requirement to simultaneously descend and decelerate in the visual segment is unique to helicopters and rotorcraft approaching a heliport. Airplanes and helicopters approaching a runway do not experience this requirement to simultaneously descend and decelerate. Hence, flight test data and historical experience gained through years of fixed-wing experience is not applicable to flight in the visual segment by helicopters approaching a heliport.

The FAA S76A helicopter was used for the flight tests. HVSE II tests included 16 industry subject pilots who completed 186 data collection flights conducted at the FAA William J. Hughes Technical Center. Three approach procedures (identified as W, X, and Y) were designed specifically for this project. The test matrix called for each subject pilot to fly 12 approaches to the heliport at FAA William J. Hughes Technical Center; each subject pilot flew 4 approaches using all 3 procedures; 15 subject pilots completed all 12 approaches; one subject pilot completed only 6 approaches due to a schedule conflict.

The approach procedures used in this evaluation were representative of Copter RNAV global positioning system (GPS) nonprecision instrument approach procedures currently in use throughout the United States, with the exception that the altitude at the missed approach point (MAP) was calculated to allow testing at specified VSDA values (8.13 degrees) and MAP to heliport distances (0.55 and 0.65 nautical miles (nm)). The W and X approach procedures have the deceleration and descent beginning at the MAP. The Y approach procedure has the deceleration beginning at the MAP and the descent beginning 0.31 nm beyond the MAP at the visual descent point (VDP). Approach procedures were designed for both northwest and southeast approach directions. This allowed approaches to be made with adverse tailwind conditions, regardless of wind direction at the test facility. The target speeds for the tests were 70 knots airspeed, 10 knots tailwind, and 80 knots ground speed.

Test data was collected using subject pilot questionnaires, data logs prepared by the flight test engineer, and the FAA GPS-based time-space-position information (TSPI) system. Aircraft system data was collected using an FAA airborne data collection system. The TSPI data were processed to yield the following data parameters: altitude above the heliport, ground speed, rate of descent (ROD), deceleration, and pitch attitude. These data were analyzed through graphical and statistical methods to arrive at a set of test findings. A mathematical model of the helicopter performance in the visual segment was developed to assist in interpreting and extrapolating the test results.

The following findings were derived from the test results and model application:

- The MAP to heliport distance of 0.55 nm evaluated in these tests (X approach procedure) is representative of the minimum distance required to decelerate and descend on a straight-in approach. Shorter MAP to heliport distances require unacceptable levels of deceleration and pitch attitude in the visual segment.

- The MAP to heliport distance of 0.65 nm evaluated in these tests (W and Y approach procedures) is representative of an optimum distance to decelerate and descend on a straight-in approach while achieving a visibility minimum of 3/4 statute miles.

- A VSDA of 8.13 degrees is representative of a safe, acceptable VSDA when MAP to heliport distance is not less than 0.55 nm.

- The visual segment obstacle identification surface (OIS) for a VSDA of 8.13 degrees is coincidental with the heliport 8:1 approach surface (7.125 degrees) recommended by FAA Heliport Design Advisory Circular (AC) 150/5390-2 and can be used for the OIS.

- HVSE II data results and subject pilots' opinions favor the use of a VDP (represented by the Y approach procedures) with a MAP to heliport distance of 0.65 nm. The use of a VDP supports a wide range of potential height above landing (HAL) area values.

- The vertical profile of helicopters approaching a heliport (altitude vs. distance to heliport) is a curved path with increasing slope as the helicopter nears the heliport. The vertical path significantly overshoots the VSDA and vertical segment OIS. Consequently, the helicopter is above the VSDA and OIS throughout the visual segment.

  Note: This finding has implications for vertically guided approaches (i.e., WAAS vertical guidance). Curved or segmented glide paths may prove to be more operationally desirable for heliport approaches. This finding also has implications when estimating the ROD for approaches to heliports. The use of formulas for aircraft flying constant-speed approaches to runways is not appropriate.

- The total number of successful approaches (181, (97.3%)) indicates that procedures having VSDA values of up to 8.13 degrees are feasible. A successful approach is defined as an approach that the subject pilot successfully transitioned to a landing and then answered the questionnaire indicating that he was completely comfortable during the maneuver.

- The number of balked approaches (5, 2.7%) included two approaches that the subject pilot aborted due to noise in the transmission. This subject pilot answered the questionnaire indicating that he was completely comfortable during the maneuver but aborted the landing due to the transmission noise. These two approaches are reported with the remaining three as balked approaches, however, these two approaches were not balked based on flyability.

- The number of flagged approaches (28, which include the 5 balked approaches) indicates that the subject pilots would benefit from awareness and training to achieve a successful approach with a VSDA of 8.13 degrees. However, a high percentage of the subject pilots indicated they were completely comfortable during the landing portion of the approach. These results suggest that, while training is recommended with the findings in this report, the need for training is relatively low. This is further supported by the fact that no training was provided and only five subject pilots routinely perform Copter IFR approach procedures to heliports.

  Note: Most approaches were flagged because they exceeded a peak ROD of 1000 feet per minute at some point during the visual segment. This limit was established by a committee during the planning phase of the project. Subsequent discussions with FAA representatives, including the helicopter directorate, indicated FAA regulations referring to a "maximum ROD of 1,000 feet per minute" are only relative when discussed with reference to the average ROD during the approach exceeding the 1000 foot per minute limit. Thus, many of the approaches flagged by H&A do not fit within the regulatory definition of "exceeding a maximum ROD of 1,000 feet per minute."

- The mean values of performance derived from the statistical analysis of 158 unflagged approaches indicated that correctly flown approach procedures produce moderate levels of pitch attitude, deceleration, and ROD. These values are shown below.

Approach Procedure	Altitude Above(+)/Below(-) MDA or VDP (feet)	Ground Speed at MAP (knots)	Pitch Attitude (degrees)	Deceleration (g's)	ROD (feet/minute)
W	45	76.8	4.21	0.074	765
X	41	76.7	4.88	0.085	764
Y	43	77.1	4.35	0.076	572

- Pilot awareness and training for steep approaches (exceeding 7.5 degrees VSDA) should reinforce the importance of the following operational factors:

  - Arrival at the MAP with the correct airspeed and altitude,

  - Prompt control input of correct amount of pitch up at the MAP to begin deceleration and maintain the pitch-up attitude to continue the deceleration throughout the visual segment until the pilot is comfortable with the prelanding airspeed,

  - Prompt control input (at the MAP or VDP) of correct collective control to establish the necessary ROD to achieve a successful landing and maintain the ROD until the pilot is comfortable with the prelanding altitude,

  - Prompt power adjustments to maintain rotor rpm within acceptable limits.

- The findings and conclusions from these HVSE II tests should be considered in future changes to TERPS criteria and policy.

- Based on the HVSE I recommendations, and the results of these HVSE II tests, some portion of the HVSE II testing should be supplemented with two helicopters that have improved power characteristics compared to the S-76A. The HVSE I recommendation was for HVSE II tests to use the Bell 430 and the Aerospatiale AS-365 in addition to the S-76A. These tests should include the W and Y approach procedures, and one or more approach procedure with intermediate altitudes. The results of these tests might identify credits or opportunities for waivers for operators having higher-performance helicopters and be supportive of future Performance Based Criteria.

- Testing in the visual segment should be performed at heliports that have actual 8:1 approach areas and physical obstructions, which are more representative of heliports routinely used. Testing conducted with these HVSE II tests have now identified the test parameters such that this testing can now be safely be conducted at operational facilities.

- Further research should be undertaken regarding the feasibility of curved and/or segmented vertical path guidance for low visibility approaches to heliports. The curved or segmented vertical path would allow helicopters to follow a more natural flight profile than approach procedures using straight-line vertical profiles.

1. INTRODUCTION.

1.1 OBJECTIVE.

The general objectives of the helicopter visual segment evaluation (HVSE) project were to collect test data and make recommendations that will

- enable the determination of the maximum visual segment descent angle (VSDA) and deceleration rates for instrument approach procedures (IAP) for helicopters flying approaches to heliports, and;

- provide information to develop guidance material for decisions regarding approval of requests for waivers for IAPs to heliports in which the VSDA or required deceleration rates do not meet standard criteria.

The primary goal of the HVSE Phase II (HVSE II) project is to assess the feasibility of changing the policy and/or provide guidance for approval of special Point-in-Space (PinS) VSDA from a maximum of 7.5 degrees to 8.13 degrees. The initial Federal Aviation Administration (FAA) PinS policy allowed VSDA to a maximum of 10.2 degrees. Current FAA PinS policy allows VSDA to of 7.5 degrees. For VSDA in excess of 7.5 degrees, a special assessment requiring Flight Standards Service approval considering specific helicopter equipment and capabilities, pilot training, and demonstrated capability is required.

The IAPs used in this evaluation are representative of Copter RNAV global positioning system (GPS) nonprecision IAPs currently in use throughout the United States, with the exception that the altitude at the missed approach point (MAP) was calculated to allow testing at specified VSDA values and MAP to heliport distances. Usually, the altitude at the MAP is based on an analysis of required obstruction clearance (ROC) in the final and missed approach segments.

1.2 BACKGROUND.

With the introduction of the GPS for use as an FAA-approved navigation source, helicopter IAPs became economically feasible as well as capable of providing operationally beneficial approach minimums to heliports. Throughout the past decade, helicopter terminal instrument approach procedures (TERPS) criteria and policy have been evolving to meet the needs of the helicopter industry. The basis of this evolution is the FAA's helicopter nonprecision GPS flight tests that were conducted in 1994. These tests produced supporting data for helicopter nonprecision GPS criteria. The 1994 tests concentrated on pilot performance and GPS performance in the instrument portions of the approach procedure. Existing criteria and policy, based on FAA Order 8260.3B (Terminal Instrument Procedures), was used to specify the visual segment in those tests. The following helicopter TERPS development events followed the 1994 testing:

- February 1996

  FAA published helicopter GPS nonprecision IAP criteria in FAA Order 8260.42. The Order provided GPS-based criteria for helicopter IAPs to both airports and heliports and relied upon the application of certain sections from FAA Order 8260.3B and FAA Order 8260.38A (Civil Utilization of Global Positioning System). A fundamental element contained within FAA Order 8260.42 was to reduce the final approach segment trapezoid boundaries to better meet the heliport obstacle-rich environments by limiting airspeed from the final approach fix (FAF) to the MAP to not greater than 70 knots indicated airspeed (KIAS).

- June 1997

  FAA Order 8260.42 was amended and reissued as FAA Order 8260.42A. FAA Order 8260.42A renamed certain terms, added conditions that require IAPs to be published as special procedures (Specials), and added provisions that increase the final approach segment for military IAPs when flown at 90 KIAS.

- June 1997 to February 1999

  Procedure developers applied criteria from FAA Order 8260.42A, and it was soon recognized that provisions for helicopter IAPs to visual flight rules (VFR) heliports and "proceed visually" provisions were needed.

- February 1999

  FAA Flight Standards Service (AFS) Flight Technologies and Procedures Division (AFS-400) issued Special Helicopter GPS PinS Approach policy, which established policy to develop a Special PinS IAP to a VFR heliport. The PinS policy also introduced what has become known as PinS "proceed visually" and "proceed VFR" IAPs, which are used for most of the Copter RNAV (GPS) IAPs throughout the U.S. Key to the HVSE II project, the PinS policy established the maximum VSDA as 7.5 degrees and restated the visual segment obstruction identification surface (OIS) to be 1 degree less than the VSDA (VSDA-1). The policy also provides methodology to mitigate situations where obstacles in the visual segment penetrate the OIS.

- February 1999 to February 2000

  Procedure developers applied PinS policy and encountered situations wherein obstacles close to the heliport cause penetrations of the visual segment OIS. AFS-420 modifies figure 2 in the PinS policy, which suggests the use of along-track distance (ATD) located between the MAP and the heliport (see figure 3 and section 2.1).

- February 2000 to present

  Procedure developers applied PinS policy and recognized that the visual segment OIS should coincide with the heliport 8:1 approach surface, but VSDAs exceeding 7.5 degrees

need AFS waivers. AFS regulators recognized the need for flight data to support the decision to allow VSDAs greater than 7.5 degrees. The HVSE project was created with the objective of collecting these data.

1.3 RELEVANT DOCUMENTS.

Applicable documents referenced in the HVSE II project are listed below.

1. Helicopter Visual Segment Evaluation: Phase 1 Performance Testing Report, DOT/FAA/AR-03/68, September 2003.

2. FAA Order 8260.3B, U.S. Standard for Terminal Instrument Procedures, through change 19, July 1976.

3. FAA Order 8260.38a, Civil Utilization of Global Positioning System (GPS), April 1995.

4. FAA Order 8260.42A, Helicopter Global Positioning System (GPS) Non-precision Approach Criteria, June 1997.

5. Interim Helicopter Point-in-Space Visual Segment Criteria, AFS-400, February 1999.

6. FAA Advisory Circular (AC)150/5390-2B, Heliport Design, September 2004.

7. Title 14 Code of Federal Regulations (CFR) Part 77, Objects Affecting Navigable Airspace.

2. DISCUSSION.

In the visual segment of an instrument approach there is a key difference between an aircraft approaching a runway and a helicopter approaching a heliport. In the visual segment, the aircraft approaching a runway descends to the runway touchdown zone. This descent is performed at a constant airspeed.

In the visual segment, the helicopter approaching a heliport descends to a hover over the heliport and decelerates to zero speed over the heliport. The requirement to simultaneously descend and decelerate in the visual segment is unique to helicopters and rotorcraft approaching a heliport. Hence, flight test data and historical experience gained through years of fixed-wing aircraft experience is not applicable to flight in the visual segment by helicopters approaching a heliport. Therefore, it is appropriate that flight tests are necessary when questions arise about helicopter approach procedures.

Section 1.2 lays out the historical progression of helicopter TERPS and PinS policy. The following paragraphs contain detailed discussions of the technical issues surrounding PinS procedures. These discussions describe the factors that contributed to the planning and design of the test matrix and IAPs used for HVSE II flight testing and evaluation. These factors include the recommendations from HVSE I, an assessment of current helicopter TERPS and PinS policy, an assessment of protected airspace surfaces identified in the heliport design AC 150/5390-2B,

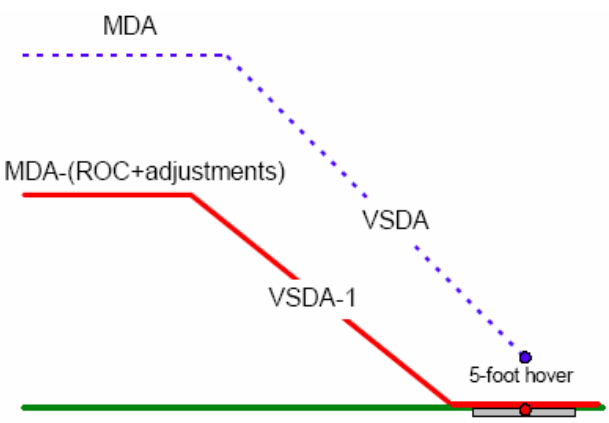
and practical weather-related ceiling and visibility limits for helicopter PinS approach procedures.

2.1 ALONG-TRACK DISTANCE/VISUAL DESCENT POINT IN THE VISUAL SEGMENT.

The diagram on the left side of figure 1 shows the major design elements in the helicopter visual segment identified in the original PinS policy issued in February 1999 (see section 1.3). These elements are:

- OIS—obstruction identification surface (identified as being at an angle of VSDA-1 degree shown in the modified diagram of figure 1).
- VSDA—visual segment descent angle
- MDA—minimum descent altitude
- ROC—required obstacle clearance
- HCH—heliport crossing height (identified by the 5-foot hover shown in the original policy in figure 1)

Original Policy (Feb 1999)



Modified Diagram (February 2000)

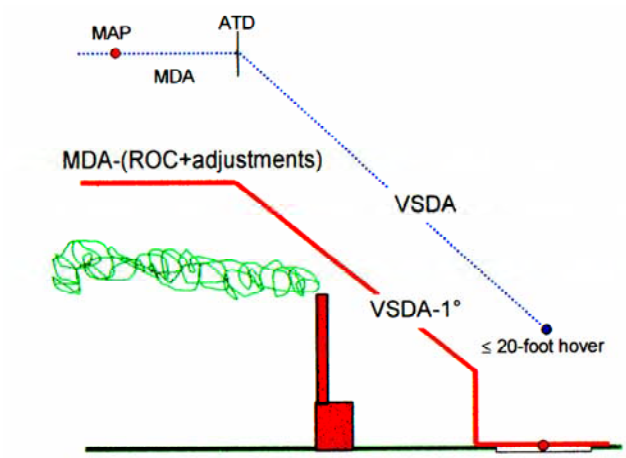


Figure 1. Profile of Visual Segment

Sections 2.3.1 through 2.3.5 of the PinS policy provide solutions to mitigate penetrations in the visual segment OIS and include traditional mitigation by removing the penetrating obstacle or lighting and marking. The PinS policy also provides mitigation by increasing the VSDA and/or heliport crossing height (HCH). It became obvious during the application of the PinS policy for the development of IAPs, that given certain conditions, the provisions contained within PinS policy for mitigation were ineffective.

Once the maximum VSDA of 7.5 degrees (OIS of 6.5 degrees) and the maximum HCH of 20 feet are applied and the obstacle remains a penetration, the PinS policy provided no additional provision for mitigation (except removing the obstacle, which in many cases is impracticable). It is also pertinent to note that the obstacle may not be a penetration to the heliport 8:1 approach area, and thereby the heliport does meet the FAA recommendations for a VFR heliport. The single IAP design element controlling everything else in this situation became the VSDA; with no solution except a waiver for the development of a PinS IAP to a heliport that meets FAA AC 150/5390-2B recommendations.

The diagram on the right of figure 1 represents a revision to PinS policy issued by AFS-420 in February 2000. Note that only the diagram was modified; the text of the policy was unchanged. This diagram introduced an ATD offset to the visual segment descent path, which aided developers in mitigating penetrations of the OIS in the vicinity of the heliport.

The revision was provided by AFS-420 as the solution, which introduced the use of an ATD point. Contrary to FAA Orders 8260.3B and 8260.42A, this AFS solution provided a means for an ATD to be placed between the MAP and heliport at a point that would provide for the mitigation of the OIS penetration within the visual segment. The ATD had no impact upon MAP location, and therefore, did not reduce the approach visibility. If the pilot did not see the landing area from the MAP, he or she executed the published missed approach. If the pilot had seen the landing area from the MAP, he or she continued to the ATD visually, the MDA and at the ATD (which functionally serves as a visual descent point (VDP)) descends and lands. It is also important to identify, in this discussion, that the entire area of MAP to ATD and descent to landing is contained within the visual segment area evaluated in accordance with PinS policy.

It was this provision and use of an ATD, already issued by FAA AFS for Special PinS policy, that was also incorporated into these HVSE II tests.

2.2 RECOMMENDATIONS FROM THE HVSE I TESTING.

The HVSE I testing provided three recommendations. These recommendations are summarized as follows:

- The minimum recommended complement of helicopters to be flown in HVSE II should include the Sikorsky S-76A, the Bell 430, and the Aerospatiale AS-365. This provides a consideration of the worst through best performers in the twin-turbine class.

- The angles of descent planned to be flown in HVSE II should include angles below and progressing toward an upper limit of 9 degrees. Approach speeds in the final segment should be 70 knots.

- The impact of tailwind was estimated from subject pilot observation and comment. The effects of tailwind on deceleration performance while executing steep VSDAs, should be evaluated and considered in IAP criteria.

2.3 ASSESSMENT OF CURRENT TERPS CRITERIA FOR THE VISUAL SEGMENT FOR HVSE II TESTS.

FAA Order 8260.42A is the current FAA helicopter TERPS criteria (see section 1.3), which establishes a minimum MAP to heliport distance at 0.3 nautical miles (nm) and a maximum VSDA of 10.2 degrees. It should also be noted that if the VSDA exceeds 6.0 degrees, the IAP must be published as a Special. Table 1 provides a summary of minimum MAP to heliport distances, VSDA, and rate of descent (ROD) relationships. As per Section 1.1 (1) of FAA Order 8260,42A, an early assessment of the current minimum MAP to heliport distance of 0.3 nm, maximum VSDA of 10.2 degrees, and maximum VSDA 6.0 degrees for public procedures was necessary for the development of realistic visual segments to be flown during HVSE II testing. It was determined that 0.3 nm does not provide adequate distance to decelerate and descend and that a maximum VSDA of 10.2 degrees is too steep.

PinS policy (see section 1.3) does not address the minimum MAP to heliport distance. It does, however, reduce the maximum VSDA from 10.2 to 7.5 degrees and continues the visual segment OIS as VSDA-1 degree. Therefore, the PinS policy does, in effect, increase the minimum MAP to heliport distance in some, albeit not all, potential scenarios and only commensurate with the derived VSDA. It became apparent early on, that if the heliport is on a rooftop or higher terrain than underneath the final approach segment, the IAP could be developed with a MAP to heliport distance of 0.3 nm, in accordance with both PinS policy and FAA Order 8260.42A, and as stated in the preceding paragraph, it is doubtful whether the distance would be sufficient for landing.

Table 1. Summary of Height Above Landing and VSDA Relationships Using FAA Order 8260.42A Criteria

FAA Order 8260.42A (IAP can be published as public and Special/training required)							
Height Above Landing	VSDA (MAP to Heliport 0.3 nm)	Meets Criteria	Distance Required for VSDA 10.2° (note 1)	Distance Required for VSDA 10.2° at 1000 ft/min	(Min) Distance Required for VSDA 6° (note 2)	ROD (ft/min) at Min Distance for VSDA 6° (note 2 and 3)	IAP Visibility Mins (sm) (note 4)
300	9.4	No (a)	0.30	0.35	0.47	745	1/2
360	11.2	No	0.33	0.42	0.56	750	1/2
420	13.0	No	0.39	0.49	0.65	754	1/2
480	14.8	No	0.44	0.56	0.75	747	3/4
540	16.5	No	0.49	0.63	0.85	741	3/4

sm = statue miles
(a) meets max VSDA 10.2^0 / but exceeds max ROD 1000 ft/min
Note 1: to meet maximum VSDA 10.2°/all cases still exceed max ROD 1000 ft/min
Note 2: meets criteria as public procedure
Note 3: conservative estimate of average ROD based on maximum speed of 70 knots in visual segment
Note 4: based on height above landing/Table 4 of FAA Order 8260.42A

PinS policy also continues to maintain the visual segment OIS beginning at the heliport elevation at a point of 50 feet from the heliport reference point (HRP) or at the leading edge of the final approach and takeoff area (FATO), whichever is farther. Thus, with the current FAA policy, the slope of the OIS should be no greater than 6.5 degrees. The options briefly summarized in section 2.1 are available to mitigate penetrations in the OIS and are shown in table 2 as HCH 5, 10, and 20.

Table 2. Summary of Height Above Landing and VSDA Relationships Using PinS Policy

PinS Policy (IAP can only be published as Special/training required)						
Height Above Landing	HCH	VSDA (MAP to Heliport 0.3 nm)	Meets Criteria	Distance Required for VSDA 7.5°	ROD (ft/min)	IAP Visbility Mins (sm) (notes 1 and 2)
300	5	9.2	No	0.37	946	1/2
	10	9.0	No	0.37	946	1/2
	20	8.7	No	0.35	1000	1/2
360	5	11.0	No	0.45	933	5/8
	10	10.9	No	0.44	955	5/8
	20	10.6	No	0.43	977	5/8
420	5	12.8	No	0.52	808	5/8
	10	12.7	No	0.51	961	5/8
	20	12.4	No	0.50	980	5/8
480	5	14.6	No	0.59	949	3/4
	10	14.5	No	0.59	949	3/4
	20	14.2	No	0.58	966	3/4
540	5	16.4	No	0.64	984	3/4
	10	16.2	No	0.67	940	7/8
	20	15.9	No	0.65	969	7/8

sm = statue miles
Note 1: based on MAP to heliport distance/PinS Attachment 1 Landing Site (c.)
Note 2: based on FAA Order 8260.3B Section 1127(c.) minimum visibility may be interpreted to be not less than 3/4 sm

A Special PinS policy also serves to clarify that a Special PinS IAP can be developed to a noninstrument flight rules (IFR) heliport, and adopt the rationale of FAA Order 8260.3B, Section 1117 that equates MAP to heliport distance relationships to be the published visibility for the IAP (but only to a maximum distance of 10,500 feet, where the procedure becomes "proceed VFR"). The issue of MAP to heliport distance used for determining visibility minimums associated with the IAP was incorporated into these HVSE II tests. FAA PinS policy also definitively introduces the relationship between Special PinS IAPs and FAA VFR heliport design recommendations (see section 2.4).

Table 2 summarizes PinS policy and continues to show the MAP to heliport distance, VSDA, and ROD relationships. As per Section 1.1 (1) of FAA Order 8260.42A, an early assessment of the current minimum MAP to heliport distance of 0.3 nm and maximum VSDA of 7.5 degrees for PinS IAPs was necessary for the development of realistic visual segments to be flown during HVSE II testing. It was determined that 0.3 nm does not provide adequate distance to decelerate and descend, and that the maximum VSDA of 7.5 degrees is possibly correct for MAP to heliport distances beginning at 0.45 nm for the typical minimum MDA of 360 feet (250′ ROC + 100′ trees rounded up to the next 20′).

One of the main purposes of the HVSE II tests was to collect data to determine whether FAA Order 8260.42A and PinS policy are correct when pertaining to the minimum MAP to heliport distance and VSDA, and to make recommendations based on the flight test results and conclusions.

2.4 ASSESSMENT OF FAA AC 150/5390-2B, HELIPORT DESIGN AND RELATIONSHIP TO SPECIAL PinS POLICY.

AC 150/5390-2B (see section 1.3) provides recommendations for heliport design and describes acceptable requirements to develop a heliport, which applies to anyone who is proposing to construct, activate, or deactivate a heliport. This AC is not mandatory and does not constitute a regulation, except when Federal funds are specifically dedicated for heliport. FAA Order 8260.42A does not alter the advisory nature of AC 150/5390-2B; however, it does require that if the criteria of the AC is waived, the procedure will be published as a Special IAP.

Attachment 1 of PinS policy is more stringent and requires both General and Procedure Specific evaluations of heliports. The General evaluation requires that "Before designing a special IFR helicopter GPS PinS approach, ensure the heliport meets the following criteria:" a finding of no objection; "conditional," but the conditions have been resolved; and in the event an objection determination was issued (and not resolved), no IFR procedure shall be developed. Subsection b. of the General evaluation section clearly establishes that "The 8:1 surface detailed in AC 150/5390-2B may not be penetrated;" thereby establishing FAA heliport design recommendations as a criteria for a PinS IAP to be approved. The General evaluation is routinely performed by an aviation safety inspector after the heliport owner has filed FAA Form 7480-1 Notice of Proposed Landing Area per 14 CFR Part 157. The Procedure Specific evaluation is primarily an evaluation of the visual segment area.

AC 150/5390-2B recommends (PinS policy, therefore, requires) that the approach/departure area should be free of hazards to navigation. While there are some differences between General Aviation/public, private/PPR, and hospital heliports, the 8:1 approach/departure path remains constant for all heliports. These approach/departure areas begin at the edge of the FATO and slope upward at an 8 to 1 ratio (8:1 ratio of horizontal to vertical). In angular terms, the 8:1 slope is 7.125 degrees above a level plane originating at the heliport elevation. AC 150/5390-2B was unchanged from 150/5390-2A regarding the 8:1 approach/departure area, and creates an OIS for the heliport, which equates to a slope of 7.125 degrees that extends outward 4000 feet horizontally to a width of 500 feet.

It also should be noted that the only known obstacle-free area for any candidate VFR heliport to receive a PinS IAP is reported as either meeting the 8:1 or not meeting the 8:1. Inspection reports do not establish site-specific slopes based on actual obstacles, and therefore, even for a heliport that has a General evaluation report filed with no objection only guarantees the heliport 8:1 approach area is clear of obstacles. Therefore, if applying the OIS for the visual segment at VSDA-1 to this surface would require a VSDA of 8.125 degrees (7.125 degrees from the AC plus 1 degree from PinS policy) to remain within this only known obstacle-free surface.

2.5 TYPICAL OPERATIONAL LIMITS FOR VISIBILITY.

FAA Order 8260.3B Section 1127 establishes the minimum approach visibility for a PinS approach is 3/4 statute miles (sm). Table 3 is a copy of table 25 from the Order. The table shows the visibility, based on height above landing (HAL), for approaches to a landing area (heliport) within 2600 feet of the MAP.

Table 3. Effect of HAL Height on Visibility Minimums, Par 1127a

HAL	250-600 ft	601-800 ft	More Than 800 ft
Visibility Minimum (mi)	1/2	3/4	1

FAA Order 8260.42A restates the minimum visibility for PinS approaches of 3/4 SM when the landing is not within 2600 feet of the MAP and to base visibility minimums on HAL for approaches to a landing area within 2600 feet in table 4 from that document.

Table 4. Effect of HAL Surface Elevation on Visibility Minimums

HAL	205-475 ft	476-712 ft	713-950 ft	Above 950 ft
Visibility Minimum (mi)	1/2	3/4	1.0	Visibility = HAL-TAN 10.2° from helipoint to plotted position of MAP ÷5280′; rounded to next higher 1/4 mile visibility increment.

PinS policy establishes the minimum visibility based upon the MAP to heliport distance. The HVSE II test used the PinS policy rationale that visibility would be based upon the MAP to heliport distance for its test approach procedures, and that the MAP location should commensurate with the reportable visibility distance. The application of reportable visibility minimums and final test IAPs is explained in greater detail in section 3.4.

3. APPROACH TO PLANNING AND DESIGN OF HVSE II FLIGHT TEST.

In preparation for the HVSE II, the FAA determined that the

- FAA Airport and Aircraft Safety Research and Development Division (AJP-6300) would manage the HVSE II project.
- FAA Sikorsky S-76A would be (the only aircraft) used for the flight tests.
- HVSE II testing would take place at the research heliport located at the FAA William J. Hughes Technical Center, Atlantic City International Airport, NJ.
- FAA would provide data collection of helicopter position during the tests using the GPS-based TSPI system.
- FAA would provide research pilots from the Flight Program Group to support the flight tests as project safety pilots.

To support the HVSE II flight tests, the FAA contracted with Hickok & Associates (H&A), Orange Beach, AL. A summary of H&A's tasks are as follows:

- Develop a HVSE project plan

- Develop flight test procedures and pilot guidance training documents for flight tests using the FAA William J. Hughes Technical Center S-76A

- Monitor instrument approach flight tests conducted by the Flight Program Group

- Reduce and analyze flight test data

- Develop draft and final HVSE Phase II project report

3.1 DEVELOPMENT OF THE HVSE II PROJECT PLAN.

In the project plan, H&A laid out the major technical and programmatic elements of HVSE II. The technical elements covered essentially the same discussions as those contained in section 2. The program elements identified key project personnel, a work breakdown structure, a proposed schedule, risk areas, funding estimates by work breakdown structure element, and estimates of the number of test approaches that could be performed given the project schedule and funding constraints. The estimate for the number of approaches ranged from 150 to 200. The project plan was delivered to the FAA in March 2005.

3.2 DEVELOPMENT OF THE HVSE II TEST PLAN.

Development of the HVSE II test plan was performed in three steps: a draft test plan, an FAA review and comment, and a final test plan. The draft test plan was delivered to the FAA in July 2005.

Key elements of the draft test plan were as follows:

- FAA project management: AJP-6300 supported by HVSE oversight team (Flight Standards Service, Aircraft Certification Service, Airport and Aircraft Safety Research and Development Division, and the Flight Program Group)

- Test aircraft: FAA Sikorsky S-76A

- Key aircraft systems: GPS navigation receiver capable of operating with 0.3 nm cross-track sensitivity

- Test heliport: FAA research heliport located at the FAA William J. Hughes Technical Center, Atlantic City International Airport, NJ

- Subject pilots: IFR-rated helicopter pilots from industry with some Sikorsky S-76 experience

- Project pilot: FAA research pilot who will act as a safety pilot on each flight and be the pilot-in-command

- Approach procedures: RNAV (GPS) approach procedures specifically designed by H&A to achieve a specific VSDA and MAP to heliport distance

- Test matrix describing test conditions and number of approaches for each subject pilot
- Preliminary flight testing: shakedown testing to determine test readiness conditions
- Data collection test schedule: day-by-day schedule showing what approach procedures will be flown by the subject pilots for data collection
- Subject pilot questionnaires:
  - Subject pilot's general qualifications and experience
  - Postapproach questionnaire—short questionnaire to be filled out after each approach
  - Posttest questionnaire—comprehensive questions to be filled out at the completion of the subject pilot's complete set of approaches
- Digital data collection:
  - TSPI precision location and altitude of aircraft
  - Aircraft systems data recorded from aircraft's flight management system (FMS)
- Manual data collection: flight test engineer data log to capture in-flight events
- Data processing: minimum set of parameters to be produced from TSPI and FMS data
- Data reduction: example analysis parameters and graphics of results
- Products from flight testing: final report—draft and final report

3.3 SIKORSKY S-76A AVAILABILITY.

After submittal of the draft test plan, it was learned that the FAA Sikorsky S-76A would be down for maintenance for an undetermined period of time. At this point in time, the HVSE II project was placed on hold until the test helicopter would be available.

3.4 THE HVSE OVERSIGHT TEAM MEETING.

Work on the HVSE II project resumed in December 2005 when the FAA AJP-6300 project manager convened a meeting of the HVSE oversight team to review the draft test plan. Key decisions from this meeting were:

- Revise the test matrix to reflect a greater emphasis on statistical significance and lesser emphasis on covering a broad range of VSDAs and MAP to heliport distances. The original test matrix in the draft test plan followed the recommendation of the HVSE I report and presented a broad range of VSDAs and MAP to heliport distances. This resulted in only 15 flights for each combination of VSDA and MAP to heliport distance.

The desired sample size was increased to at least 50 approaches with the same VSDA and MAP to heliport distance.

- Eliminate all night approaches. The FAA heliport is not currently equipped for night operations. Additionally, the HVSE II test is designed to evaluate the subject pilot and helicopter performance in the visual segment, neither of which is affected by lighting. The subject pilot's inability to identify enough queues to perform a night approach in the visual segment is a lighting issue not a visual segment performance issue.

- Tailwind conditions should be considered in the test execution.

- Simplify the postapproach questionnaire to make it easier for subject pilots to answer the questions while on the heliport at the conclusion of the approach.

H&A updated the test plan to accommodate these decisions. A second test matrix was developed with a single VSDA (8.13 degrees) and two MAP to heliport distances (0.55 and 0.65 nm). This VSDA was selected to be compatible with heliport protected surfaces of 8:1. The two MAP to heliport distances, 0.55 and 0.65 nm, were selected to represent the full distance range of 3/4 sm visibility. Also, for two approach procedures, the test matrix identified use of a visual descent point (VDP) located at an ATD point. This resulted in four approach procedures identified as Z, Y, X, and W. The updated test plan was accepted by the FAA, and the shakedown testing was scheduled for February 2006.

3.5 RESULTS FROM HVSE SHAKEDOWN TESTING—FEBRUARY 2006.

On February 14 and 15, 2006, HVSE II shakedown tests were performed using FAA pilots as the subject pilots. Following the shakedown testing, a meeting of the FAA HVSE oversight team, chaired by the FAA project manager, produced the following changes to the HVSE test plan:

- FAA subject pilots expressed concern with the Z approach procedure. This procedure had the MAP located 0.55 nm from the heliport and an ATD of 0.21 nm. Subject pilots indicated they had too little time to decelerate the aircraft while flying this approach procedure. Because there are no real operational benefits of the Z approach procedure, when compared with the Y approach procedure, and because of the FAA subject pilots' concern, the oversight team decided to eliminate the Z approach procedure from further testing.

- The test schedule called for approach procedures to be flown over a 2-week period in early May 2006. Approaches would be flown daily on Monday through Thursday with Friday being a maintenance day for the aircraft. Two subject pilots would fly 12 approaches each day, which provided for 16 subject pilots. The approaches were divided into two sorties, morning and afternoon. During the morning sortie, the first subject pilot would fly six approaches. The aircraft would return to the ramp and the second subject pilot would replace the first subject pilot. The second subject pilot would then fly six approaches. The afternoon sortie followed this same pattern. If fully executed, this plan would produce a total of 192 approaches with each W, X, and Y approach procedure being flown 64 times. The approach procedure sequence would be adjusted in a pseudo-

random manner so that the subject pilot would see a different sequence after each set of three approaches (e.g., a WXY sequence would be followed by an XYW sequence) and no two identical approach procedures followed each other (e.g., XX, YY, and ZZ sequences were not allowed).

- The FAA William J. Hughes Technical Center project pilots stated that HVSE subject pilots should have some Sikorsky S-76A model experience. They recommended that a question be added to the pretest questionnaire regarding Sikorsky S-76A model experience.

- The HVSE oversight team discussed autopilot use during the instrument portion of the HVSE test approaches. The oversight team decided that use of the autopilot should be allowed for those subject pilots who normally used the autopilot during instrument approaches (i.e., those subject pilots whose operational specifications (Ops Specs) permitted autopilot use). The oversight team recommended that a question be added to the pretest questionnaire regarding approved use of autopilot during instrument approaches.

- The instrument portion of the tests will be flown at 80 knots ground speed to emulate the effect of a 70-knot airspeed and a 10-knot tailwind.

- The minimum practical HAL area value achievable in GPS procedure design is 300 feet. This is based on a required obstruction clearance of 250 feet plus an allowance of 50 feet to account for obstacles in the approach airspace. The maximum beneficial HAL is about 600 feet. Experience has shown that values above 600 feet produce little economic benefit for helicopter operators. When subjected to other requirements identified herein, the HAL values for the test scenarios range from 299 to 569 feet. When flown at the FAA William J. Hughes Technical Center heliport, this produced MDA ranging from 355 to 625 feet.

- Test cases were designed to produce an average deceleration rate ranging from 0.07 to 0.08 g and an average descent rate ranging from 400 to 600 feet per minute.

- The updated test plan provided adequate testing at each flight condition to produce statistically significant results.

- Excessive descent rates (in excess of 1000 feet/minute) are unacceptable.

- Excessive pitch attitudes that cause the subject pilot to lose visual with the heliport environment are unacceptable.

Table 5 identifies the test matrix, which achieved the above-stated requirements for HVSE II flight-testing. A graphical presentation of the three test cases in table 5 is shown in figure 2. Appendix D shows the approach plates for the three test cases (W, X, and Y). H&A developed test approach procedures to a 145-degree approach course and a 310-degree approach course. This permitted flexibility in the choice of approach directions and allowed data collection in some tailwind conditions per the HVSE I recommendation.

Test case Y evaluates the use of an ATD to allow sufficient distance to decelerate the helicopter in the visual segment while accommodating lower HAL values. Test case X evaluates more aggressive deceleration schedules with the MAP located at 0.55 nm to the heliport. Test cases X and W locate the MAP on the VSDA slope and, therefore, do not use an ATD. These cases will test higher rates of descent needed to achieve a 5-foot HCH.

Table 5. The HVSE II Test Matrix

Test Case	MDA (ft)	HAL (ft)	MAP-HRP* (nm)	VSDA (degrees)	Ground Speed (knots)	ATD (nm)	Deceleration Time^ (seconds)
Y	355	299	0.65	8.13~	80	0.31	15.9
X	540	484	0.55	8.13	80	—	—
W	625	569	0.65	8.13	80	—	—

*0.55 to 0.65 nm equals range of 3/4 statue miles visibility
^ at 70 knots (average 80 to 60 knots deceleration at MDA)
~ VSDA measured from ATD point

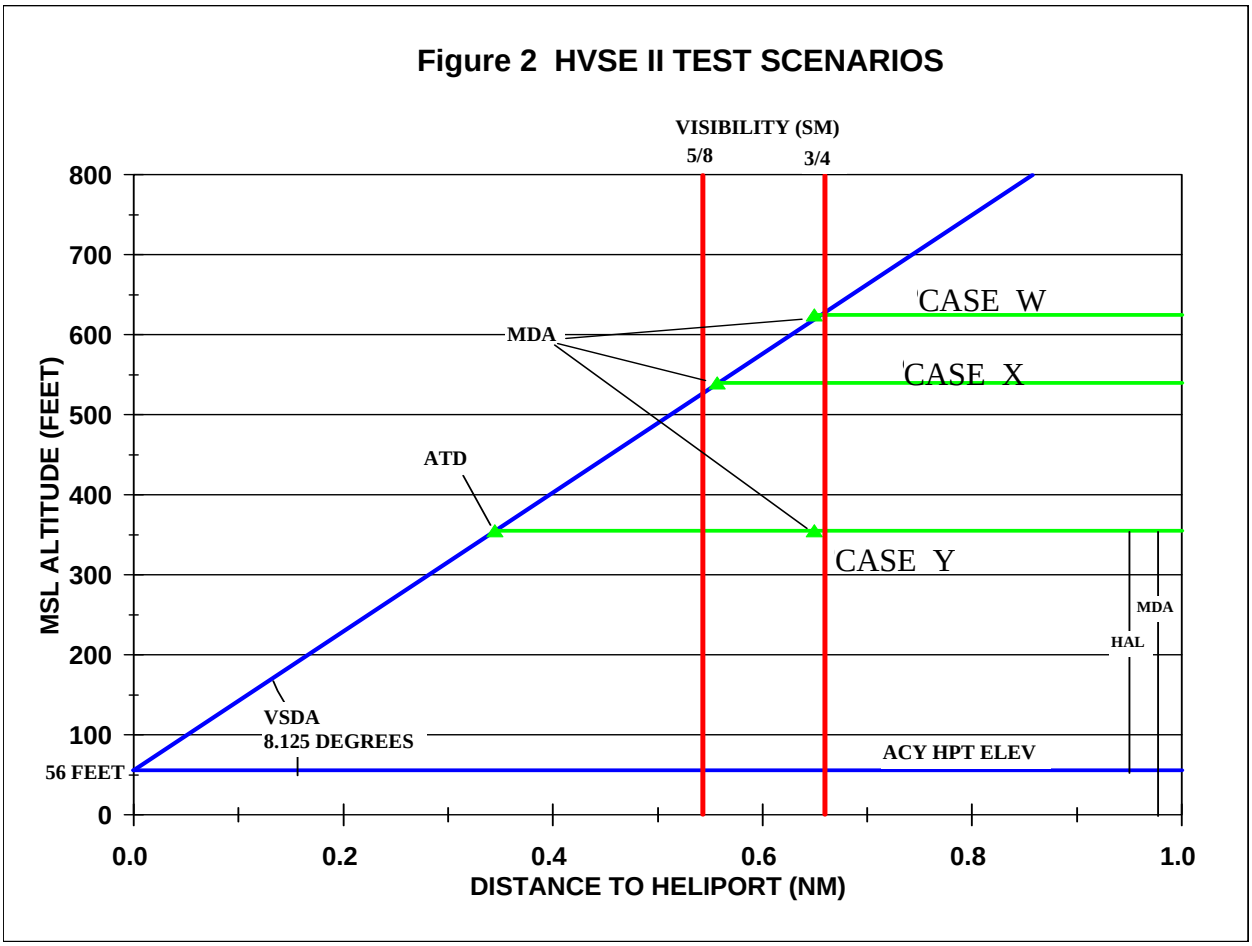


Figure 2. The HVSE II Test Scenarios

To achieve a HAL value of 299 feet (MDA = 355 feet), with the MAP located at 0.65 nm, requires that an ATD be used for test case Y. The ATD value is 0.31 nm. For this test case, the subject pilot will proceed visually from the MAP to the ATD at the MDA while decelerating the helicopter. At the ATD point, the subject pilot will begin descent from MDA while continuing to decelerate to achieve a 5-foot hover height over the heliport.

4. ANALYSIS AND RESULTS.

4.1 SUBJECT PILOT DATA.

Sixteen subject pilots participated in the HVSE II flight tests. The subject pilots provided background information prior to being selected for the HVSE II tests. All subject pilots were instrument-rated and represented a cross section of the helicopter industry. The subject pilots also had a broad range of flying experience, IFR experience, and Sikorsky S-76 experience. A summary of the most relevant subject pilot data is contained in the first ten columns of table 6. Detailed statistical summaries and graphical presentations of subject pilot experience data are contained in appendix A, pages A-2 thorough A-5.

Fifteen of the subject pilots flew a full test complement of 12 approaches (4 W, 4 X, and 4 Y approach procedures). Due to a schedule conflict, subject pilot P15 could only fly during the morning sortie, so this subject pilot flew only six approaches (2 W, 2 X, and 2 Y approach procedures). The total approach count for HVSE II is 186 (62 W, 62 X, and 62 Y approach procedures).

At the conclusion of each approach, the subject pilots completed the postapproach questionnaire. These eight questions were designed to capture the subject pilot's thoughts regarding the safety and ease of flying the approach while these thoughts were fresh in the subject pilot's mind. Detailed statistical summaries and graphical presentations of the postapproach questionnaire data are contained in appendix A, pages A-6 through A-13. The graphs on pages A-6 through A-9 pertain to all 186 approach procedures flown during the tests. The graphs on pages A-10 though A-13 are broken down according to the approach procedure flown (W, X, or Y). Key results from the postapproach questionnaires are:

- Of 186 approaches, 181 (97.3 percent) achieved a successful landing or hover over the heliport.
- Of 186 approaches, 173 (93.0 percent) subject pilots claim to be completely comfortable during the landing portion of the approach.
- Of 186 approaches, 184 (98.9 percent) were rated safe or moderately safe; 165 (88.7 percent) were rated safe; 19 (10.2 percent) were rated moderately safe.
- About 75 percent of the approaches were rated not difficult in decelerating to land.
- About 75 percent of the approaches were rated not difficult in descending to land.

- The Y approach procedure, which used the ATD point, was rated higher (higher percentage rating) than the W and X approach procedures as being rated completely comfortable, safe, not difficult to decelerate, and not difficult to descend.

Each subject pilot completed the posttest questionnaire at the conclusion of their last test flight. This questionnaire provided subject pilots with the opportunity to summarize their overall impressions of the visual segment testing and to comment on all aspects of their test experience. This questionnaire contained 16 questions covering areas of experience with IFR approaches to heliports, orientation and preparation for participating in the HVSE II project, safety of the procedures, training requirements for steep approaches, realism of the HVSE test environment, and benefits for their flight operations.

Answers to five key posttest questions by subject pilots are included in columns 15 through 19 in table 6. Graphical presentations of all the posttest questionnaire data are contained in appendix A, pages A-14 through A-29. Commentary provided by the subject pilots regarding the topic covered by the question is included below the graphical presentation. Results from important posttest questions not included in table 6 include:

- Out of 11 subject pilots, 8 answered that "no" special aircrew training was needed for the test approaches; 3 answered that "yes" special aircrew training should be required. Note that only subject pilots who flew instrument approaches to heliports routinely or occasionally were asked to answer this question.

- All 16 subject pilots strongly agreed that the initial subject pilot briefing, the familiarization flight, and the pretest activities prepared them to be a subject pilot in the HVSE II project.

- Ten subject pilots strongly agreed that the MAP and visual segment transition point were about where they should be; five moderately agreed and one was neutral.

- Nine subject pilots strongly agreed that the HVSE test environment was a realistic representation of IFR operations at heliports; three moderately agreed, three were neutral and one generally disagreed. Comments indicated that two subject pilots felt that most heliports have more obstacles in and around the landing site than provided by the FAA William J. Hughes Technical Center heliport.

- Ten subject pilots strongly agreed that the IFR helicopter pilots they knew or work with could operate safely using the HVSE approaches; five moderately agreed and one was neutral.

Table 6. Subject Pilot Summary Sheet

Subject Pilot No.	Pretest Questionnaire/Pilot Data										Frequency the Subject Pilot Flies Copter IFR Approaches to a Heliport	Number-Type of Test Approaches Subject Pilot Aborted Landing	Number-Type of Test Approaches Pilot was Not Completely Comfortable	Overall Safety Rating of Visual Transition: (Safe, Moderately Safe, or Unsafe)	Subject Pilot's Overall Comfort Level Rating During Transition to Landing: (Low, Moderate, or High)	Pilot's Comparison of Test vs other Copter RNAV IAPs to a Heliport		
	Type Flight Operations Subject Pilot Normally Flies	Helicopter IFR Flight Hours (Actual Instrument and Hood)	Number of Helicopter Approaches Flown in Previous 6 Months	Total Helicopter Flight Hours	Total Flight Hours	Helicopter Pilot Ratings	Does Subject Pilot Normally Use Autopilot During IFR Approaches	Flight Hours in S-76 (all models)	Flight Hours in S-76 (A-Model)	Helicopter Make and Model Subject Pilot Usually Flies (present job)						Overal Level of Effort of Visual Transition on Test Approaches	Overal Pilot Workload of Visual Transition on Test Approaches	Test Approaches vs Should Require Special Aircrew Training
P01	Corporate Part-91	1225	10	9,600	10,100	ATP CFII	Yes	6000	2000	S76B	Never	0	0	Safe	High	N/A	N/A	N/A
P02	EMS Part-135	510	0	9,435	12,640	ATP CFII	Yes	680	680	BO105	Seldom	0	0	Safe	High	Low	Low	No
P03	Corporate Part-91	300	8	4,800	5,500	ATP	Yes	3800	2200	S76B	Seldom	0	0	Safe	High	Low	Low	No
P04	EMS Part-135	114	10	7,923	10,578	ATP	No	294	80	AS350	Seldom	0	0	Safe	High	Moderate	Low	No
P05	Corporate Part-91	514	10	8,003	8,066	ATP	Yes	4397	585	S76B	Routinely	1-W	1-W	Safe	High	Low	Low	No
P06	Corporate Part-91	154	15 (sim)	5,000	5,000	ATP	Yes	4800	3600	S76B S76C+	Seldom	0	0	Safe	High	Moderate	Moderate	No
P07	Corporate Part-91	264	4	5,289	5,289	ATP	Yes	1147	285	S76B S76C+	Seldom	0	2-W, 2-X 1-Y	Moderately Safe	Moderate	Moderate	Low	Yes
P08	EMS Part-135	165	10	6,250	8,230	ATP CFII	No	1450	1450	S76A	Seldom	0	0	Safe	High	Low	Low	Yes
P09	EMS Part-135	1200	45	14,480	14,500	ATP	Yes	5800	4500	S76C+	Never	0	0	Safe	High	N/A	N/A	N/A

Table 6. Subject Pilot Summary Sheet (Continued)

Subject Pilot No.	Pretest Questionnaire/Pilot Data										Frequency the Subject Pilot Flies Copter IFR Approaches to a Heliport	Number-Type of Test Approaches Subject Pilot Aborted Landing	Number-Type of Test Approaches Pilot was Not Completely Comfortable	Overall Safety Rating of Visual Transition: (Safe, Moderately Safe, or Unsafe)	Subject Pilot's Overall Comfort Level Rating During Transition to Landing: (Low, Moderate, or High)	Pilot's Comparison of Test vs other Copter RNAV IAPs to a Heliport		
	Type Flight Operations Subject Pilot Normally Flies	Helicopter IFR Flight Hours (Actual Instrument and Hood)	Number of Helicopter Approaches Flown in Previous 6 Months	Total Helicopter Flight Hours	Total Flight Hours	Helicopter Pilot Ratings	Does Subject Pilot Normally Use Autopilot During IFR Approaches	Flight Hours in S-76 (all models)	Flight Hours in S-76 (A-Model)	Helicopter Make/Model Subject Pilot Usually Flies (present job)						Overal Level of Effort of Visual Transition on Test Approaches	Overal Pilot Workload of Visual Transition on Test Approaches	Test Approaches vs Should Require Special Aircrew Training
P10	Corporate Part-91	890	6	5,250	5,500	ATP	Yes	2000	0	S76B	Routinely	0	1-W	Safe	High-Y&W Moderate-X	Moderate	Moderate-Y&W High-X	Yes
P11	Corporate Part-91	275	9	10,015	10,015	ATP CFII	Yes	2500	200	S76C+	Seldom	0	0	Safe	High	Moderate	Low	No
P12	Corporate Part-91	630	10	6,900	7,000	ATP	Yes	5000	200	S76C+	Never	0	0	Safe	High-Y&W Moderate-X	N/A	N/A	N/A
P13	Corporate Part-91	1500	6	8,000	13,338	ATP	Yes	1500	1500	S76A	Never	0	2-X	Safe	Moderate	N/A	N/A	N/A
P14	Corporate Part-91	142	0	2,755	2,865	ATP	Yes	1096	0	S76C+	Never	1-X	1-X	Moderately Safe	High	N/A	N/A	N/A
P15	Corporate Part-135	300	15	18,000	20,500	Com.Rcraft Instrument	Yes	3100	2000	S76B	Routinely	1-W, 1-X	1-W, 1-X	Safe	High	Low	Low	No
P16	Acft Mfctr. Pilot	110	15	1,300	1,300	Com.Rcraft Instrument	No	15	5	S70,S76 S92	Never	1-W	1-W	Safe	High	N/A	N/A	N/A

4.2 DIGITAL DATA COLLECTION.

The TSPI system provided very accurate aircraft position data at 1-second increments during the HVSE approaches. The TSPI provides aircraft position in latitude, longitude, and altitude format. The TSPI data has to be further processed to provide useful data for HVSE analysis. H&A developed algorithms and software to produce the HVSE analysis data. In summary, the software developed by H&A preformed the following operations:

- Converted aircraft latitude and longitude to aircraft position measured in nm east and north of the heliport (west and south positions are negative values). These data were used to develop the plan view of aircraft position with regard to the heliport.

- Converted aircraft altitude with reference to GPS ellipsoidal altitude to altitude (feet) above mean sea level (MSL) and the HAL (feet) area of the FAA William J. Hughes Technical Center heliport. Calculated the aircraft distance (nm) to the heliport. This distance and the MSL altitude were used to develop the profile view of aircraft position with regard to the heliport.

- Converted successive latitude and longitude position values to ground speed (knots) by using numerical techniques for mathematical differentiation. The differentiation process introduced some noise into the ground speed calculation. The effect of this noise was mitigated by smoothing the ground speed output. The smoothing technique used was to average the ground speed output over 11 seconds using the output value in question, the five prior values, and the five following values.

- Converted successive aircraft altitude values to vertical ROD (feet per minute) by using numerical technical techniques for mathematical differentiation. A smoothing process analogous to that used for ground speed was used to smooth the vertical ROD values.

- Converted ground speed values to horizontal deceleration values (g's) using numerical techniques for mathematical differentiation. Unfiltered ground speed data were used as inputs for this calculation. The output deceleration values were smoothed using a process analogous to that used for ground speed.

- Converted ROD values to vertical deceleration values (g's) using numerical techniques for mathematical differentiation. Unfiltered ROD data were used as inputs for this calculation. The output vertical deceleration values were smoothed using a process analogous to that used for ground speed.

- Estimated the change in pitch attitude of the helicopter rotor system from horizontal deceleration. The change in pitch attitude (degrees with pitch up being positive) was calculated as the arctangent of the horizontal deceleration measured in g's).

- Calculated the angle from the heliport to the aircraft (degrees) by taking the arctangent of the ratio of the HAL value and the distance to the heliport (measured in feet).

The TSPI system provided useable data for 183 of the 186 approaches. On three approaches for subject pilot P03 on May 2, the TSPI system failed to provide useful data. This occurred on approaches three, five, and six, which were two X approach procedures and one Y approach. The failure of the TSPI system was not recognized until the data was processed overnight by the FAA William J. Hughes Technical Center data acquisition staff. The problem was traced to a failure of the airborne TSPI receiver to receive signals from the GPS satellites during some portions of the morning sortie. This problem was researched by the FAA William J. Hughes Technical Center technical staff. They recommended cleaning the aircraft TSPI antenna on a daily basis to remove any soot from the engine exhaust that may have accumulated. This procedure was followed during the remaining days of testing and the loss of data problem did not reoccur.

Note: In normal operation, the proper functioning of the airborne TSPI receiver is not readily available to the aircrew or the flight test engineers.

Digital data from the aircraft FMS was also recorded from an ARINC 429 databus. These data were processed using five software modules provided by the FAA William J. Hughes Technical Center. This processing produced the following FMS parameters useful to the HVSE project:

- Barometric (baro) altitude
- True airspeed
- FMS ground speed
- True heading
- True track
- Outside air temperature
- Active waypoint
- Wind speed
- Wind direction

Inspection of the baro altitude and true airspeed values indicated that these values required some filtering to provide useful data. A low pass filter with a 5-second time constant was applied and the resultant output was sufficiently smooth for graphical presentations. Further processing was applied to the wind speed and wind direction to produce tailwind and crosswind components of wind with respect to the approach paths used in the HVSE project.

Note: Many output parameters are available from the FMS digital data output. The nine parameters listed above were the parameters most useful to the HVSE project.

The processed TSPI data were used to produce graphical plots needed to describe the trajectory of the helicopter in the final and visual segments (within 2 miles of the heliport). These plots include:

- Plan view (nm north and east (south and west) of the heliport)
- Profile view (MSL altitude (feet) versus distance to heliport (nm))
- Ground speed (knots) versus distance to heliport (nm)
- Vertical ROD (feet per minute) versus distance to heliport (nm)
- Angle to the heliport (degrees) versus distance to heliport (nm)

- Change in pitch attitude (degrees) of the helicopter rotor system versus distance to heliport (nm)

- Horizontal deceleration (g's) versus distance to heliport (nm)

- Vertical deceleration (g) versus distance to heliport (nm)

These plots were developed for each of the 186 approaches flown in the HVSE II project. These plots are presented in Appendix B. Tailwind and crosswind data at the MAP were taken from the FMS and manually added to the plan view plots. Data for the winds at the heliport were taken from the flight test engineer's data log. These data were manually recorded for each approach from radio contacts with the Atlantic City tower as the helicopter turned on the base leg of the approach. The weather reports from the tower are referenced to magnetic north. These were converted to true north reference by subtracting 12 degrees magnetic declination.

Plots for the three approaches when the TSPI failed were taken from the FMS data. For these approaches, horizontal deceleration, vertical deceleration, and pitch attitude, parameters were not calculated because the FMS data was not sufficiently accurate.

4.3 SUBJECT PILOT PERFORMANCE PARAMETERS CALCULATED FROM FMS AND TSPI DATA.

A statistical analysis of subject pilot performance based on TSPI and FMS data was performed. The parameters analyzed include:

- Barometric altitude error (baro alt—MDA) at MAP (186 approaches) (from FMS data)
- Barometric altitude error (baro alt—MDA) at VDP (62 Y approaches) (from FMS data)
- Ground speed at MAP (186 approaches) (from FMS data)
- Ground speed at VDP (62 Y approaches) (from FMS data)
- True airspeed at MAP (186 approaches) (from FMS data)
- True airspeed at VDP (62 Y approaches) (from FMS data)
- Tailwind at MAP (186 approaches) (from FMS data)
- Maximum pitch attitude during approach (186 approaches) (from TSPI data)
- Maximum ROD during approach (186 approaches) (from TSPI data)

Plots of the probability density function and probability distribution function for these nine parameters are presented in appendix C. These plots reveal the following test results:

- Barometric altitude errors at MAP—a bell-shaped density function centered around zero error; a significant number of approaches (20 percent) have error magnitudes greater than ±50 feet.

- Barometric altitude errors at VDP—a bell-shaped density function centered around -12.5 feet. A significant number of approaches (25 percent) had error magnitudes greater than ±50 feet. Most error magnitudes greater than 21 percent were negative, indicating that these subject pilots descended below the MDA prior to the VDP.

- Ground speed at MAP—a bell-shaped density function centered around 77.5 knots, which is close to the target test ground speed of 80 knots. Seventy percent of subject pilots were at 80 knots or less, indicating many subject pilots were beginning to decelerate prior to arriving at the MAP.

- Ground speed at VDP—a two-humped density function with peaks at 65 and 75 knots. Fifty percent of these Y approaches were at 70 knots at the VDP, which is about 10 knots faster than desired. This indicates many subject pilots were late in decelerating at the MAP.

- True airspeed at MAP—two-humped density function with peaks at 60 and 70 knots; median true airspeed at MAP is 69 knots. When compared with ground speed at MAP, this provided an indication that many approaches were performed in tailwind conditions.

  Note: True airspeed was within 2 knots of calibrated airspeed for the temperatures, pressures, and altitudes encountered during the HVSE tests.

- True airspeed at VDP—nonuniform density function with most true airspeed values ranging from 40 to 65 knots; median true airspeed was 60 knots—another indicator that many subject pilots were late in decelerating at the MAP.

- Tailwind at MAP—almost uniform distribution of tailwind at MAP ranging from -4 knots to +20 knots; median tailwind of +7 knots confirms observation from comparison of ground speed and true airspeed that many approaches were performed in tailwind conditions.

- Maximum pitch attitude during approach—a bell-shaped density function centered around 7.0 degrees with significant occurrences of high pitch attitudes (e.g., 5 percent were 10 degrees or greater, which indicates these subject pilots were either late in beginning the deceleration or overcontrolled the pitch attitude); median pitch attitude is about 6.8 degrees; occurrence of low maximum pitch attitude likely indicated that the subject pilot was too slow at the MAP.

- Maximum ROD during approach—a somewhat bell-shaped density function centered at 900 feet per minute with more points at lower descent rates; median descent rate is about 835 feet/minute; a significant number of points (18 percent) exceed the upper limit of 1000 feet per minute indicating that some subject pilots were late in reducing torque at the MAP (W and X approach procedures) or VDP (Y approach procedures).

4.4 FLIGHT TEST ENGINEER DATA LOGS.

Flight test engineers from H&A manually recorded details of the flight including: subject pilot number, test run number, start and end times of the approach, subject pilot verbal comments, reported temperature and winds from the Atlantic City tower, aircraft weight, and other information considered pertinent by the flight test engineer or observer. Figure 3 shows notes recorded by the flight test engineers.

FPP – FAA project/safety pilot FTE – Flight test engineer SP – Subject pilot

Pilot P01 –
FTE: Subject pilot maneuvered aircraft during visual segment to land into strong left crosswind (20 kt crosswind) on approaches #1 through #8. After approach #8, FTE requested pilot to fly straight-in to heliport from MAP to simulate confined heliport environment where maneuver to land would not be possible.
SP: Pilots who are current flying these approaches could fly OK; pilots who fly these approaches only once a year would have their hands full.

Pilot P02 – No comments.

Pilot P03 – Subject pilot was given opportunity but did not want to fly any practice approaches.

Pilot P04 –
FTE: Subject pilot maintained yaw into the wind on approach to landing (e.g. crabbed into wind throughout landing rather than transitioning to wing-down 'slipping' to point the nose at the heliport), which also improved visibility to the landing area (pilot continued on a straight in path to the heliport).
FTE: Subject pilot makes significant deceleration to slow aircraft to near hover (below ETL) at about 300 feet; then carries lots of power to approach heliport very slowly. When asked about this technique, subject pilot said he was flying per company ops specs (note: pilot is from Denver, e.g. mountain flying techniques used).
FTE: Pilot chose to fly moving map display instead of CDI; need to check track accuracy as map display was not checked for calibration.
FTE: On approach #9 FPP noticed significant difference between winds aloft and surface winds indicating wind shear caused by afternoon sea breeze.

Pilot P05 –
SP: These approaches would be much easier in the S-76B.
FTE: SP waved off approach #10; indicated he could not get helicopter down through thermals.
FTE: Changed to headwind approaches on approach #10 because winds aloft indicated 20 kt tailwind.

Pilot P06 – No comments.

Pilot P07 –
FTE: Outbound on first approach, SP indicated some confusion about whether approaches were RNAV only or RNAV/VNAV.
FTE: Afternoon flights encountered wind shift from sea breeze on all approaches. Wind shifted from quartering tailwind at about 300 feet AGL to headwind.
FPP: Turn and bank indicator is stuck on full left deflection.

Pilot P08 –
SP: On approach #2 (first Y approach) SP noted that if you get the decel in at the MAP there is little transition at the VDP – slight adjustment needed, then just steady state.
SP: On approach #5 (second W approach) SP indicated he could feel the effect of the tailwind.

Pilot P09 – No comments.

Figure 3. Comments Recorded on Flight Test Engineer's Data Logs

Pilot P10 –

FTE: Subject pilot maintained yaw into the wind on approach to landing (e.g. crabbed into wind throughout landing rather than transitioning to wing-down 'slipping' to point the nose at the heliport), which also improved visibility to the landing area (pilot continued on a straight in path to the heliport).
SP: Approach #2 (first X approach) SP commented, "Helicopter doesn't want to come down."
SP: Approach #3 (first Y approach) SP commented, "Made it harder for myself – could have slowed down more."
SP: On approach #5 (second Y approach) SP commented, "This is nice," indicating positive impression of the VDP.
SP: At conclusion of testing SP indicated he likes Y approach with the VDP and ATD applied.

Pilot P11 –

FTE: On approach #1 (first X approach) SP flew with autopilot coupled. SP overshot the pad slightly (10 to 15 feet). SP commented that approach would have been better uncoupled. SP flew uncoupled on rest of approaches.

Pilot P12 –

FPP and SP: Detailed discussions about when autopilot should be couple and uncoupled with respect to MAP and VDP. SP chose to use altitude hold and decouple at MDA (W and X approaches) and VDP (Y approach).
SP: "In low minimums I would use autopilot, so will use it in the tests."
SP: On approach #3 (first X approach) SP commented, "I'd say this was kind of steep."
SP: On approach #4 (second W approach) SP commented, "Not sure I would want to be heavy."
FTE: On approaches #8 (third Y approach) and #12 (fourth Y approach) SP did not decelerate until reaching the VDP. On approach #8, ground speed at VDP was approximately 85 knots.

Pilot P13 –

FTE: SP used map display on all approaches (IFR portion).
FPP: On approach #4 (second X approach) reminded SP to watch rotor RPM. SP replied, "If you were heavy, rotor RPM would go out of sight."
FPP: On approach #5 (second Y approach) FPP reminded SP to look outside after reaching MAP and before reaching VDP.
FPP: On approach #6 (second W approach) had shift in winds at 500 feet.
FTE: On approaches #7 through #10 sea breeze caused wind shear. On approaches #11 and #12 the sea breeze reached the airport and winds were more consistent.

Pilot P14 –

FPP: On approach #1 (first X approach) SP was below minimums prior to MAP.
FTE: SP seemed to confuse being at minimums with being at MAP.
FPP: On approach #3 (first W approach) SP did not decouple autopilot at MAP.
SP: SP indicated that autopilot did not keep the CDI needle centered.
SP: SP indicated he was concentrating on speed and lost visual contact with the heliport.

Pilot P15 –

FTE: First flight was delayed about 1 hour due to low ceilings.
FPP: flew IFR segments of approach at 1200 feet in initial and intermediate segments due to low ceiling.
FTE: Approach #2 (first W approach) SP waved off approach due to SP concerns with transmission noise (whine when unloading). SP indicated he was late in decoupling autopilot and didn't decelerate soon enough. Workload was not high – just didn't decel soon enough.
SP: Approach #4 (second W approach) SP stated, "Felt good all the way."
SP: Approach #5 (second X approach) SP waved off the approach indicating that he had trouble using ground speed reference on approach due to lag in response. SP indicated he very much preferred using airspeed instead of ground speed.
SP: Approach #6 (second Y approach) SP stated, "Simple, easy approach," at conclusion of approach.

Figure 3. Comments Recorded on Flight Test Engineer's Data Logs (Continued)

Pilot P16 –
FPP: Initial and intermediate segments flown at 1000 feet due to low ceilings.
FTE: Approach #1 (first W approach) SP flew 310 heading and had to make some heading changes to remain visual. SP had needles at FAF but chose to wave off landing due to exceeding 1000 fpm in descent.

Figure 3. Comments Recorded on Flight Test Engineer's Data Logs (Continued)

4.5 DETAILED ANALYSES OF FLAGGED APPROACHES.

H&A established a set of conditions that would flag approaches requiring more in-depth analyses. The in-depth analyses were performed using the helicopter trajectory data contained in appendix B. The three conditions that would flag an approach are:

- Subject pilot aborted the landing (postapproach question 1)
- Subject pilot indicated "no" to being "completely comfortable during the landing portion of the approach" (postapproach question 3)
- Maximum ROD in the visual segment exceeded 1000 feet per minute

Using these criteria, 28 of the 186 approaches (15 percent) fell in the "flagged" category. The analysis of flagged approaches was performed by looking at the following helicopter trajectory elements:

1. Aircraft status upon arrival at the MAP (fast, slow, high, low, climbing, descending, etc.)
2. Wind (tailwind, headwind, crosswind, or wind shear)
3. Review of plots from appendix B (approach plan view, profile view, ground speed, ROD, angle to heliport, pitch attitude, horizontal, and vertical deceleration)
4. Review of answers from subject pilot's posttest questionnaire
5. Review of observer logs filled out by the flight test engineer

The analysis of flagged approaches involved interpretation of several data elements. To indicate the steps that were undertaken in this analysis, three example analyses are included. Figure 4 contains a list of the subject pilot performance events for each of the example approaches. The figure also contains useful definitions and abbreviations used in the analyses.

Figure 5 shows the analysis of approach number 48, which was subject pilot P05's first W approach procedure. The ROD for this approach exceeded 1000 ft/min by 31 ft/min.

Figure 6 shows the analysis of approach number 61, which was subject pilot P05's fourth W approach procedure. The ROD significantly exceeded 1000 ft/min for this approach (1124 ft/min), the subject pilot waved off this approach and was not completely comfortable in the visual segment.

Figure 7 shows the analysis of approach number 77, which was subject pilot P07's first X approach procedure. The ROD significantly exceeded 1000 ft/min for this approach (1113 ft/min), and the subject pilot was not completely comfortable in the visual segment. Note that the tailwind at the MAP was very high (21 knots) for this approach.

Table 7 shows the analysis of all 28 flagged approaches. Data is shown for each approach as well as findings and contributing factors. Additionally, corrective recommendations are included. The corrective recommendations fall into three possible categories: (1) no action, (2) added training requirements for the pilot, and (3) approach criteria considerations.

Pilot Performance Events for Approach # 48

- Initiated descent with power reduction and pitch-decel
- Increased power/leveled off ROD/ballooned
- Reduced power/reestablished descent
- Dropped nose/pitch; ROD increased to max; decel rate decreased
- Corrected ROD by increasing power
- Intercepted power-controlled approach profile (backside of power curve); increased pitch/decel; reduced power
- Passed through ETL/continued power-controlled approach to landing
- 80 knots ground speed visual segment entry at MAP
  +13 knots tailwind

Pilot Performance Events for Approach # 61

- Initiated descent with power reduction and pitch-decel
- Increased power; reduced ROD
- Began to climb; ballooned
- Reduced power/reestablished descent
- Dropped nose (never readjusted pitch-decel which exacerbated ROD and reduced deceleration; max ROD
- Increased power to arrest ROD; slight/insufficient nose up pitch-decel attitude
- Never decelerated below 45 knots ground speed
- Waved off landing

Pilot Performance Events for Approach # 77

- Progressive power reduction and decel-pitch
- 79 kts/gs at MAP; 21 kt tailwind increased pitch-decel/rate and max ROD requirements; became steeper/ballooned
- Intercepted/maintained power-controlled approach
- Passed through ETL/continued power-controlled approach
- Pilot seldom flies Copter RNAV (GPS) IAPs to heliports; did this one just about perfect with challenging conditions
- 0.55 NM decel distance insufficient for conditions

Definitions

- Ballooned: aircraft did not descend as intended
- Effective Translational Lift (ETL): aircraft 'decelerated' to the point where the main rotor system is in disturbed air, rotor efficiency reduced, and more power required
- Power vs. Airspeed Controlled Approach: aircraft decelerated to its landing altitude (versus maintaining higher airspeed); allows increasing collective/power which both reduces ROD and continues the deceleration due to aircraft altitude.

Abbreviations

decel - deceleration
ETL - effective translational lift
GPS - Global Positioning System
gs - ground speed
IAP - instrument approach procedure
kt/kts - knot/knots
MAP - missed approach point
NM - nautical mile
ROD - rate of descent

Figure 4. Event Description for Example Flagged Approaches

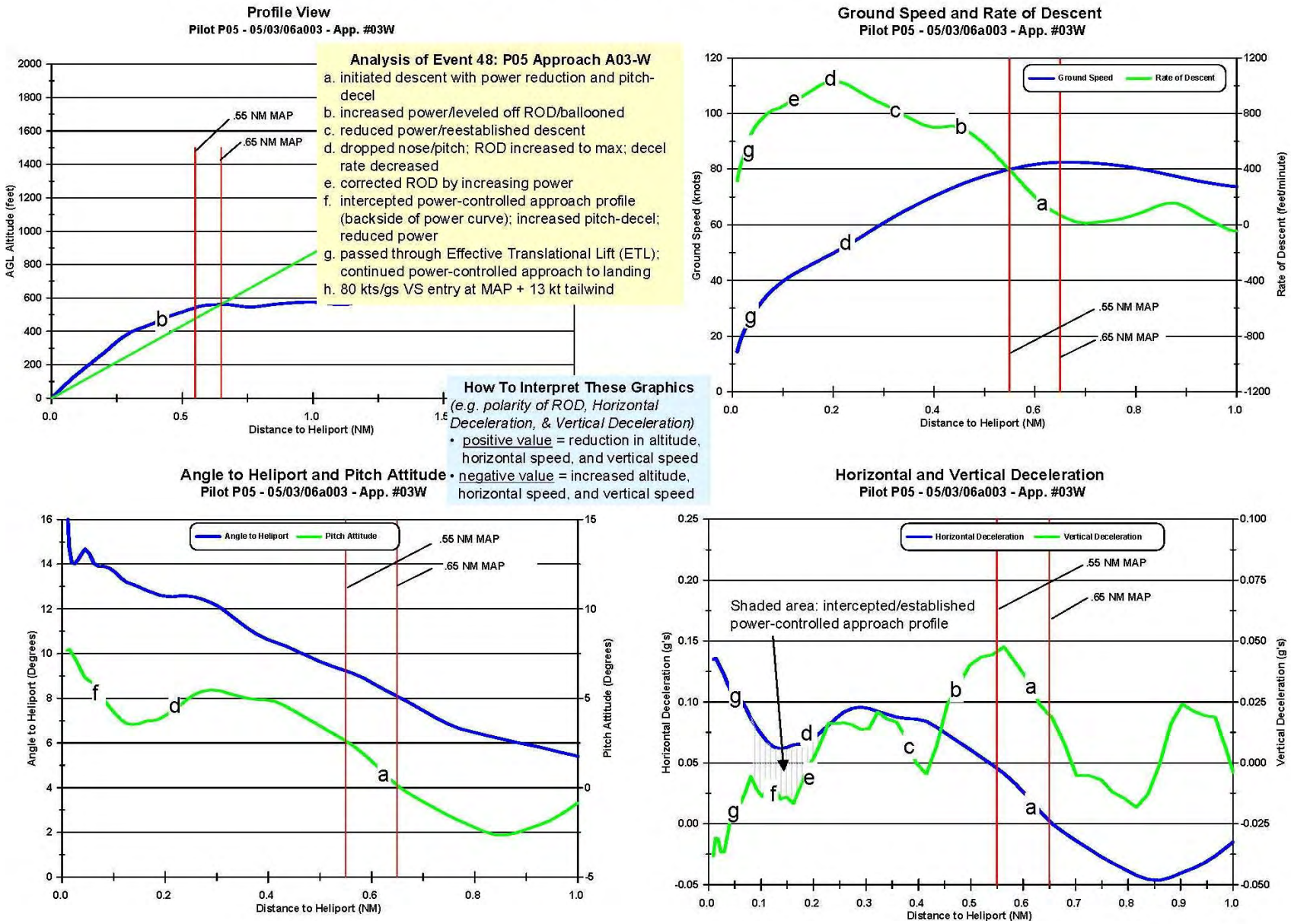


Figure 5. Graphics Analysis of Flagged Approach/Event #48 (Pilot 5 Approach #A03-W)

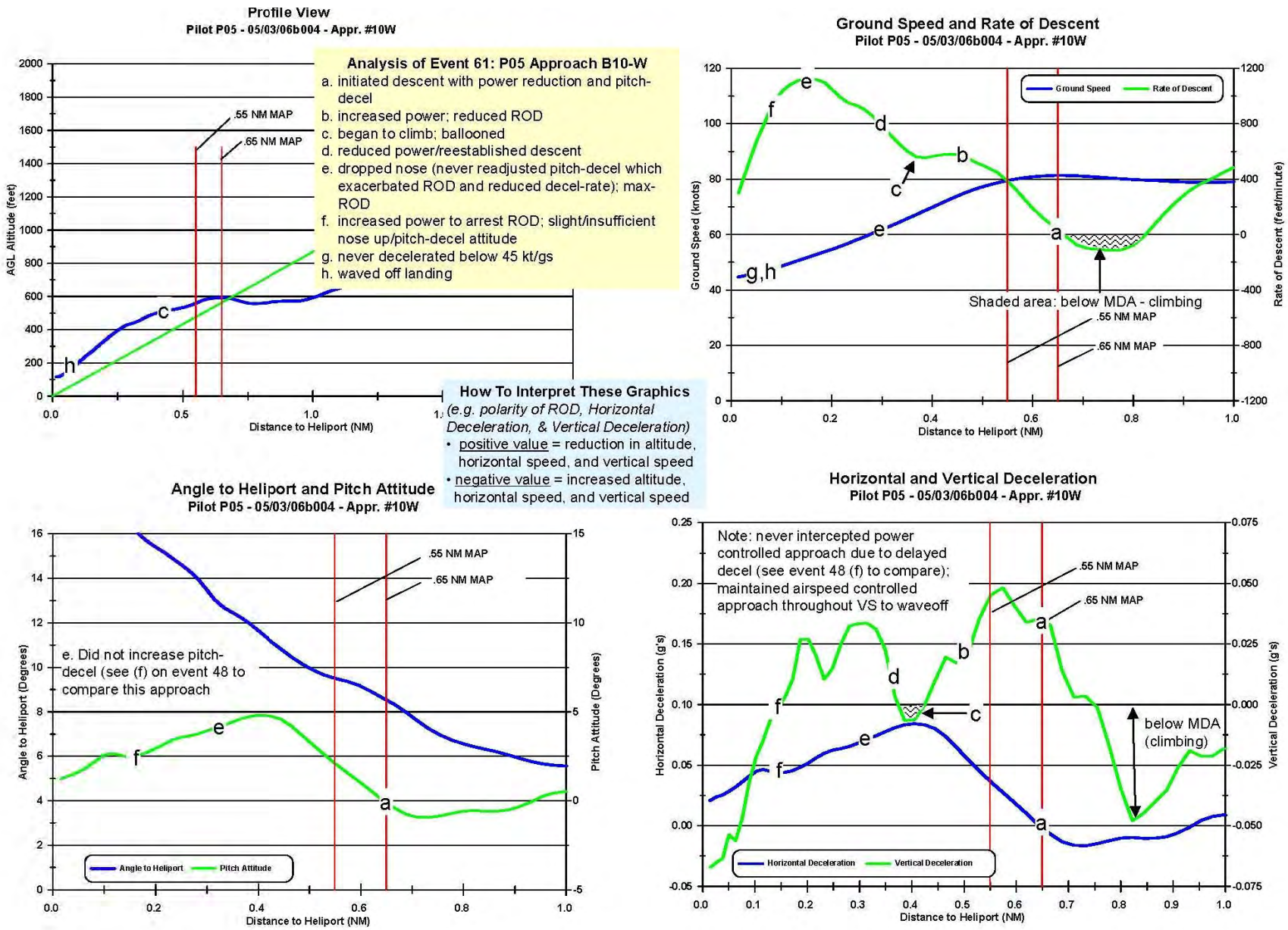


Figure 6. Graphics Analysis of Flagged Approach/Event #61 (Pilot 5 Approach #B10-W

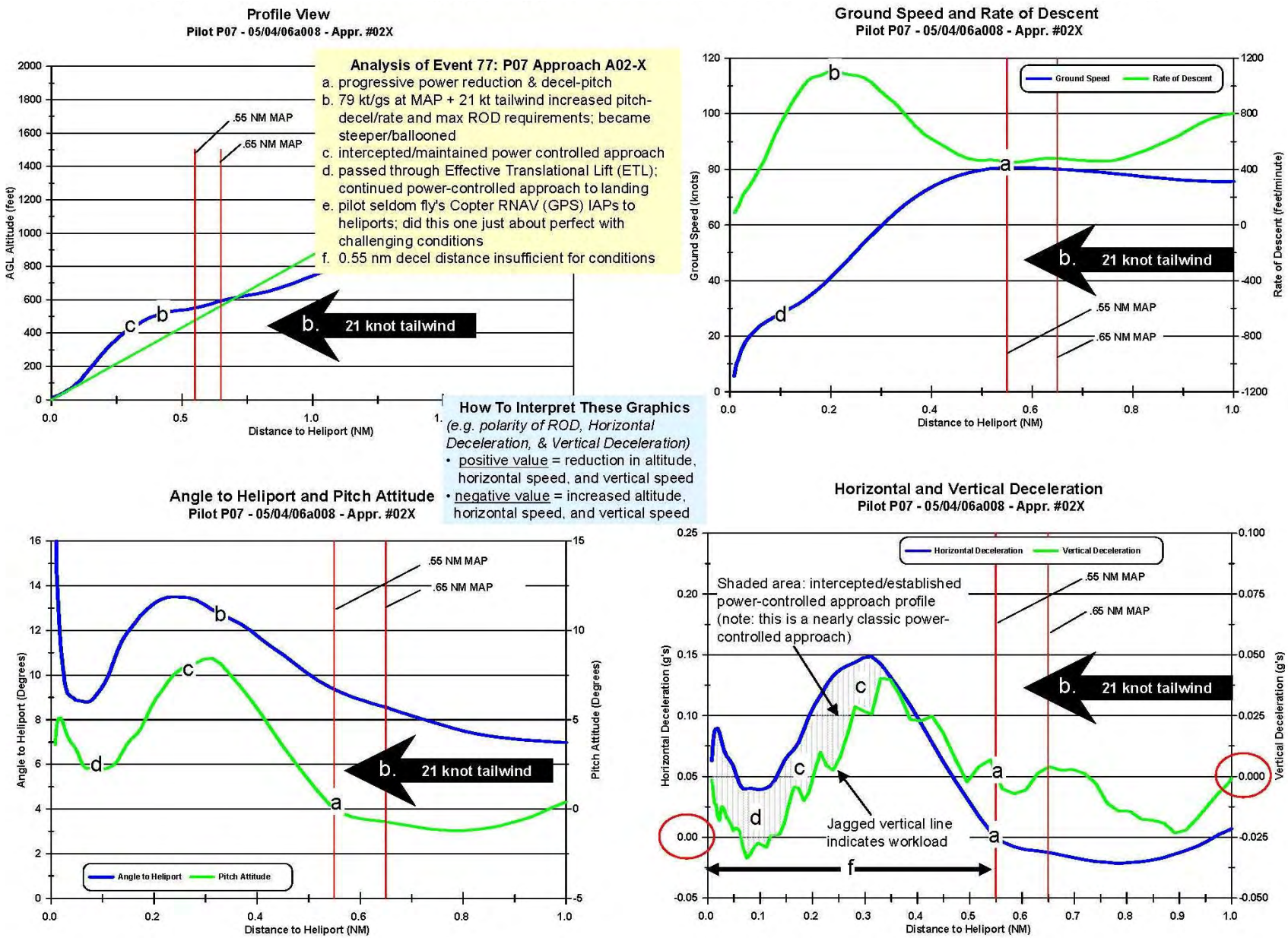


Figure 7. Graphic Analysis of Flagged Approach/Event #77 (Pilot 7 Approach #A02-X)

Table 7. Analysis of Flagged Approaches

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																			Contributing Factor			Corrective Recommendation		
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)								
Approach/Event No.	Subject Pilot No.	Type Ops Flown [1]	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings [2]	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged: (W, X, or Y)	Appendix 3 Question 1.1 [3]	Appendix 2 Question 1 [4]	Appendix 2 Question 3 [5]	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS [6]	N = None Required	T= Training Required	C = Criteria
48	P05	C1	514	10	8003	1	Y	A03	W	3	Y	Y	8	**1031**	0.14	80	-17	13	**(a)** initiated descent with power reduction and pitch-decel **(b)** increased power/leveled off ROD/ballooned[ii] **(c)** reduced power/reestablished descent **(d)** dropped nose/pitch; ROD increased to max; decel rate decreased **(e)** corrected ROD by increasing power **(f)** intercepted power-controlled approach profile (backside of power curve); increased pitch-decel; reduced power **(g)** passed through ETL[i]/continued power-controlled approach to landing **(h)** 80 kts/gs VS entry at MAP + 13 kt tailwind	Q	W			T	
61	P05	C1	514	10	8003	1	Y	B10	W	3	**N**	**N**	5	**1124**	0.08	80	-13	-3	**(a)** initiated descent with power reduction and pitch-decel **(b)** increased power; reduced ROD **(c)** began to climb; ballooned[ii] **(d)** reduced power/reestablished descent **(e)** dropped nose (never readjusted pitch-decel which exacerbated ROD and reduced decel-rate); max-ROD **(f)** increased power to arrest ROD; slight/insufficient nose up/pitch-decel attitude **(g)** never decelerated below 45 kt/gs **(h)** waved off landing	Q				T	
77	P07	C1	264	4	5289	1	Y	A02	X	2	Y	**N**	8	**1113**	0.15	79	56	21	**(a)** progressive power reduction & decel-pitch **(b)** 79 kt/gs at MAP + 21 kt tailwind increased pitch-decel/rate and max ROD requirements; became steeper/ballooned[ii] **(c)** intercepted/maintained power controlled approach[iii] **(d)** passed through ETL[i]/continued power-controlled approach to landing **(e)** pilot seldom fly's Copter RNAV (GPS) IAPs to heliports; did this one just about perfect with challenging conditions **(f)** 0.55 nm decel distance insufficient for conditions		W				C

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																								
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)				Contributing Factor			Corrective Recom'dation		
Approach/Event No.	Subject Pilot No.	Type Ops Flown [1]	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings [2]	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 [3]	Appendix 2 Question 1 [4]	Appendix 2 Question 3 [5]	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS [6]	N = None Required	T= Training Required	C = Criteria
81	P07	C1	264	4	5289	1	Y	A06	W	2	Y	N	8	928	0.14	79	5	20	**(a)** pitch-decel rate exceeded power reduction; acft 'floated'; insufficient power reduction continued; ballooned[ii] **(b)** 79 kt/gs at MAP + 20 kt tailwind exacerbated conditions; no parameters exceeded but high workload **(c)** did establish power controlled approach[ii] **(d)** pilot seldom fly's Copter RNAV (GPS) IAPs to heliports with current employer, however, previously flew as an IFR EMS Part-135 pilot and routinely performed Copter RNAV (GPS) IAPs to heliports.		W		N		
88	P07	C1	264	4	5289	1	Y	B07	Y	2	Y	N	7	570	0.11	71	-35	5	**(a)** 35' below MDA **(b)** reduced power at MAP (Type-Y approach: "maintain MDA to VDP") then corrected by increasing power **(c)** continued decel to VDP **(d)** established power controlled approach[iii] and followed designed VSDA to landing **(e)** wind shear: 11 kt right-qtr/crosswind (5 kt tailwind component) at MAP became 14 kt headwind at heliport/surface **(f)** see event 81.(d): same applies		W	P		T	
90	P07	C1	264	4	5289	1	Y	B09	X	2	Y	N	8	763	0.14	72	-34	7	**(a)** 34' below MDA **(b)** initial progressive decel/descent established then pitch-decel amount/rate exceeded power reduction requirements; acft floated then ballooned[ii] **(c)** no parameters reached/exceeded but controlled ROD with high-workload pitch/power adjustments **(d)** wind shear: 15 kt right-qtr/crosswind (7 kt tailwind component) at MAP became 12 kt headwind at heliport/surface **(e)** see event 81.(d): same applies **(f)** 0.55 nm decel distance		W	P			C
93	P07	C1	264	4	5289	1	Y	B12	W	2	Y	N	7	**1106**	0.12	75	-19	8	**(a)** began pitch-climb at MAP (e.g. excessive pitch-decel attitude) **(b)** significant pitch adjustment to correct high decel-rate; dropped nose below horizon/acft accelerated; increased power; ROD peaked/quickly decreasing **(c)** intercepted power-controlled approach profile **(d)** wind shear: 14 kt right-qtr/crosswind (8 kt tailwind component) at MAP became 10 kt headwind at heliport/surface **(e)** see event 81.(d): same applies	Q	W			T	

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																								
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)				Contributing Factor			Corrective Recom'dation		
Approach/Event No.	Subject Pilot No.	Type Ops Flown (1)	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings (2)	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 (3)	Appendix 2 Question 1 (4)	Appendix 2 Question 3 (5)	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS (6)	N = None Required	T= Training Required	C = Criteria
87	P08	E2	165	10	6250	1,2	N	B12	X	2	Y	Y	7	**1027**	0.13	81	-92	2	**(a)** 92' below MDA **(b)** established descent by significant power reduction followed by significant increased power when ROD quickly peaked **(c)** progressive pitch-decel rate less then required; pilot flew with collective (high workload) **(d)** pilot seldom fly's Copter RNAV (GPS) IAPs to heliports **(e)** 0.55 nm decel distance	Q		P		T	C
99	P10	C1	890	6	5250	1	Y	A06	W	3	Y	Y	6	**1016**	0.11	78	-5	-3	**(a)** deliberate power controlled approach(iii) technique used: higher ROD & pitch-decel attitude required (by pilot technique) early in the transition; nose lowered to enter power controlled approach **(b)** 20 kt crosswind	Q	W		N		
107	P10	C1	890	6	5250	1	Y	B08	W	3	Y	**N**	8	**1064**	0.15	82	-18	-2	**(a)** see event # 99.(a) description: same deliberate technique used **(b)** initially increased pitch-decel rate higher than power reduction rate; climbed at MAP; became steep which required higher ROD to correct **(c)** 25 kt crosswind	Q	W			T	
122	P11	C1	275	9	10015	1,2	Y	A05	W	2	Y	Y	7	**1042**	0.12	79	0	18	**(a)** progressive power reduction & decel-pitch rates at less than required/available; became steep; required higher ROD to correct **(b)** 79 kt/gs at MAP + 18 kt tailwind **(c)** pilot seldom fly's Copter RNAV (GPS) IAPs to heliports	Q	W			T	
138	P12	C1	630	10	6900	1	Y	B09	W	1	Y	Y	6	**1181**	0.11	86	9	4	**(a)** began climb at MAP with power increase and became steep; corrected with significant power reduction but established high sink rate; insufficient pitch-decel commensurate with power reduction and ROD **(b)** dropped nose; ROD increased to max **(c)** established power controlled approach(iii) late (0.2 nm) and continued to landing **(d)** 17 kt crosswind **(e)** pilot has never flown Copter RNAV (GPS) IAPs to heliports until these tests	Q	W			T	
140	P12	C1	630	10	6900	1	Y	B11	W	1	Y	Y	7	**1050**	0.12	81	10	2	**(a)** see event # 138.(a) description; same description except did not begin climb at MAP/therefore required less Max ROD **(b)** 20 kt crosswind **(c)** see event 138.(e): same applies	Q	W			T	

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																										
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)				Contributing Factor			Corrective Recom'dation		
Approach/Event No.	Subject Pilot No.	Type Ops Flown (1)	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings (2)	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 (3)	Appendix 2 Question 1 (4)	Appendix 2 Question 3 (5)	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS (6)	N = None Required	T= Training Required	C = Criteria
142	P13	C1	1500	6	8000	1	Y	A01	W	1	Y	Y	5	**1164**	0.09	76	80	11	**(a)** initiated descent with power reduction; progressive decel-pitch rate less than required/available; ballooned(ii)/required higher ROD; intercepted power-controlled approach, but not until (late) at 0.15 NM to landing (performed airspeed-controlled approach profile throughout most of maneuver/required higher decel-rate just prior to landing) **(b)** 76 kt/gs at MAP + 11 kt tailwind **(c)** see event 138.(e): same applies	Q	W			T	
147	P13	C1	1500	6	8000	1	Y	A06	W	1	Y	Y	7	**1215**	0.12	80	56	12	**(a)** see event #145.(b)-(c) description; performance nearly identical **(b)** due to 0.65 v. 0.55 nm this event (e.g. increased MAP to heliport decel distance) had sufficient distance/time to intercept power controlled approach(iii) profile (pilot was "comfortable" even with higher ROD v. event #145: note this goes to both increased available distance to decelerate, and to comfort level when flying power controlled approach v. airspeed controlled) **(c)** 80 kt/gs at MAP + 12 kt tailwind **(d)** see event 138.(e): same applies	Q	W			T	
155	P13	C1	1500	6	8000	1	Y	B08	W	1	Y	Y	7	**1194**	0.12	83	38	12	**(a)** progressive power reduction & decel-pitch rates less than required/available; intercepted power controlled descent (note: refer to even # 147: tailwinds identical, both procedures Type-W: on this event the pilot established a power-controlled approach profile at 0.4 nm v. 0.3 nm on event # 147. Suspect 'learning' occurred on repetitive approaches: which also supports 'training required'); reduced pitch-decel rate/maintained descent rate; did not compensate for tailwind **(b)** 83 kt/gs at MAP + 12 kt tailwind **(c)** see event 138.(e): same applies	Q	W			T	
158	P13	C1	1500	6	8000	1	Y	B11	X	1	Y	Y	10	**1249**	0.17	84	56	16	**(a)** progressive power reduction & decel-pitch rates less than required/available; did not intercept power controlled descent until 0.2 nm to landing (see event #143.(c): same applies) **(b)** 83 kt/gs at MAP + 16 kt tailwind **(c)** wind shear: 16 kt tailwind at MAP became 10 kt headwind at heliport/surface **(d)** 0.55 nm decel distance **(e)** see event 138.(e): same applies	Q	W				C

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																									
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)				Contributing Factor			Corrective Recom'dation		
Approach/Event No.	Subject Pilot No.	Type Ops Flown (1)	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings (2)	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 (3)	Appendix 2 Question 1 (4)	Appendix 2 Question 3 (5)	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS (6)	N = None Required	T= Training Required	C = Criteria
159	P13	C1	1500	6	8000	1	Y	B12	W	1	Y	Y	6	**1063**	0.10	86	7	6	**(a)** progressive power reduction & decel-pitch rates less than required/available; intercepted power controlled descent at 0.4 nm to landing (see event #147.(b): same applies); maintained pitch-decel/descent rates **(b)** wind shear: 6 kt tailwind at MAP became 14 kt headwind at heliport/surface **(c)** see event 138.(e): same applies	Q	W			T	
152	P14	C1	79	0	2755	1	Y	A05	W	1	Y	Y	7	**1065**	0.12	77	-1	14	**(a)** initially lowered nose/accelerated **(b)** progressive power reduction & decel-pitch rates less than required/available; required increased ROD **(c)** 'not quite' intercepted power controlled approach(iii) and not until at 0.2 nm to landing (e.g. airspeed approach technique flown) **(d)** 77 kt/gs at MAP + 14 kt tailwind **(e)** see event 138.(e): same applies	Q	W			T	
153	P14	C1	79	0	2755	1	Y	A06	X	1	**N**	**N**	7	**1117**	0.12	67	31	17	**(a)** was slow at 0.9 nm prior to MAP; in pitch-down/accelerating profile upon arrival at MAP **(b)** continued acceleration past MAP **(c)** power reduction & decel-pitch adjustments late/rates less than required/available **(d)** became steep/required increased ROD **(e)** flew airspeed controlled approach(iii) (never intercepted power controlled approach profile); aborted landing **(f)** accelerating at MAP + 17 kt tailwind, accelerating past MAP, and 0.55 nm decel distance did not provide adequate decel distance (especially when using an airspeed controlled approach technique) **(h)** see event 138.(e): same applies	Q	W	P		T	C
160	P14	C1	79	0	2755	1	Y	B07	W	1	Y	Y	6	**1011**	0.11	70	-12	-7	**(a)** progressive power reduction & decel-pitch rates less than required/available **(b)** became steep and ROD increased when pilot lowered nose (pitch-decel reduced) to resume "pilot's technique" of flying an airspeed controlled approach(iii) **(c)** see event 138.(e): same applies	Q				T	

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																			Contributing Factor			Corrective Recom'dation		
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)								
Approach/Event No.	Subject Pilot No.	Type Ops Flown (1)	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings (2)	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 (3)	Appendix 2 Question 1 (4)	Appendix 2 Question 3 (5)	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS (6)	N = None Required	T= Training Required	C = Criteria
161	P14	C1	79	0	2755	1	Y	B08	X	1	Y	Y	7	**1074**	0.12	75	72	-4	**(a)** progressive power reduction & decel-pitch rates less than required/available **(b)** became steep; ROD increased to max when pilot lowered nose/pitch-decel; corrected with increased pitch-decel **(c)** continued flying airspeed control approach to landing **(d)** 0.55 nm decel distance insufficient for this pilot/his technique, even without tailwind **(e)** see event 138.(e): same applies	Q				T	C
163	P14	C1	79	0	2755	1	Y	B10	W	1	Y	Y	5	**1088**	0.08	76	-27	-2	**(a)** 27' below MDA **(b)** dropped nose/reduce pitch-decel/reduced power at MAP; pulled 'significant' power to arrest max ROD **(c)** late getting nose up to increase pitch-decel **(d)** pumped collective making power adjustments (high workload; attributable to pilot's technique of airspeed controlled approaches(iii)) **(e)** decel-pitch rates used throughout approach far less than required/available **(f)** see event 138.(e): same applies	Q		P		T	
165	P14	C1	79	0	2755	1	Y	B12	X	1	Y	Y	7	**1017**	0.12	73	48	20	**(a)** nose/pitch down and accelerating through MAP (presumably to get down to MDA) **(b)** significant pitch-attitude changes; pumped collective (e.g. pilot workload) throughout approach **(c)** at 0.3 nm to landing ROD increased to max when pilot lowered nose/pitch-decel rather than pulling power and transitioning to a power controlled approach(iii) profile (ref. pilot's technique of flying airspeed controlled approaches); immediately pulled significant power to compensate for resultant high ROD **(d)** corrected with increased pitch-decel **(d)** 20 kt tailwind and 0.55 nm decel distance exacerbated pilot's workload while attempting to fly airspeed controlled profile **(e)** see event 138.(e): same applies	Q	W			T	C

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																								
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)				Contributing Factor			Corrective Recom'dation		
Approach/Event No.	Subject Pilot No.	Type Ops Flown (1)	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings (2)	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 (3)	Appendix 2 Question 1 (4)	Appendix 2 Question 3 (5)	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Analysis Findings / Contributing Factors Leading to Flagged Event** **Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS (6)	N = None Required	T= Training Required	C = Criteria
167	P15	C2	300	15	18000	1	Y	A02	W	3	N	N	6	1065	0.10	85	-25	1	**(a)** 25' below MDA **(b)** power reduced to begin descent at MAP; late decel/slow pitch-decel adjustments throughout manuever; increased power before (even) reaching 5 degrees nose up pitch-decel; angle steepened; reduced more power but did not increase pitch-decel attitude **(c)** waved off landing with comment that he didn't like the "backlash" sound of the transmission as his reason **(d)** FAATC pilot confirmed power was always registered on the torque and needles married (e.g. not in autorotation/rotor system not "unloaded") **(e)** decel-pitch rates used throughout approach far less than required/available **(f)** on post sortie questionnaire pilot commented that "airspeed control was difficult when using ground speed readout rather than airspeed ... 'real world' would compensate for downwind conditions with airspeed reduction which would have made the visual segment to land very easy." (note: this pilot did not have any tailwinds on test procedures; so was refering to test requirement of 'simulating' tailwinds by flying groundspeed to the MAP)	Q		P	N	T	
170	P15	C2	300	15	18000	1	Y	A05	X	3	N	N	7	1027	0.13	89	32	-2	**(a)** see event #167(b) description: performance nearly identical **(b)** see event #167(d) description: identical wave off/reason stated **(c)** see event #167.(c) description: repeated performance **(d)** 0.55 nm decel distance exacerbated situation	Q				T	C

Table 7. Analysis of Flagged Approaches (Continued)

HVSE PHASE 2: ANALYSIS OF FLAGGED APPROACHES																								
		Pre-Test Questionnaire / Pilot Data								From Test Plan Appendix 2 & 3			Maximum during visual segment			Aircraft status (arrival at MAP)			Analysis Findings / Contributing Factors Leading to **Flagged Event**	Contributing Factor			Corrective Recom'dation		
Approach/Event No.	Subject Pilot No.	Type Ops Flown (1)	Helicopter IFR Flight Hours	# Approaches/Previous 6 Mo.	Total Helicopter Flight Hours	Pilot Ratings (2)	Pilot Typically Uses Autopilot	Approach No. Flagged (AM=A PM=B)	Approach Type Flagged	Appendix 3 Question 1.1 (3)	Appendix 2 Question 1 (4)	Appendix 2 Question 3 (5)	Max Pitch-Decel (nose up)	Maximum ROD (Rate Of Descent)	Max g	Ground Speed (knots)	Altitude (agl)	Tailwind (positive # = tailwind)	**Determinates for Detailed Analysis:** **(1)** Pilot aborted Landing **(2)** Pilot not comfortable with visual segment (even if landing) **(3)** Exceeded 1,000 fpm ROD in the VS **Analysis Included:** **(1)** Aircraft status upon arrival at the MAP **(2)** Wind **(3)** Review of Approach Plan View, Profile View, Ground Speed & Rate of Descent, Angle to Heliport & Pitch Attitude, Horizontal & Vertical Deceleration Graphs and Plots **(4)** Review of Post Approach Questionnaire/Appendix 2 pilot answers **(5)** Review of Post Test Questionnaire, Appendix 3 pilot answers, and observer logs *(See Graphics Analysis of Flagged Approaches/Events 48, 61, and 77 for example of analysis performed on all flagged events)*	Q = Pilot Technique	W = Tailwind	P = Pilot Failed to meet PTS (6)	N = None Required	T= Training Required	C = Criteria
172	P16	M	110	15	1300	2	N	A01	W	1	**N**	Y	5	**1121**	0.09	77	43	12	**(a)** power reduced to begin descent at MAP; late decel; increased power at 0.45 nm to landing but pitch-decel was only approx. 1 degree nose up; acft continued to fall through (e.g. without pitch-decel attitude) and max ROD quickly reached at 0.40 nm to landing **(b)** very slow progressive decel rate continued/max pitch of (only) 5 degrees not reached until at 0.2 nm to landing **(c)** never achieved power controlled approach(iii) profile and continued airspeed controlled profile, high ROD, and aborted landing **(d)** 12 kt tailwind combined with airspeed controlled pilot technique contributed to aborting landing **(e)** never decelerated below ETL(i) **(f)** see event 138.(e): same applies	Q	W			T	
180	P16	M	110	15	1300	2	N	B09	X	1	Y	Y	7	**1000**	0.13	73	-33	-3	**(a)** see event #172.(a) description: very similar with faster decel rate/sooner & max pitch-decel increased to 7 degrees, but continued airspeed controlled technique **(b)** pilot lowered nose at 0.3 nm to landing (e.g. airspeed technique v. entering power-controlled approach); ROD increased to max **(c)** 0.55 nm decel distance combined with airspeed controlled technique required higher ROD (note: no tailwind this event and entered at 73 kt/gs v. 80 kt/gs: otherwise might have needed to abort landing) **(e)** see event 138.(e): same applies	Q		P		T	C
																			Total Contributing Factors & Recommendations:	26	21	6	4	30	16
																			Contributing Factors & Recommendations (Y-Type):	0	1	1	1	1	0
																			Contributing Factors & Recommendations (W-Type):	17	14	1	3	16	0
																			Contributing Factors & Recommendations (X-Type):	9	6	4	0	8	11

Footnote Legend

(1) Type Operations Engaged in: E=EMS C=Corporate 1=Part 91 2=Part 135 M=Acft Manufacture

(2) Helicopter Pilot Ratings: 1=ATP / 2=CFII / 3=Commercial-Instrument

(3) Pilot Fly's Copter RNAV (GPS) IAPs to a heliport: 1=Never 2=Seldom 3=Routinely

(4) "Did you successfully land or terminate at a hover at the heliport?" Y=yes N=no

(5) "Were you completely comfortable during the landing portion of this approach." Y=yes N=no

(6) Pilot failed to meet PTS in the Final Approach Segment: arrived at the MAP outside acceptable performance standards (for this analysis used arrival at MAP < 20' below MDA)

Definition Of Terms "As Used Herein"

(i) Effective Translational Lift (ETL): aircraft *'decelerated'* to the point the main rotor system is in disturbed air, rotor efficiency reduced, and more power required.

(ii) Ballooned: aircraft did not descend as intended; caused approach angle to steepen.

(iii) Power v. Airspeed Controlled Approach: aircraft decelerated to its landing attitude (versus maintaining higher airspeed); allows increasing collective/power which both reduces ROD, and continues the deceleration due to acft attitude.

4.6 STATISTICAL ANALYSIS OF THE VISUAL SEGMENT PROFILES.

4.6.1 Statistical Analysis Methodology.

H&A performed a statistical analysis of the approaches that were not flagged for analysis in section 4.5. These approaches are identified as "unflagged approaches." The unflagged approaches were subdivided according to the three approach procedures, W, X, and Y. In total, 186 approaches were flown during the testing, 62 approaches for each of the three approach procedures. The 28 flagged approach procedures (16 W, 10 X, and 2 Y) were eliminated from this analysis for the following reasons:

- As discussed in section 4.5, the flagged approaches identified problems with subject pilot technique, subject pilot comfort level, and/or environmental factors (excessive tailwind) that placed their flight profile outside the acceptable performance limits established in the test plan. H&A believes that problems leading to the flagged approaches can largely be eliminated through increased awareness and training. This leaves the unflagged approaches as being a representative sample of the normal range of performance in the visual segment.

Due to the TSPI failure during the second day of testing, three approaches did not have sufficient data points in the visual segment to permit detailed analysis. Two of these were W approach procedures and one was an X approach procedure. In summary, the statistical samples included 44 W, 51 X, and 60 Y approach procedures.

Using linear interpolation techniques, four performance parameters (altitude, ground speed, ROD, and horizontal deceleration) were determined at 0.05 nm increments (304 feet) from the heliport to 1.0 nm. Another distance point was added to the heliport at 0.01 nm (61 feet) to capture data close to the heliport. The pitch attitude, a fifth parameter, was calculated from the horizontal deceleration using the following relationship:

$$\textit{Pitch Attitude} = (180/\pi) \times \textit{arctangent (Horizontal Deceleration)}$$

where,

Horizontal deceleration is measured in g's

Pitch attitude is measured in degrees

Using the small angle approximation for the arctangent, this relationship produces the result that 4 degrees of change in pitch attitude approximately equates to 0.07 g deceleration.

The sample mean and standard deviation were calculated for each distance to the heliport for each approach type. The mean and mean plus/minus two standard deviation values of each performance parameter were plotted as a function of distance to the heliport.

4.6.2 Statistical Results.

The results of the statistical analysis are presented in graphical form in appendix F. A subset of the graphs from appendix F is shown for the W approach procedures in figures 8 through 11. Correct interpretation of these graphs is important. The altitude above heliport graph (figure 8) will be used as an example. The black line with triangles shows the mean value for all 44 W approaches for the altitude above heliport. The upper black line is the mean value plus 2 standard deviations of altitude difference; the lower black line is the mean value minus 2 standard deviations of altitude difference. From a statistical perspective, the area between the upper and lower black lines contains approximately 95 percent of all altitude values for the specified distance to the heliport. The blue line is constructed from the visual segment performance model discussed in section 4.7 and appendix E. Examining the black line with triangles and the blue line allows comparison between the model results and the results of the statistical analysis.

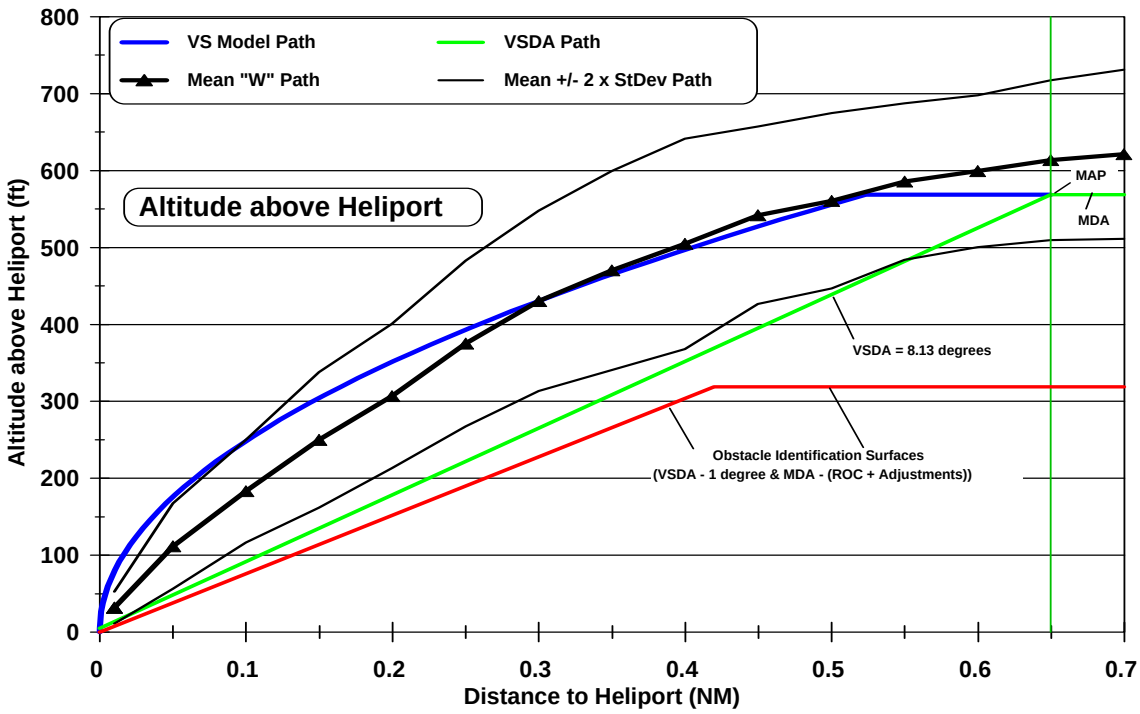


Figure 8. Statistical Analysis of Altitude Above Heliport for W Approaches

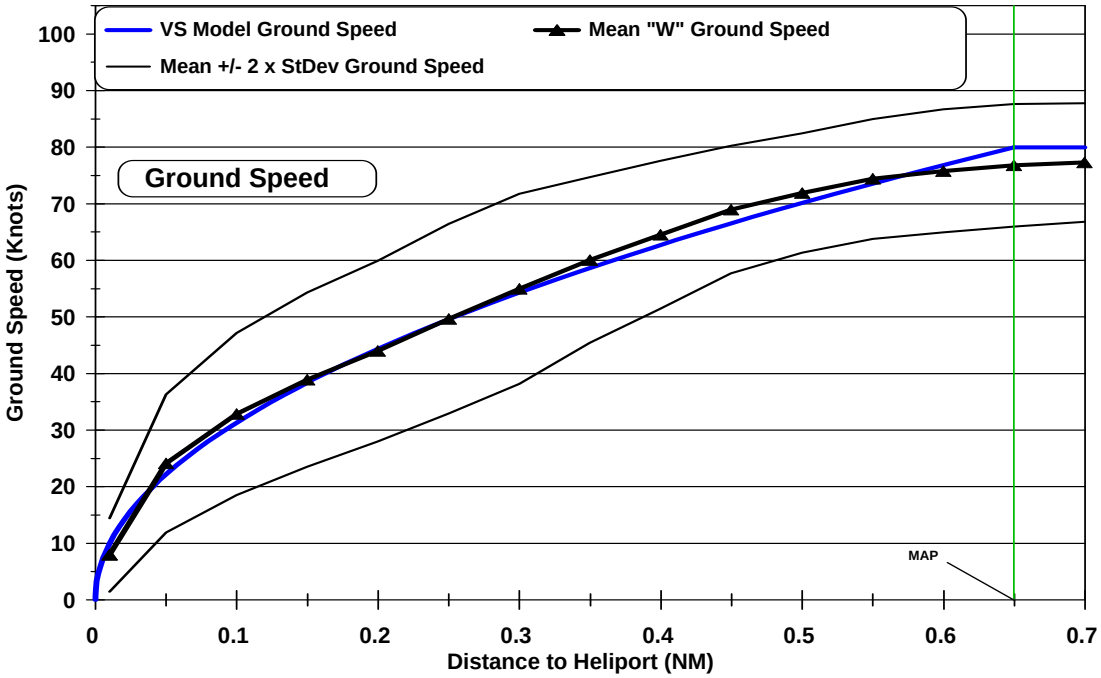


Figure 9. Statistical Analysis of Ground Speed for W Approaches

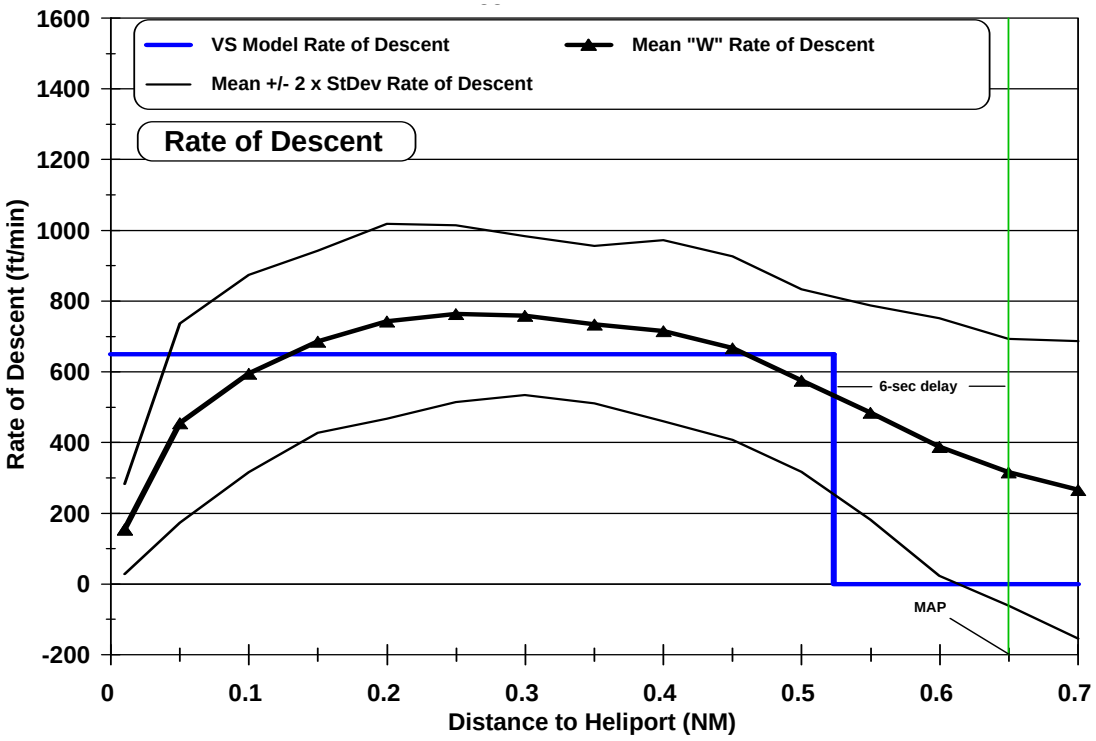


Figure 10. Statistical Analysis of ROD for W Approaches

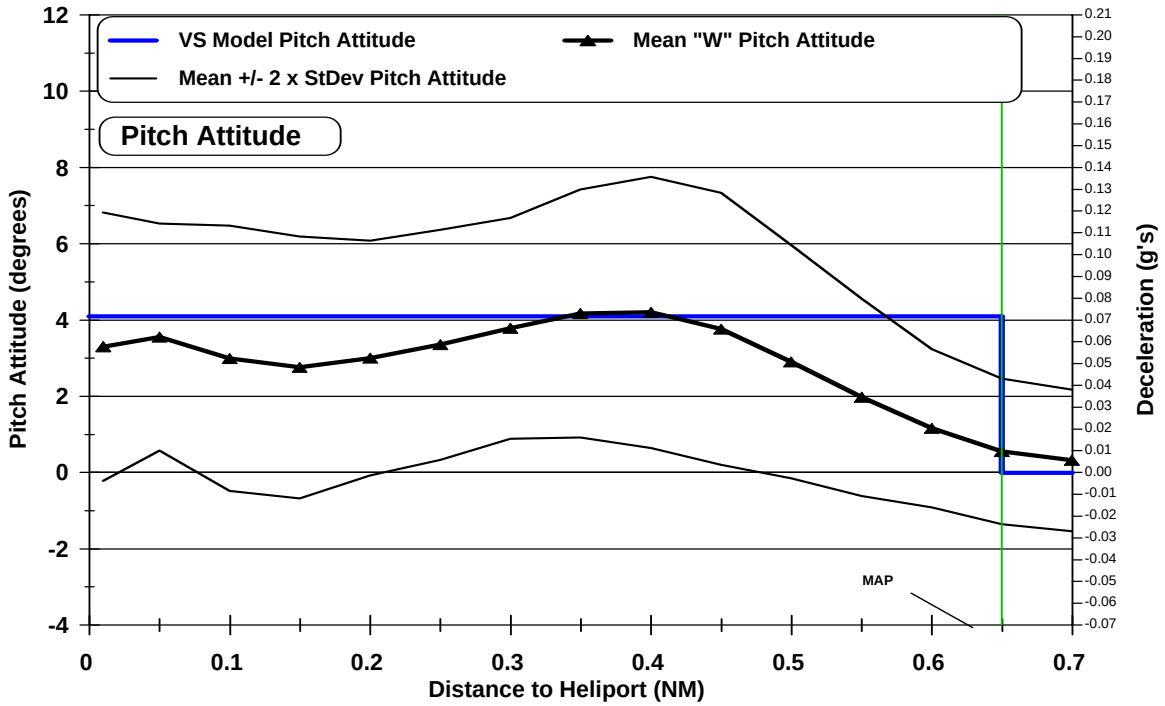


Figure 11. Statistical Analysis of Pitch Attitude and Deceleration for W Approaches

Included on the altitude plots are the VSDA (green line) and the visual segment OIS (red line). The OIS is a sloped surface beginning at the center of the heliport and extending upward at an angle of 1 degree less than the VSDA. The OIS continues upward until reaching an altitude equal to the ROC plus any adjustments to the ROC. For these plots, a ROC of 250 feet (as specified in FAA Order 8260.42A, section 1.3) with zero adjustments was applied.

The mean altitude paths clearly show a curved vertical flight path for each of the three approach procedures. The mean paths are well above the VSDA and visual segment OIS for all three approach types. The decent appears to have been delayed beyond the MAP (or VDP for the Y approach procedure) causing the descent profile to be significantly above the VSDA. The curved altitude path indicates that subject pilots do not fly in a sloped straight line path toward the heliport in the visual segment. This differs from helicopter and fixed-wing approaches to runways. This is primarily caused by the helicopter decelerating during the approach to a heliport. This differs significantly from an aircraft flying to a runway at nearly a constant speed.

For normally distributed (Gaussian) random variables, the mean plus/minus 2 standard deviations curves encompass 95 percent of all the variables and is widely used as a containment surface for visual flight operations. Throughout the visual segment, the mean minus 2 standard deviations path are well above the OIS for the W and X procedures. For the Y procedure, the mean minus 2 standard deviations curve is slightly below the OIS at the 0.1 nm point. This may have been a result of the lack of obstacles in the vicinity of the test heliport.

The mean ground speed plots are similar for all three approach procedure types. The mean ground speed begins to decline at the MAP and declines more rapidly as the helicopter

approaches the heliport. This is a consequence of the deceleration of the helicopter as it approaches the heliport. The Y approach procedures show a larger standard deviation in ground speed than did the W or X approach procedures. Some subject pilots tended to carry a higher ground speed in the Y approach procedure than in the W and X approach procedures. This may have been because the use of the VDP in the Y approach procedure was new to all subject pilots. The notion of decelerating the helicopter for approximately 15 seconds prior to initiating the descent is an uncommon procedure for many helicopter pilots and some subject pilots may have reduced the deceleration accordingly.

For the W and X approach procedures, the mean ROD plots show the helicopter descending at about 300 feet/minute at the MAP (or VDP for the Y approach procedure). As the helicopter passes the MAP or VDP, the ROD continues to increase to a peak at about 0.3 nm (approximately 18 to 20 seconds for typical airspeed observed) beyond that point.

Taken together, the mean altitude plots and the mean ROD plots indicate that the subject pilots tended to be above the MDA prior to the MAP descending to the MDA at the MAP. The mean ROD peaked at about 780 feet/minute for the W and X approach procedures. The mean ROD peaked at about 575 feet/minute for the Y approach procedure. The peak value for the mean plus 2 standard deviations curve is just slightly greater than 1000 feet/minute for the W and X approach procedures and is 800 feet/minute for the Y approach procedures. The mean ROD peaks at about 0.25 nm to the heliport for the W and X approach procedures and at about 0.15 nm to the heliport for the Y approach procedures.

For all approach procedures, the mean pitch attitude peaks at slightly greater than 4 degrees (0.07g). The peak comes at 0.4 nm to the heliport for the W approach procedures and 0.3 nm to the heliport for the X and Y approach procedures. The closer distance to the heliport for the peak is expected for the X approach procedure because the MAP is located closer to the heliport than for the W and Y approach procedure. The closer distance for the Y approach procedure indicates subject pilots were not as vigorous in decelerating when the VDP was located beyond the MAP. For all three approach procedures, the peak deceleration is reached about 18 seconds after passing the MAP for the W and X approach procedures and about 24 seconds after passing the VDP for the Y approach procedure.

4.6.3 Summary of Statistical Results.

For all three approach procedure types, the altitude profile of the helicopter in the visual segment is curved rather than straight, which is the norm for aircraft approaching a runway. This curved path is caused by the deceleration of the helicopter as it approaches the heliport. The slope of the curve continues to increase as the helicopter nears the heliport indicating an increasing angle to the heliport. The angle to the heliport reaches a maximum of about 12 to 14 degrees at a point about 0.2 nm to the heliport and an altitude of 250 to 300 feet above the heliport elevation.

When plotted with respect to distance to the heliport, the ground speed decreases with increasing rate as the helicopter approaches the heliport. The increasing slope is caused by the deceleration of the helicopter throughout the visual segment.

Most subject pilots approached the MAP or VDP with a positive ROD of about 300 feet/minute. The ROD continued to increase until reaching a peak about 20 seconds after passing the MAP or VDP.

The peak value for mean deceleration for all three approach procedure types was between 0.07 and 0.08 g. The peak value occurred about 18 to 24 seconds after reaching the MAP.

4.7 MODELING THE VERTICAL PROFILE.

4.7.1 Problems With Using Formulas Involving Fixed-Wing Approaches.

Throughout the planning phase of the HVSE II it became apparent that a number of persons reviewing the project plan and test plan were using fixed-wing methods (approaches to runways versus approaches to heliports) to estimate the characteristics of the vertical performance of the helicopter in the visual segment. Most notable was the repeated use of an incorrect method of calculating ROD. A commonly used formula for estimating the ROD of a fixed-wing aircraft on approach to a runway is the following:

$$ROD = 101.27 \times \text{Ground Speed} \times \sin(\text{Glide Path Angle})$$

Where

ROD is measured in feet/minute
Ground Speed is measured in knots
Glide Path Angle is measured in radians
The factor 101.27 converts knots to feet/minute

This formulation correctly calculates ROD, assuming the aircraft descends in a straight path along the glide slope angle at a constant ground speed.

By substituting the VSDA for the glide path angle, the project plan and test plan reviewers were using this formula to calculate the ROD of the helicopter in the visual segment. Because the helicopter is decelerating and not flying at a constant speed, this is an incorrect application of the ROD formula. Use of this incorrect formula calculates a higher ROD for the helicopter than that observed in the test results. As an example, the formula calculates a ROD of 1002 feet/minute for a helicopter flying at 70 knots ground speed with an 8.13 VSDA. At 80 knots ground speed, the estimated ROD increases to 1145 feet/minute for the same VSDA. To address this problem of incorrect estimations of helicopter performance in the visual segment, H&A developed a mathematical model of a decelerating, descending helicopter in the visual segment.

4.7.2 Visual Segment Performance Model.

A simplified formulation of vertical profile of a helicopter on approach to a heliport is presented in appendix E. This formulation assumes the helicopter decelerates throughout the approach. The resulting formulas predict that the vertical profile is a curved path that increases in slope as the helicopter approaches the heliport. In mathematical terms, the shape of the curved path is that of a parabola. It is shown in graphical form in appendix F that the resulting performance curves (altitude above heliport, ground speed, ROD, pitch attitude, and deceleration) are substantial agreement in shape and value with the statistical curves described in section 4.6.

The following equations from appendix E are resulting key relationships of helicopter performance in the visual segment are:

$$D2H = D_0 - V_0 \times (Time)/3600 + 1.929 \times 10^{-8} \times (V_0^2/D_0) \times (Time^2) \qquad \text{(E-13)}$$

$$Ground\ Speed = V_0 - ((V_0^2/D_0)/7200) \times (Time) \qquad \text{(E-14)}$$

$$Decel = 7.286 \times 10^{-6} \text{ x } (V_0^2/D_0) \qquad \text{(E-6)}$$

$$T_0 = 7200 \times (D_0/V_0) \qquad \text{(E-8)}$$

$$ROD = 60 \times HAL/(7200 \times (D_0/V_0) - TD) \qquad \text{(E-16)}$$

$$\begin{gathered} For\ Time < TD,\ H_H = HAL \\ For\ Time >= TD\ and\ Time < T_0,\ H_H = HAL - (ROD/60) \times (Time) \\ For\ Time > T_0,\ H_H = 0 \end{gathered} \qquad \text{(E-17)}$$

$$Pitch\ Attitude = (180/\pi) \times arctangent\ (Decel) \qquad \text{(E-18)}$$

Where

D2H = distance to the heliport measured in nm
D_0 = distance from the MAP to the heliport measured in nm
V_0 = ground speed at the MAP measured in knots
Time is measured in seconds beginning when the helicopter passes the MAP
Ground Speed is measured in knots
Decel is measured in g's
T_0 = the time to fly from the MAP to the heliport
ROD = rate of descent in feet per minute
HAL = height above landing area in feet
TD = the time delay for the pilot control input and aircraft response.
H_H = height above the heliport in feet
Pitch Attitude is measured in degrees

The performance values predicted by the visual segment model were calculated for the three approach procedures flown during the flight tests. The results are shown in table 8.

Table 8. Key Performance Measures From Visual Segment Model

Approach Procedure	HAL (feet)	D_0 (NM)	V_0 (knots)	T_0 (sec)	D_V (NM)	V_V (knots)	T_V (sec)	TD (sec)	Decel (g's)	Pitch Att. (degrees)	ROD (ft/min)
W	569	0.65	80	58.5	NA	NA	NA	6	0.072	4.1	650
X	484	0.55	80	49.5	NA	NA	NA	6	0.085	4.8	668
Y	299	0.65	80	58.5	0.34	57.9	42.3	6	0.072	4.1	494

ATT = Attitude
NA = Not applicable

4.7.3 Graphs of the Visual Segment Performance Model Results.

Plots of the model results for altitude above heliport, ground speed, ROD, pitch attitude, and deceleration are shown in appendix F. These plots are overlaid on plots showing the results of the statistical analysis of the flight test profiles discussed in section 4.6. The following observations are offered.

4.7.3.1 Altitude Above Heliport.

For the W and X approach procedures, the model agrees well with test data (mean W and X path) until it reaches 0.3 nm to the heliport. At that point, the test data path becomes shallower than the model path and presents a more linear characteristic. The angle to the heliport at that point is approximately 13 degrees.

For the Y approach procedure, the model correctly identifies the start of the descent point from MDA. After that point, the test data path becomes slightly shallower than model path.

For all three approach procedures, the altitude model is a much better predictor of the vertical profile than the linear path along the VSDA.

4.7.3.2 Ground Speed.

For the W and X approach procedures, there is excellent agreement between test data (mean W and X ground speed) and the model.

For the Y approach procedure, the test data (mean Y ground speed) is 3 to 5 knots greater than the model for distances from the heliport of 0.1 to 0.5 nm.

For all three approach procedures, the ground speed model provides an accurate estimator for the mean ground speed profile in the visual segment.

4.7.3.3 Rate of Descent.

For all three approach procedures, the model for ROD is a constant value that approximates the mean ROD curve.

For the W approach procedure, the mean ROD curve ramps upward beginning before the MAP and reaches a maximum at 0.25 and 0.30 nm to the heliport. At that point, the ROD declines rapidly and reaches zero value at the heliport.

For the X approach procedure, the mean ROD curve ramps upward beginning before the MAP and reaches a maximum at 0.20 and 0.25 nm to the heliport. At that point, the ROD declines rapidly and reaches zero value at the heliport.

For the Y approach procedure, the mean ROD curve ramps upward beginning before the MAP and reaches a maximum at 0.15 nm to the heliport. At that point, the ROD declines rapidly and reaches zero value at the heliport.

The maximum value of mean ROD for each of the three approach types is about 100 feet/minute greater than the value predicted by the model.

4.7.3.4 Pitch Attitude and Deceleration.

For all three approach procedures, the model for pitch attitude and deceleration is a constant approximation of the mean pitch attitude and deceleration curve.

For the W approach procedure, the mean pitch attitude and deceleration curve ramps upward beginning near the MAP and reaches a maximum at 0.40 nm to the heliport. At that point, the pitch attitude and deceleration curve declines slightly with a secondary peak at .05 nm to the heliport.

For the X approach procedure, the mean pitch attitude and deceleration curve ramps upward beginning before the MAP and reaches a maximum at 0.3 nm to the heliport. At that point, the pitch attitude and deceleration curve declines slightly with a secondary peak at .05 nm to the heliport.

For the Y approach procedure, the mean pitch attitude and deceleration curve ramps upward beginning near the MAP and reaches a maximum at 0.25 nm to the heliport. At that point, the pitch attitude and deceleration curve declines very slightly with a secondary peak at .05 nm to the heliport.

The maximum value of mean pitch attitude and deceleration for each of the three approach types (W, X, and Y) is accurately predicted by the model.

4.7.4 Application of the Model to Required Pitch Attitude and Deceleration.

The current GPS helicopter approach criteria (FAA Order 8260.42A, section 1.3) allow the MAP to heliport distances to be as small as 0.30 nm. Based on experience and HVSE I and HVSE II test results, this distance does not permit an adequate stopping distance for helicopter instrument approaches. The visual segment performance model was used as a tool to estimate the required pitch attitude and deceleration values as a function of MAP to heliport distance.

The resulting estimates of pitch attitude and deceleration are shown graphically in figure 12 for two values of ground speed, 70 and 80 knots. The value of 70 knots represents the maximum permissible airspeed allowed in the final segment of the approach and zero tailwind. The value of 80 knots represents 70-knot airspeed and a tailwind of 10 knots. The resulting curves show a rapid increase in the required pitch attitude and ROD as the MAP to heliport distance is reduced. Specific points shown on the curves of 0.55 and 0.65 nm MAP to heliport distance relate to the approaches used in the HVSE II flight tests. The 0.65 nm distance represents the W and Y approach procedures, and the 0.55 nm distance represents the X approach procedure. Using the

80-knot curve with a MAP to heliport distance of 0.65 nm produces a required pitch attitude of 4.10 degrees and deceleration of 0.072 g. Whereas, a MAP to heliport distance of 0.55 nm produces a required pitch attitude of 4.85 degrees and deceleration of 0.085 g.

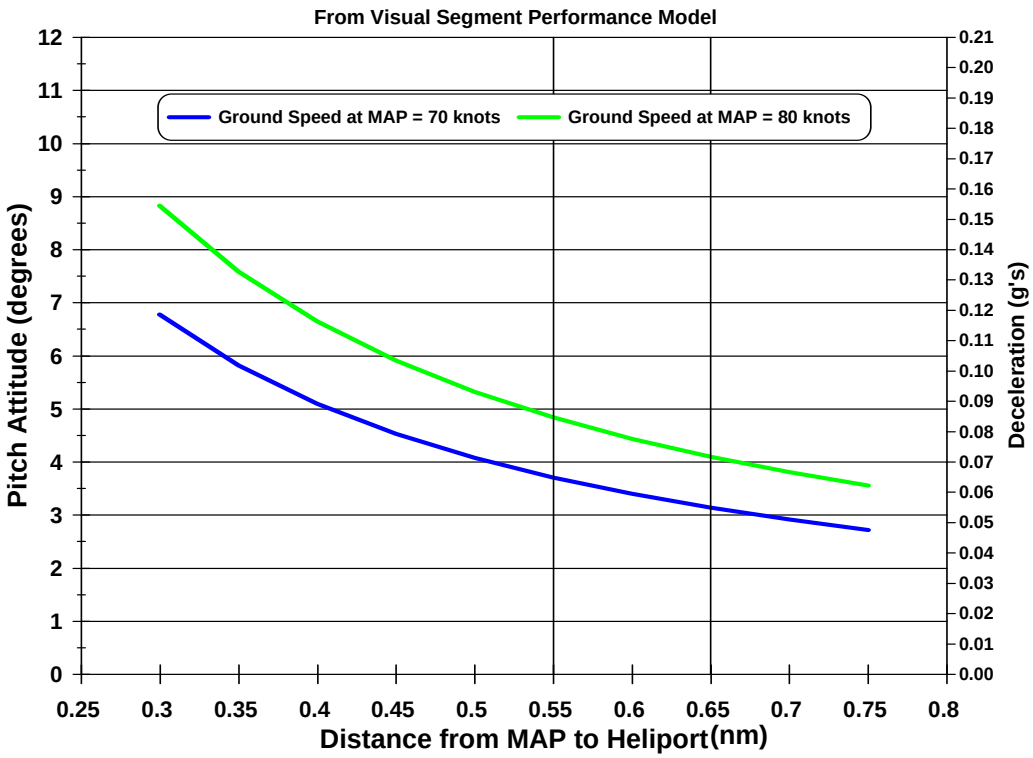


Figure 12. Required Pitch Attitude and Deceleration

Similarly, using the 80-knot curve with an MAP to heliport distance of 0.30 nm produces a required pitch attitude of 8.84 degrees and deceleration of 0.155 g. These values of pitch attitude and deceleration are nearly twice those used during the HVSE II flight tests. Clearly, the 0.30 nm MAP to heliport distance creates excessive pitch attitude and deceleration. For safety reasons, the FAA should consider increasing the minimum MAP to heliport distance to 0.55 nm or greater.

4.7.5 Implications for Vertically Guided Helicopter Approaches to Heliports.

Both the statistical analysis of the test data and the visual segment performance model strongly indicate that the altitude profile (as indicated by the altitude above heliport plots) is a curved path with increasing slope as the helicopter moves closer to the heliport. This observation has a profound impact on vertically guided approaches such as those supported by the GPS Wide Area Augmentation System (GPS WAAS). Use of a curved vertical path for GPS WAAS approaches would allow the helicopter to follow a more natural descent profile into the heliport. Use of a single, straight glide path angle would force the helicopter to follow a path that would generate very high rates of descent during the high-speed portion of the descent transitioning to low rates of descent as the helicopter nears the heliport and the ground speed diminishes. The use of a single-curved vertical path (or alternatively, the use of two or more straight glide path segments to approximate the curved vertical path) should be analyzed and, if found to be analytically

viable, tested to assess the helicopter performance and human factors impact of curved vertical profiles.

4.7.6 Summary of the Visual Segment Performance Model.

For all three test approach procedures, the model is a useful estimator of the mean helicopter altitude until it reaches 0.3 nm from the heliport. At this point, the mean helicopter altitude shows a more linear characteristic with a slope of approximately 13 degrees (4.3:1 slope).

For X and Y approach procedures, the model is a useful estimator of the mean helicopter ground speed throughout the visual segment. For Y approach procedures, the model is a useful estimator of the ground speed, but underestimates the ground speed by 3 to 5 knots for distance to the heliport between 0.5 and 0.1 nm.

The maximum value of mean ROD for all three approach procedure types is about 100 feet/minute greater than the value predicted by the model.

The maximum value of mean pitch attitude and deceleration for all three approach types is accurately predicted by the model.

The assumptions of constant ROD and constant deceleration are simplifications of the actual results from flight testing. These assumptions are useful because they yield closed-form equations to describe the helicopter performance in the visual segment. In addition, these equations produce numerical results that are close to the mean performance curves generated from the statistical analysis of the flight test data.

Analysis of the flight test data and model development indicate the helicopter naturally follows a curved vertical profile in the visual segment. The FAA should consider further analysis and testing of curved vertical paths for vertically guided approaches to heliports.

4.8 ANALYSIS OF BALKED APPROACHES.

The five balked approaches that occurred during the HVSE II flight tests were analyzed by comparing their flight performance profiles with the statistically derived profiles discussed in section 4.6 and the model-derived profiles discussed in section 4.7. Plots comparing performance during the balked approaches with the statistical and model plots are found in appendix G. The following analyses are derived from the comparison of these plots.

4.8.1 Balked Approach #1, Pilot P05, Approach #10, W Approach Procedure.

Winds: 3-knot headwind at MAP, 10-knot headwind at heliport

The altitude profile is very similar to the mean W approach procedure profile. There are no apparent problems with altitude control during the approach.

The ground speed profile is higher than the mean ground speed profile (5 to 7 knots) throughout the approach. At 0.3 nm to the heliport, the ground speed deviation from mean increases. At about 0.12 nm to heliport, ground speed increases beyond the 95 percent boundary and the subject pilot waves off the approach. The subject pilot never had his speed under control.

The ROD profile is lower than the mean ROD profile until 0.3 nm to the heliport. At that point, the ROD is increasing rapidly. This is caused by the ground speed being higher than the mean. If ground speed were correct, this high ROD would not have been necessary.

The pitch attitude and deceleration profile is very close to the mean pitch attitude and deceleration profile. However, in this case, the pitch attitude and deceleration are not adequate to slow the aircraft to a point where a comfortable ROD could be established. As a result, the subject pilot waved off the approach.

4.8.2 Balked Approach #2, Pilot 14, Approach #06, X Approach Procedure.

Winds: 17-knot tailwind at MAP, 9-knot tailwind at heliport

The altitude above heliport is high and exceeds the 95 percent boundary at about 0.23 nm to heliport. Altitude continues above the 95 percent boundary throughout the remainder of the approach until the subject pilot waves of the approach. The subject pilot did not begin descent soon enough.

Ground speed is low at MAP and the subject pilot increases speed and goes beyond the mean ground speed curve at about 0.46 nm to heliport. Ground speed remains between mean and upper 95 percent boundary throughout remainder of approach. Ground speed was high but within 95 percent values.

The ROD is well below the mean ROD profile until 0.23 nm to the heliport. At that point, the subject pilot rapidly increases the ROD and exceeds the 95 percent values at 0.15 nm to the heliport.

The pitch attitude and deceleration shows the subject pilot actually increasing speed at the MAP. After the MAP, the subject pilot does not increase pitch attitude adequately to slow the aircraft to perform a successful approach. In summary, the subject pilot was late in controlling both the aircraft pitch attitude and ROD, which resulted in a failed approach.

The subject pilot indicated he terminated the approach due to concerns over transmission loading. Analysis of the fundamental performance reveals that excessive ground speed at the MAP led to the need for this level of transmission loading.

4.8.3 Balked Approach #3, Pilot 15, Approach #01, W Approach Procedure.

Winds: 1-knot tailwind at MAP, 8-knot headwind at heliport

Altitude profile is very similar to mean W profile up to about 0.26 nm to heliport. At that point, the altitude deviation from the mean W profile increases to about 40 feet higher at 0.15 nm, but remains within 95 percent value.

The subject pilot passed the MAP with a higher than normal ground speed of 90 knots. The ground speed profile is higher than the mean ground speed profile (12 to 15 knots) throughout much the approach. The combination of being higher and faster than the mean profiles led the subject pilot to wave off approach.

The ROD profile is lower than the mean value prior to 0.45 nm to the heliport. At that point, the ROD increases, reaching a steady value of about 200 feet/minute above the mean. At 0.15 nm to the heliport, the ROD exceeds the 95 percent value and remains above that value for the remainder of the approach until the subject pilot waves off the approach.

The pitch attitude and deceleration follow the mean value until 0.43 nm to the heliport. From that point, the pitch attitude and deceleration exceed the mean value and reach the 95 percent value at 0.20 nm to the heliport. Because the helicopter is fast at the MAP, a greater value of pitch attitude and deceleration was needed to slow the aircraft and complete a successful approach. At 0.10 nm to the heliport, the subject pilot decides to wave off the approach.

4.8.4 Balked Approach #4, Pilot 15, Approach #05, X Approach Procedure.

Winds: 2-knot headwind at MAP, 6-knot headwind at heliport

The altitude profile is very similar to mean X profile up to about 0.28 nm to heliport. At that point, the altitude deviation from the mean X profile increases to about 40 feet higher at 0.13 nm, but remains within 95 percentile values.

The ground speed profile is at or higher than the upper 95 percent value throughout the approach. The subject pilot began the approach with too much ground speed and he was not able to reduce the ground speed adequately to complete a successful approach.

The ROD profile was greater than the mean profile and within the 95 percent value for most of the approach. The ROD exceeded the 95 percent value at 0.13 nm to the heliport. The higher than average ROD was a consequence of the high-ground speed.

The pitch attitude and deceleration were greater than the mean profile throughout most of the visual segment. However, the greater than average pitch attitude and deceleration were still not adequate to reduce the ground speed sufficiently to permit a successful approach in the visual segment.

4.8.5 Balked Approach #5, Pilot 16, Approach #1, W Approach Procedure.

Winds: 12-knot tailwind at MAP, 9-knot tailwind at heliport

The altitude profile is slightly higher (35 feet) than the mean W profile at 0.5 nm to heliport, which is equal to the mean profile at 0.38 nm and is 10 to 30 feet below the mean profile throughout remainder of approach. The altitude above heliport profile indicates no altitude problem.

Ground speed is equal to the mean profile at 0.45 nm to heliport and increases to about 5 knots above the mean from 0.35 nm to heliport until the subject pilot waves off the approach at about 0.05 nm to heliport. This approach was well within the 95 percent values of altitude and ground speed until the subject pilot decided to wave off the approach. From the altitude and ground speed plots, it looks like this approach could have been completed safely if the subject pilot had so desired.

The ROD profile indicates the subject pilot was late in initiating the descent. When descent was initiated, the ROD quickly increased to reduce altitude above the heliport. The ROD exceeded the 95 percent value at 0.40 nm to the heliport and remained above the 95 percent value for much of the remainder of the approach.

The pitch attitude and deceleration profile indicates the subject pilot was also late in initiating the deceleration. The deceleration remained below the mean profile until 0.30 nm to the heliport. The pitch attitude and deceleration value remained within the 95 percent values throughout the approach. In summary, this was the subject pilot's first test approach and he was late in making the required control inputs to achieve a successful approach.

4.8.6 Summary Analysis of Balked Approaches.

The analyses of balked approaches provide insight into the reasons that five balked approaches were observed during the HVSE II testing. Key reasons are:

- Inadequate pitch control input at the MAP; resulting deceleration was not adequate to slow the helicopter in the visual segment to permit a safe landing (balked approach #1).

- The subject pilot was late in making pitch and collective input at the MAP. Helicopter altitude was too high and ground speed was too fast to permit a safe landing (balked approaches #2 and #5).

- Improper entry speed for the visual segment at the MAP; subject pilot entered visual segment at 90 knots ground speed; pitch control inputs were not adequate to slow helicopter enough to make a safe landing (balked approaches #3 and #4).

5. FINDINGS.

- The MAP to heliport distance of 0.55 nm evaluated in these tests (X approach procedure) was representative of the minimum distance required to decelerate and descend on a straight-in approach. Shorter MAP to heliport distances require unacceptable levels of deceleration and pitch attitude in the visual segment.

- The MAP to heliport distance of 0.65 nm evaluated in these tests (W and Y approach procedures) was representative of the optimum distance required to decelerate and descend on a straight-in approach while achieving a visibility minimum of 3/4 sm.

- VSDA 8.13 degree was representative of a safe, acceptable VSDA when the MAP to heliport distance is not less than 0.55 nm.

- The visual segment OIS for VSDA 8.13 degree was coincidental, with the heliport 8:1 approach surface (7.125 degrees) recommended by the FAA AC 150/5390-2, and can be used for the visual segment OIS.

- HVSE II data results and subject pilots' opinions favor the use of a VDP (represented by the Y approach procedures) with a MAP to heliport distance of 0.65 nm. The use of a VDP supports a wide range of potential HAL values.

- HVSE II test conditions satisfies examination of approaches flown with tailwinds for both 0.55 and 0.65 nm MAP to heliport distances and approaches with a VDP.

  - Test Condition: The HVSE II tests required the subject pilot to decelerate from 80 knots ground speed (to simulate 70 KIAS plus 10-knot tailwind). It should also be noted that 80 knots ground speed was used for entry into the visual segment, even during actual tailwind conditions.

  - Test Condition: Of the 188 HVSE II approaches, 146 (78 percent) were flown downwind with actual tailwind conditions. Eighty-four approaches (45 percent) were flown downwind with tailwinds exceeding 10 knots, and 46 approaches (25 percent) were flown downwind with tailwinds exceeding 15 knots. There were also 11 approaches flown with tailwinds in excess of 20 knots.

- The vertical profile of helicopters approaching a heliport (altitude versus distance to heliport) is a curved path with increasing slope as the helicopter nears the heliport. The vertical path significantly overshot the VSDA and vertical segment OIS.

  Note: This finding has implications for vertically guided approaches (i.e., WAAS vertical guidance). Curved or segmented glide paths may prove to be more operationally desirable for approaches to heliports. This finding also has implications when estimating ROD for approaches to heliports. The use of formulas for aircraft flying constant speed approaches to runways is not appropriate.

- The total number of successful approaches (181, (97.3 percent)) indicated that procedures having VSDA values of up to 8.13 degrees are feasible. A successful approach was defined as an approach that the subject pilot successfully transitioned to a landing and answered the questions that he was completely comfortable during the maneuver.

- The number of balked approaches (five, (2.7 percent)) included two approaches that the subject pilot aborted due to noise in the transmission. The subject pilot answered that he was completely comfortable during the maneuver but aborted the landing due to the transmission noise. These two approaches were reported with the remaining three as balked approaches, however, these two approaches were not balked based on flyability.

- The number of flagged approaches (28, which include the 5 balked approaches) indicated that the subject pilots would benefit from awareness and training regarding the procedures necessary to achieve a successful approach with a VSDA of 8.13 degrees. Most were flagged because they exceeded a peak ROD exceeding 1000 feet per minute. There was no quantitative measure to be applied in these discussion of peak versus average ROD, however, the most pertinent qualifier for these tests applied was the subject pilots' answering whether they were completely comfortable during the maneuver (173 of the 186 (93%) answered they were completely comfortable during the landing portion). These answers, when considering that no training was provided, and that only five subject pilots routinely perform Copter IFR approaches to heliports, also suggested that while training is recommended with the findings in this report, the need for training is relatively low.

- It is also important to note that in this discussion pertaining to peak versus average ROD, the helicopter directorate and the FAA regulations that refer to a maximum ROD of 1000 feet per minute are only relative when discussed with reference to average ROD, and that, lacking any quantitative definition to qualify peak versus average ROD, H&A flagged all approaches with a peak ROD exceeding 1000 feet.

- The mean values of performance derived from the statistical analysis of 158 unflagged approaches indicate that correctly flown approaches produce moderate levels of pitch attitude, deceleration, and ROD. These values are shown in the following table.

Approach Procedure	Altitude above(+)/below(-) MDA or VDP (feet)	Ground Speed at MAP (knots)	Pitch Attitude (degrees)	Deceleration (g's)	ROD (feet/minute)
W	45	76.8	4.21	0.074	765
X	41	76.7	4.88	0.085	764
Y	43	77.1	4.35	0.076	572

- Pilot awareness and training for steep approaches (exceeding 7.5 degrees VSDA) should reinforce the importance of the following operational factors:

  - Arrival at the MAP with the correct airspeed and altitude

- Prompt control input of correct amount of pitch up at the MAP to begin deceleration and maintaining the pitch up attitude to continue the deceleration throughout the visual segment until the subject pilot is comfortable with the prelanding airspeed

- Prompt control input (at the MAP or VDP) of correct collective control to establish the necessary ROD to achieve a successful landing and maintaining the ROD until the subject pilot is comfortable with the prelanding altitude

- Prompt power adjustments to maintain rotor revolution per minute within acceptable limits

The following summarizes the basis for these findings:

- On the W approach procedures (MAP to heliport distance of 0.65 nm), the subject pilots consistently performed within the flagging parameters using a VSDA of 8.13 degrees and were comfortable with the procedure regardless of their training or experience.

- On the Y approach procedures (VDP between MAP and heliport), the subject pilots consistently performed within the flagging parameters with the VDP located on the heliport 8:1 (VSDA 8.13 degree) angle, and were comfortable with the procedure regardless of their training or experience.

- On the X approach procedures (MAP to heliport distance of 0.55 nm) using a VSDA of 8.13 degrees, the subject pilots performance was not consistent and appeared to be based somewhat upon technique, training, or experience.

6. CONCLUSIONS.

The following conclusions are based on helicopter visual segment evaluation (HVSE) test data and the findings outlined in section 5.1 for a maximum visual segment decent angle (VSDA) of 8.13 degrees:

- The safe and acceptable VSDA of 8.13 degrees is supported by the HVSE Phase II (HVSE II) test results.

- The minimum missed approach procedure (MAP) to heliport distance should be 0.55 nm and subject pilot training should be required.

- The optimum MAP to heliport distance for a 3/4 statute mile visibility; minimum is 0.65 nautical mile.

- The use of a visual descent point (VDP) established as an along-track distance (ATD) after passing the MAP is supported by the HVSE II test results and if a VDP is used subject pilot training should be required.

7. RECOMMENDATIONS.

1. The findings and conclusions from these HVSE II tests should be considered in future changes to TERPS criteria and policy.

2. Based on the HVSE I recommendations, and the results of these HVSE II tests, some portion of the HVSE II tests should be supplemented with two helicopters that have improved power characteristics compared to the Sikorsky S-76A. The HVSE I recommendation was for HVSE II tests to use the Bell 430 and the Aerospatiale AS-365, in addition to the Sikorsky S-76A. These tests should include the W and Y approach procedures, as well as one or more approach procedures with intermediate altitudes. The results of these tests might identify credits or opportunities for waivers for operators having higher performance helicopters and are supportive of future performance-based criteria.

3. Testing in the visual segment should be performed at heliports that have actual 8:1 approach areas and physical obstructions, which are more representative of heliports routinely used. Tests conducted with HVSE II at the FAA William J. Hughes Technical Center heliport have now identified the parameters that can be safely conducted at real-world operational facilities.

4. Further research should be undertaken regarding the feasibility of curved and/or segmented vertical path guidance for low visibility approaches to heliports. The curved or segmented vertical path would allow helicopters to follow a more natural flight profile than would approaches using straight line vertical profiles.

Table 9 shows HVSE II conclusions applied with current criteria from FAA Order 8260.42A and PinS Policy to enable the development of criteria and policy and guidance material for approving requests for waivers for IAPs to heliports as per objective (2) section 1.1

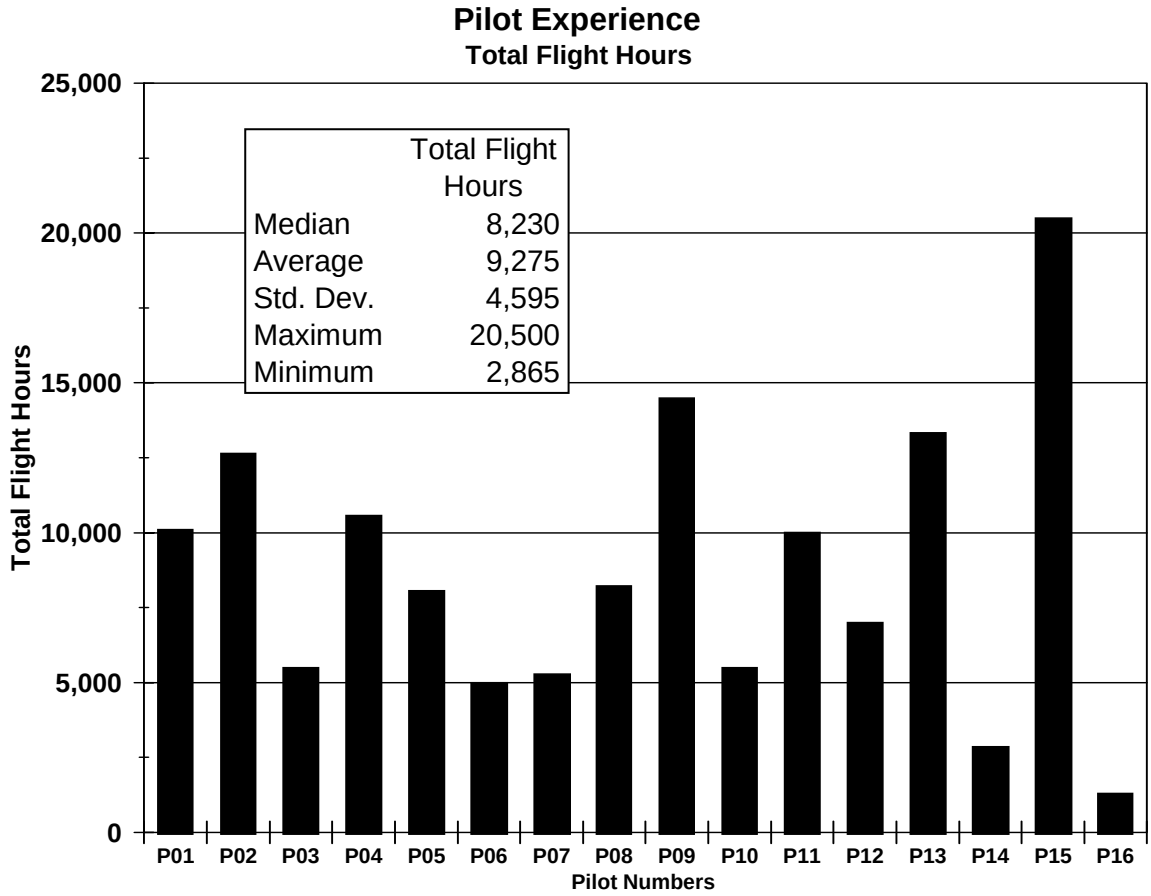
Table 9. Summary of Conclusions From Criteria, Policy and Flight Testing

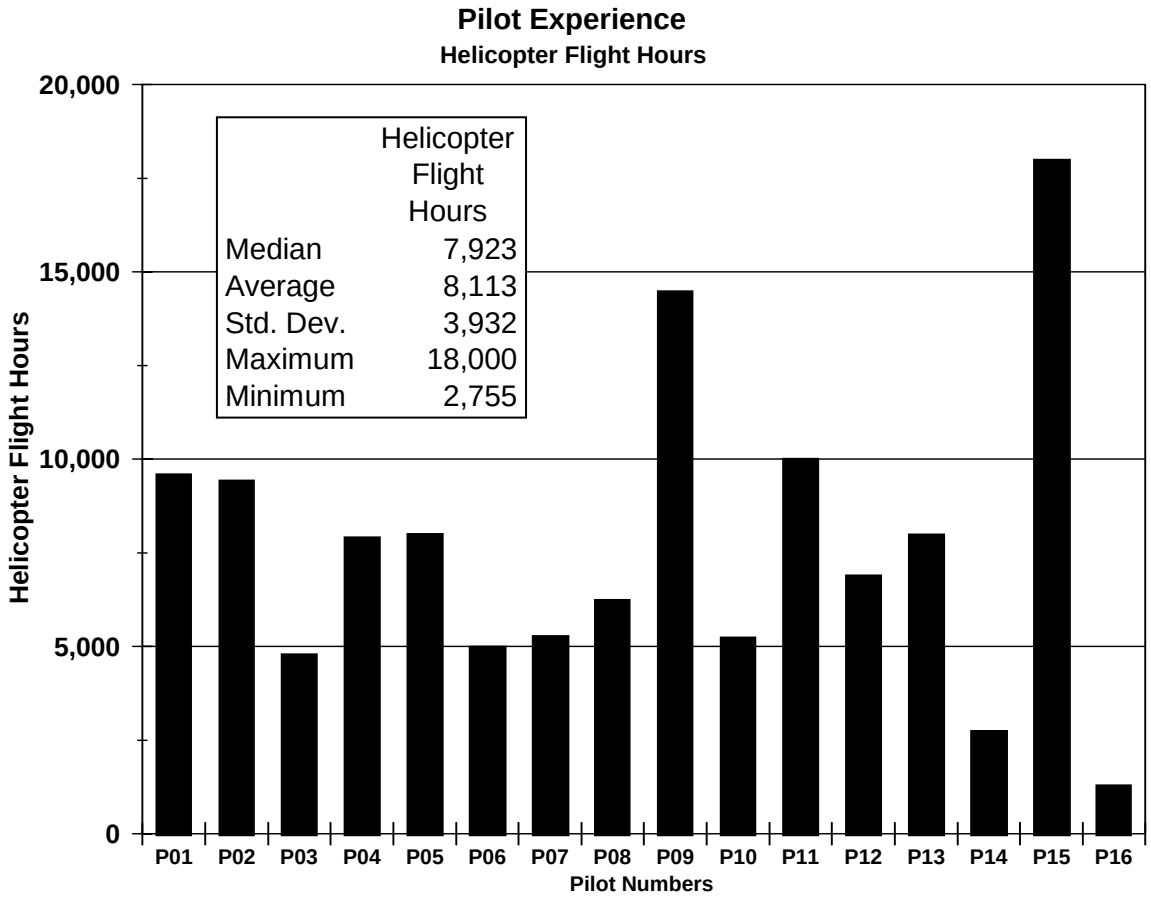
HVSE II Conclusions Applied With FAA Order 8260.42A and AFS PinS Policy					
Criteria/Policy/ Basis	Maximum VSDA	Special IAP (Pilot Training Required)	Maximum HAL		Minimum Visibility Statute Miles (Per Criteria/Policy)
			MAP to Heliport Distance 0.55 nm (Minimum)	MAP to Heliport Distance 0.65 nm (Optimum)	
8260.42A	VSDA 6°	No	250-351	250-415	1/2
PinS Policy	VSDA 7.5°	Yes	250-460 (1)	250-540 (1)	3/4
HVSE II	VSDA 8.13°	Yes	250-497 (1)	250-584 (1)	3/4

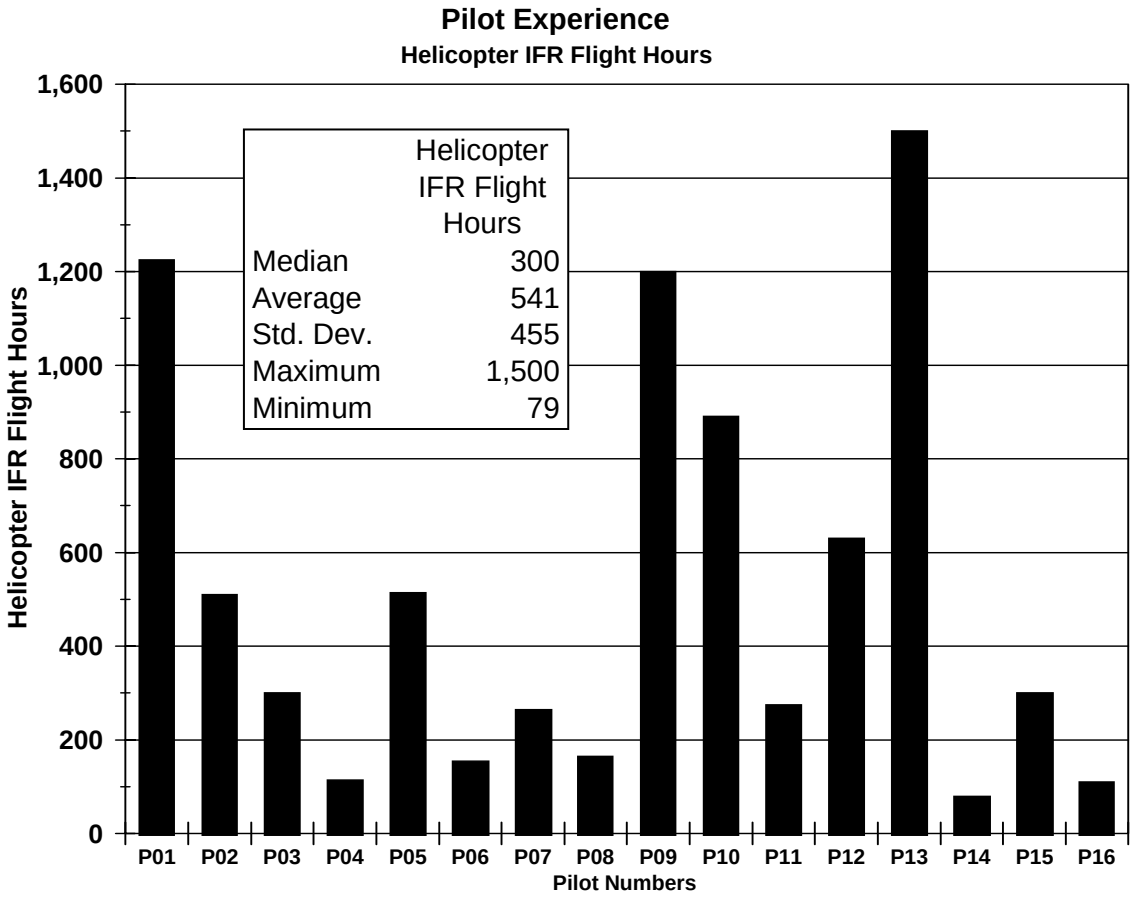
(1) Maximum HAL requires HCH 20'
Note: Not shown - FAA Order 8260.42A Maximum VSDA 10.2°

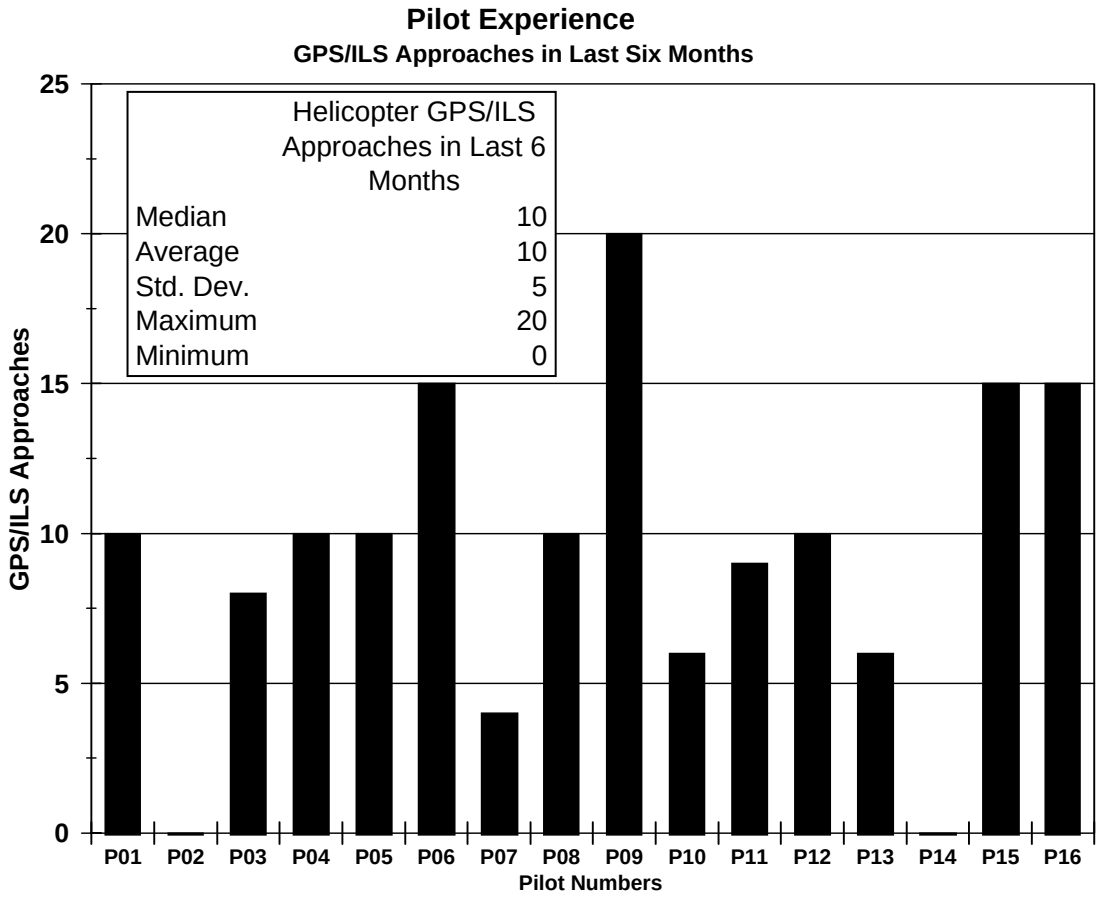
APPENDIX A—SUBJECT PILOT DATA AND QUESTIONNAIRE RESULTS

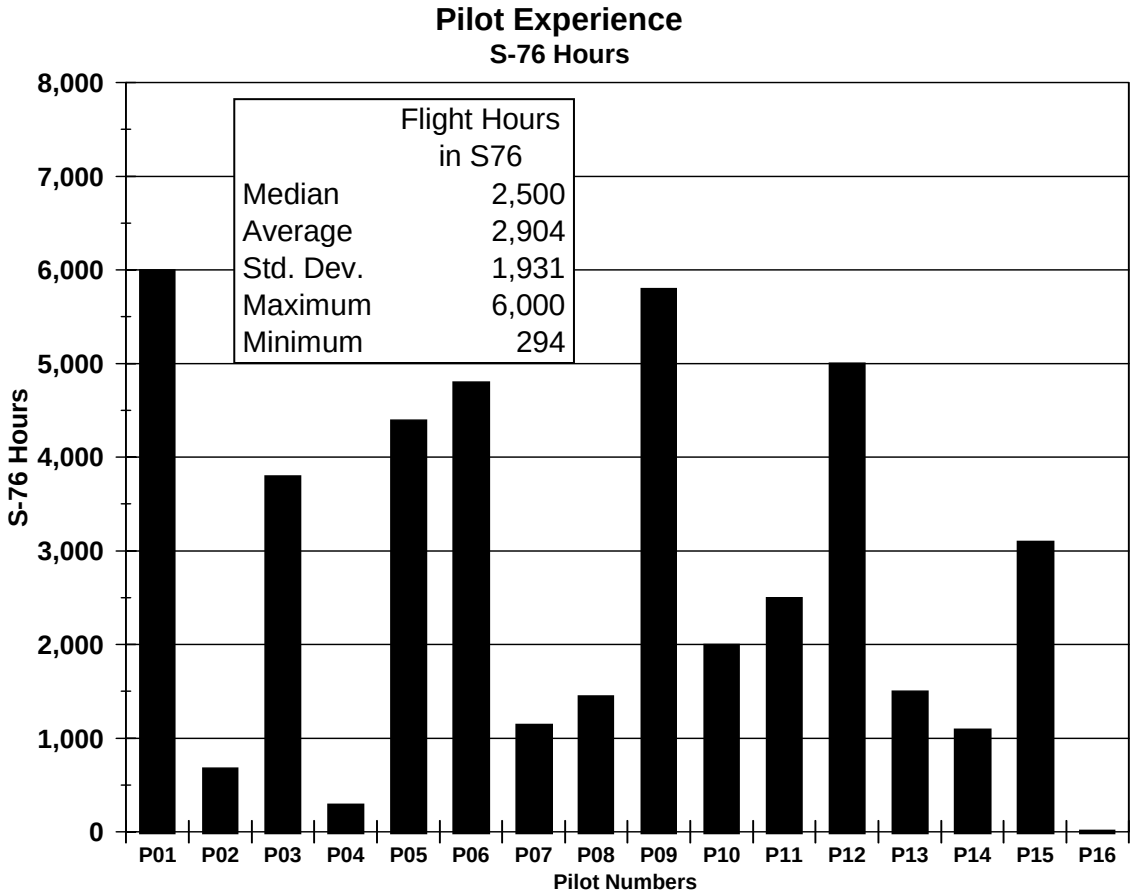
The pretest questionnaire and pilot data are shown on pages A-2 through A-5. The Postapproach questionnaire answers are shown on pages A-6 through A-13. The Posttest questionnaire answers and comments are shown on pages A-14 thought A-29.

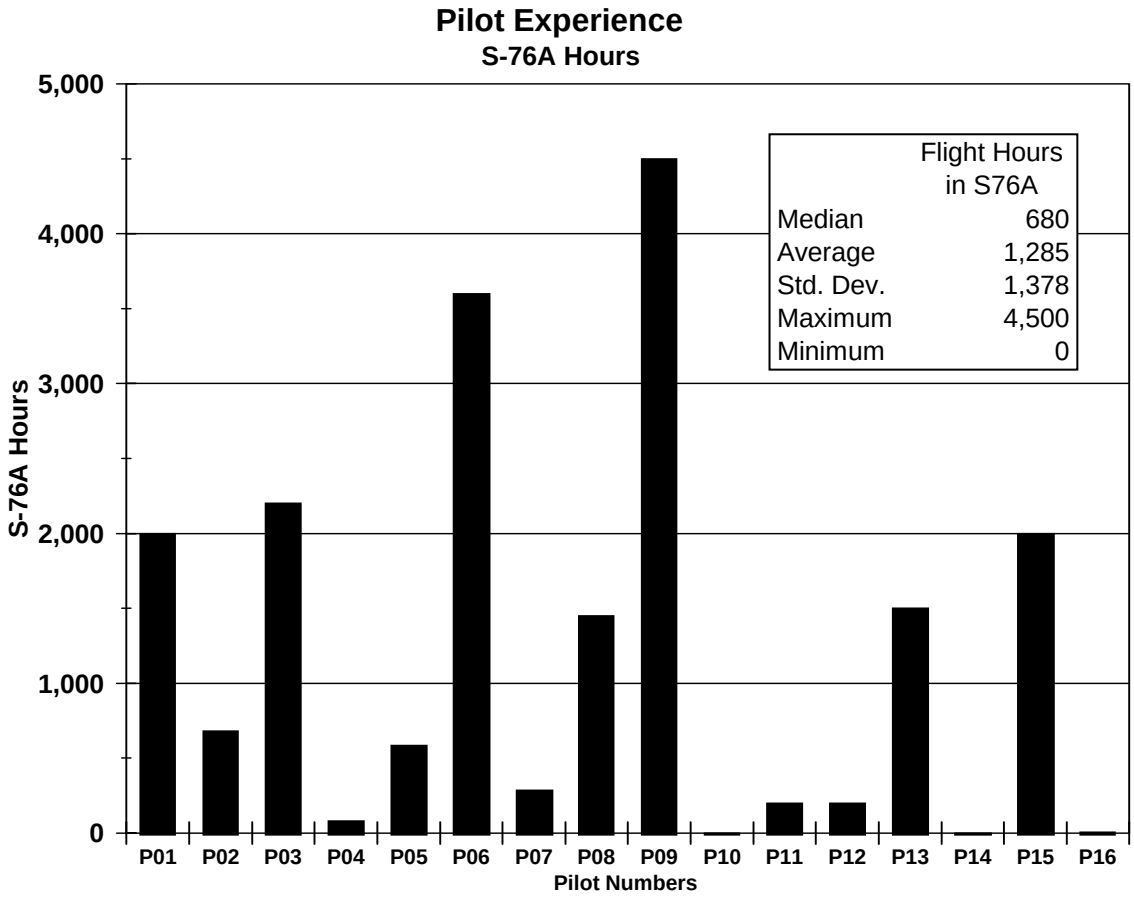

Pilot Experience
Total Flight Hours
Total Flight Hours
Median 8,230
Average 9,275
Std. Dev. 4,595
Maximum 20,500
Minimum 2,865
25,000
20,000
15,000
10,000
5,000
0
Total Flight Hours
P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16
Pilot Numbers

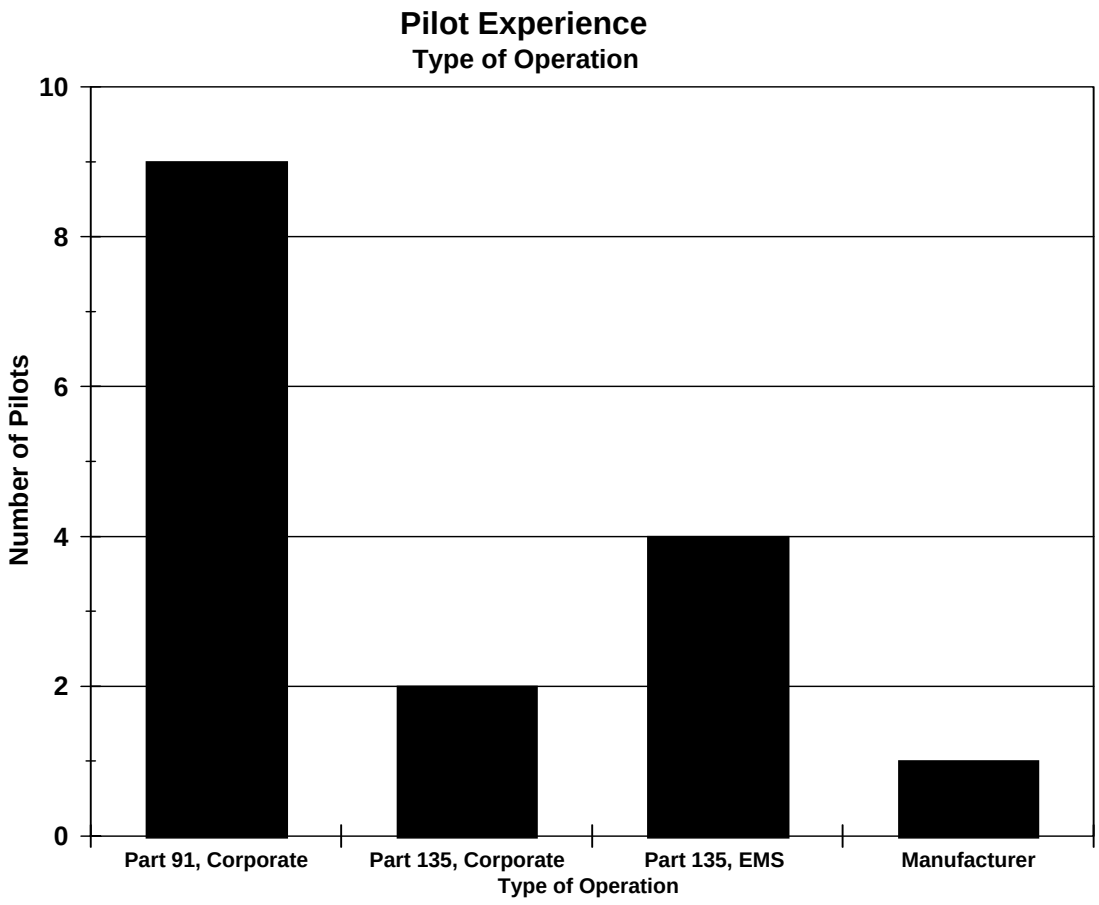

Pilot Experience
Helicopter Flight Hours
Helicopter Flight Hours
Median 7,923
Average 8,113
Std. Dev. 3,932
Maximum 18,000
Minimum 2,755
20,000
15,000
10,000
5,000
0
Helicopter Flight Hours
P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16
Pilot Numbers


Pilot Experience
Helicopter IFR Flight Hours
Helicopter IFR Flight Hours
Median 300
Average 541
Std. Dev. 455
Maximum 1,500
Minimum 79
Helicopter IFR Flight Hours
0
200
400
600
800
1,000
1,200
1,400
1,600
P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16
Pilot Numbers


Pilot Experience
GPS/ILS Approaches in Last Six Months
Helicopter GPS/ILS Approaches in Last 6 Months
Median 10
Average 10
Std. Dev. 5
Maximum 20
Minimum 0
GPS/ILS Approaches
0
5
10
15
20
25
P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16
Pilot Numbers

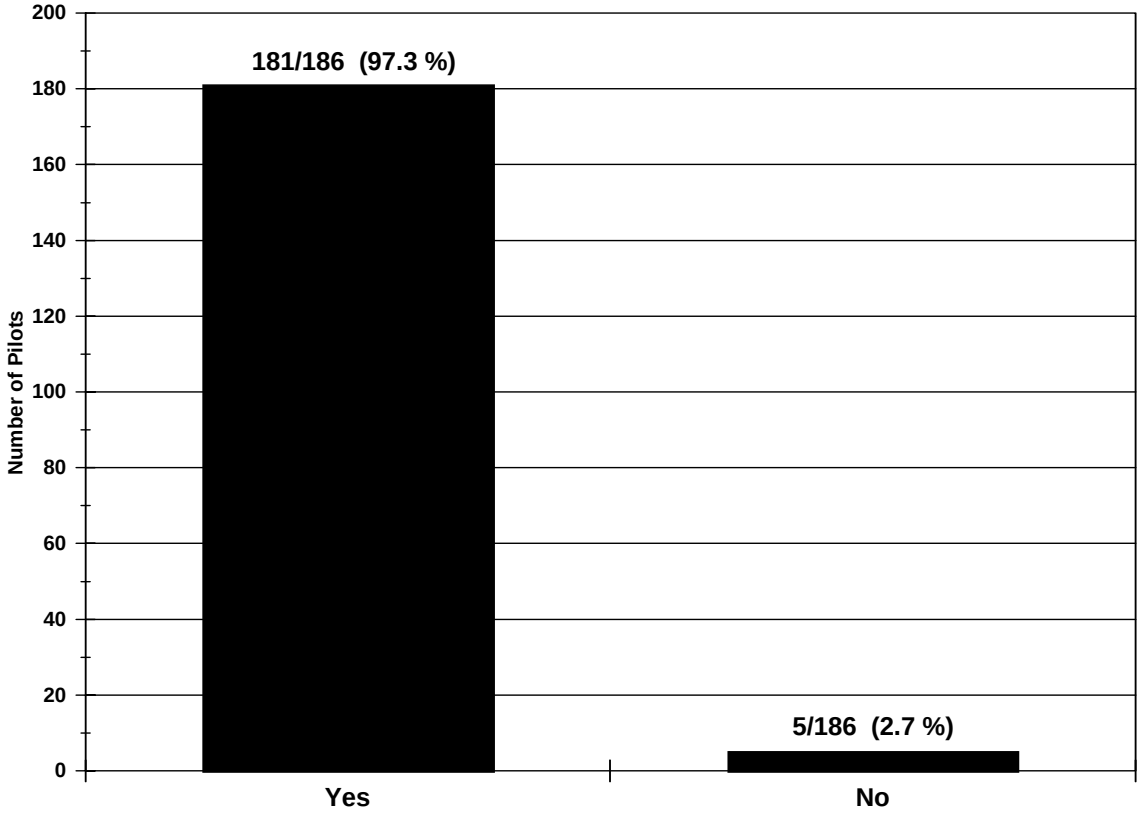

Pilot Experience
S-76 Hours
Flight Hours in S76
Median 2,500
Average 2,904
Std. Dev. 1,931
Maximum 6,000
Minimum 294
S-76 Hours
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16
Pilot Numbers


Pilot Experience
S-76A Hours
Flight Hours in S76A
Median 680
Average 1,285
Std. Dev. 1,378
Maximum 4,500
Minimum 0
S-76A Hours
5,000
4,000
3,000
2,000
1,000
0
P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16
Pilot Numbers


Pilot Experience
Type of Operation
Number of Pilots
10
8
6
4
2
0
Part 91, Corporate
Part 135, Corporate
Part 135, EMS
Manufacturer
Type of Operation

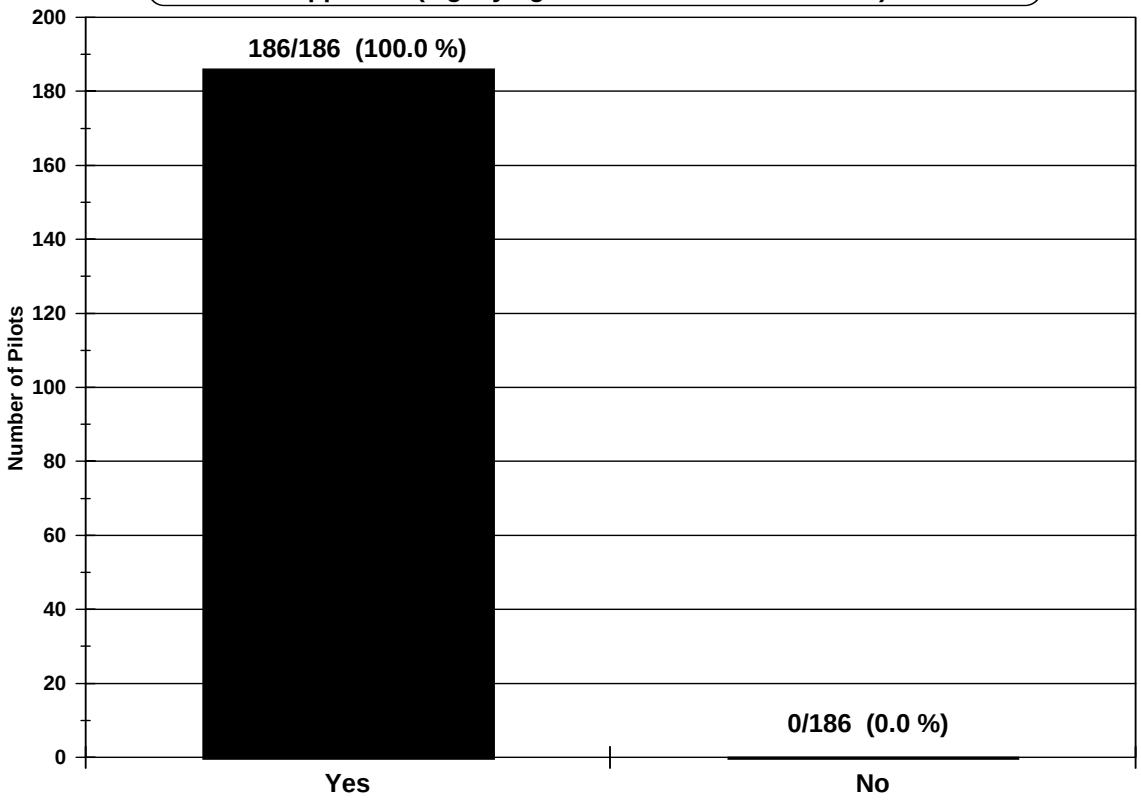
Answers to Post-Approach Questionnaire

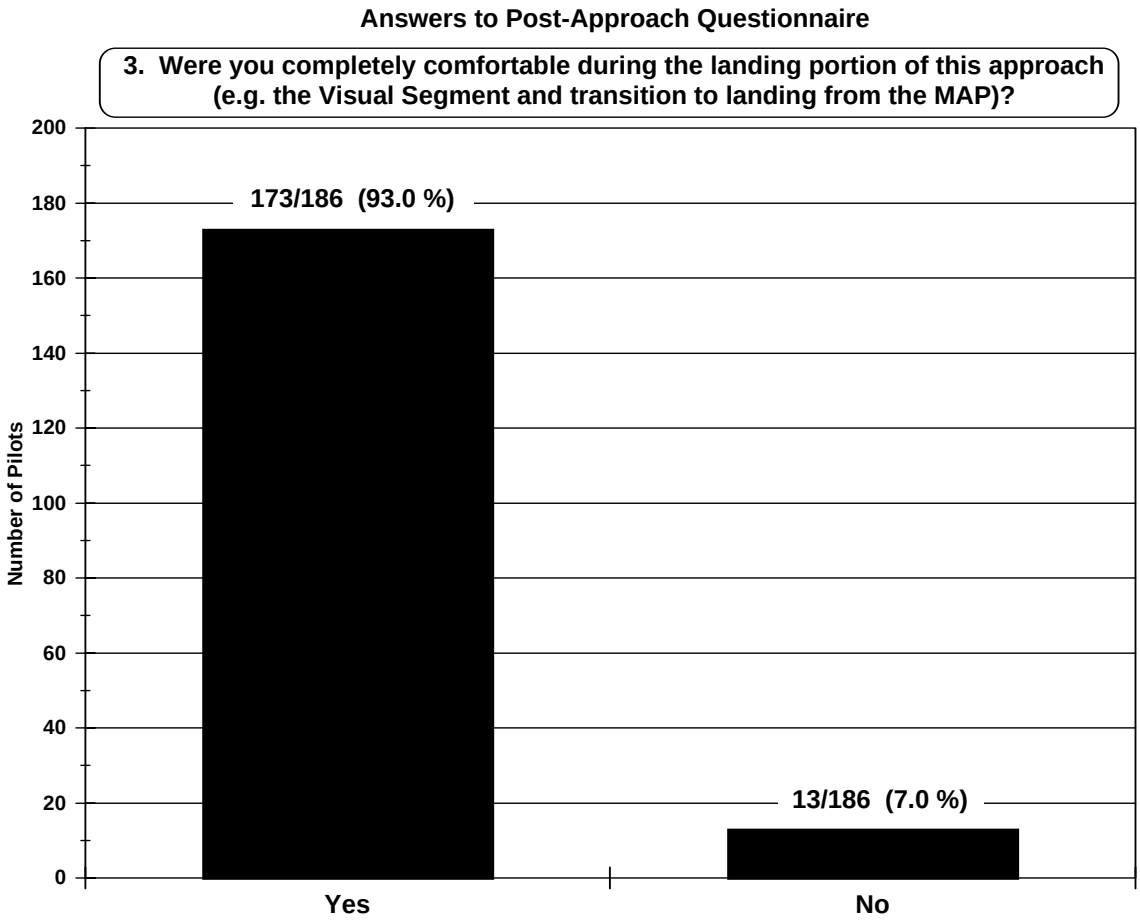
1. Did you successfully land or terminate at a hover at the heliport?

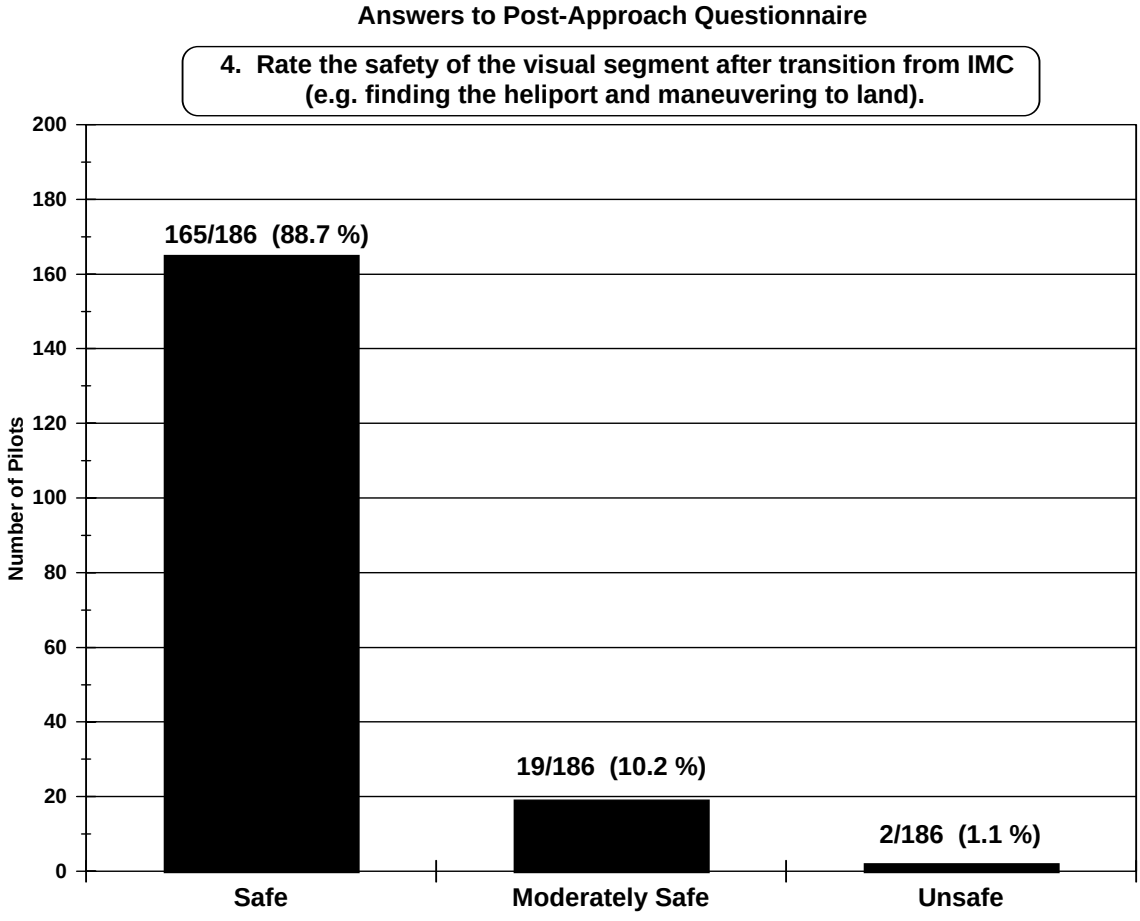


Answers to Post-Approach Questionnaire

2. Were you completely comfortable during the IMC portion of this approach (e.g. flying on instruments to the MAP)?

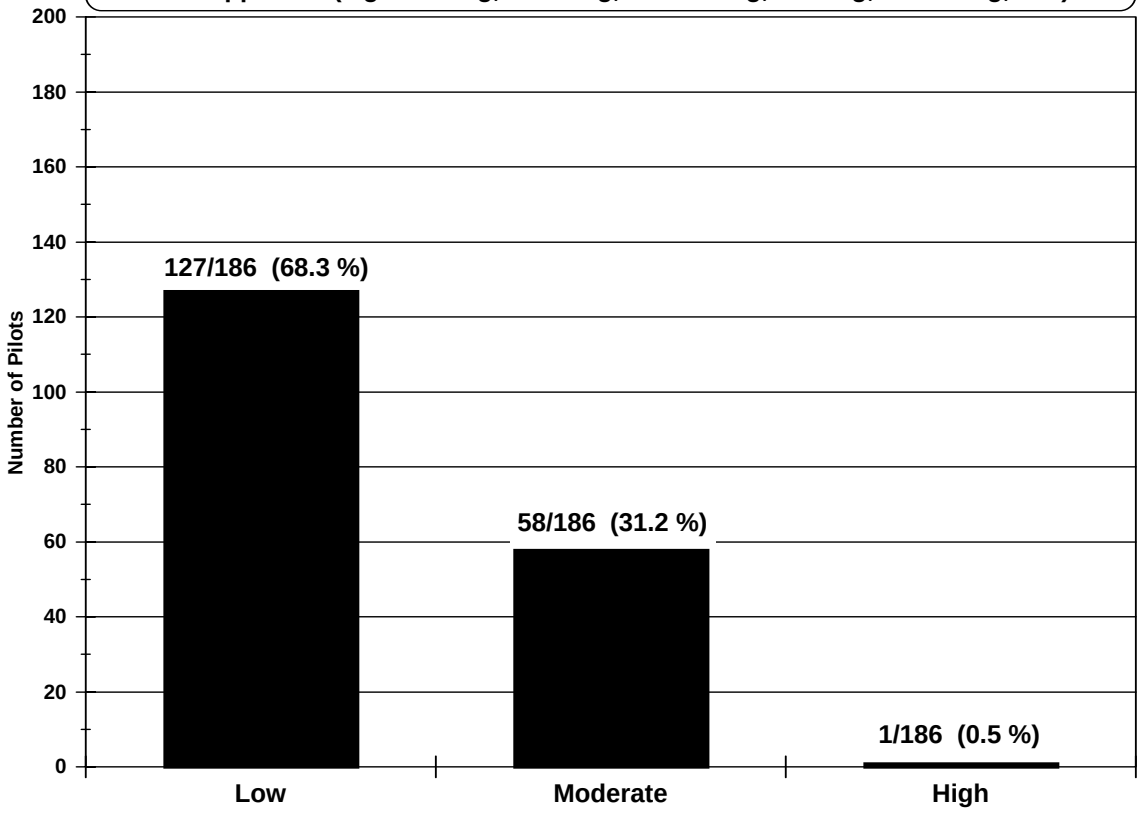



Answers to Post-Approach Questionnaire
3. Were you completely comfortable during the landing portion of this approach (e.g. the Visual Segment and transition to landing from the MAP)?
Number of Pilots
200
180
160
140
120
100
80
60
40
20
0
173/186 (93.0 %)
13/186 (7.0 %)
Yes
No


Answers to Post-Approach Questionnaire
4. Rate the safety of the visual segment after transition from IMC (e.g. finding the heliport and maneuvering to land).
Number of Pilots
200
180
160
140
120
100
80
60
40
20
0
165/186 (88.7 %)
19/186 (10.2 %)
2/186 (1.1 %)
Safe
Moderately Safe
Unsafe

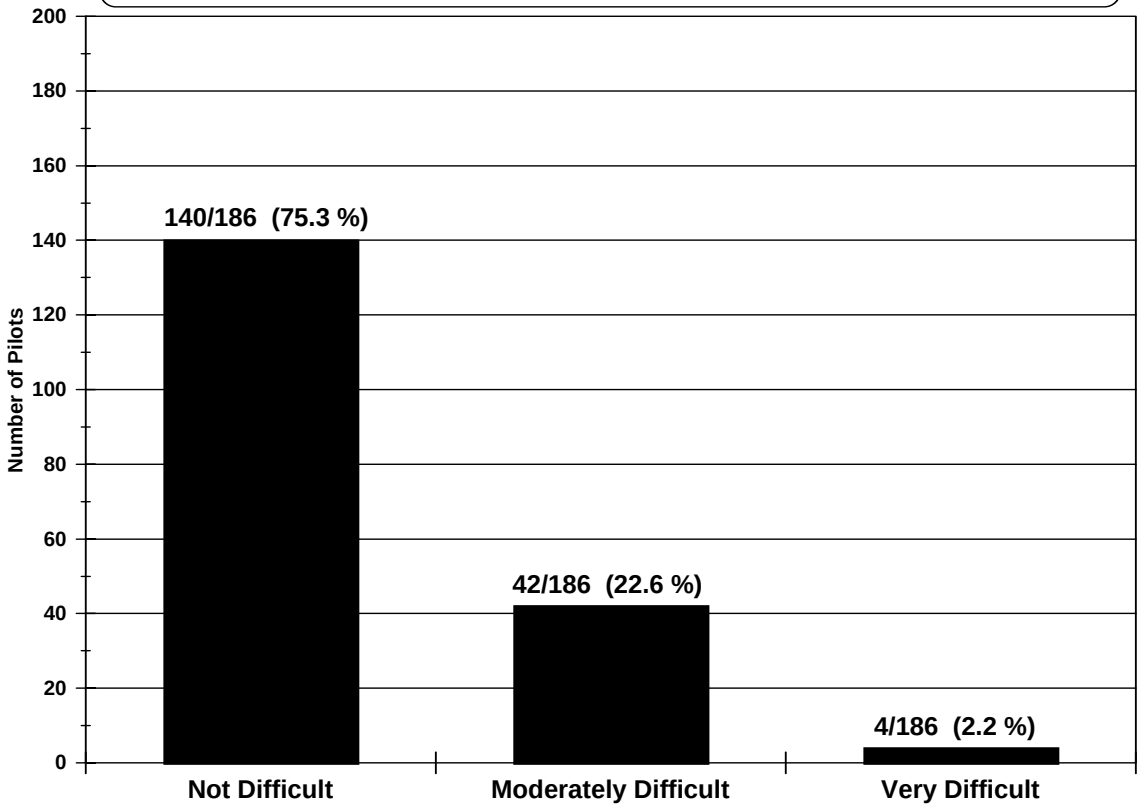
Answers to Post-Approach Questionnaire

5. Rate the pilot mental workload during the visual segment and landing portion of this approach (e.g. thinking, deciding, calculating, looking, searching, etc.).



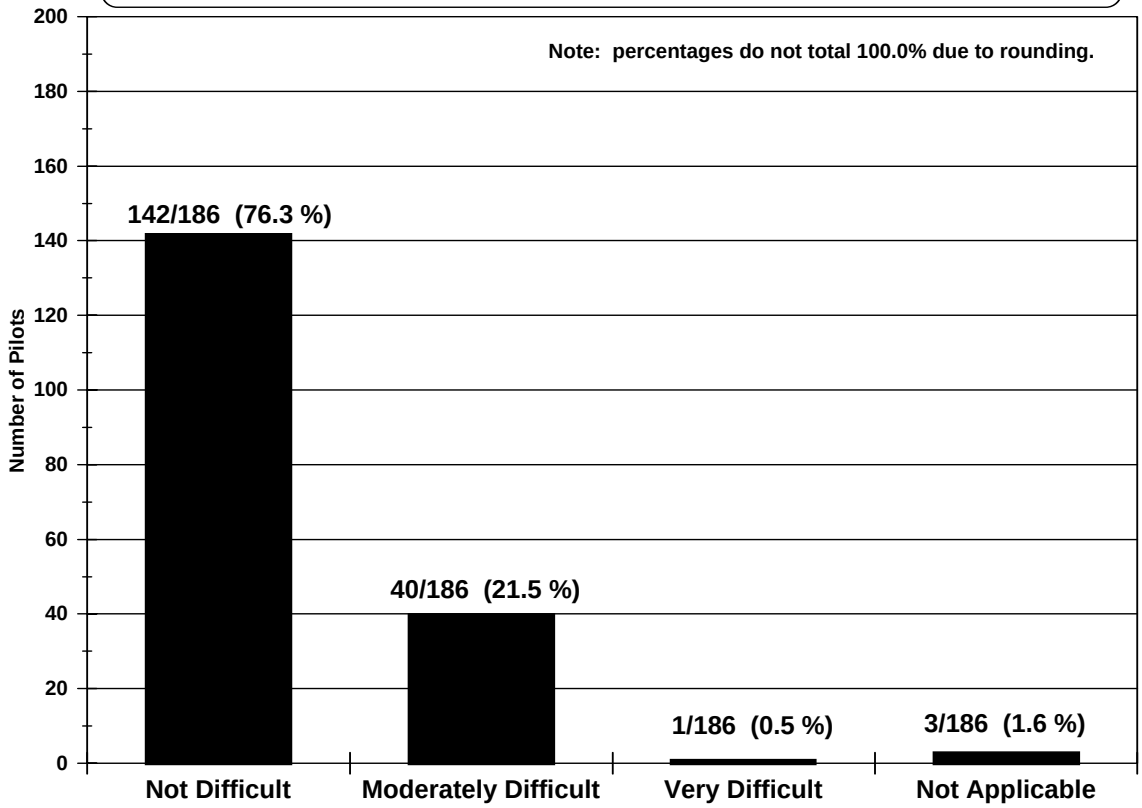
Answers to Post-Approach Questionnaire

6a. Answer the following as it pertains to the visual segment and landing portion of this approach -- decelerating to land at the heliport was (e.g. slowing down):



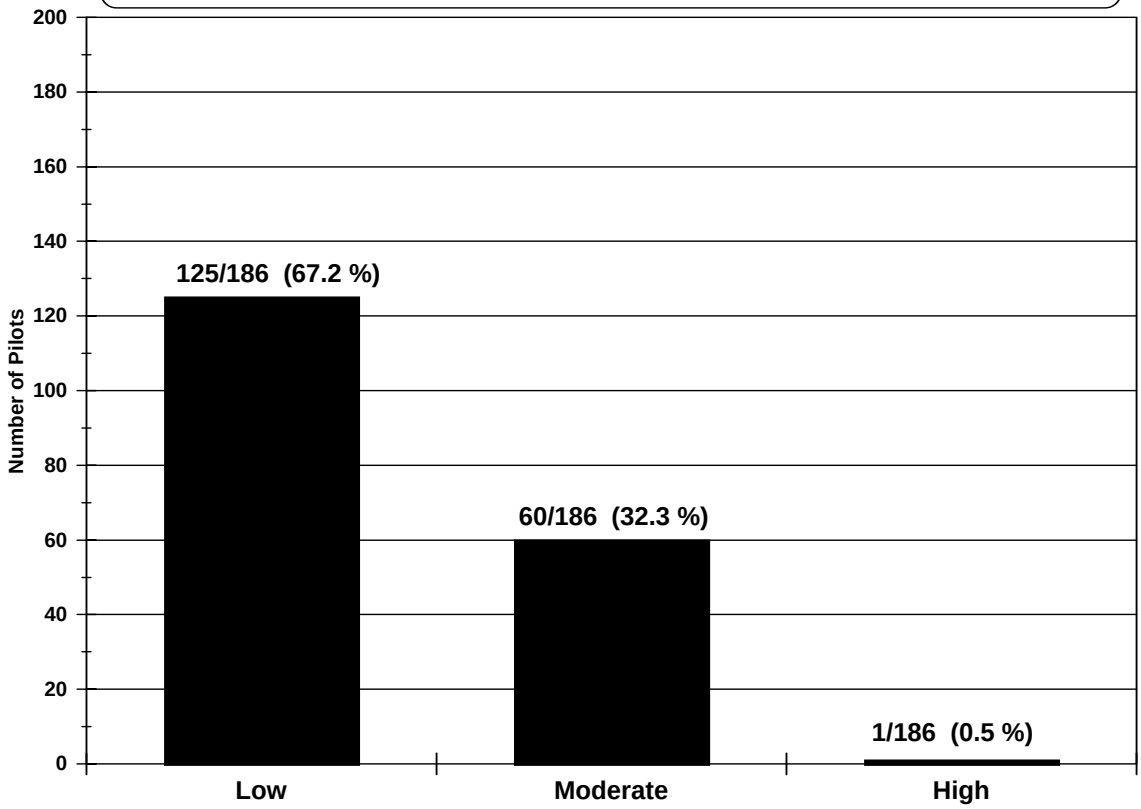
Answers to Post-Approach Questionnaire

6b. Answer the following as it pertains to the visual segment and landing portion of this approach -- descending to land at the heliport was (e.g. rate of descent):



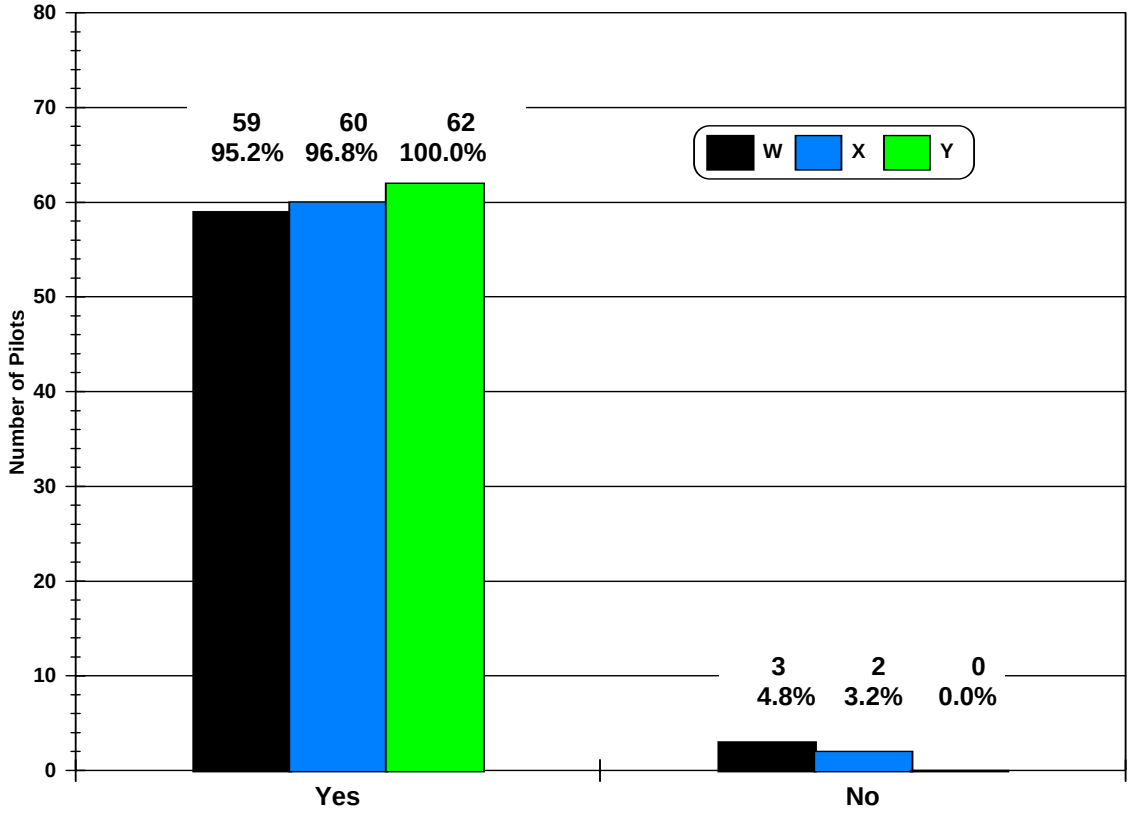
Answers to Post-Approach Questionnaire

7. Rate the pilot physical workload during the visual segment and landing portion of this approach (e.g. pushing, pulling, turning, controlling, activating, etc.).



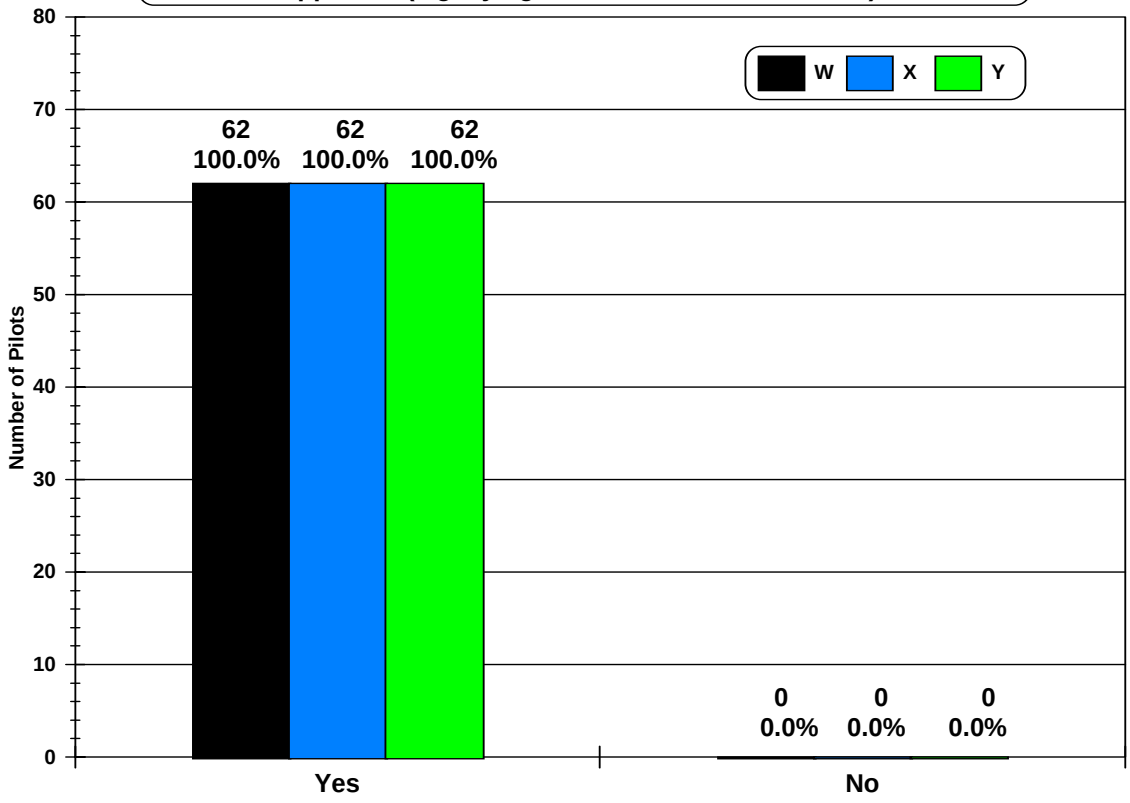
Answers to Post-Approach Questionnaire

1. Did you successfully land or terminate at a hover at the heliport?



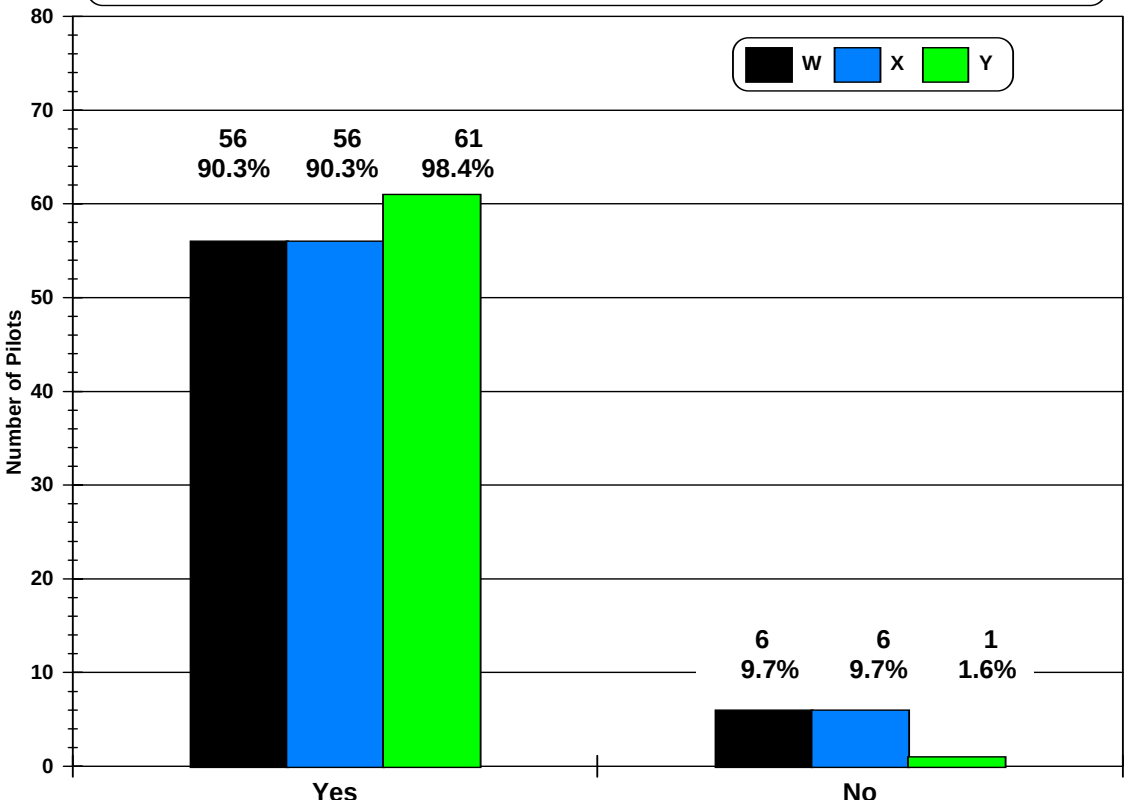
Answers to Post-Approach Questionnaire

2. Were you completely comfortable during the IMC portion of this approach (e.g. flying on instruments to the MAP)?



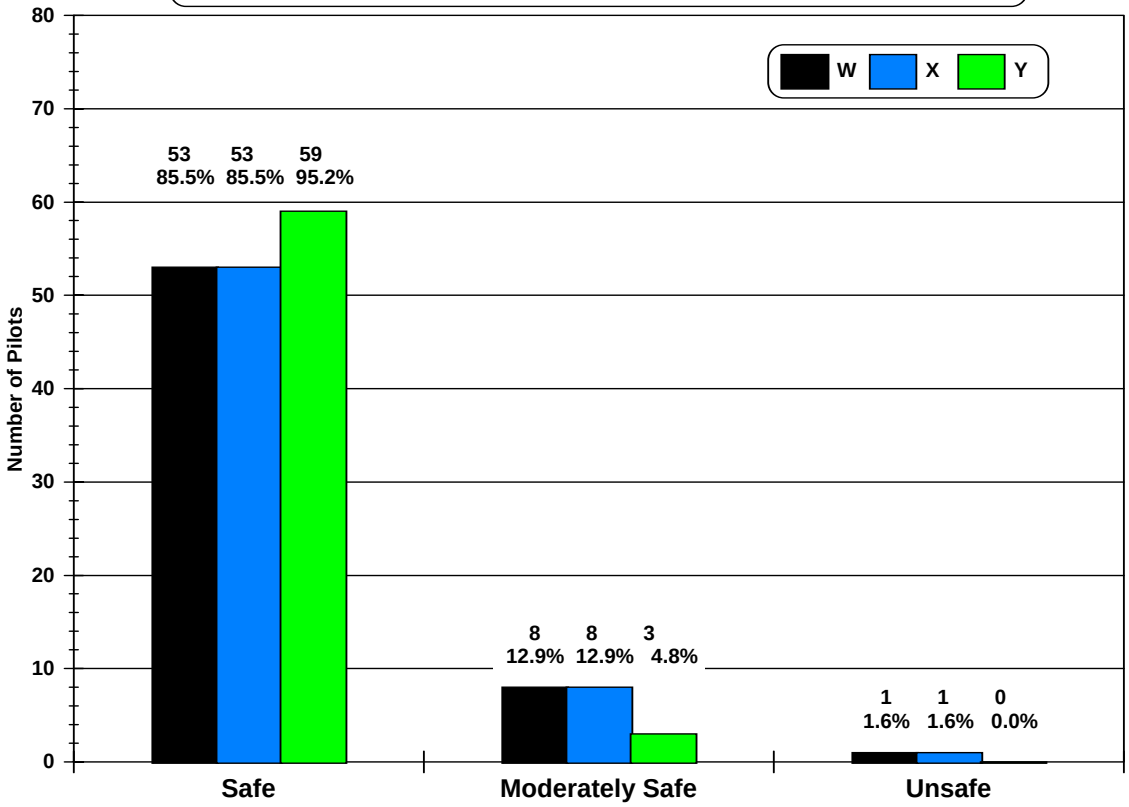
Answers to Post-Approach Questionnaire

3. Were you completely comfortable during the landing portion of this approach (e.g. the Visual Segment and transition to landing from the MAP)?



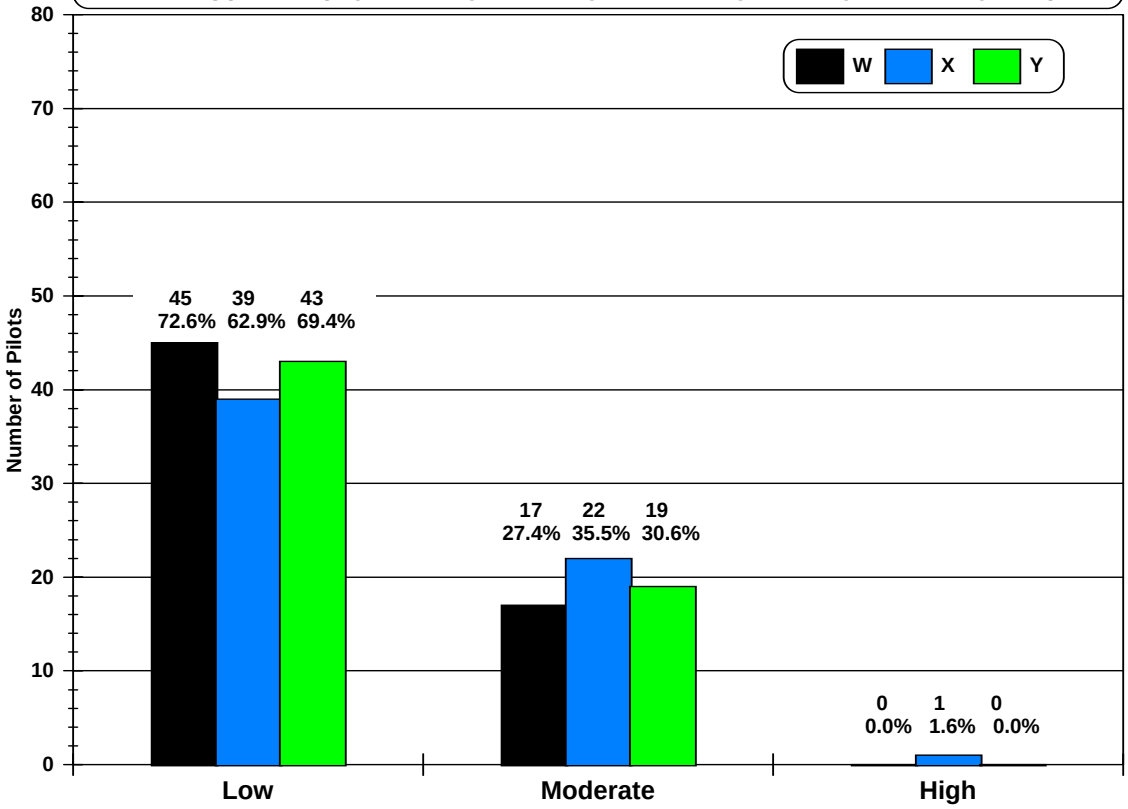
Answers to Post-Approach Questionnaire

4. Rate the safety of the visual segment after transition from IMC (e.g. finding the heliport and maneuvering to land).



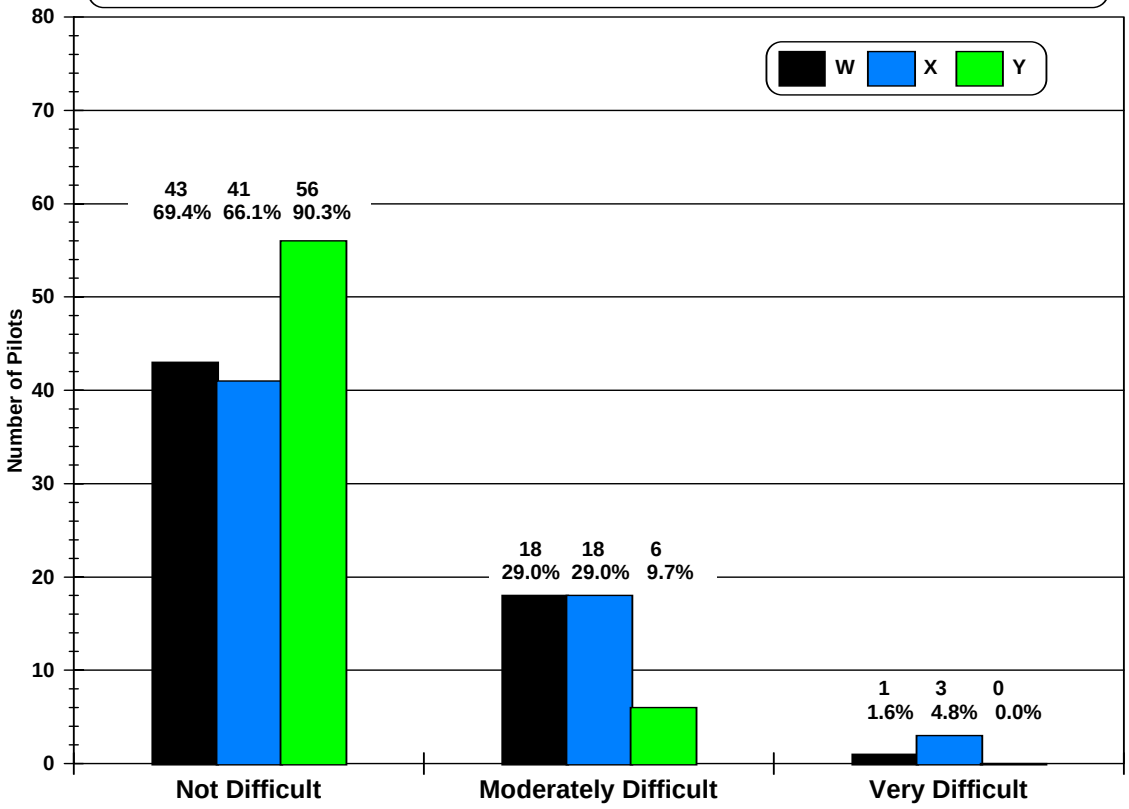
Answers to Post-Approach Questionnaire

5. Rate the pilot mental workload during the visual segment and landing portion of this approach (e.g. thinking, deciding, calculating, looking, searching, etc.).



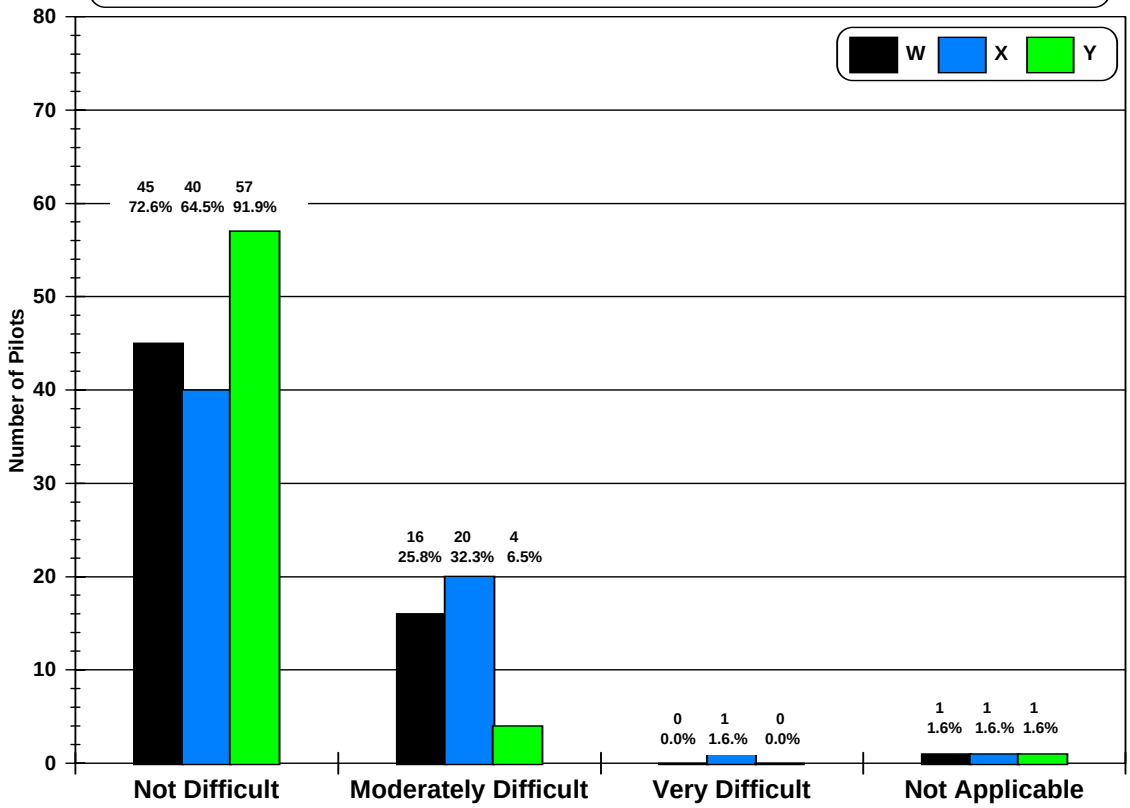
Answers to Post-Approach Questionnaire

6a. Answer the following as it pertains to the visual segment and landing portion of this approach -- decelerating to land at the heliport (e.g. slowing down) was:



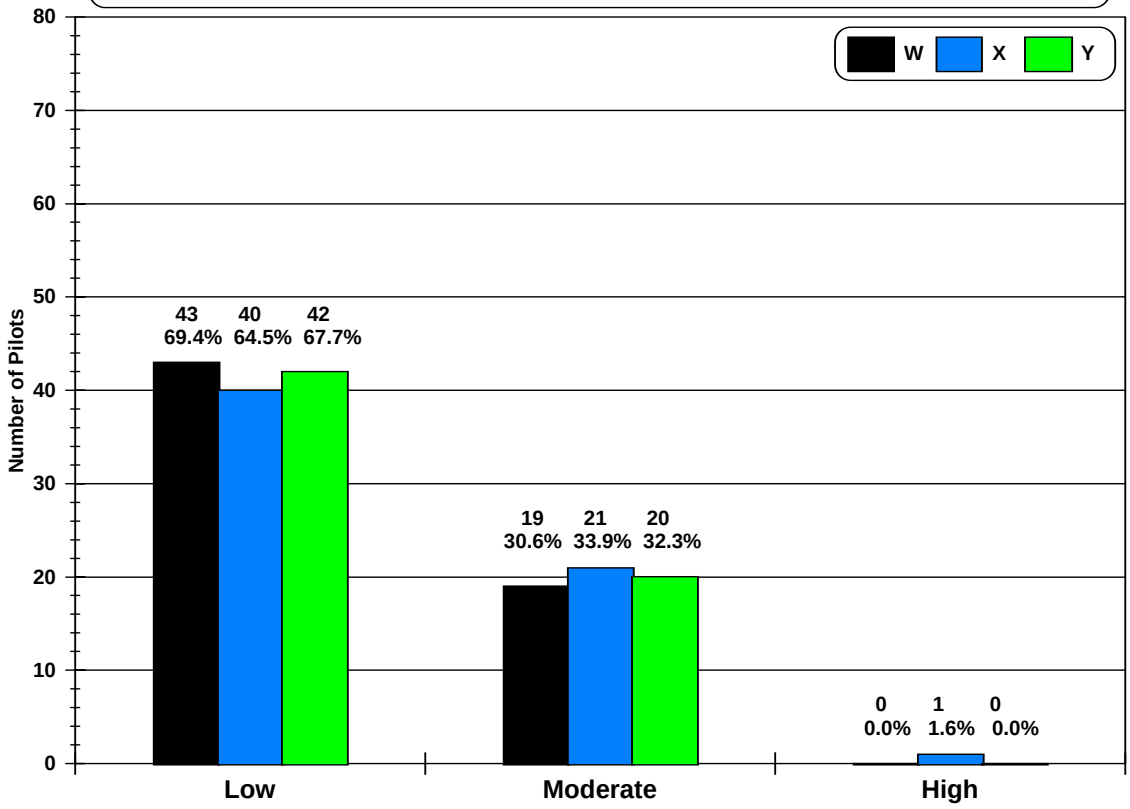
Answers to Post-Approach Questionnaire

6b. Answer the following as it pertains to the visual segment and landing portion of this approach -- descending to land at the heliport was (e.g. rate of descent):



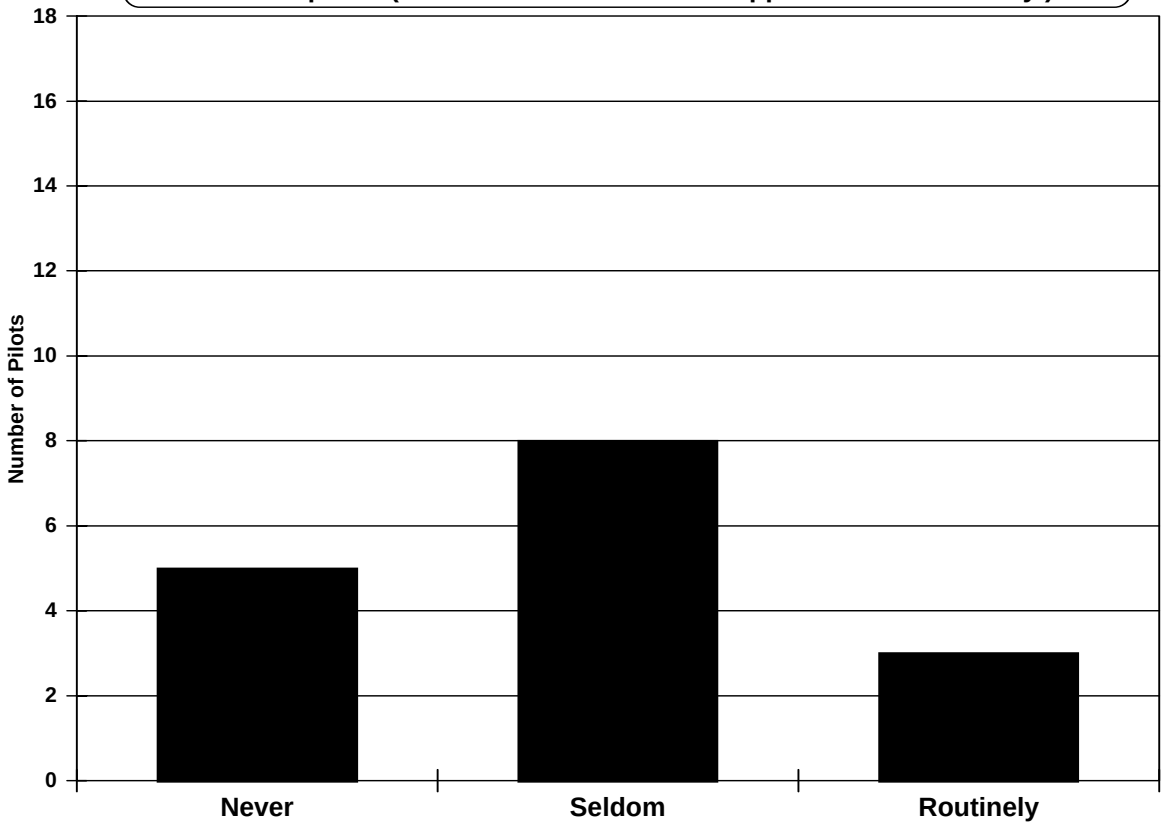
Answers to Post-Approach Questionnaire

7. Rate the pilot physical workload during the visual segment and landing portion of this approach (e.g. pushing, pulling, turning, controlling, activating, etc.).



Answers to Post-Test Questionnaire

1.1 How often do you fly Copter RNAV (GPS) instrument approach procedures to a heliport? (Do not include instrument approaches to a runway.)

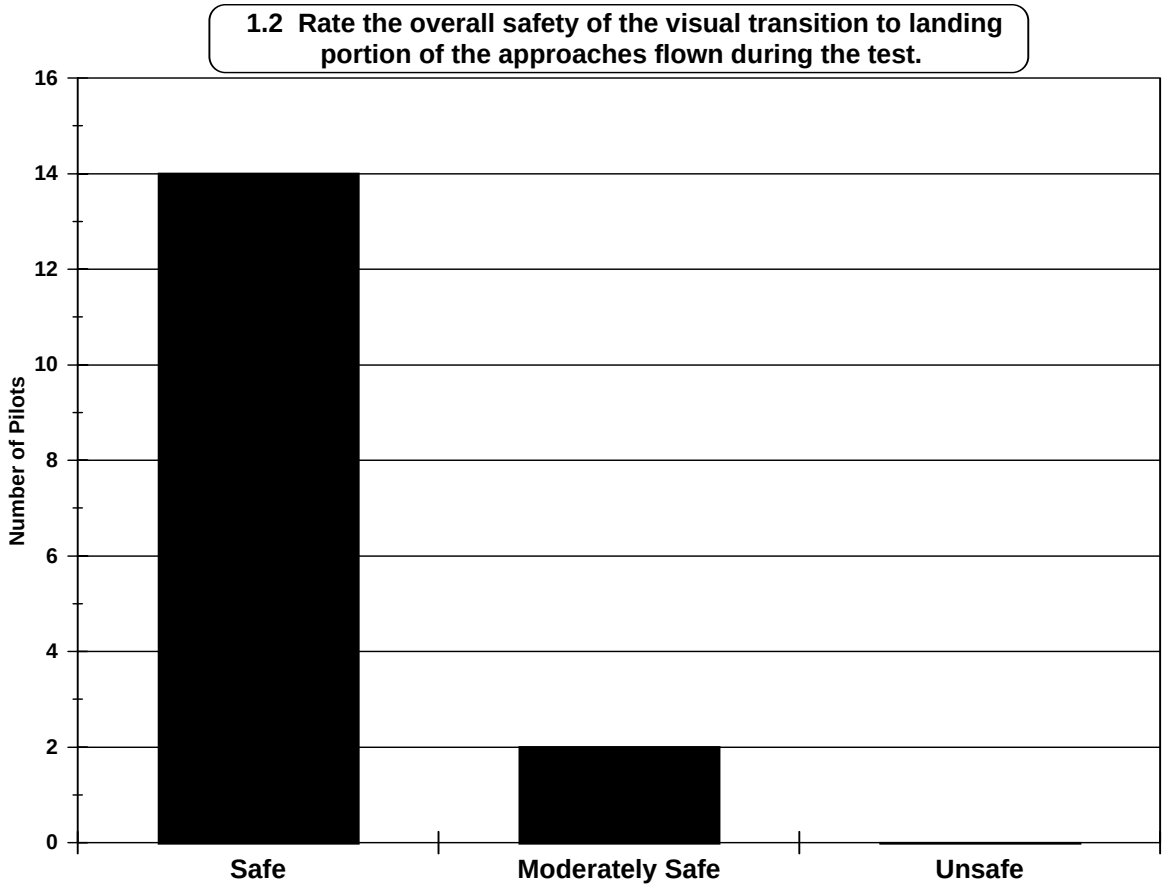


Pilot Comments

Q 1.1 How often do you fly Copter RNAV (GPS) instrument approach procedures to a heliport (e.g. do not include instrument approaches to a runway).

P14: Company IAPs to point-in-space *(approaches)* in *(city)*. *(Note: Subject Pilot checked "Seldom".)*

Answers to Post-Test Questionnaire

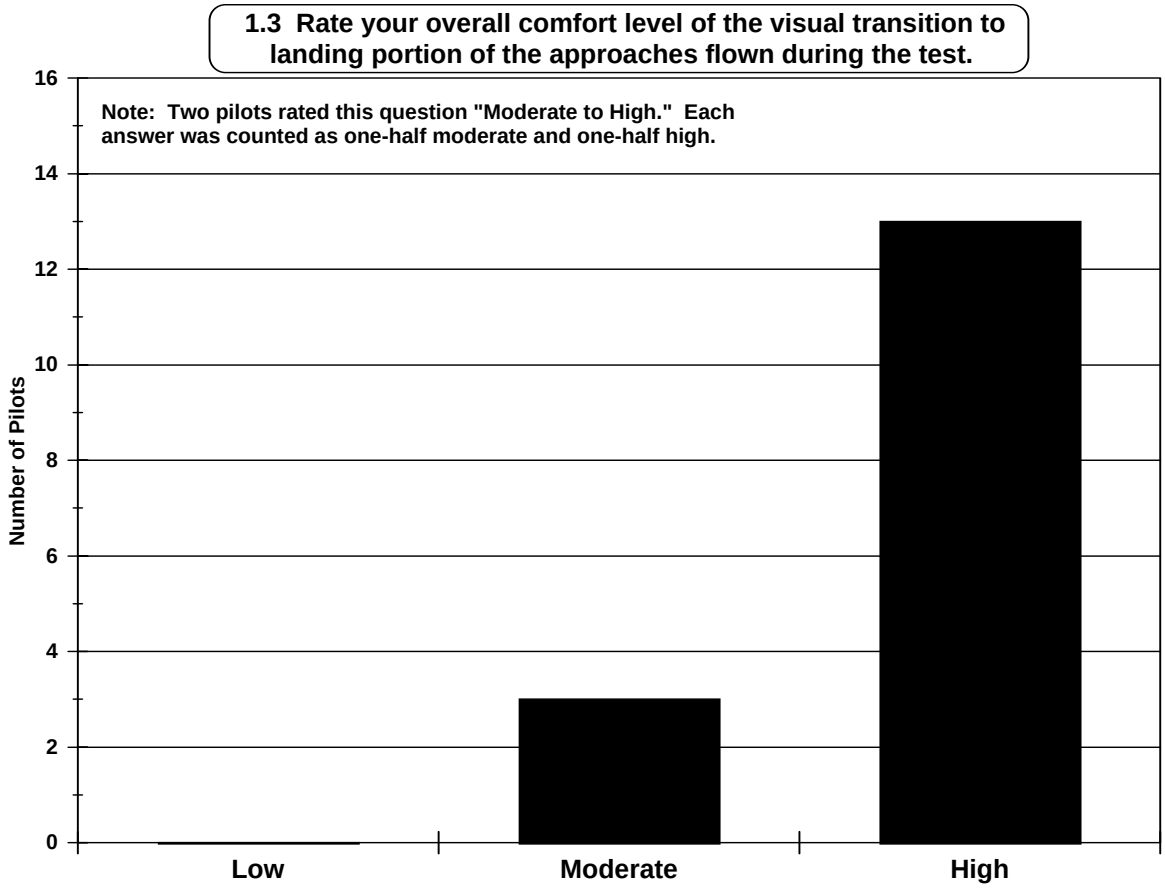


Pilot Comments

Q 1.2 Rate the overall safety of the visual transition to landing portion of the approaches flown during the test.

Note: No pilot comments.

Answers to Post-Test Questionnaire



Pilot Comments

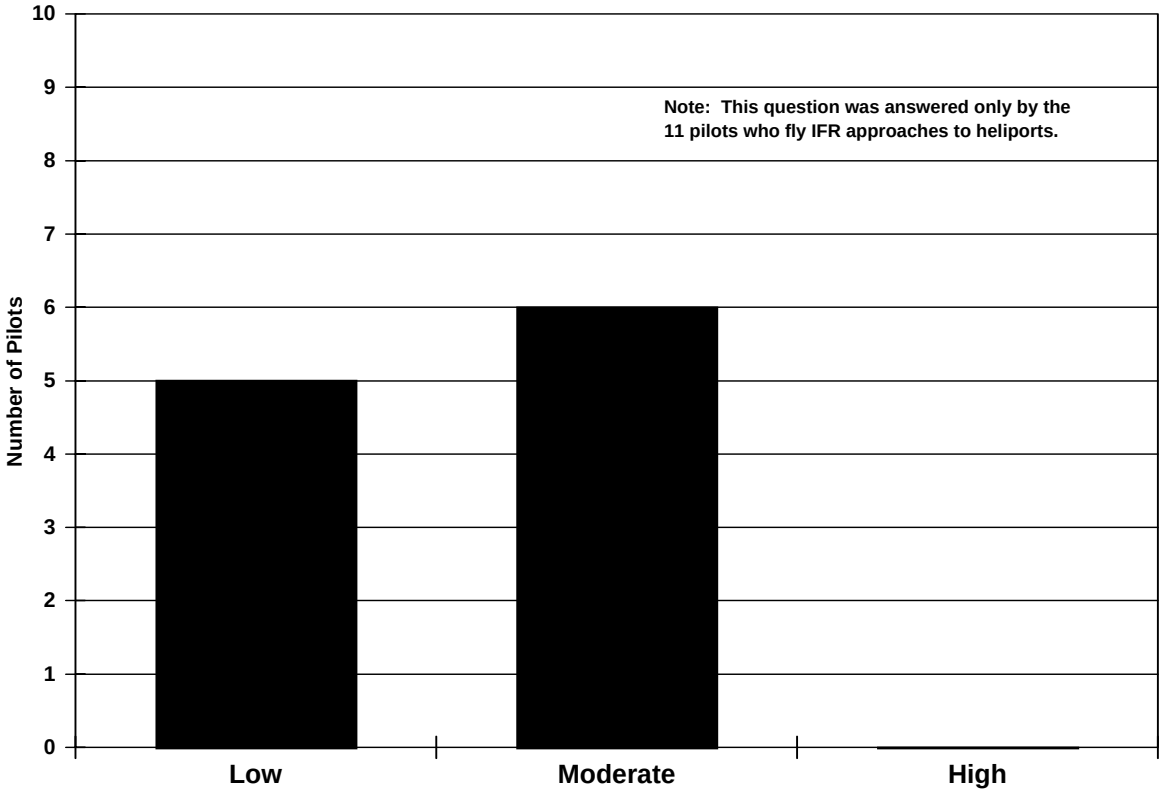
Q 1.3 Rate your overall comfort level of the visual transition to landing portion of the approaches flown during the test.

P12: Generally "High"; "X" approaches could be moderate. *(Subject Pilot checked both "Moderate" and "High" with this comment)*

P13: *(I)* felt better with approaches after morning session.

Answers to Post-Test Questionnaire

1.4 Compared to other Copter RNAV (GPS) approaches you fly, rate the overall level of effort required completing the visual transition to landing portion of the HVSE test approaches.



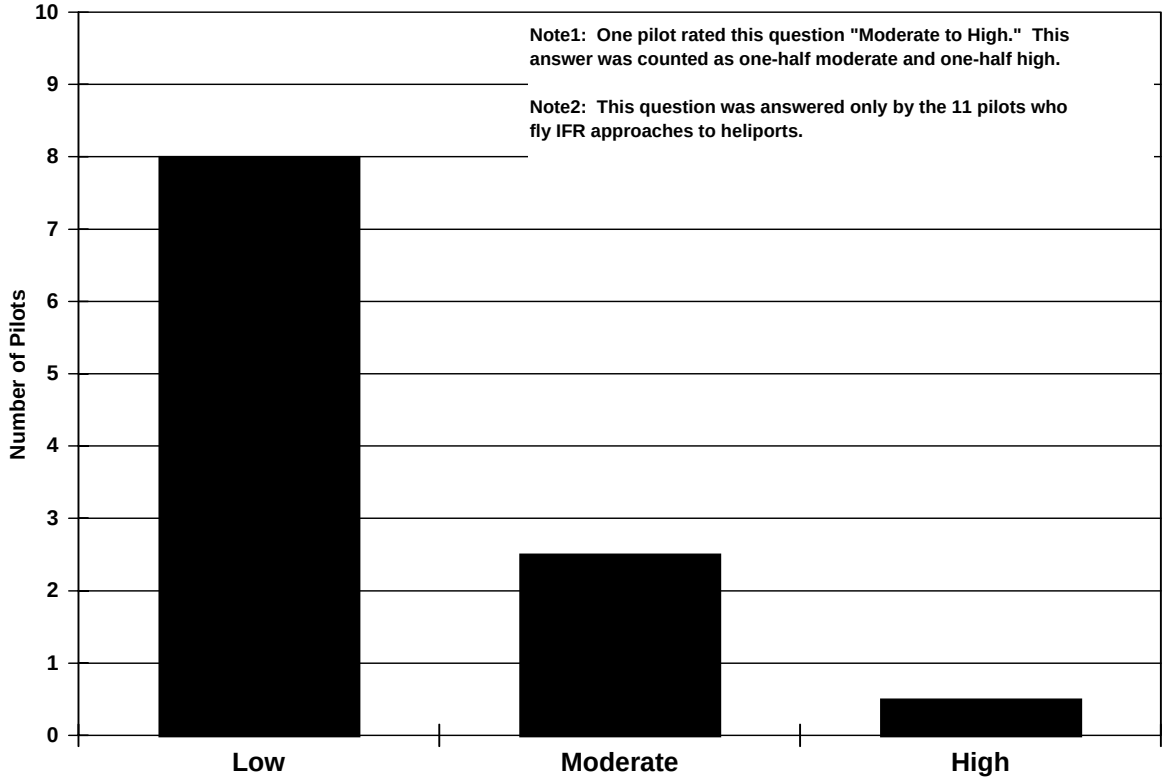
Pilot Comments

Q 1.4 Compared to other Copter RNAV (GPS) approaches you fly, rate the overall level of effort required completing the visual transition to landing portion of the HVSE test approaches.

Note: No pilot comments.

Answers to Post-Test Questionnaire

1.5 Compared to other Copter RNAV (GPS) approaches you fly, rate the overall pilot workload required completing the visual transition to landing portion of the HSVE test approaches.



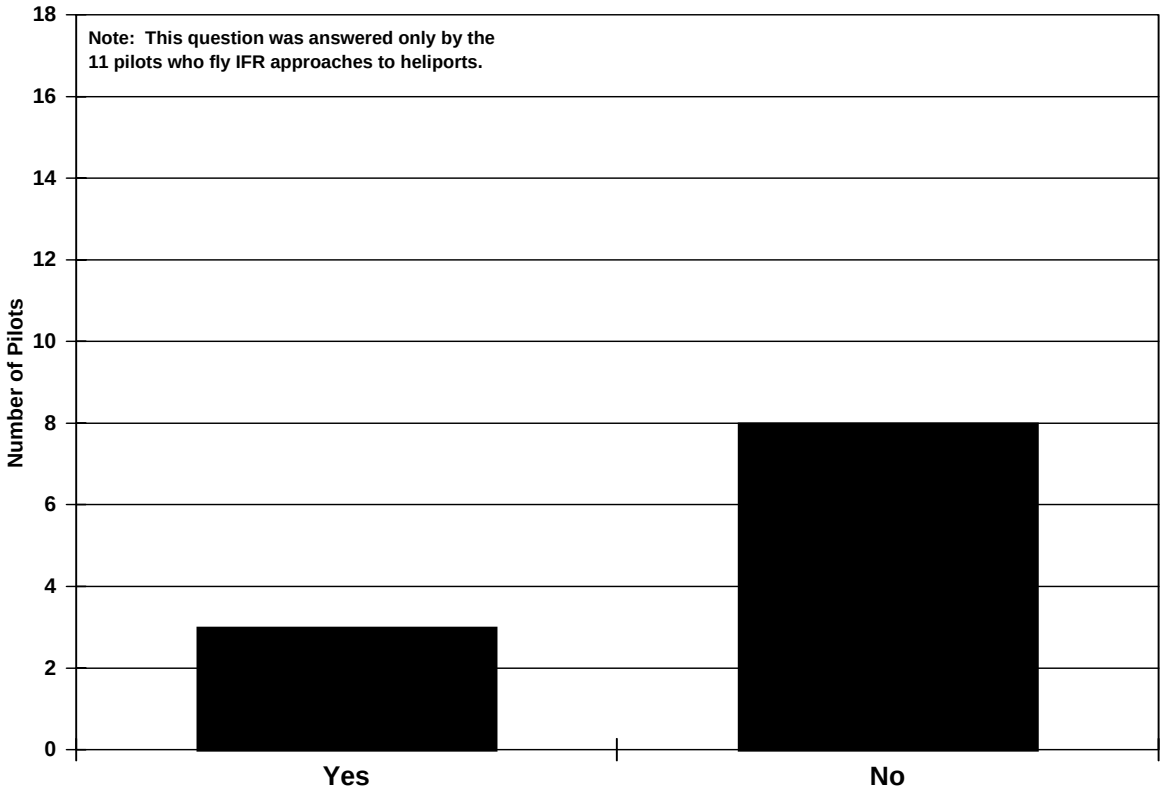
Pilot Comments

Q 1.5 Compared to other Copter RNAV (GPS) approaches you fly, rate the overall pilot workload required completing the visual transition to landing portion of the HSVE test approaches.

Note: No pilot comments.

Answers to Post-Test Questionnaire

1.6 Do you think the visual transition to landing portion of the HSVE test approaches you flew should require special aircrew training.



Pilot Comments

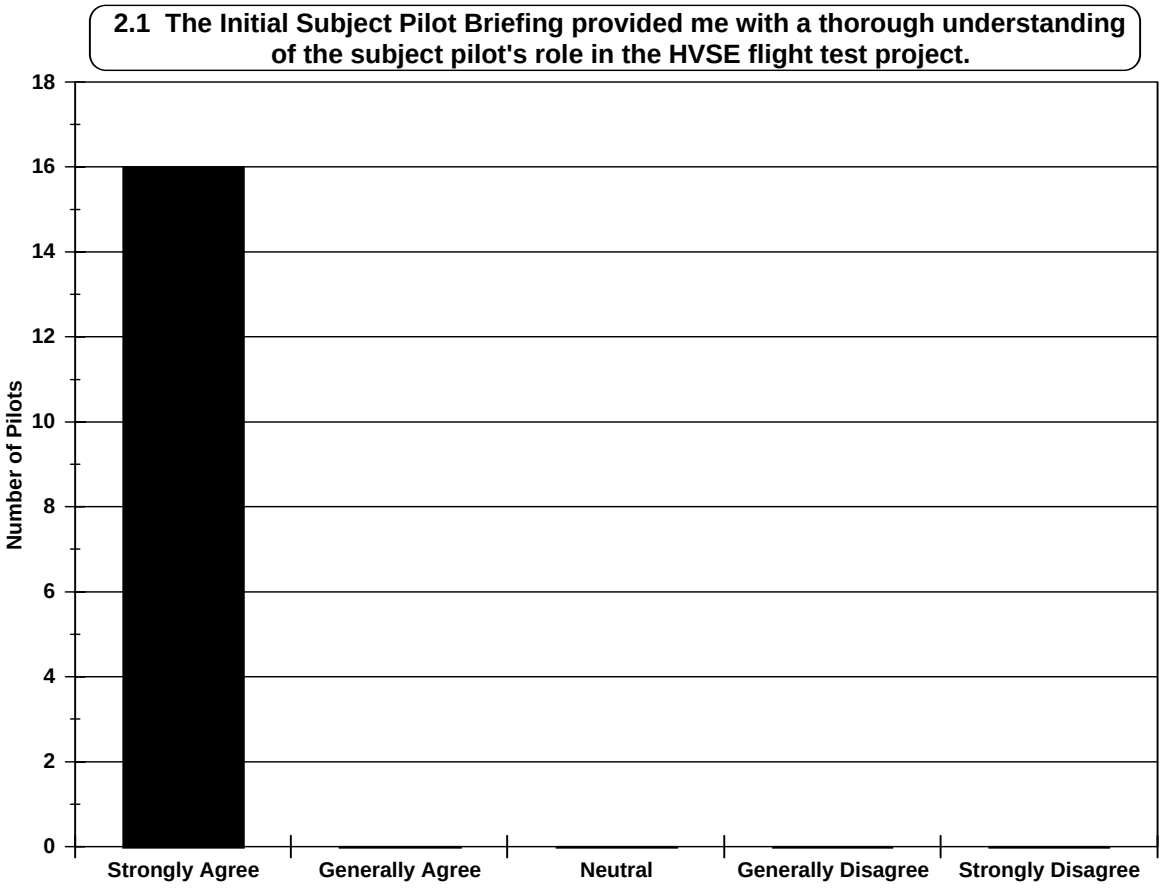
Q 1.6 Do you think the visual transition to landing portion of the HVSE test approaches you flew should require special aircrew training?

P10: I think that some training on the theory and some practical training would be very beneficial.

P03: Possible 1-hour class at (simulation facility) to review procedures and pitfalls to look for.

P14: Figuring that pilots are reasonably familiar with their aircraft and go to heliports VFR. If this descent profile is rarely used, a few practice runs in VFR would help.

Answers to Post-Test Questionnaire



Pilot Comments

Q 2.1 The Initial Subject Pilot Briefing provided me with a thorough understanding of the subject pilot's role in the HVSE flight test project. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

The Initial Subject Pilot Briefing could be improved in the following areas:

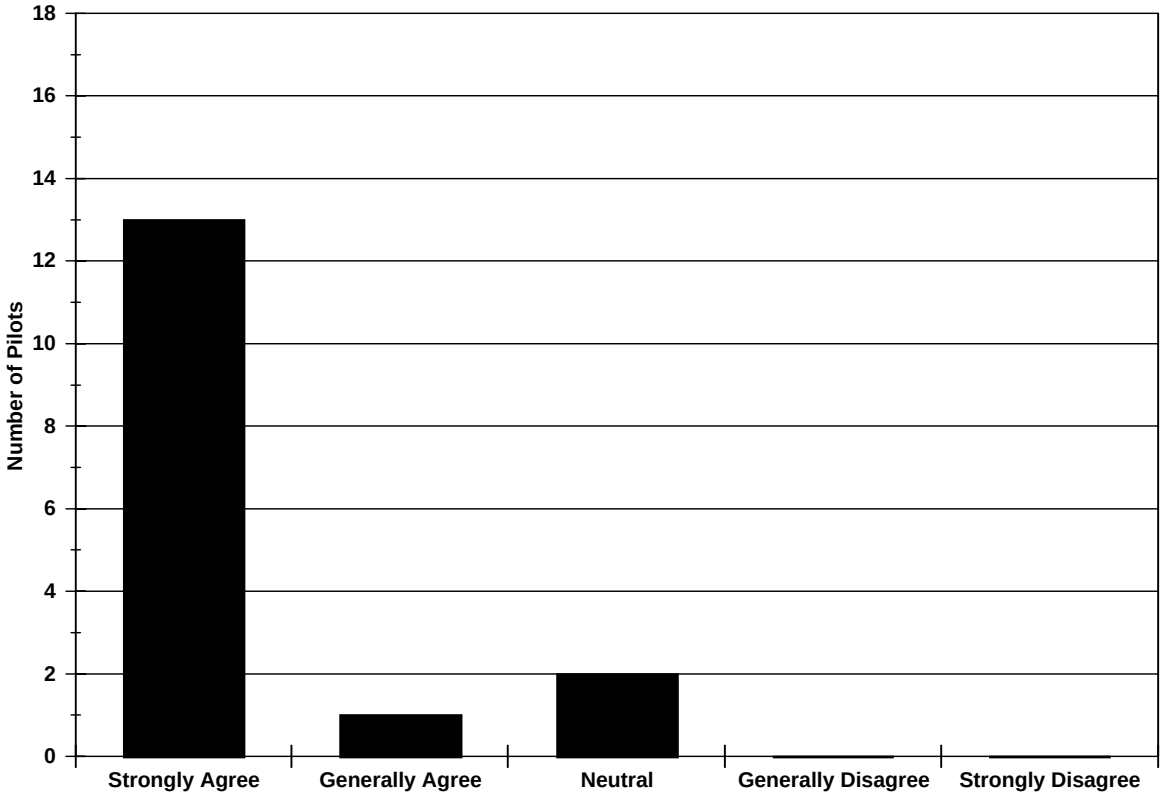
P02: Email handout to pilots ahead of time and they will have read it. I got a copy and was pre-loaded upon arrival.

P05: The information sent ahead of time by email was very helpful.

P07: I thought the initial briefing was very thorough.

Answers to Post-Test Questionnaire

2.2 The Aircraft Orientation Briefing provided me with a thorough understanding of the helicopter systems, the avionics, and the necessary introductions to the FAA's S-76 GPS receiver.



Pilot Comments

Q 2.2 The Aircraft Orientation Briefing provided me with a thorough understanding of the helicopter systems, the avionics, and the necessary introductions to the FAA's S-76 GPS receiver. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

The Aircraft Orientation Briefing could be improved in the following areas:

P05: Tell subject pilots there is no handhold by the side of the pilot's door (common on other S76 aircraft).

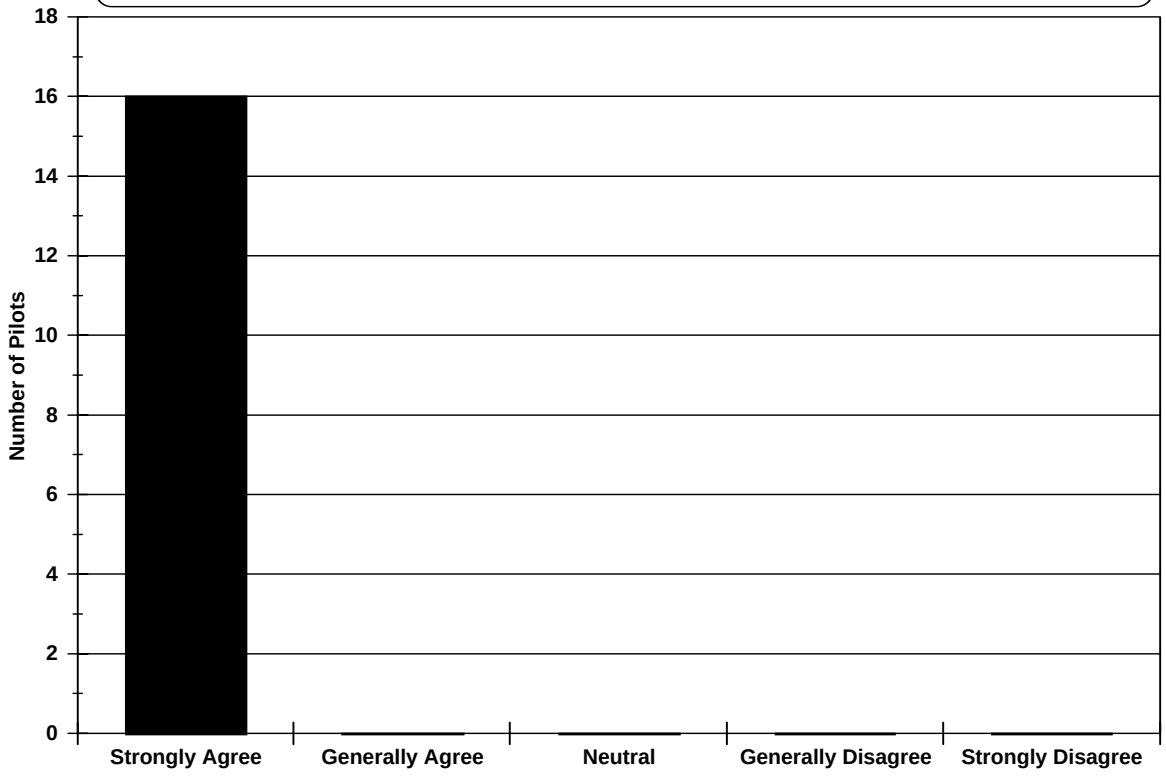
P07: I felt briefed enough to do the required tasks with a safety pilot. I don't know how to improve what was done.

P14: Avionics operated by project pilot. *(I)* could have spent more time familiarizing (S76) A-model switches and gauges, but that's just me having no time in A-model. *(Note: subject pilot checked "Neutral".)*

P16: N/R. Subject pilots were have familiarization with S-76 GPS receivers. Briefing did not include systems refresher.

Answers to Post-Test Questionnaire

2.3 The HVSE Familiarization Flight provided me with enough training: 1) in the operation of the aircraft, 2) in using the GPS receiver for navigation, and 3) to fly the HVSE approach procedure with confidence .



Pilot Comments

Q 2.3 The HVSE Familiarization Flight provided me with enough training: 1) in the operation of the aircraft, 2) in using the GPS receiver for navigation, and 3) to fly the HVSE approach procedure with confidence . (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

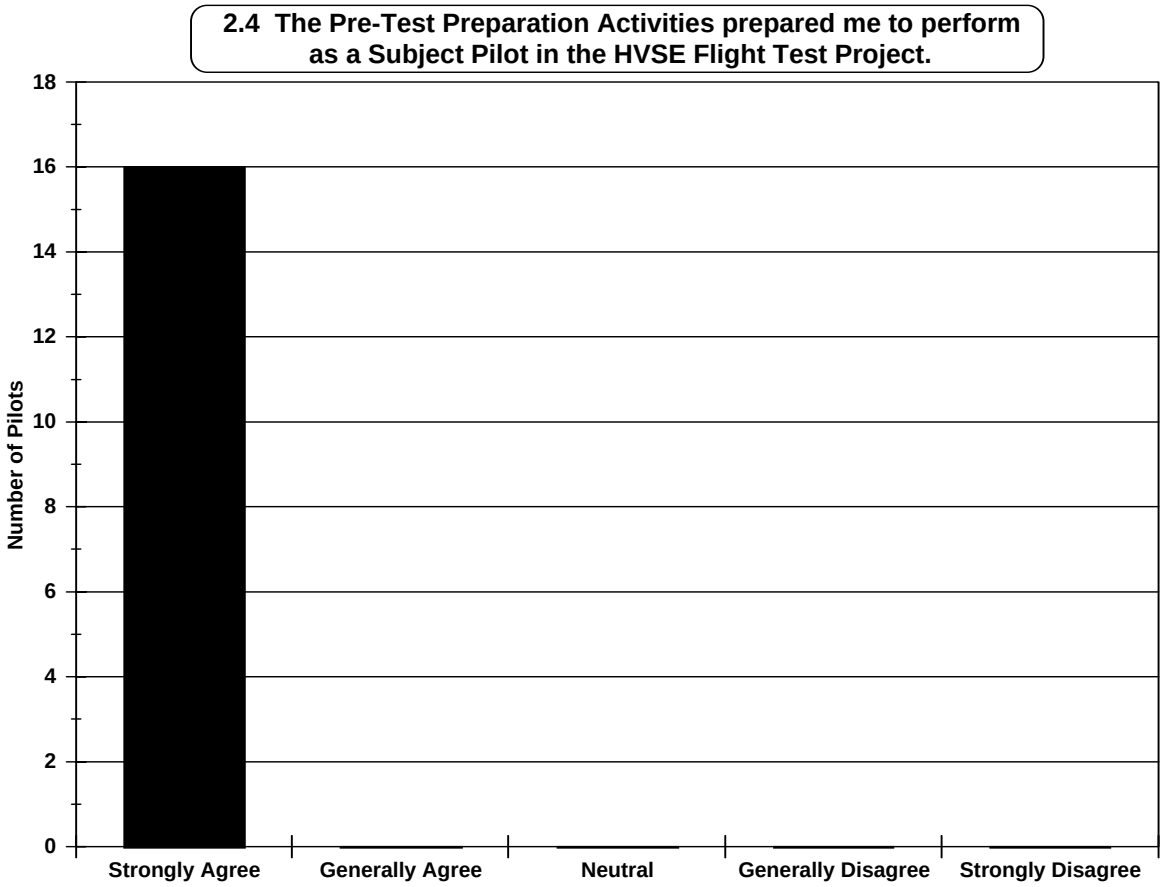
The HVSE Familiarization Flight could have offered additional training in the following areas:

P07: I think the familiarization flight was adequate for the task.

P13: Strongly agree with 1) (operation of the aircraft) and 2) (in using the GPS receiver for navigation). Wind shear and tailwind training are needed to gain confidence in procedure.

P14: Flies like other S76 models, just took me a bit to get instrument scan and feel.

Answers to Post-Test Questionnaire



Pilot Comments

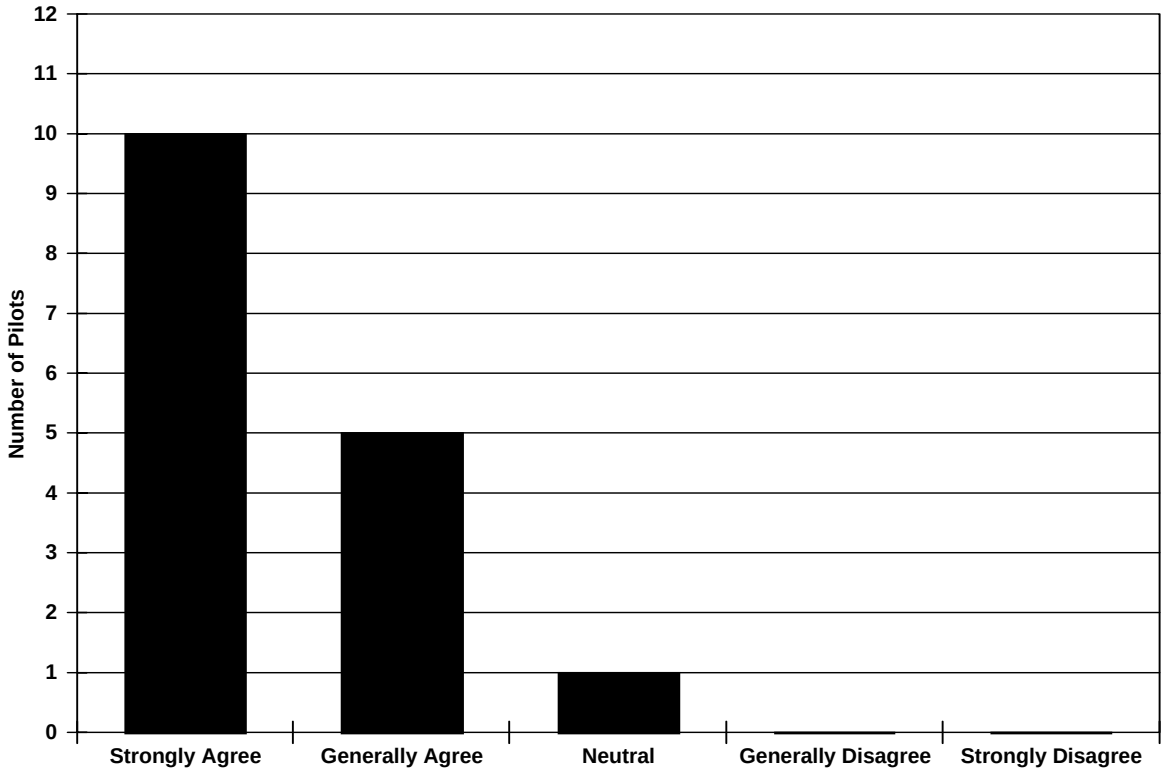
Q 2.4 The Pre-Test Preparation Activities prepared me to perform as a Subject Pilot in the HVSE Flight Test Project. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

The Pre-Test Preparation Activities could have offered additional training in the following areas:

P07: I can't think of any.

Answers to Post-Test Questionnaire

3.1 The MAP and visual segment transition point on the approaches for this test were just about where I thought they should be. (e.g. the combination of angle, distance to heliport, and altitude).



Pilot Comments

Q 3.1 The MAP and visual segment transition point on the approaches for this test were just about where I thought they should be. (e.g. the combination of angle, distance to heliport, and altitude). (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

If you answered Generally or Strongly Disagree please explain:

P07: I felt that the MAPs were a bit close. That's why I felt special crew training was needed. The vertiport was obscured by the aircraft nose at the MAPs on some approaches. This applies to the X approach.

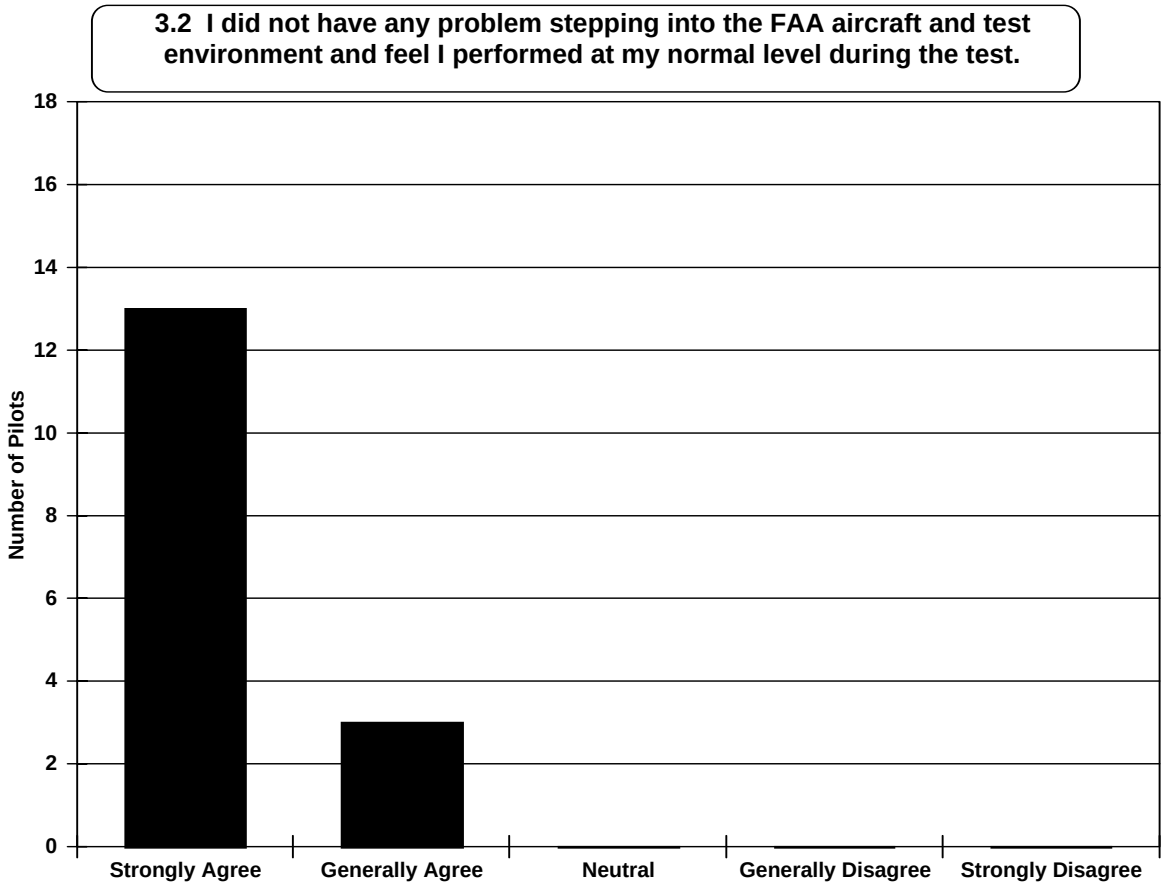
P08: I prefer the lower of the 3 approaches *(Y approach)* with the deceleration at MDA provides for a slower approach during descent.

P10: I think most helicopter pilots would like a more shallow approach angle.

P11: All approaches except for "X" I would strongly agree. "X" seemed to put me in the highest workload condition.

P14: After a dozen runs it was fine. At first it seemed tougher.

Answers to Post-Test Questionnaire



Pilot Comments

Q 3.2 I did not have any problem stepping into the FAA aircraft and test environment and feel I performed at my normal level during the test. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

Describe any problems you feel that might have impacted your performance:

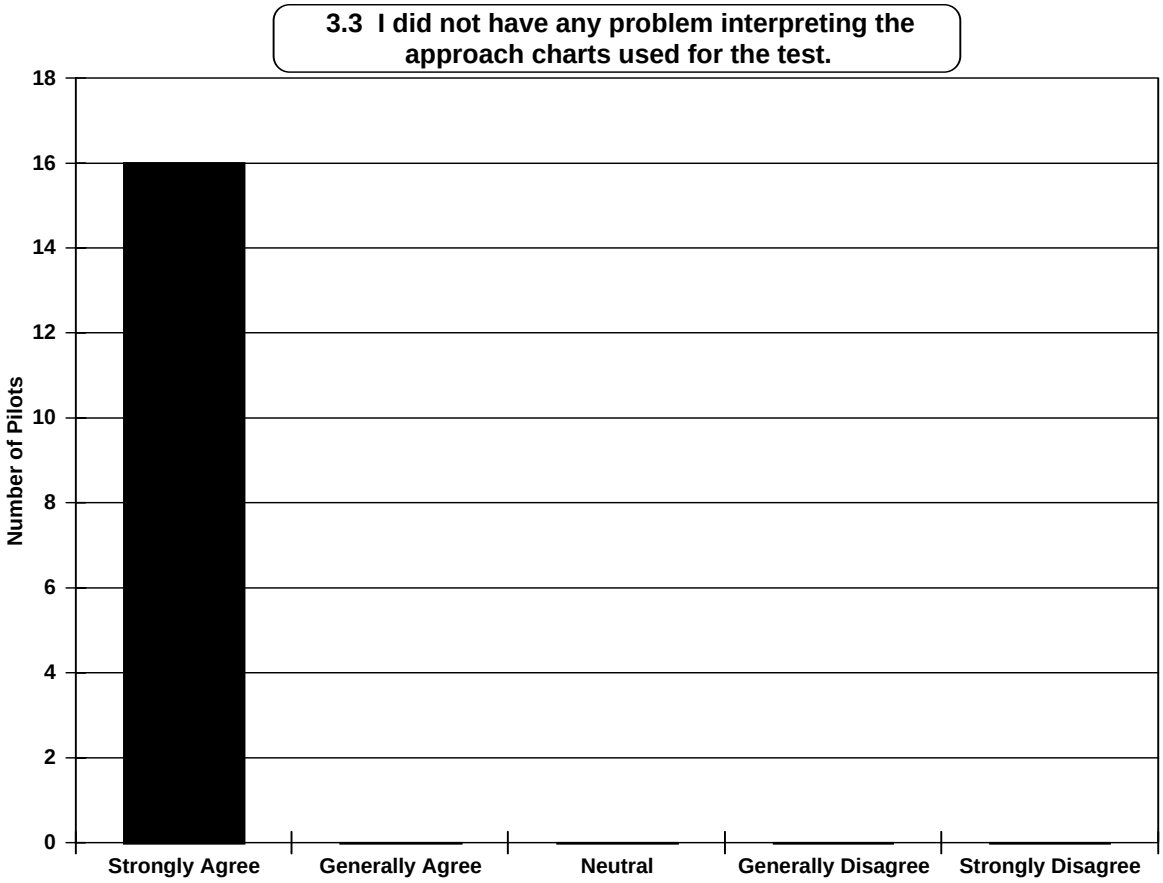
P02: Strong winds made it challenging.

P05: I had the advantage of having been a subject pilot for the FAA Technical Center previously.

P07: I don't feel I had any problems.

P14: Project team made me feel very much at ease.

Answers to Post-Test Questionnaire



Pilot Comments

Q 3.3 I did not have any problem interpreting the approach charts used for the test. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

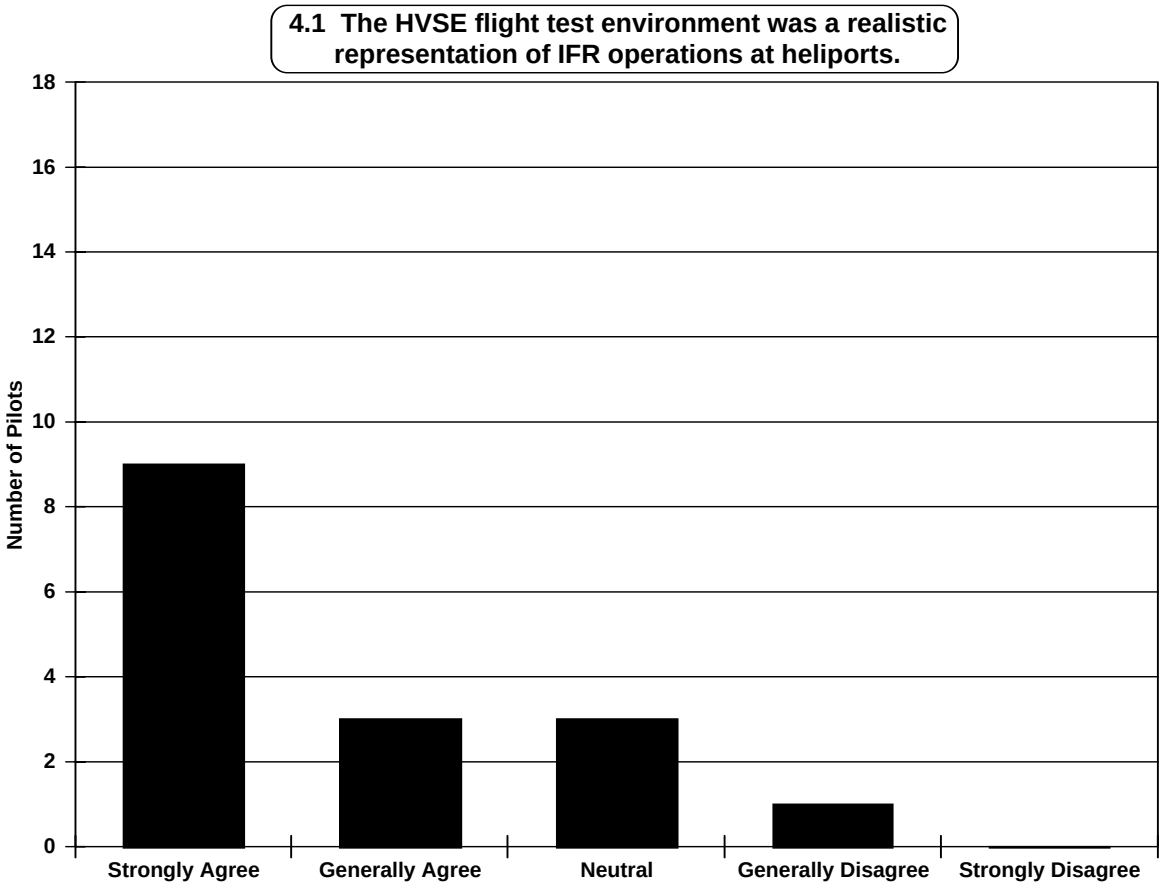
If you answered Generally or Strongly Disagree please provide comments for FAA Charting Forums (e.g. information not provided that should be; information provided that should not be or provided in a different format:

P02: Received ahead of time. Familiar when I arrived.

P03: MDA to VP *(VDP)*

P13: Depiction of holding pattern after missed approach.

Answers to Post-Test Questionnaire



Pilot Comments

Q 4.1 The HVSE flight test environment was a realistic representation of IFR operations at heliports. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

If you answered Generally or Strongly Disagree, please provide comments as to if you believe additional testing should be done at other heliports to supplement these test results. (e.g. if you believe testing should also be done at obstacle rich heliports, or rooftop heliports):

P05: The conditions (airspeeds, crosswinds, etc.) were excellent in the incorporation of the test data.

P09: If any way to reduce visibility would help.

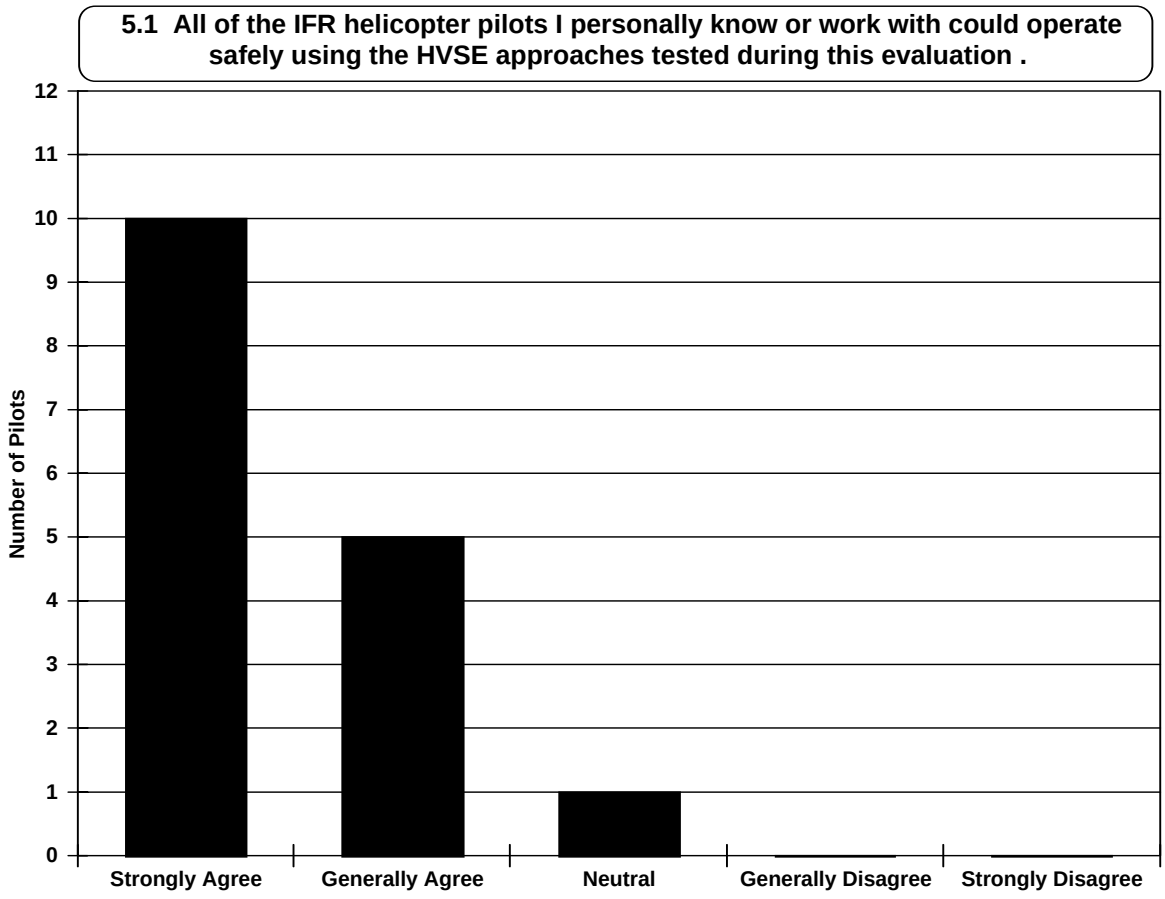
P11: Most heliports have more obstacles in or around the landing site.

P13: I have very limited operations to/from heliports.

P15: The test environment was good but airspeed control was difficult when using ground speed readout rather than airspeed. Real world would compensate for downwind conditions with airspeed reduction which would have made the vis to land *(visual)* segment very easy.

P16: I would include testing to confined areas and or rooftops that best replicate environment for subject use.

Answers to Post-Test Questionnaire



Pilot Comments

Q 5.1 All of the IFR helicopter pilots I personally know or work with could operate safely using the HVSE approaches tested during this evaluation . (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

If you answered Generally or Strongly Disagree please provide comments as to what special aircrew training should be provided:

P07: Because the vertiport was obscured by the nose, I feel several practice approaches should be done so that the crew will know where to expect the vertiport (applies to X).

P09: Training to know the need for an immediate beginning to the slow down of aircraft.

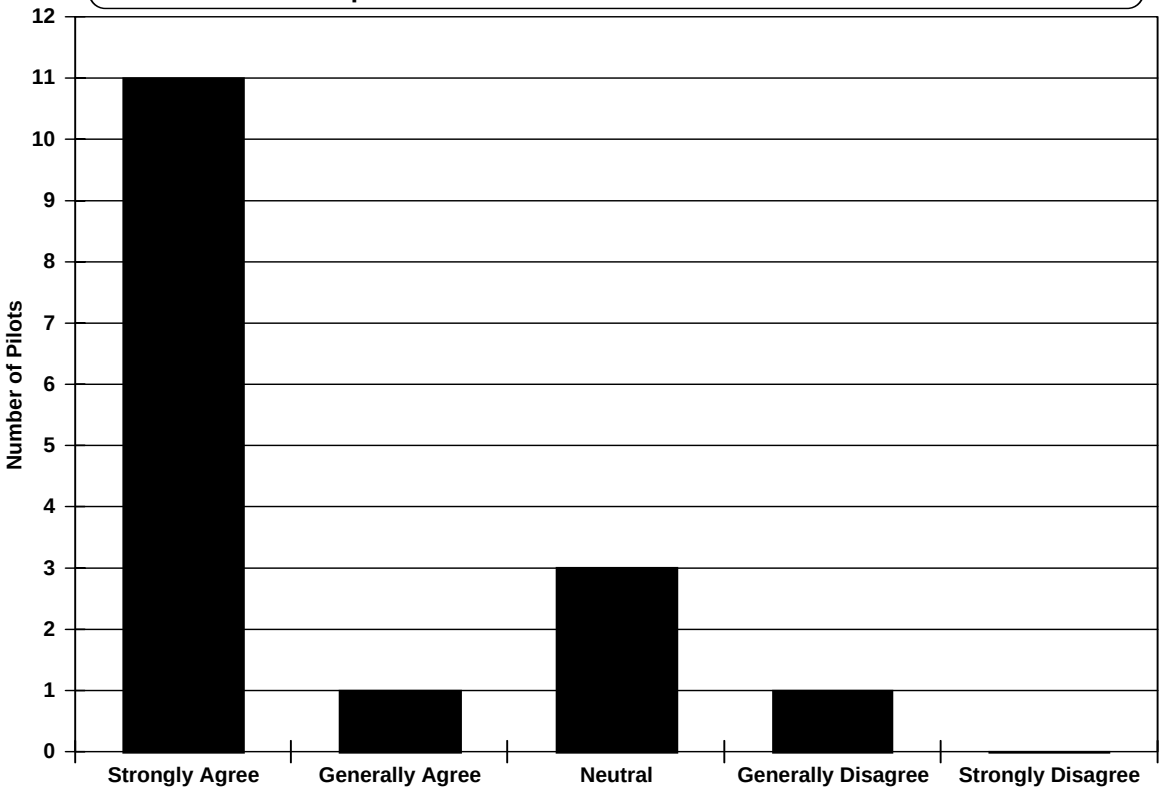
P10: These approaches require a higher workload from the MAP or VDP than current (HVSE) copter GPS point-in-space approaches.

P10: General Comment: On a hot day with a higher gross weight (IFR fuel plus reserves plus passengers), I'm concerned that getting an S76 slowed down and beginning a descent would be difficult to do considering maintaining Nr in limits while getting the aircraft slowed and descending. ("X" approach would be the most difficult to accomplish.)

P13: I would recommend that all our company pilots receive training before executing (these) procedures.

Answers to Post-Test Questionnaire

5.2 One or more of the HVSE approach procedures from this test would benefit my flight operations at a heliport requiring a steep visual segment due to terrain, obstacles or other operational conditions.



Pilot Comments

Q 5.2 One or more of the HVSE approach procedures from this test would benefit my flight operations at a heliport requiring a steep visual segment due to terrain, obstacles or other operational conditions. (Choices: Strongly Agree, Generally Agree, Neutral, Generally Disagree, Strongly Disagree).

If you answered Generally or Strongly Agree, please explain that answer:

P03: It would replace the ILS 4/22 at LaGuardia which would keep us out of their *(flow)* and expedite our arrivals into NYC heliports.

P05: We have approaches to private heliports that are noise sensitive.

P06: Copter GPS approach to *(Company Location)* for *(Company)* definitely improve pilot's ability and awareness when doing this approach and handling of aircraft for final approach segment.

P07: Approaches into New York City would be ideal candidates for these types of approaches.

P08: Our EMS operations would benefit greatly because of obstacles in the vicinity of the heliport. We would benefit: 1) by having 8-degree approaches, and, 2) by having a network of IFR heliports.

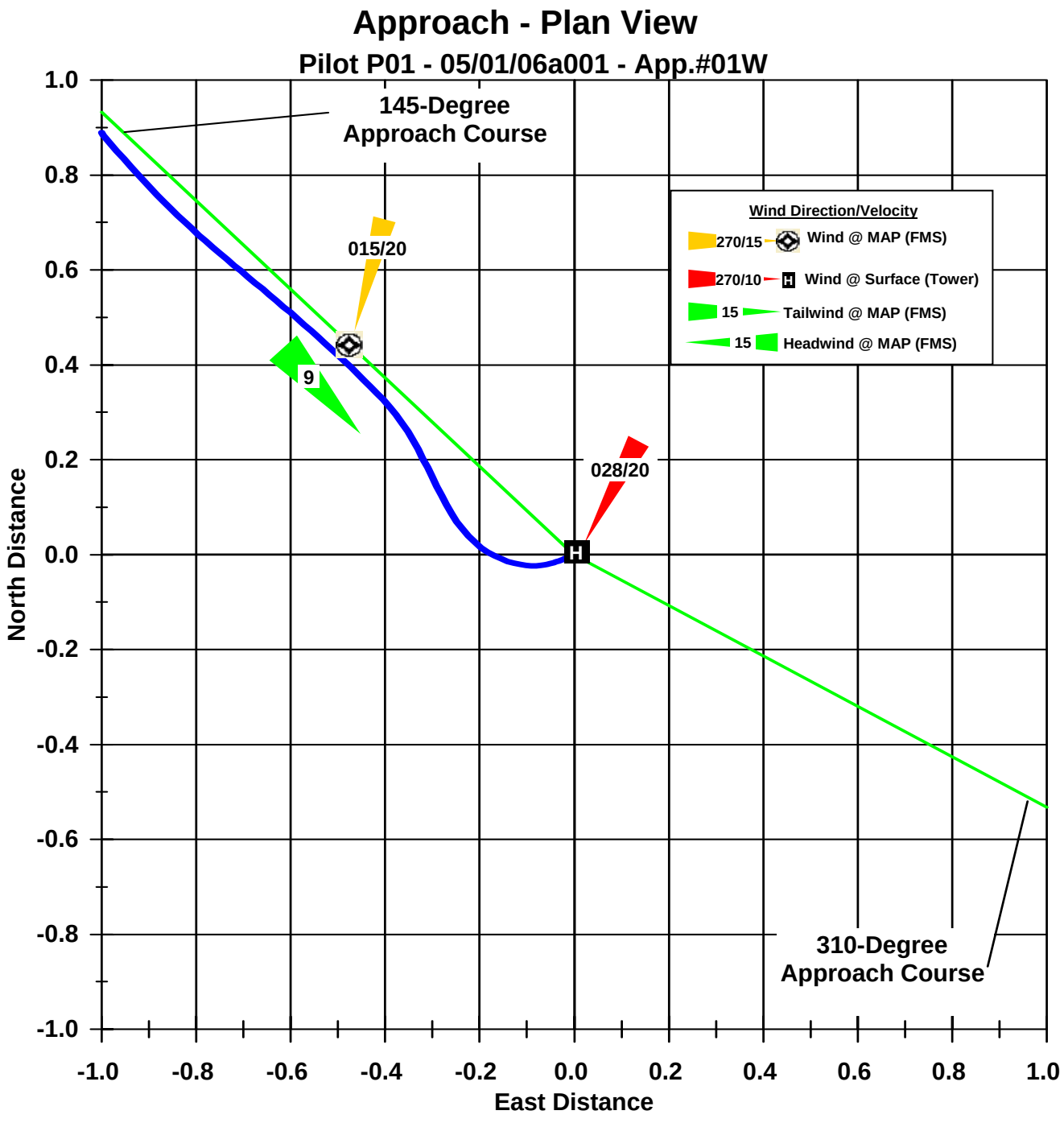
P09: Being able to get an approach to a hospital, which generally have numerous obstructions, would be a benefit.

P13: *(Our)* company only uses IFR at airports with runways.

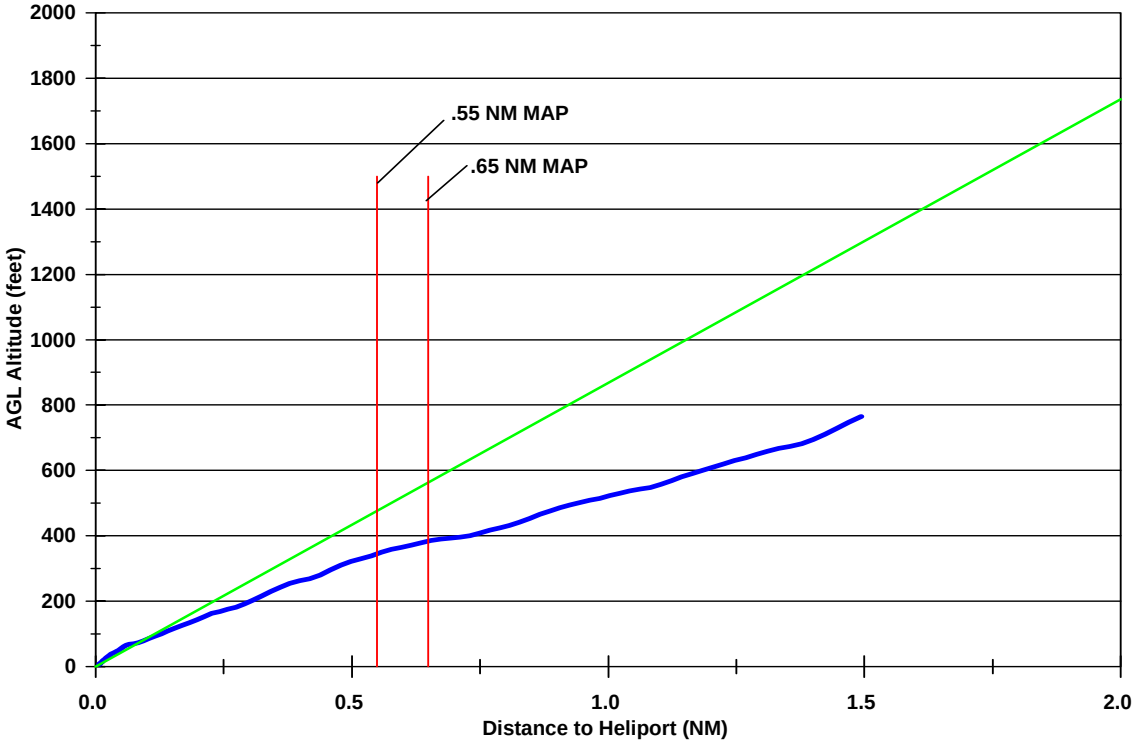
P14: … flying into *(heliport)* in *(city)* there are bridges to north and south and buildings to the east.

P15: Obstacle clearance close in *(to heliport)*.

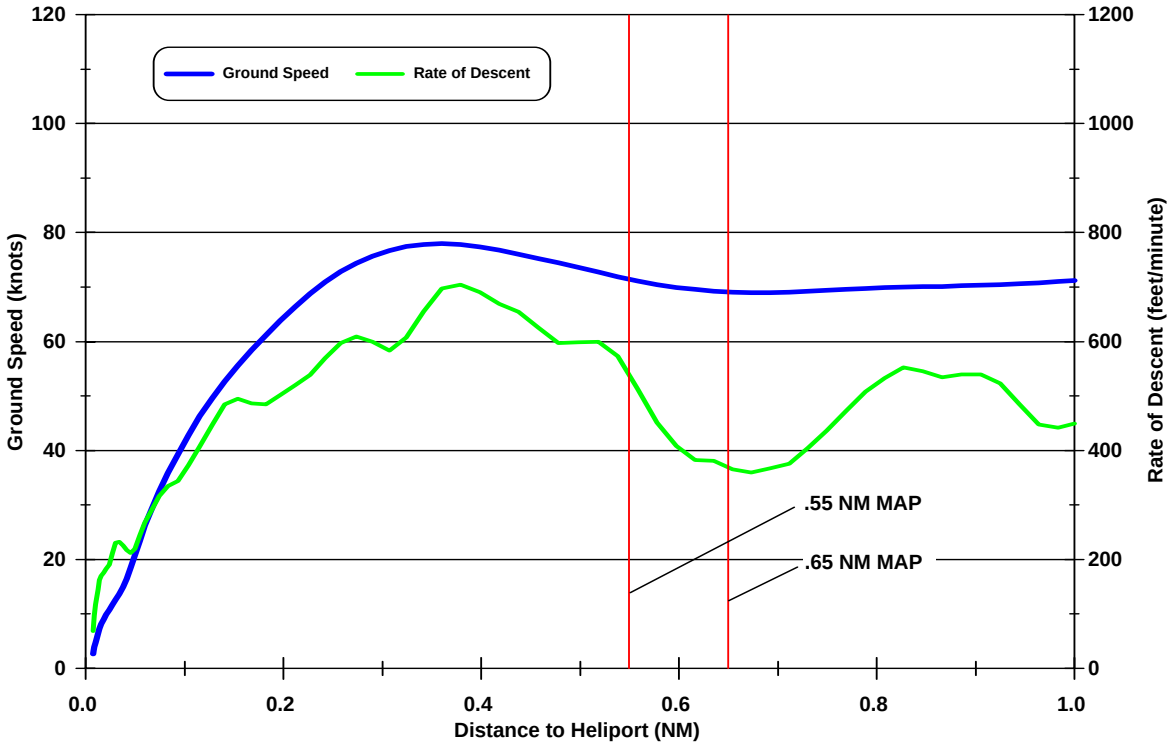
APPENDIX B—AIRCRAFT TRAJECTORY PLOTS BASED ON ANALYSIS OF TIME AND SPACE POSITION INDICATOR DATA


Approach - Plan View
Pilot P01 - 05/01/06a001 - App.#01W
145-Degree
Approach Course
015/20
9
028/20
H
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

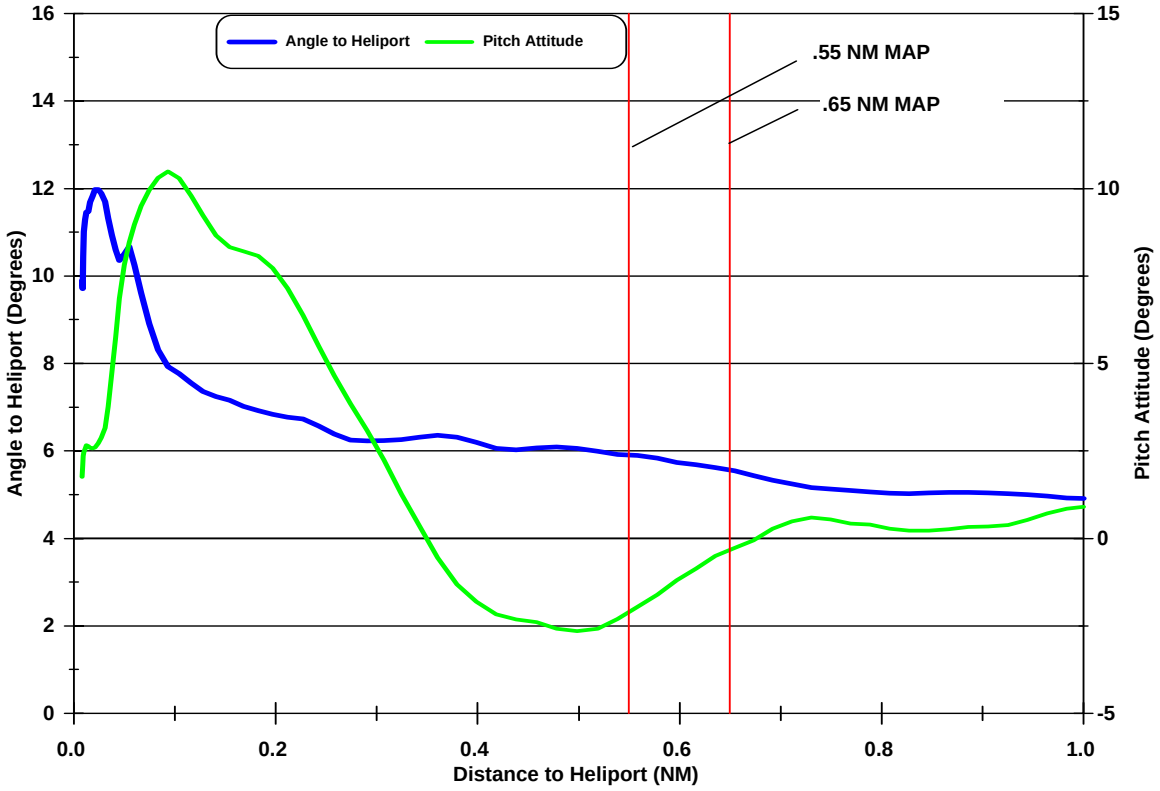
Profile View
Pilot P01 - 05/01/06a001 - App. #01W



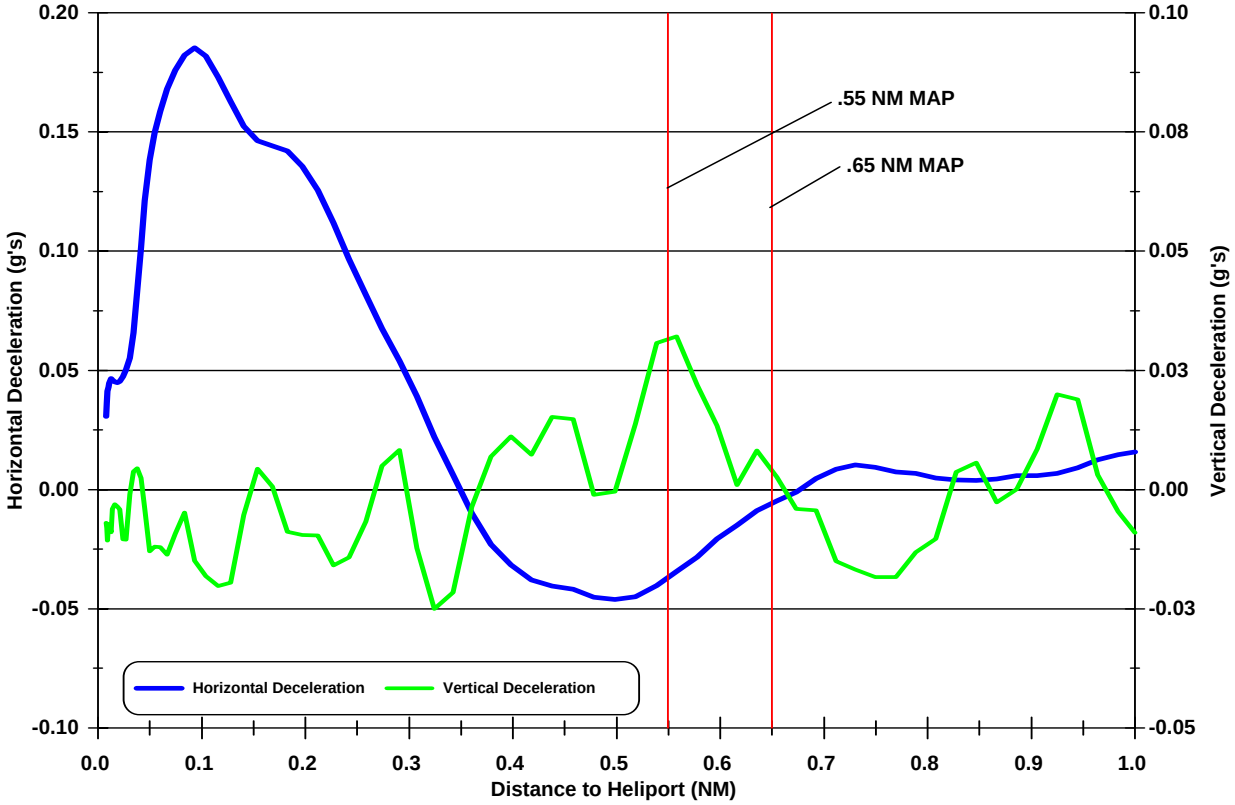
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06a001 - App. #01W

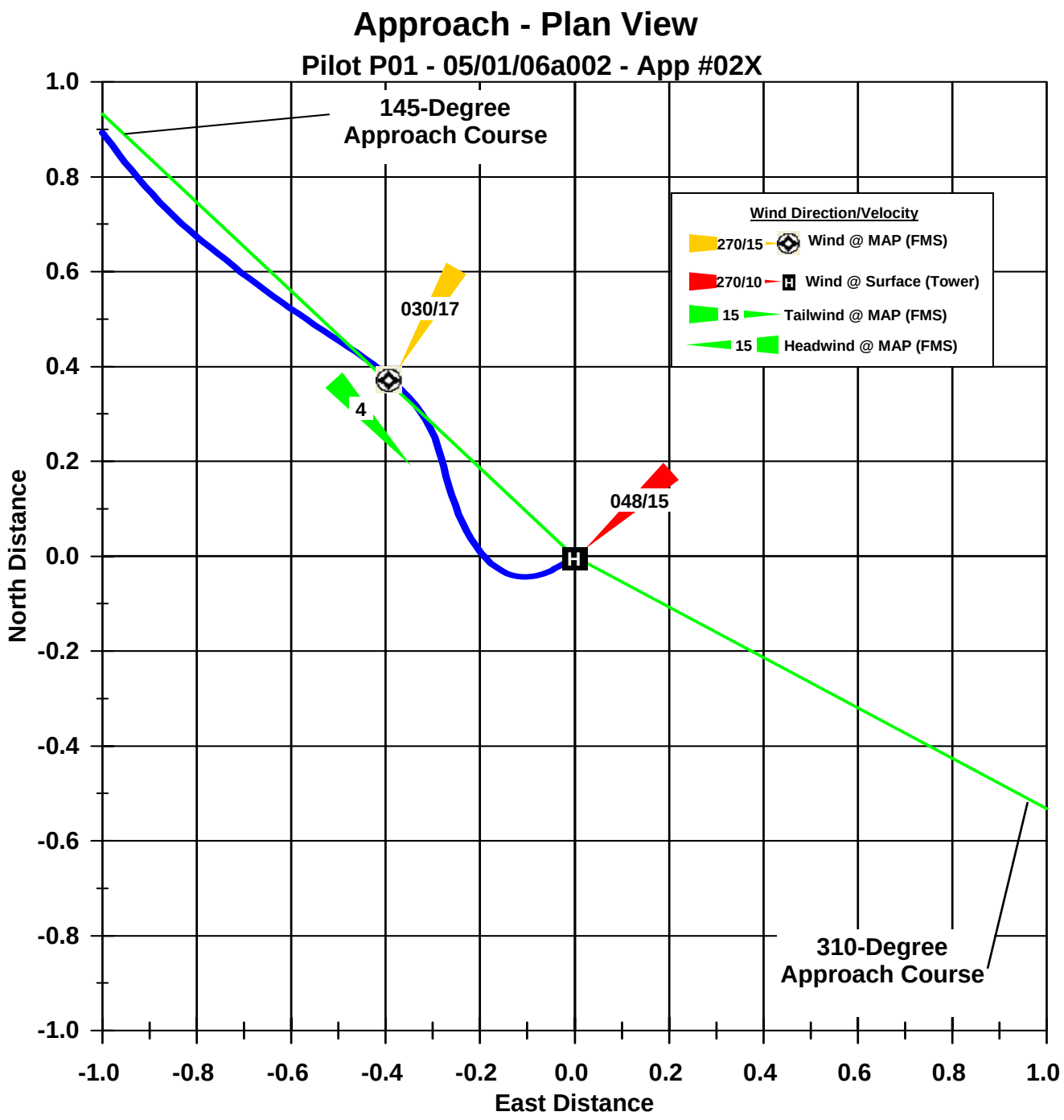


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06a001 - App. #01W



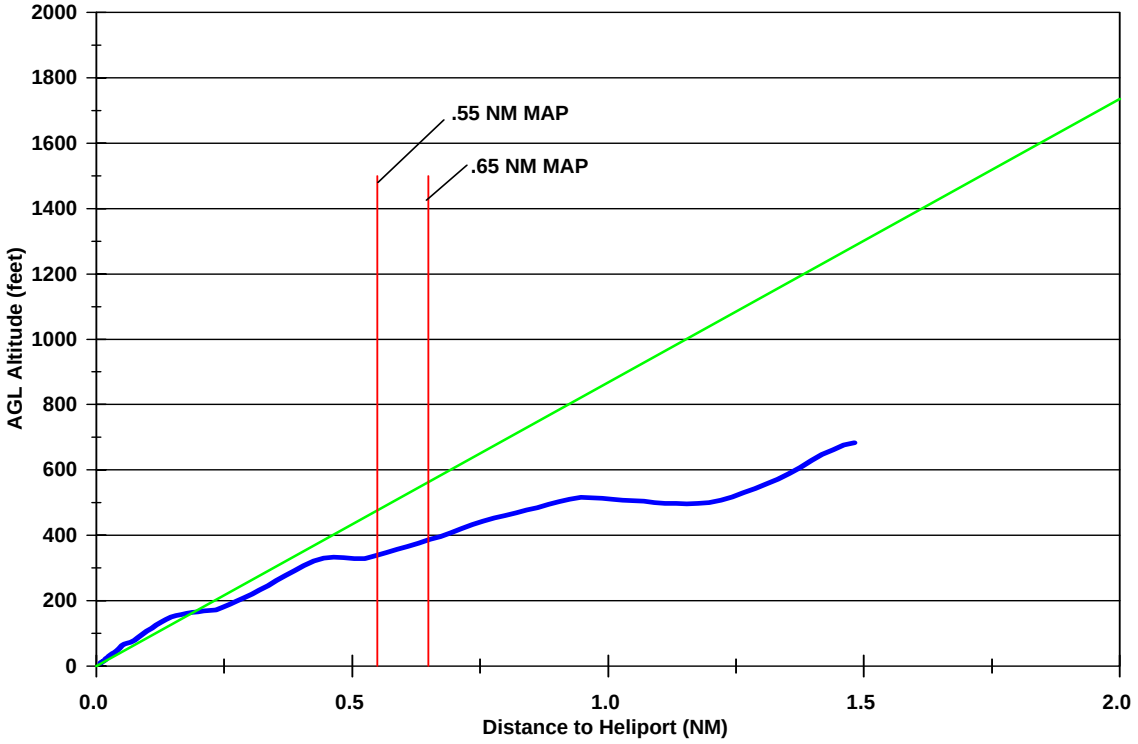
Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06a001 - App. #01W




Approach - Plan View
Pilot P01 - 05/01/06a002 - App #02X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
030/17
4
048/15
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

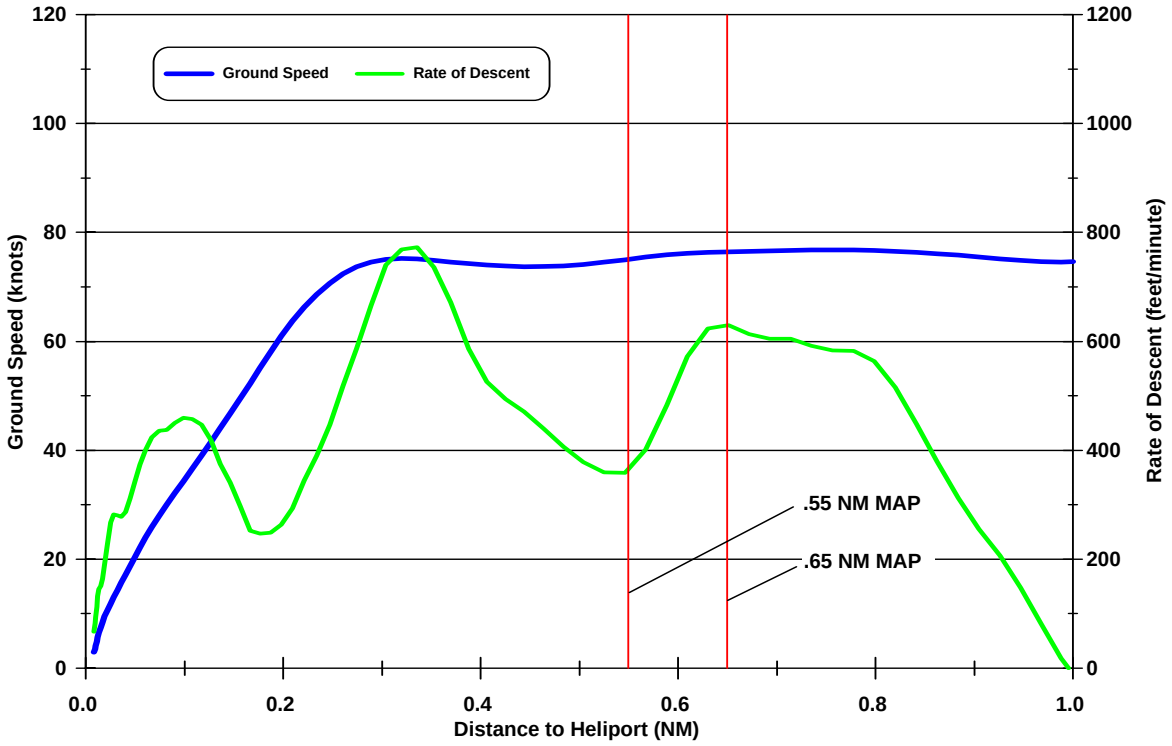
Profile View

Pilot P01 - 05/01/06a002 - App. #02X

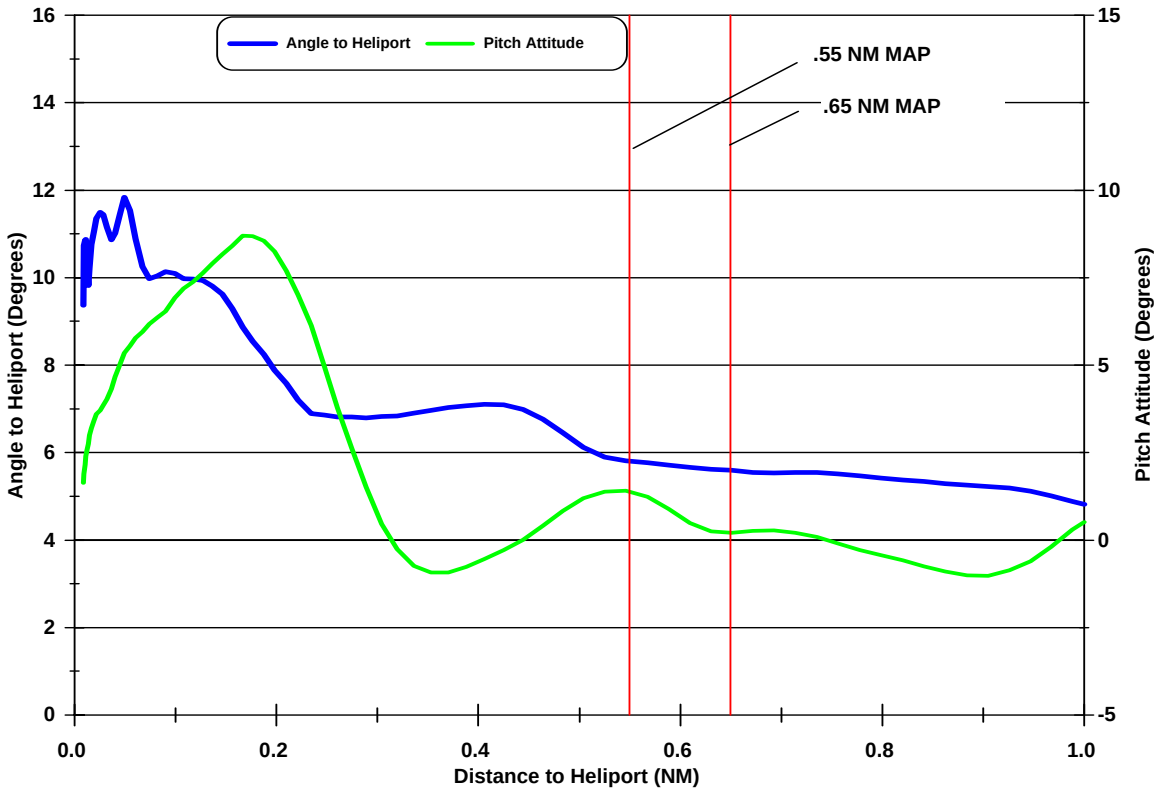


Ground Speed and Rate of Descent

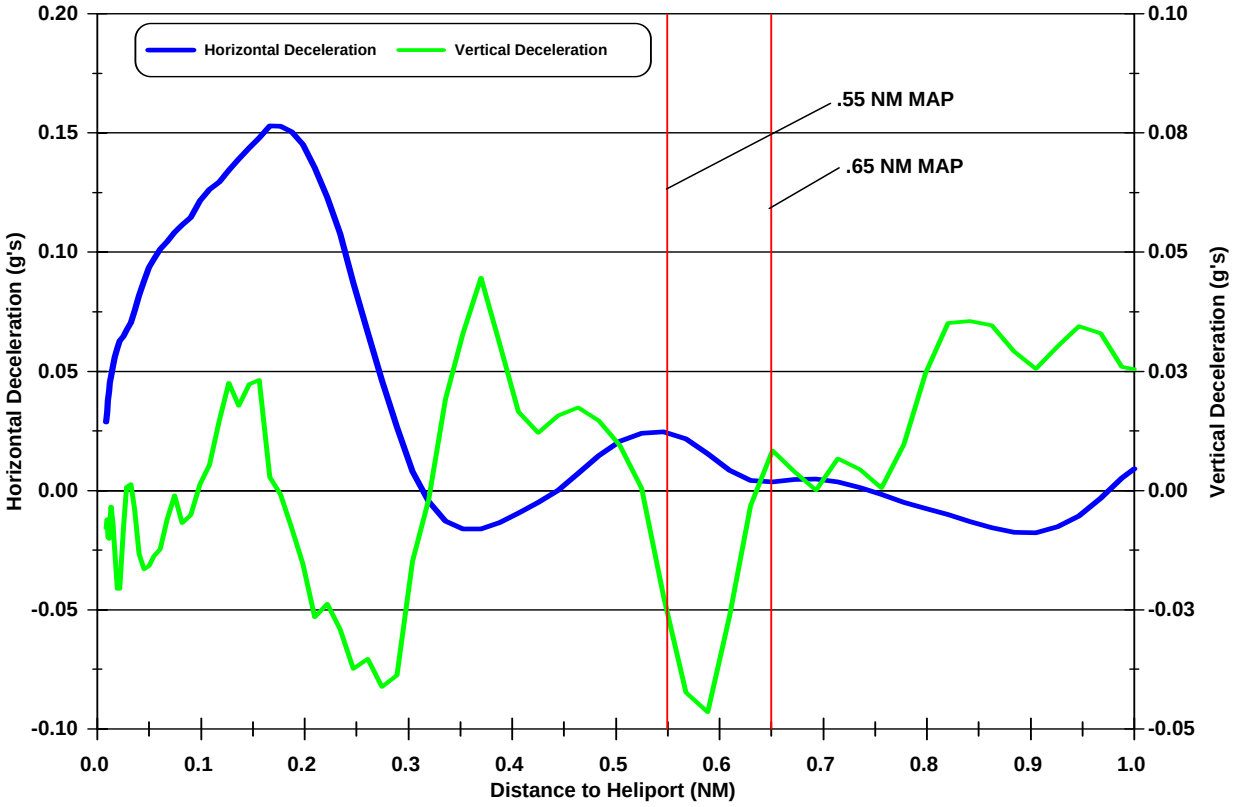
Pilot P01 - 05/01/06a002 - App. #02X

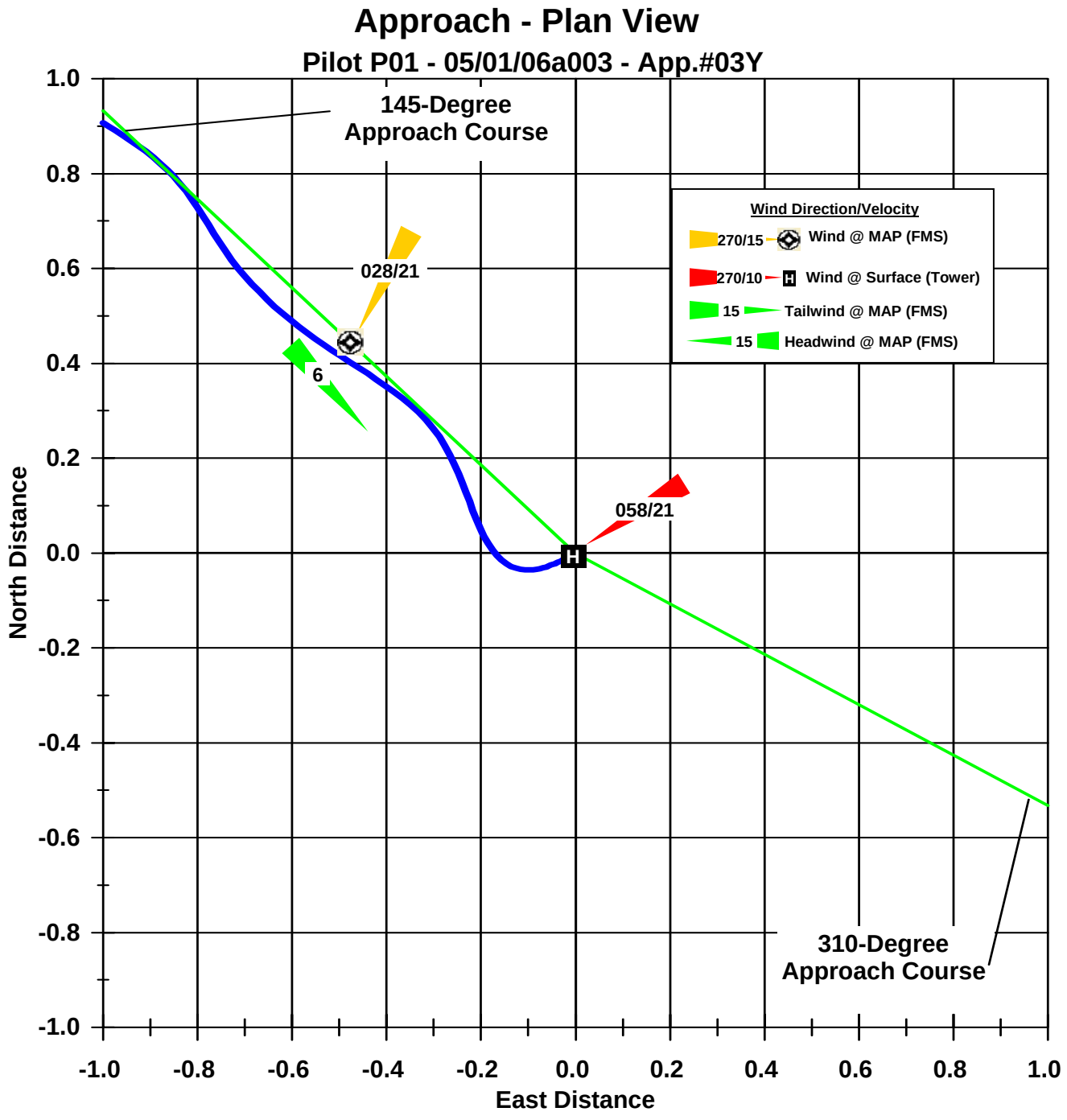


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06a002 - App. #02X

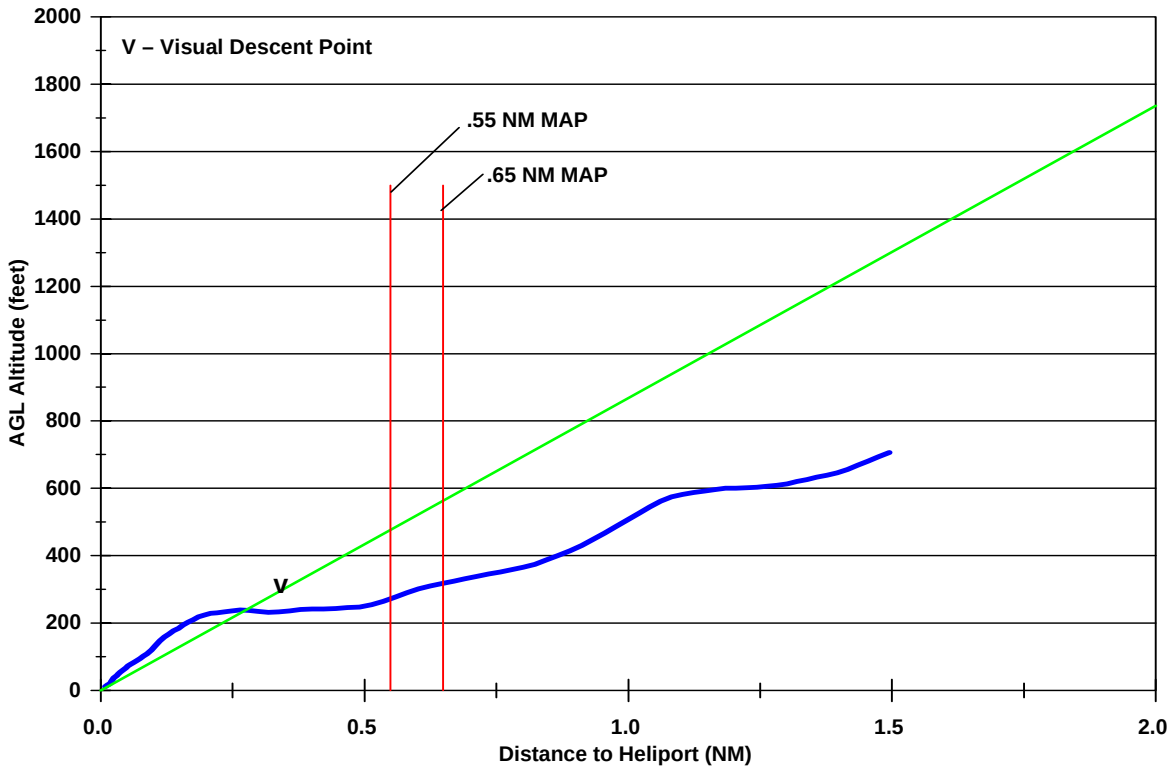


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06a002 - App. #02X

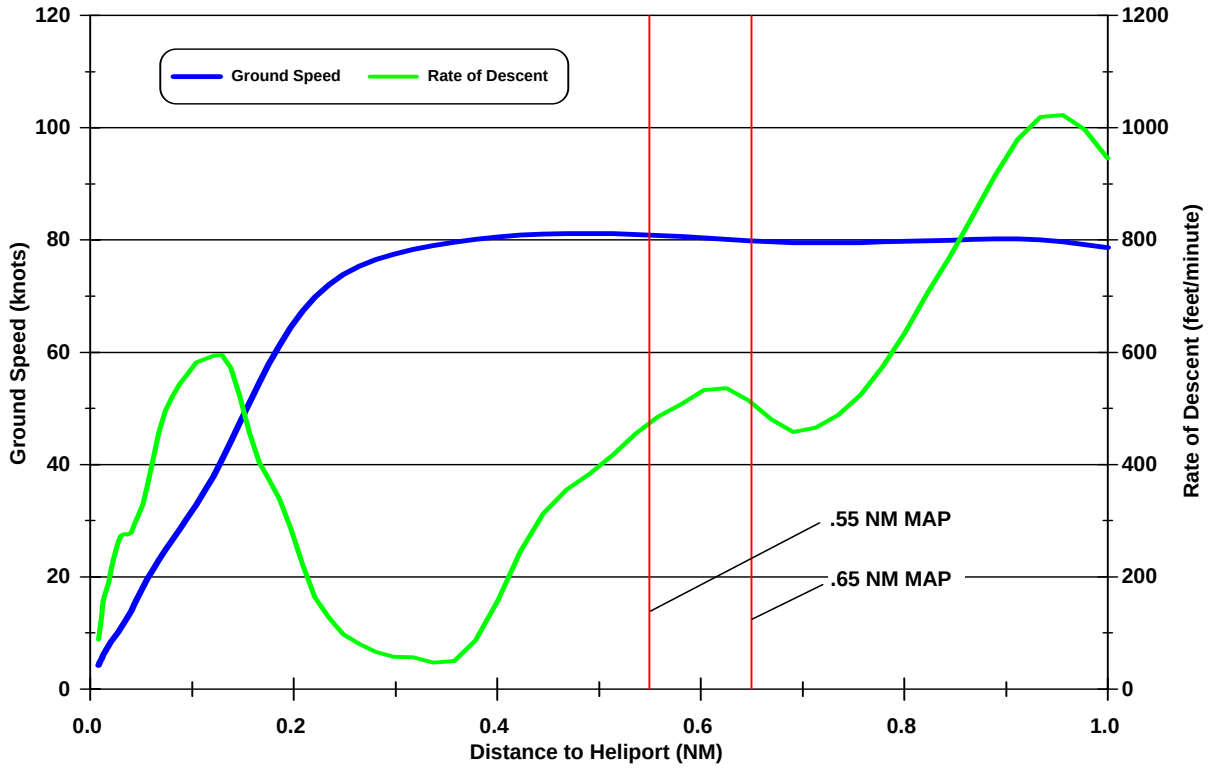



Approach - Plan View
Pilot P01 - 05/01/06a003 - App.#03Y
145-Degree
Approach Course
028/21
6
058/21
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

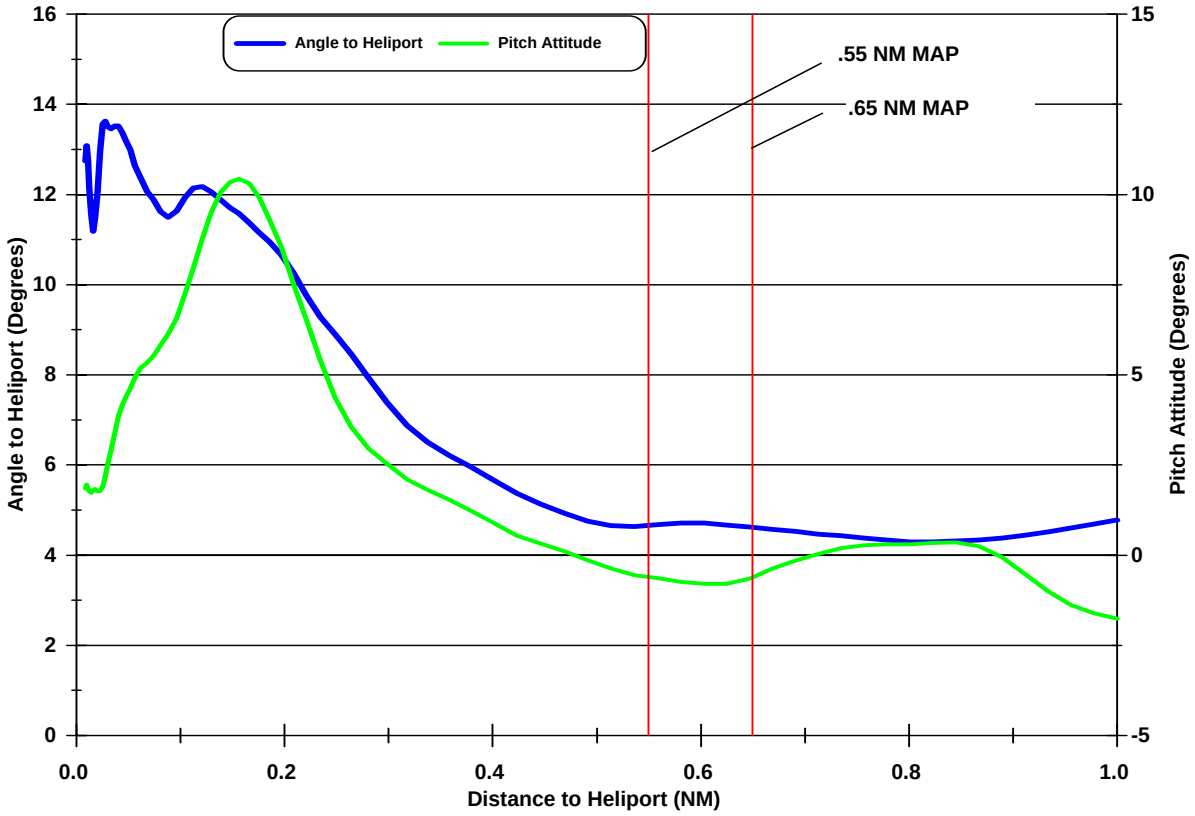
Profile View
Pilot P01 - 05/01/06a003 - App. 03Y



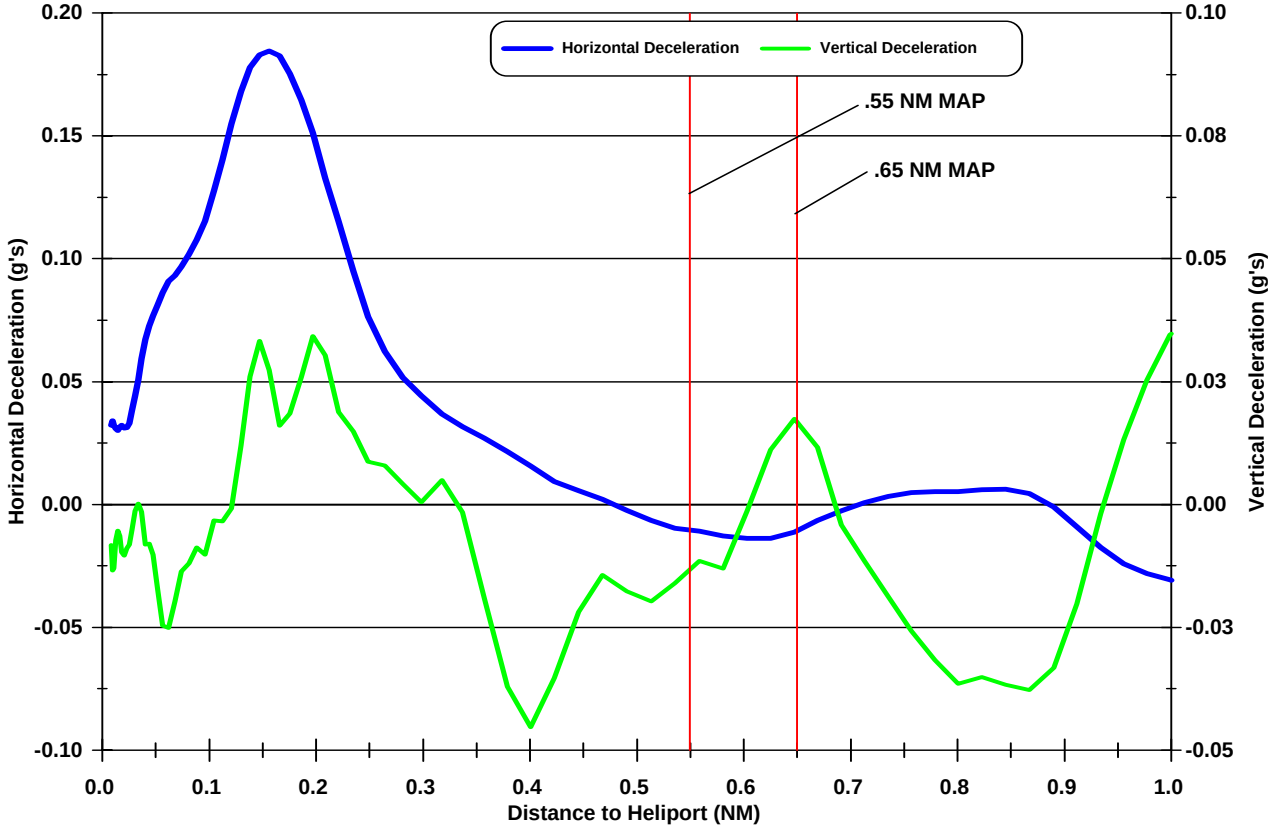
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06a003 - App. 03Y

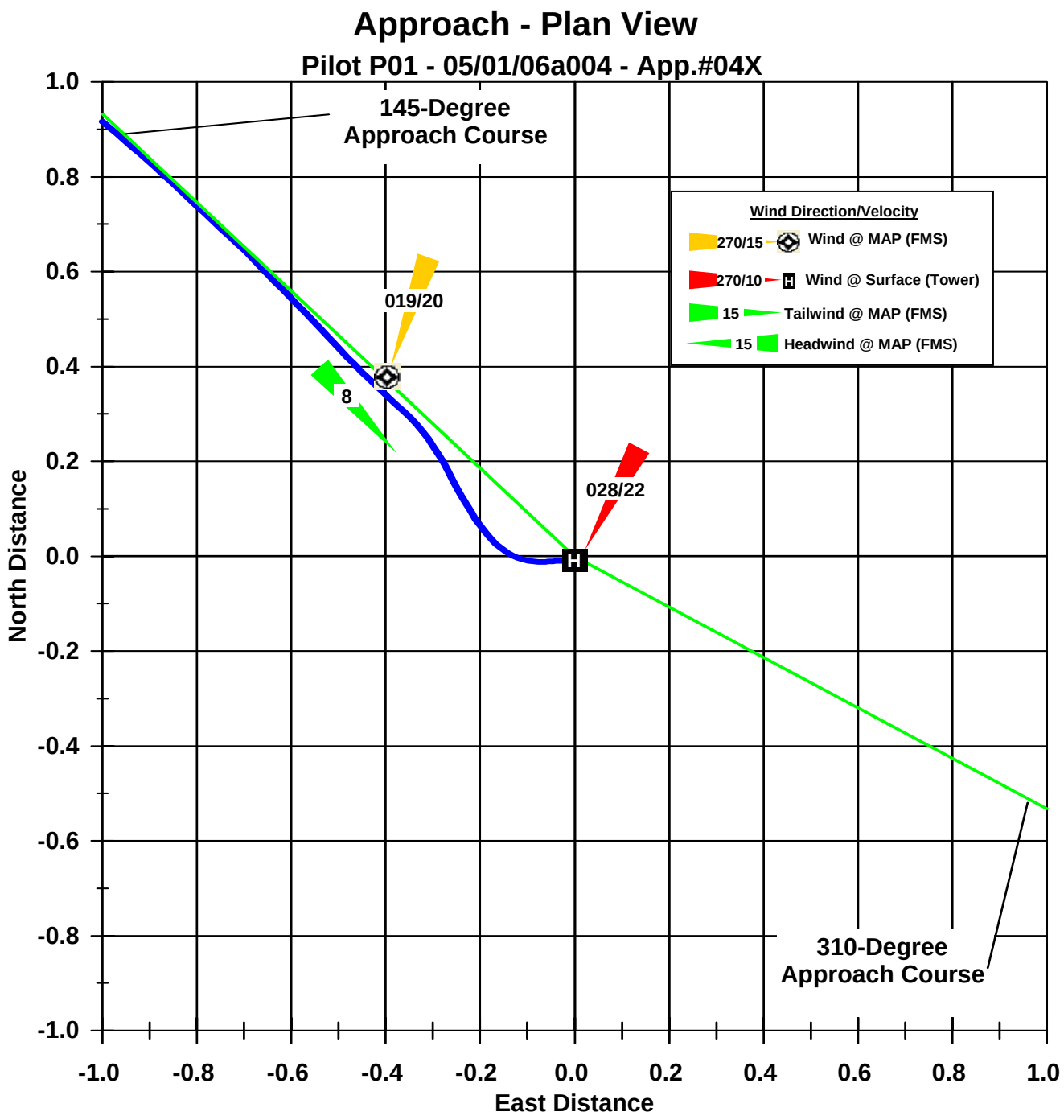


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06a003 - App. 03Y

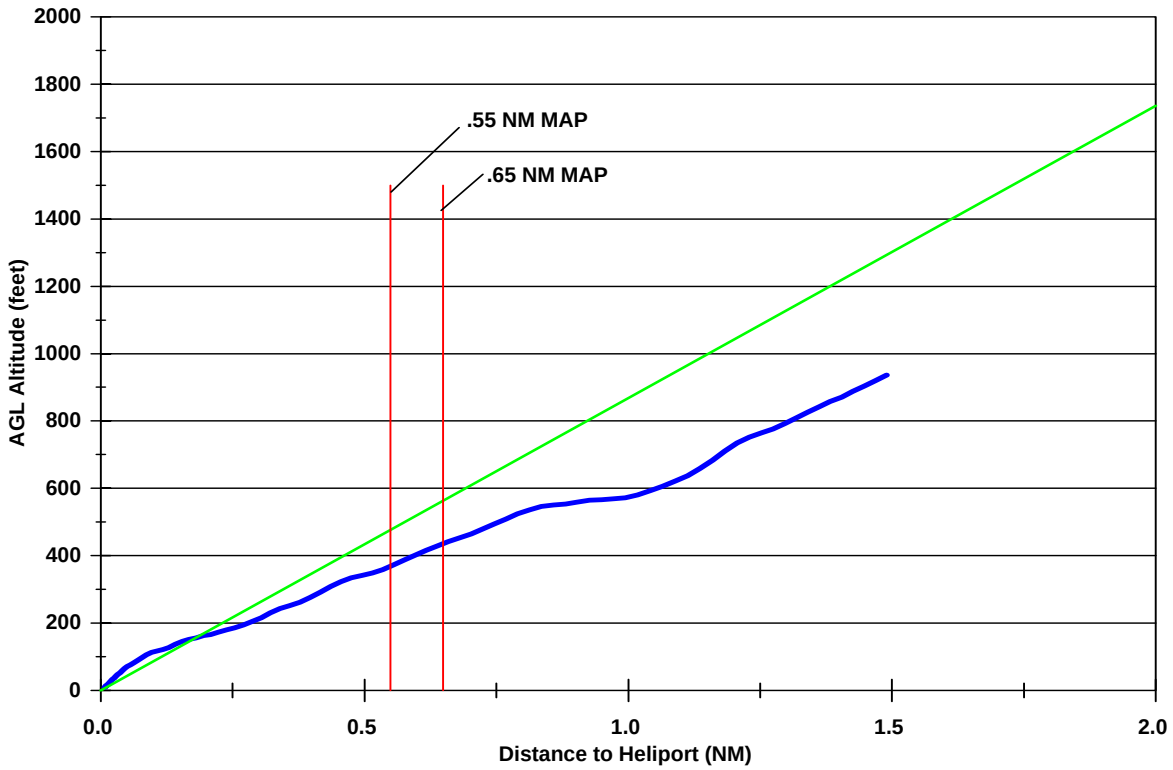


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06a003 - App. 03Y

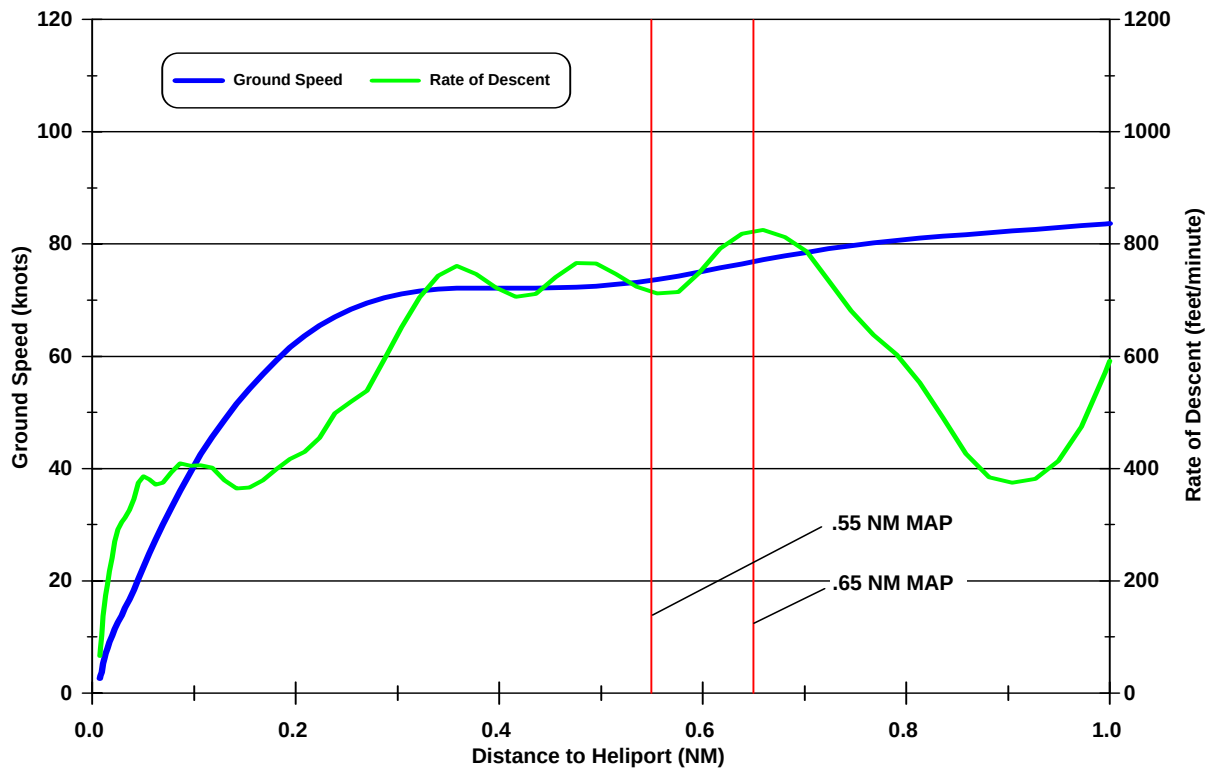



Approach - Plan View
Pilot P01 - 05/01/06a004 - App.#04X
145-Degree
Approach Course
310-Degree
Approach Course
019/20
028/22
8
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

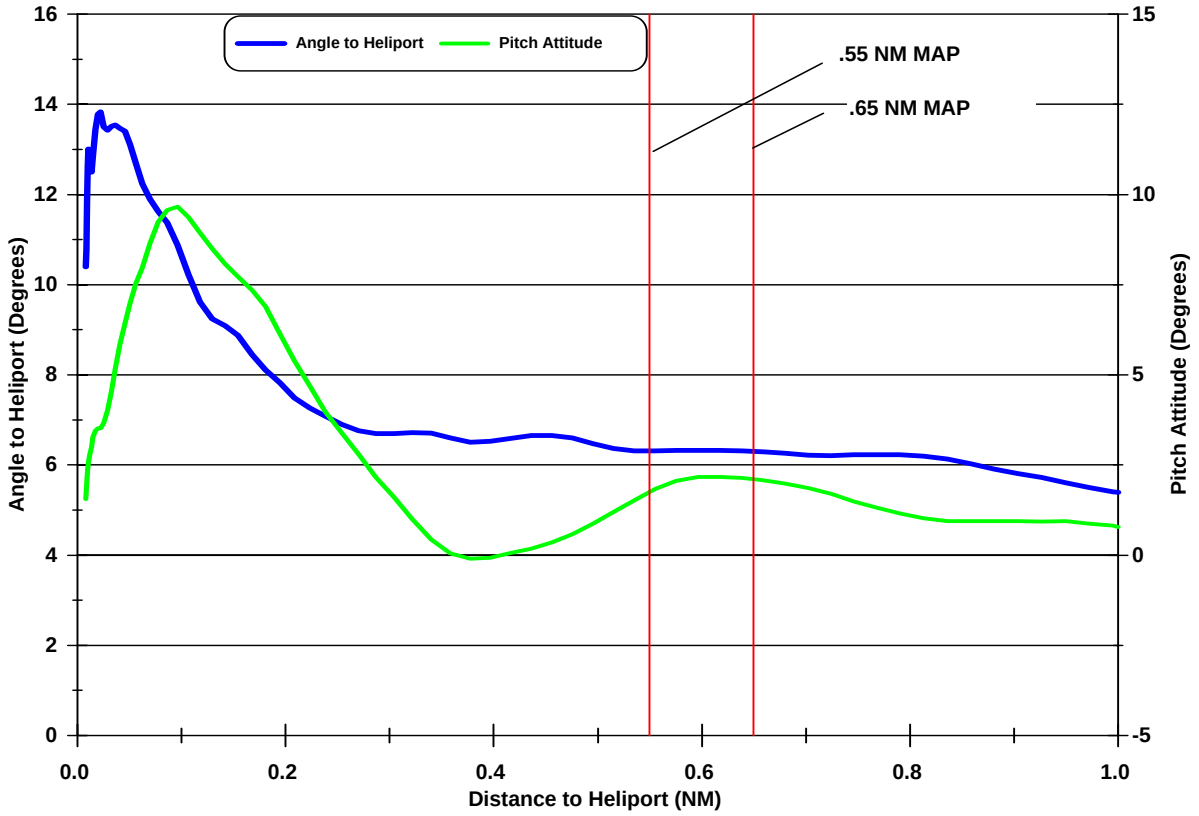
Profile View
Pilot P01 - 05/01/06a004 - App. 04X



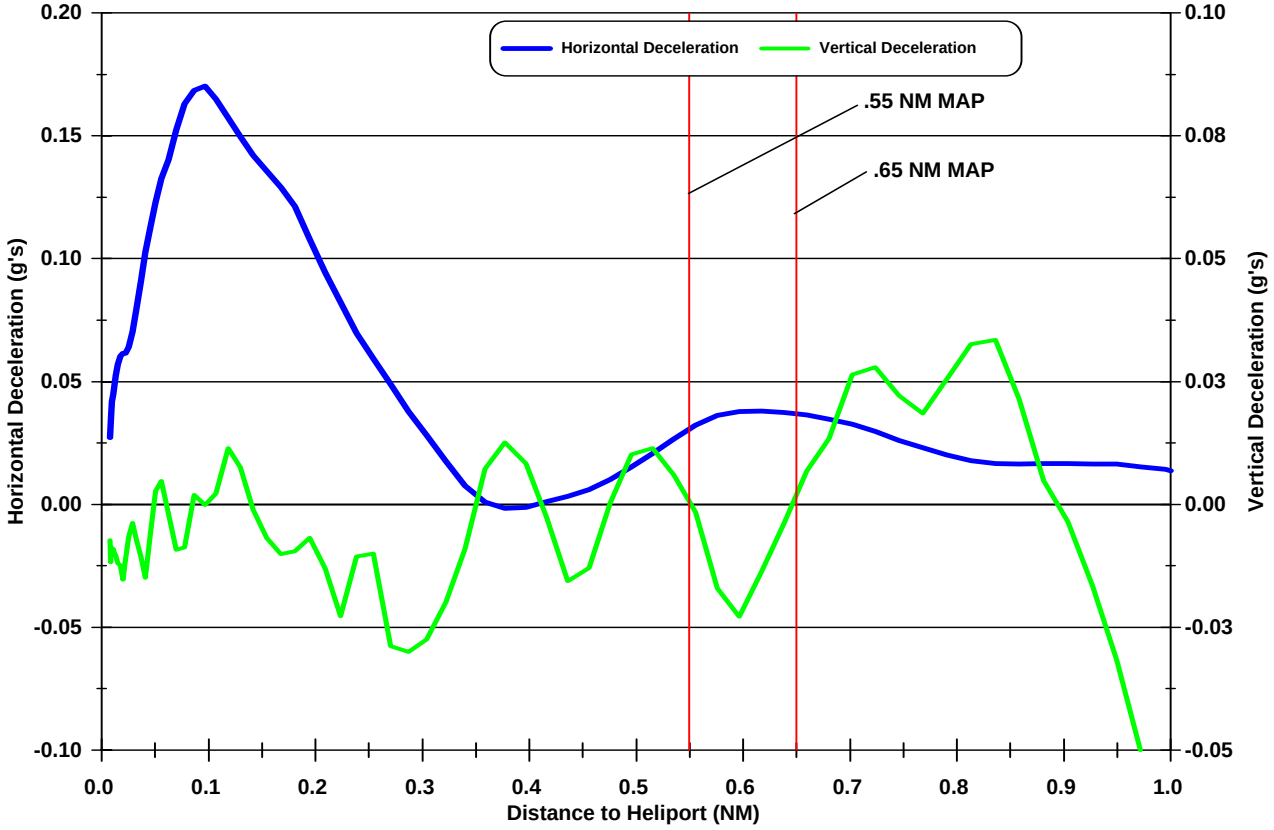
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06a004 - App. 04X

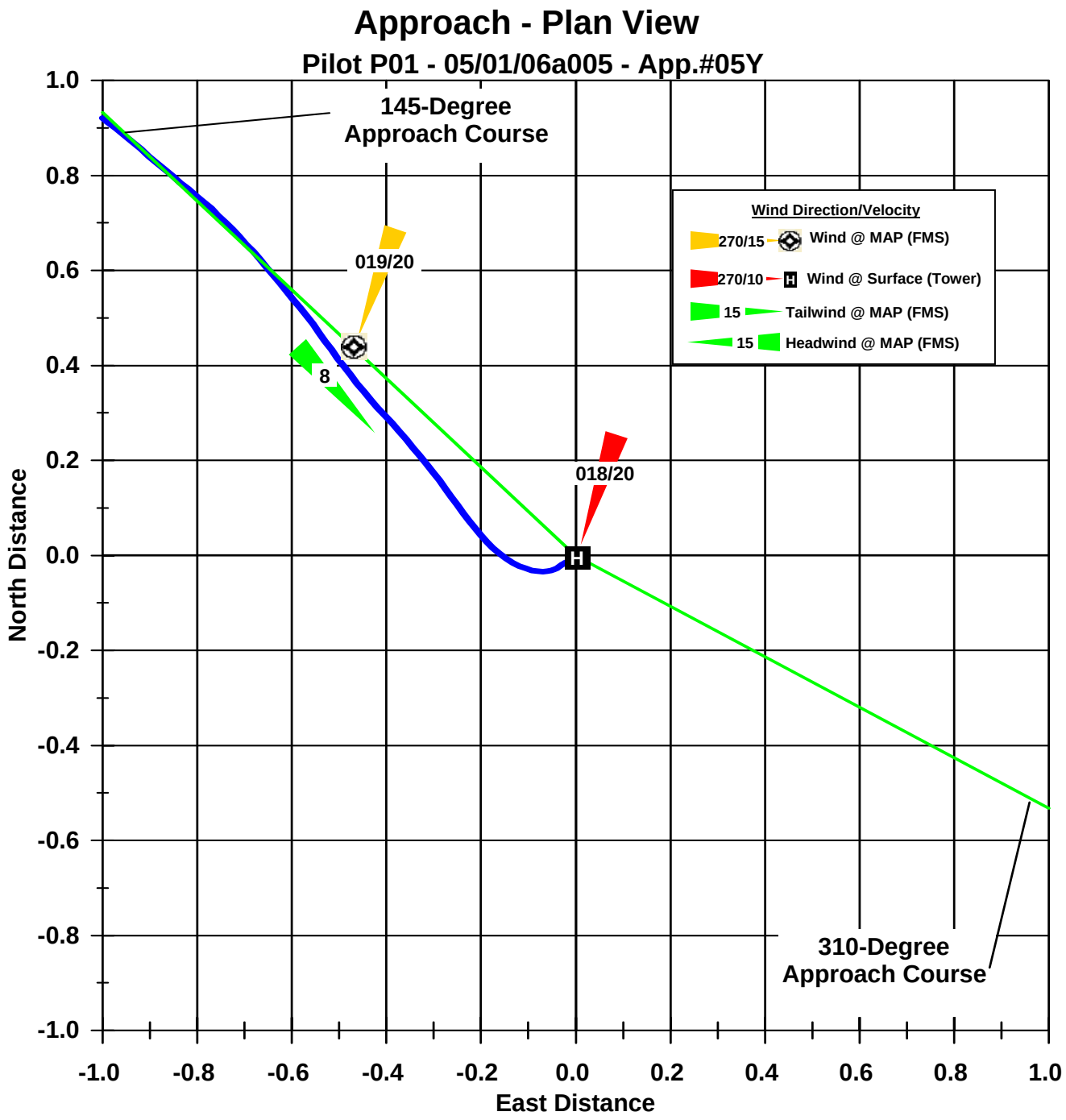


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06a004 - App. 04X

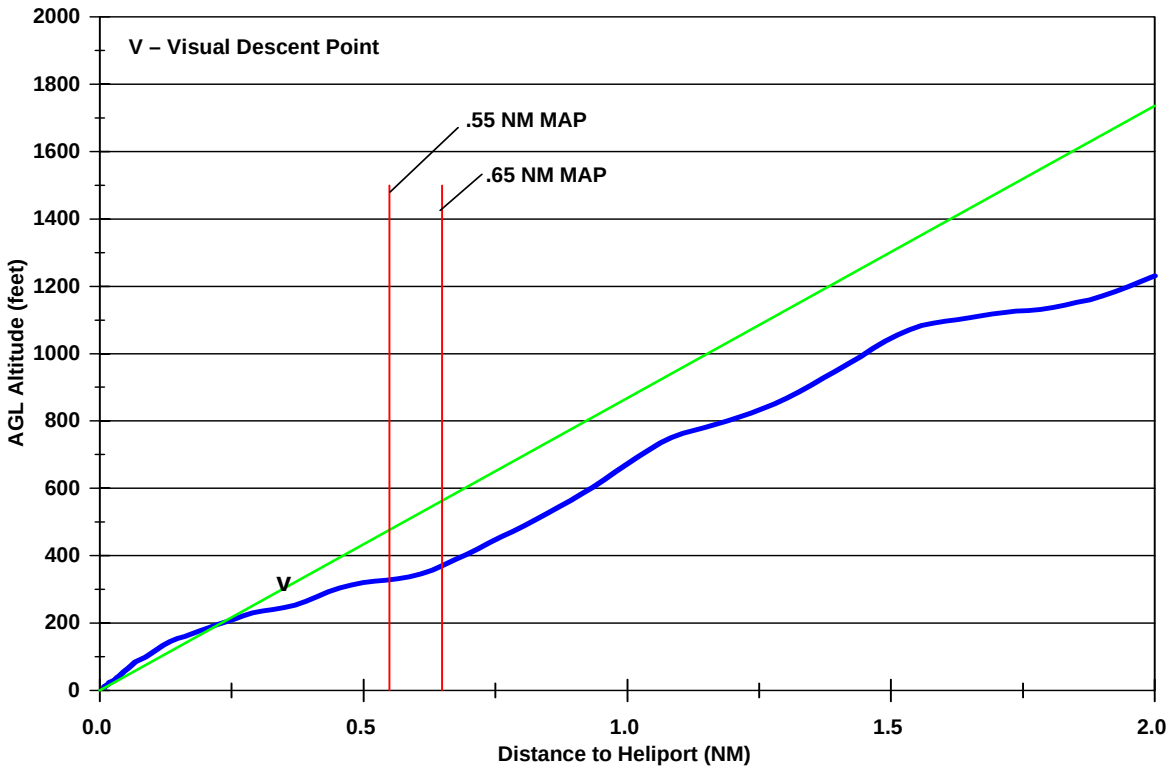


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06a004 - App. 04X

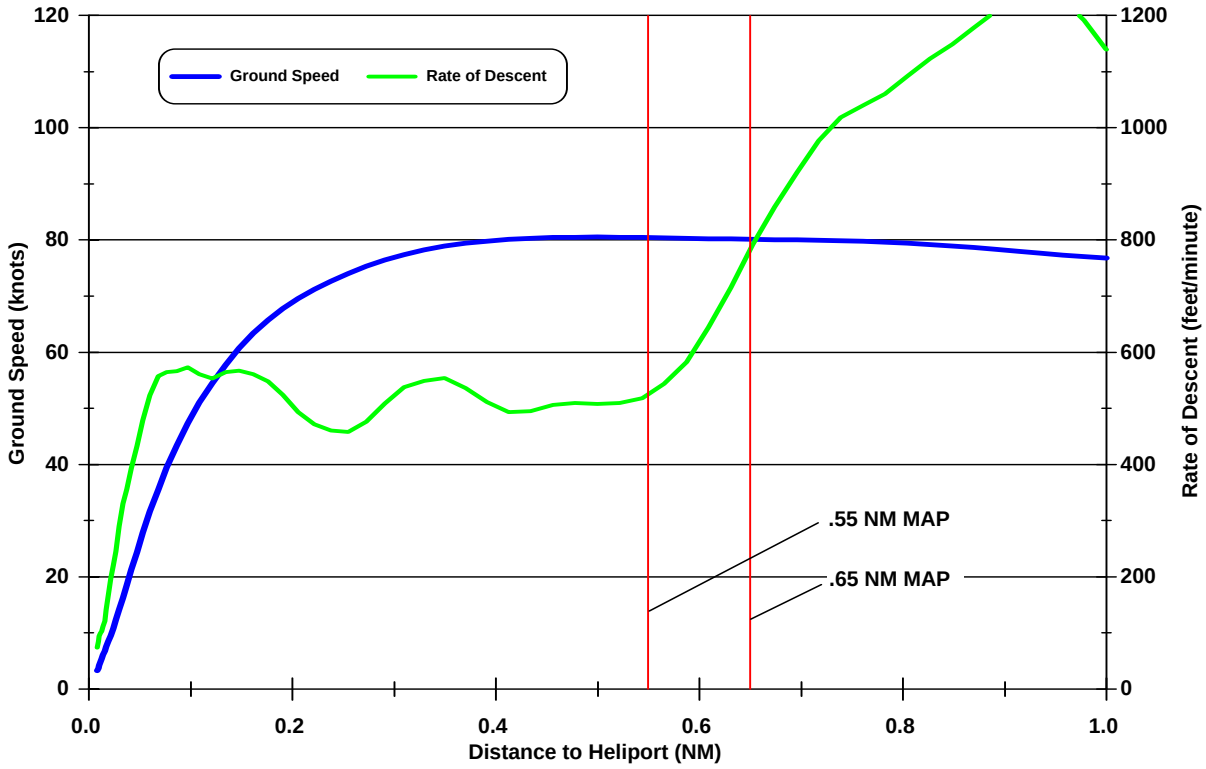



Approach - Plan View
Pilot P01 - 05/01/06a005 - App.#05Y
145-Degree
Approach Course
019/20
8
018/20
H
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

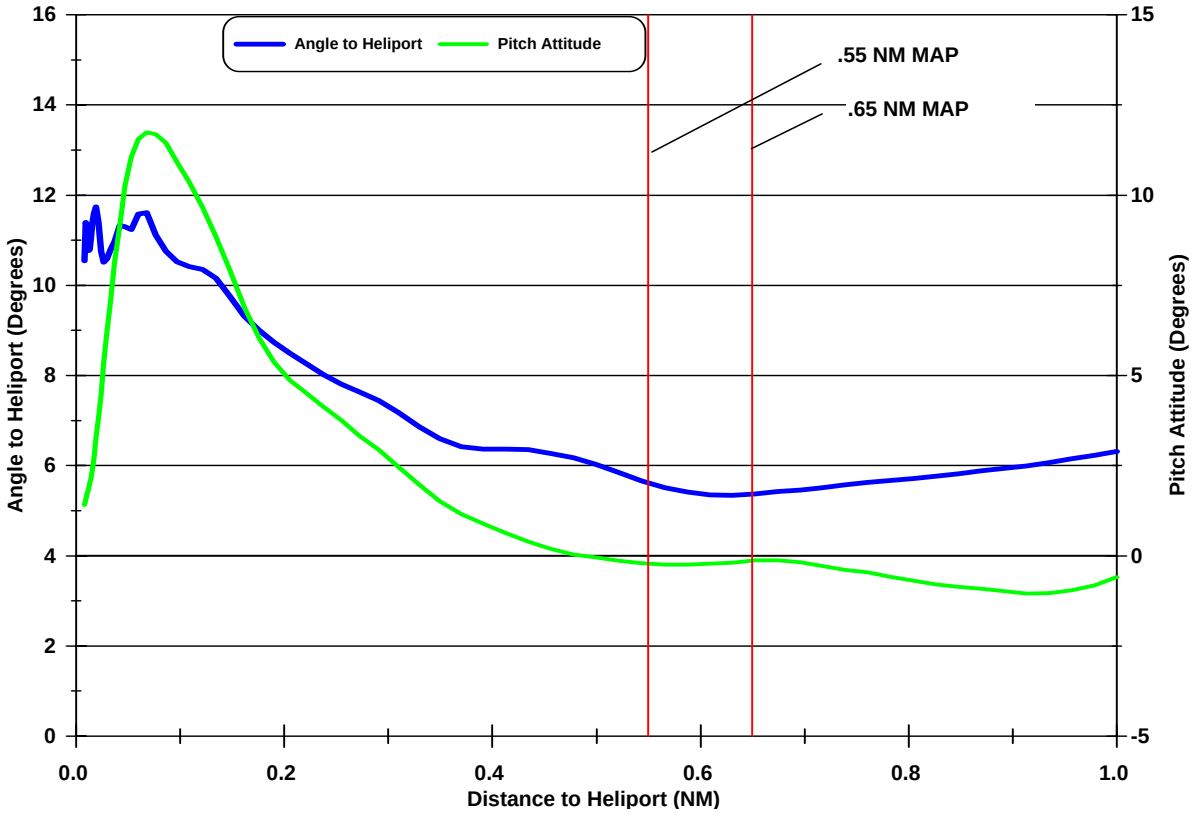
Profile View
Pilot P01 - 05/01/06a005 - App. 05Y



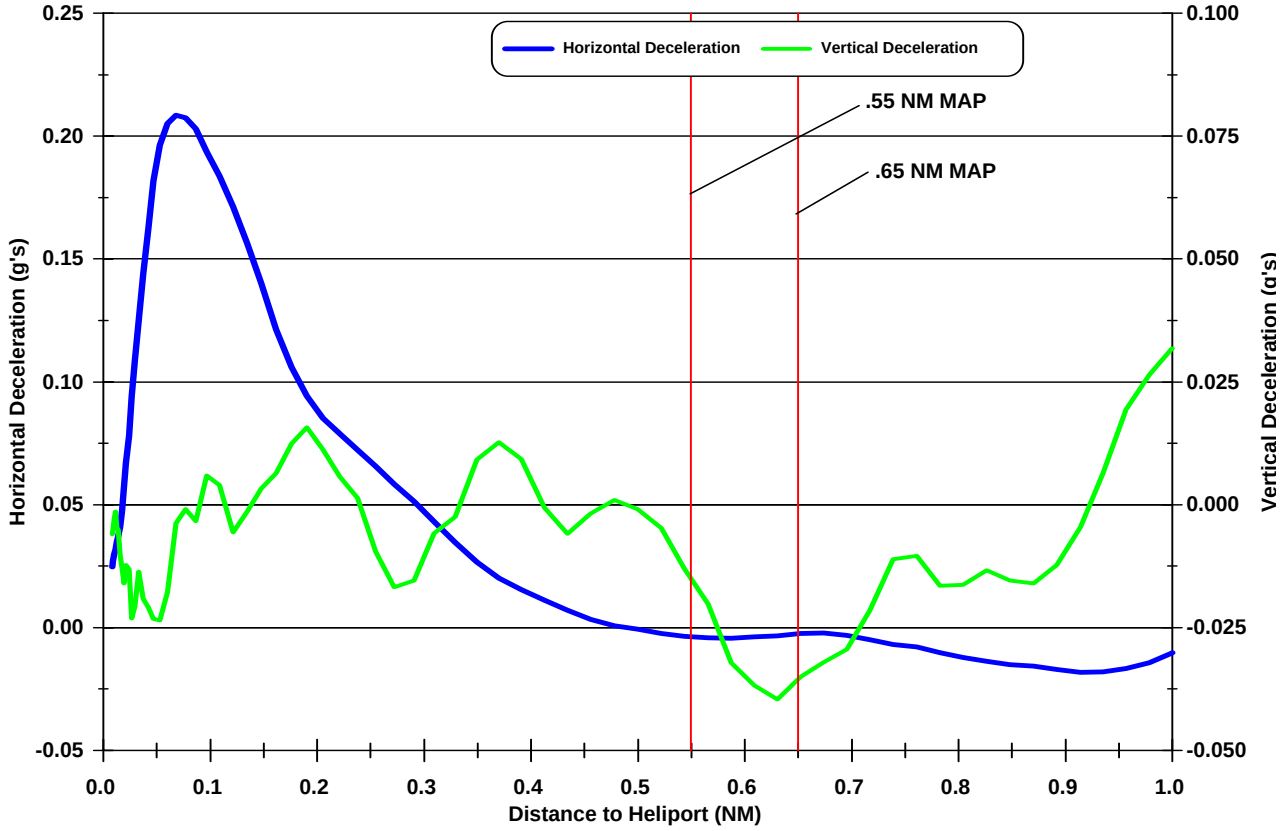
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06a005 - App. 05Y

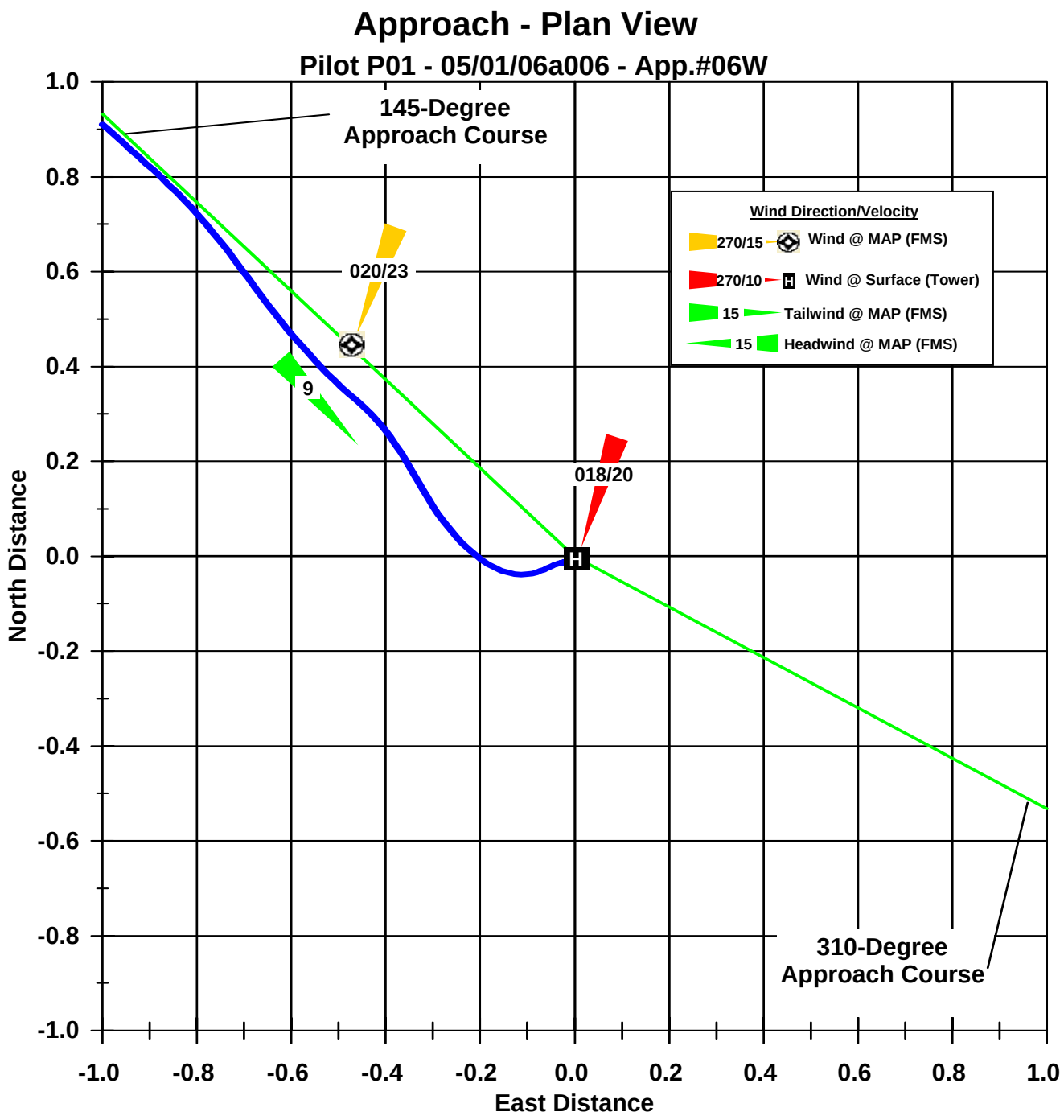


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06a005 - App. 05Y

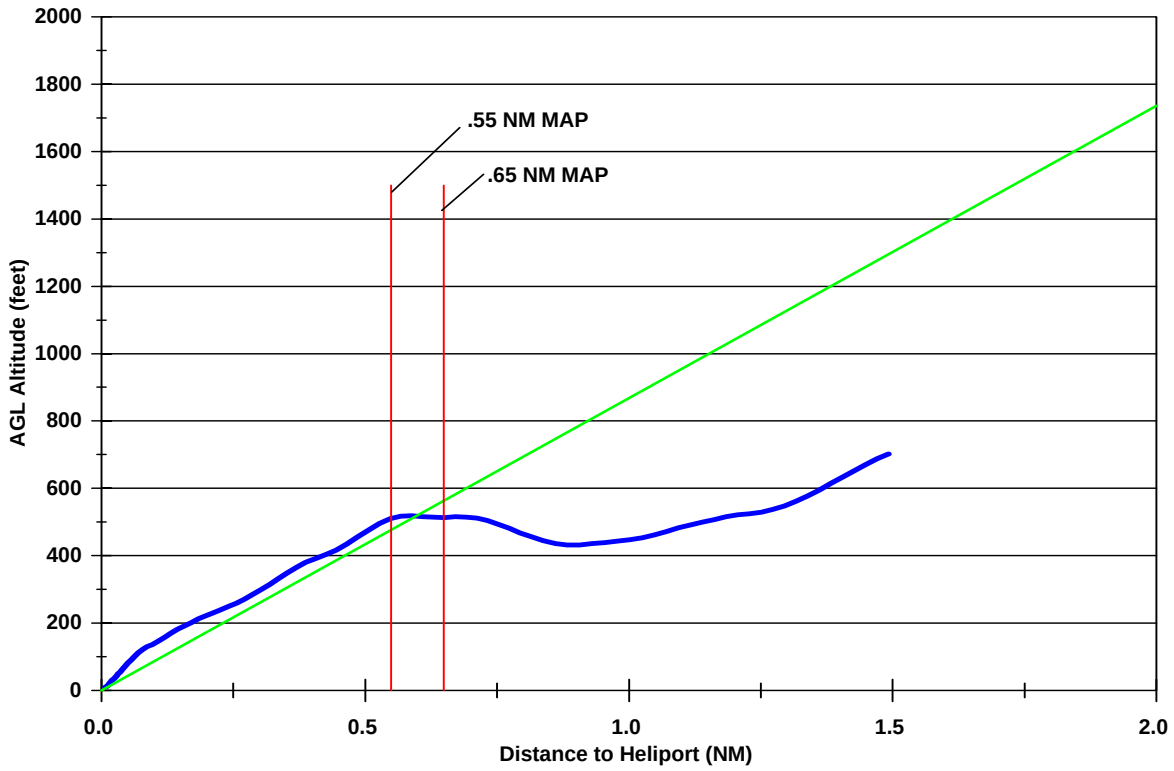


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06a005 - App. 05Y

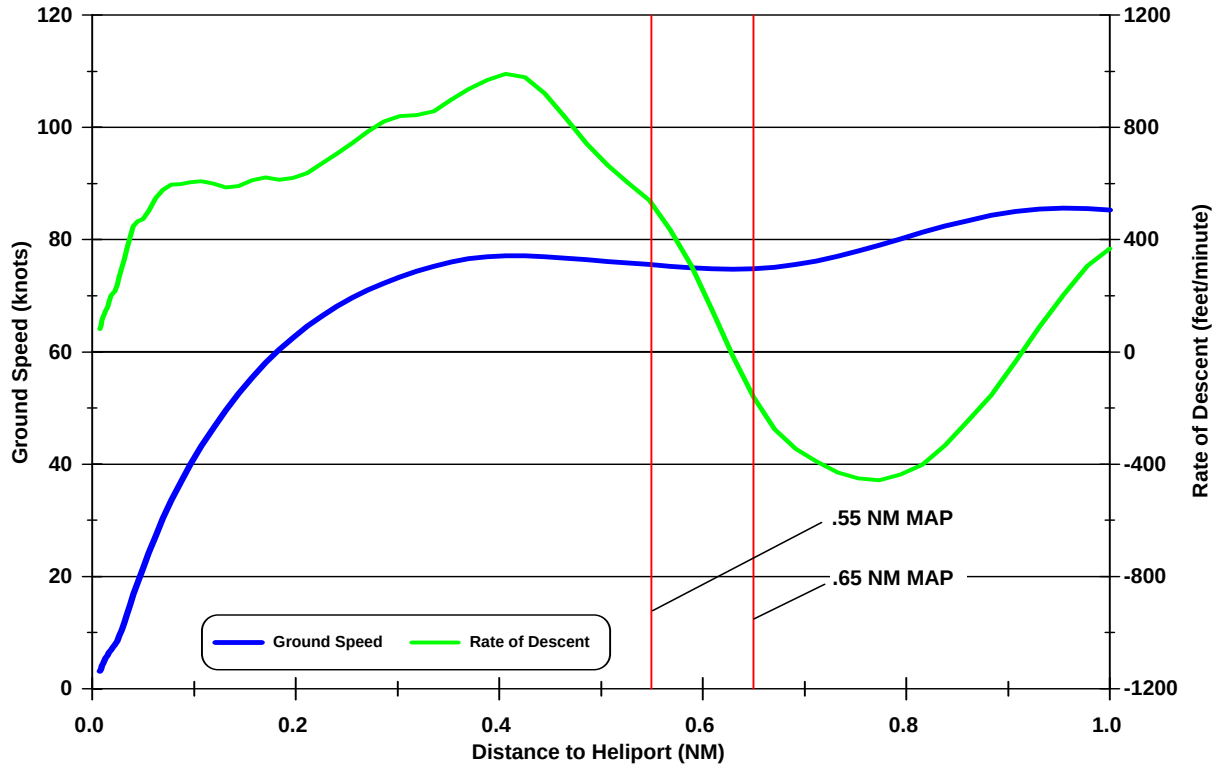



Approach - Plan View
Pilot P01 - 05/01/06a006 - App.#06W
145-Degree
Approach Course
310-Degree
Approach Course
020/23
9
018/20
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

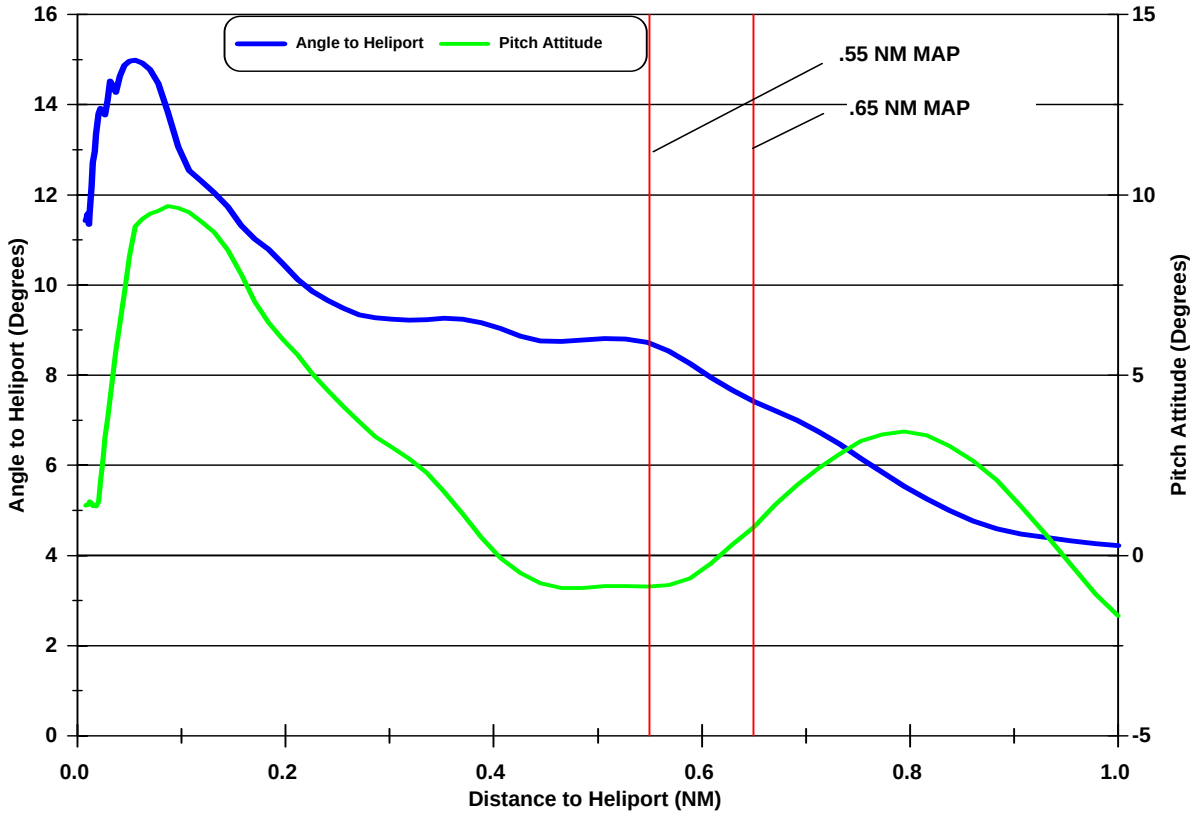
Profile View
Pilot P01 - 05/01/06a006 - App. #06W



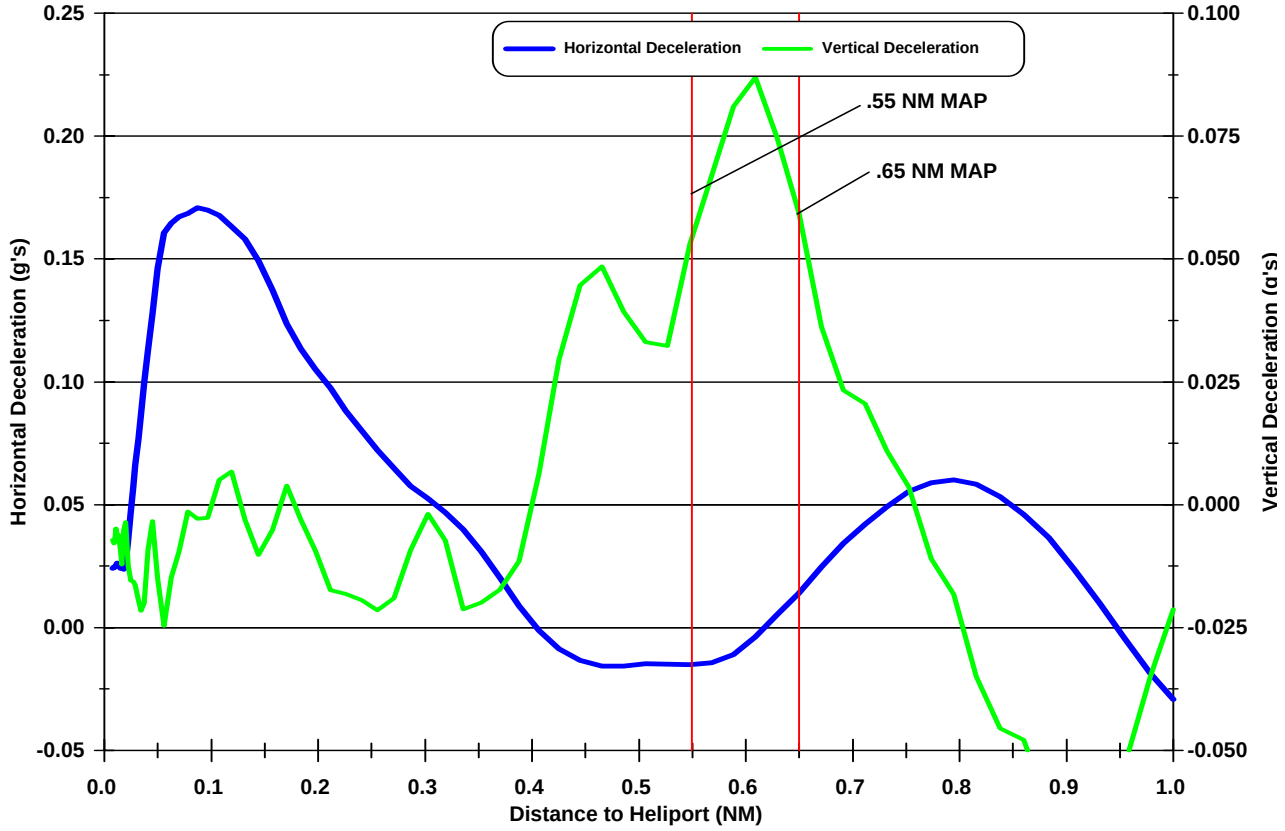
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06a006 - App. #06W

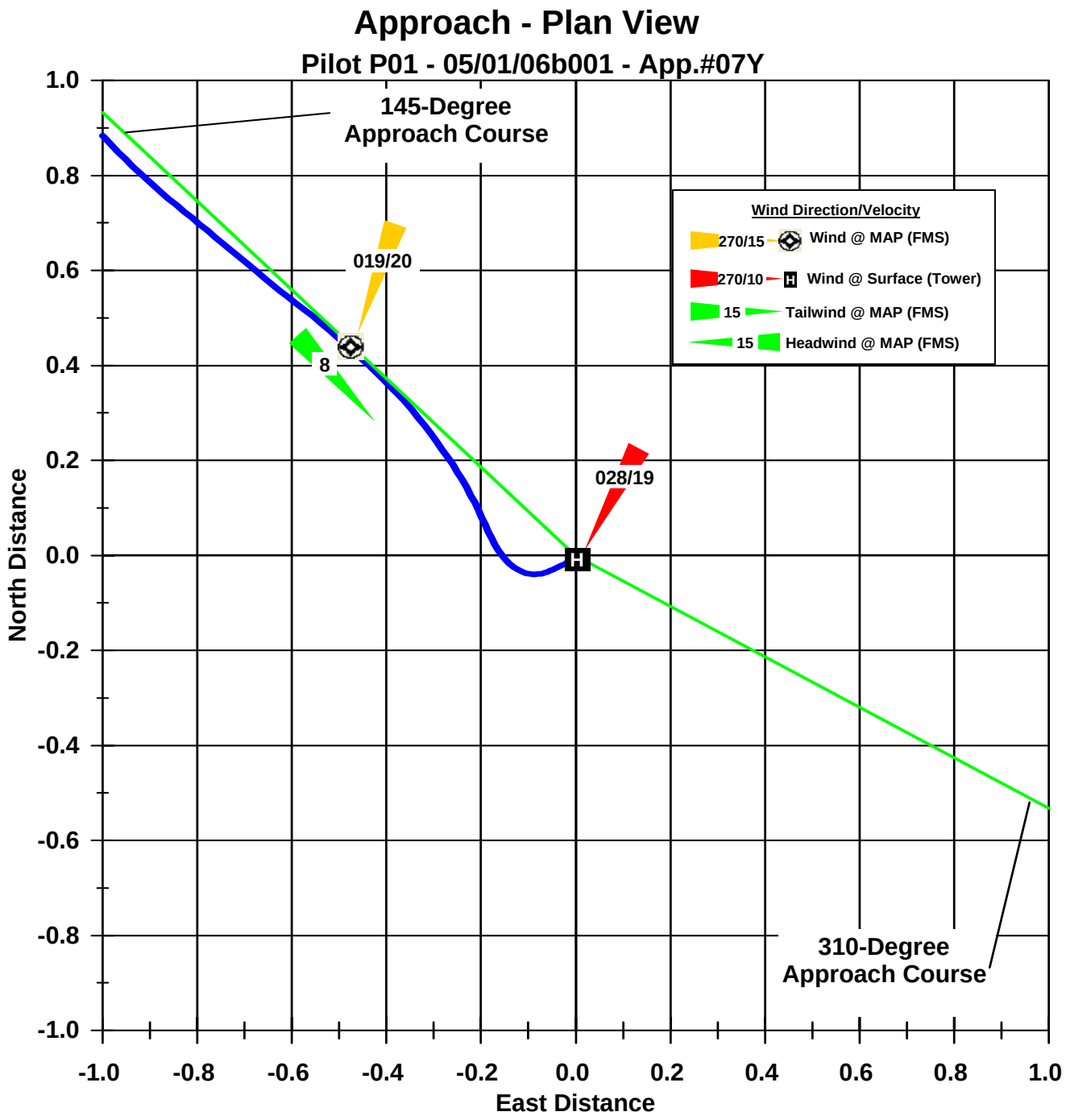


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06a006 - App. #06W

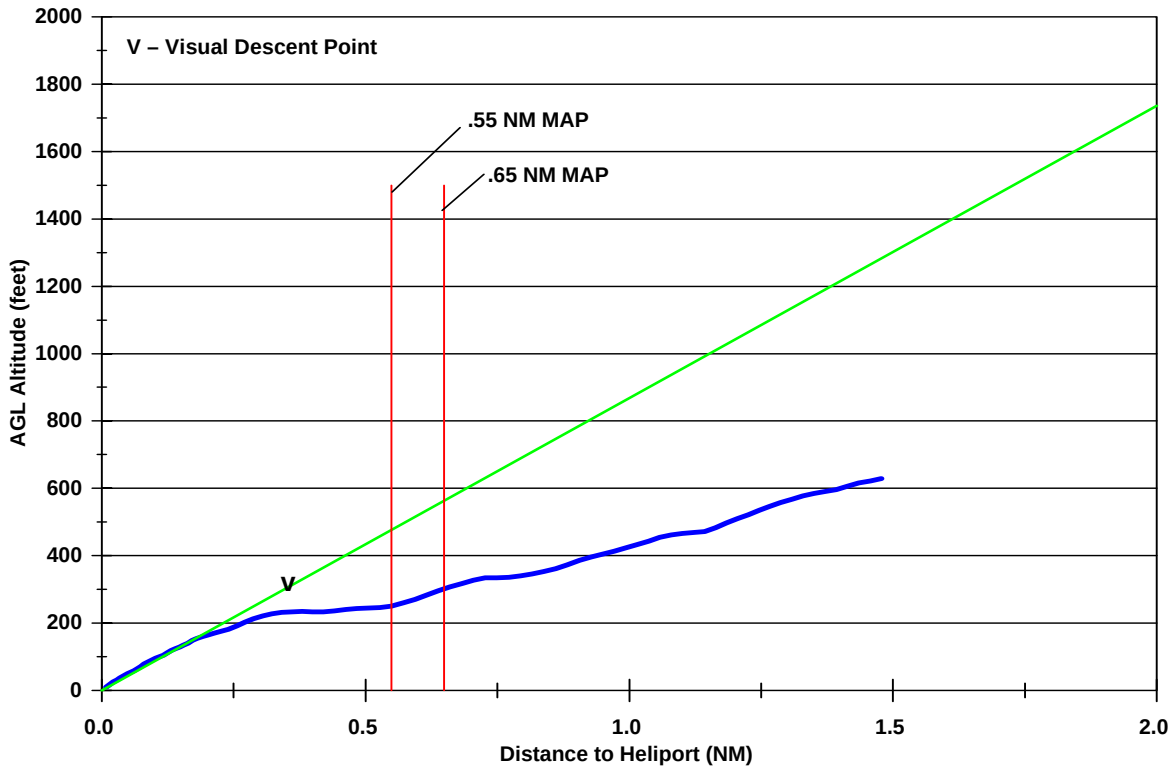


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06a006 - App. #06W

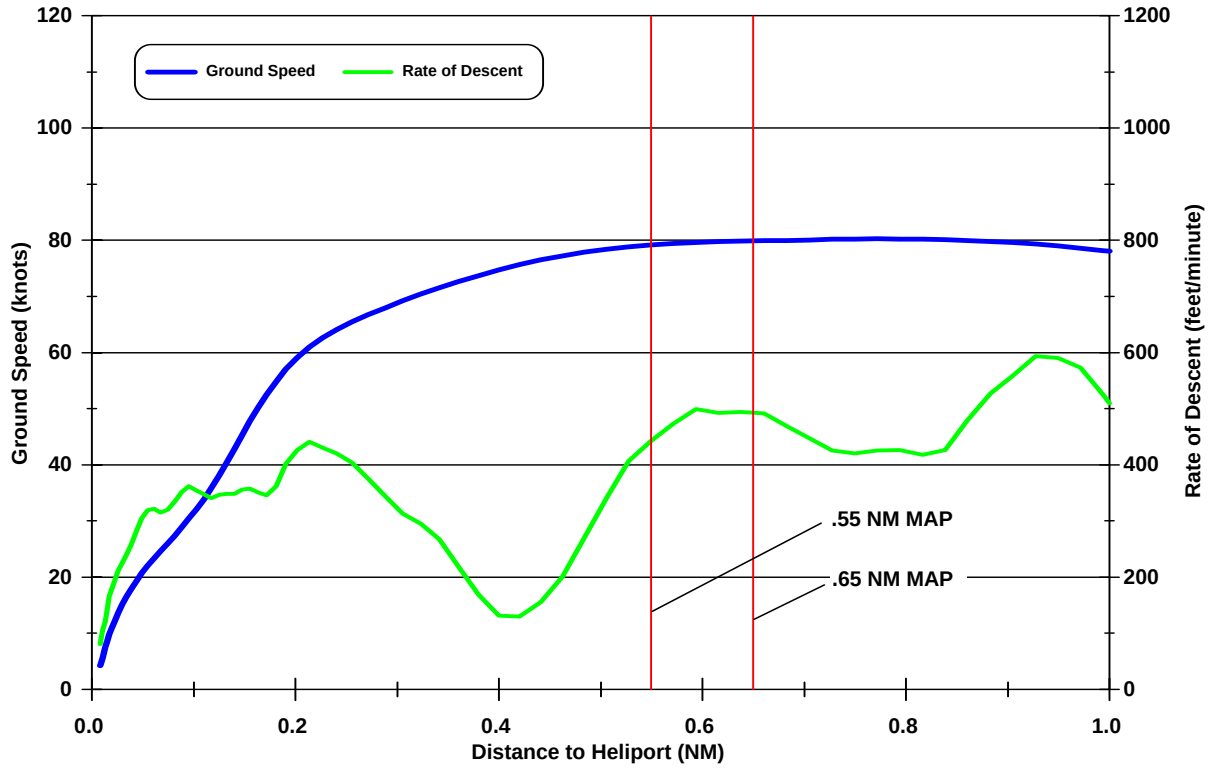



Approach - Plan View
Pilot P01 - 05/01/06b001 - App.#07Y
145-Degree
Approach Course
310-Degree
Approach Course
019/20
8
028/19
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

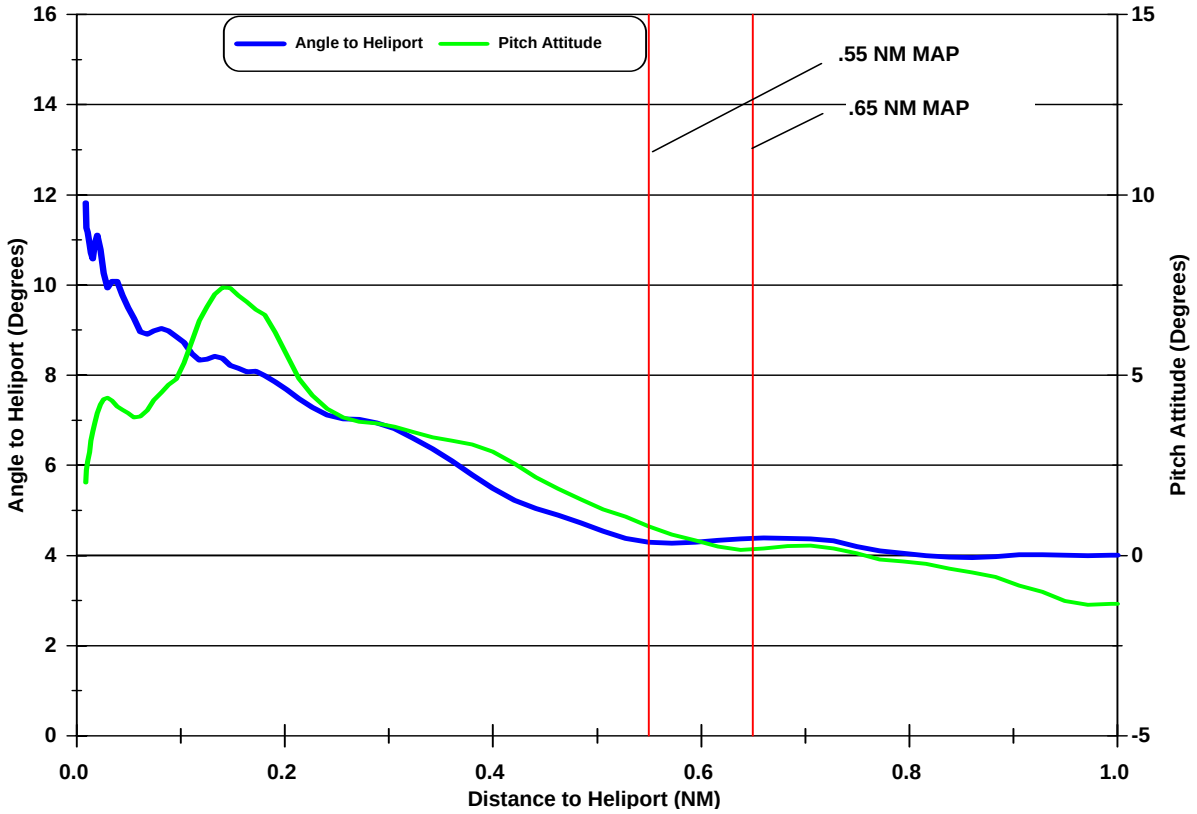
Profile View
Pilot P01 - 05/01/06b001 - App. #07Y



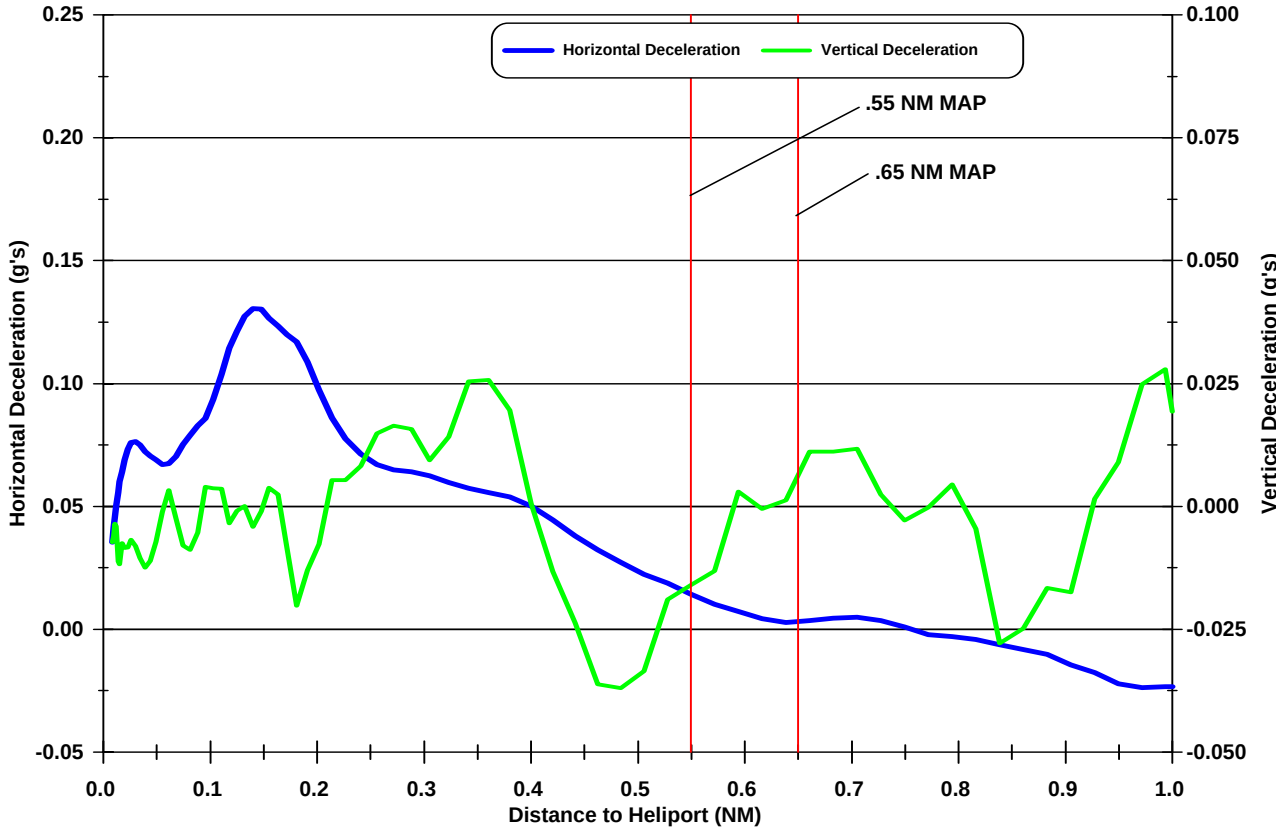
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06b001 - App. #07Y

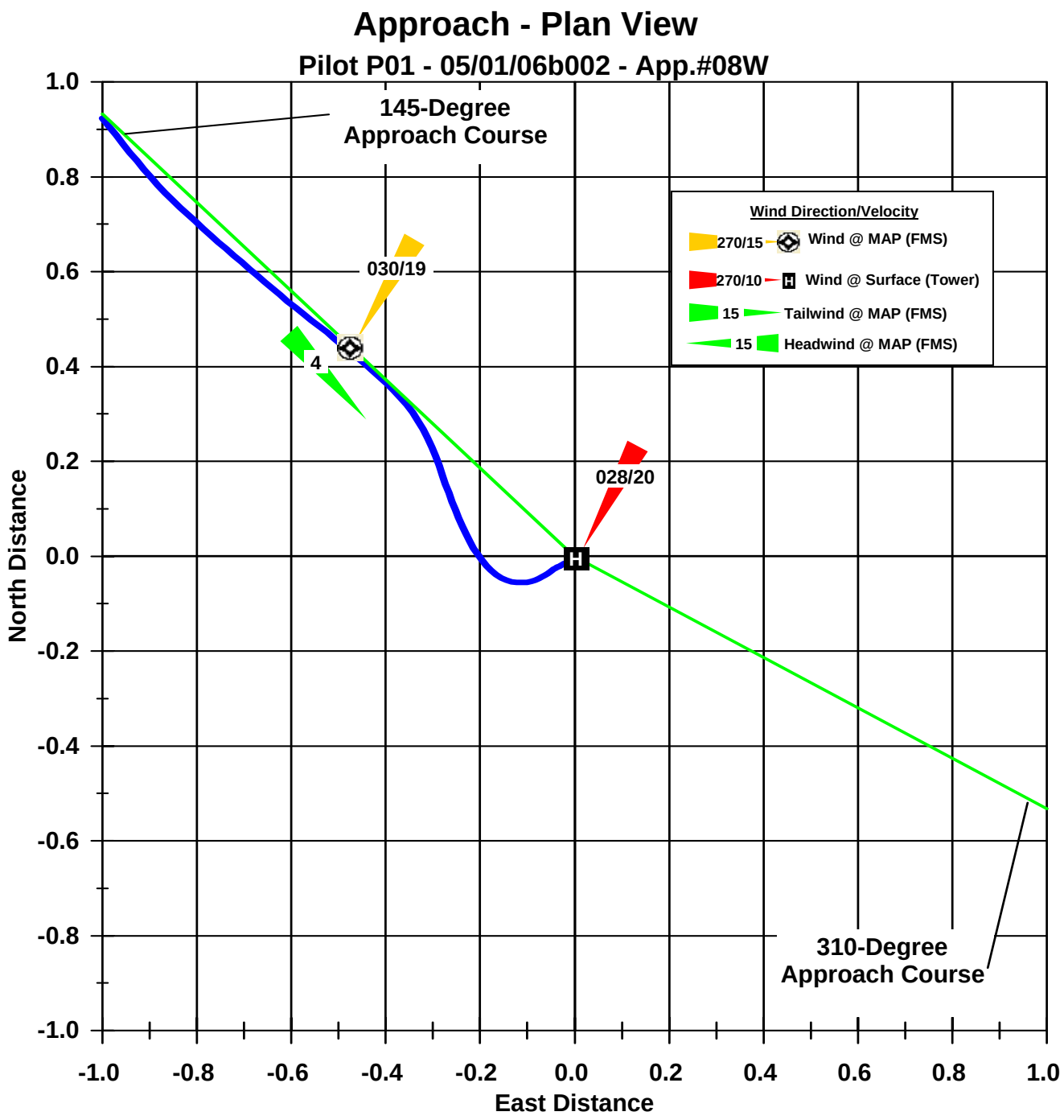


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06b001 - App. #07Y

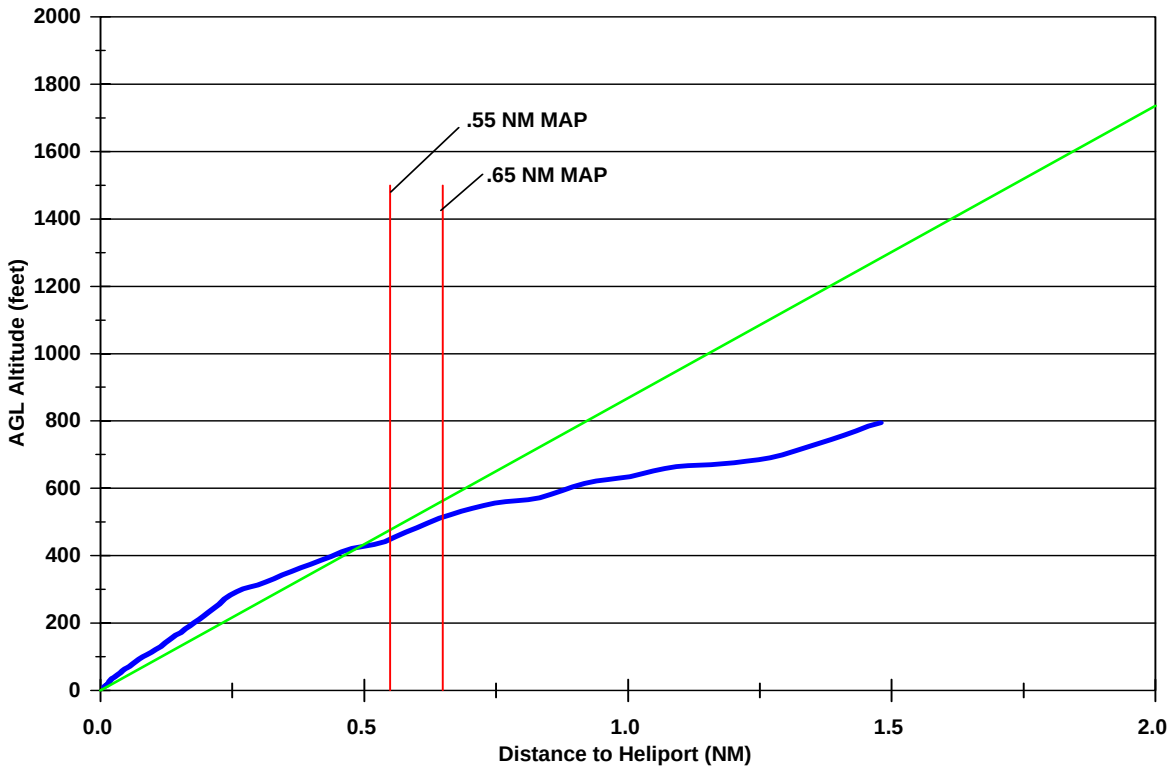


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06b001 - App. #07Y

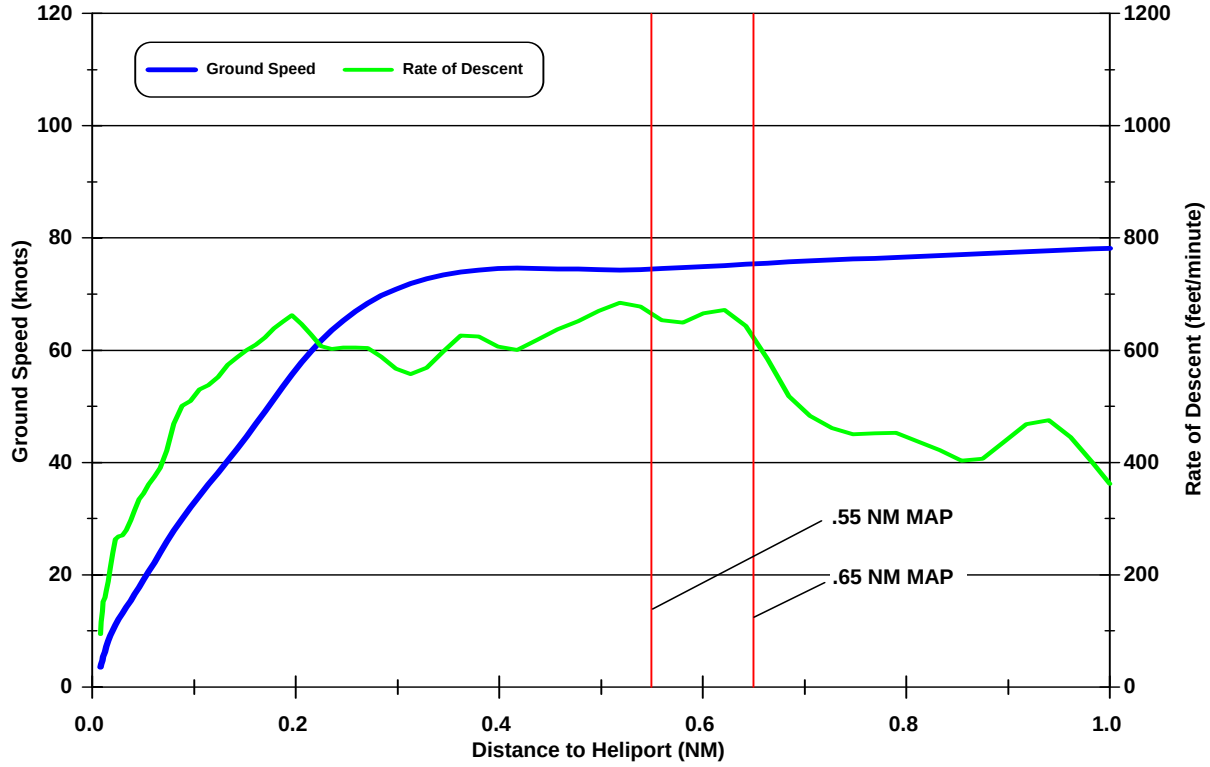



Approach - Plan View
Pilot P01 - 05/01/06b002 - App.#08W
145-Degree
Approach Course
310-Degree
Approach Course
030/19
4
028/20
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

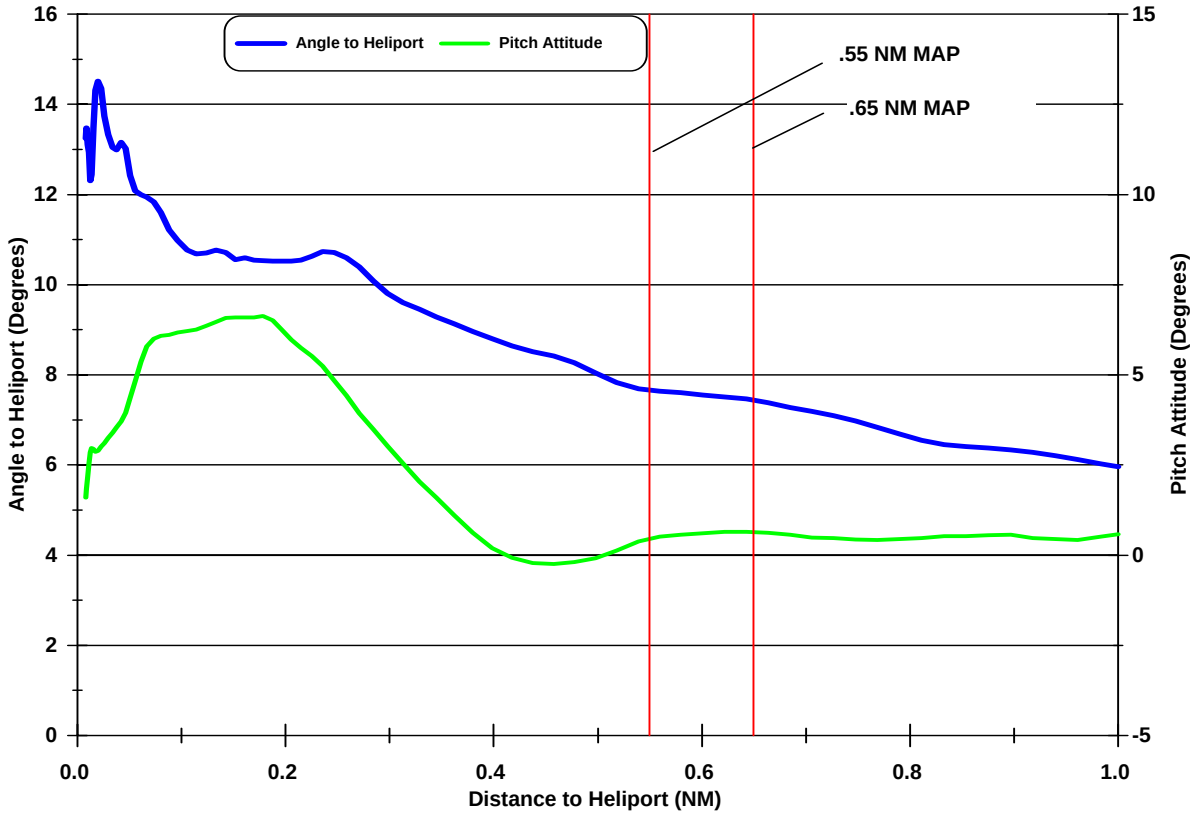
Profile View
Pilot P01 - 05/01/06b002 - App. #08W



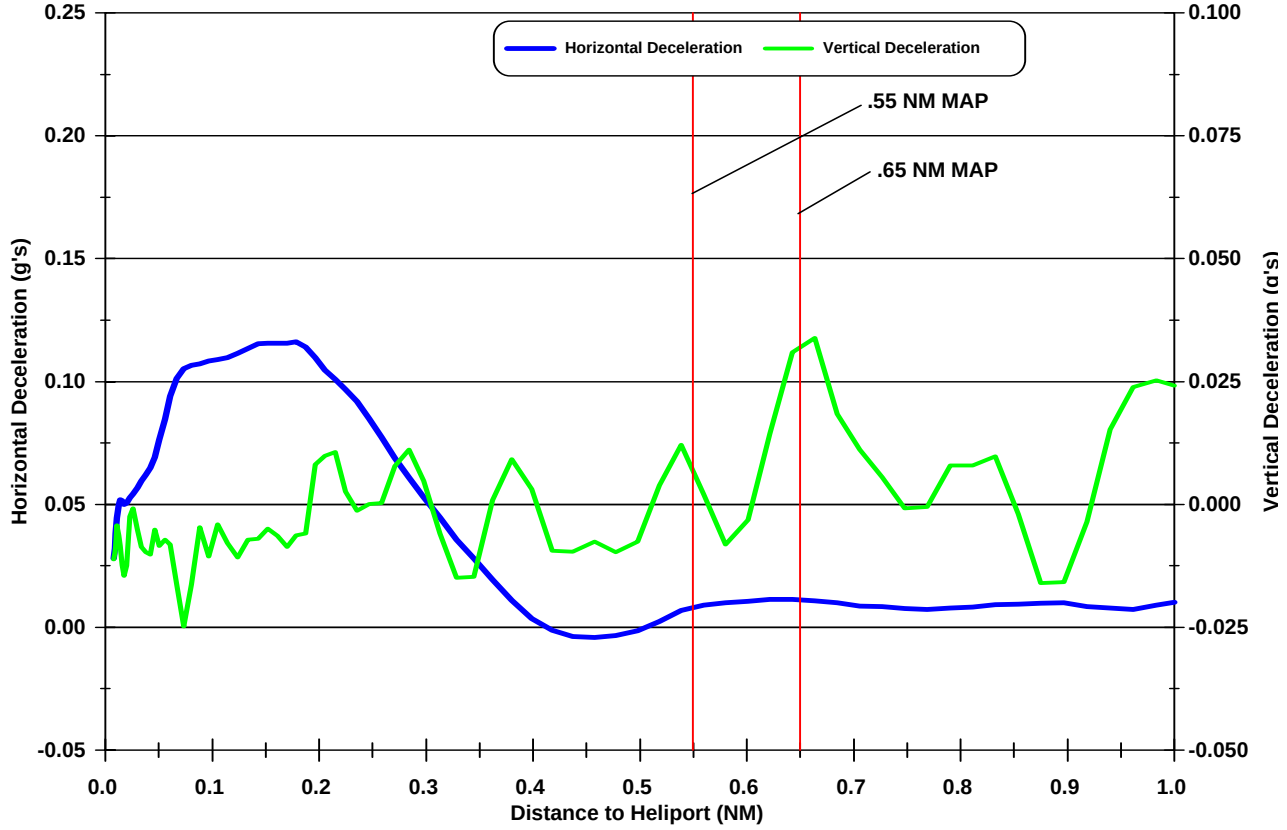
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06b002 - App. #08W

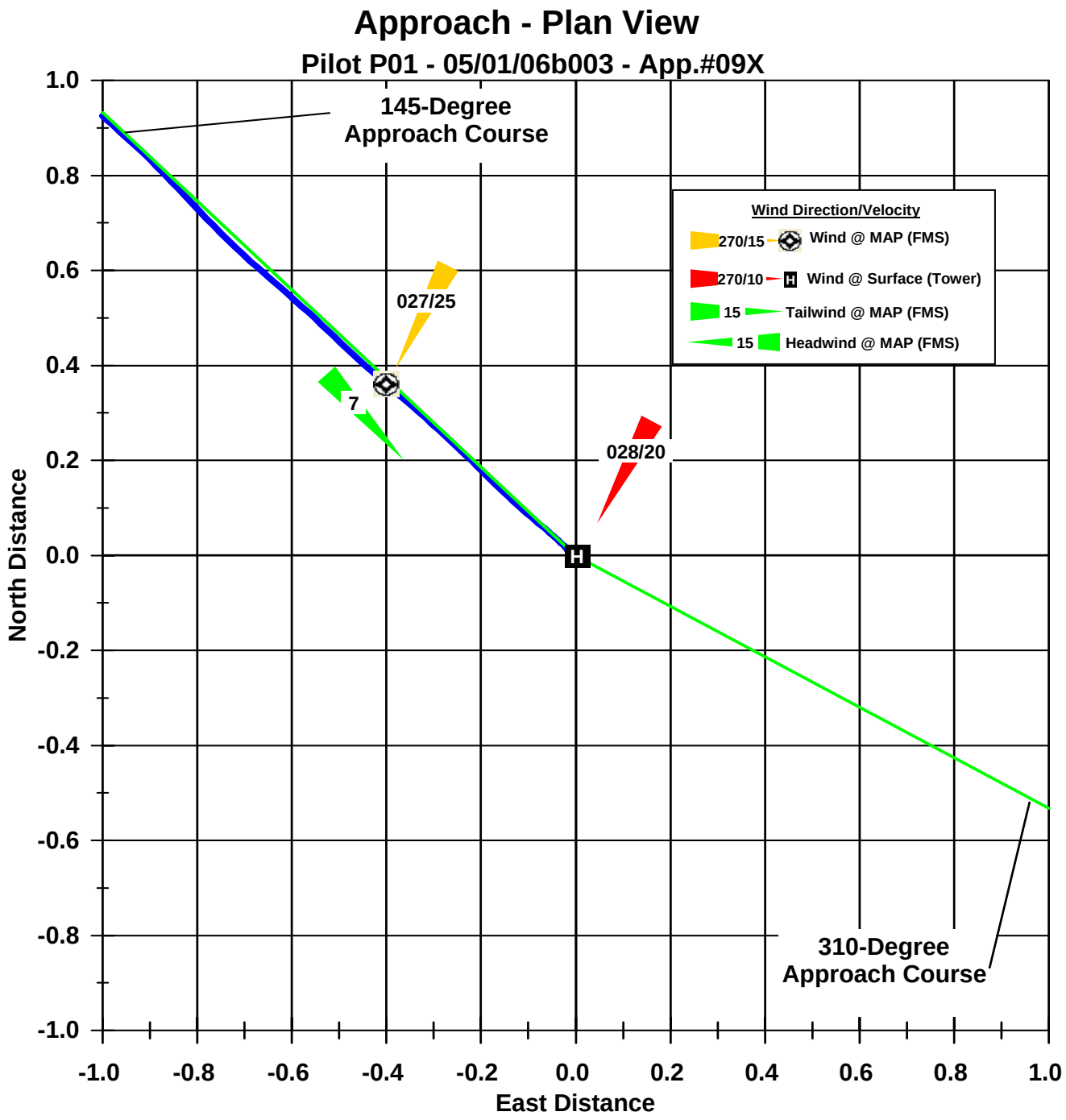


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06b002 - App. #08W

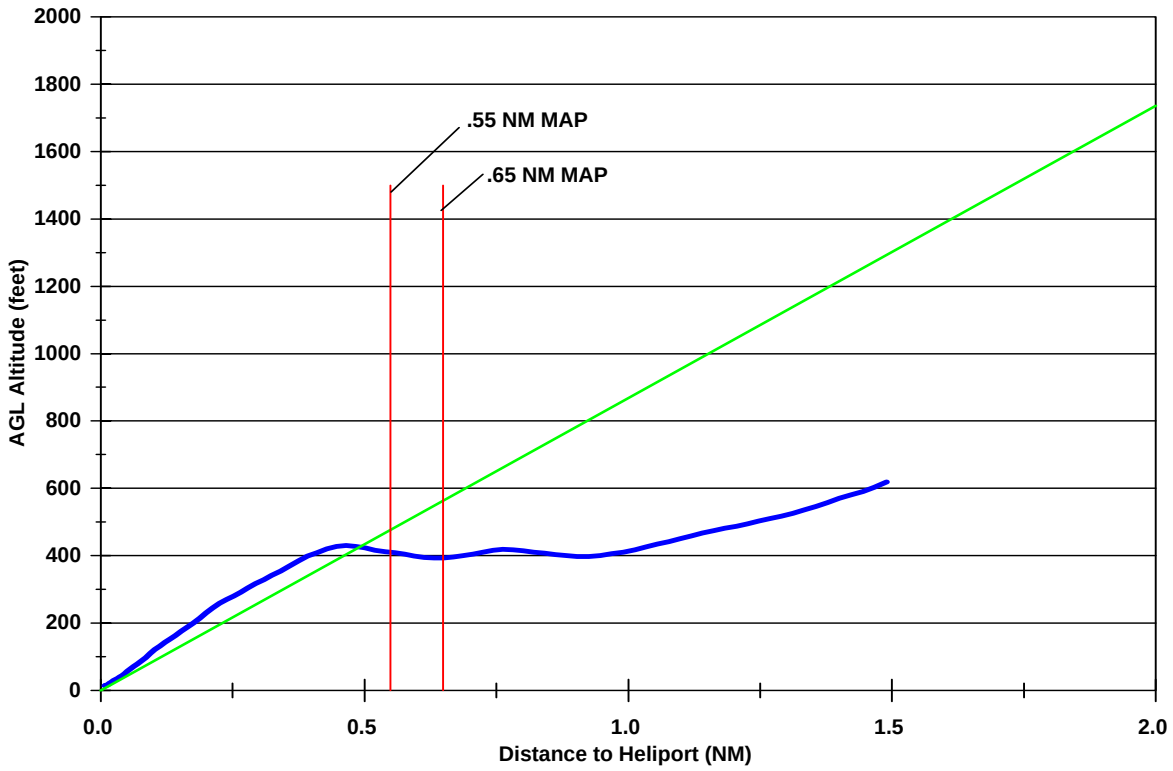


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06b002 - App. #08W

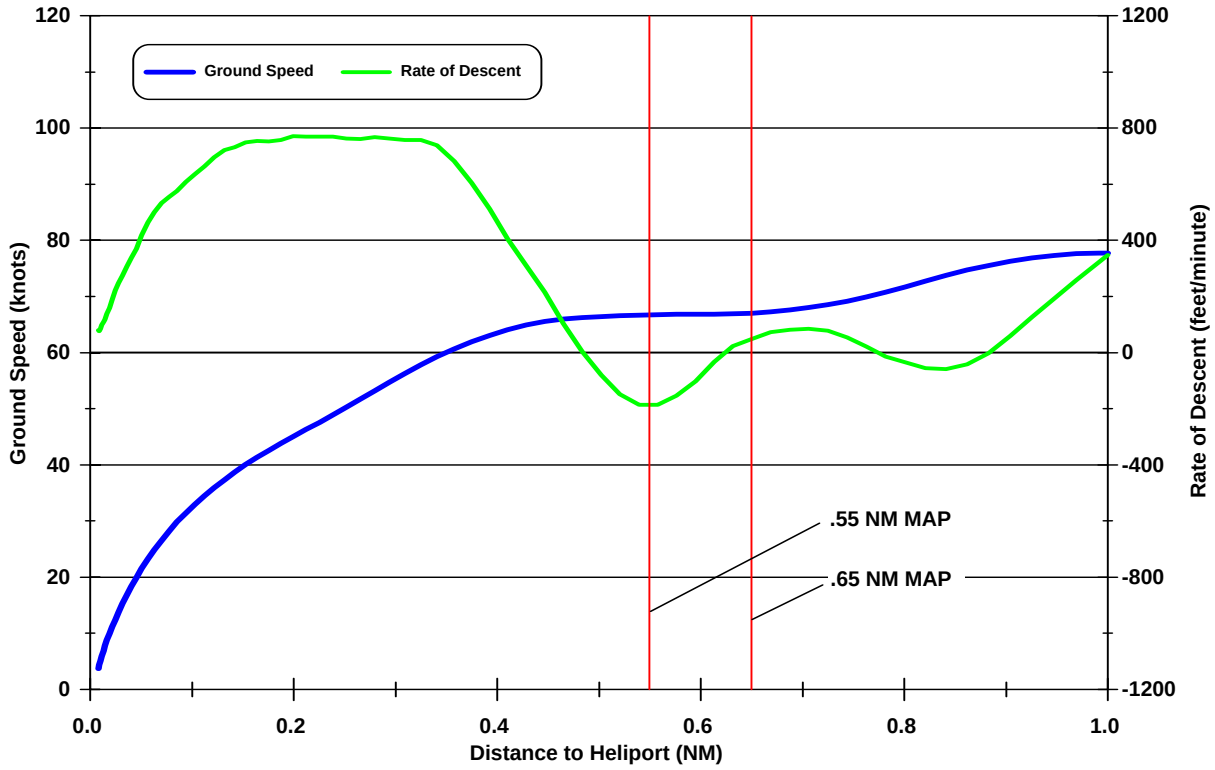



Approach - Plan View
Pilot P01 - 05/01/06b003 - App.#09X
145-Degree
Approach Course
310-Degree
Approach Course
027/25
7
028/20
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

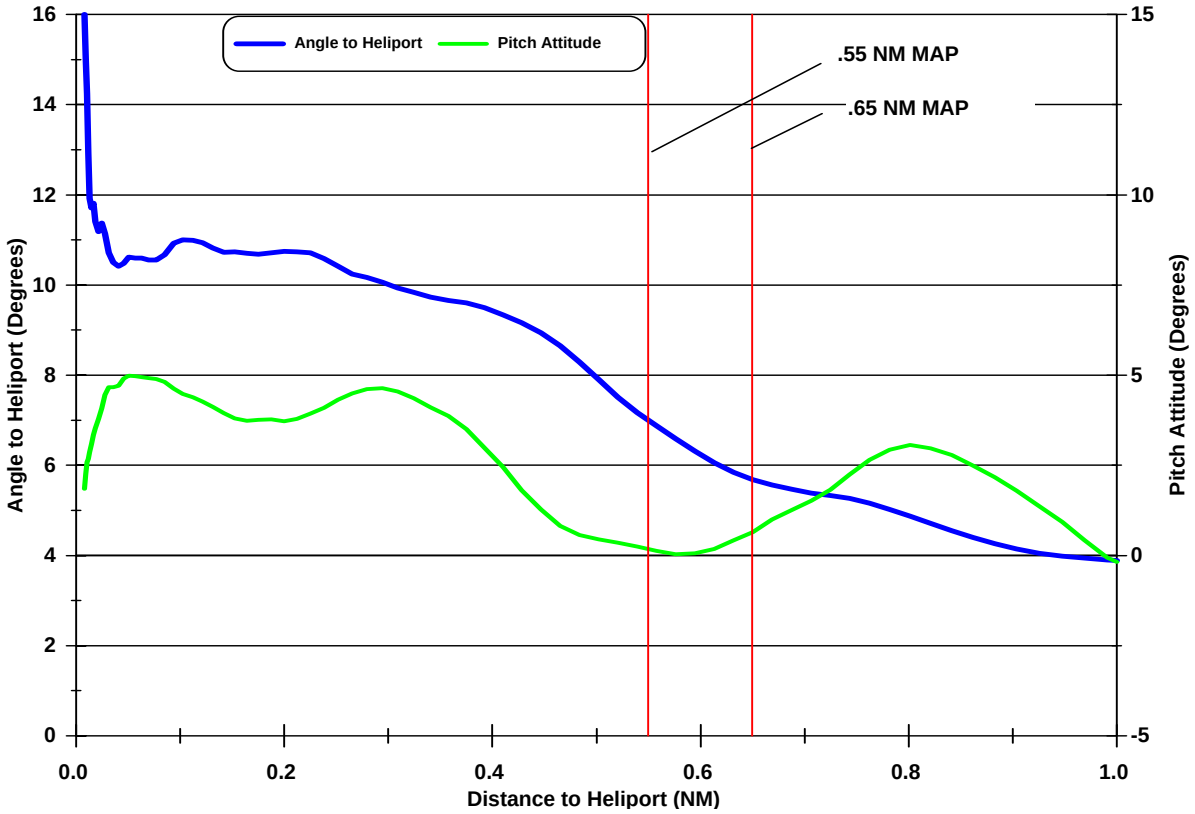
Profile View
Pilot P01 - 05/01/06b003 - App. #09X



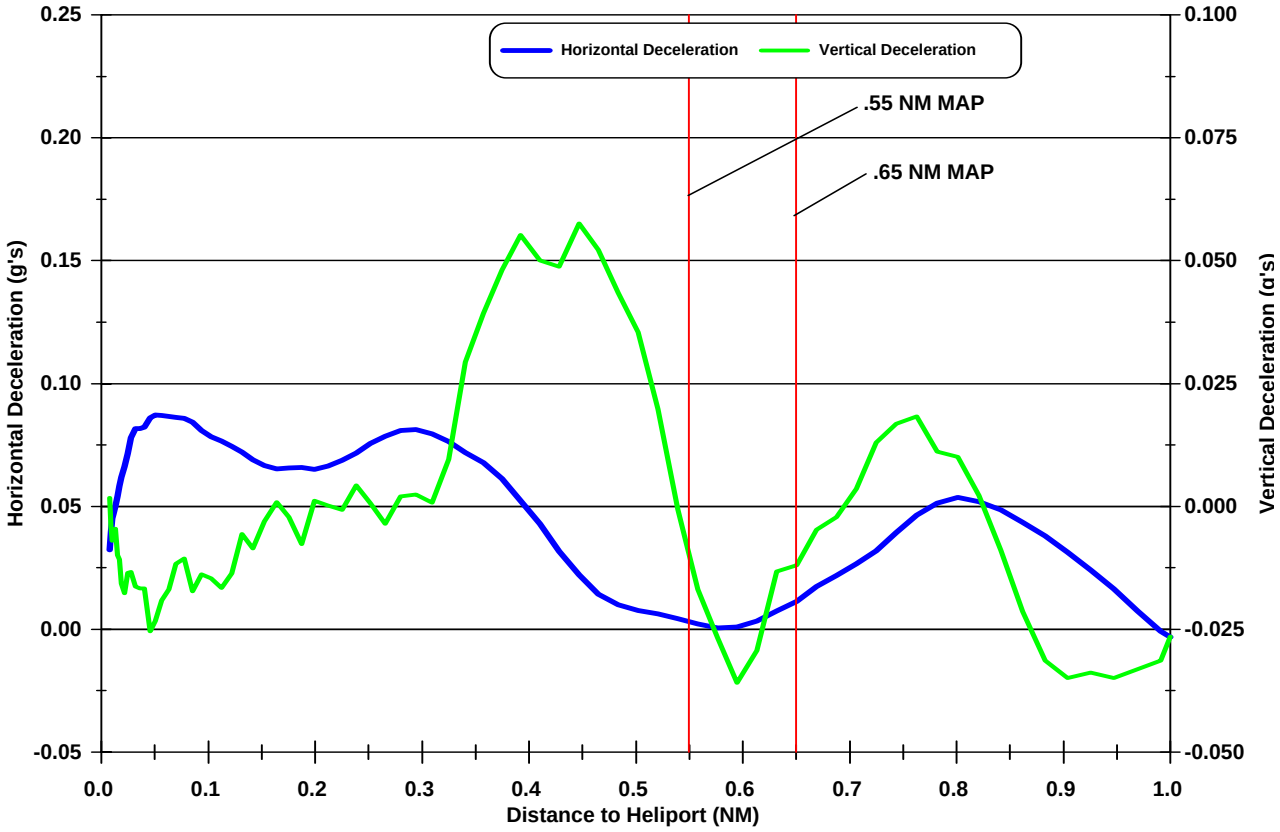
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06b003 - App. #09X

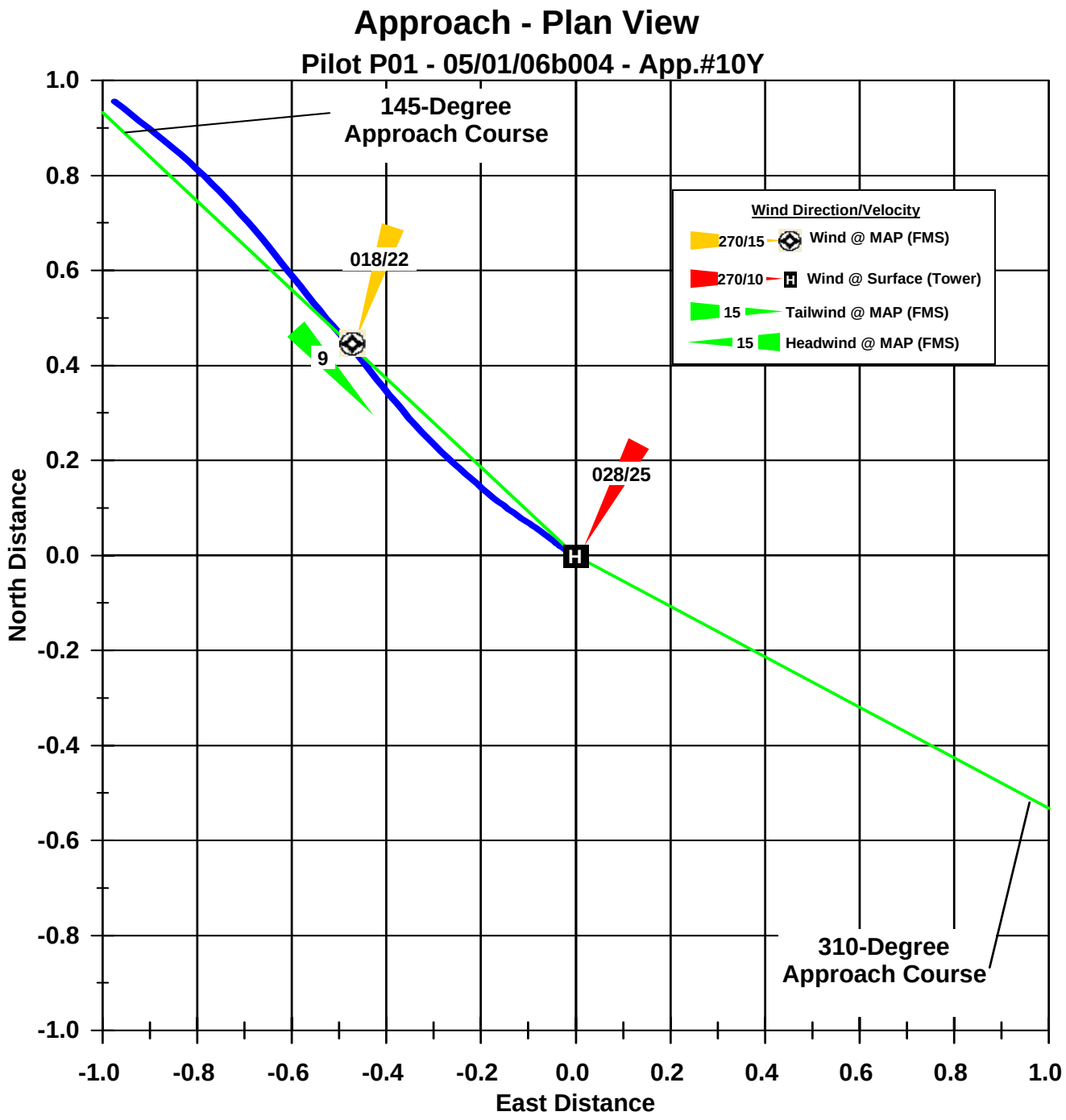


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06b003 - App. #09X

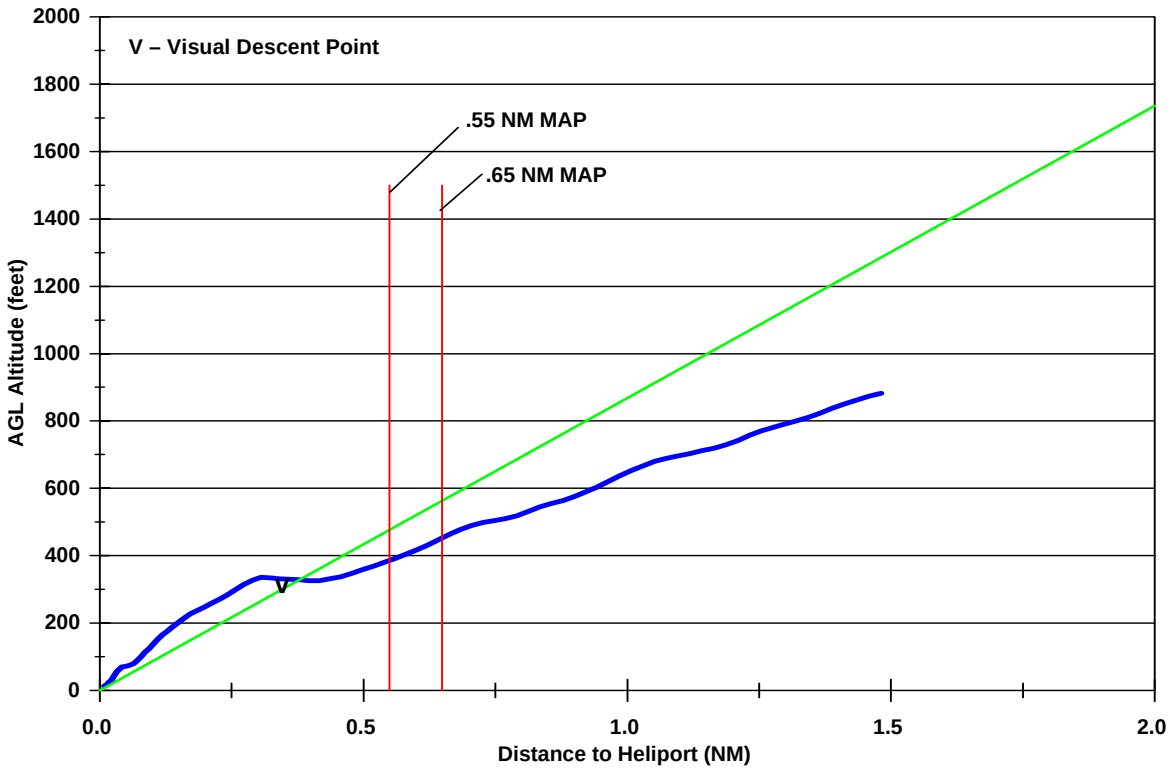


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06b003 - App. #09X

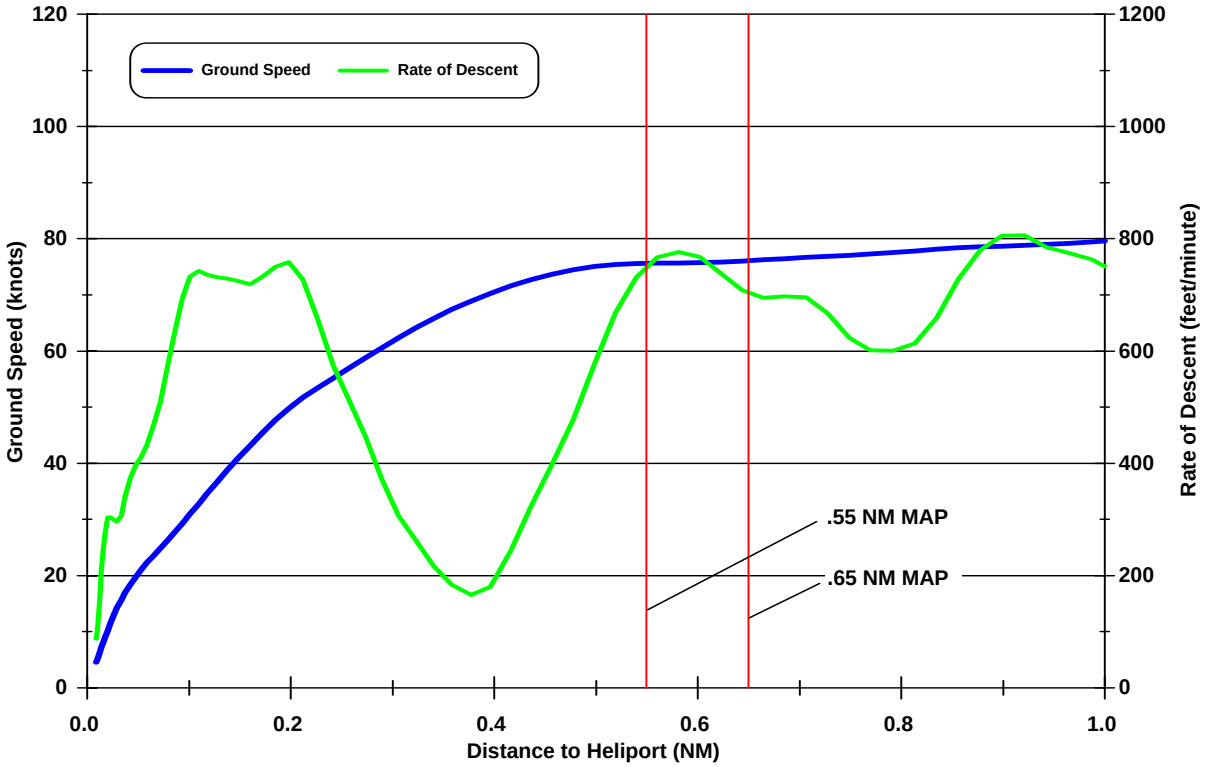



Approach - Plan View
Pilot P01 - 05/01/06b004 - App.#10Y
145-Degree
Approach Course
018/22
9
028/25
H
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

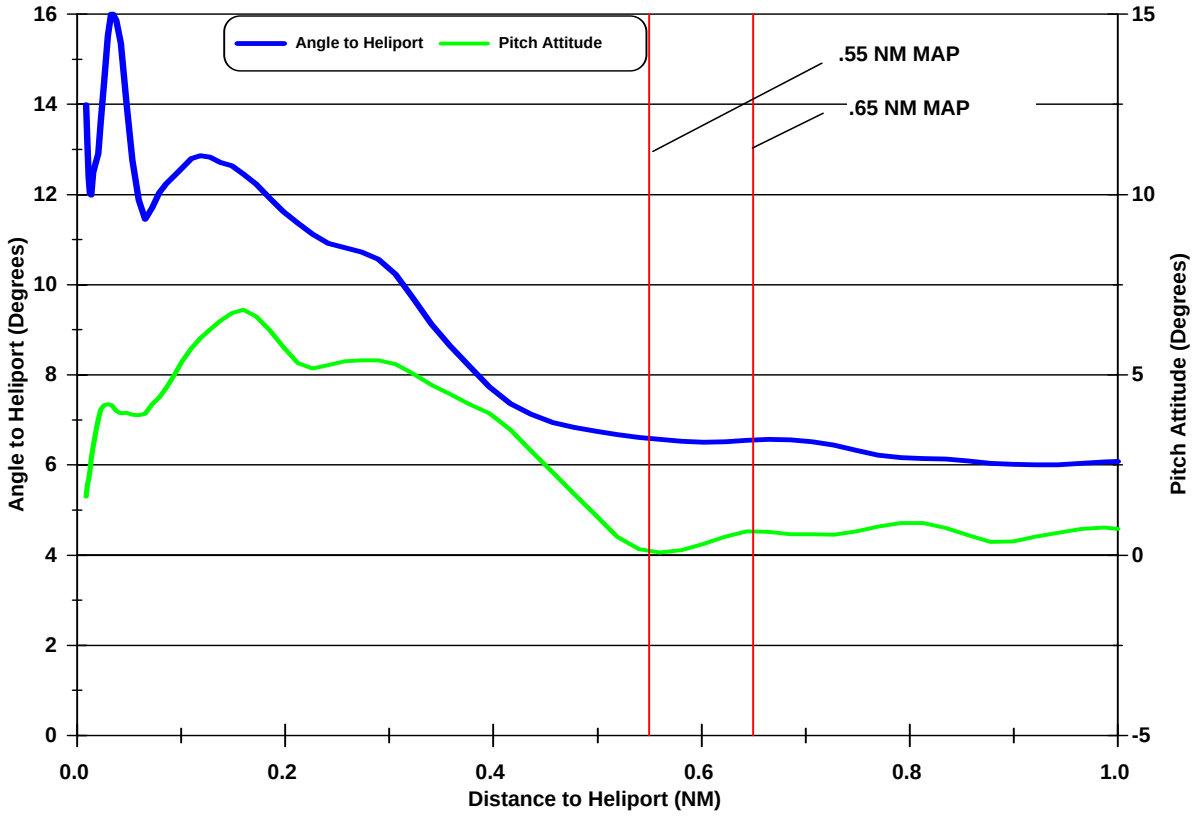
Profile View
Pilot P01 - 05/01/06b004 - App. #10Y



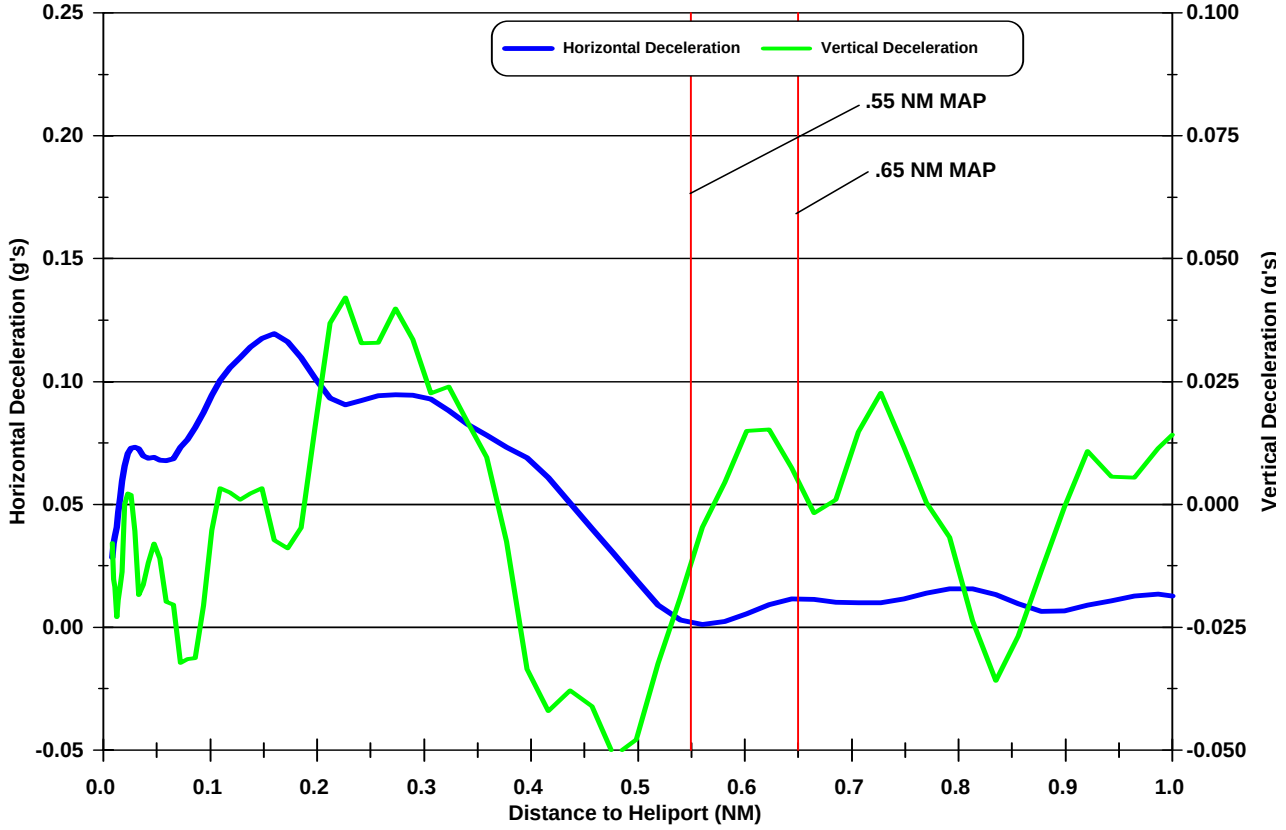
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06b004 - App. #10Y

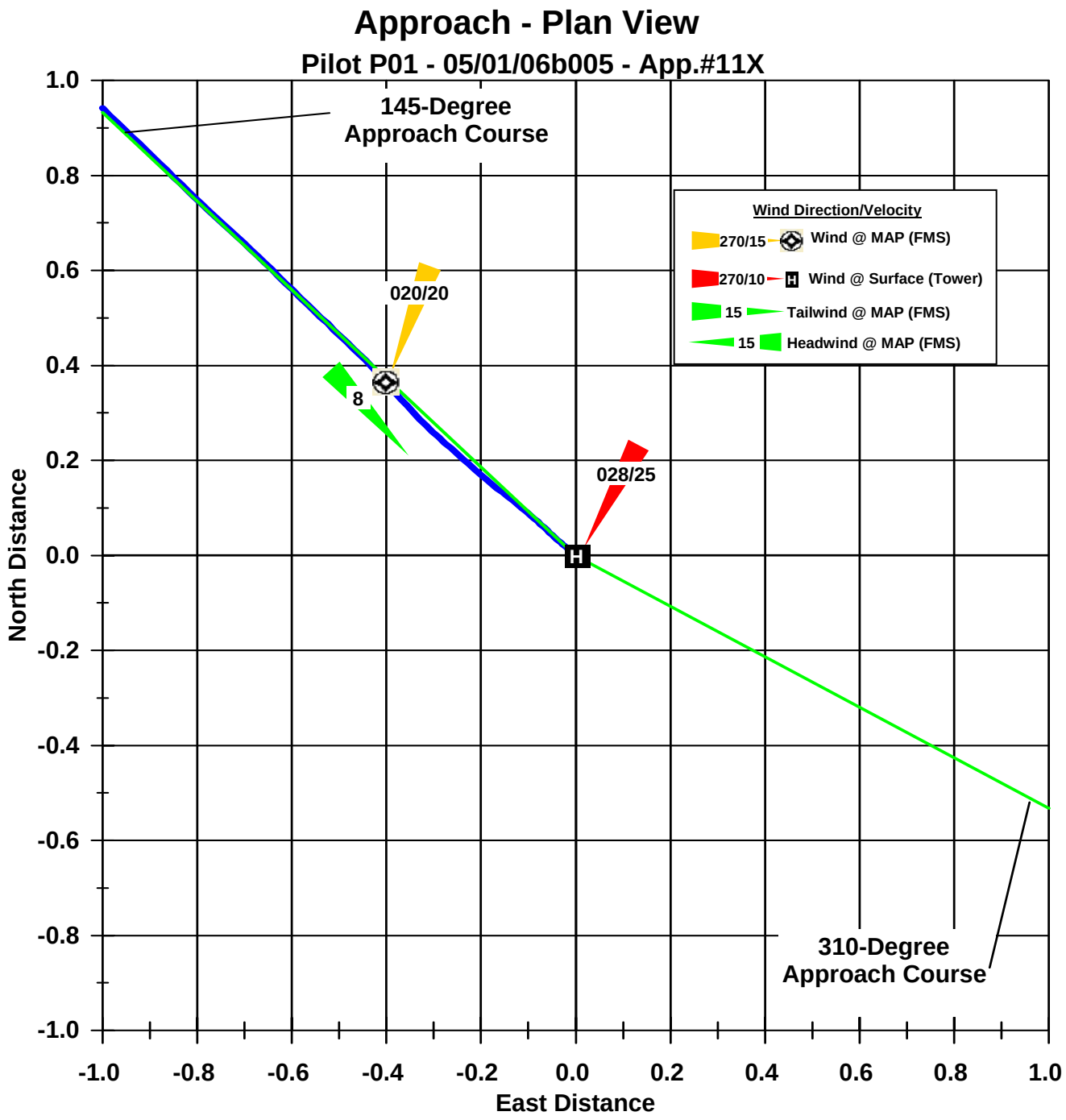


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06b004 - App. #10Y

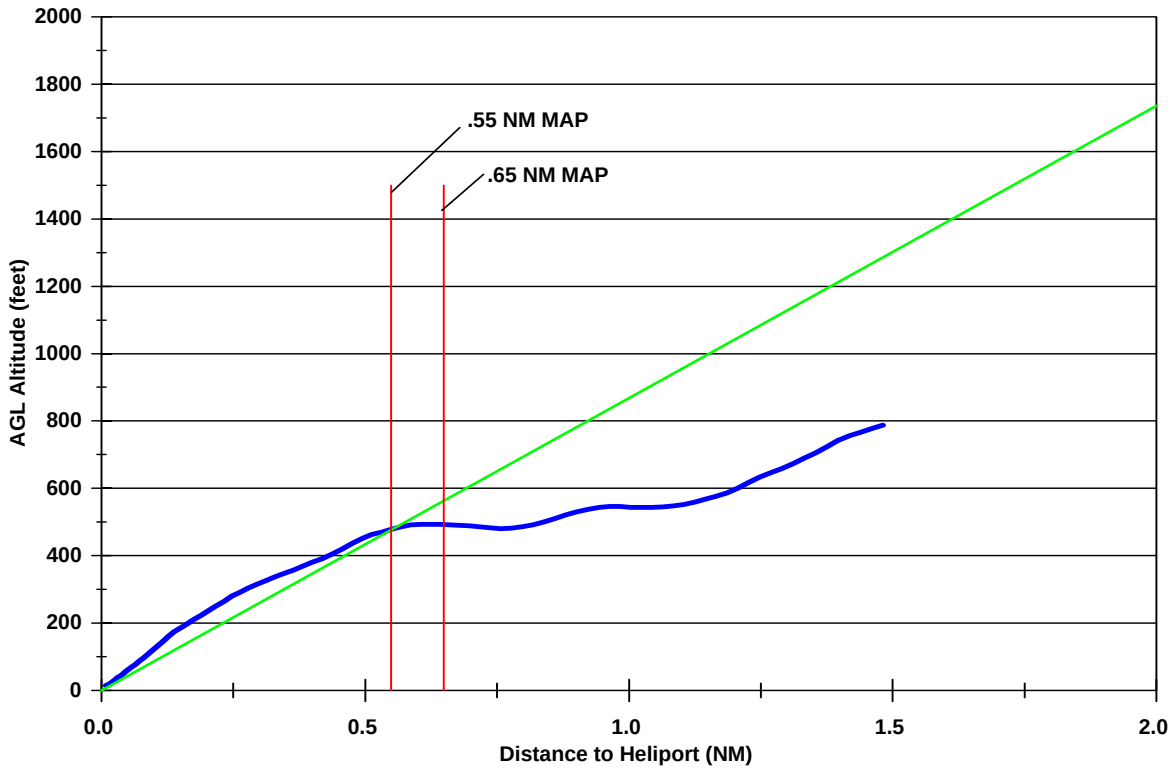


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06b004 - App. #10Y

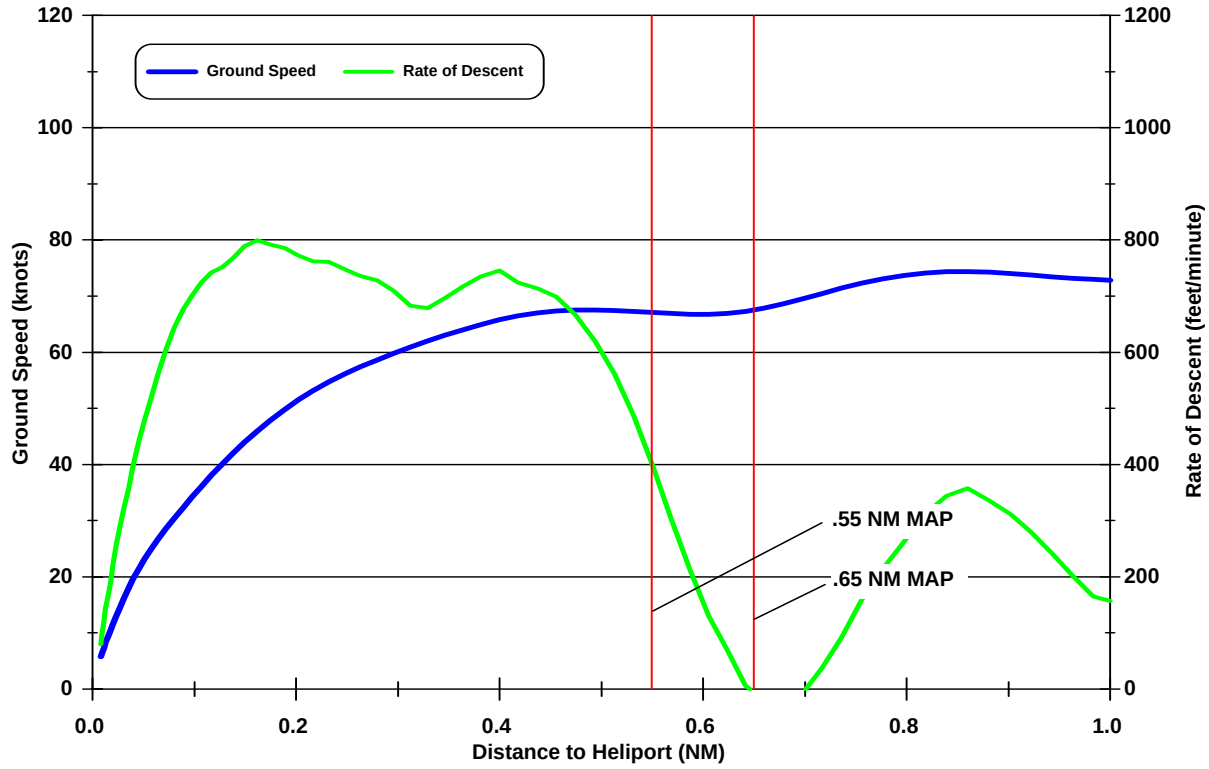



Approach - Plan View
Pilot P01 - 05/01/06b005 - App.#11X
145-Degree
Approach Course
310-Degree
Approach Course
020/20
8
028/25
H
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

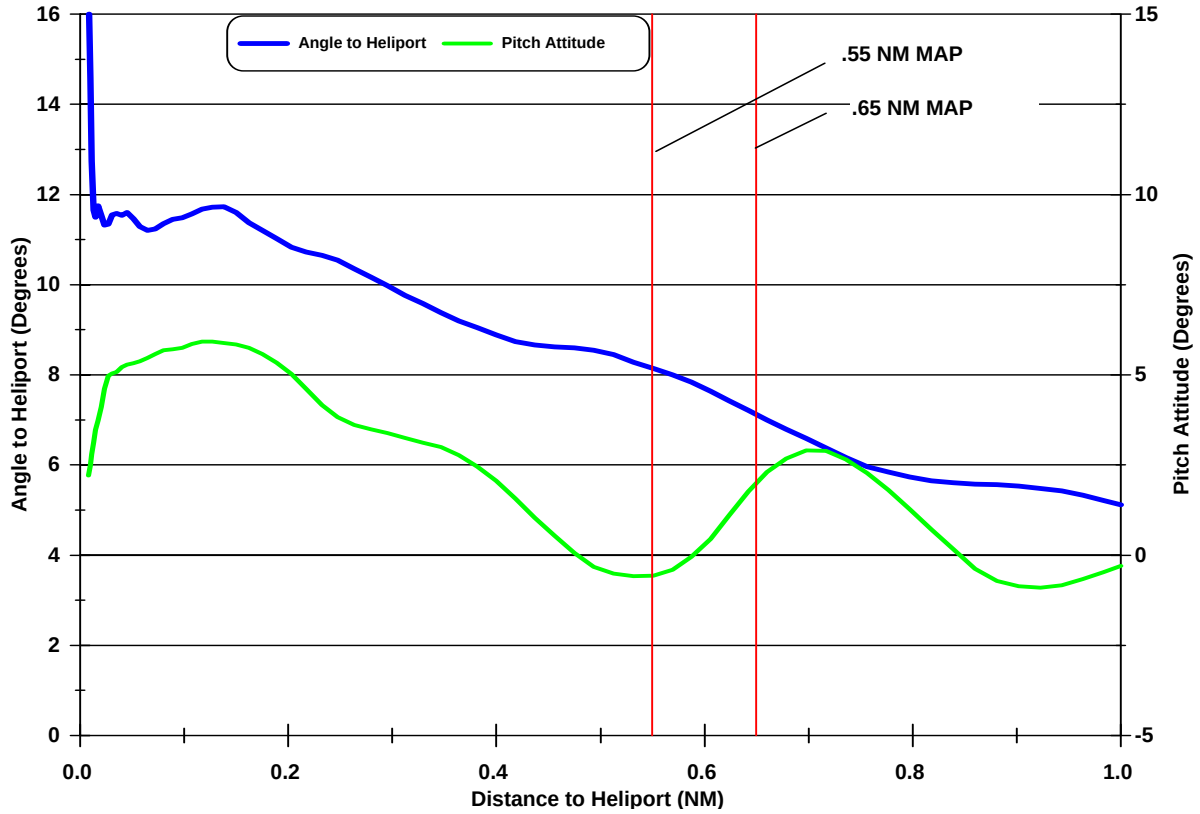
Profile View
Pilot P01 - 05/01/06b005 - App. #11X



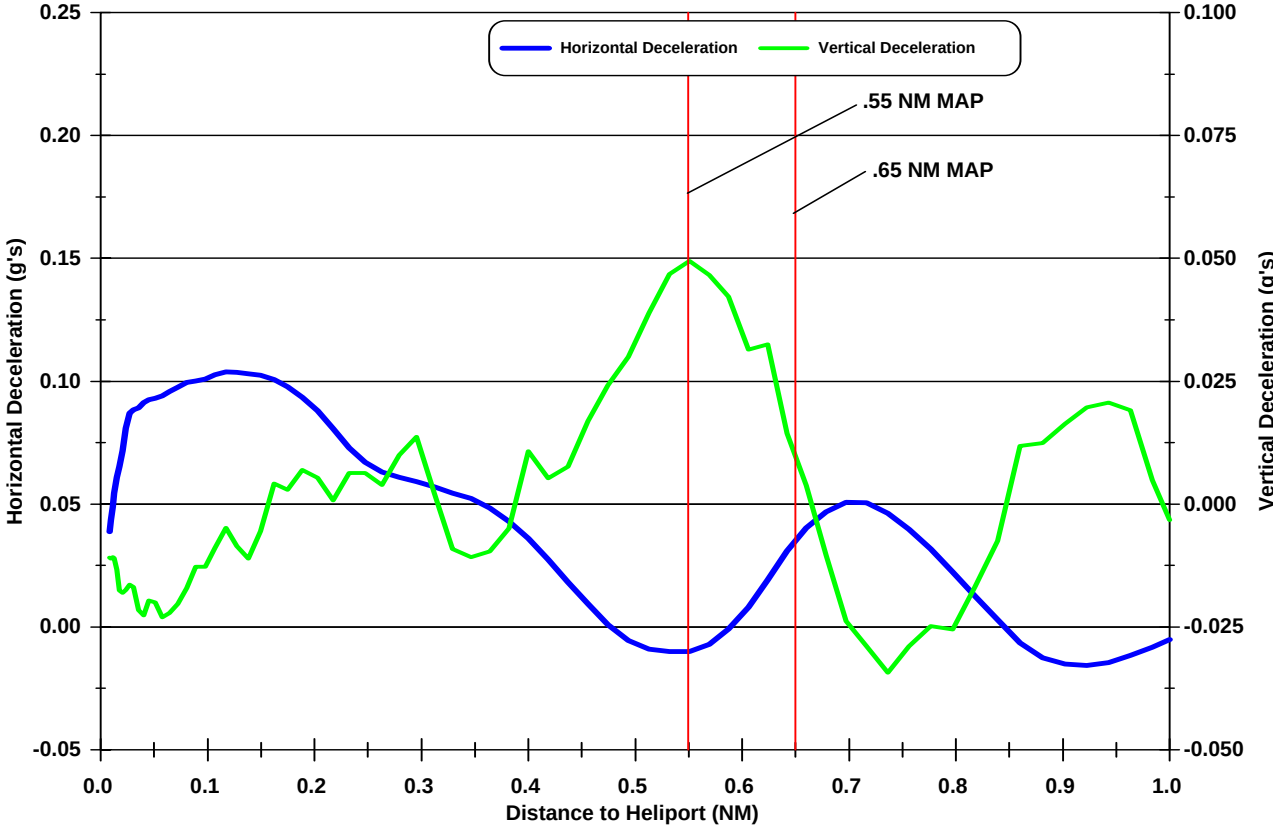
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06b005 - App. #11X

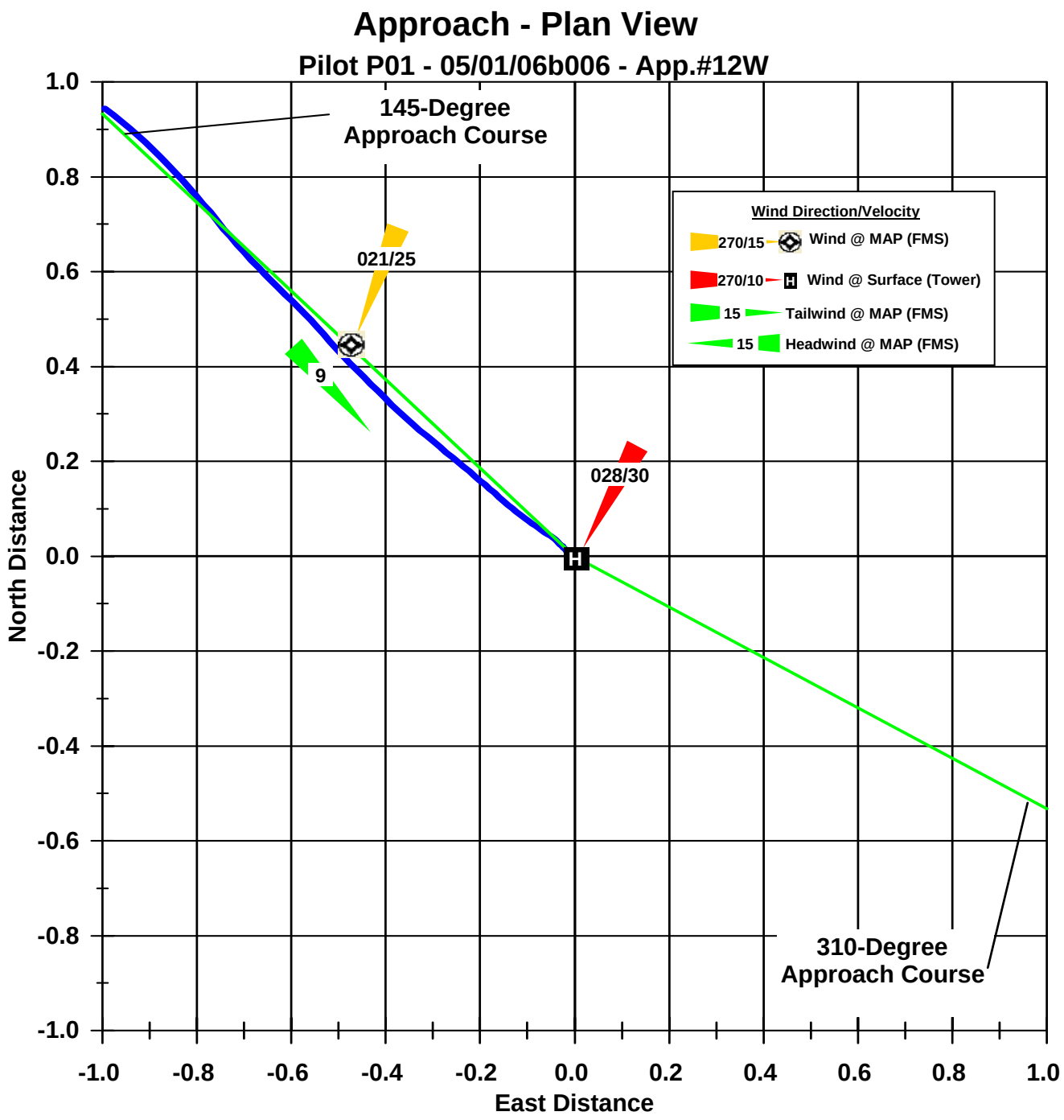


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06b005 - App. #11X

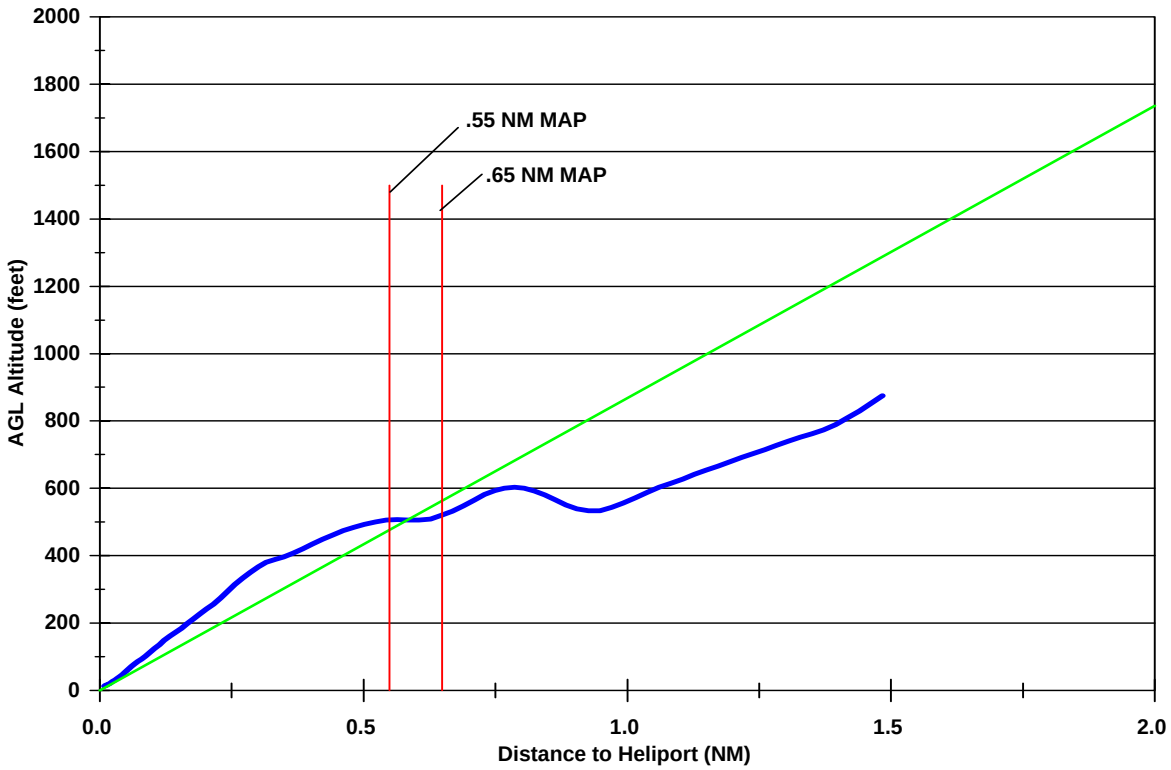


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06b005 - App. #11X

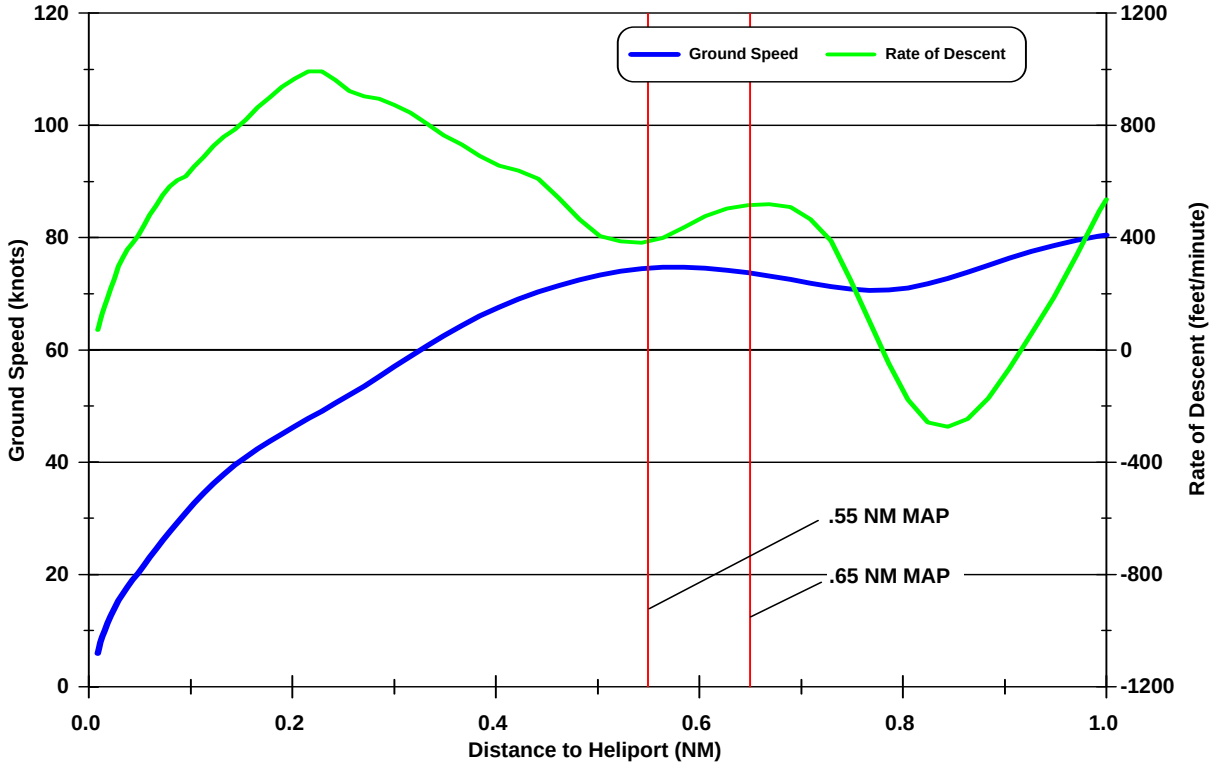



Approach - Plan View
Pilot P01 - 05/01/06b006 - App.#12W
145-Degree
Approach Course
021/25
9
028/30
H
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

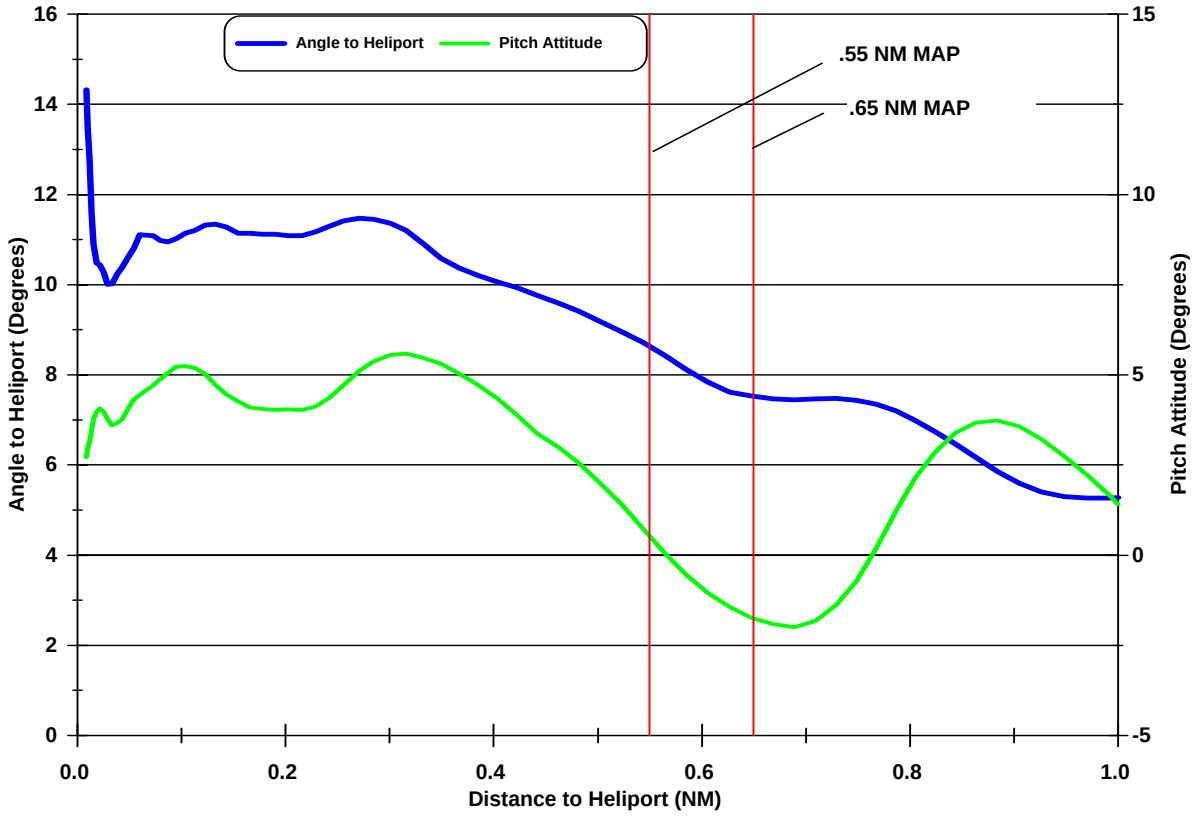
Profile View
Pilot P01 - 05/01/06b006 - App. #12W



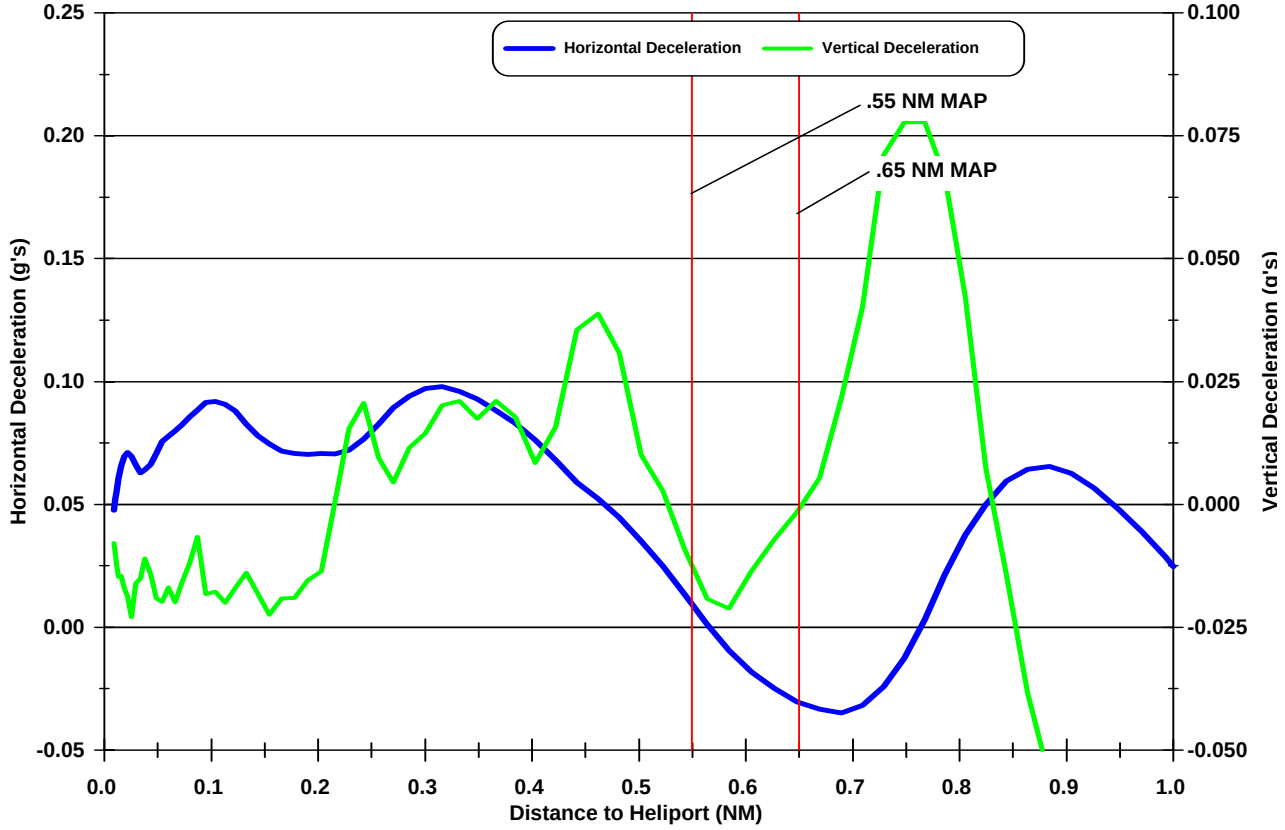
Ground Speed and Rate of Descent
Pilot P01 - 05/01/06b006 - App. #12W

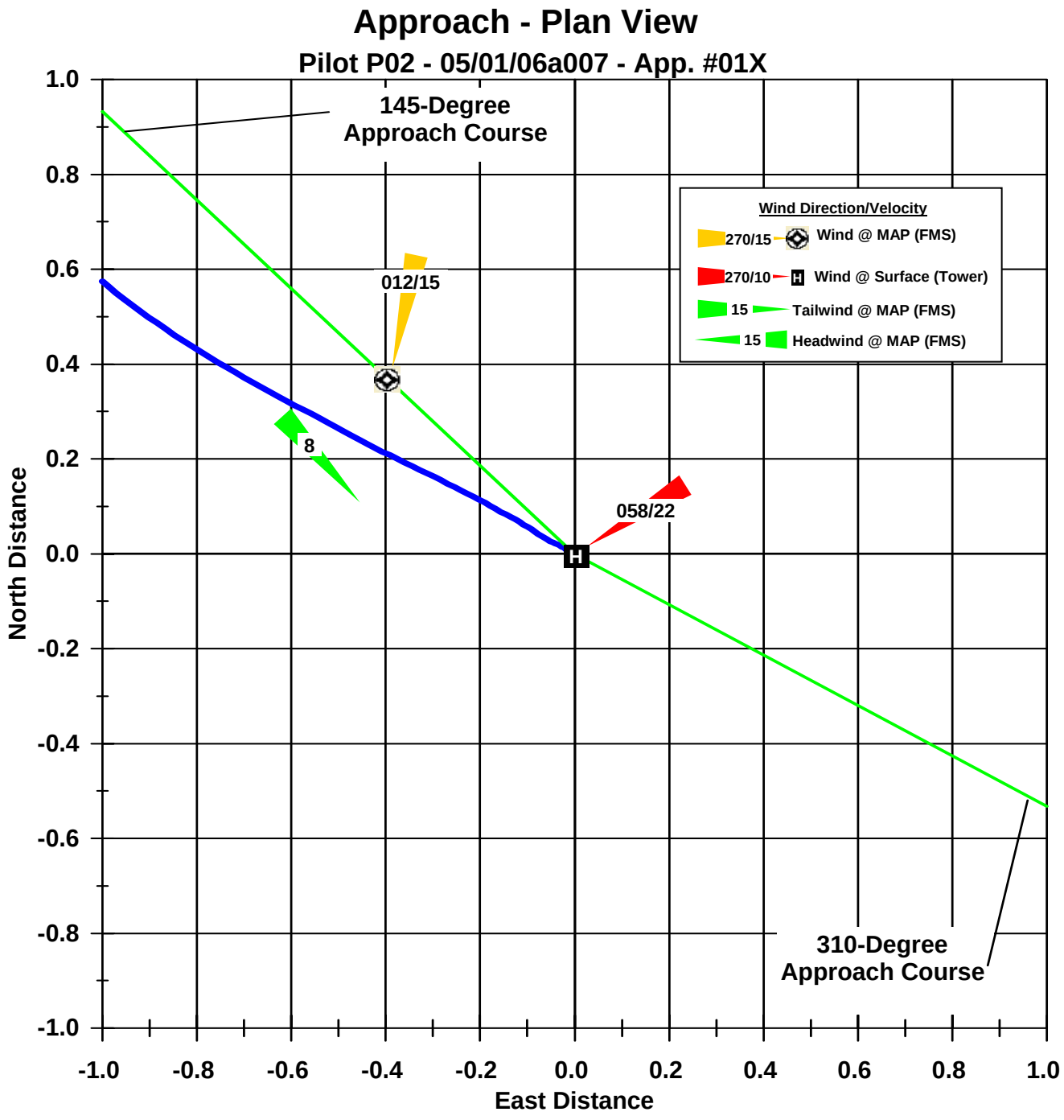


Angle to Heliport and Pitch Attitude
Pilot P01 - 05/01/06b006 - App. #12W

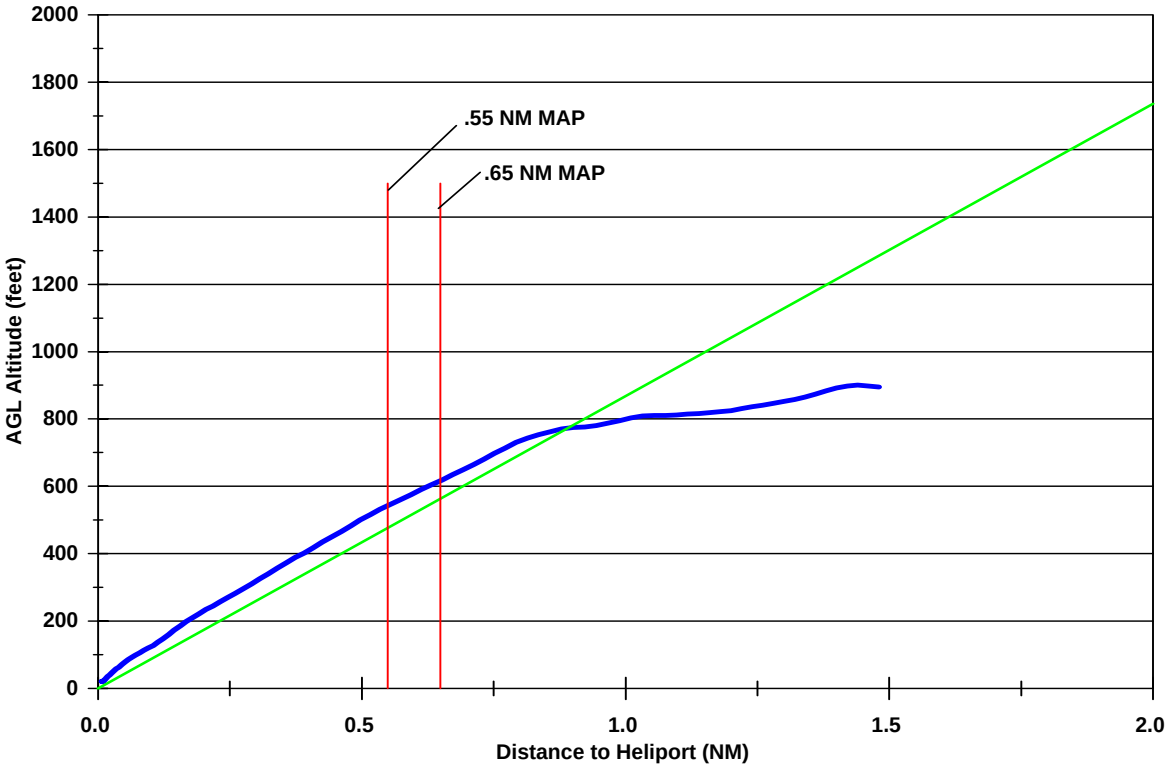


Horizontal and Vertical Deceleration
Pilot P01 - 05/01/06b006 - App. #12W

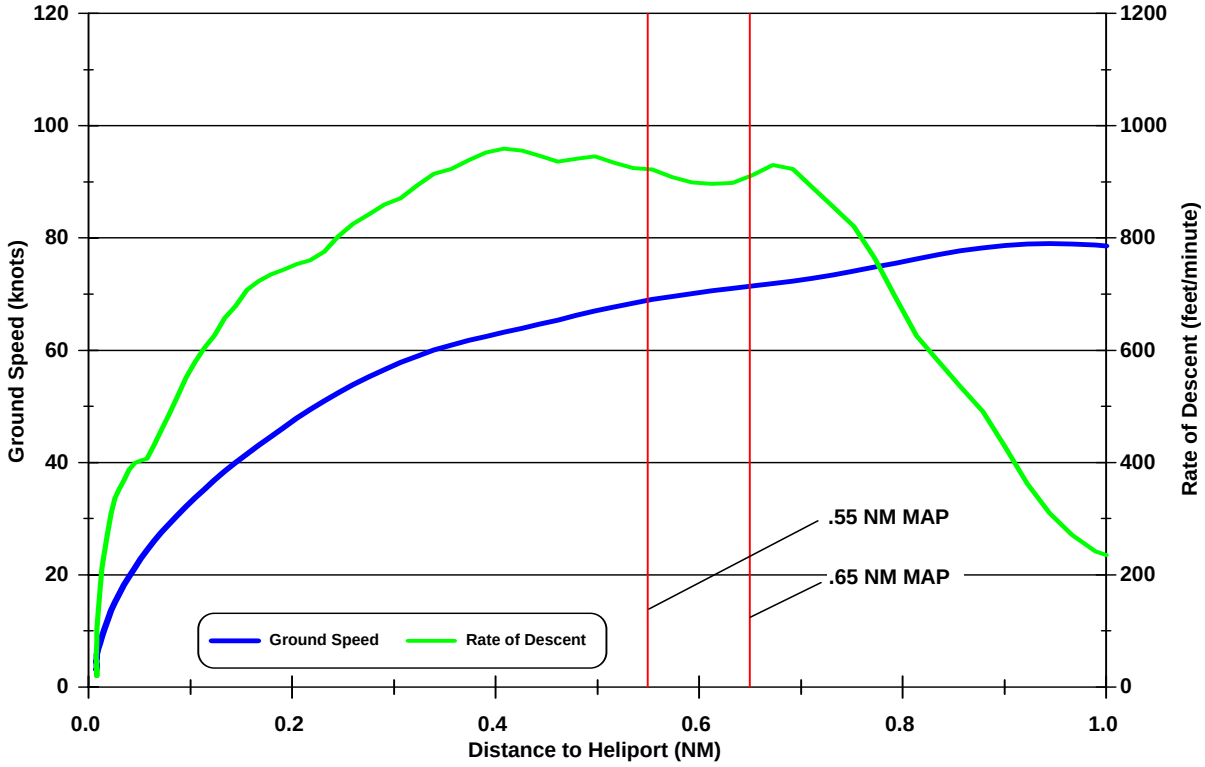



Approach - Plan View
Pilot P02 - 05/01/06a007 - App. #01X
145-Degree
Approach Course
310-Degree
Approach Course
012/15
058/22
8
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

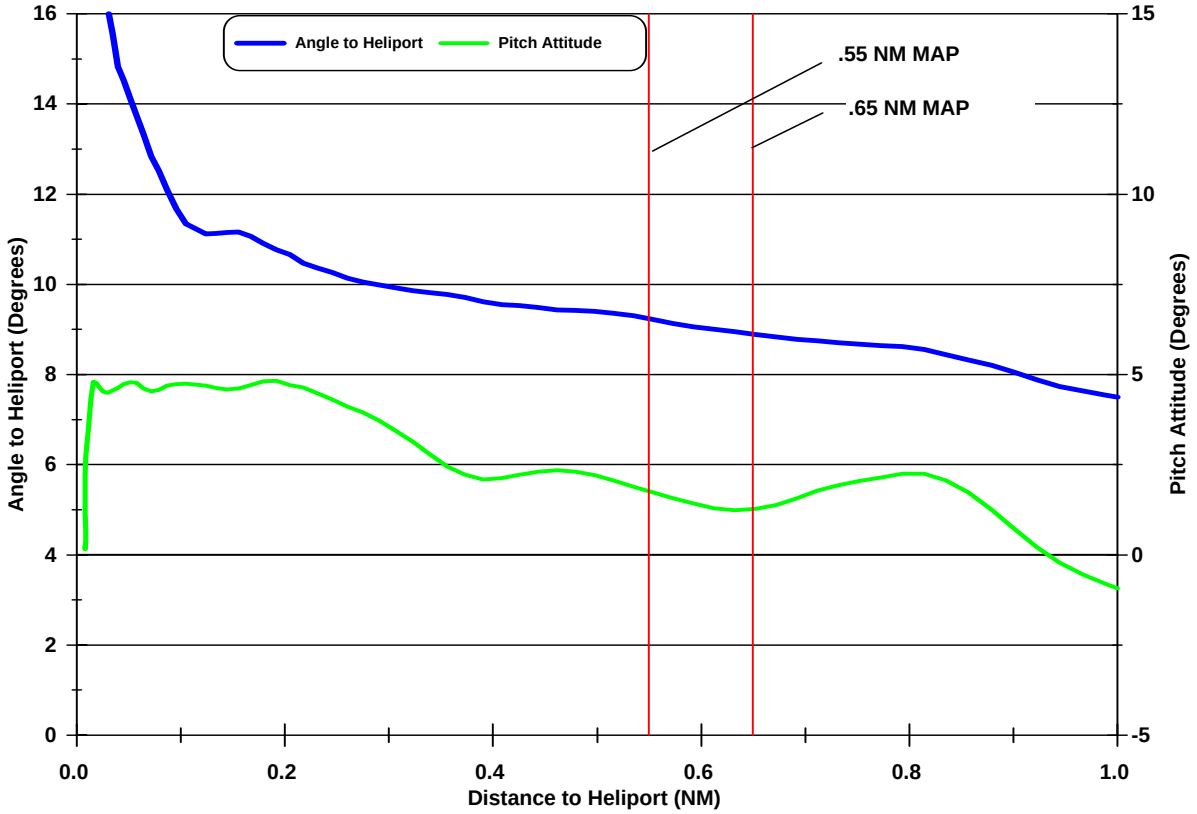
Profile View
Pilot P02 - 05/01/06a007 - App. #01X



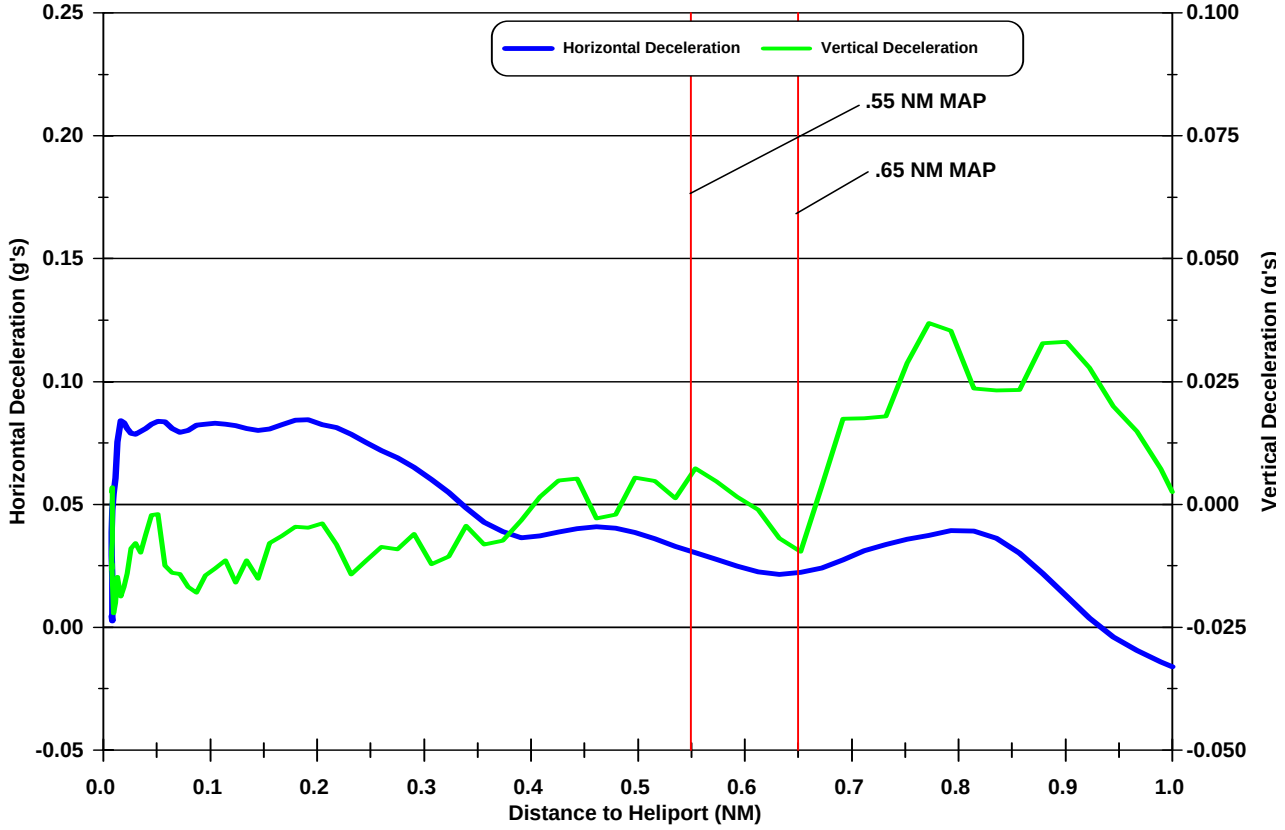
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06a007 - App. #01X

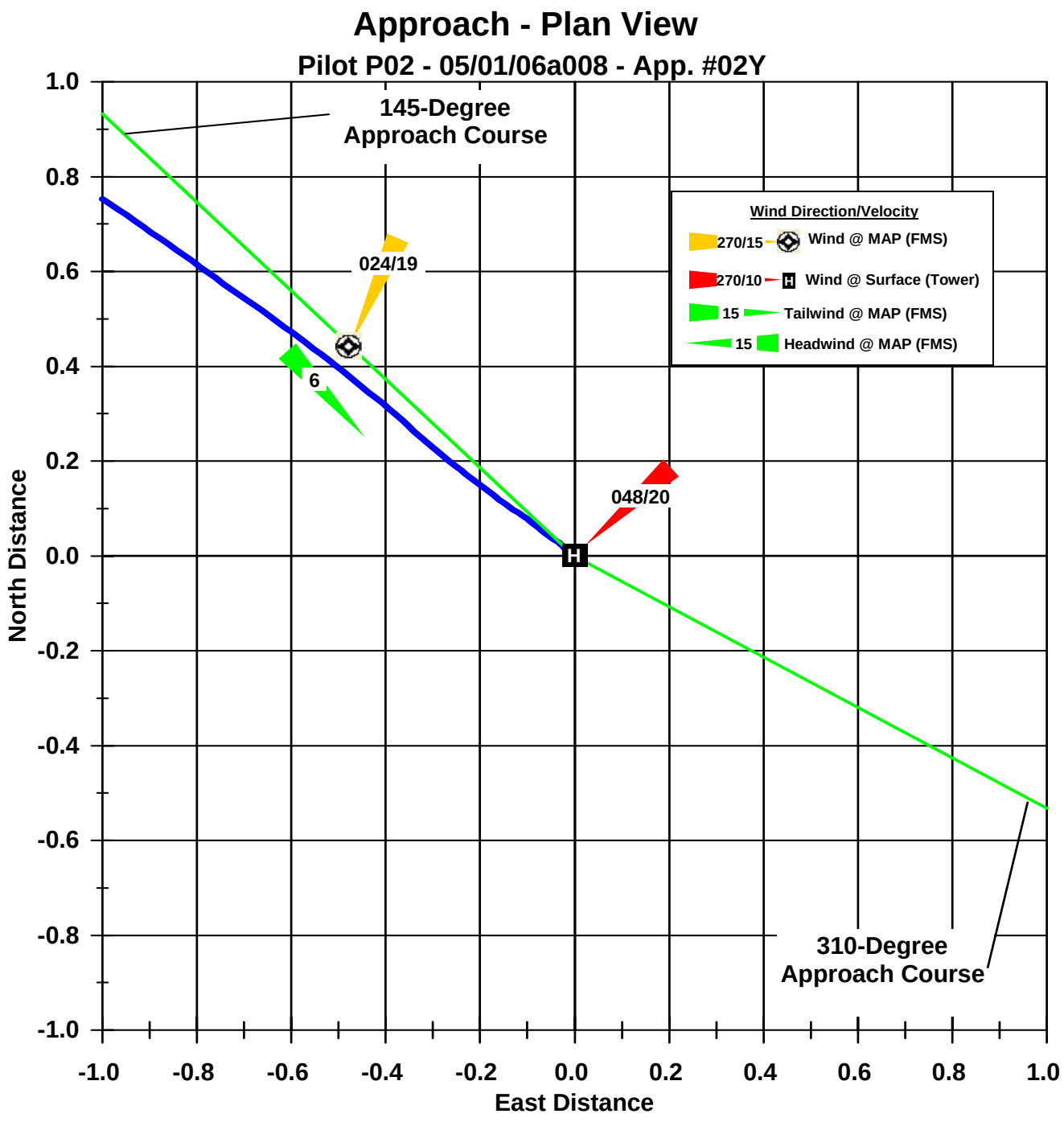


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06a007 - App. #01X

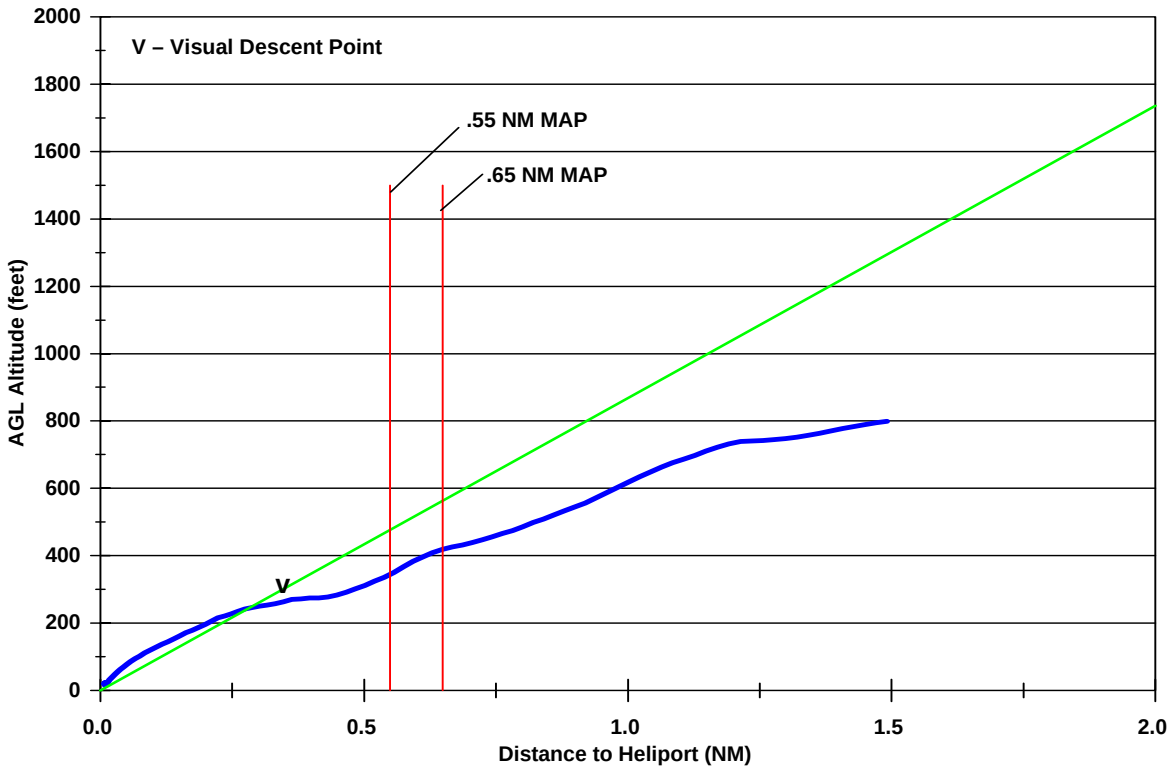


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06a007 - App. #01X

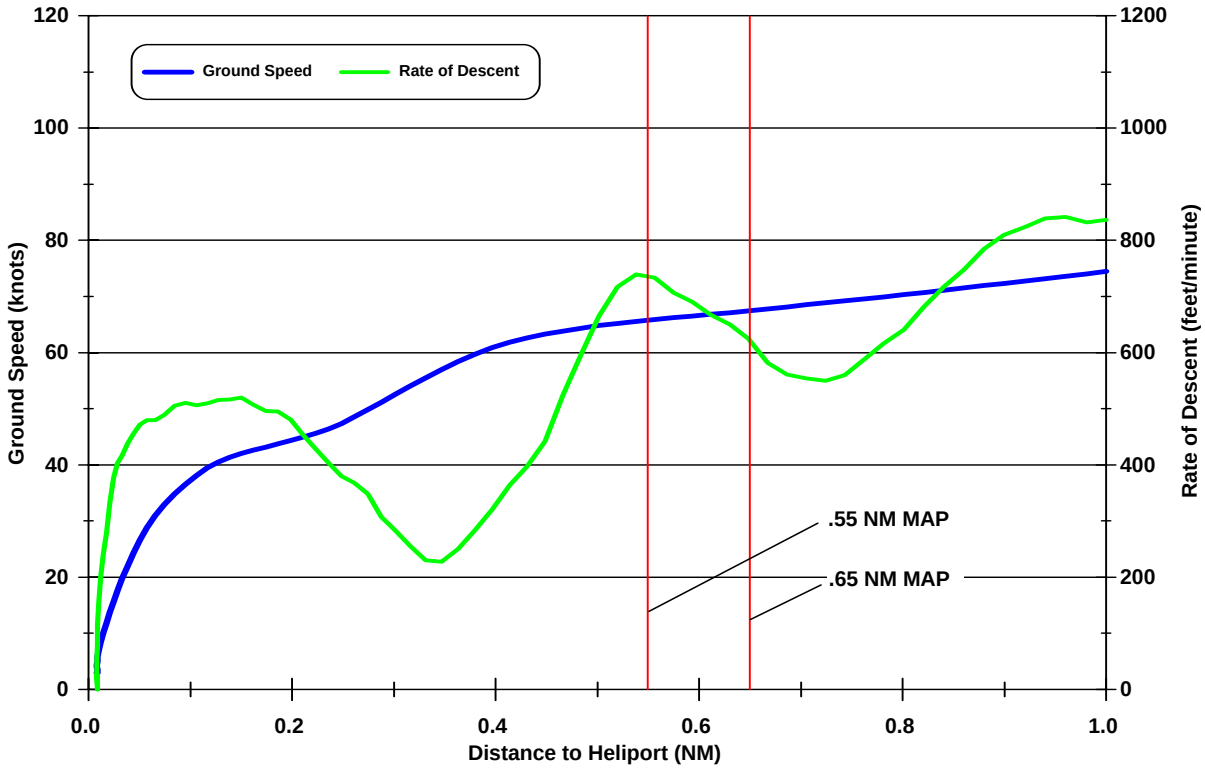



Approach - Plan View
Pilot P02 - 05/01/06a008 - App. #02Y
145-Degree
Approach Course
310-Degree
Approach Course
024/19
6
048/20
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

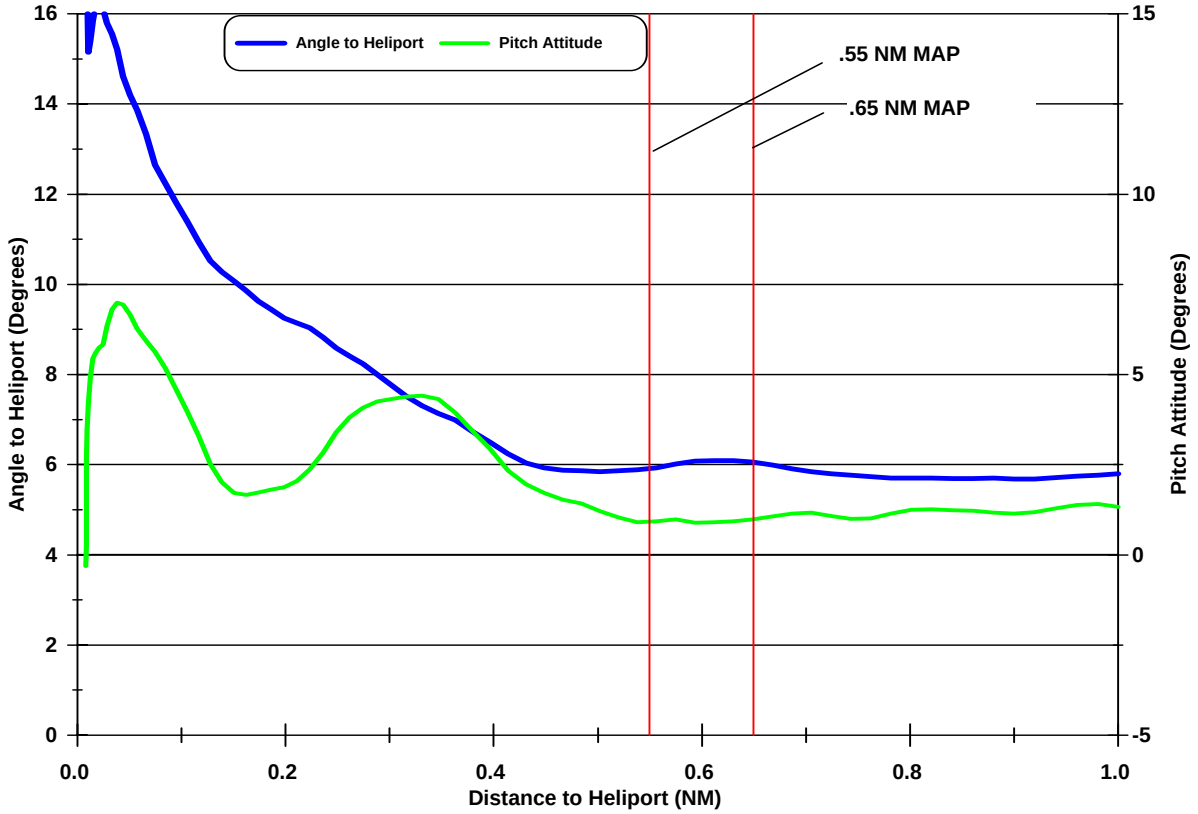
Profile View
Pilot P02 - 05/01/06a008 - App. #02Y



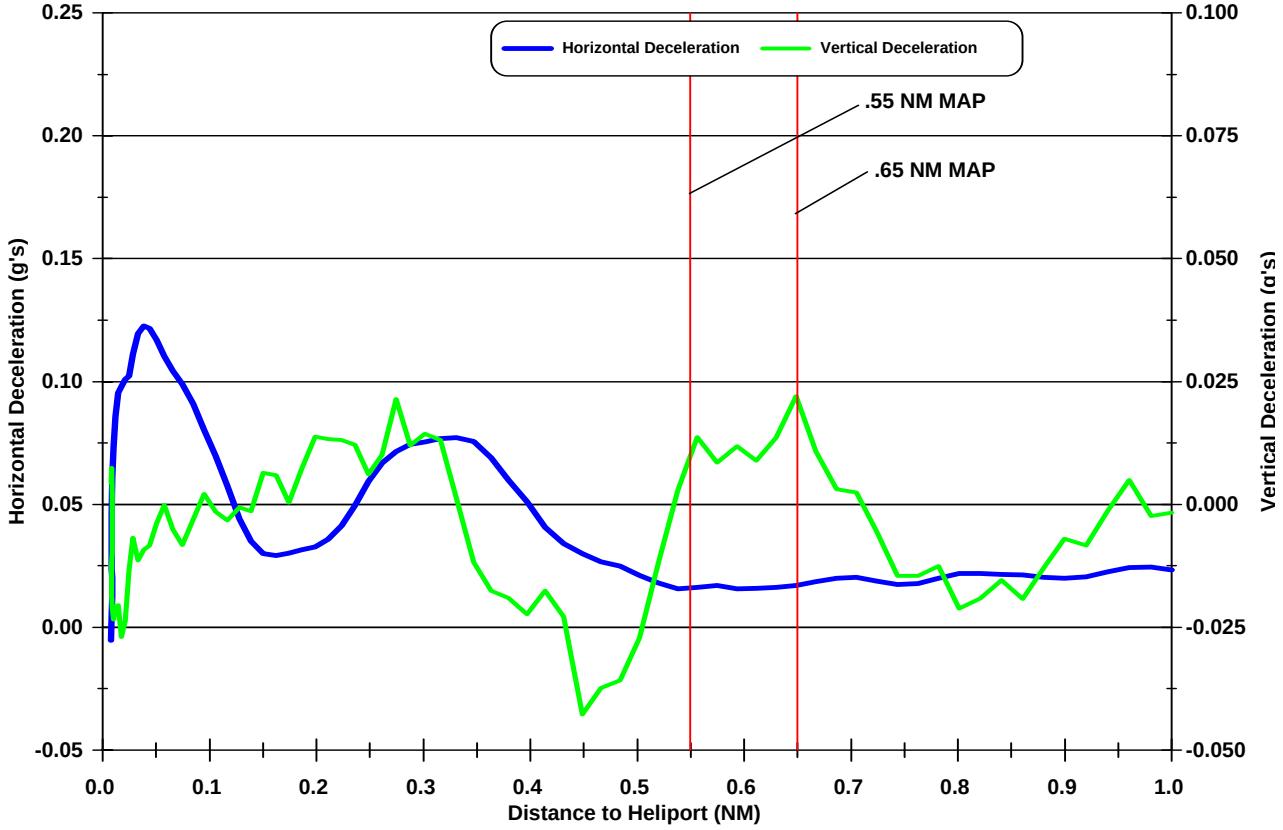
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06a008 - App. #02Y

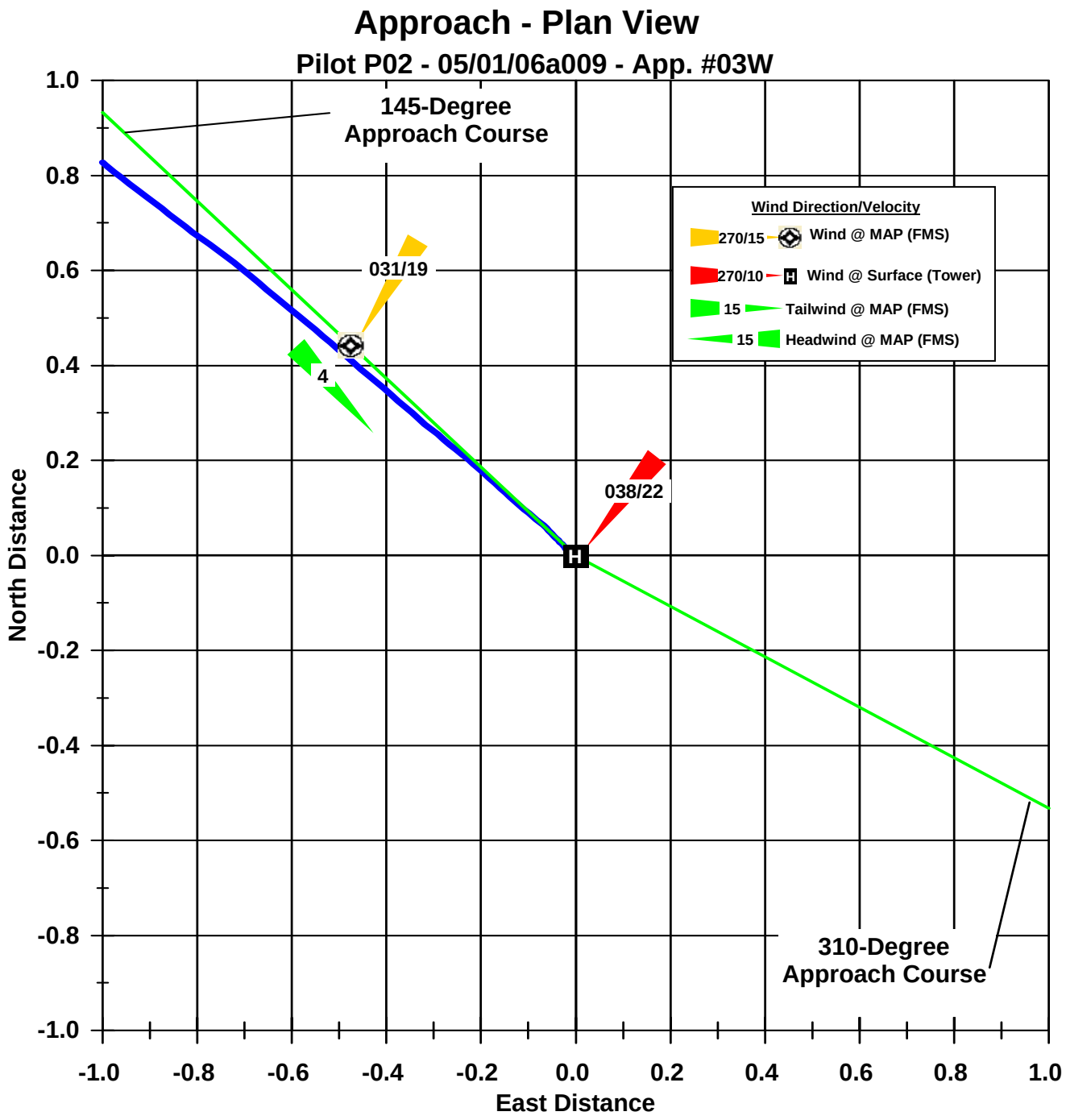


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06a008 - App. #02Y

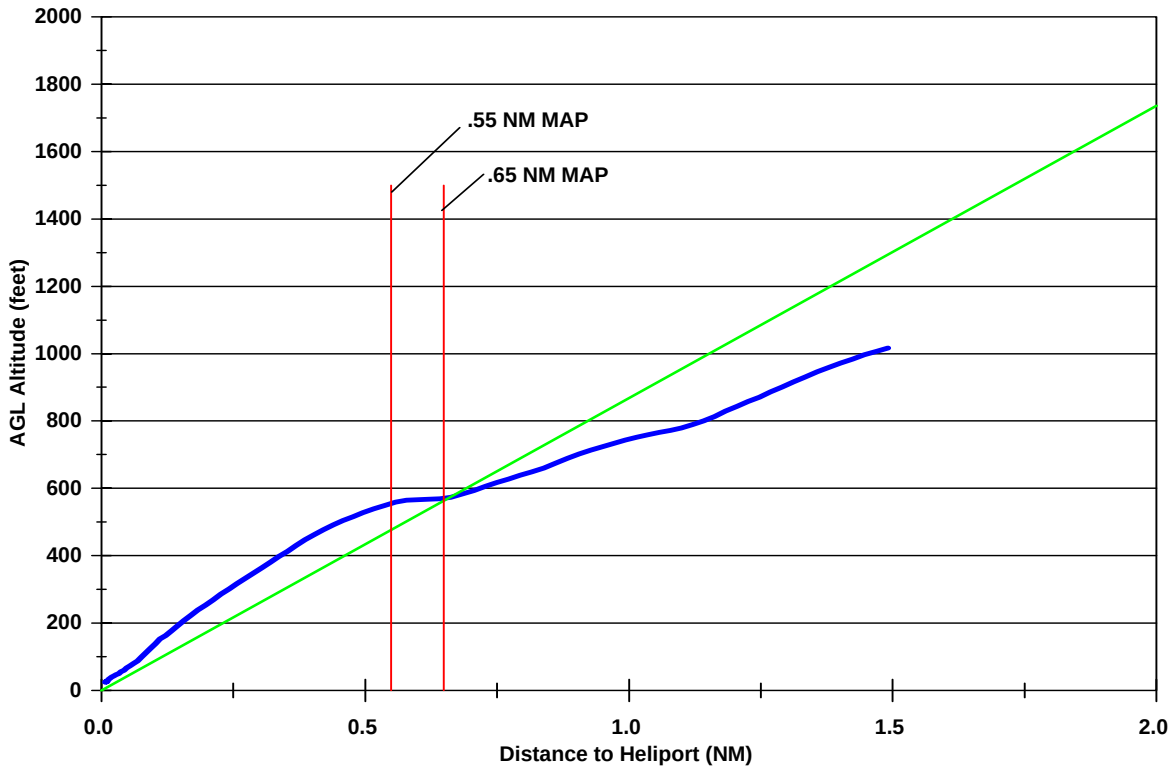


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06a008 - App. #02Y

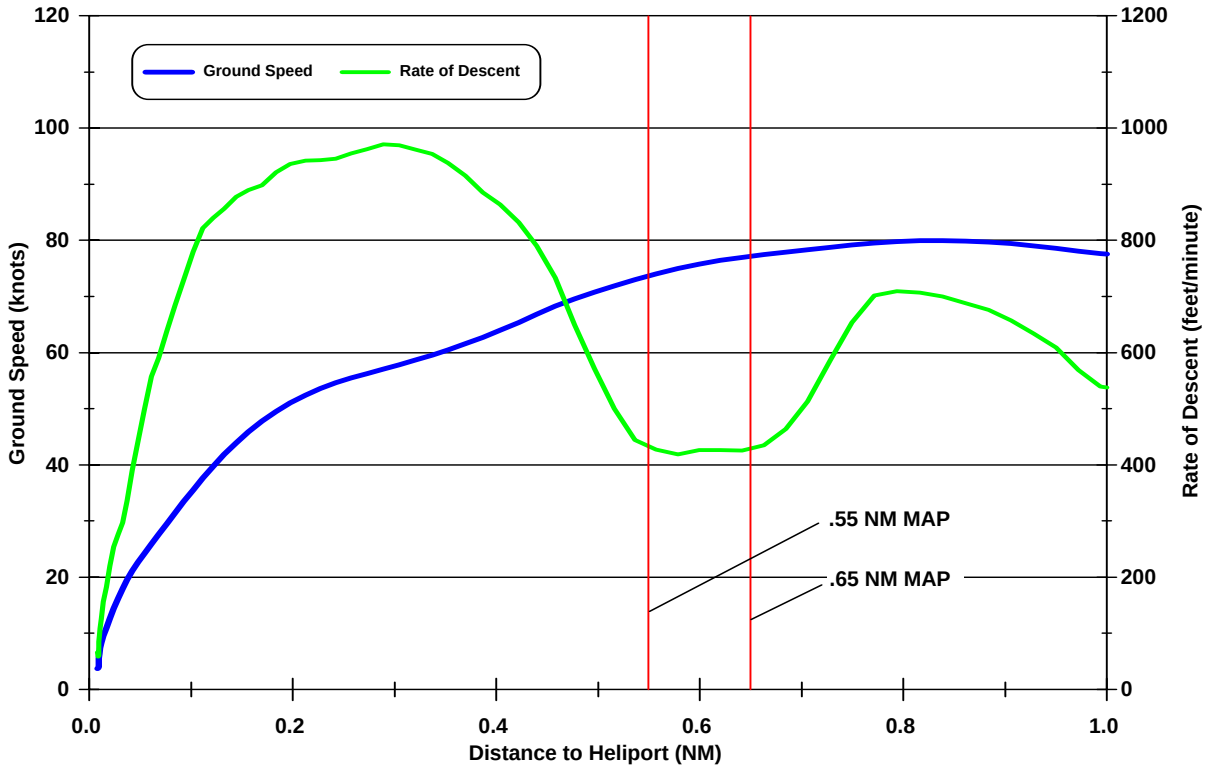



Approach - Plan View
Pilot P02 - 05/01/06a009 - App. #03W
145-Degree
Approach Course
310-Degree
Approach Course
031/19
4
038/22
H
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

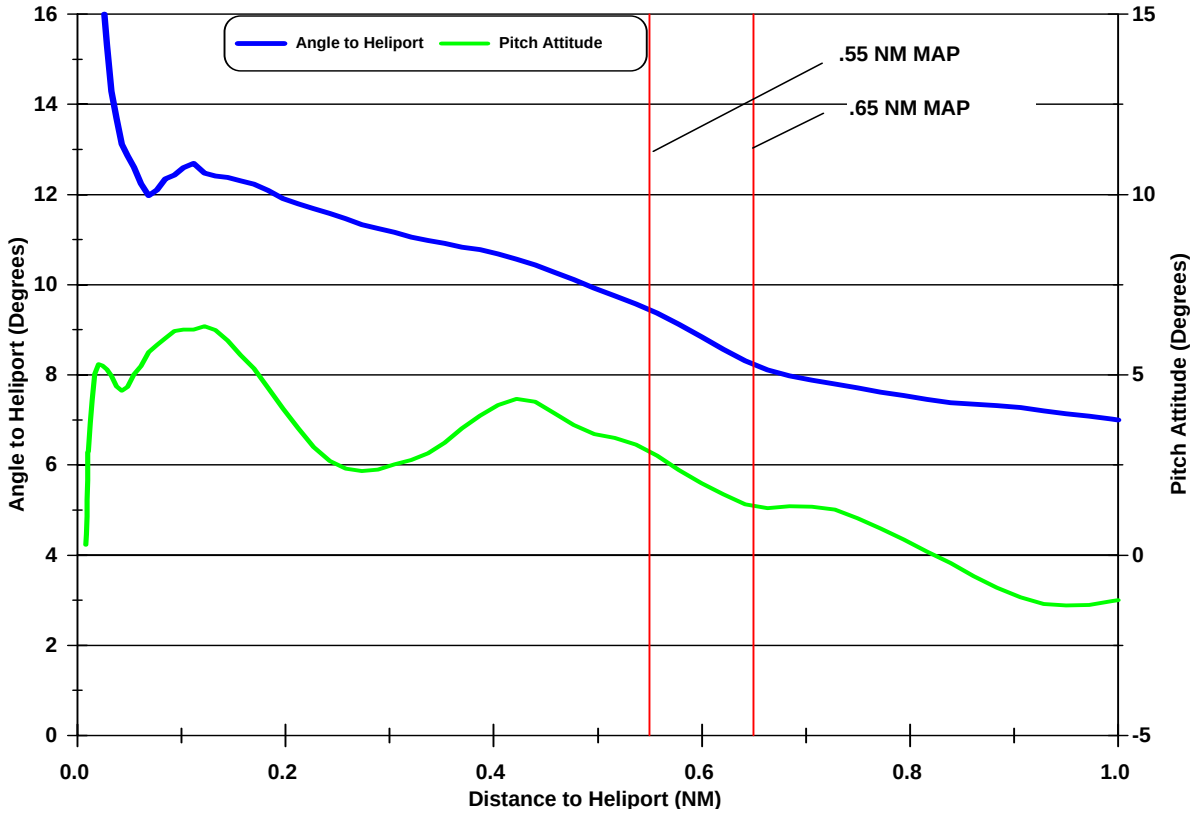
Profile View
Pilot P02 - 05/01/06a009 - App. #03W



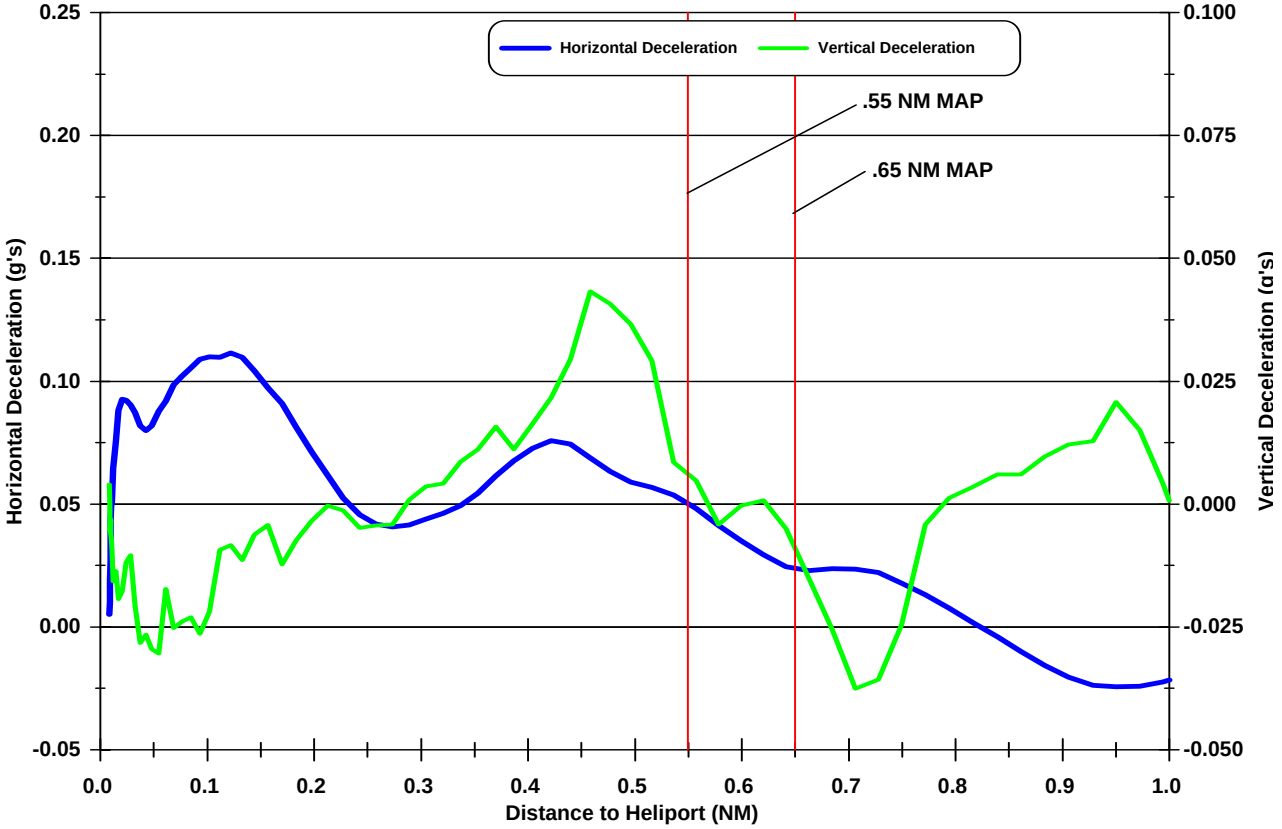
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06a009 - App. #03W

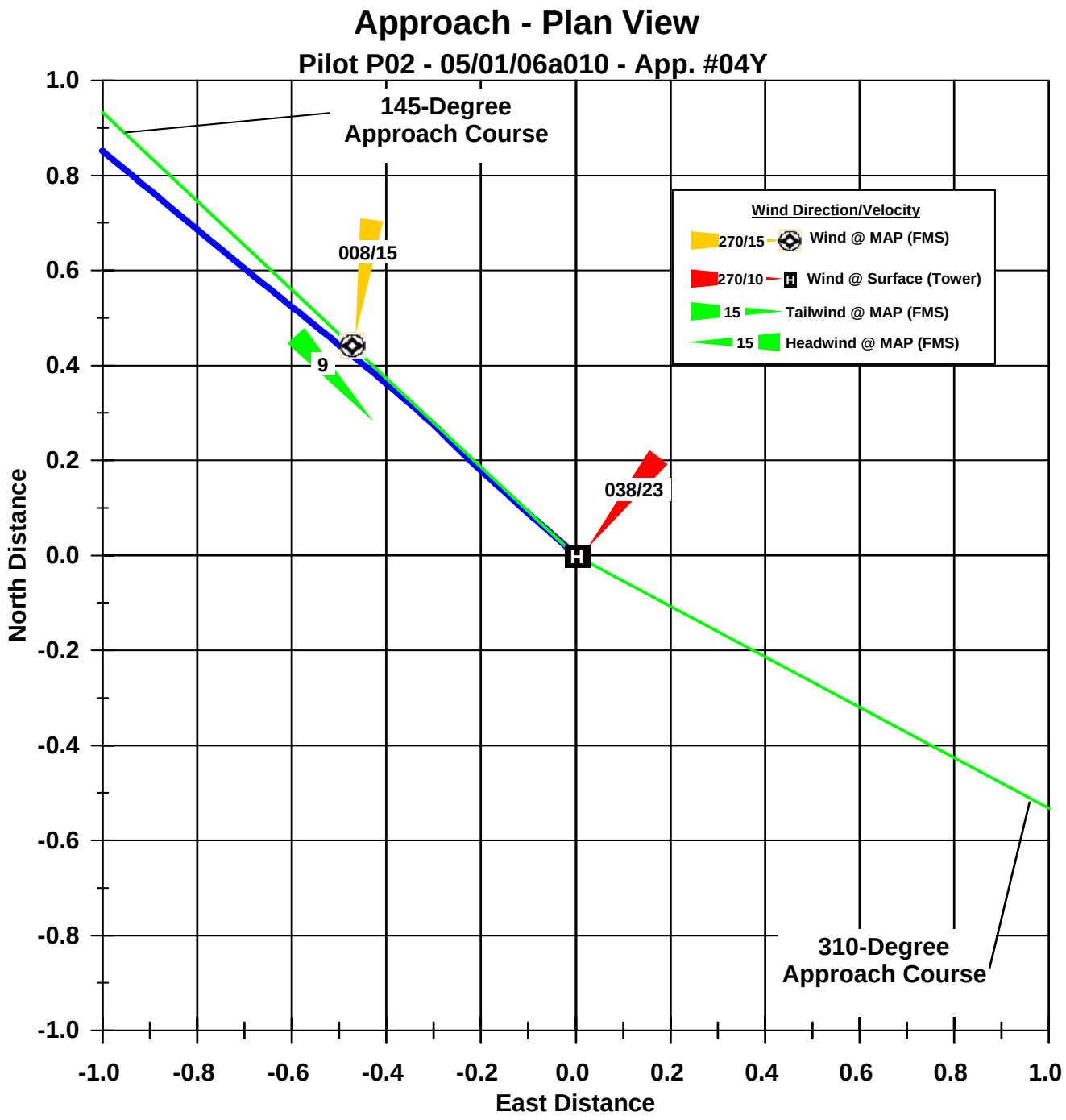


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06a009 - App. #03W

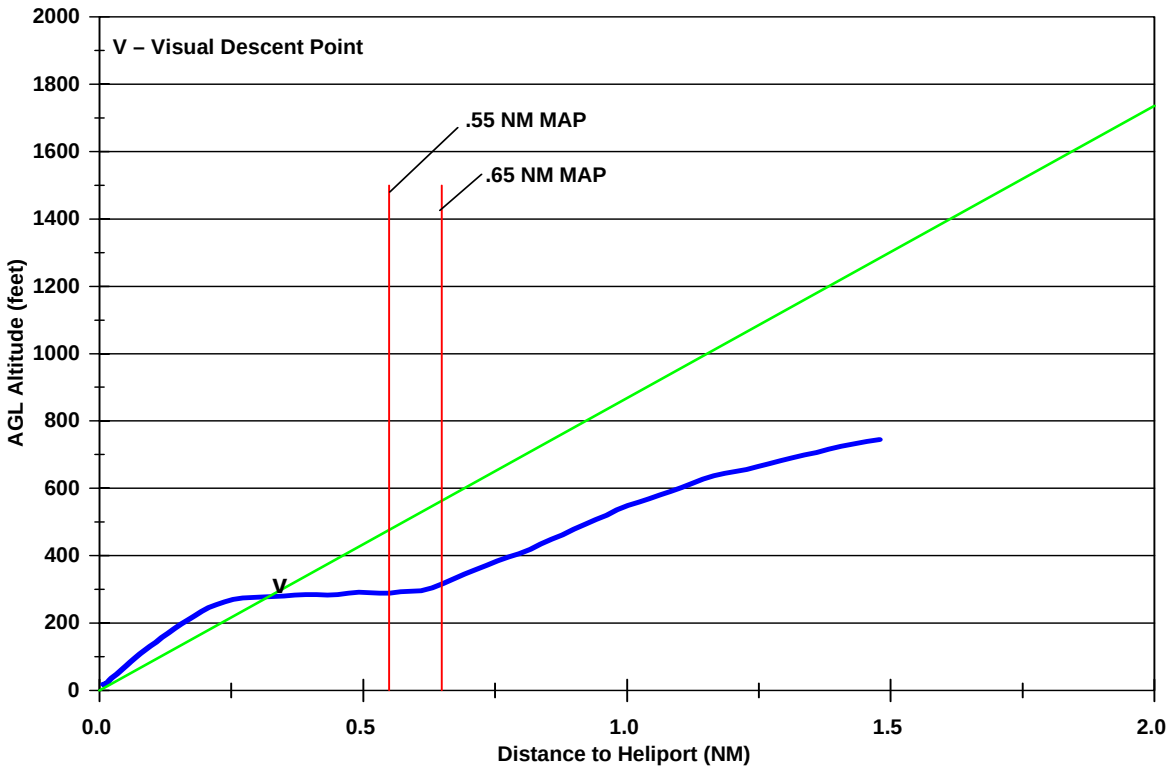


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06a009 - App. #03W

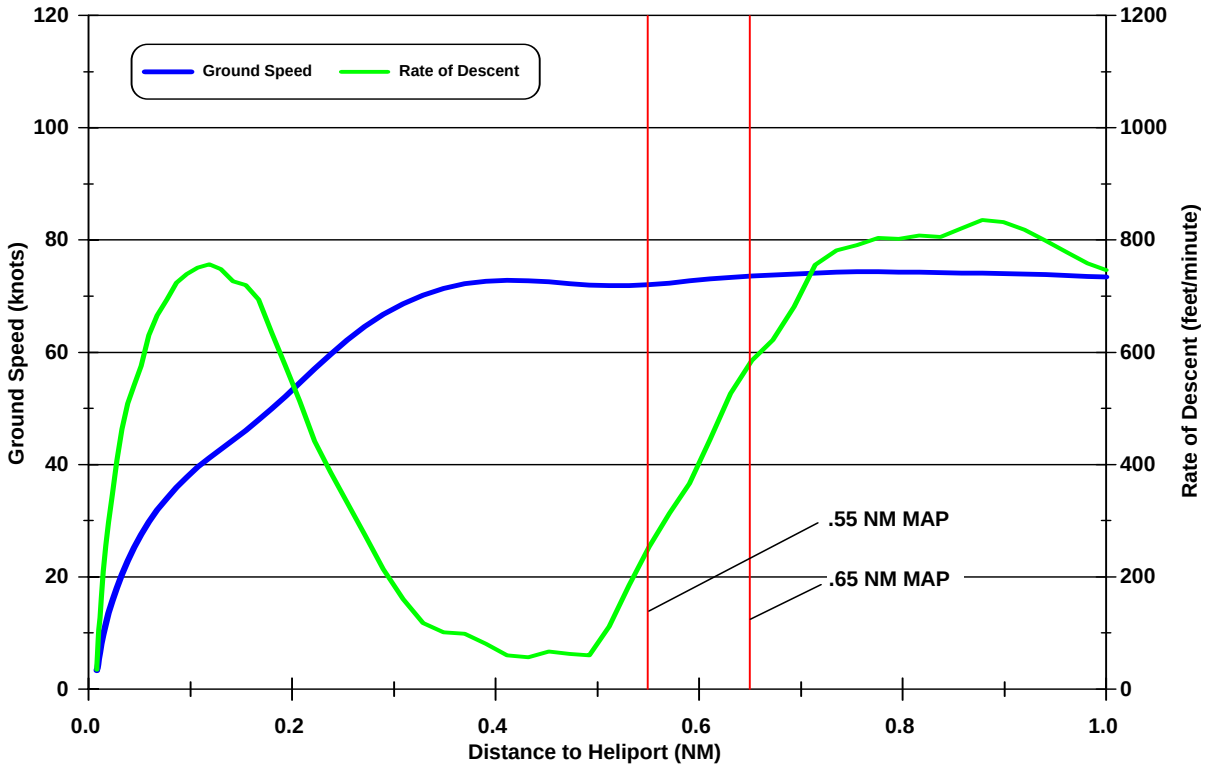



Approach - Plan View
Pilot P02 - 05/01/06a010 - App. #04Y
145-Degree
Approach Course
310-Degree
Approach Course
008/15
9
038/23
H
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

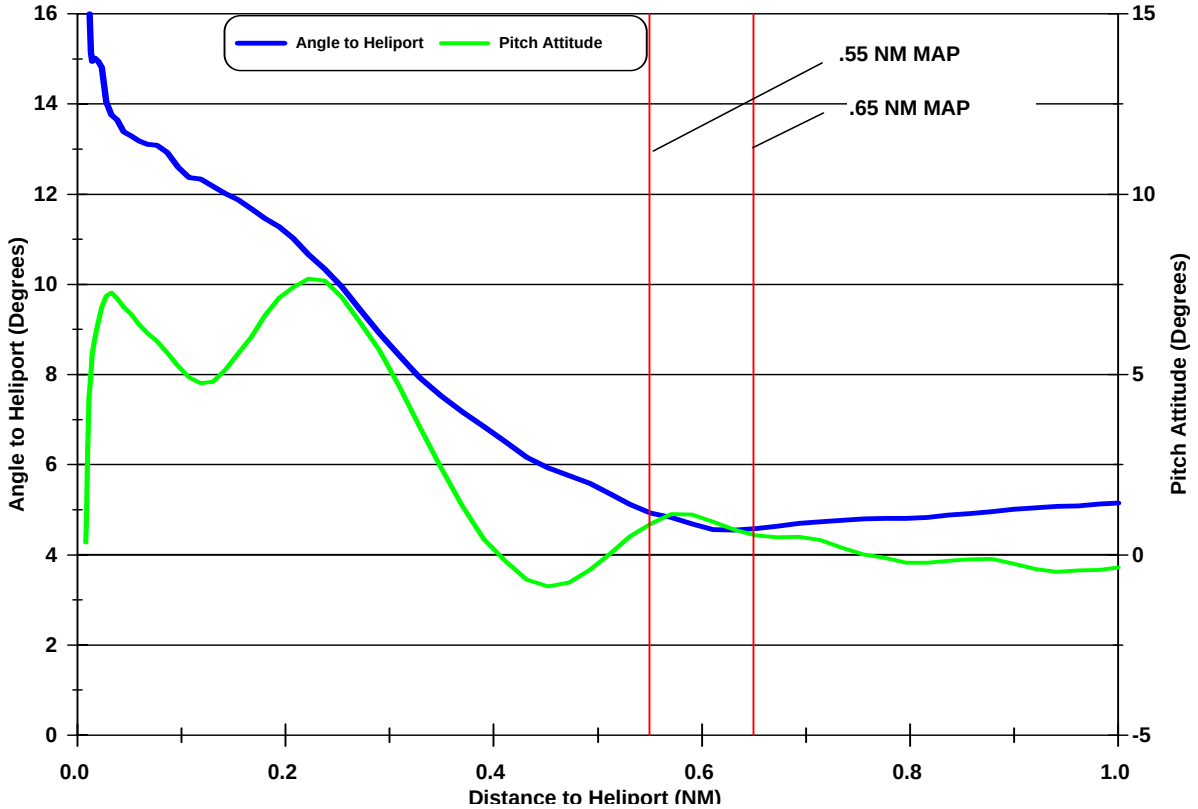
Profile View
Pilot P02 - 05/01/06a010 - App. #04Y



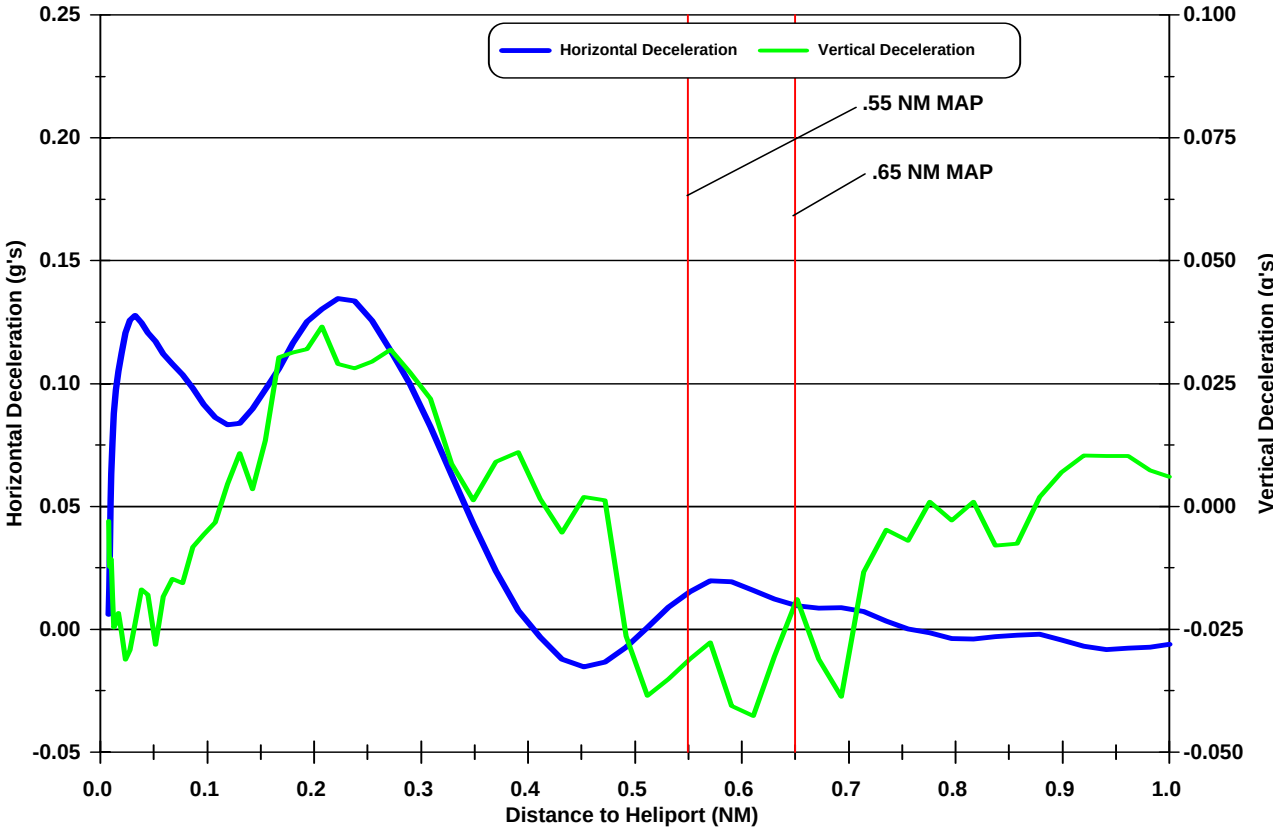
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06a010 - App. #04Y

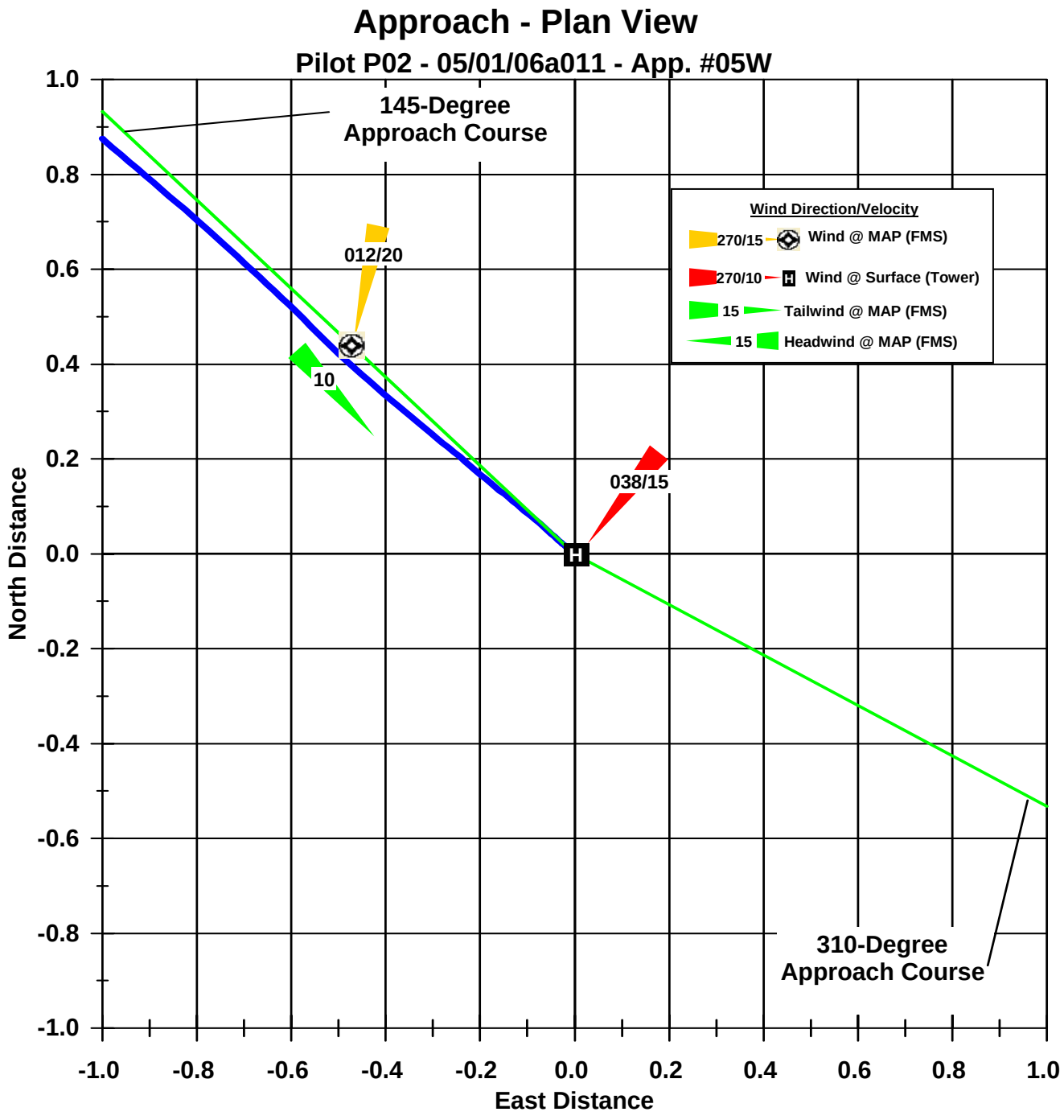


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06a010 - App. #04Y

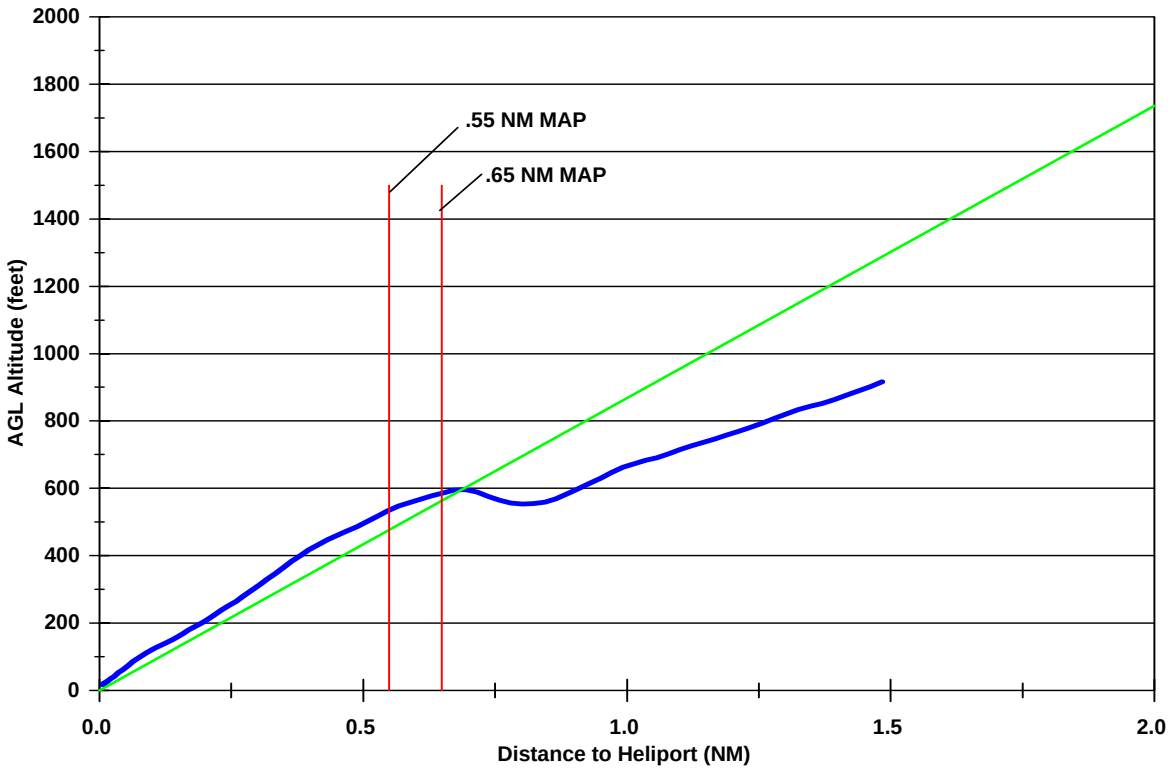


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06a010 - App. #04Y

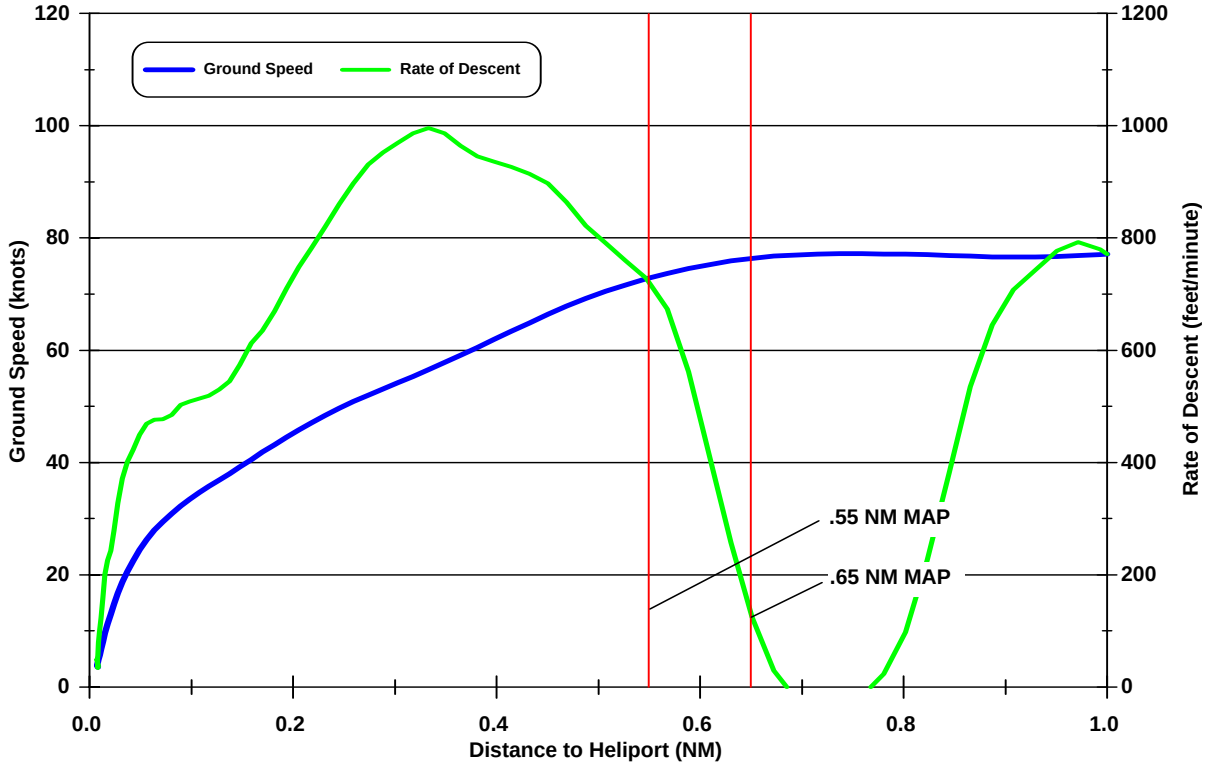



Approach - Plan View
Pilot P02 - 05/01/06a011 - App. #05W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
012/20
10
038/15
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

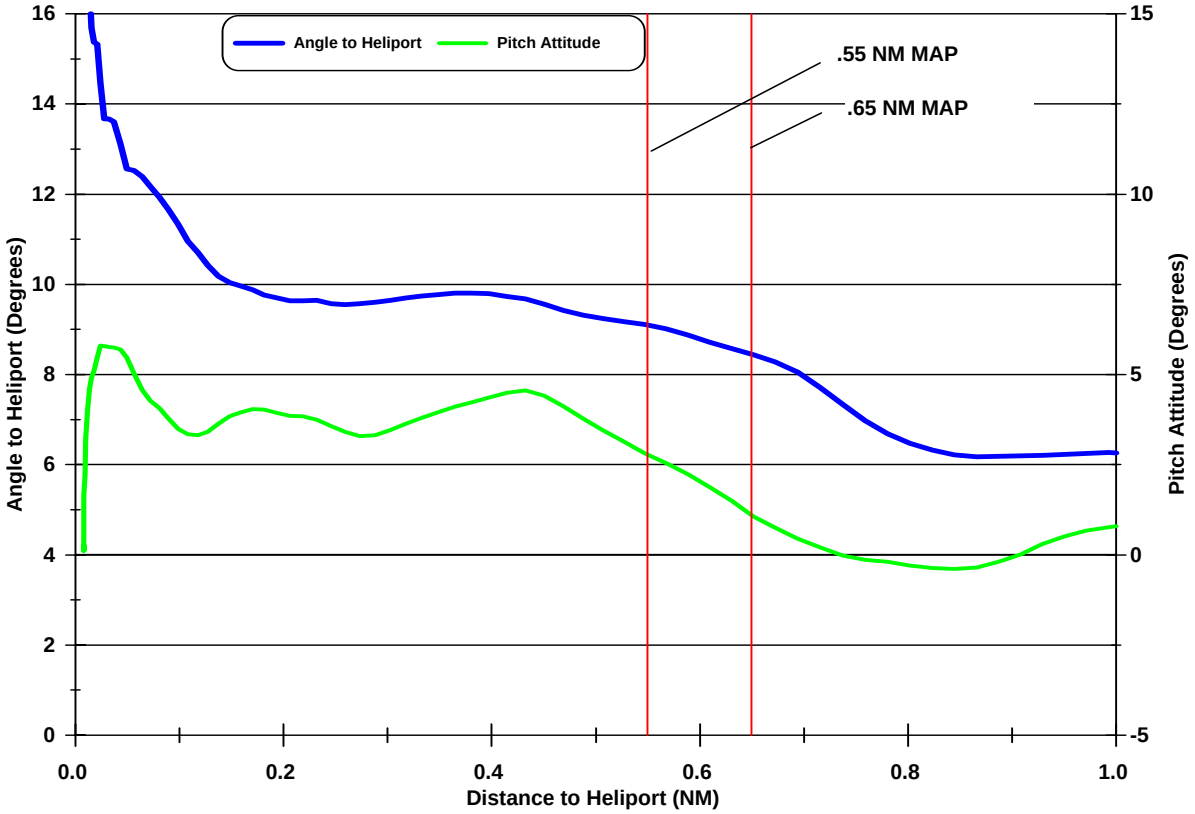
Profile View
Pilot P02 - 05/01/06a011 - App. #05W



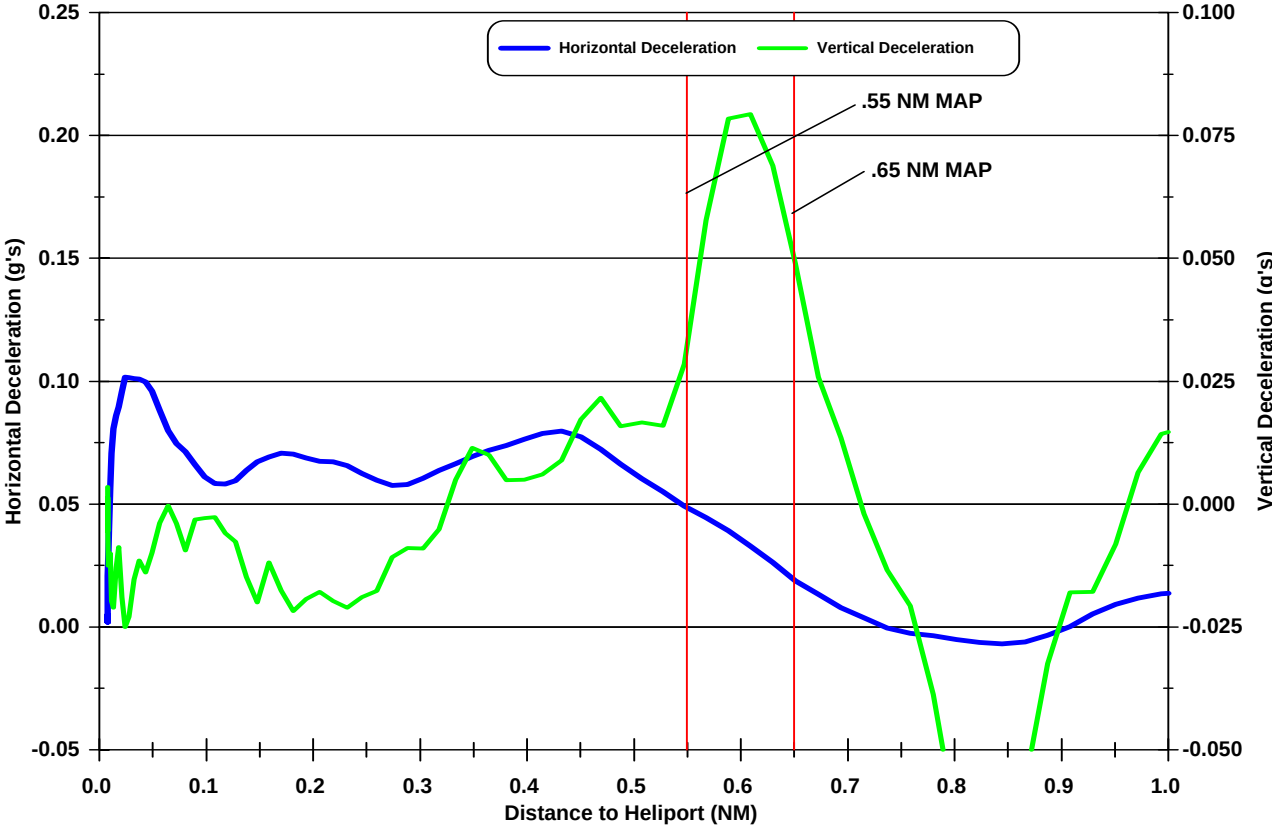
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06a011 - App. #05W

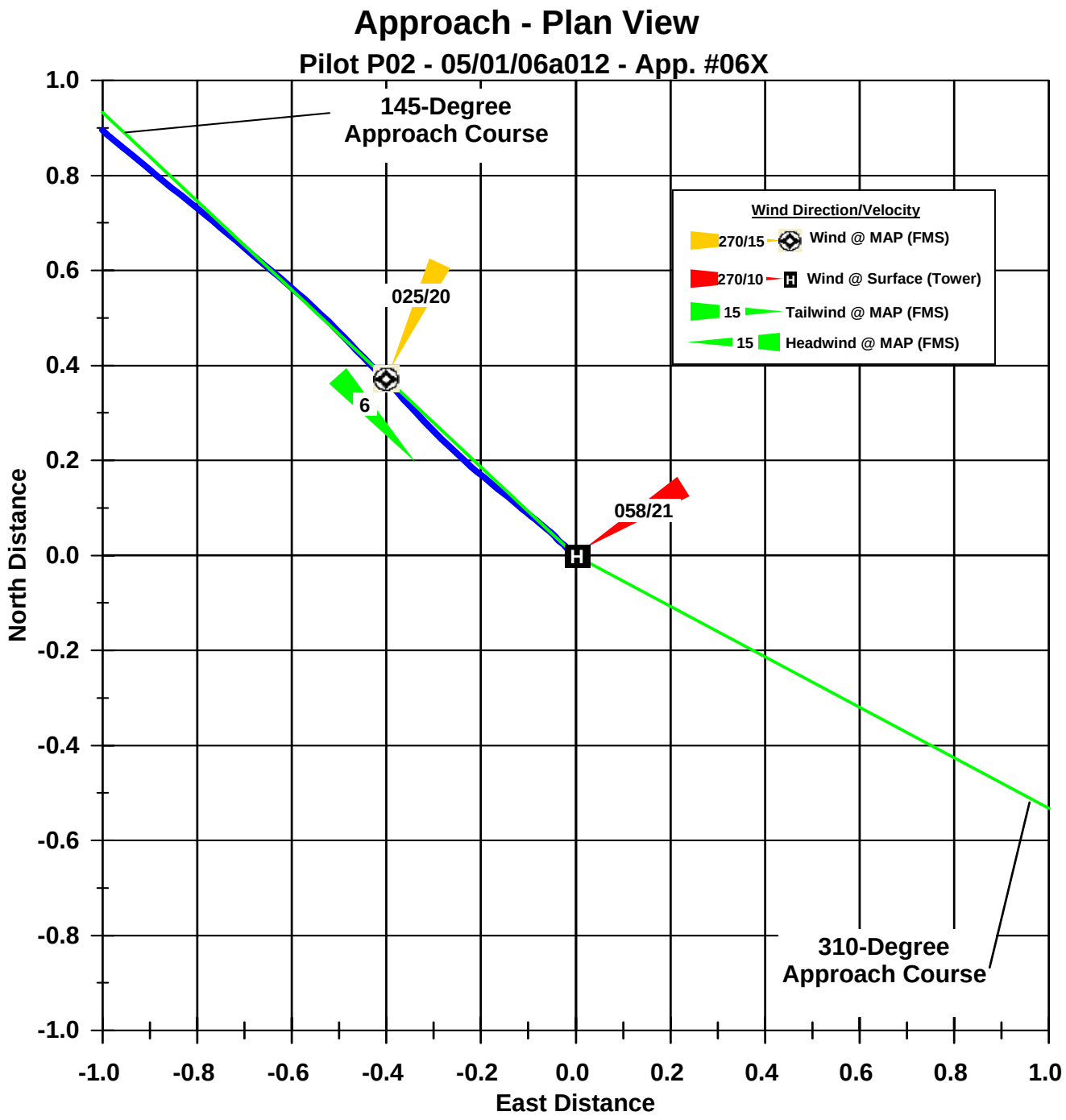


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06a011 - App. #05W

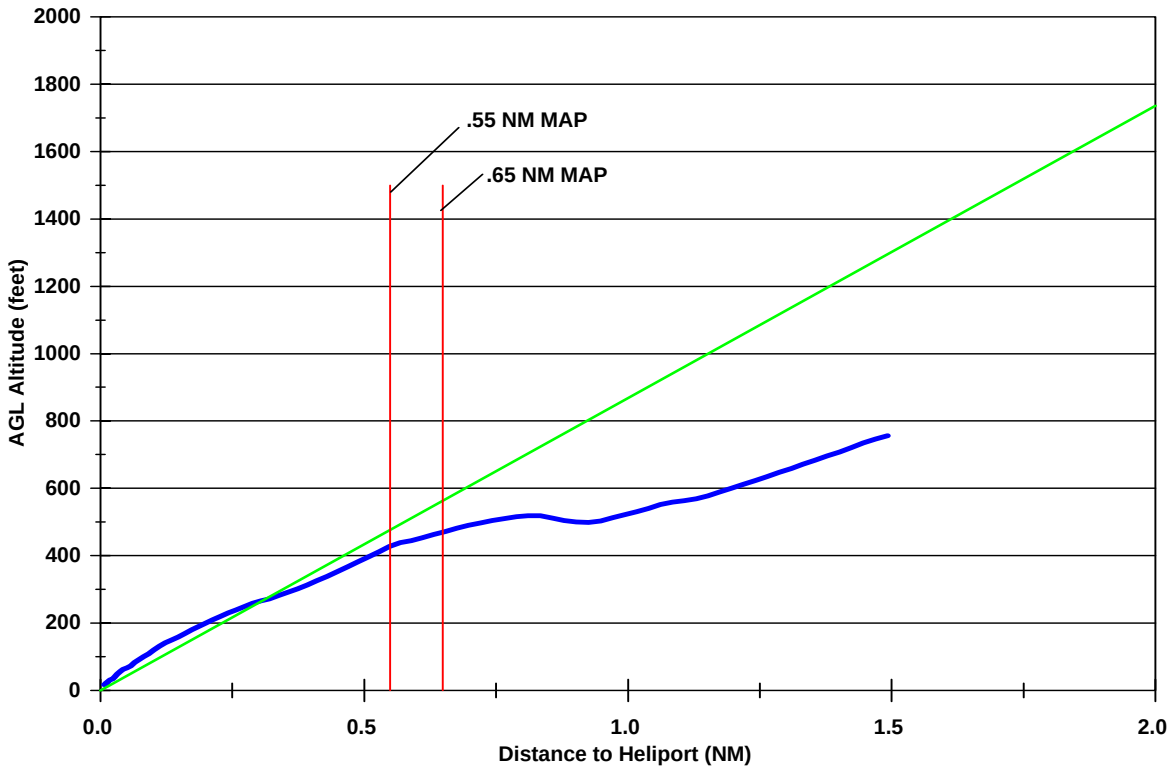


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06a011 - App. #05W

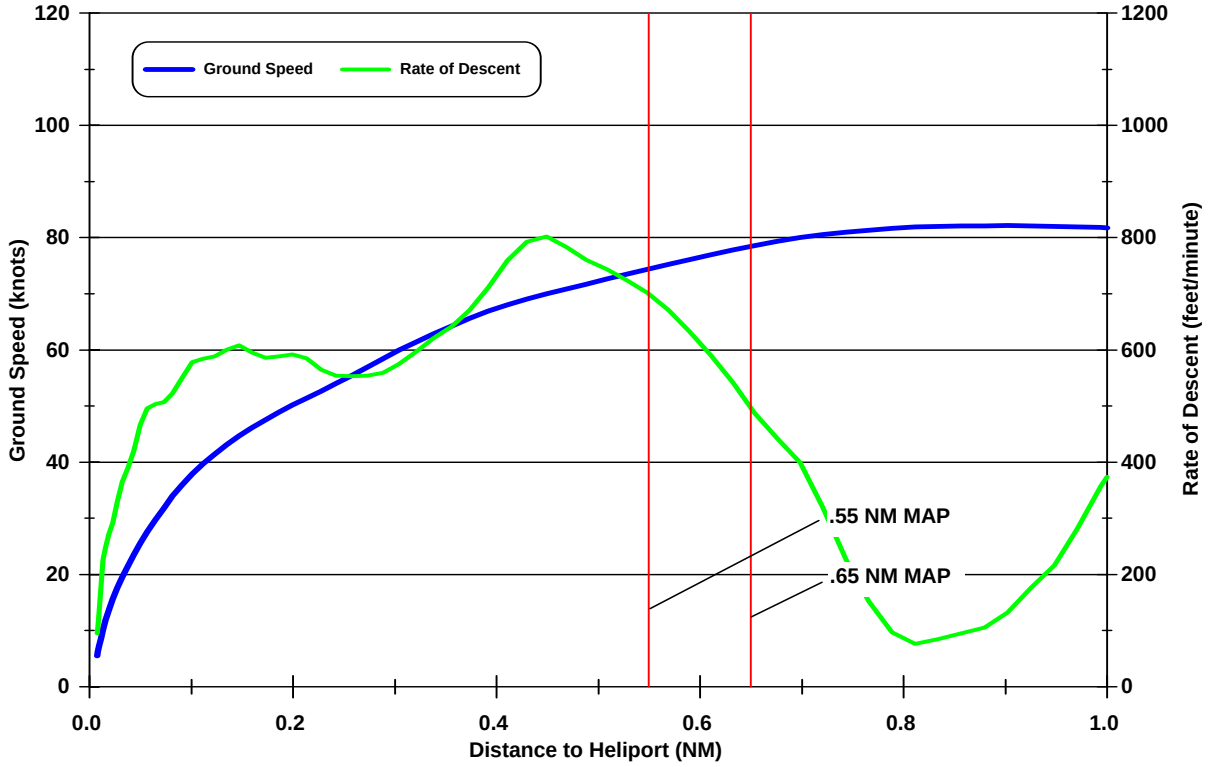



Approach - Plan View
Pilot P02 - 05/01/06a012 - App. #06X
145-Degree
Approach Course
310-Degree
Approach Course
025/20
6
058/21
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

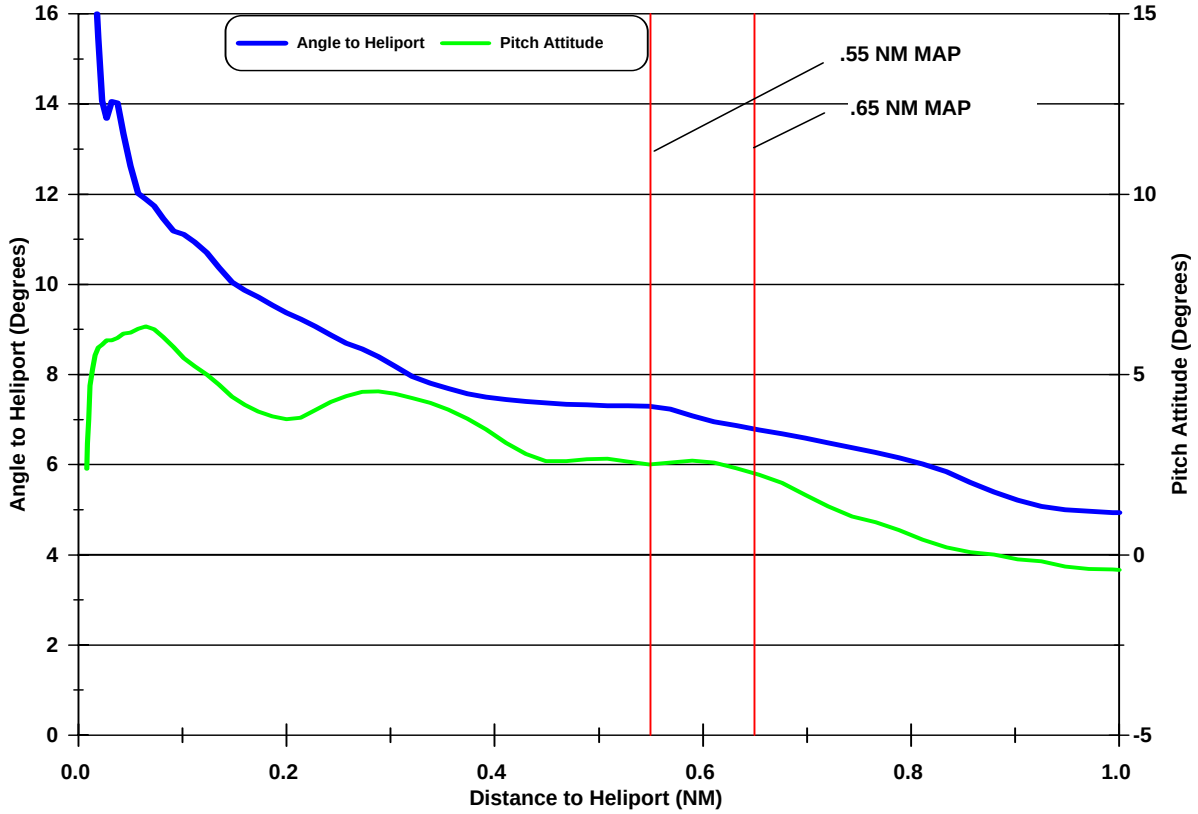
Profile View
Pilot P02 - 05/01/06a012 - App. #06X



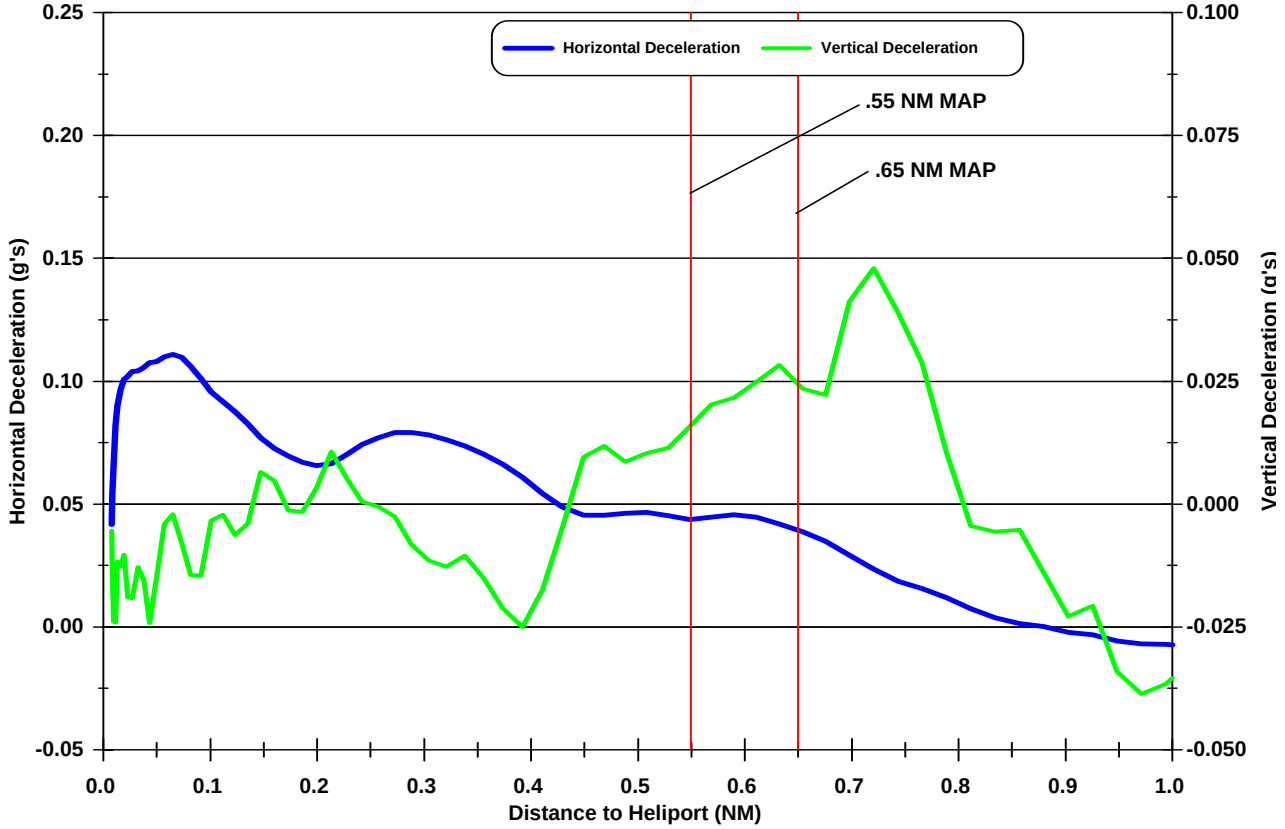
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06a012 - App. #06X

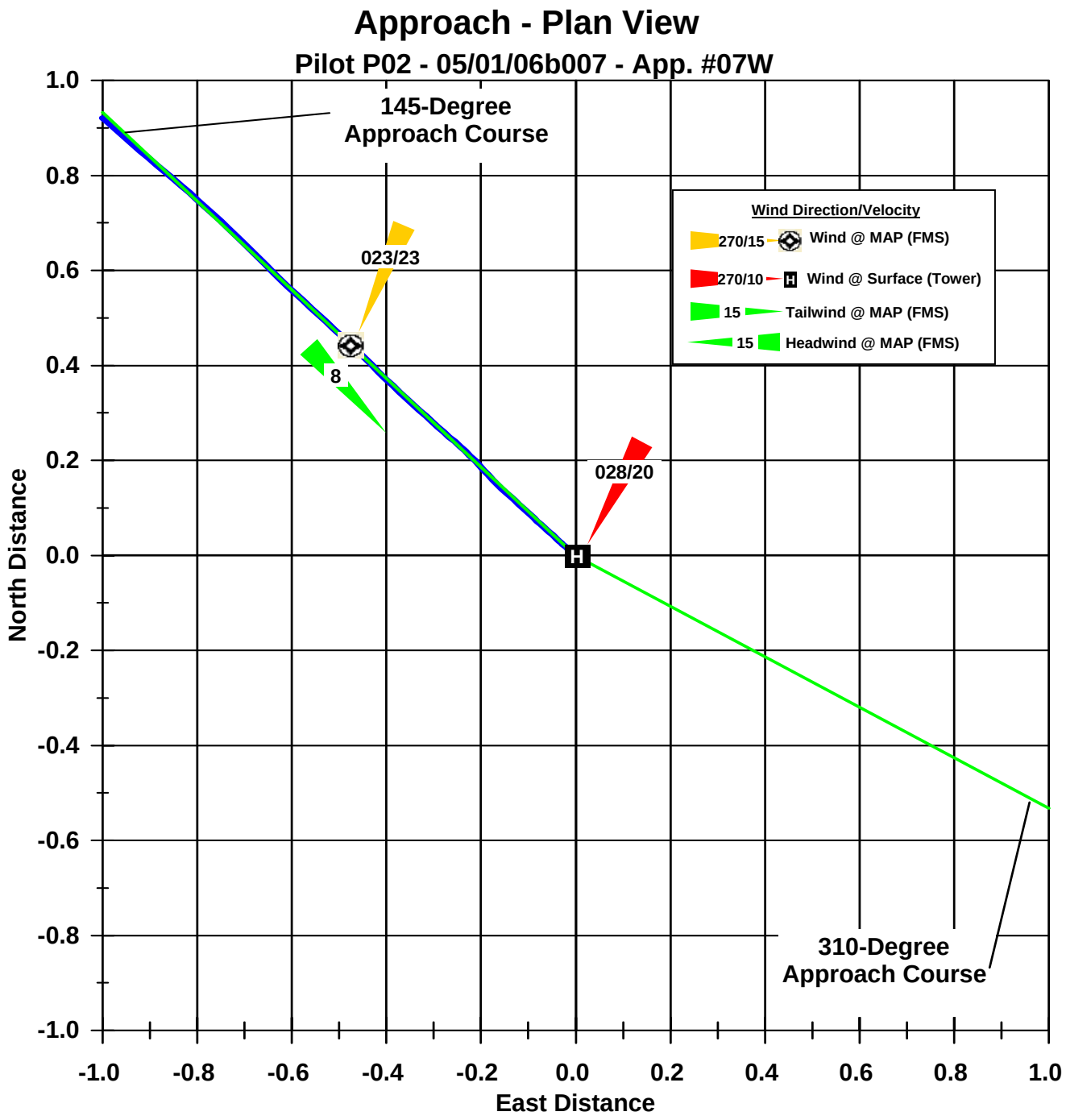


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06a012 - App. #06X

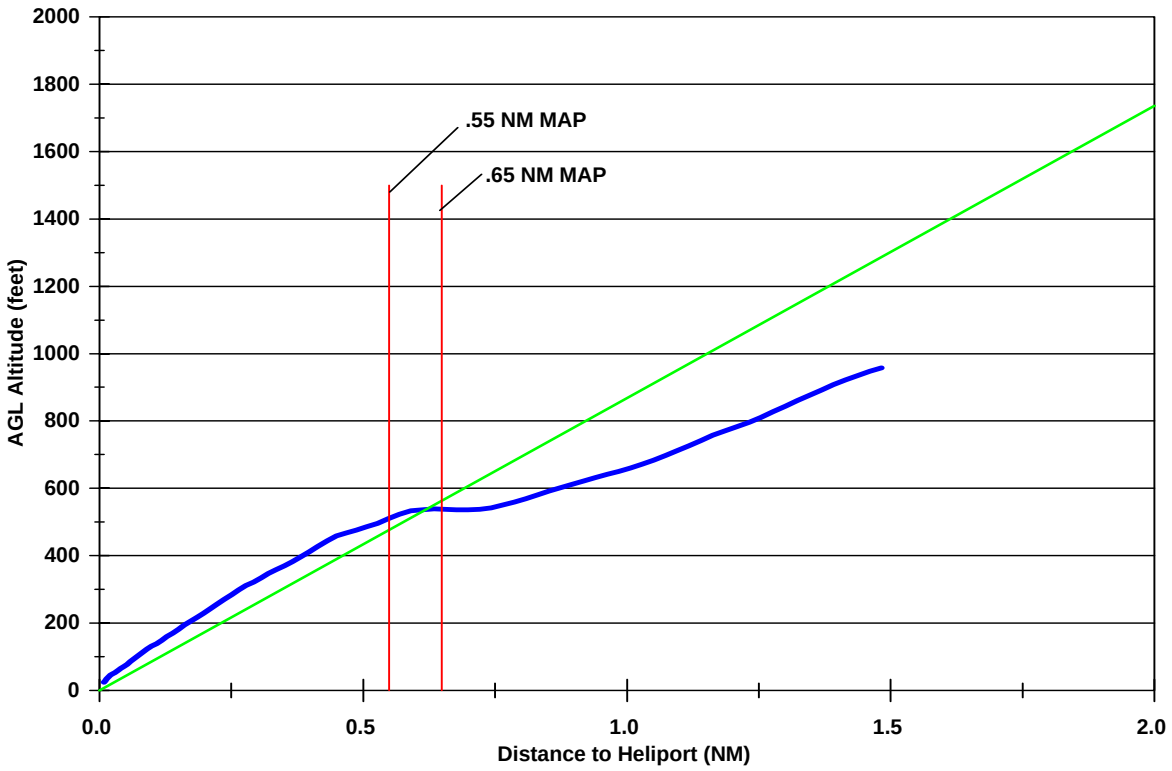


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06a012 - App. #06X

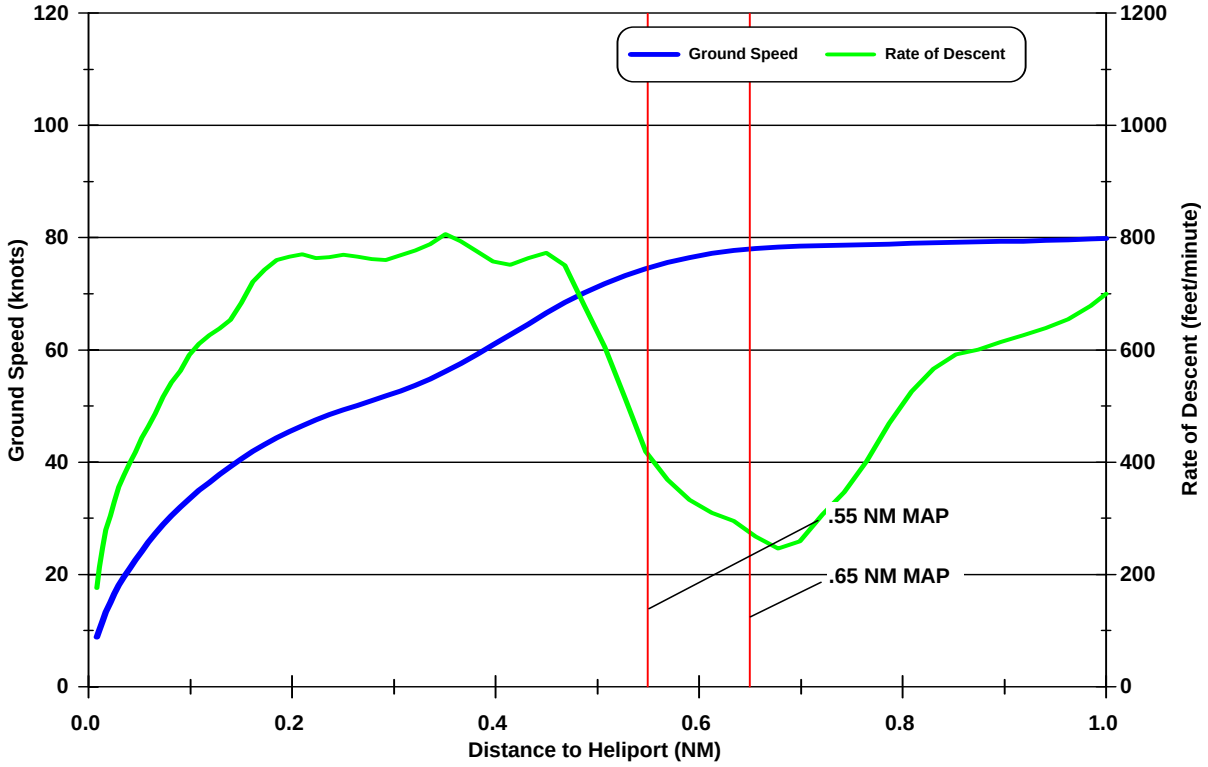



Approach - Plan View
Pilot P02 - 05/01/06b007 - App. #07W
145-Degree
Approach Course
310-Degree
Approach Course
023/23
8
028/20
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

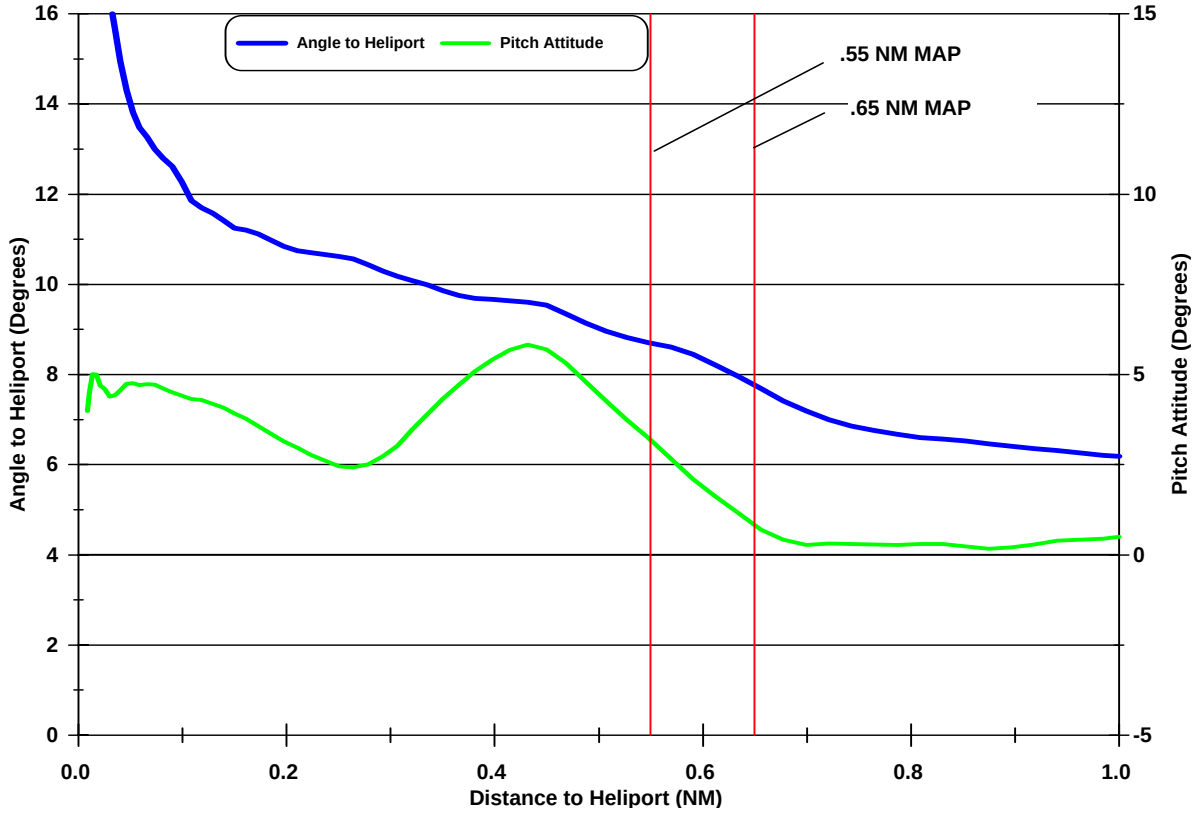
Profile View
Pilot P02 - 05/01/06b007 - App. #07W



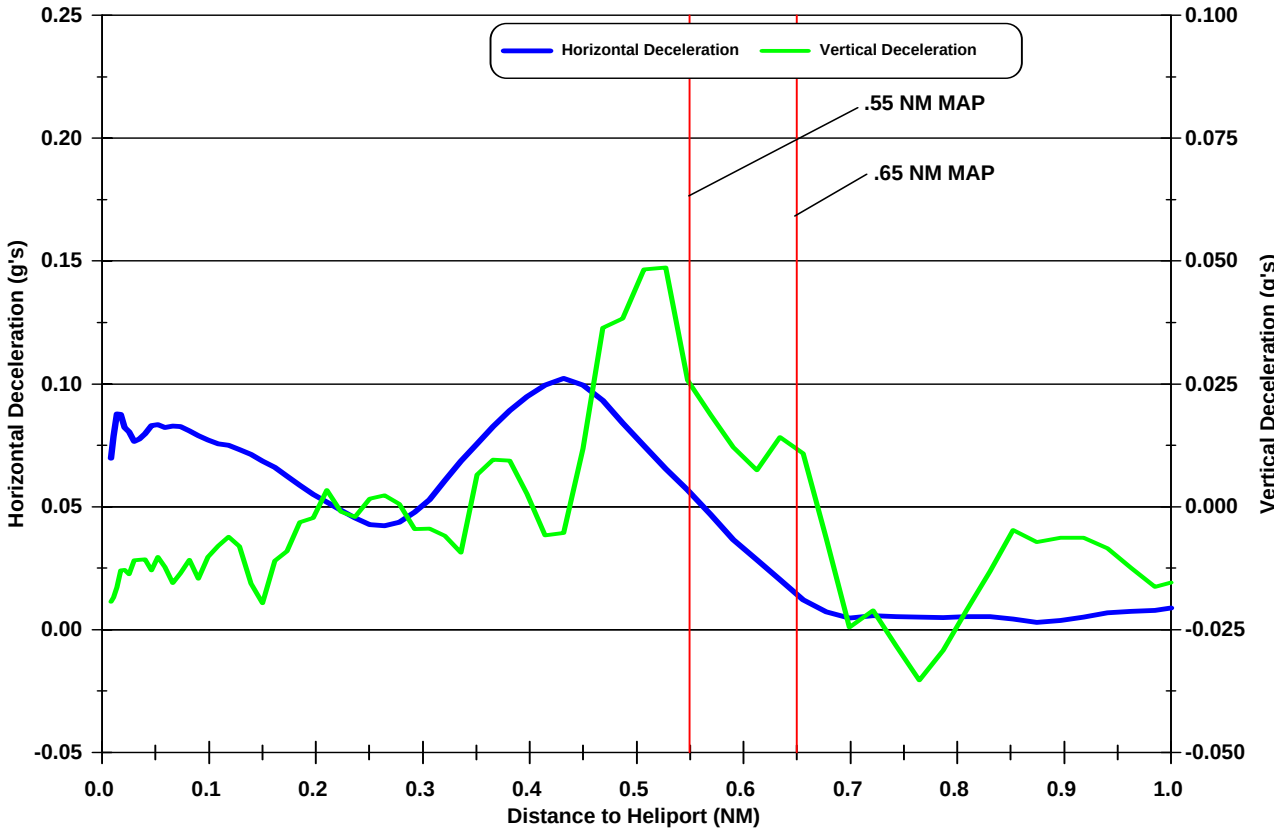
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06b007 - App. #07W

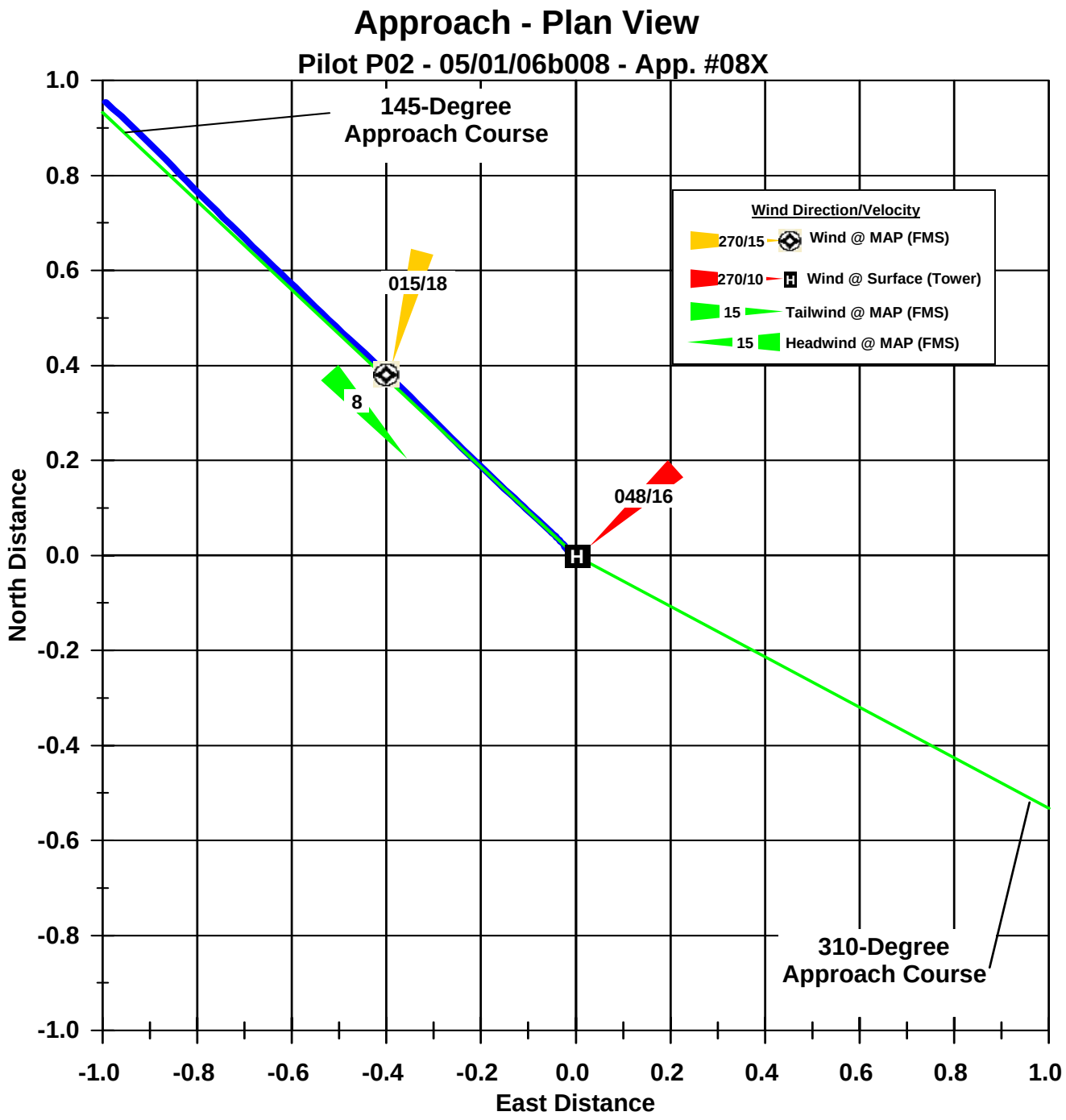


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06b007 - App. #07W

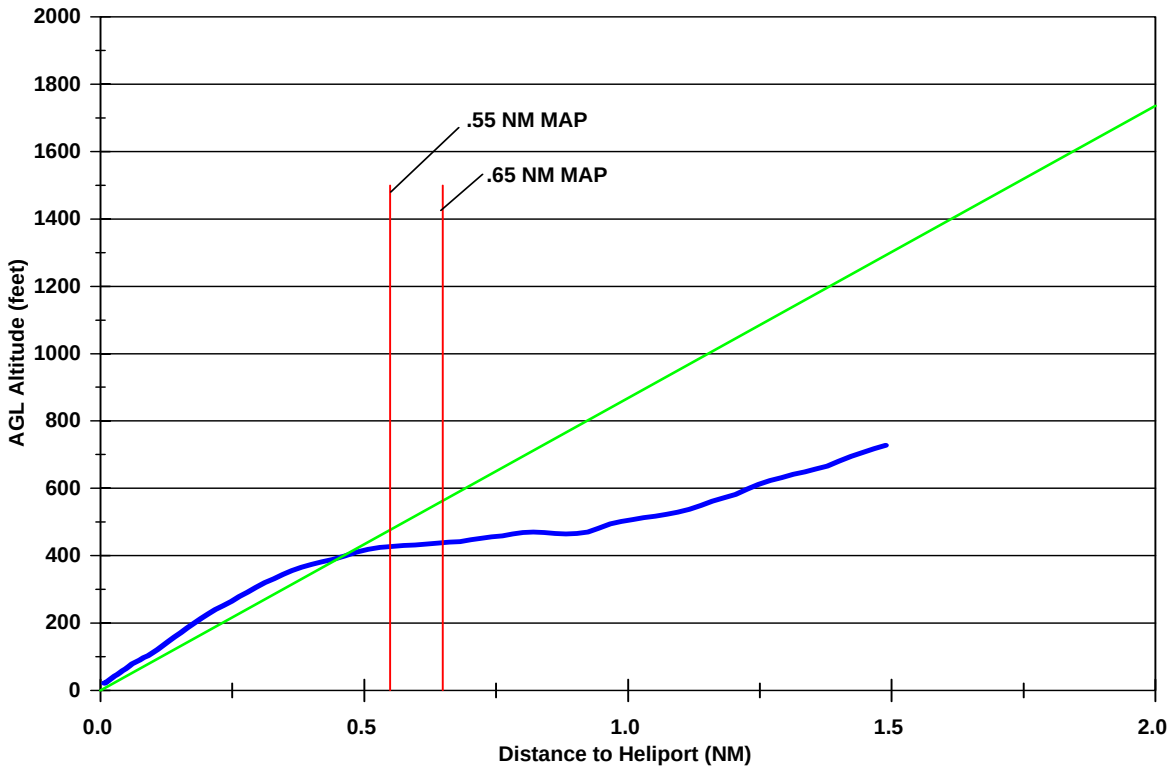


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06b007 - App. #07W

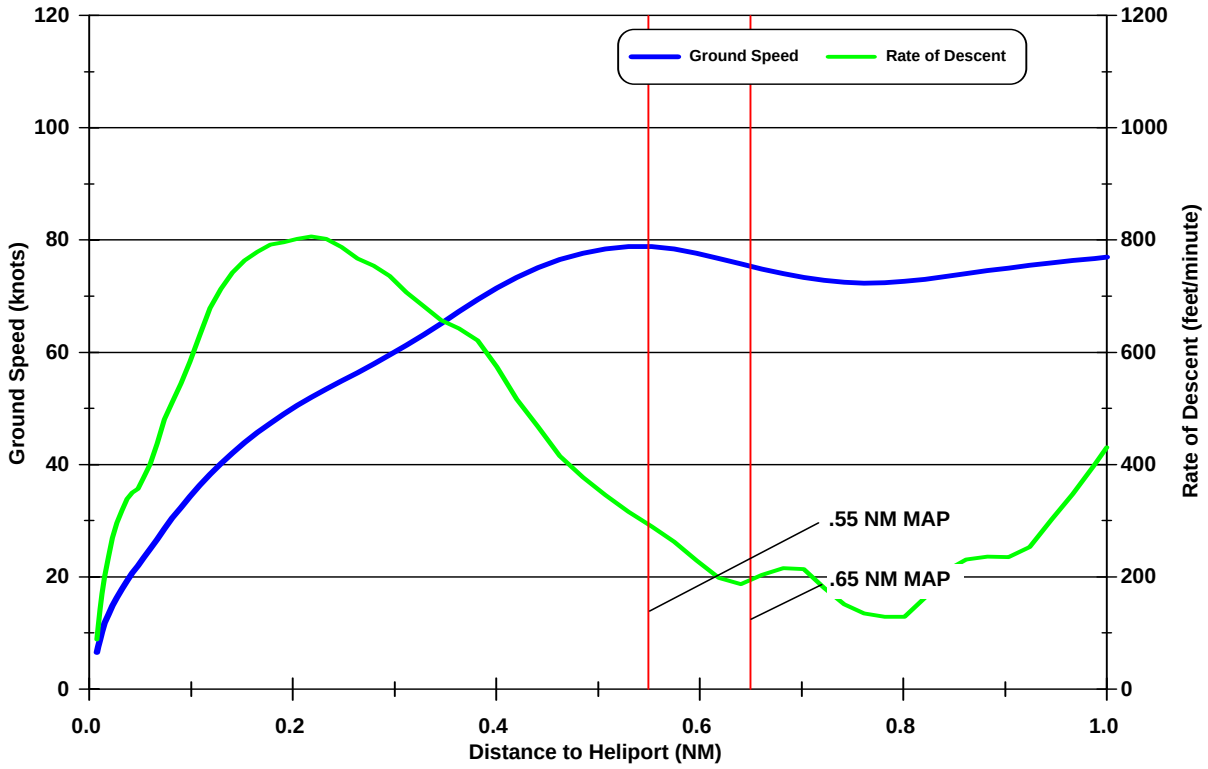



Approach - Plan View
Pilot P02 - 05/01/06b008 - App. #08X
145-Degree
Approach Course
310-Degree
Approach Course
015/18
8
048/16
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

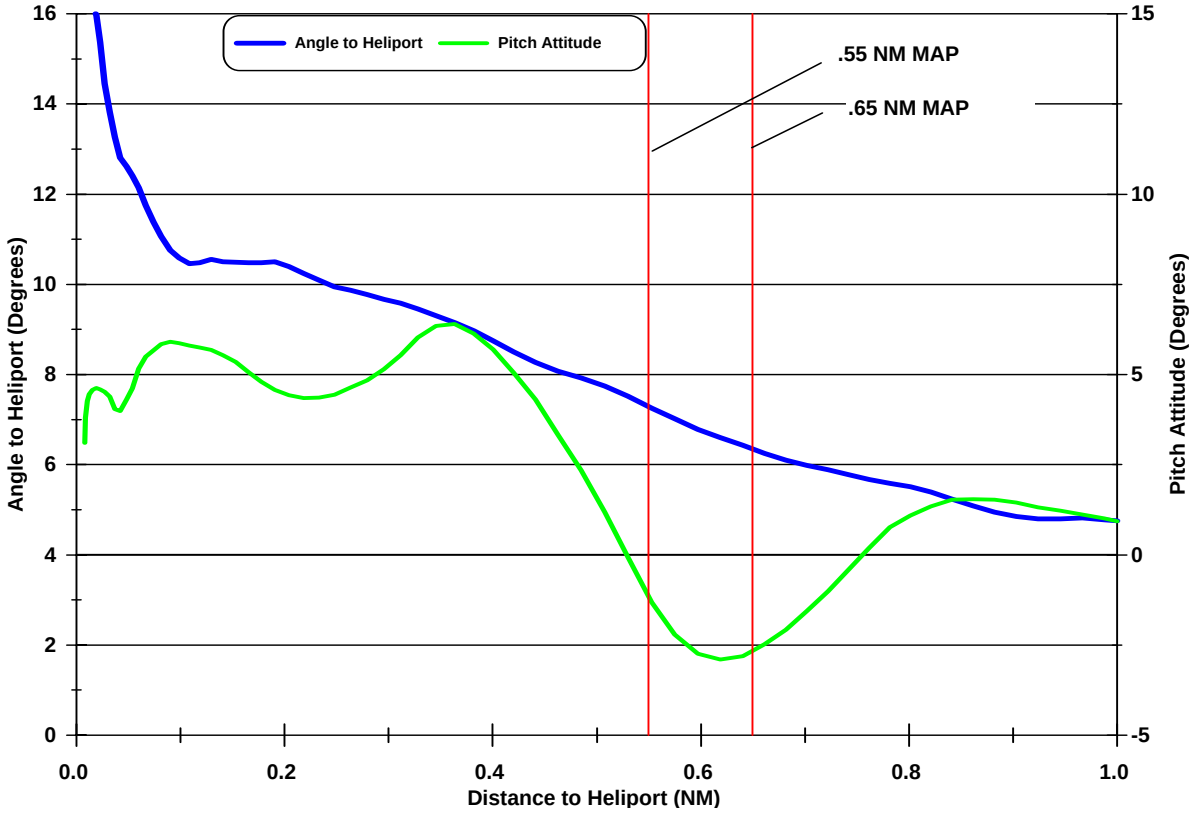
Profile View
Pilot P02 - 05/01/06b008 - App. #08X



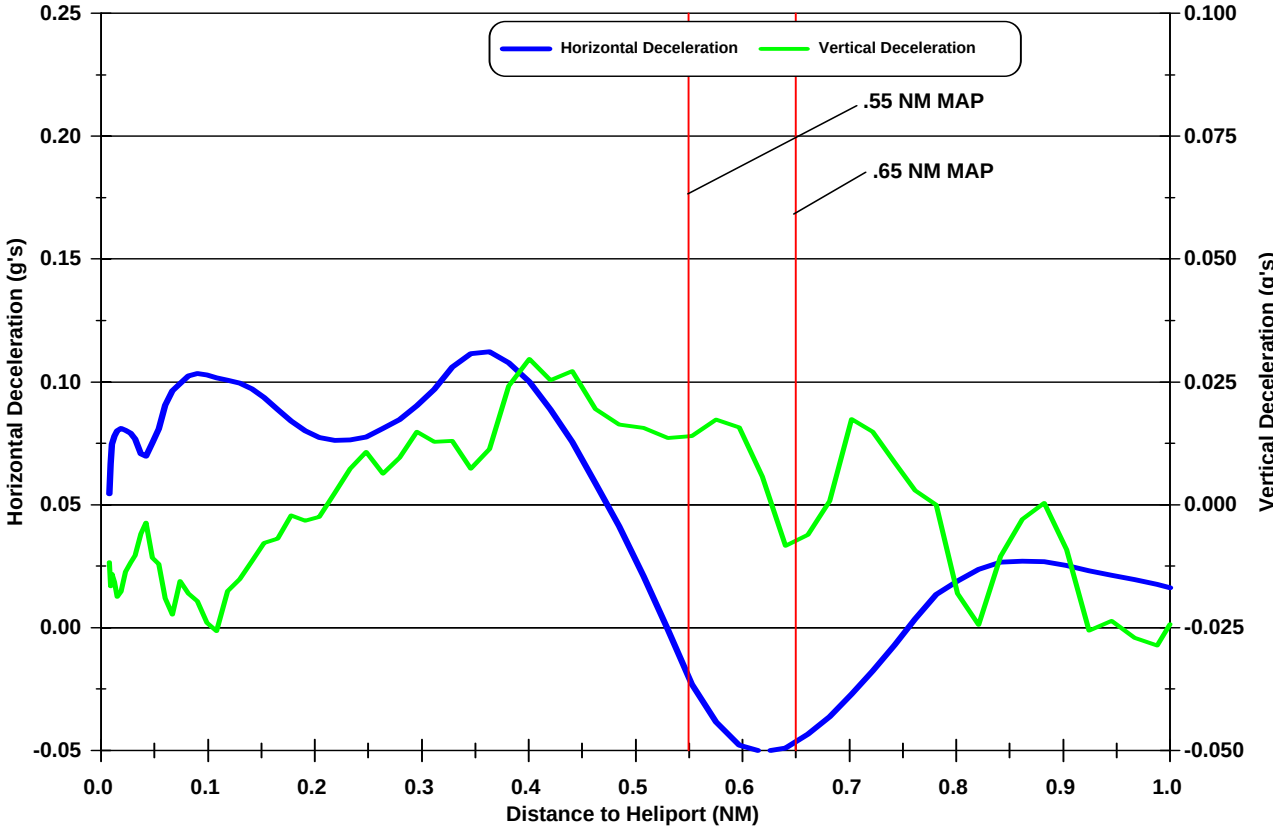
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06b008 - App. #08X

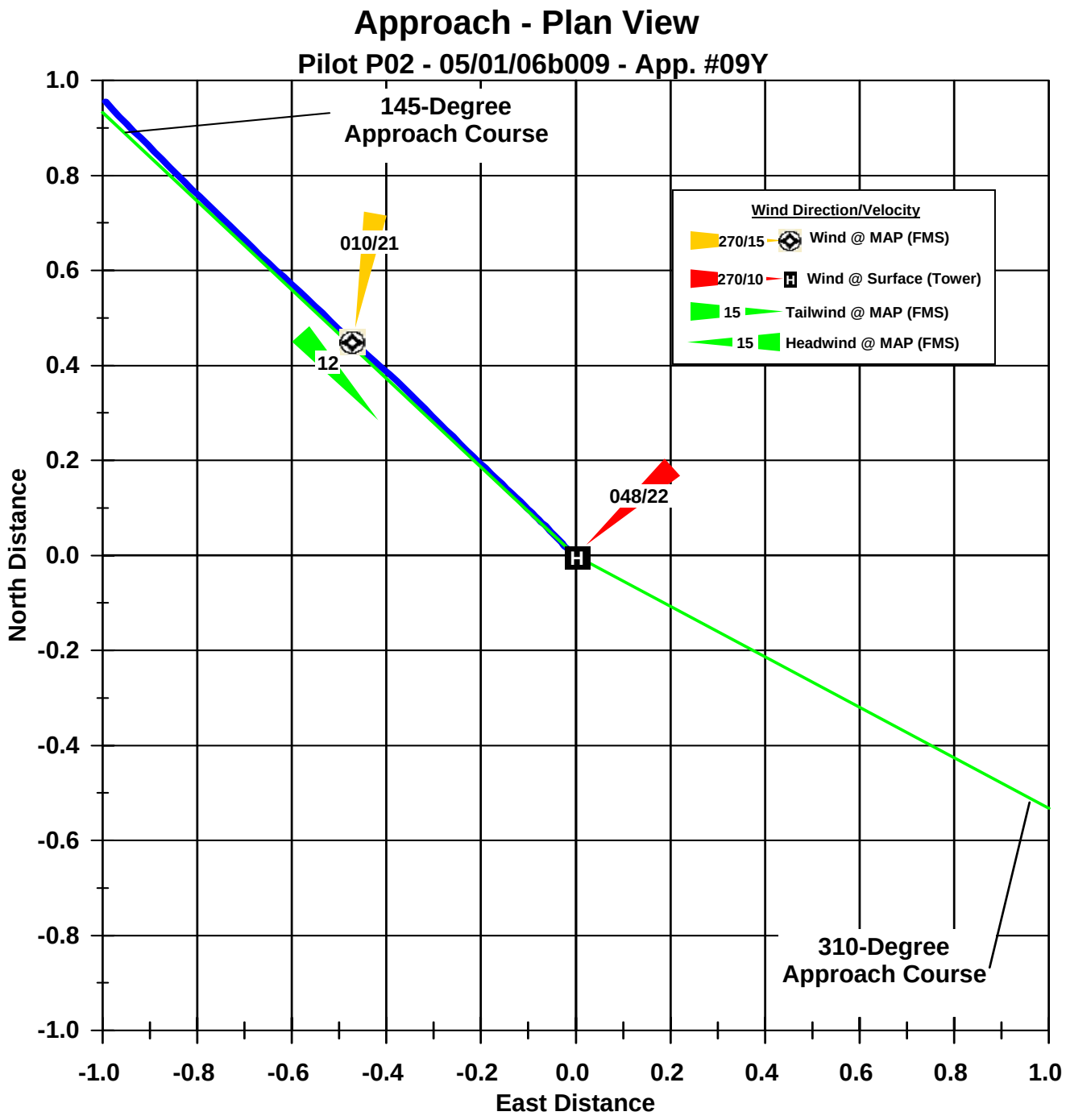


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06b008 - App. #08X

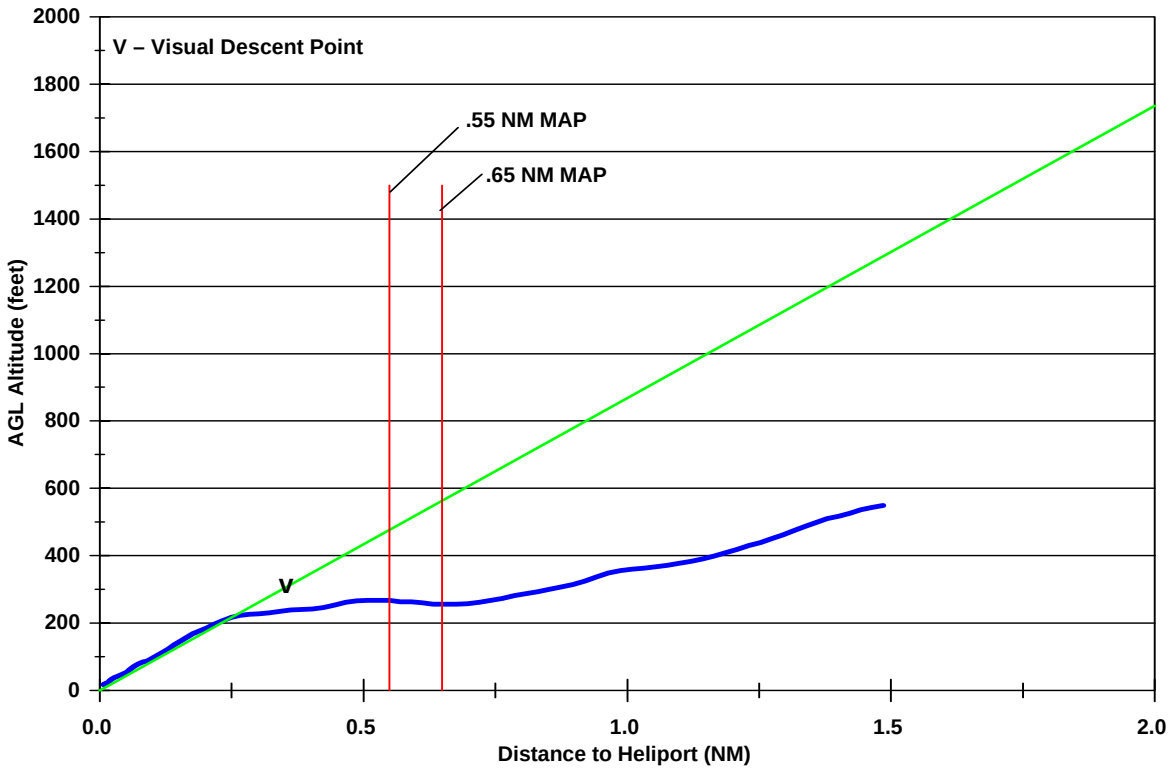


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06b008 - App. #08X

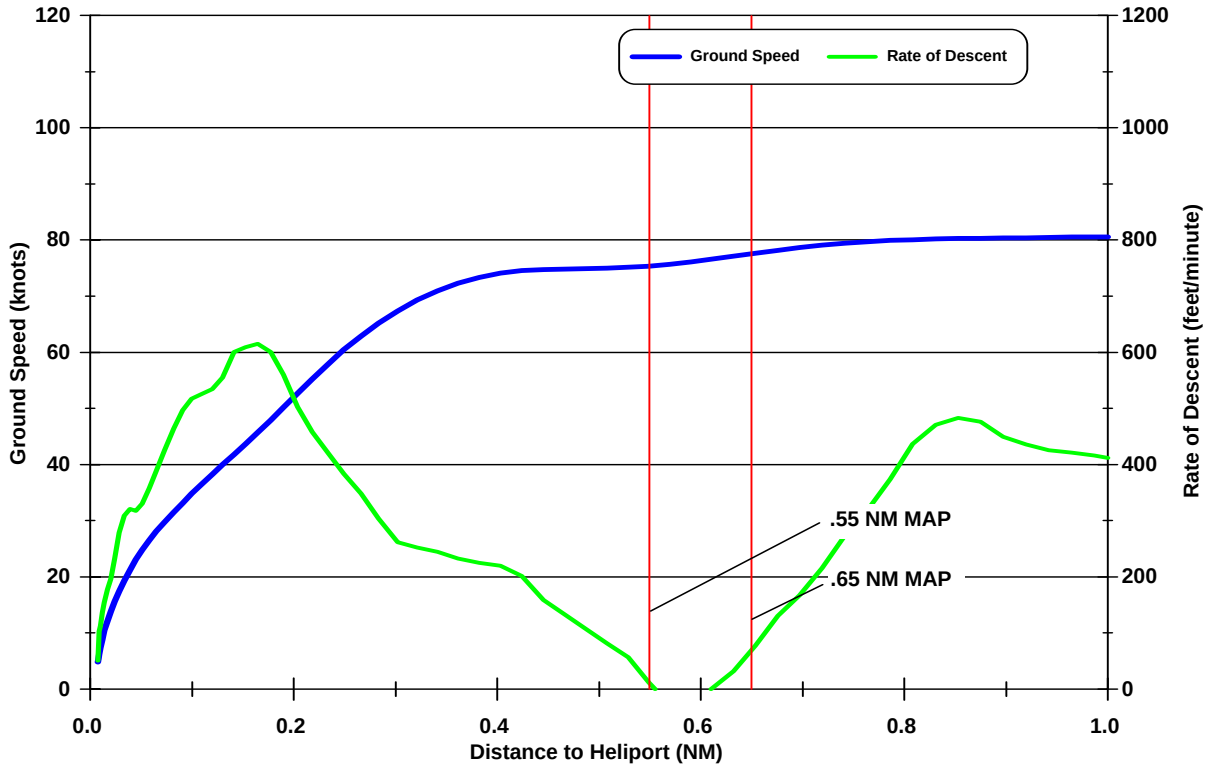



Approach - Plan View
Pilot P02 - 05/01/06b009 - App. #09Y
145-Degree
Approach Course
010/21
12
048/22
H
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

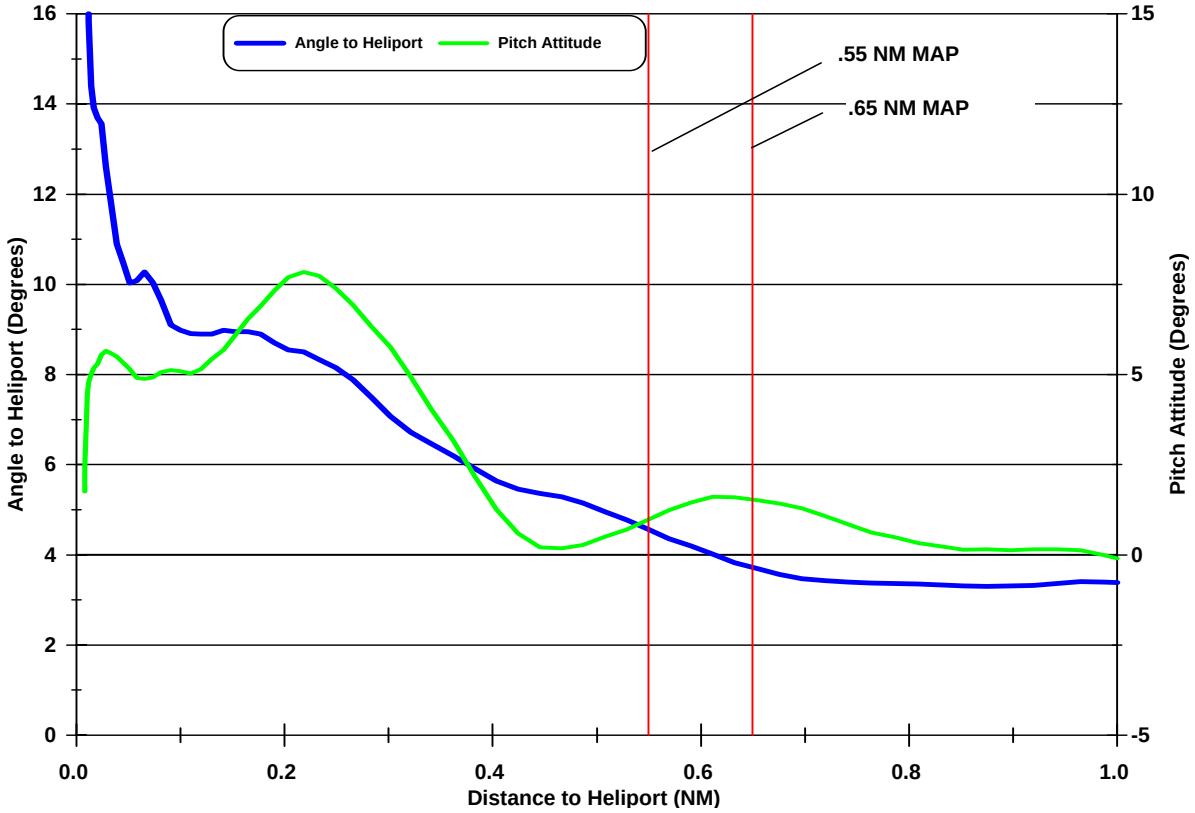
Profile View
Pilot P02 - 05/01/06b009 - App. #09Y



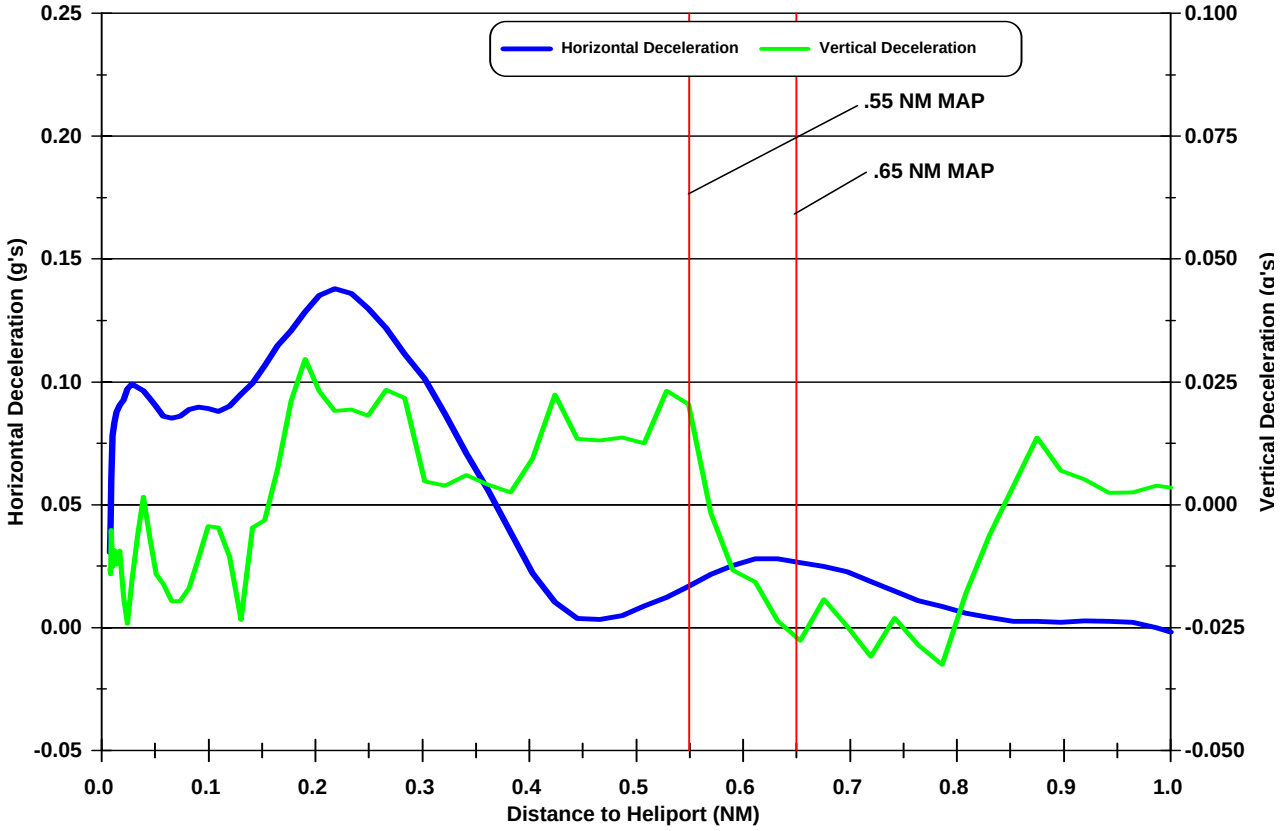
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06b009 - App. #09Y

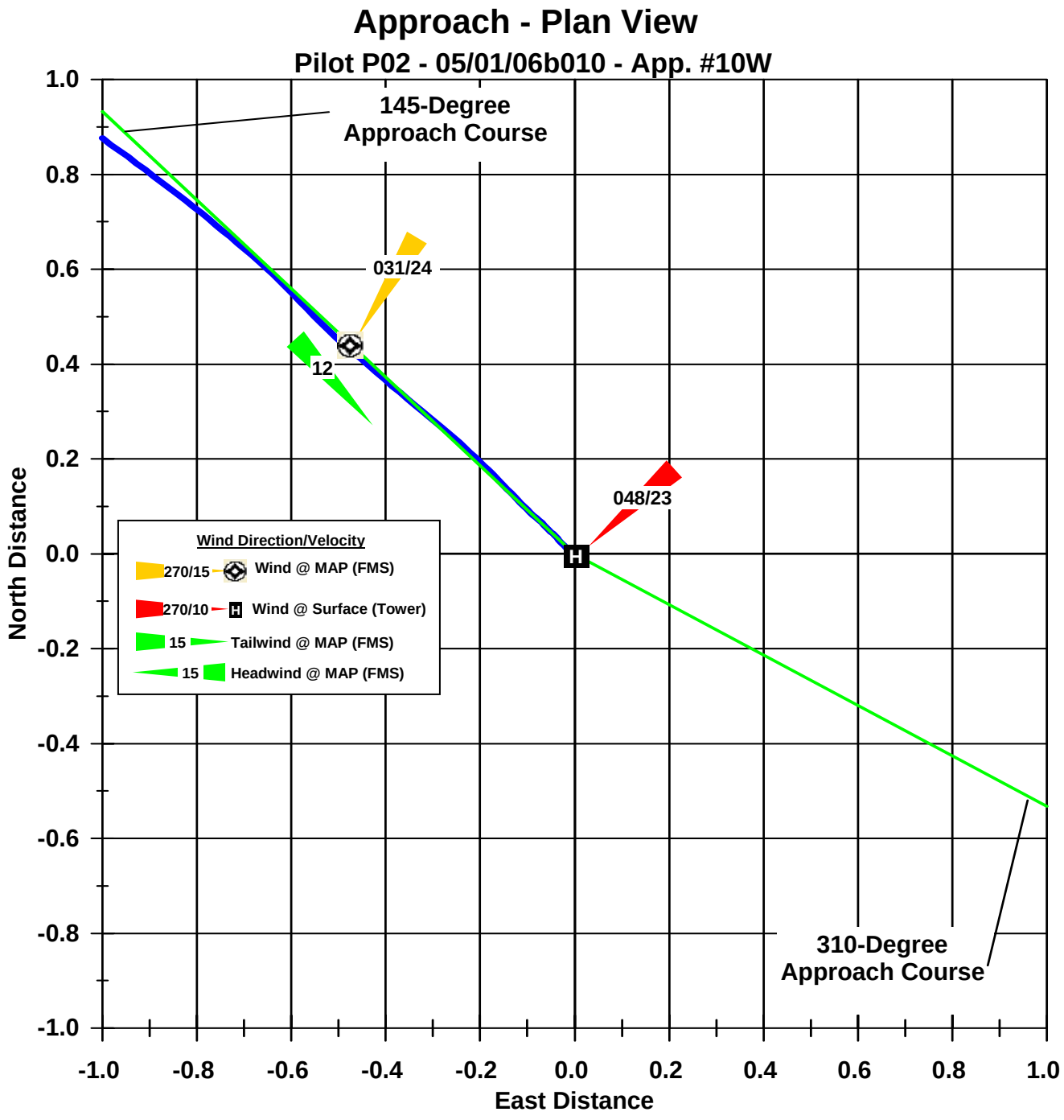


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06b009 - App. #09Y

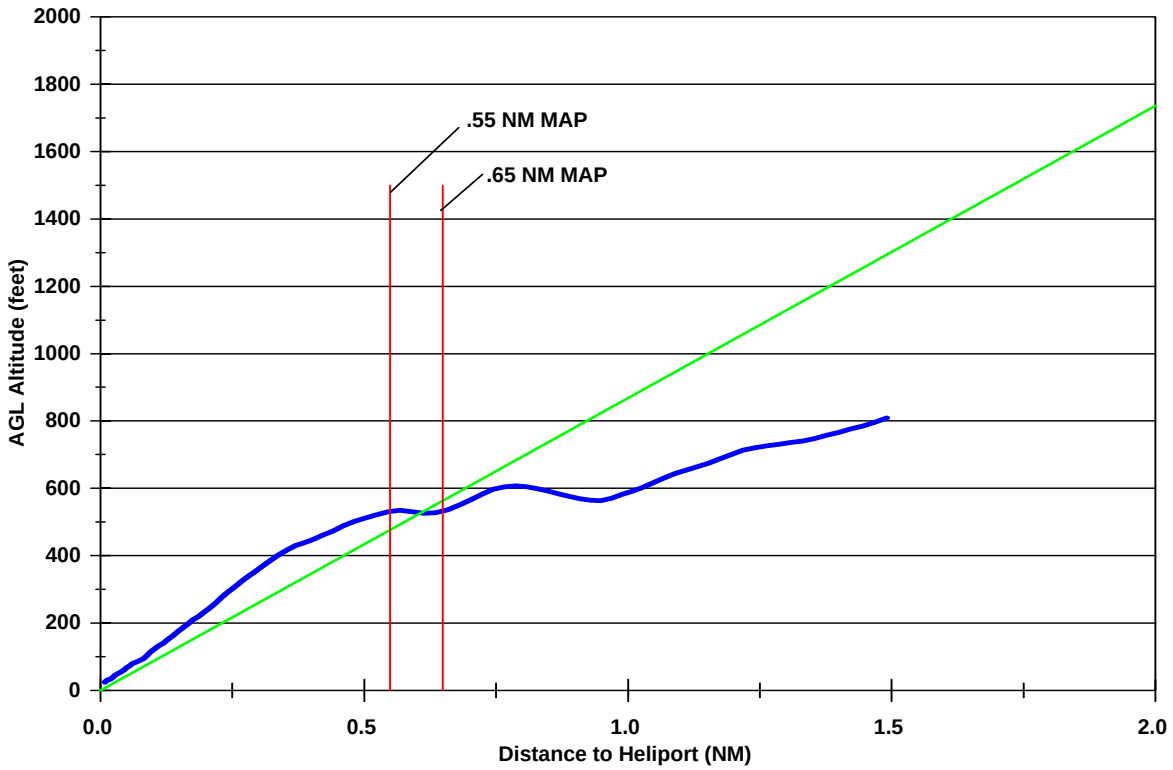


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06b009 - App. #09Y

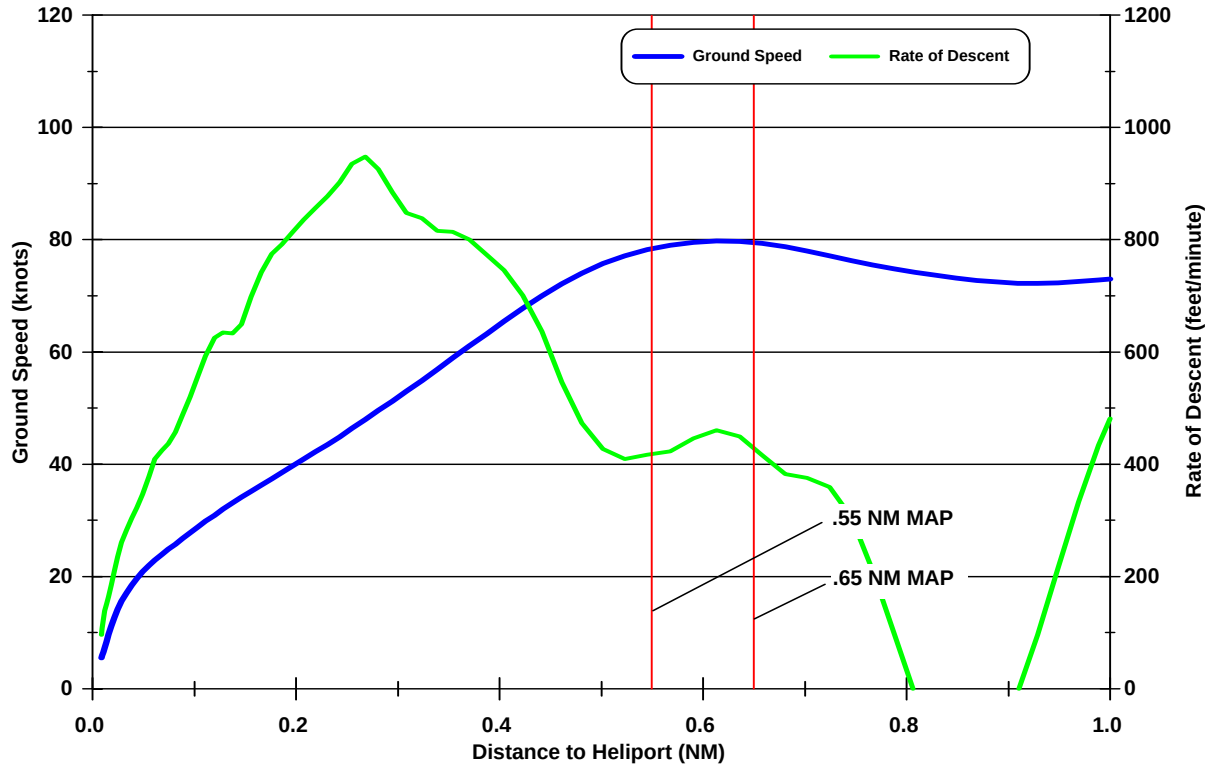



Approach - Plan View
Pilot P02 - 05/01/06b010 - App. #10W
145-Degree
Approach Course
031/24
12
048/23
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

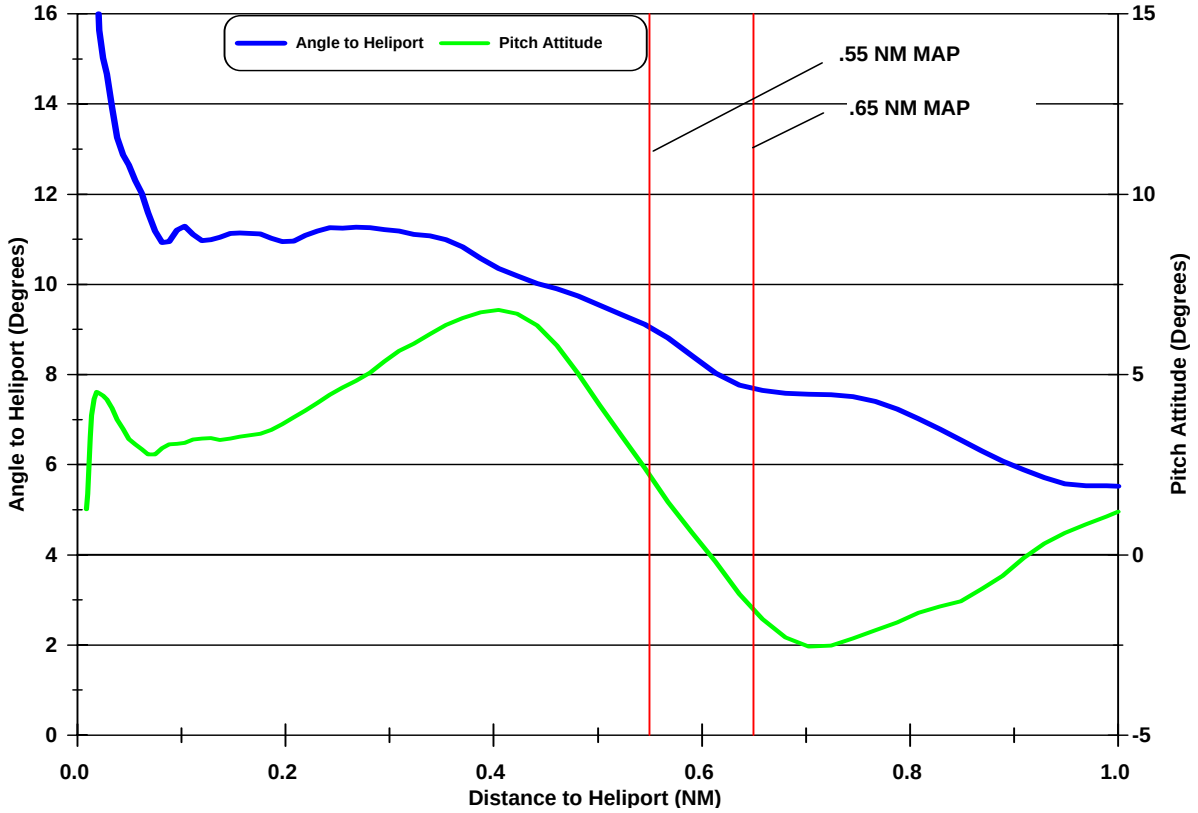
Profile View
Pilot P02 - 05/01/06b010 - App. #10W



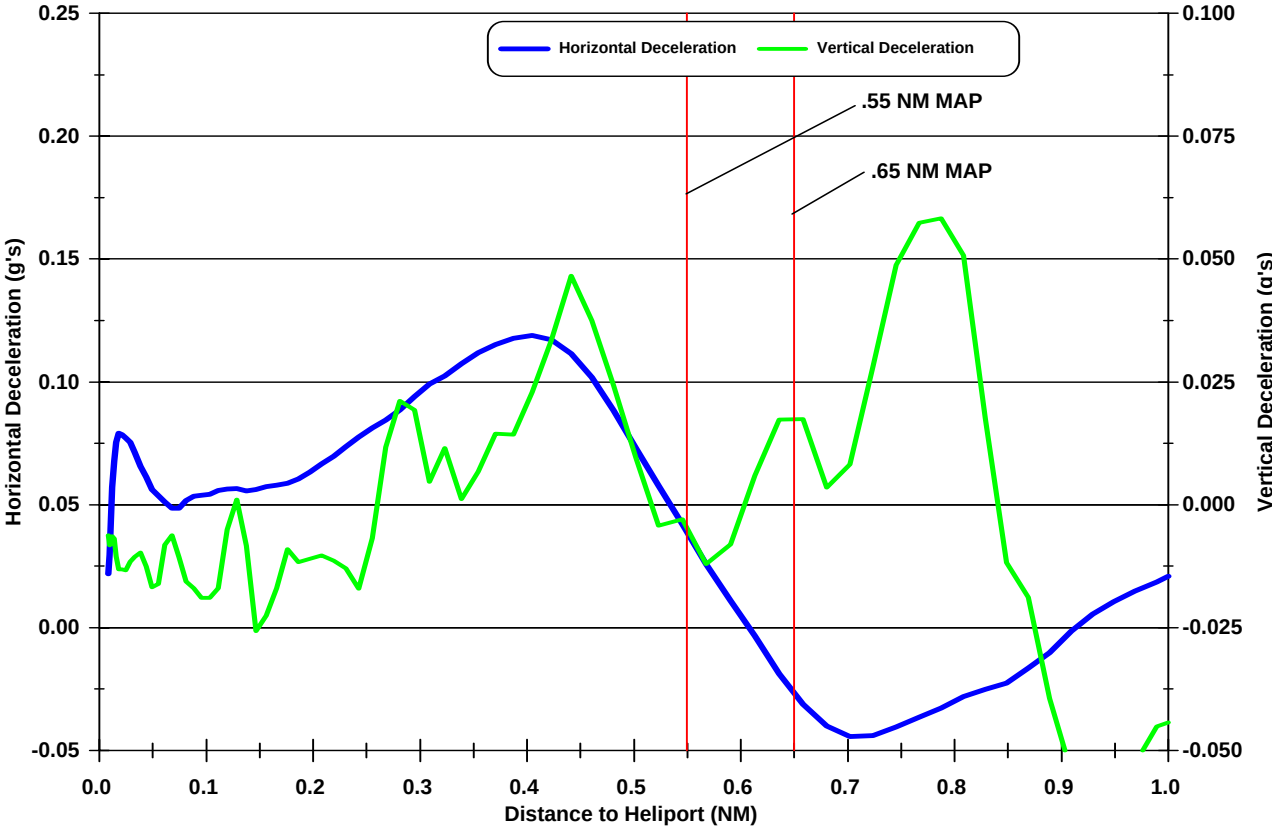
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06b010 - App. #10W

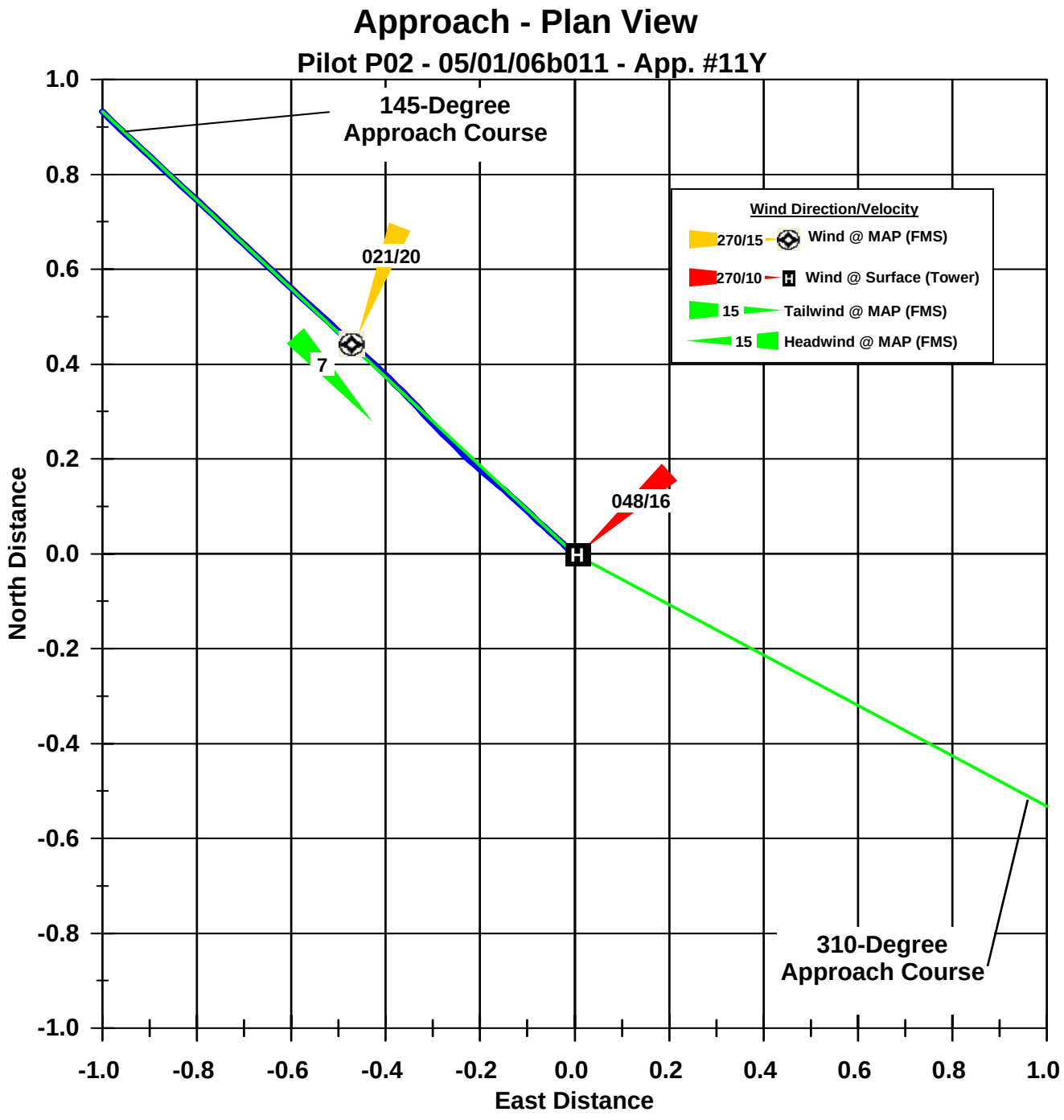


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06b010 - App. #10W

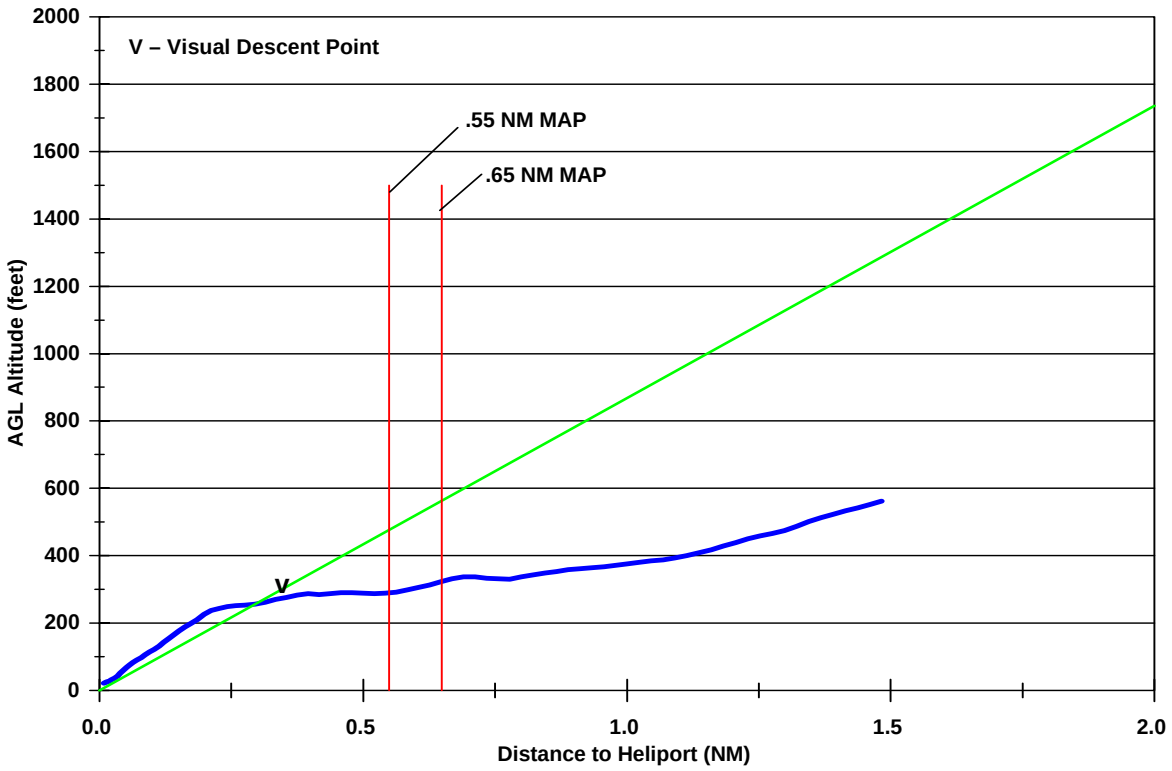


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06b010 - App. #10W

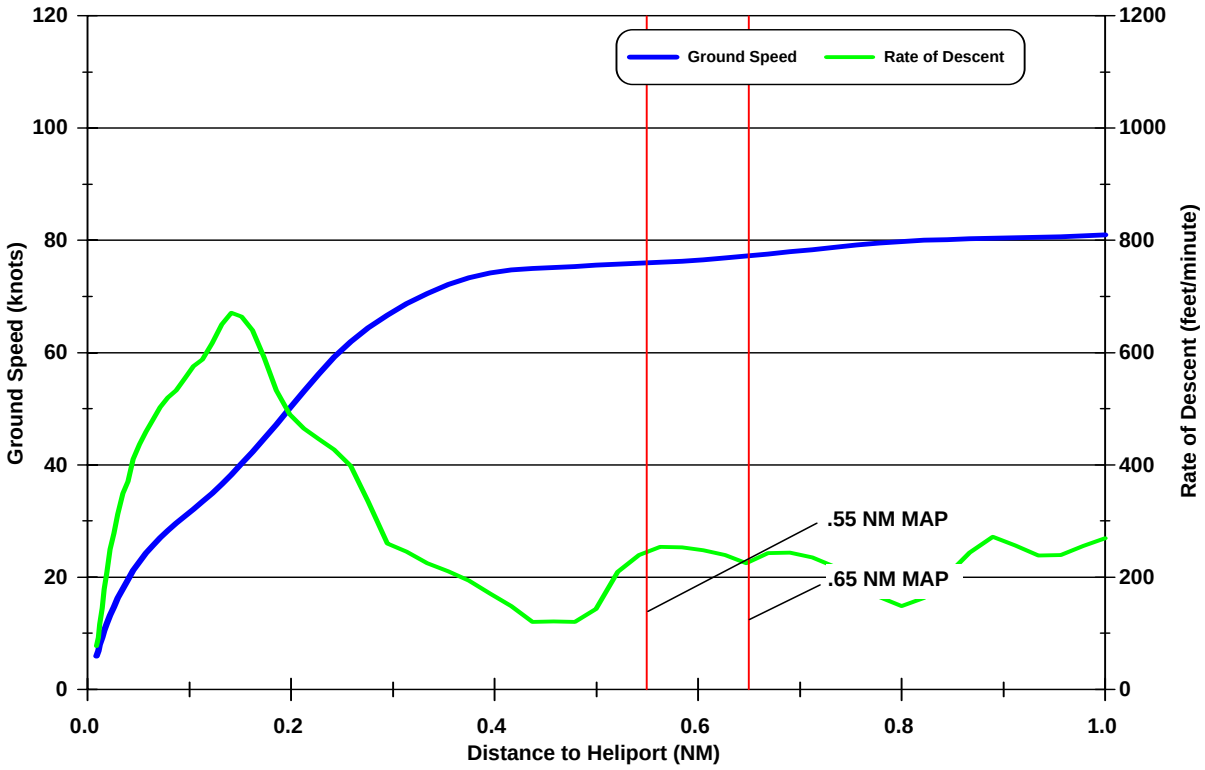



Approach - Plan View
Pilot P02 - 05/01/06b011 - App. #11Y
145-Degree
Approach Course
310-Degree
Approach Course
021/20
7
048/16
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

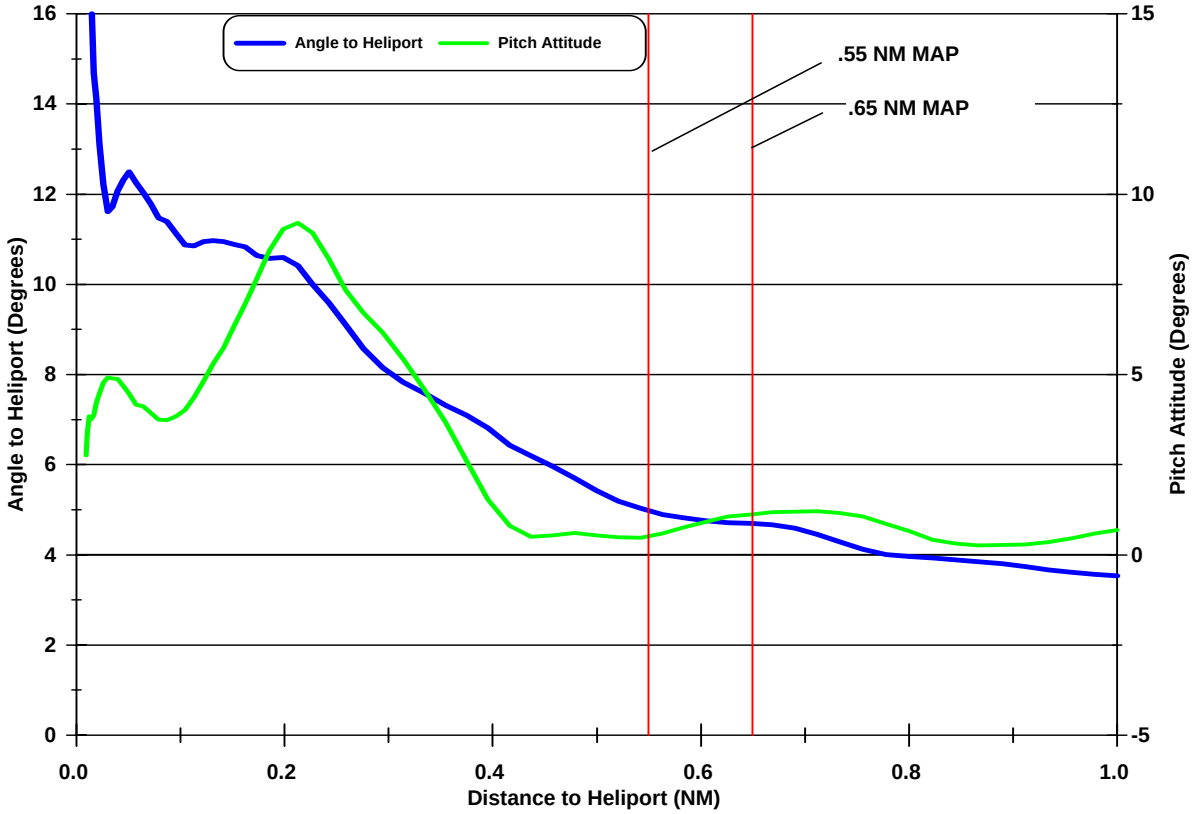
Profile View
Pilot P02 - 05/01/06b011 - App. #11Y



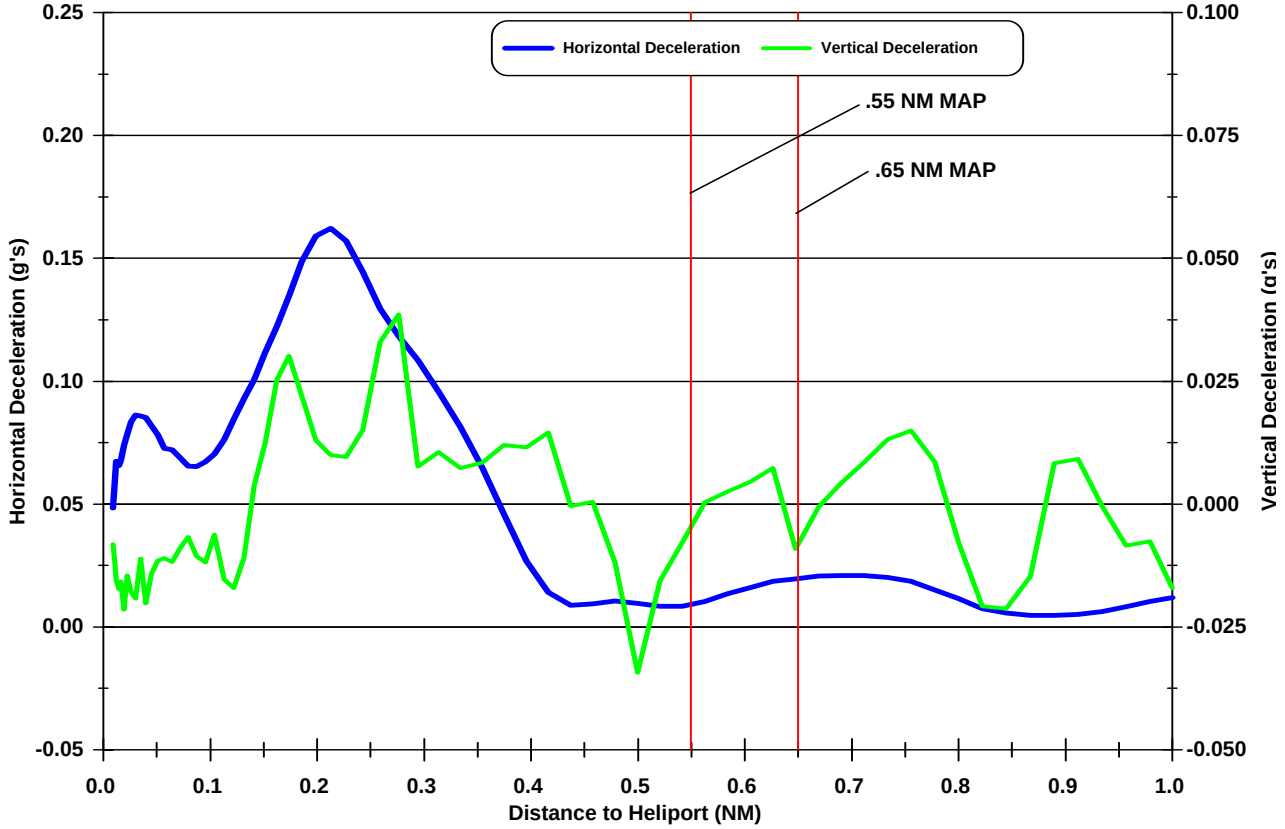
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06b011 - App. #11Y

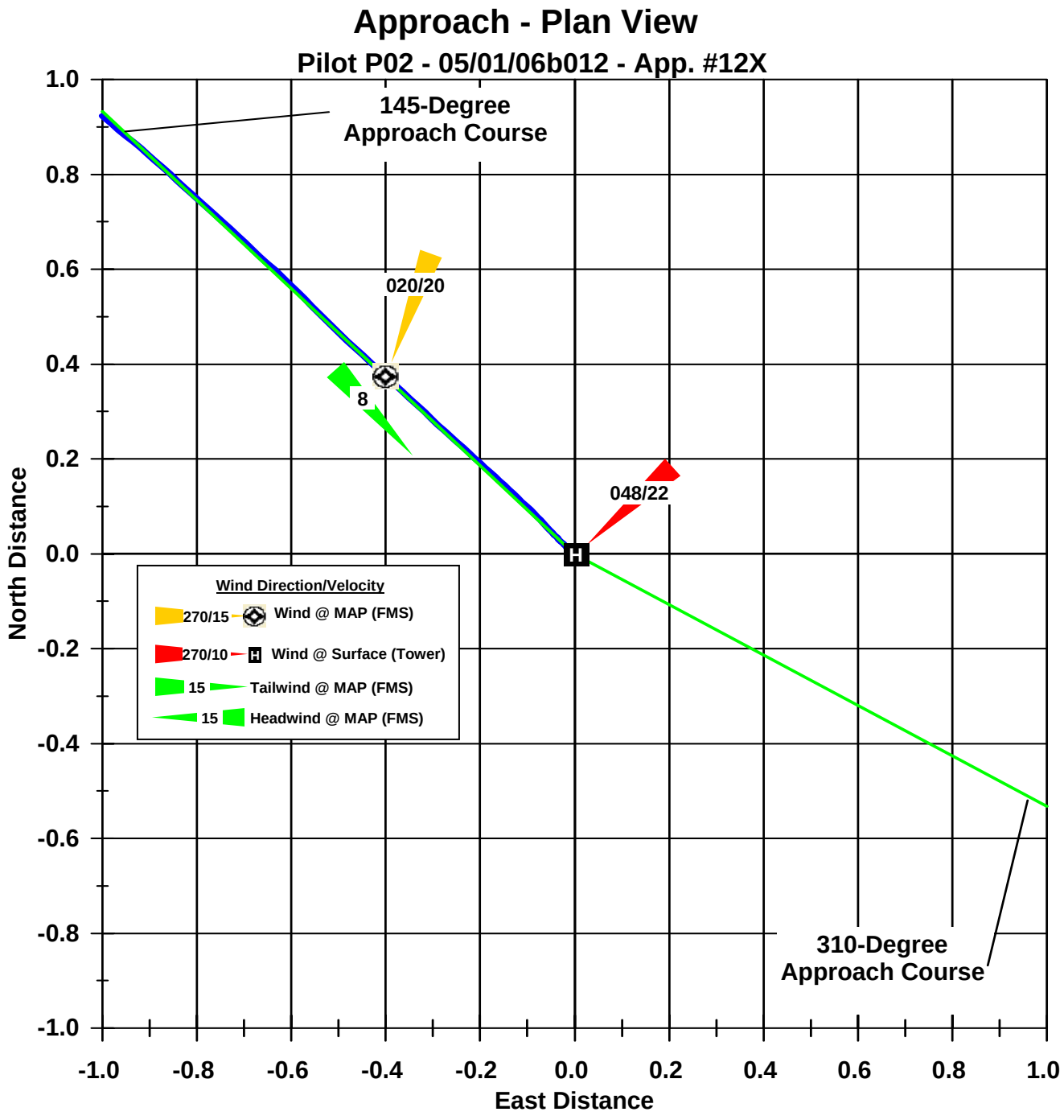


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06b011 - App. #11Y

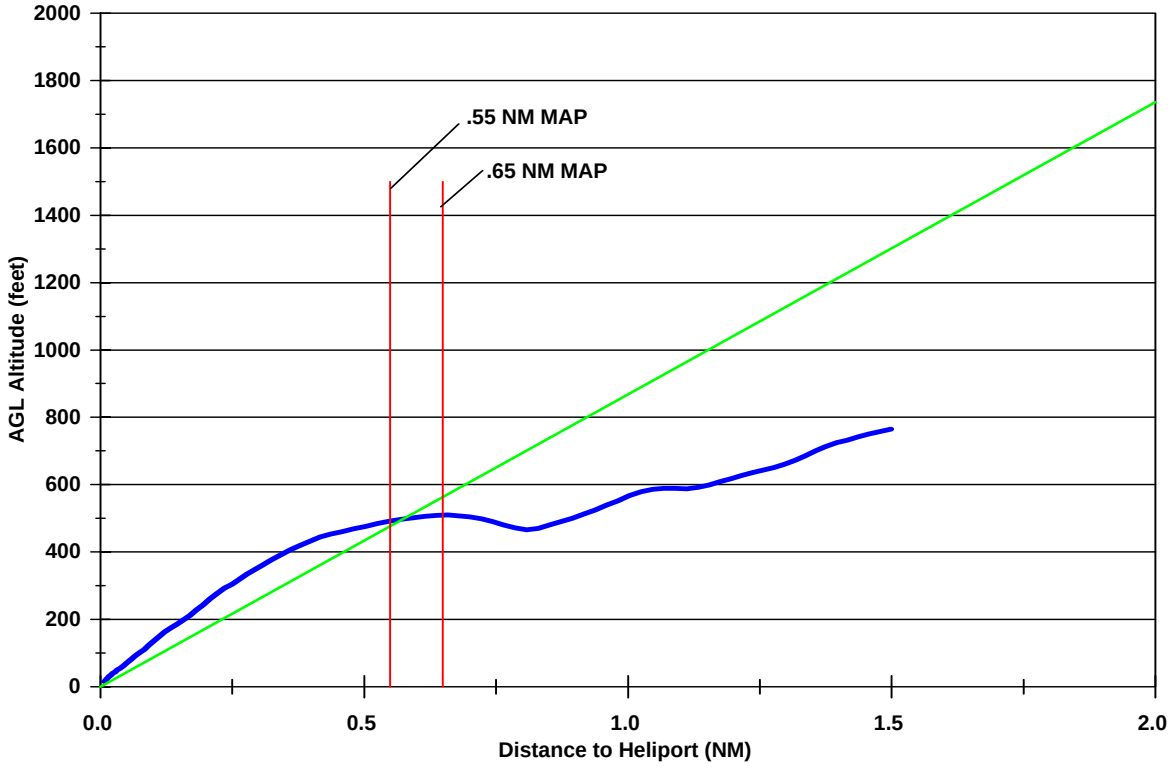


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06b011 - App. #11Y

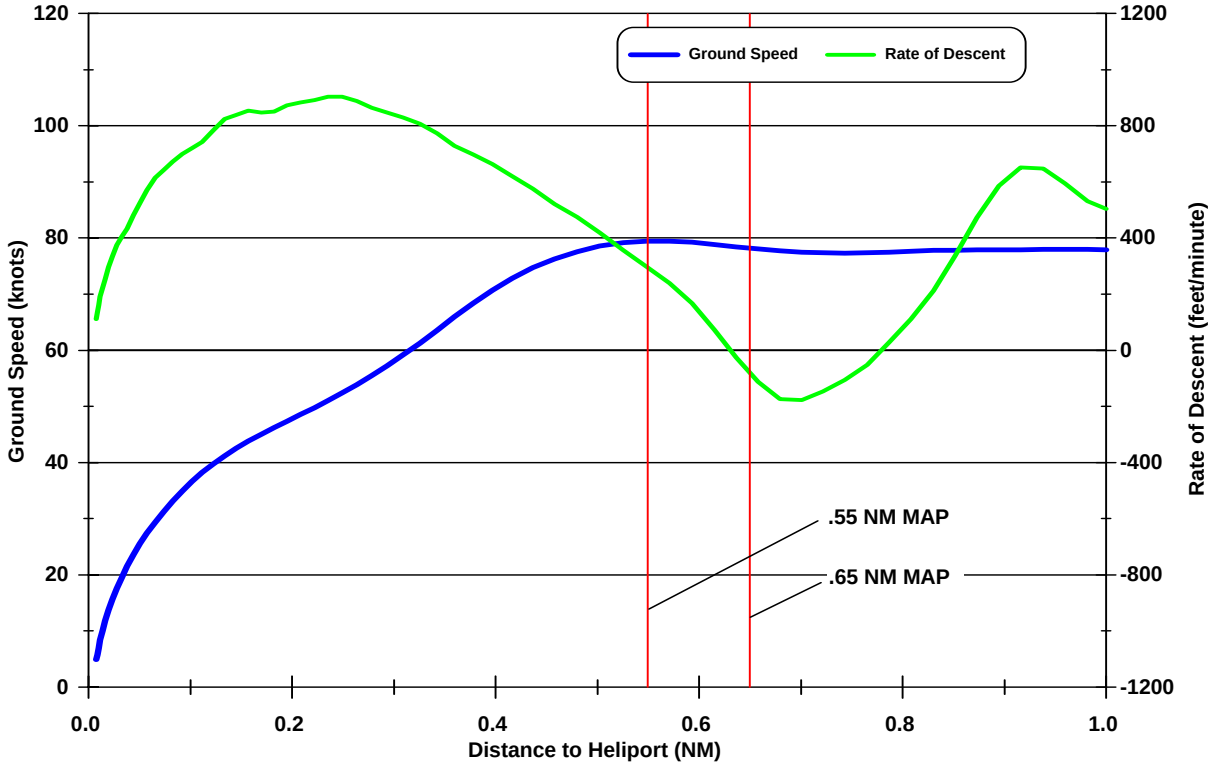



Approach - Plan View
Pilot P02 - 05/01/06b012 - App. #12X
145-Degree
Approach Course
020/20
8
048/22
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

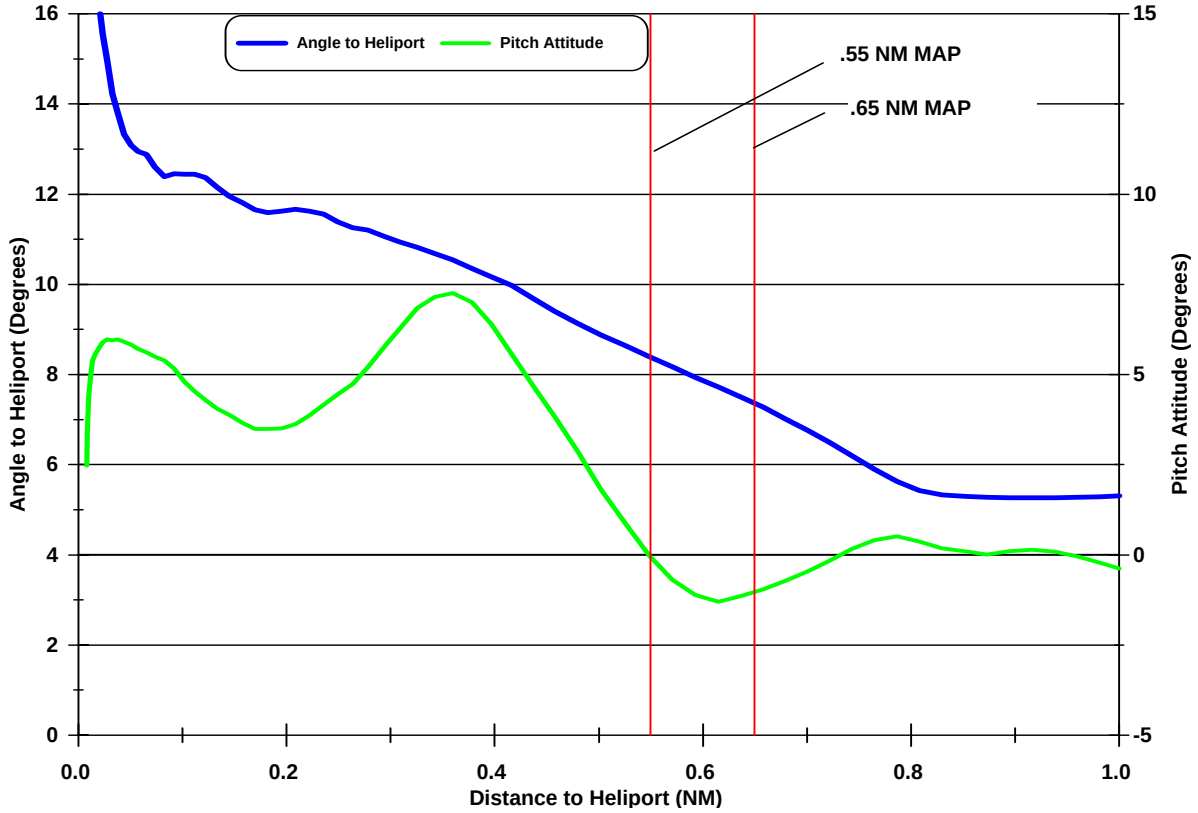
Profile View
Pilot P02 - 05/01/06b012 - App. #12X



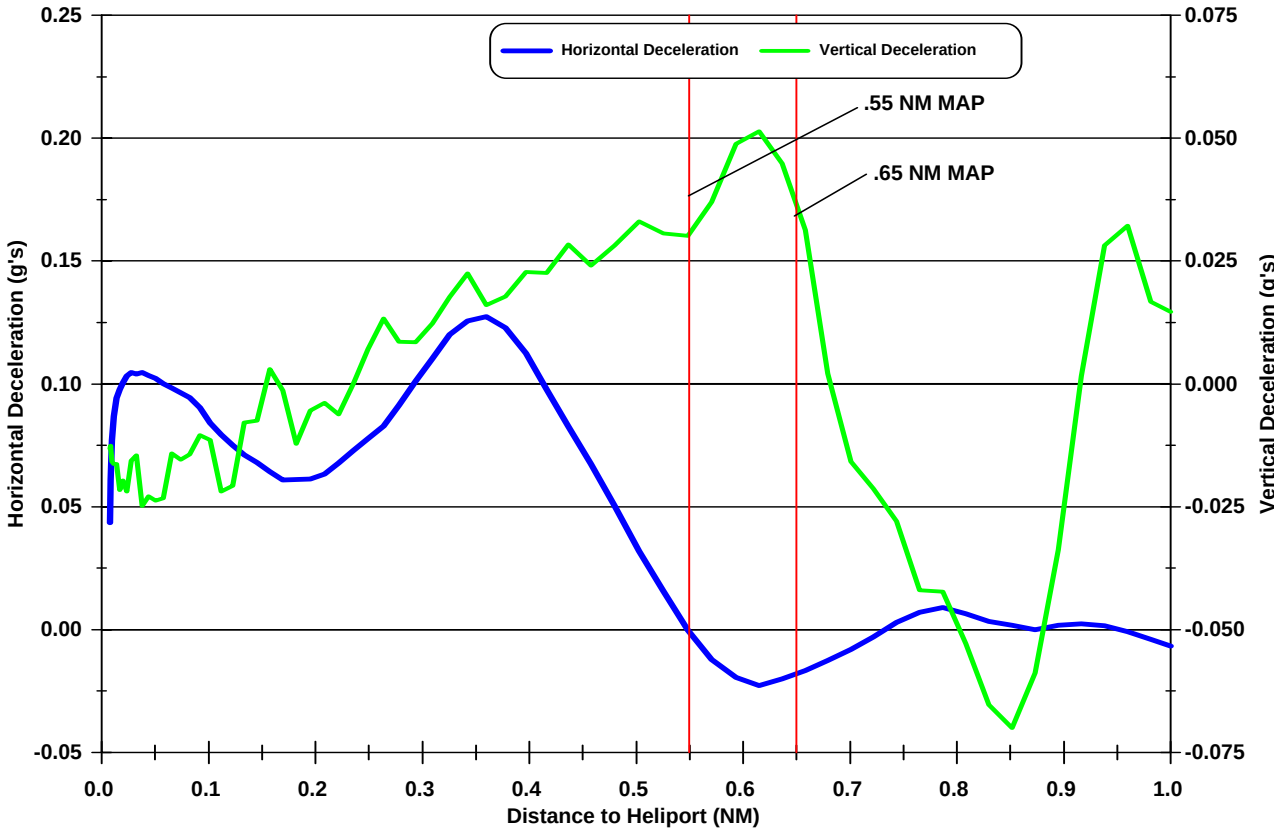
Ground Speed and Rate of Descent
Pilot P02 - 05/01/06b012 - App. #12X

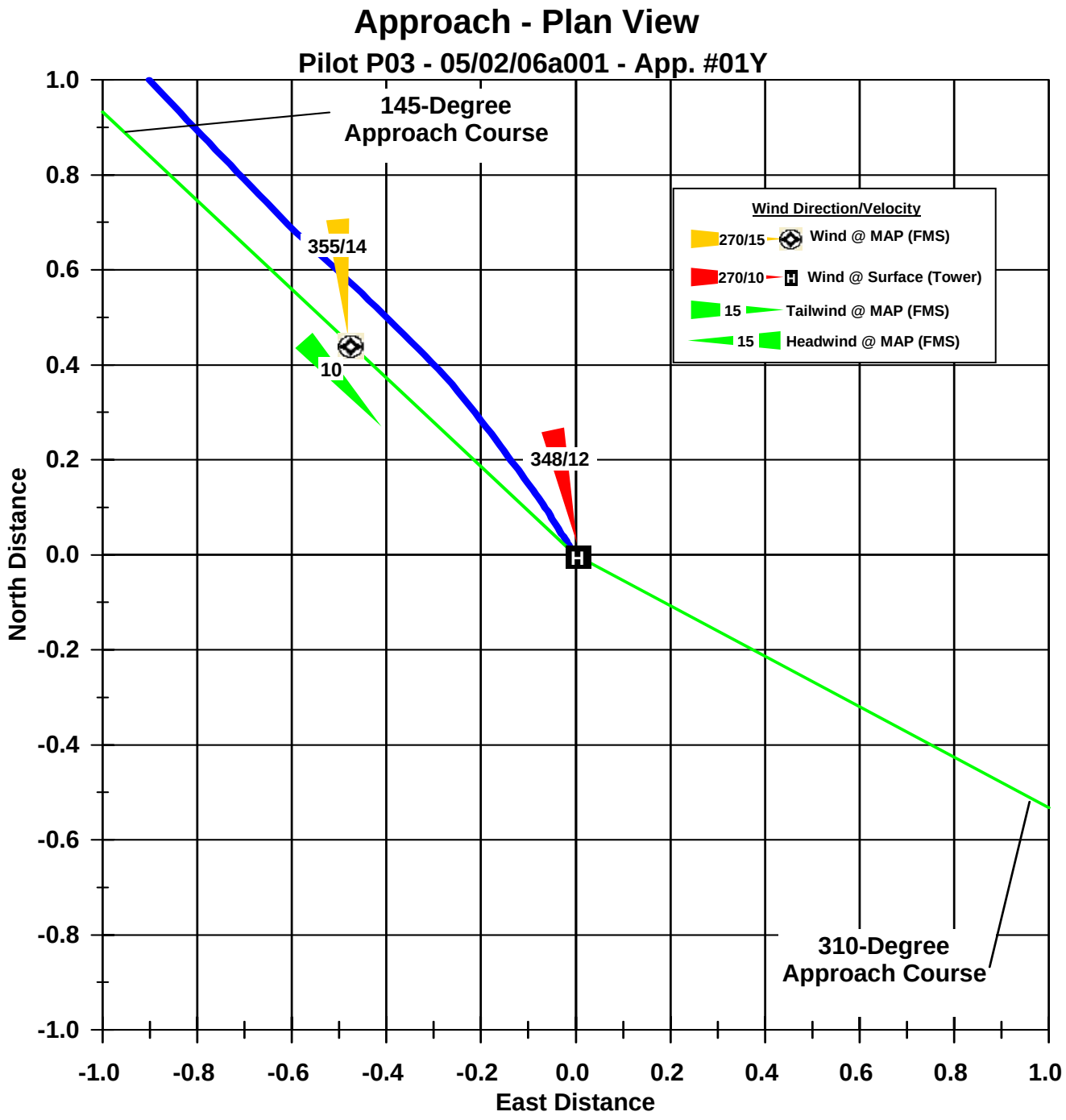


Angle to Heliport and Pitch Attitude
Pilot P02 - 05/01/06b012 - App. #12X

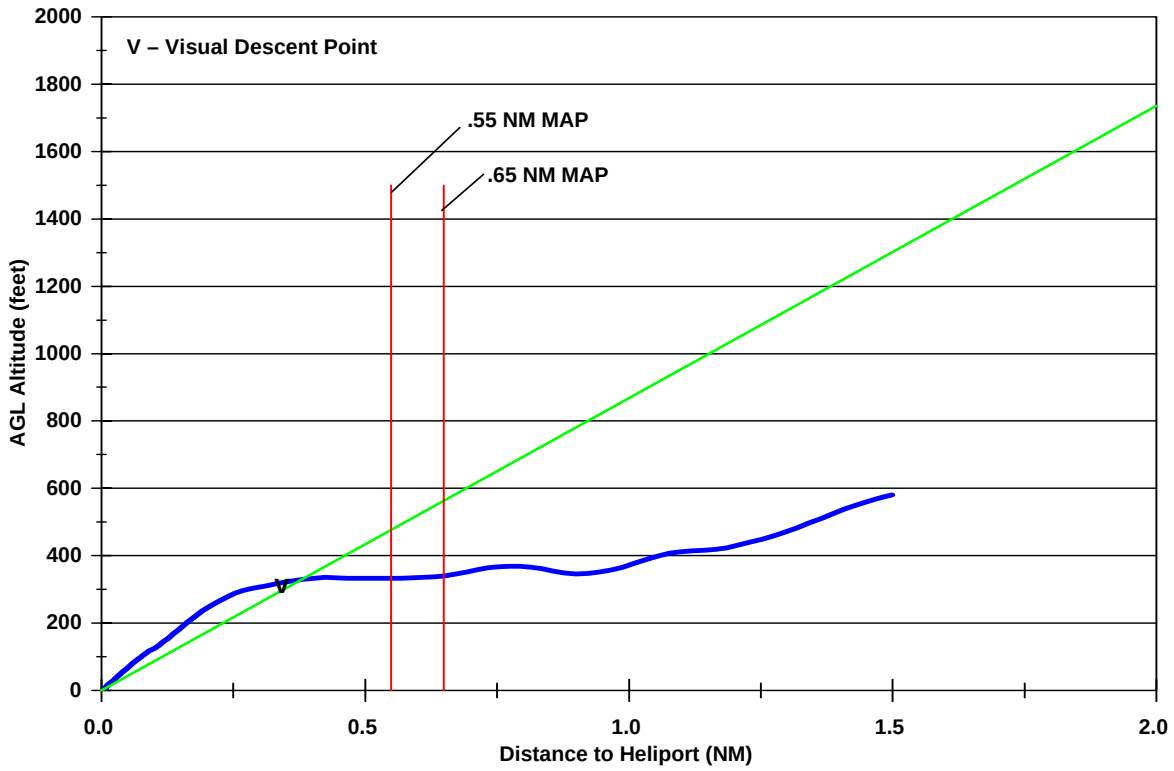


Horizontal and Vertical Deceleration
Pilot P02 - 05/01/06b012 - App. #12X

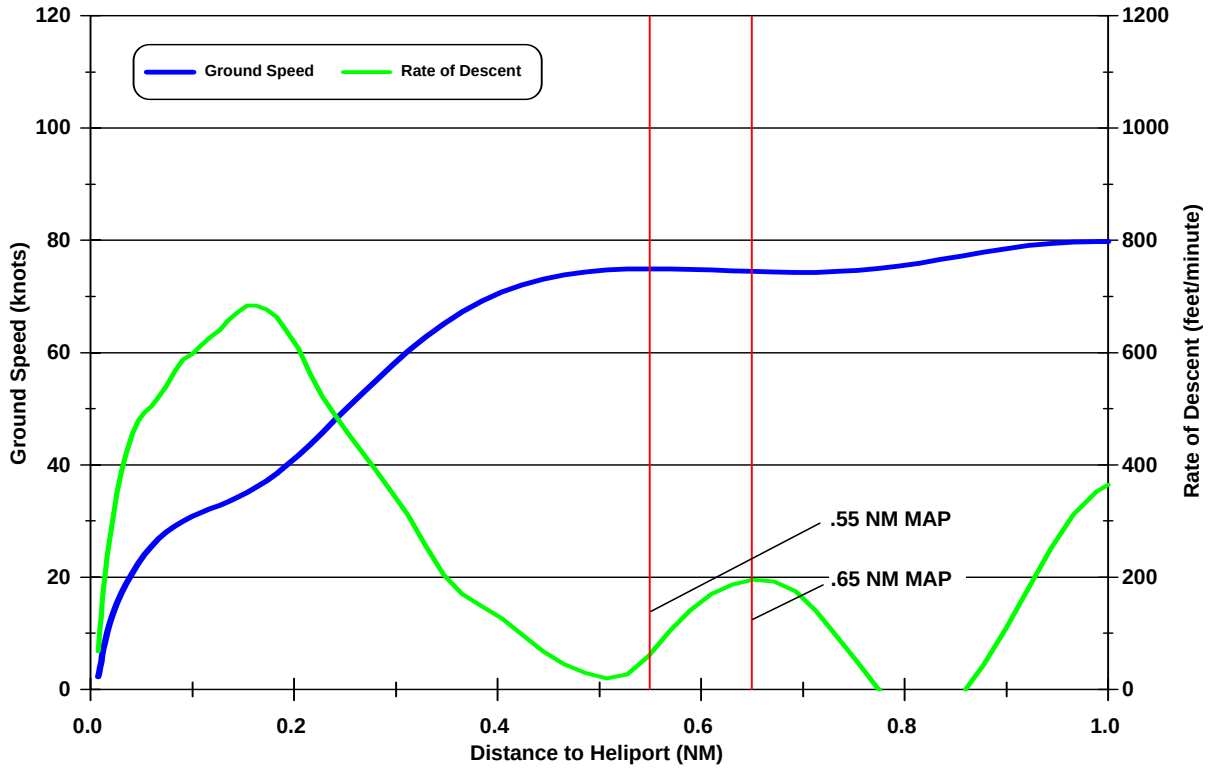



Approach - Plan View
Pilot P03 - 05/02/06a001 - App. #01Y
145-Degree
Approach Course
310-Degree
Approach Course
355/14
10
348/12
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

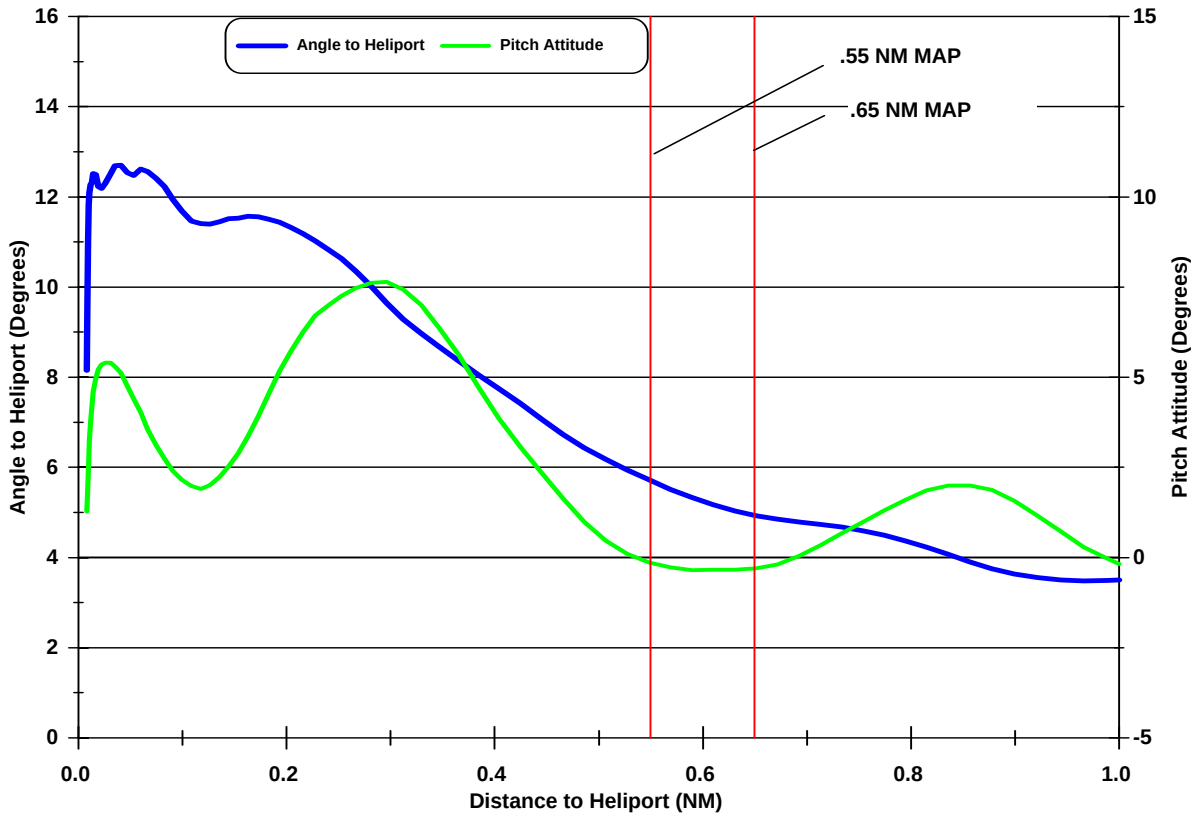
Profile View
Pilot P03 - 05/02/06a001 - App. #01Y



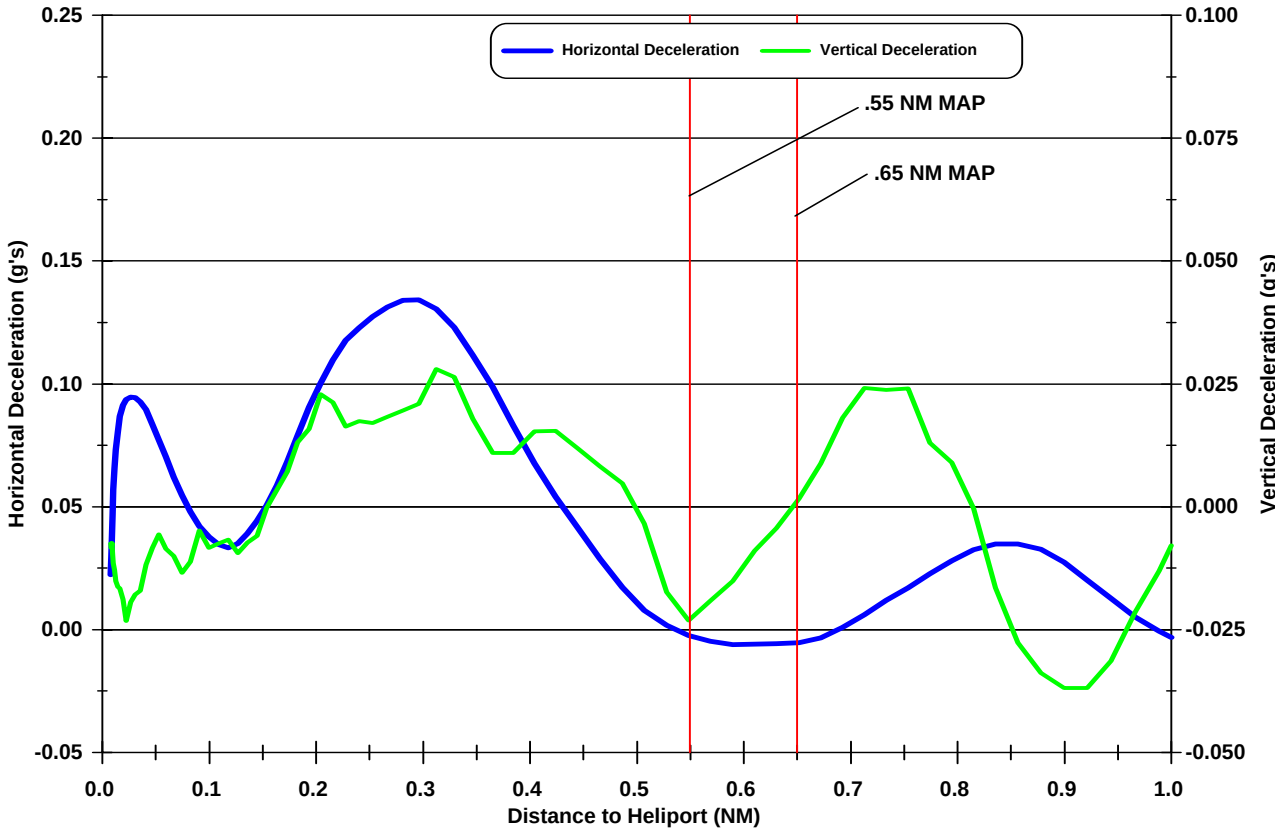
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06a001 - App. #01Y

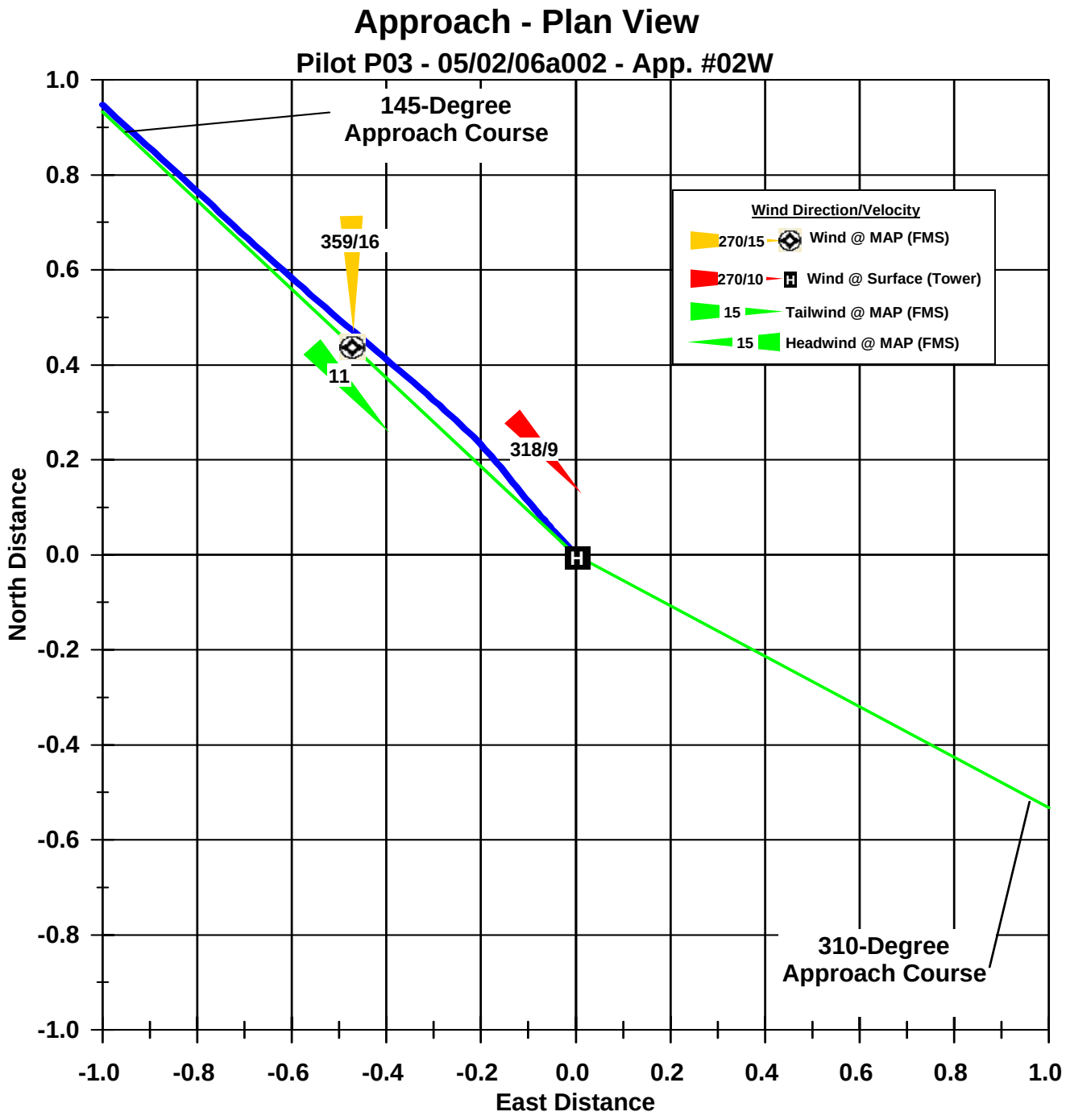


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06a001 - App. #01Y

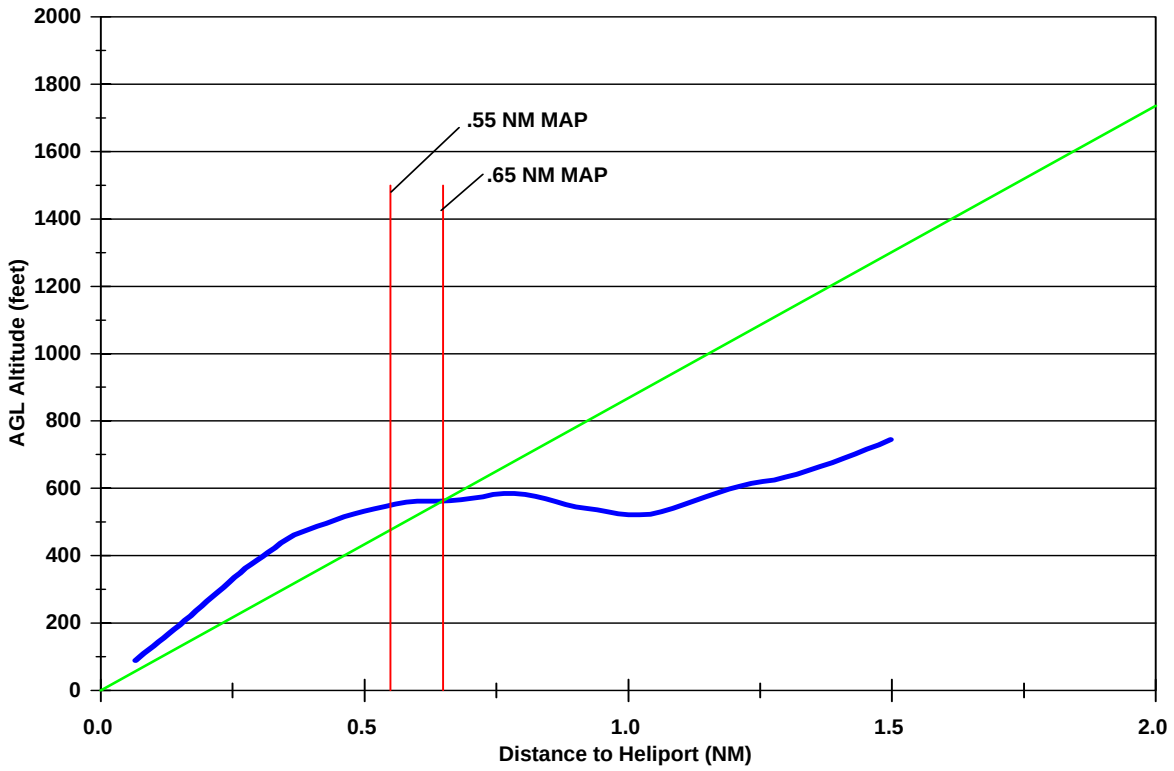


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06a001 - App. #01Y

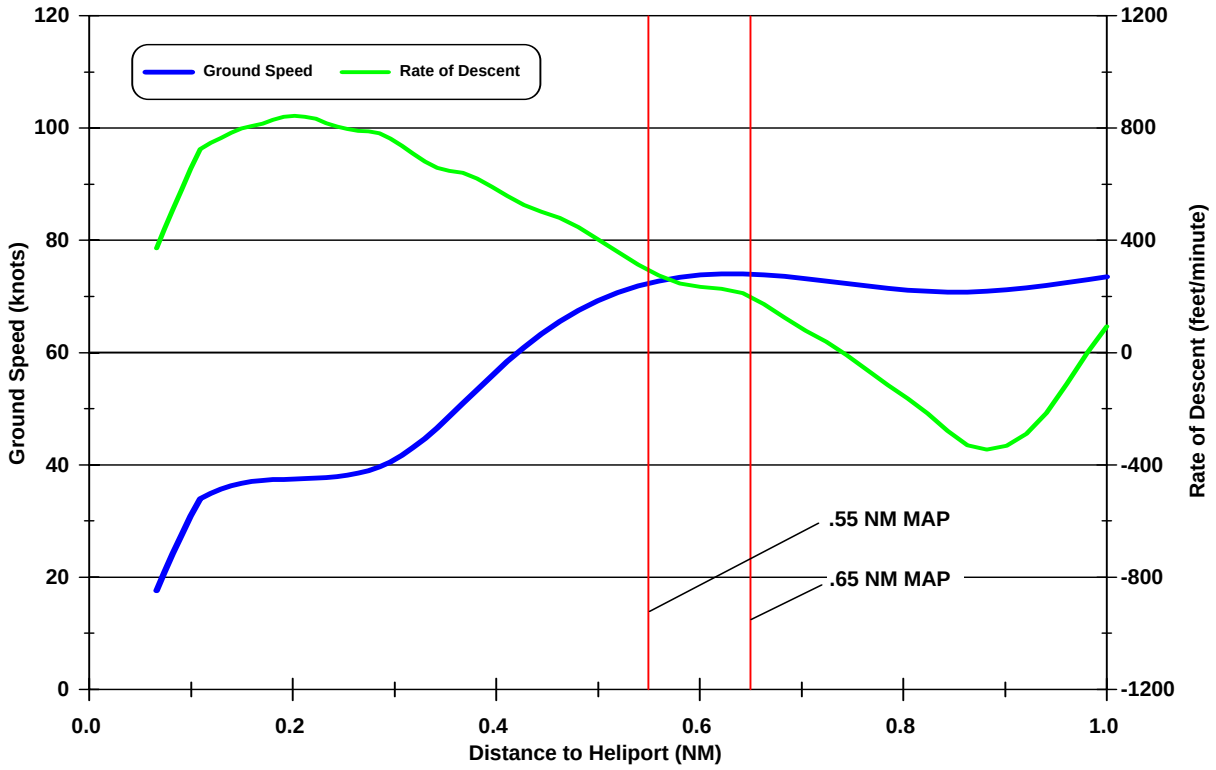



Approach - Plan View
Pilot P03 - 05/02/06a002 - App. #02W
145-Degree
Approach Course
310-Degree
Approach Course
359/16
11
318/9
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

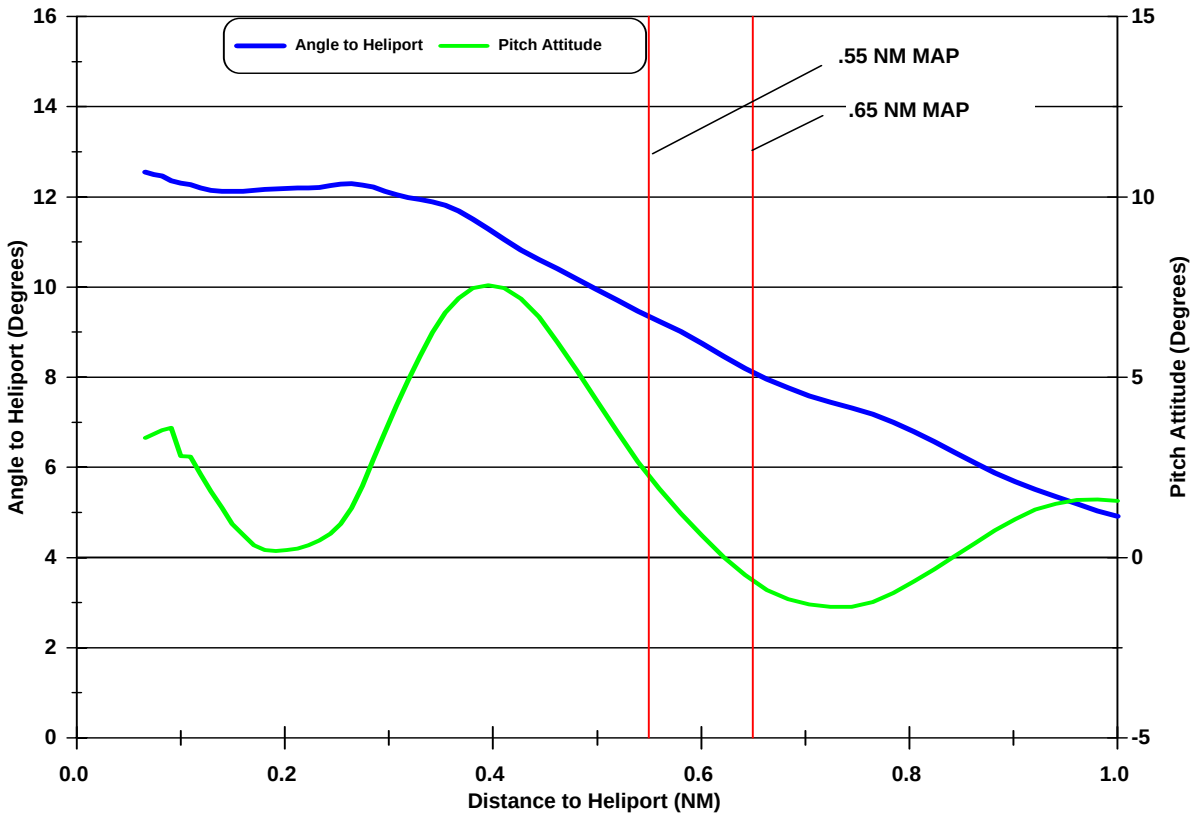
Profile View
Pilot P03 - 05/02/06a002 - App. #02W



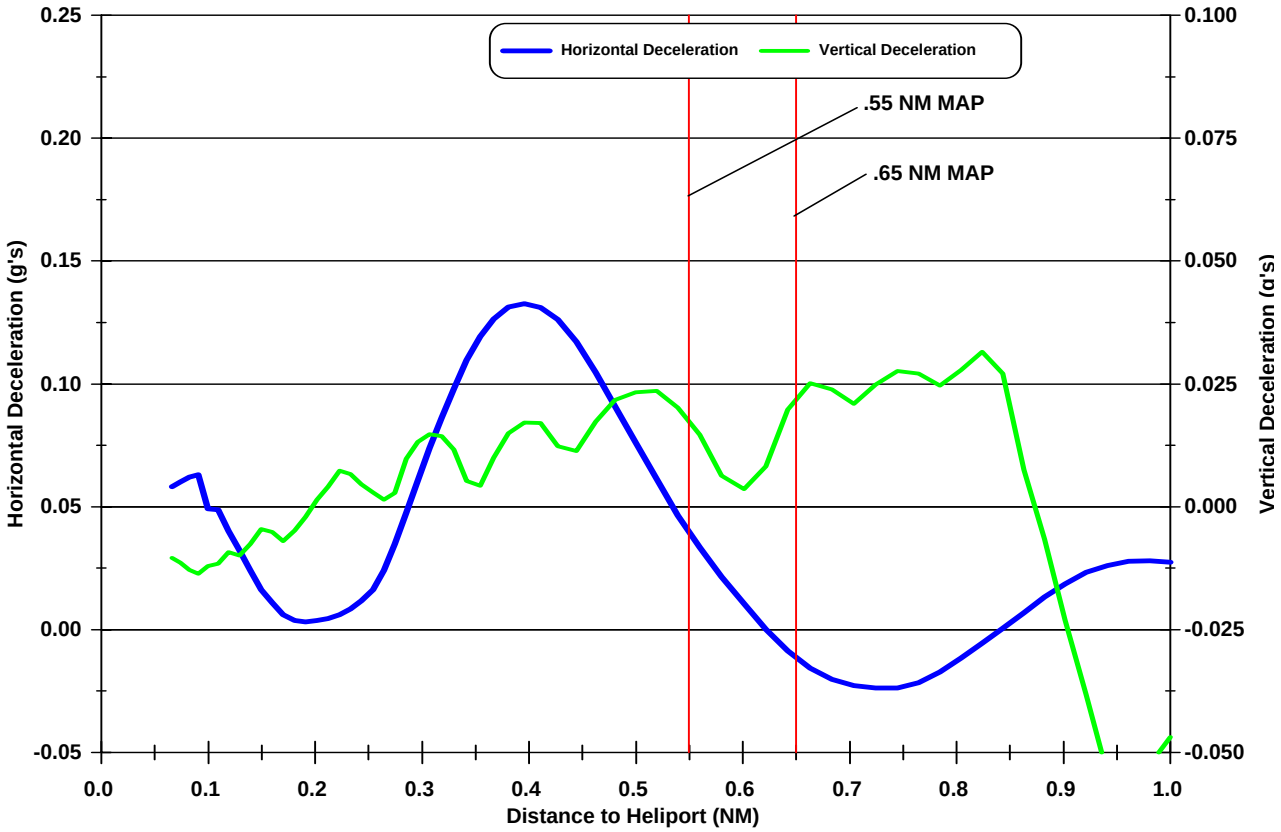
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06a002 - App. #02W

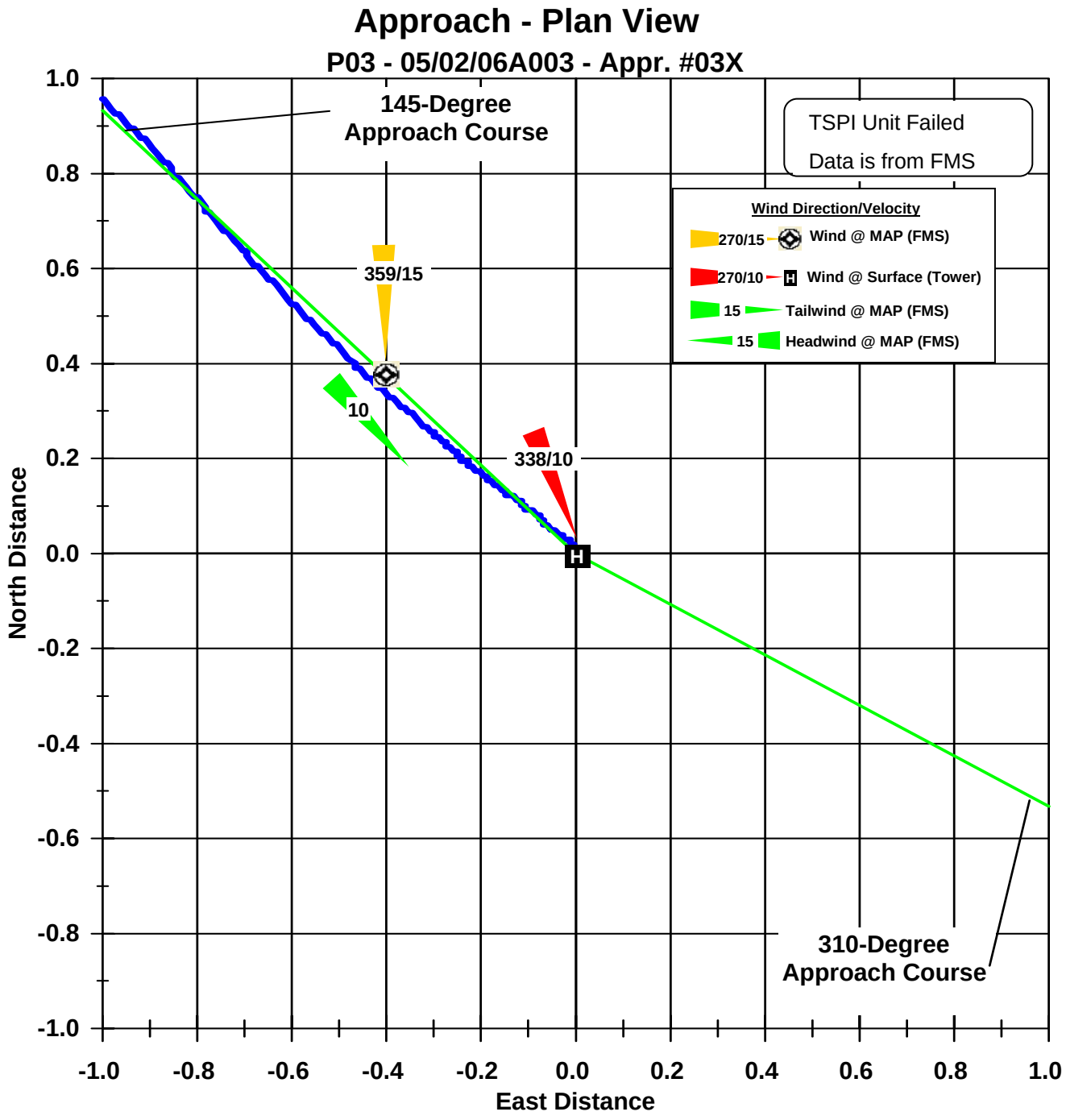


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06a002 - App. #02W

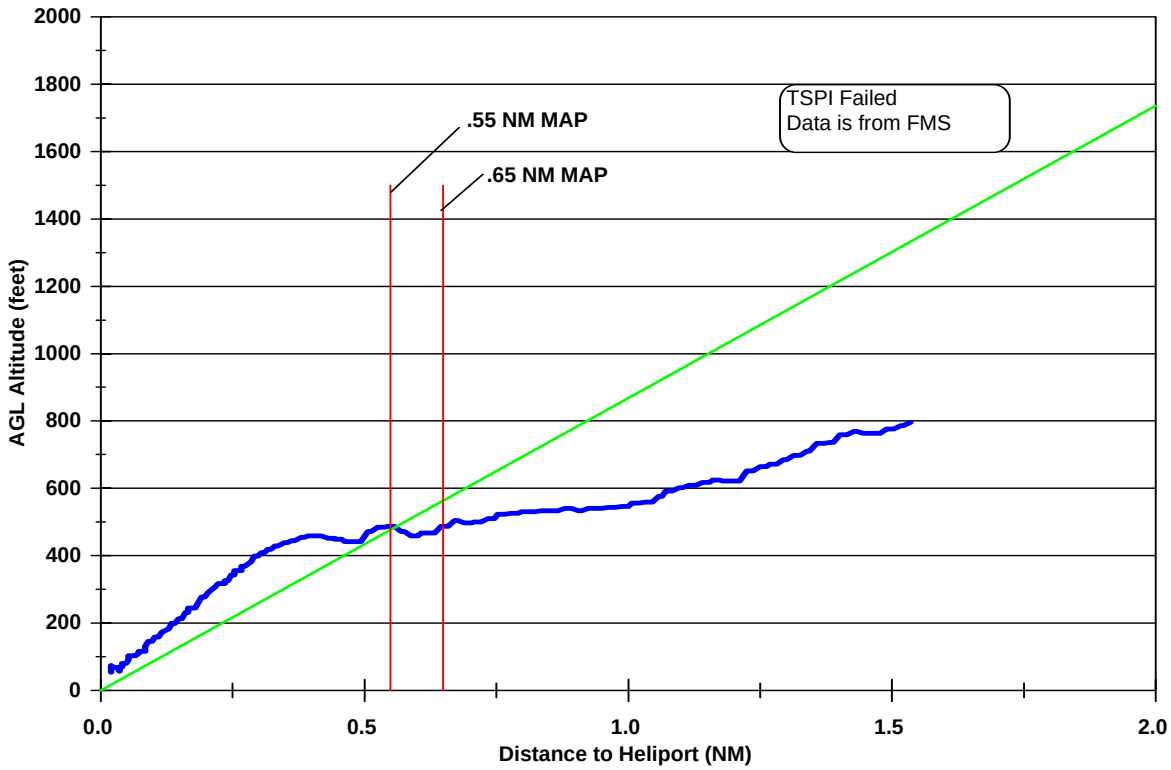


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06a002 - App. #02W

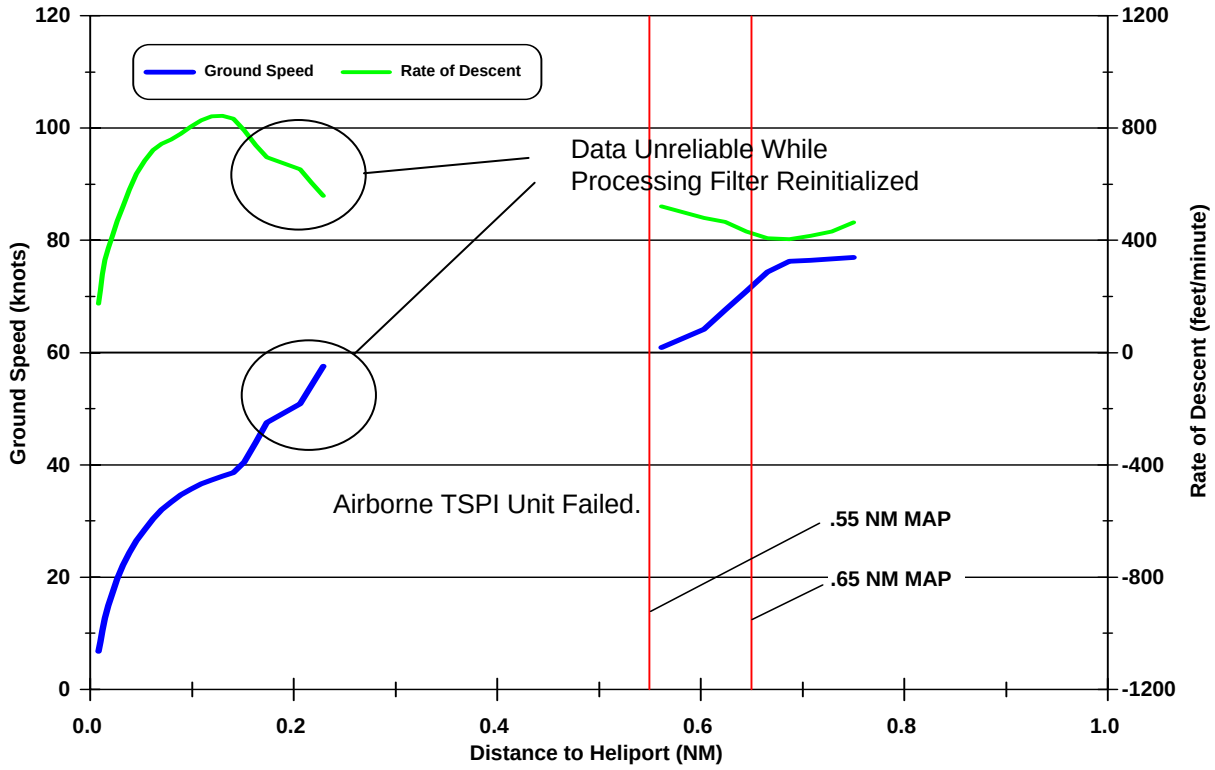



Approach - Plan View
P03 - 05/02/06A003 - Appr. #03X
145-Degree
Approach Course
TSPI Unit Failed
Data is from FMS
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
359/15
10
338/10
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

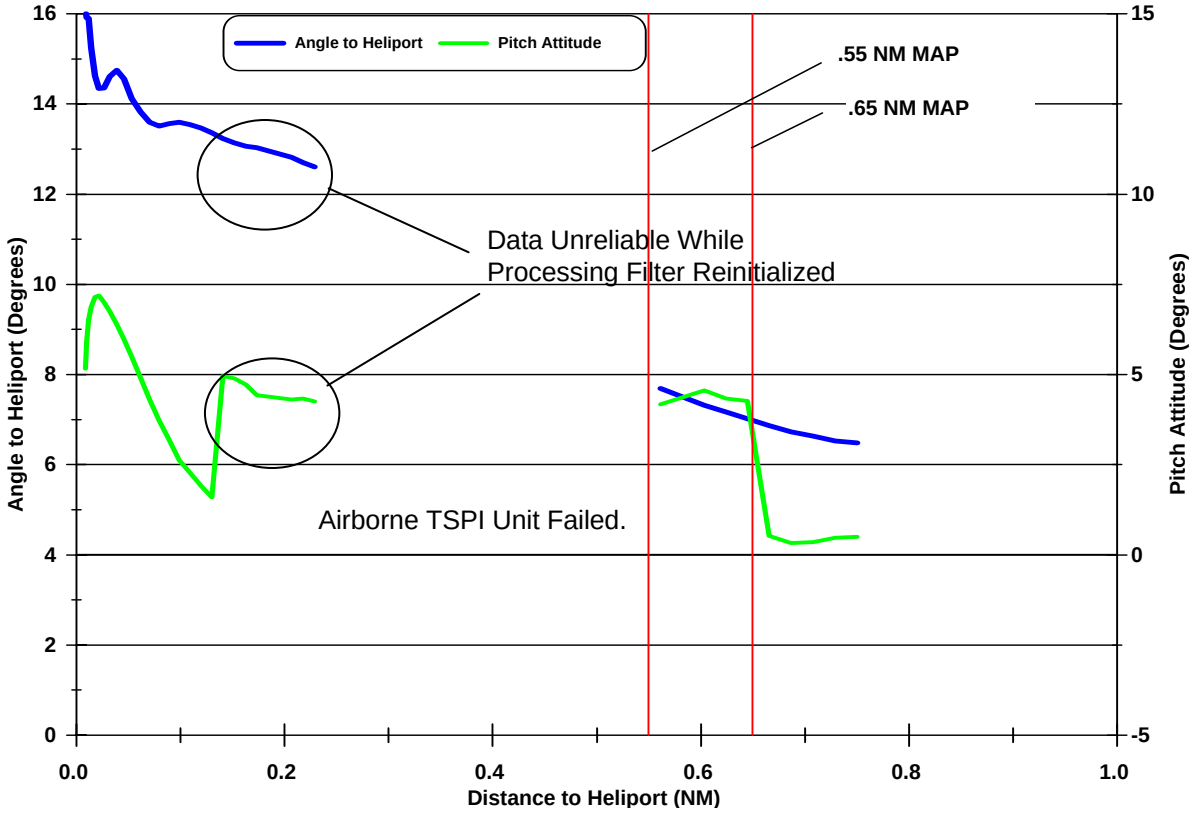
Profile View
P03 - 05/02/06A003 - Appr.#03X



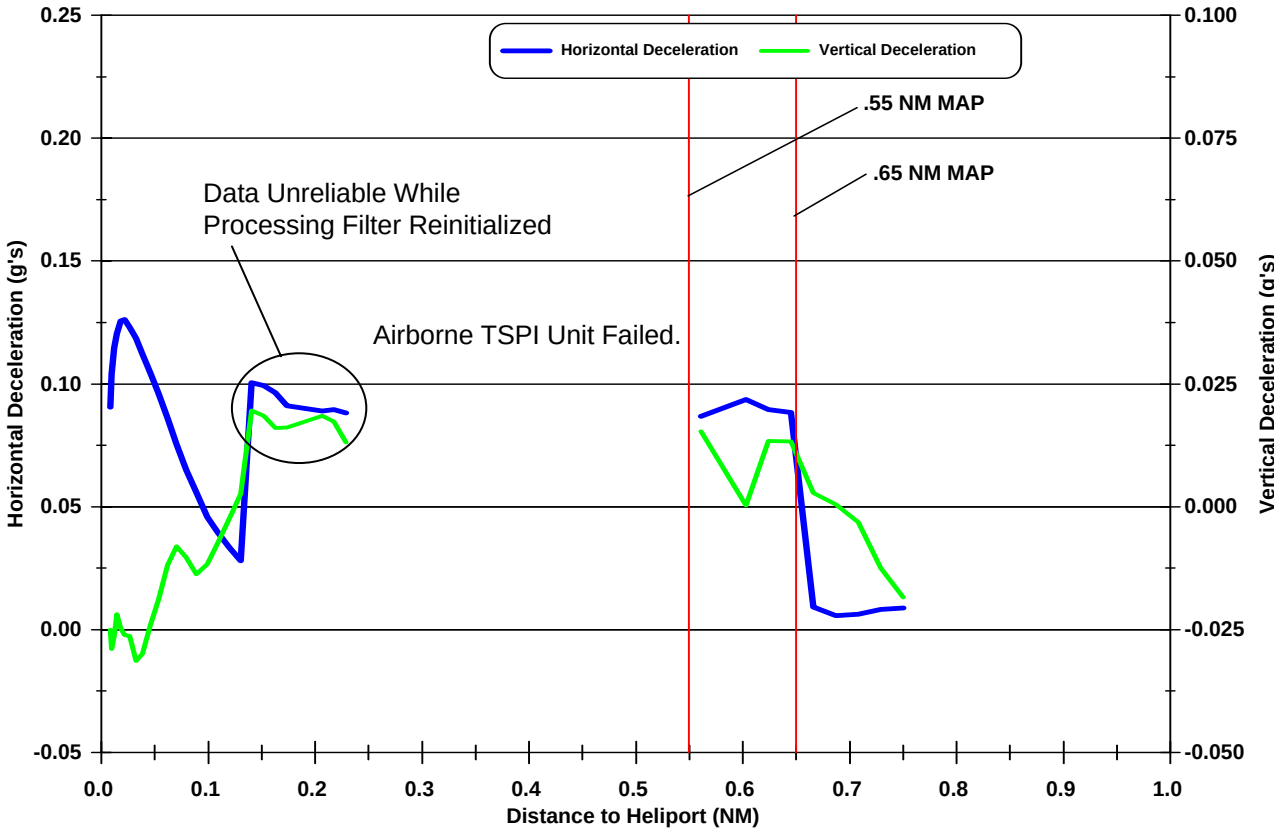
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06a003 - App. #03X

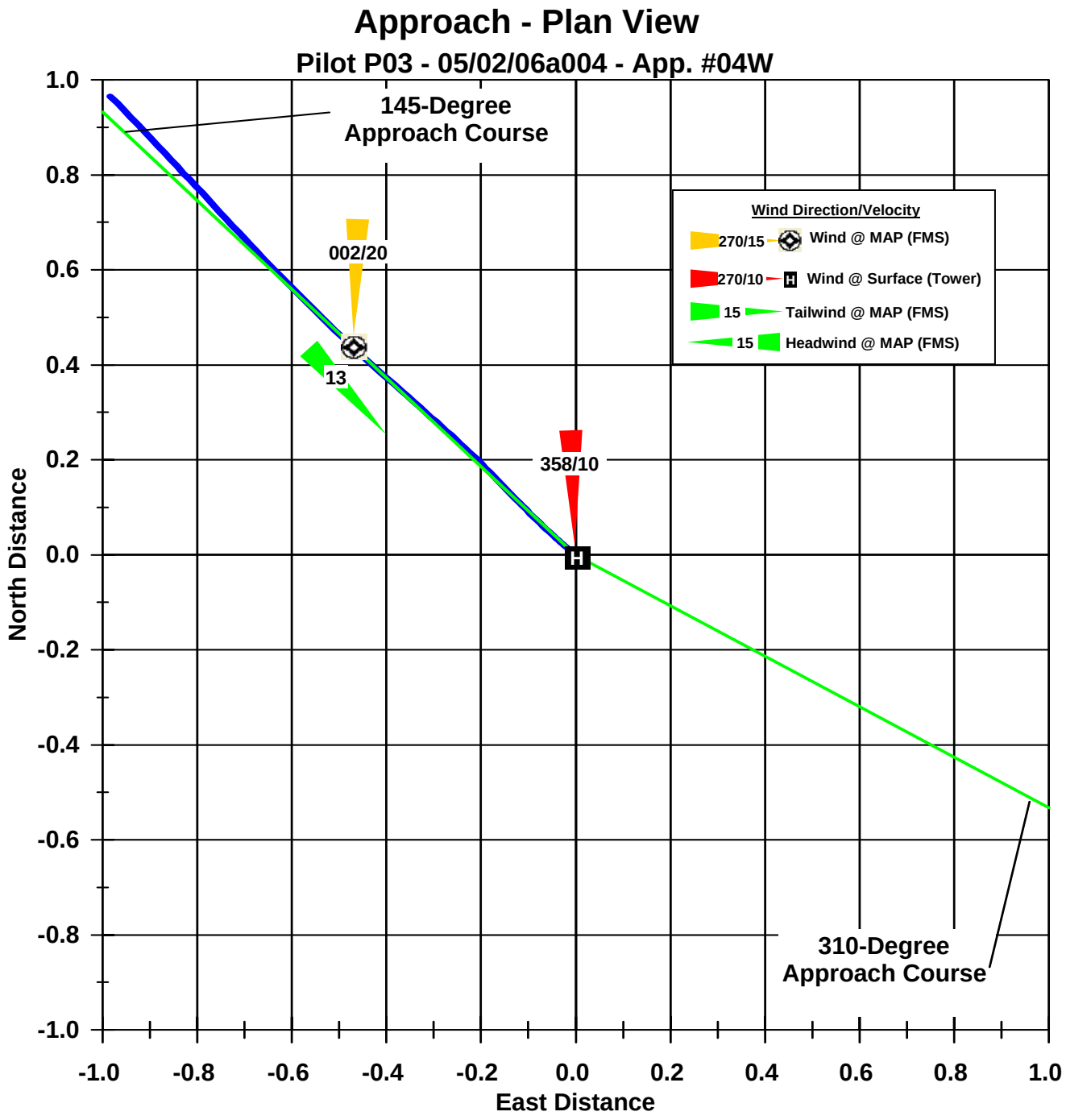


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06a003 - App. #03X

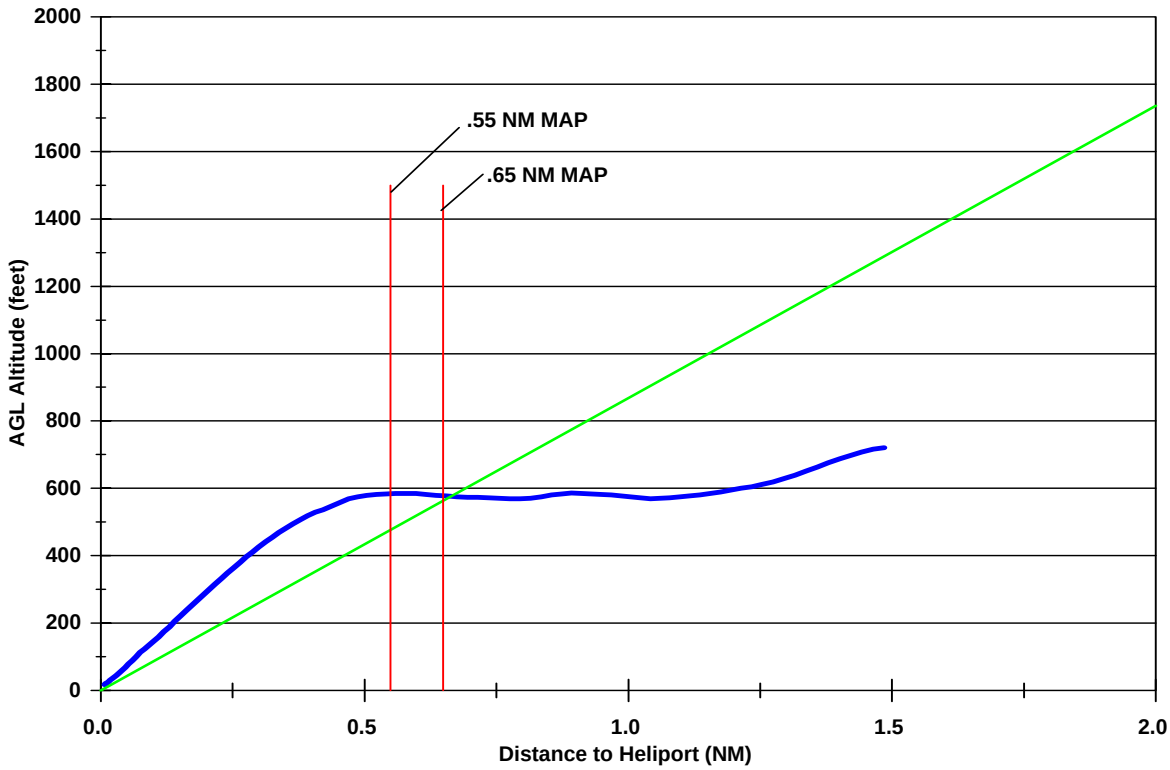


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06a003 - App. #03X

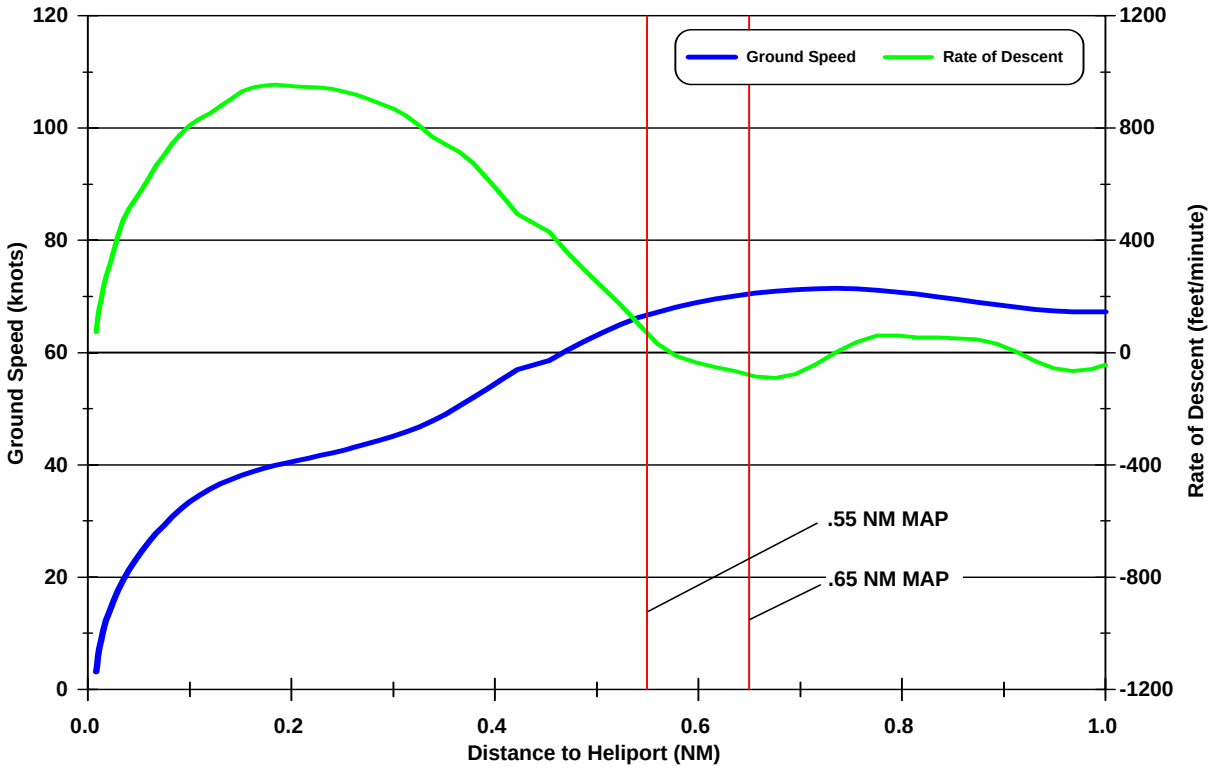



Approach - Plan View
Pilot P03 - 05/02/06a004 - App. #04W
145-Degree
Approach Course
002/20
13
358/10
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

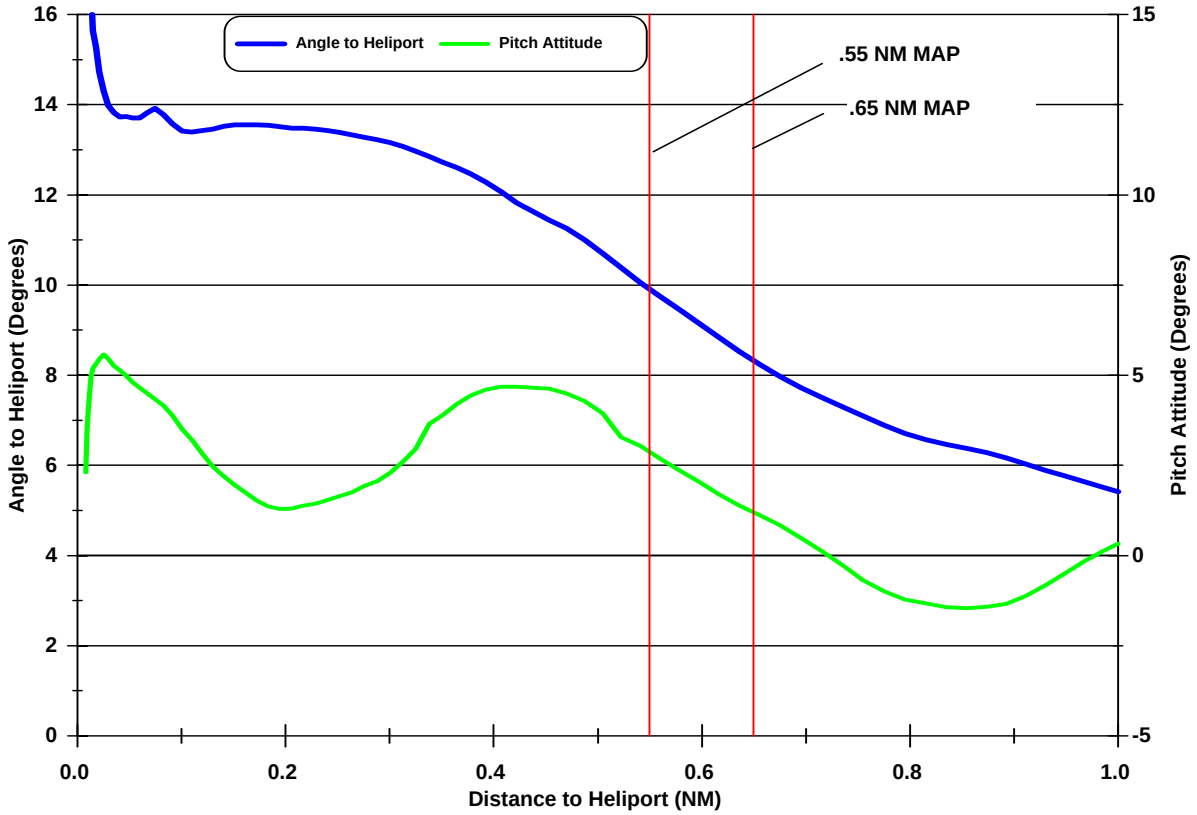
Profile View
Pilot P03 - 05/02/06a004 - App. #04W



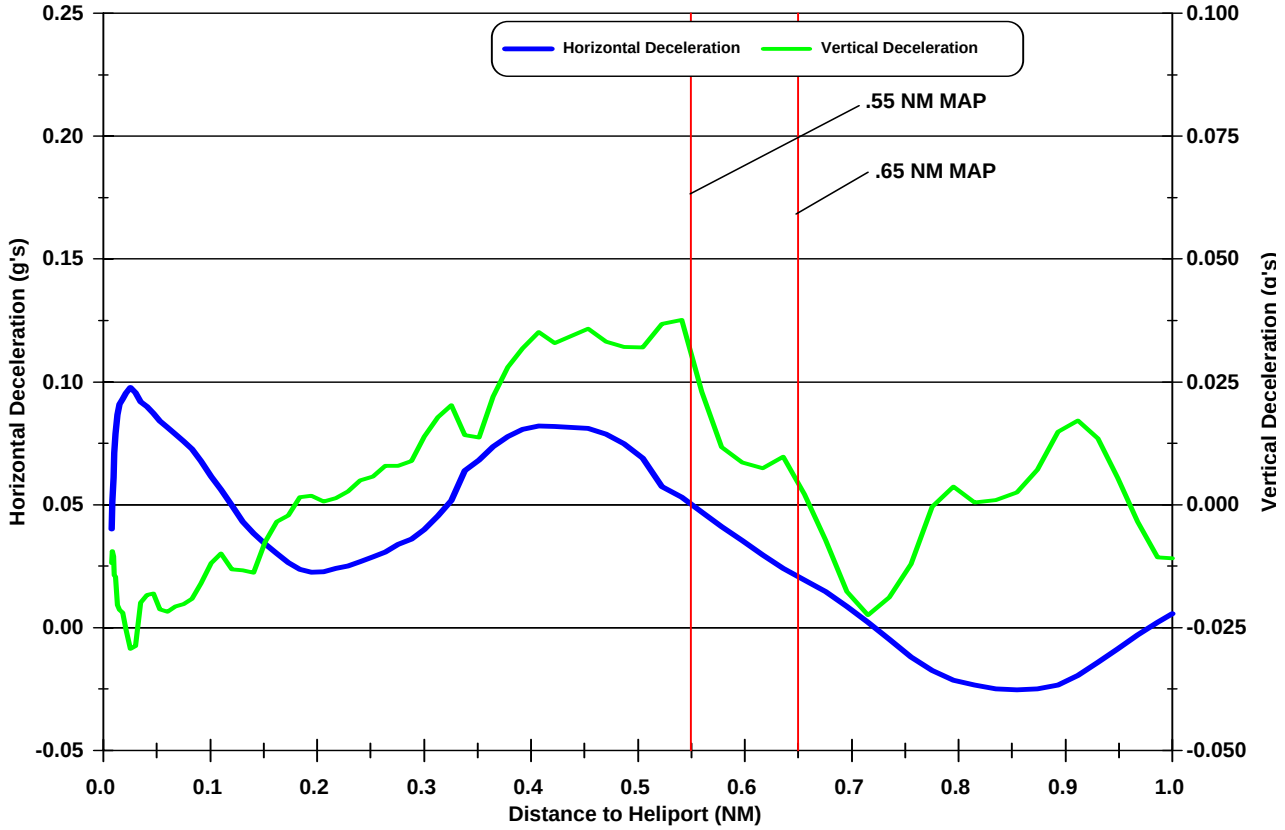
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06a004 - App. #04W

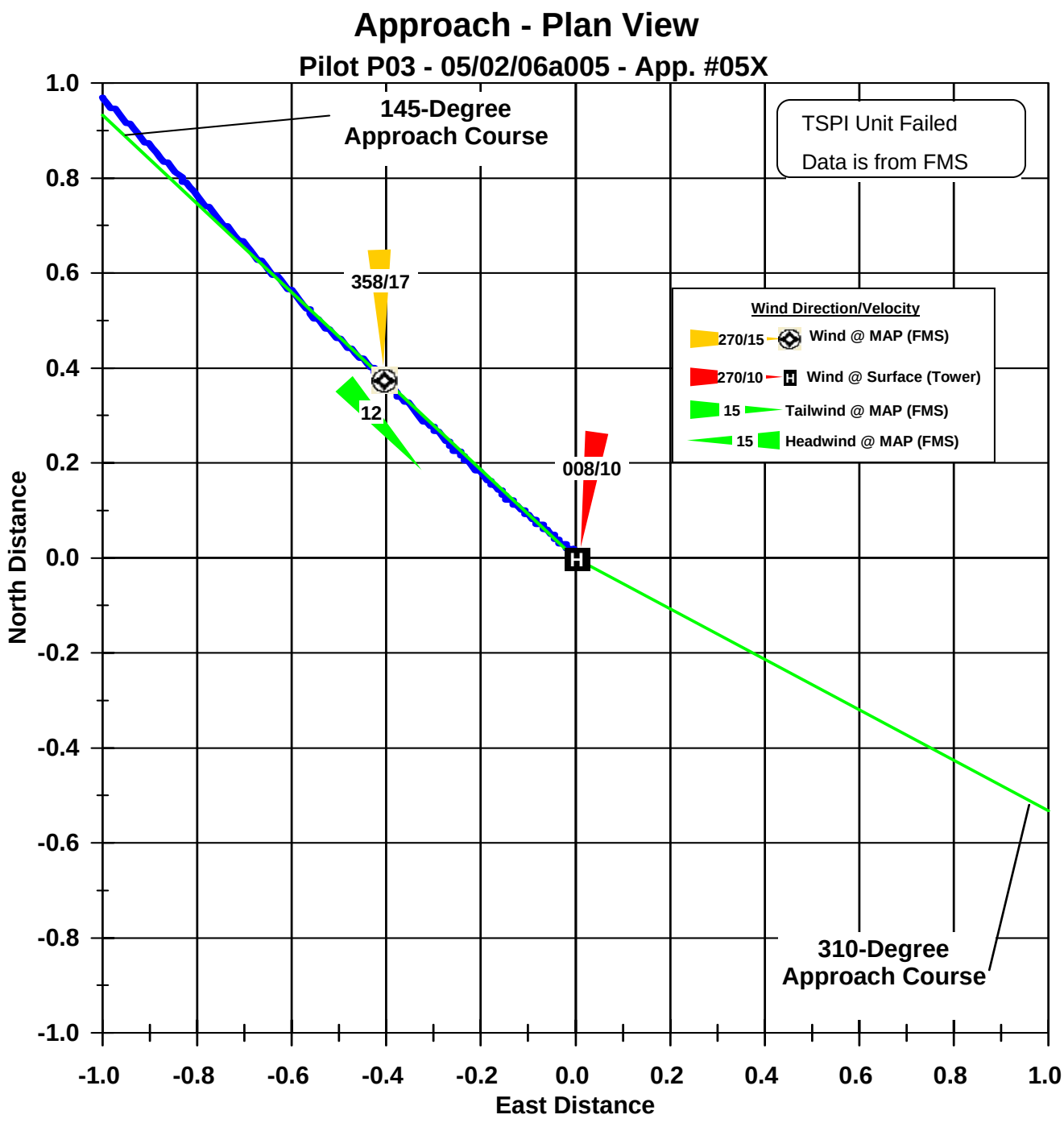


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06a004 - App. #04W

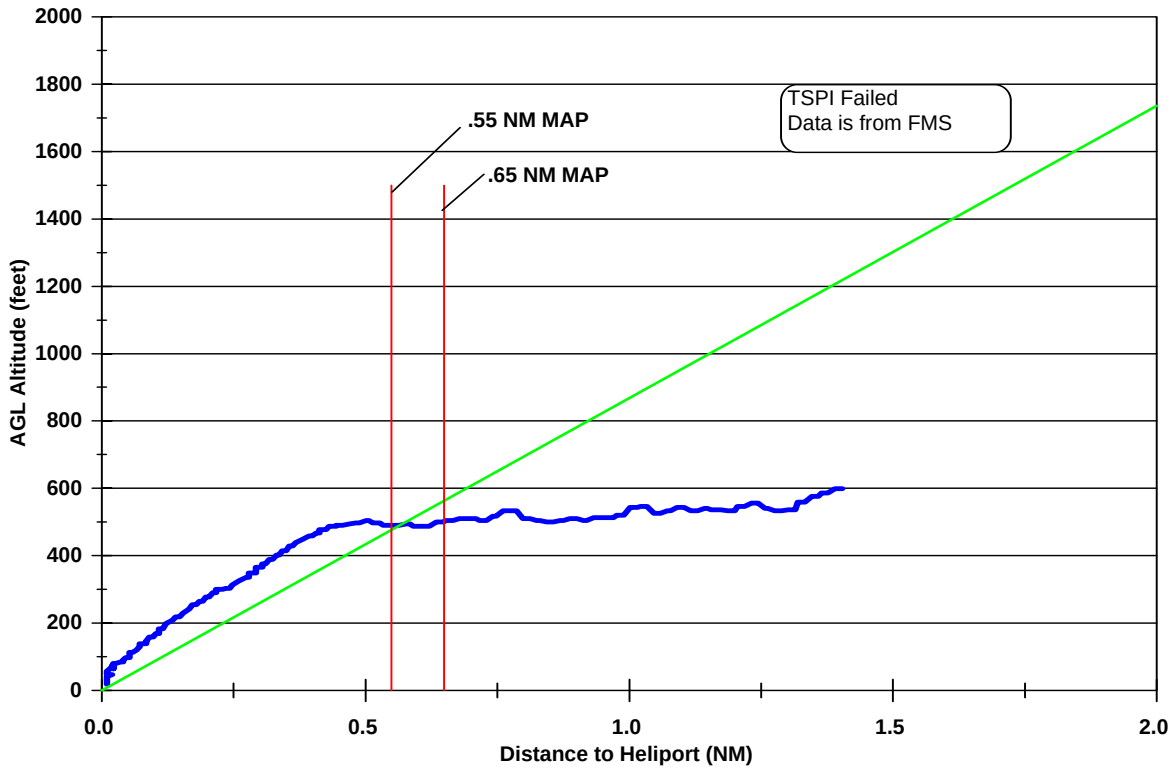


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06a004 - App. #04W

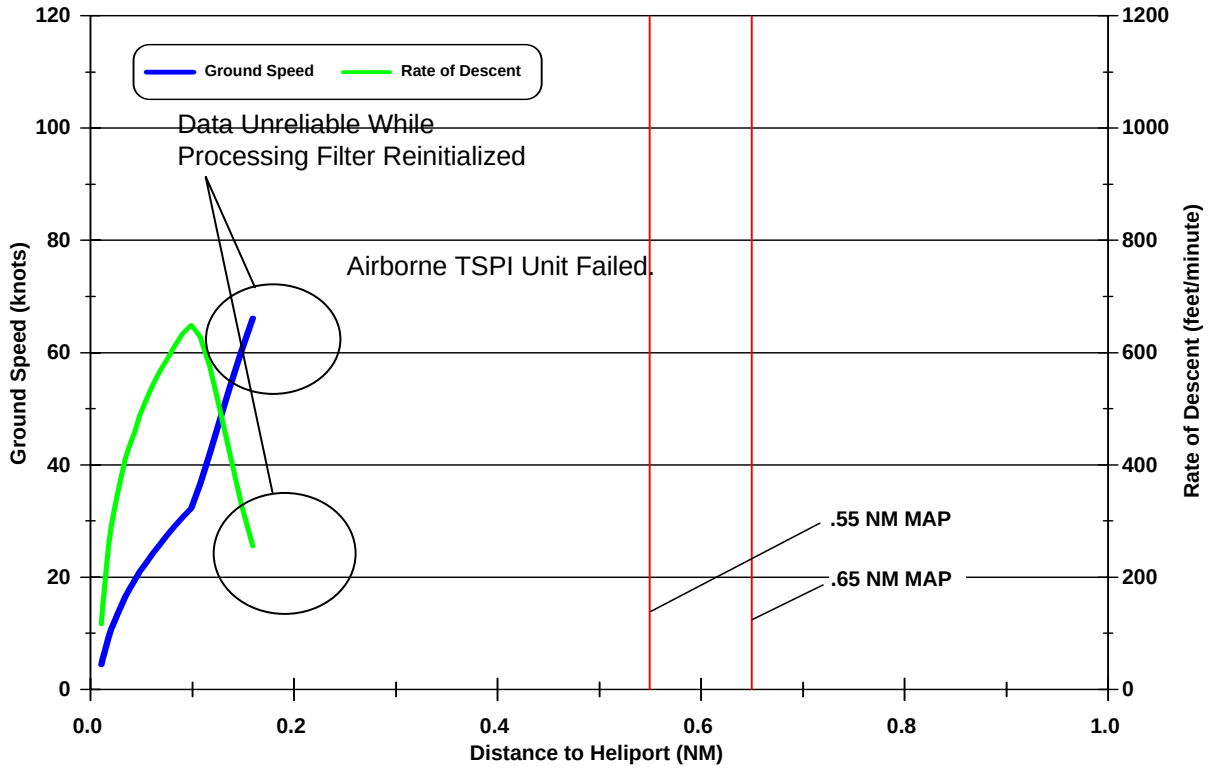



Approach - Plan View
Pilot P03 - 05/02/06a005 - App. #05X
145-Degree
Approach Course
TSPI Unit Failed
Data is from FMS
358/17
12
008/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

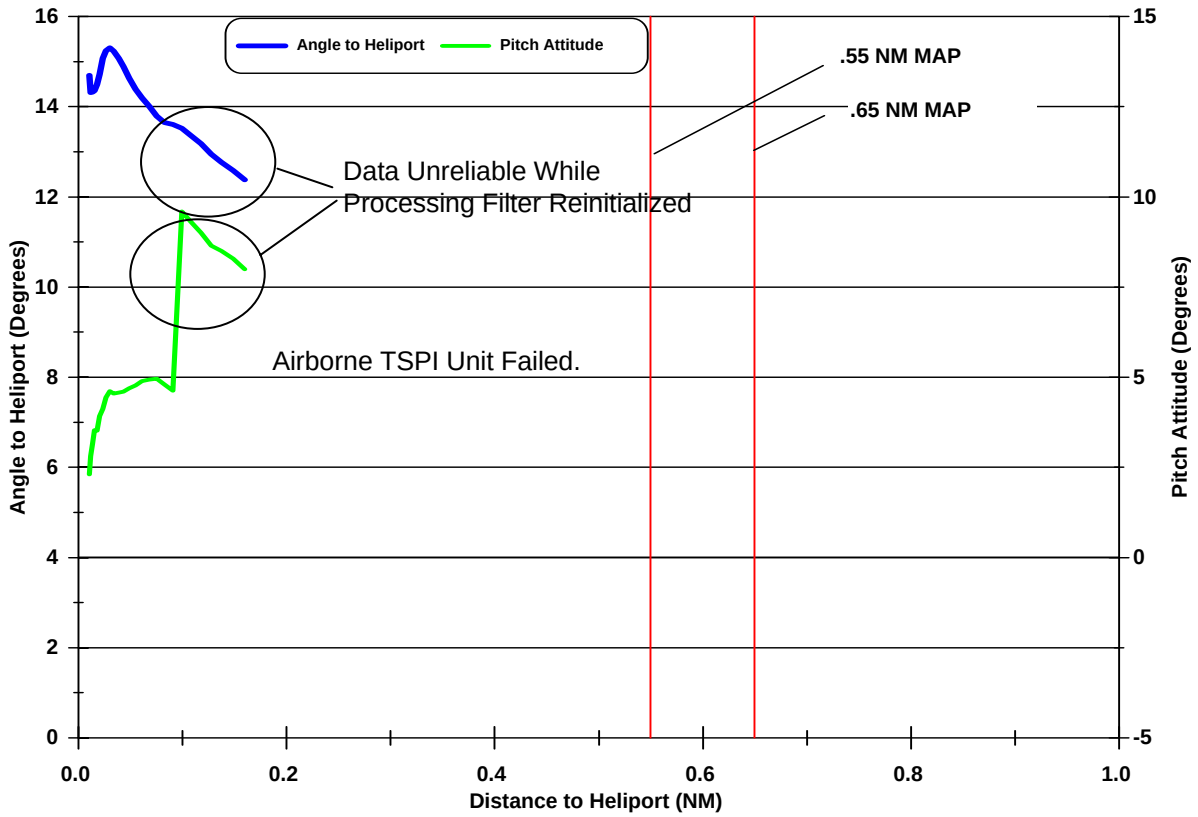
Profile View
P03 - 05/02/06A005 - Appr.#05X



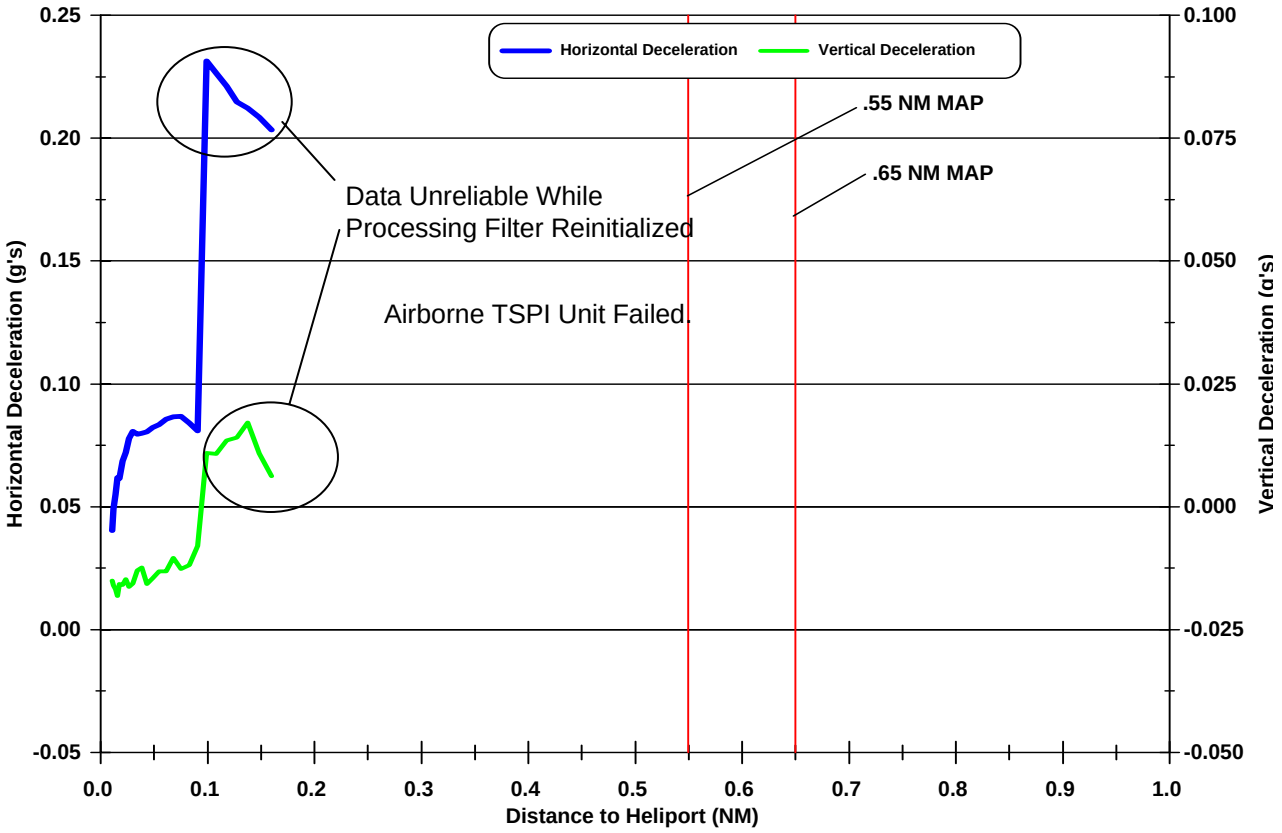
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06a005 - App. #05X

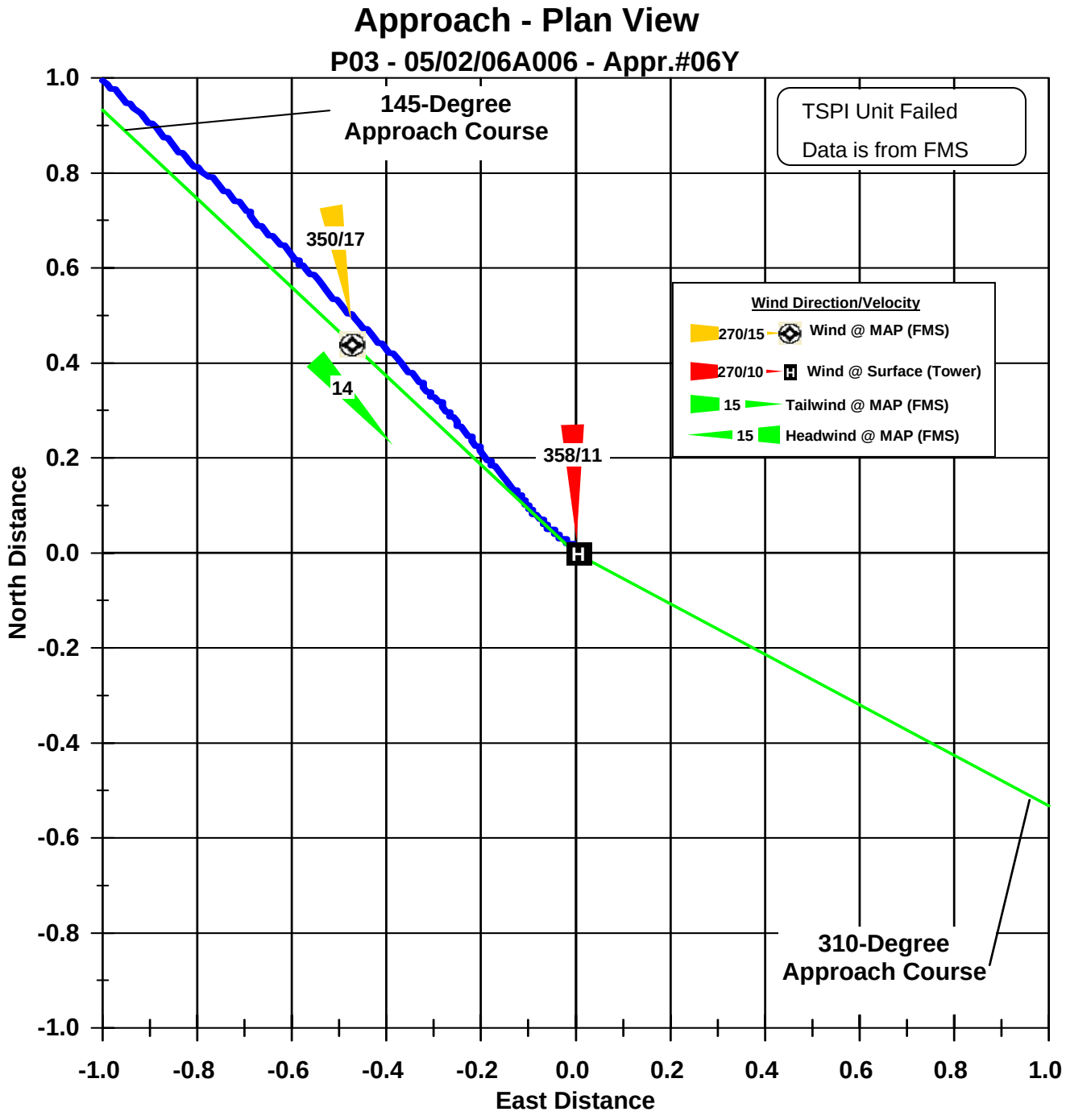


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06a005 - App. #05X

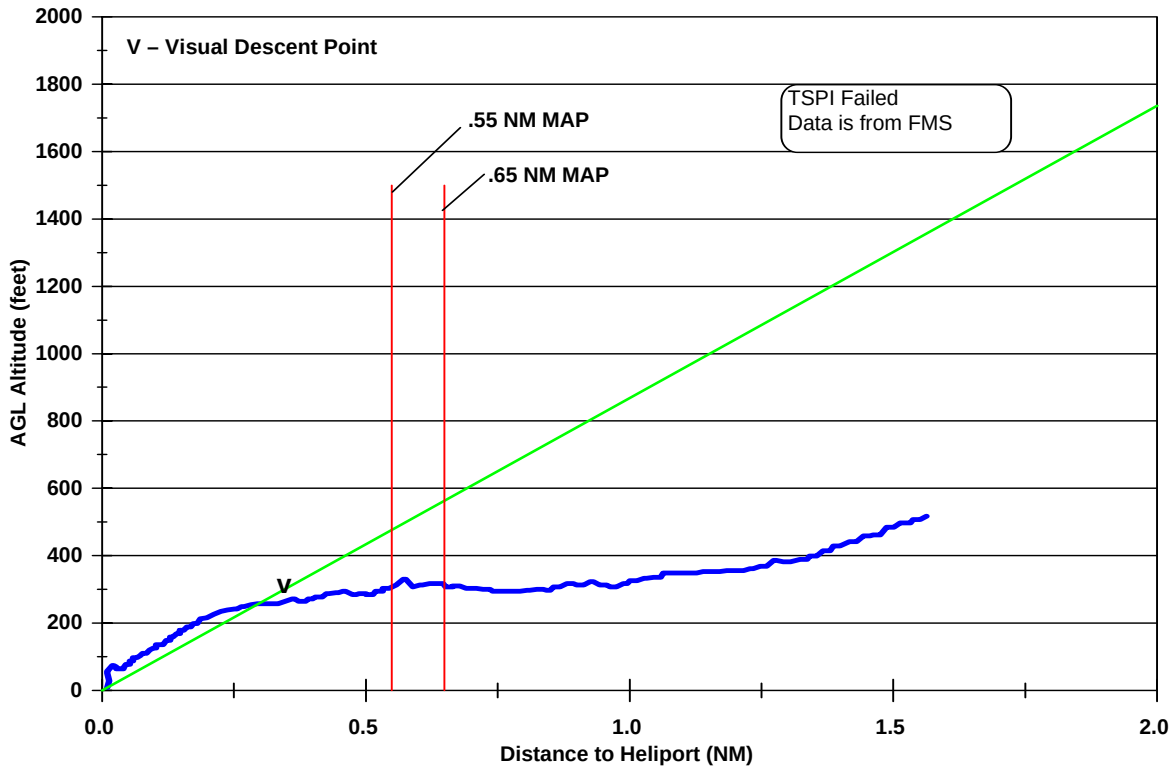


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06a005 - App. #05X

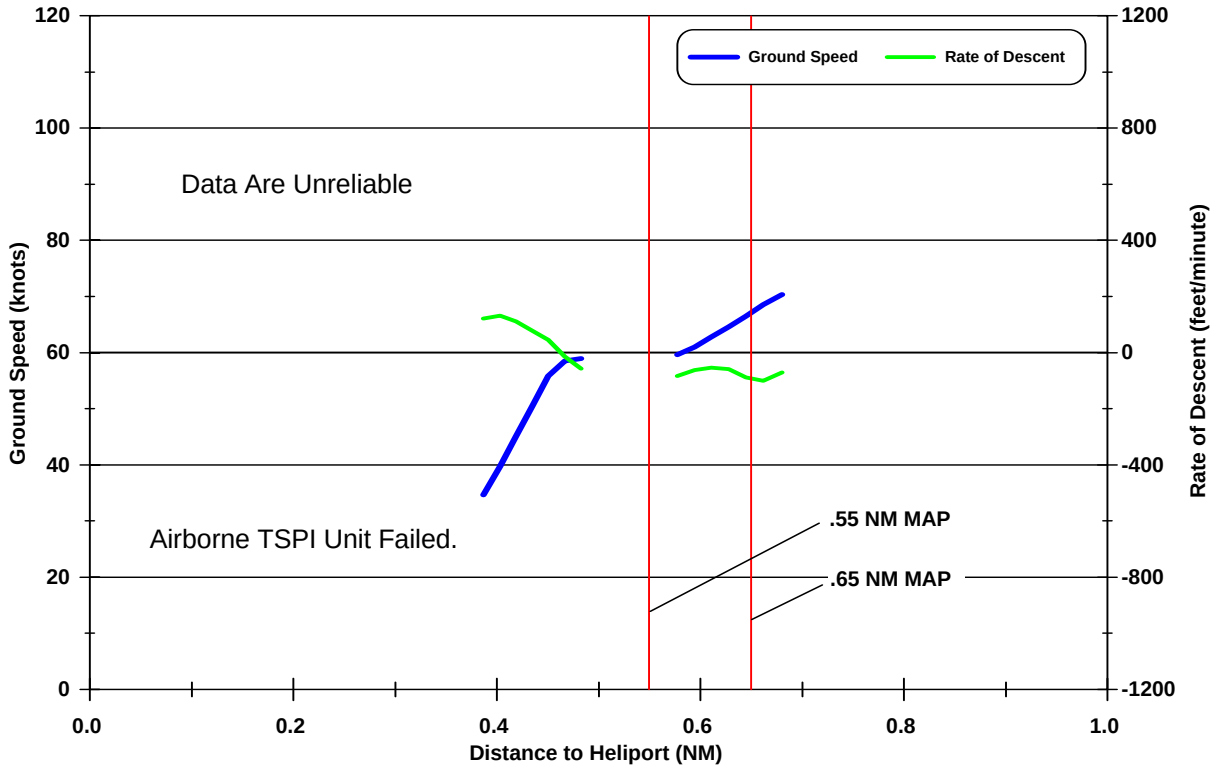



Approach - Plan View
P03 - 05/02/06A006 - Appr.#06Y
145-Degree
Approach Course
TSPI Unit Failed
Data is from FMS
350/17
14
358/11
H
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

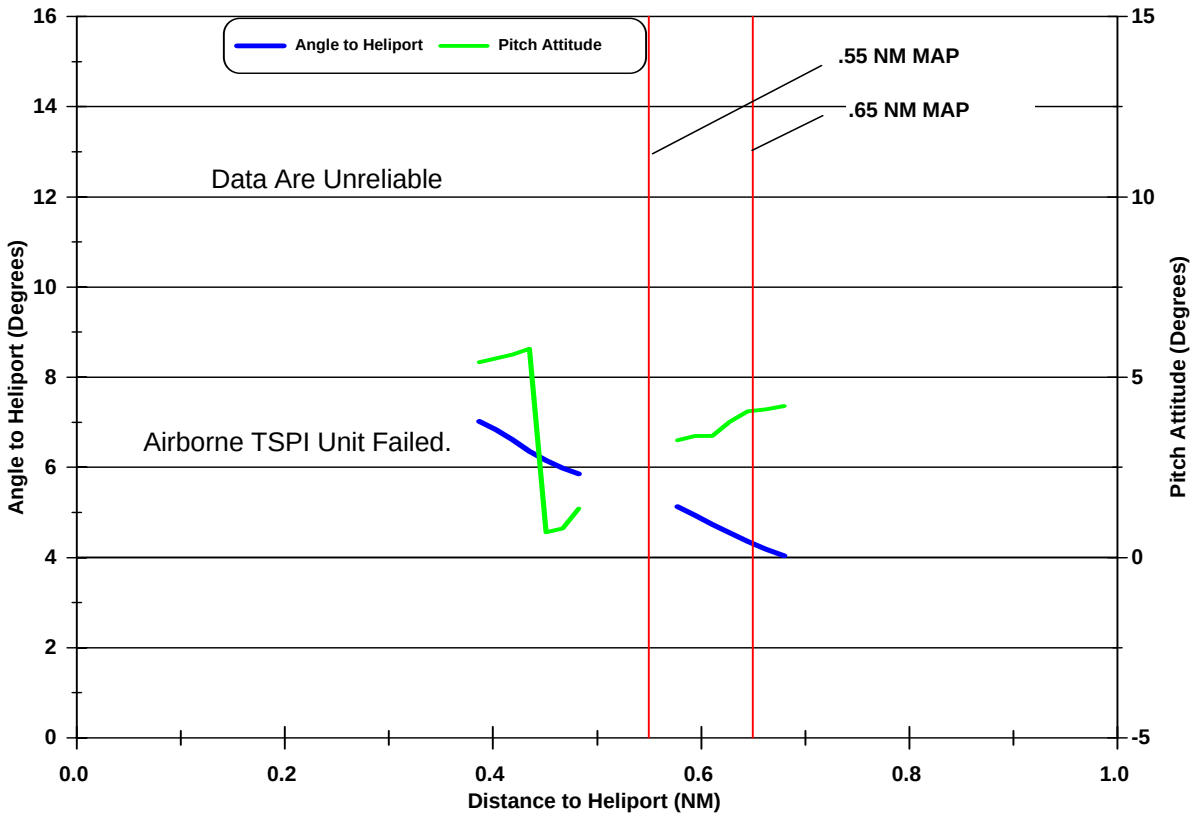
Profile View
P03 - 05/02/06A006 - Appr.#06Y



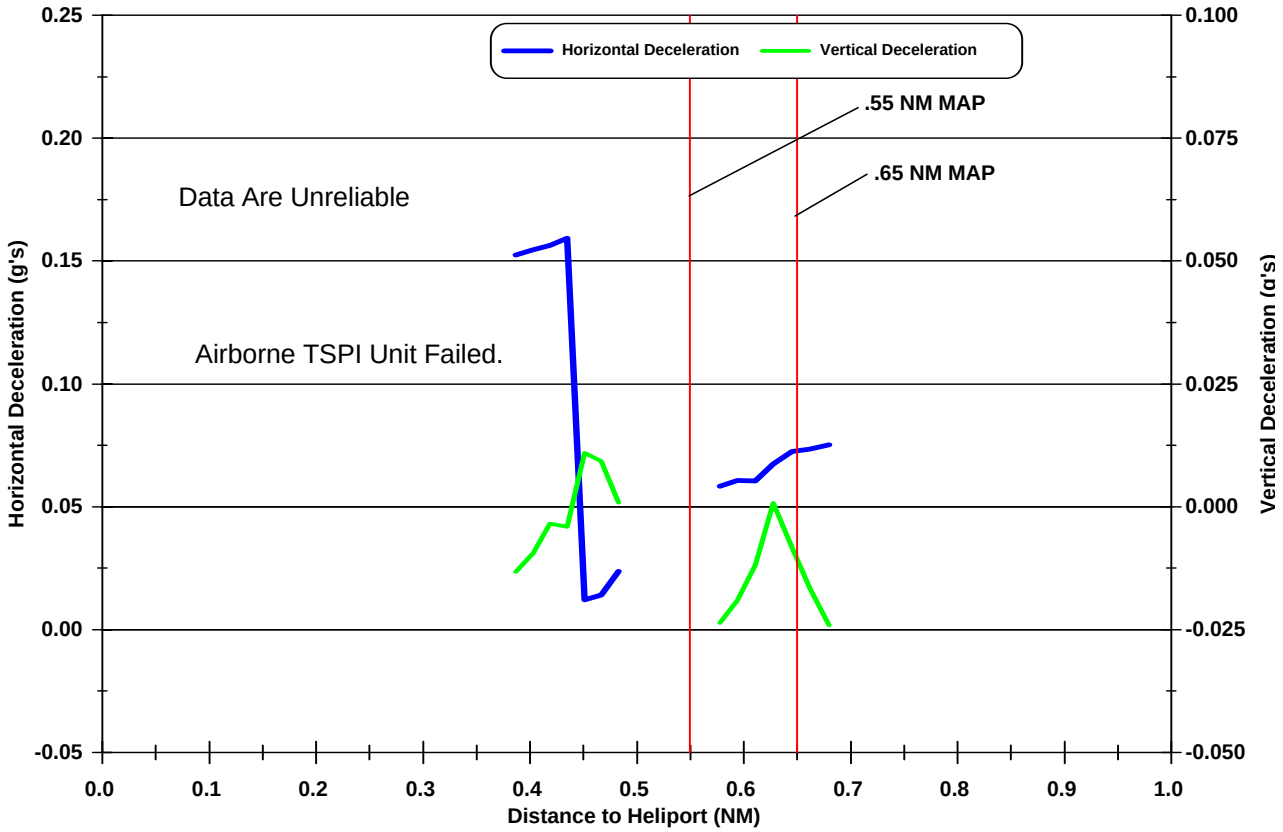
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06a006 - App. #06Y

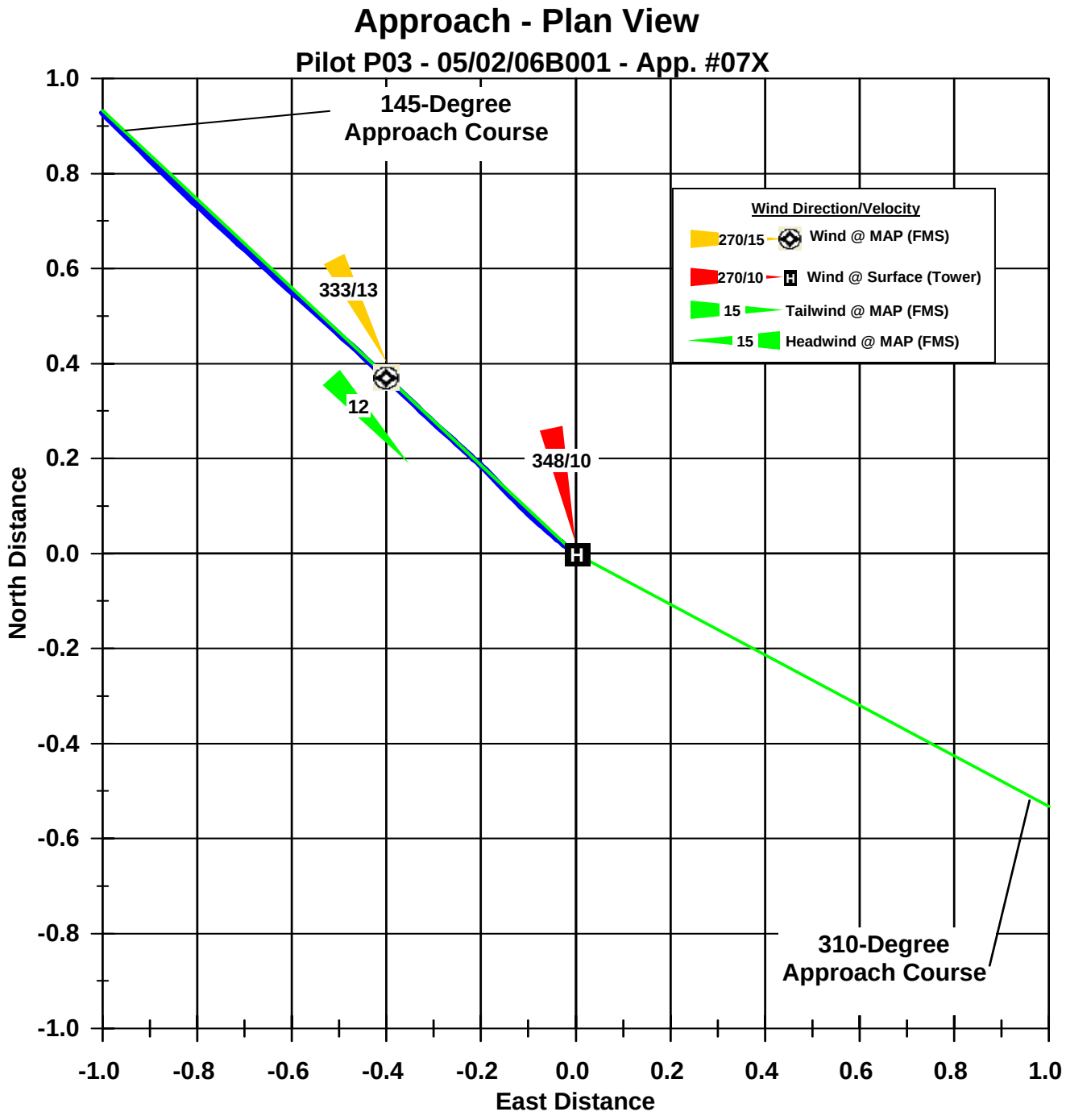


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06a006 - App. #06Y

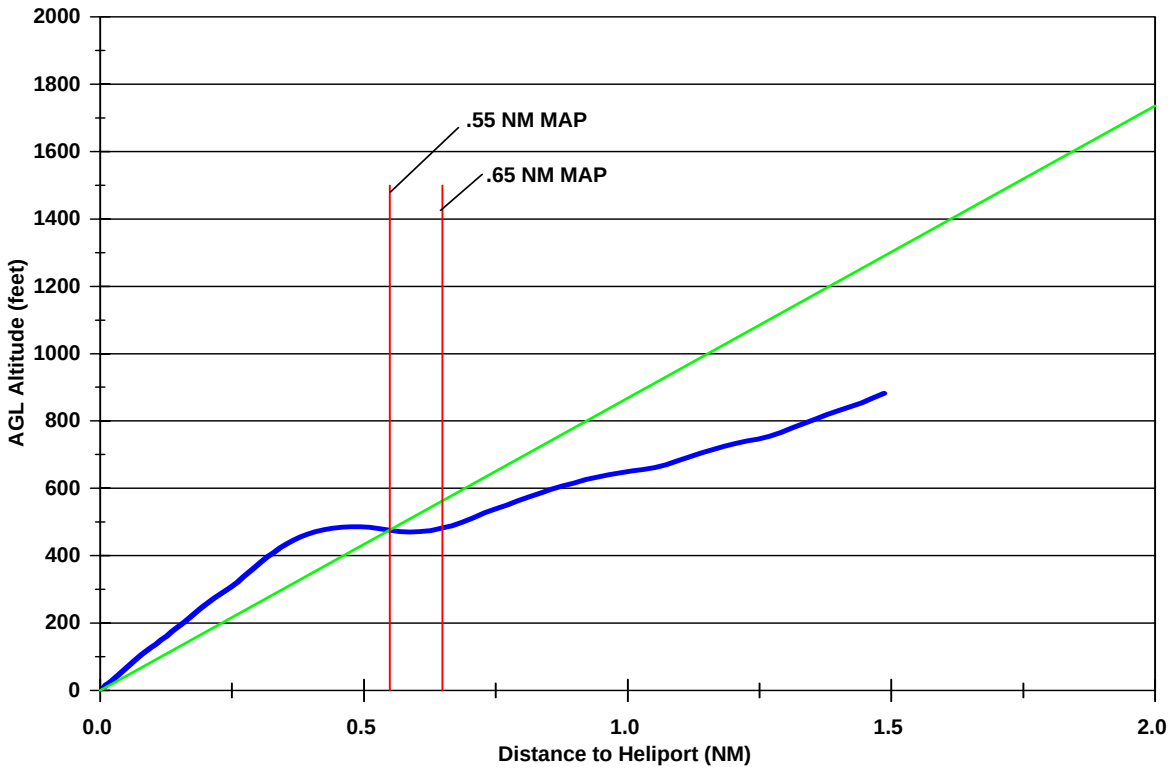


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06a006 - App. #06Y

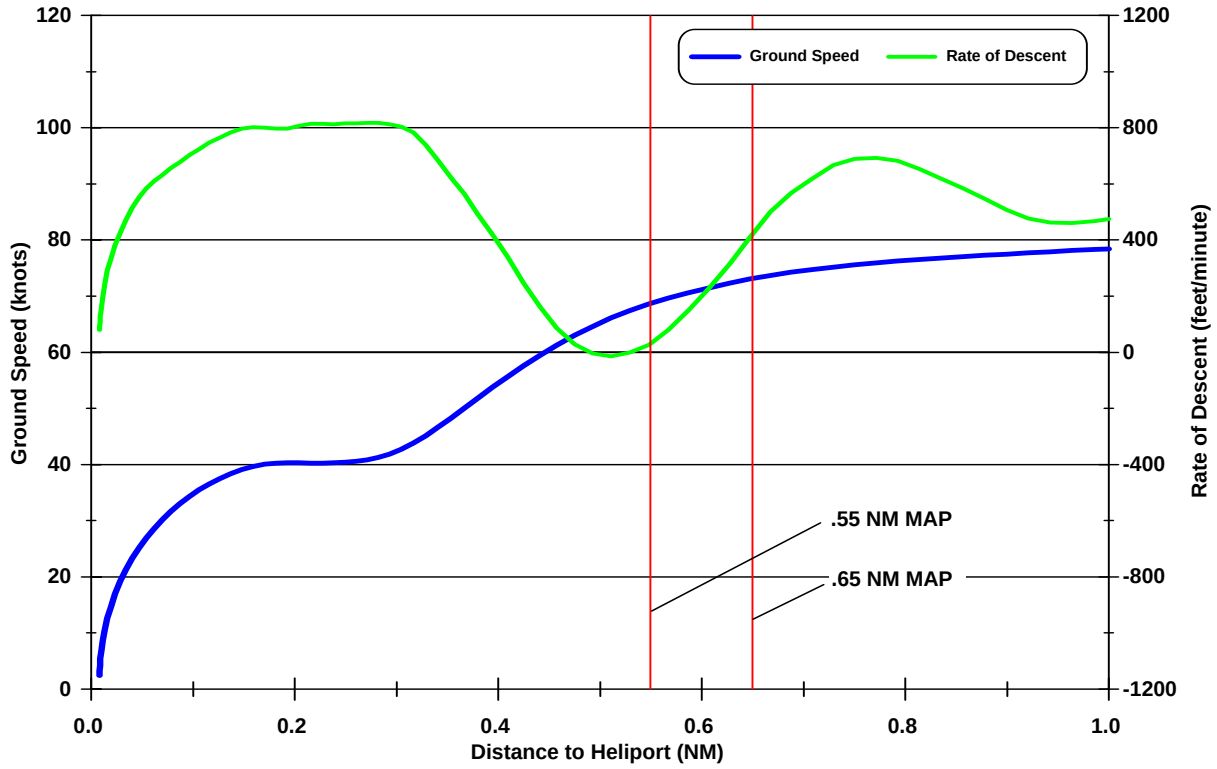



Approach - Plan View
Pilot P03 - 05/02/06B001 - App. #07X
145-Degree
Approach Course
310-Degree
Approach Course
333/13
12
348/10
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

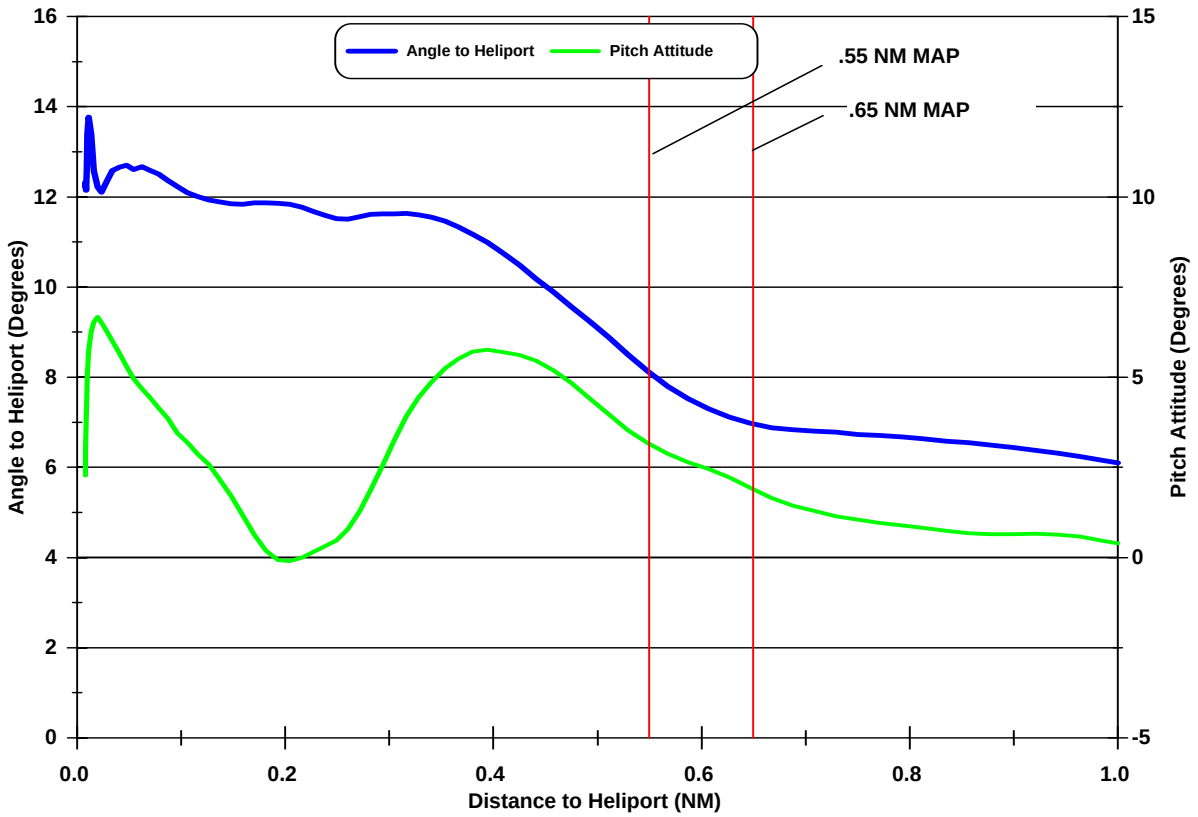
Profile View
Pilot P03 - 05/02/06B001 - App. #07X



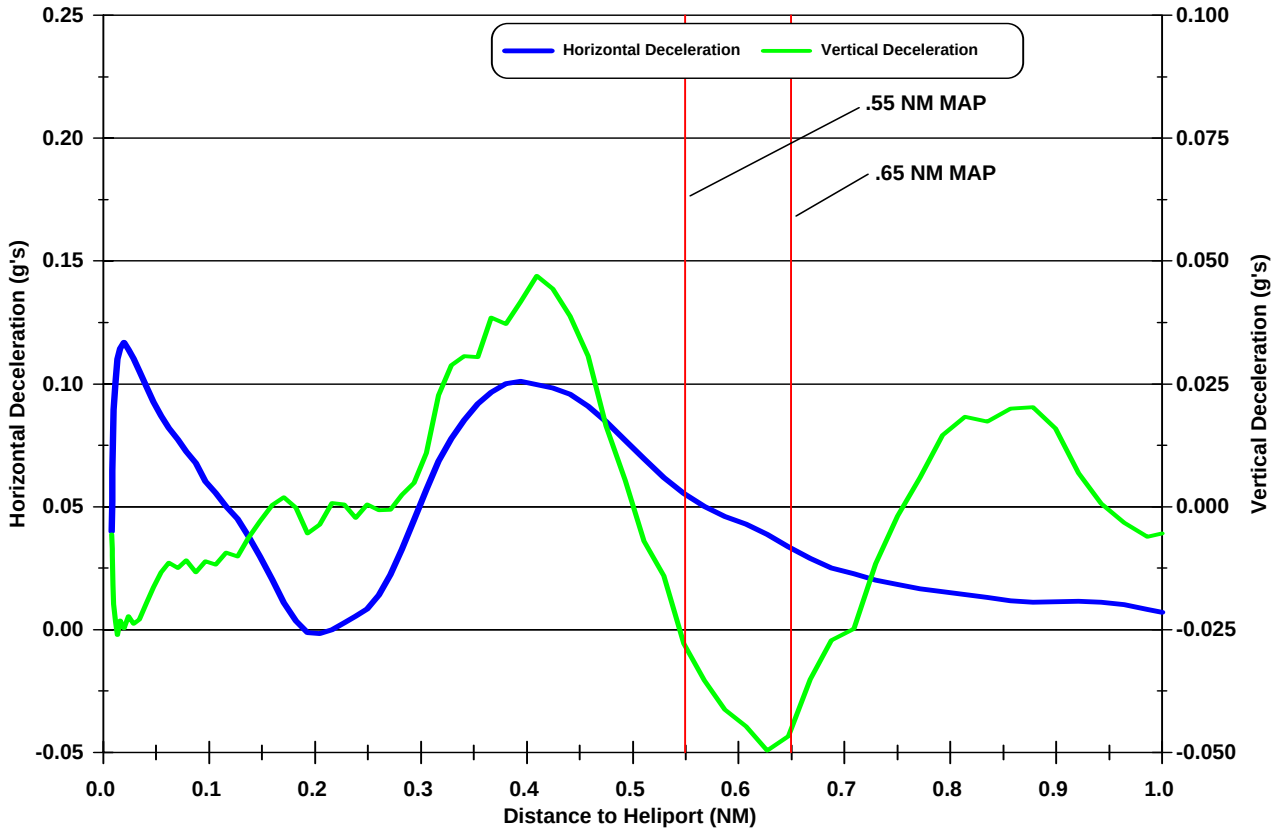
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06B001 - App. #07X

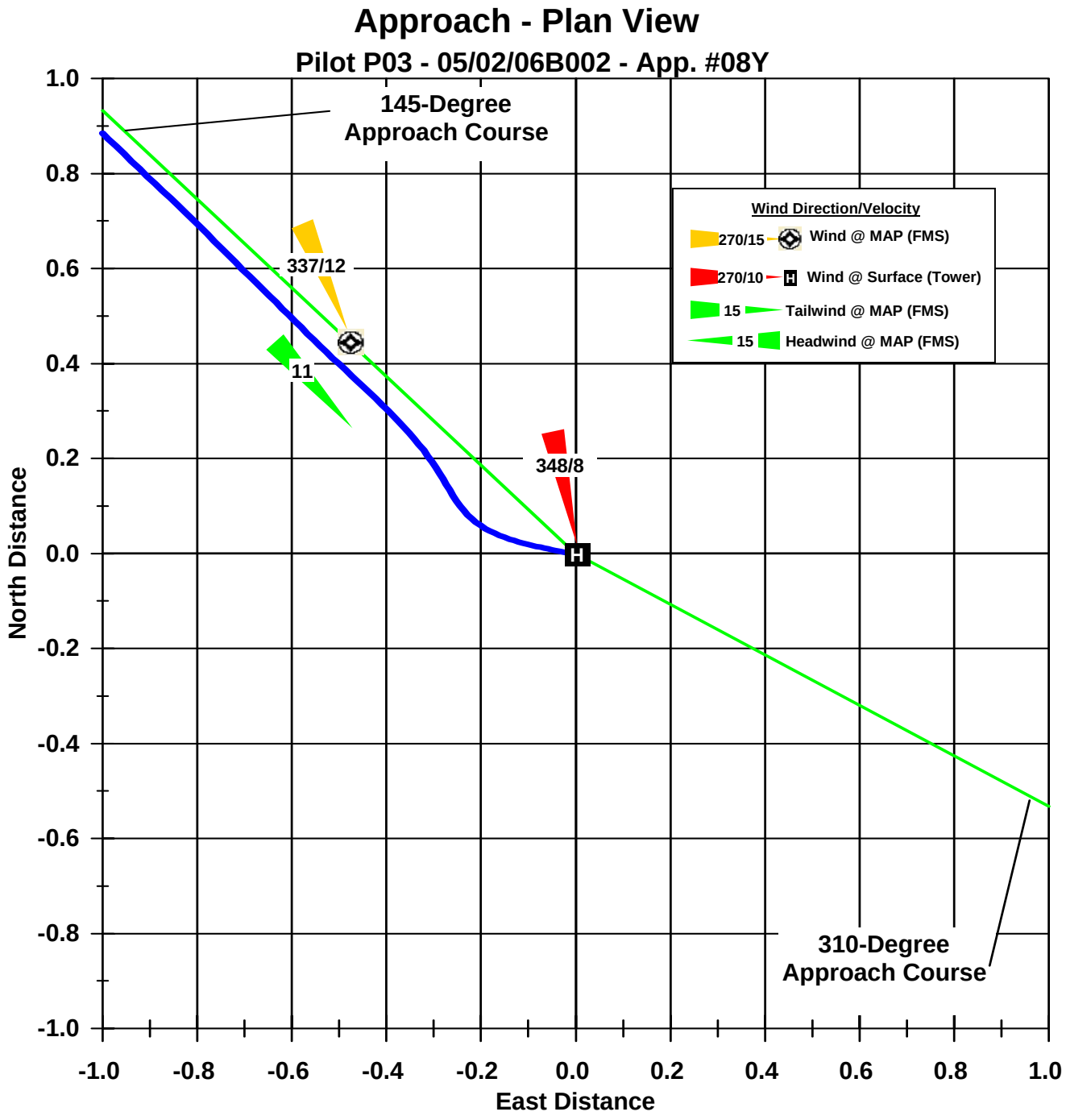


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06B001 - App. #07X

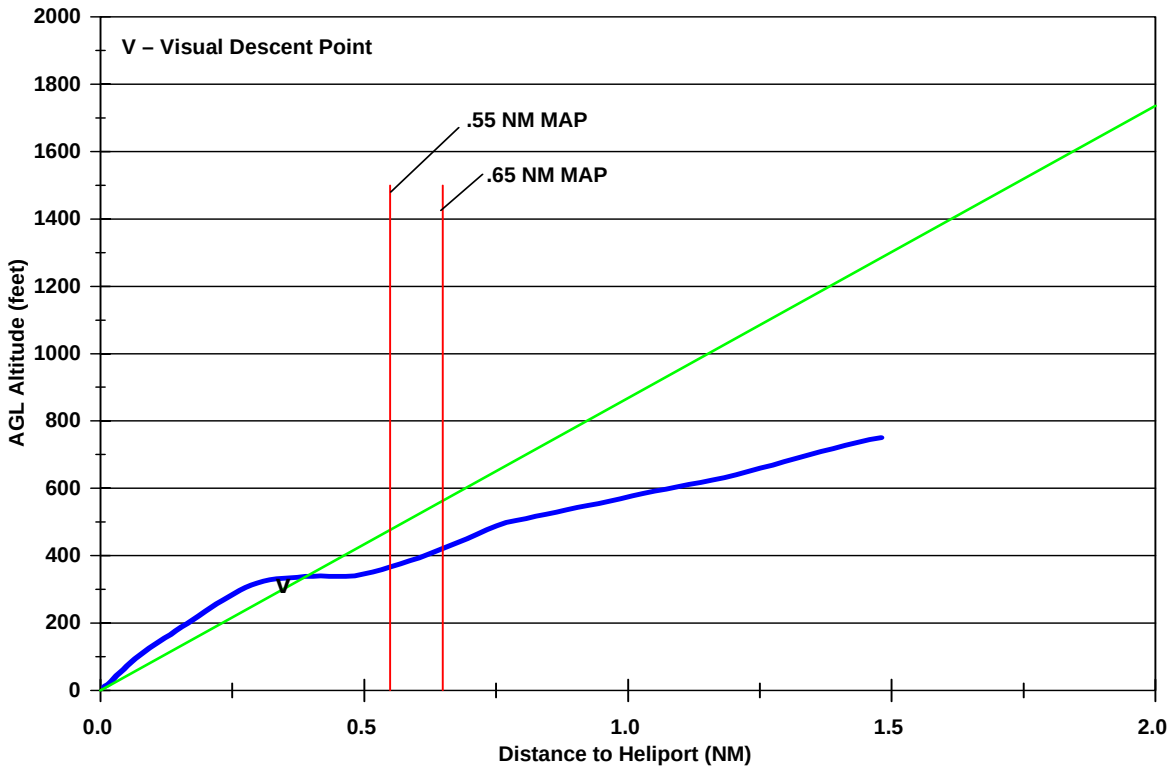


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06B001 - App. #07X

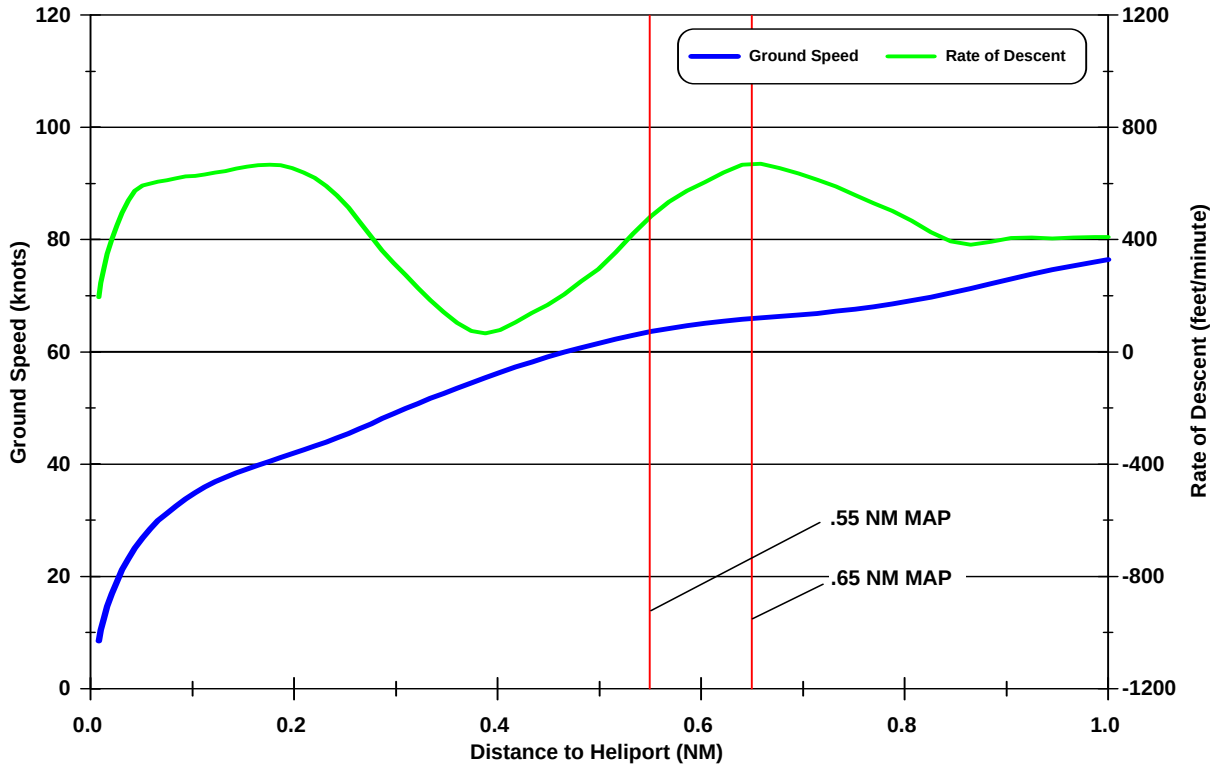



Approach - Plan View
Pilot P03 - 05/02/06B002 - App. #08Y
145-Degree
Approach Course
310-Degree
Approach Course
337/12
11
348/8
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

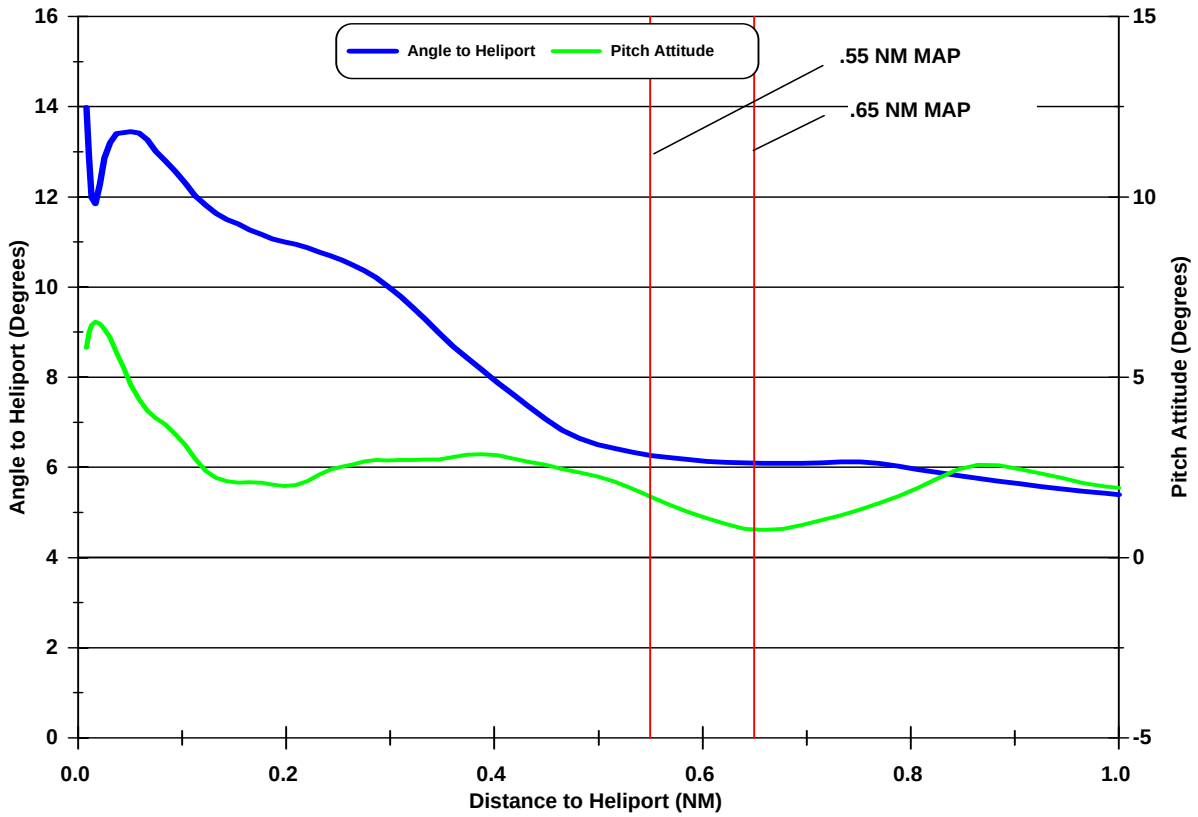
Profile View
Pilot P03 - 05/02/06B002 - App. #08Y



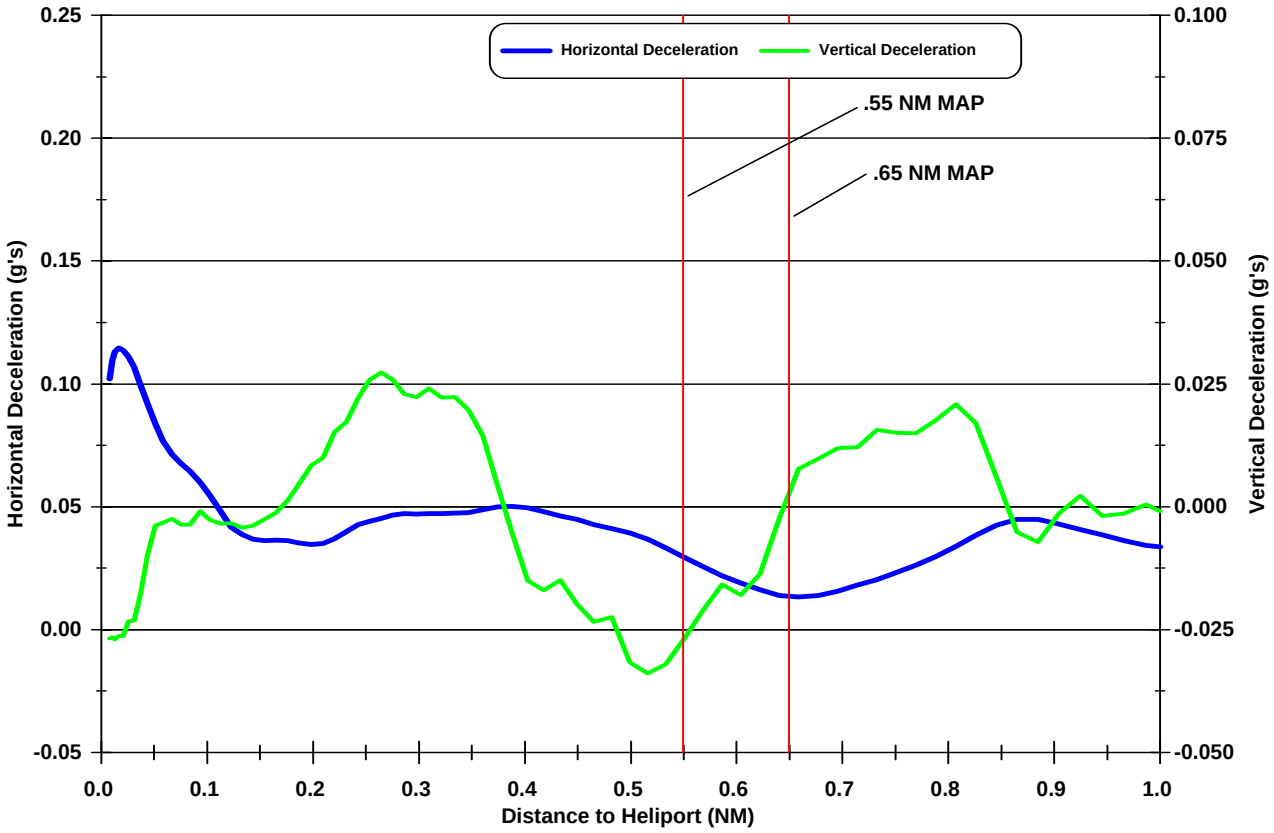
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06B002 - App. #08Y

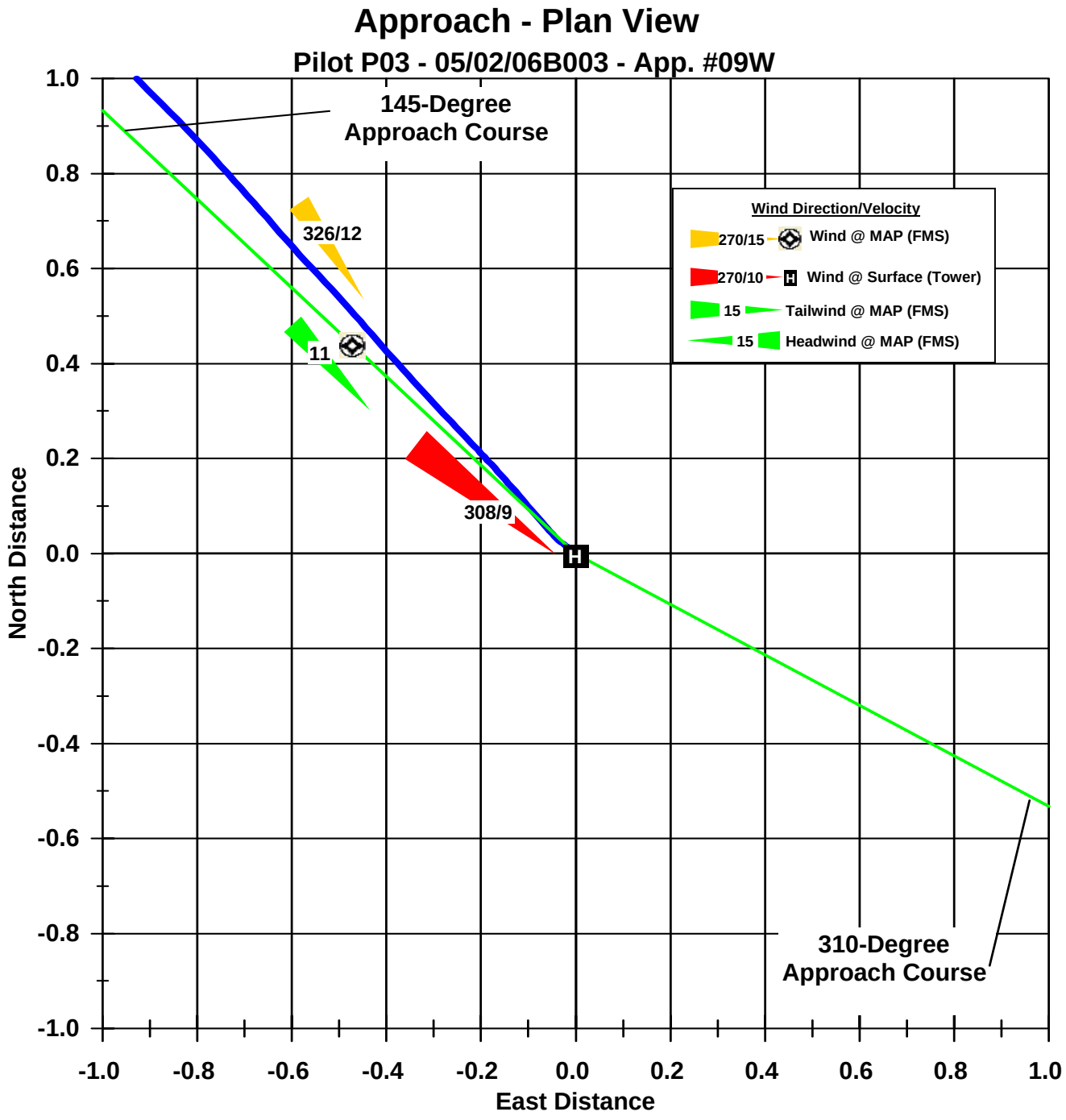


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06B002 - App. #08Y

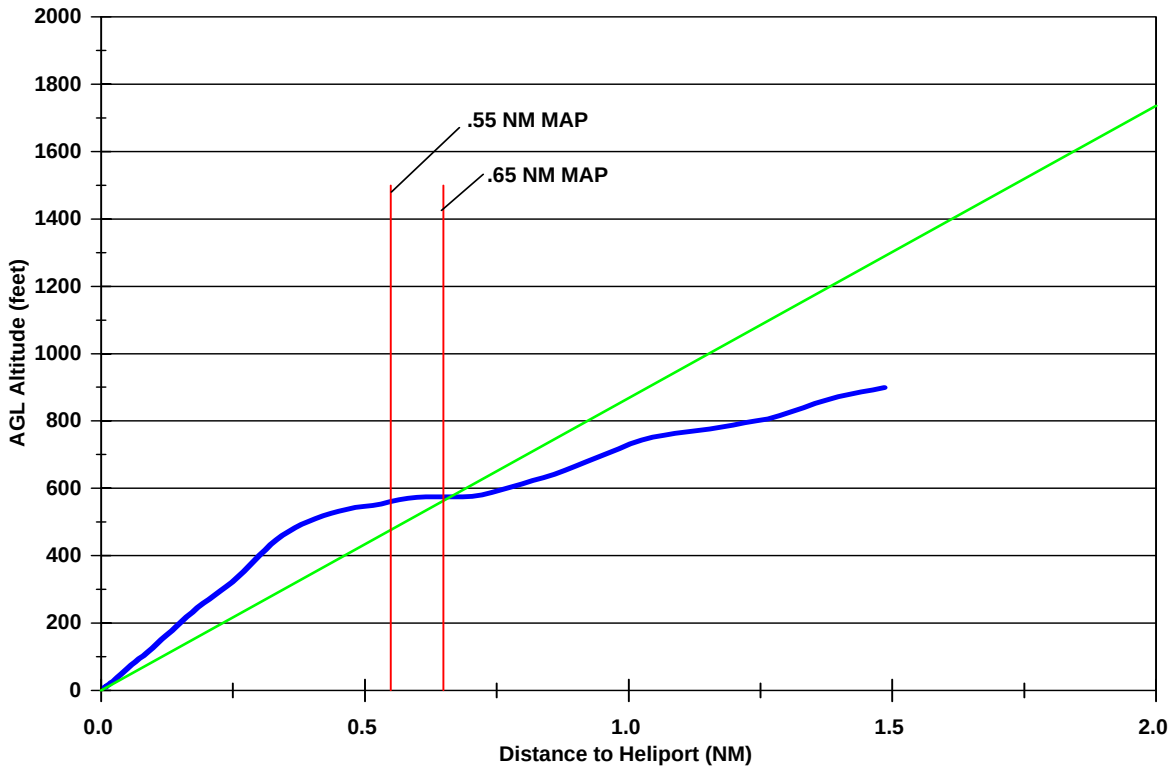


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06B002 - App. #08Y

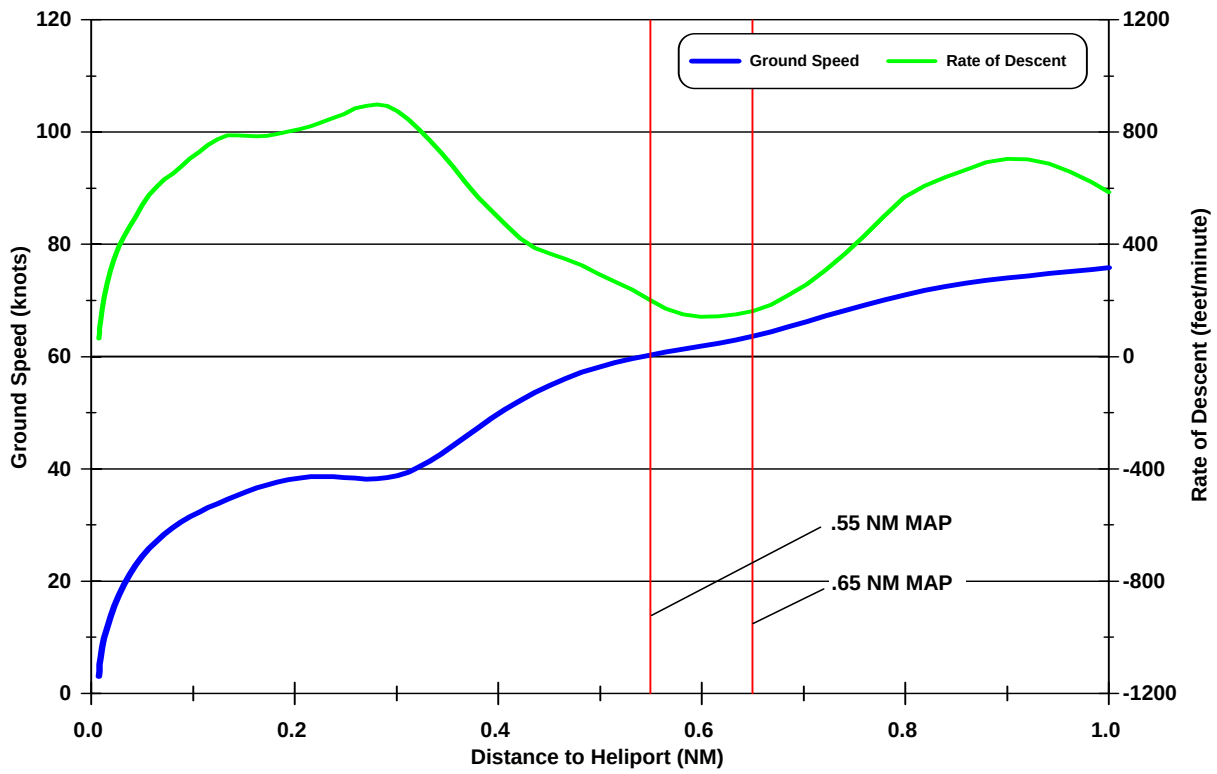



Approach - Plan View
Pilot P03 - 05/02/06B003 - App. #09W
145-Degree
Approach Course
310-Degree
Approach Course
326/12
11
308/9
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

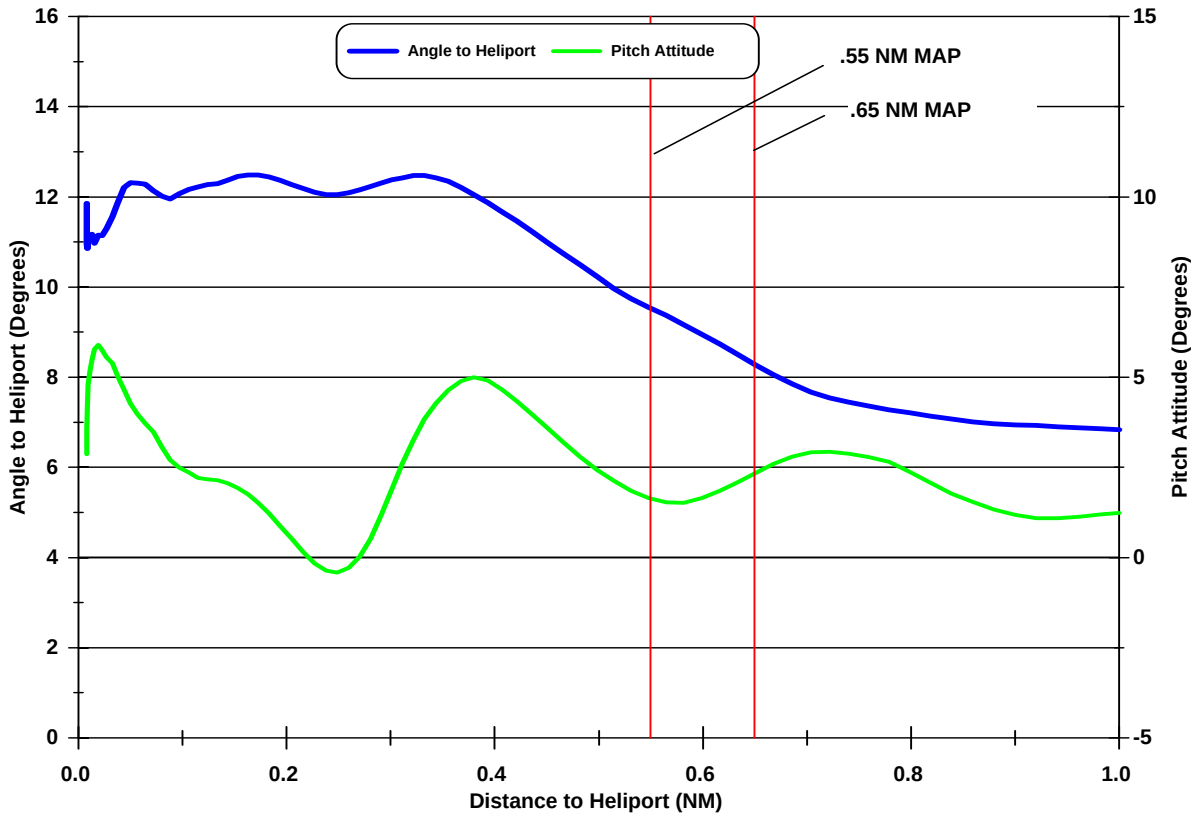
Profile View
Pilot P03 - 05/02/06B003 - App. #09W



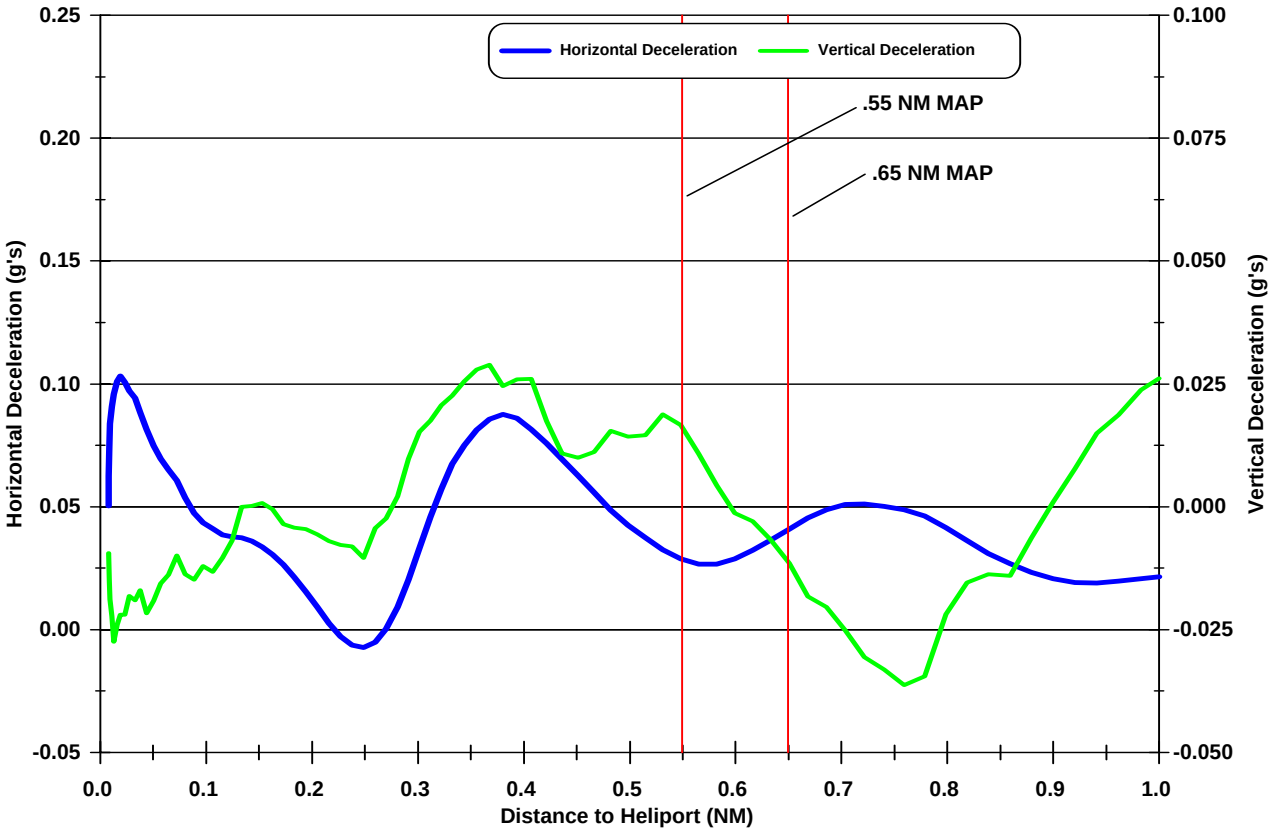
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06B003 - App. #09W

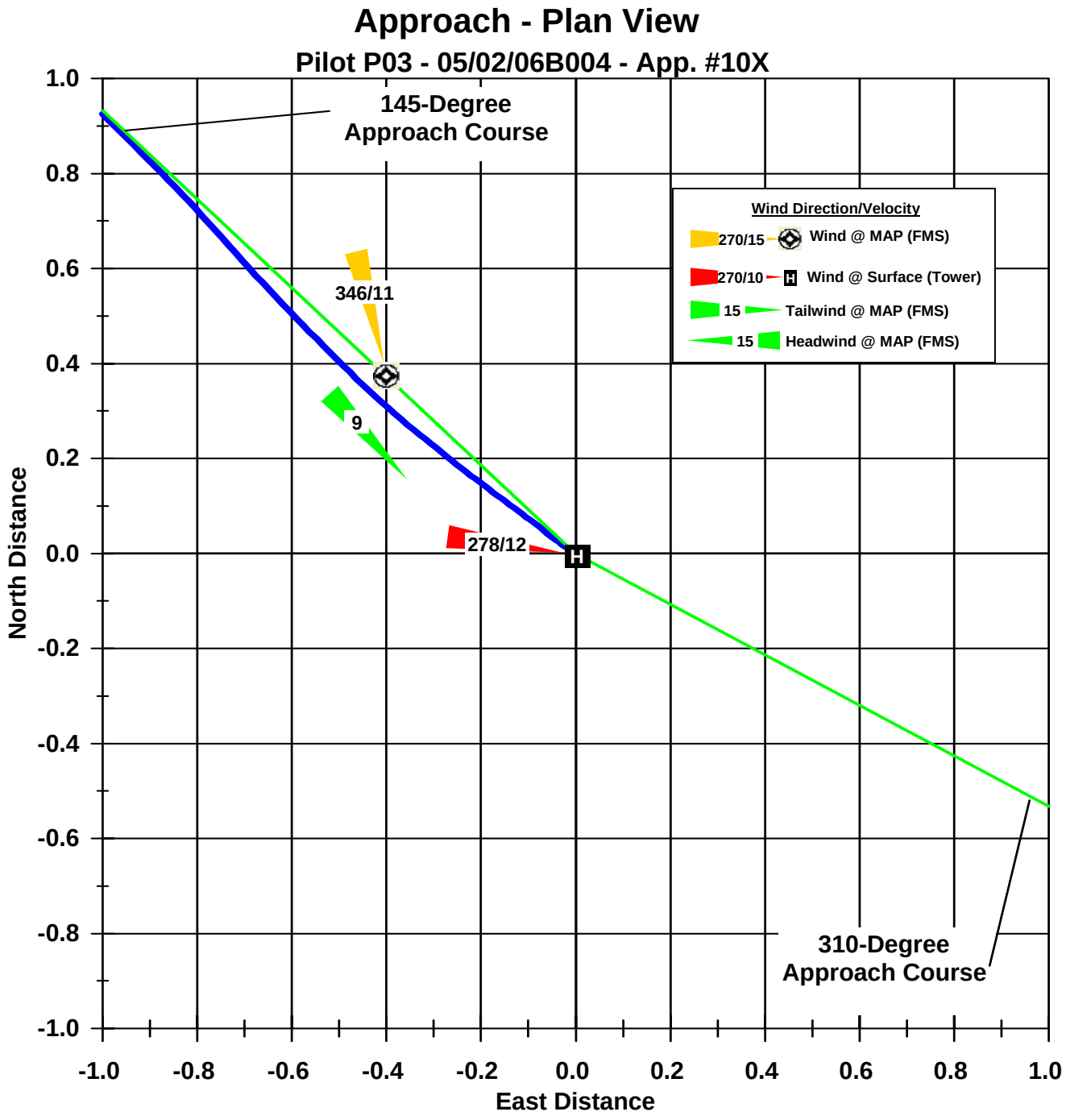


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06B003 - App. #09W

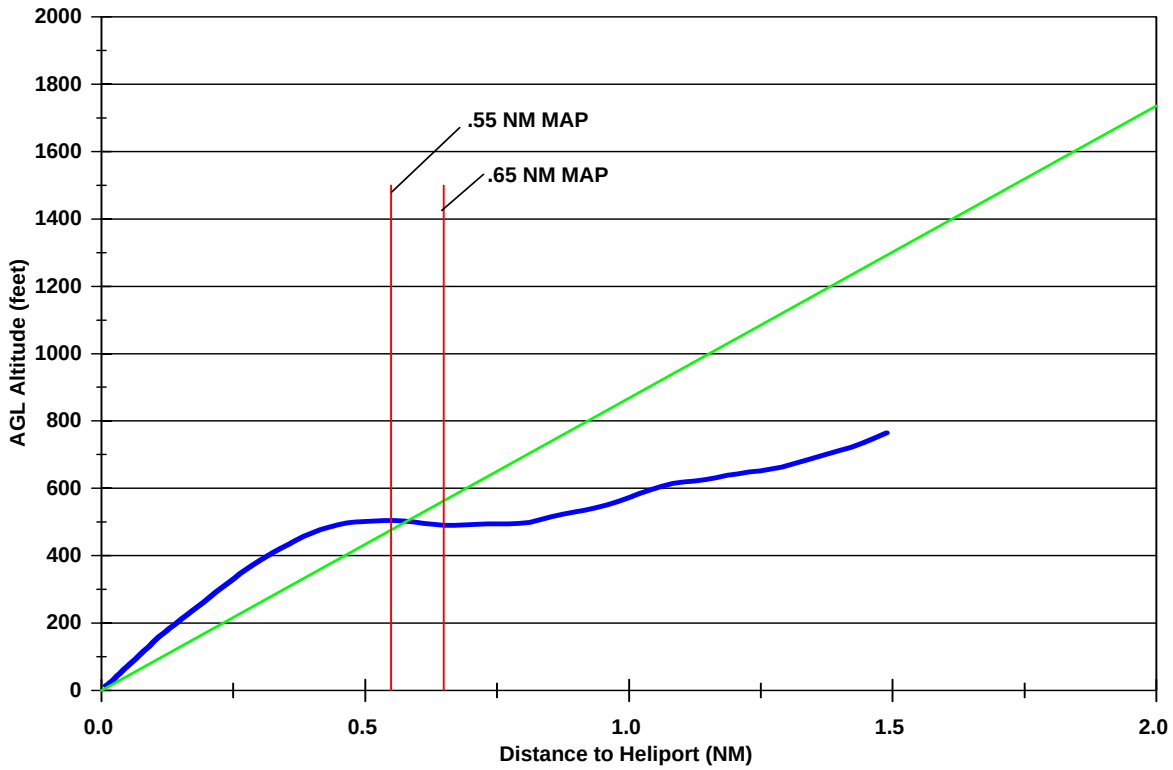


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06B003 - App. #09W

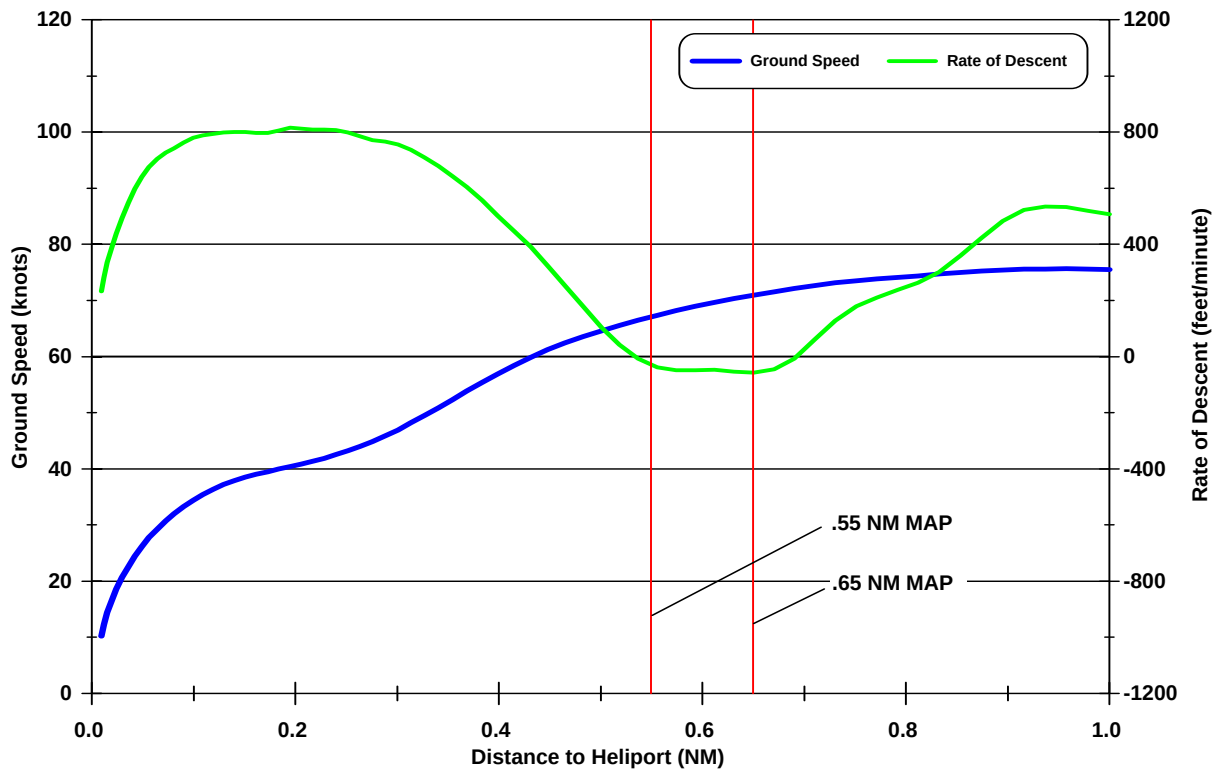



Approach - Plan View
Pilot P03 - 05/02/06B004 - App. #10X
145-Degree
Approach Course
310-Degree
Approach Course
346/11
9
278/12
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

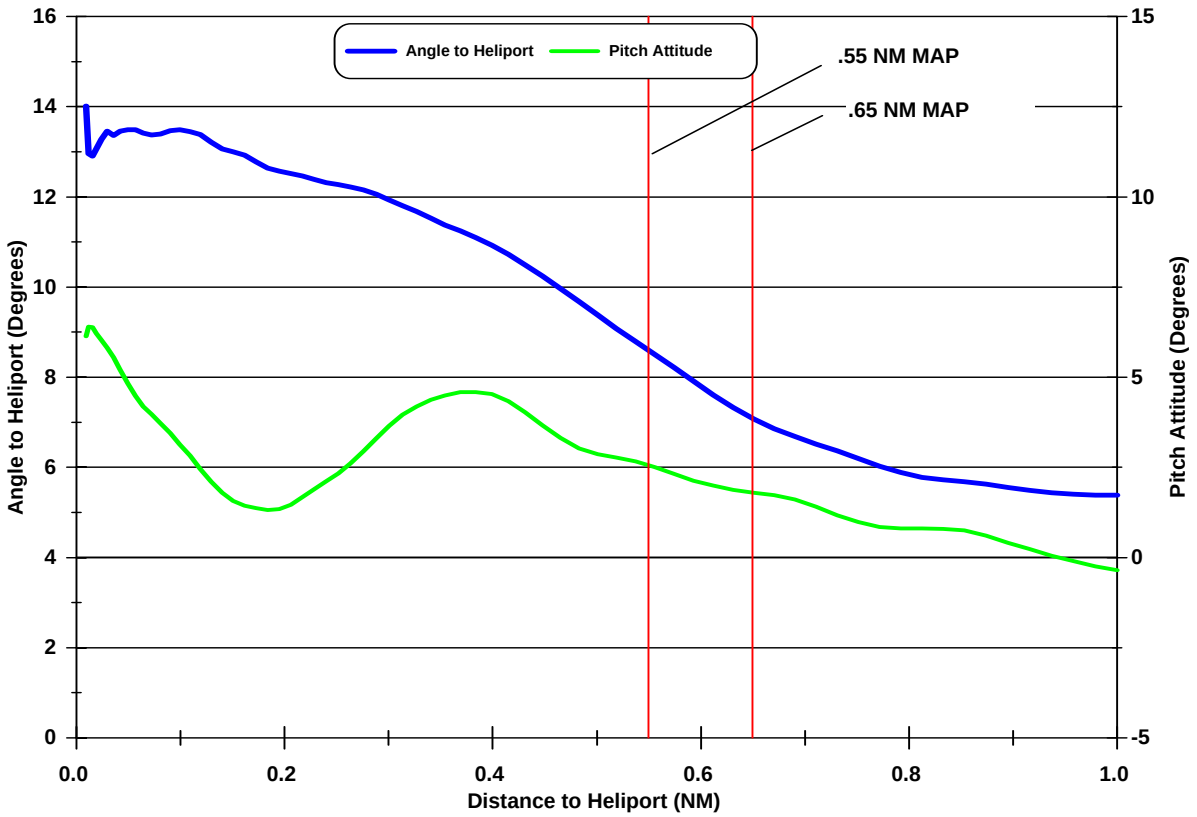
Profile View
Pilot P03 - 05/02/06B004 - App. #10X



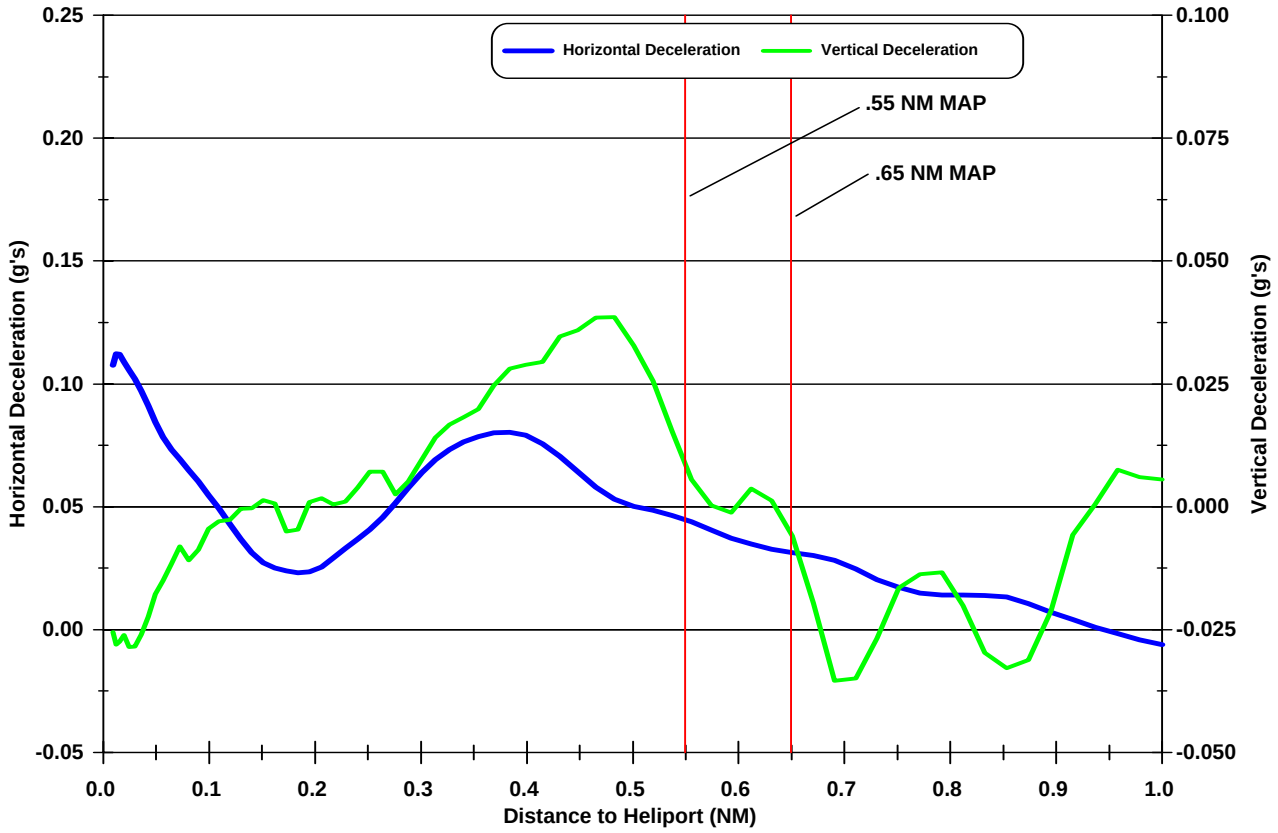
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06B004 - App. #10X

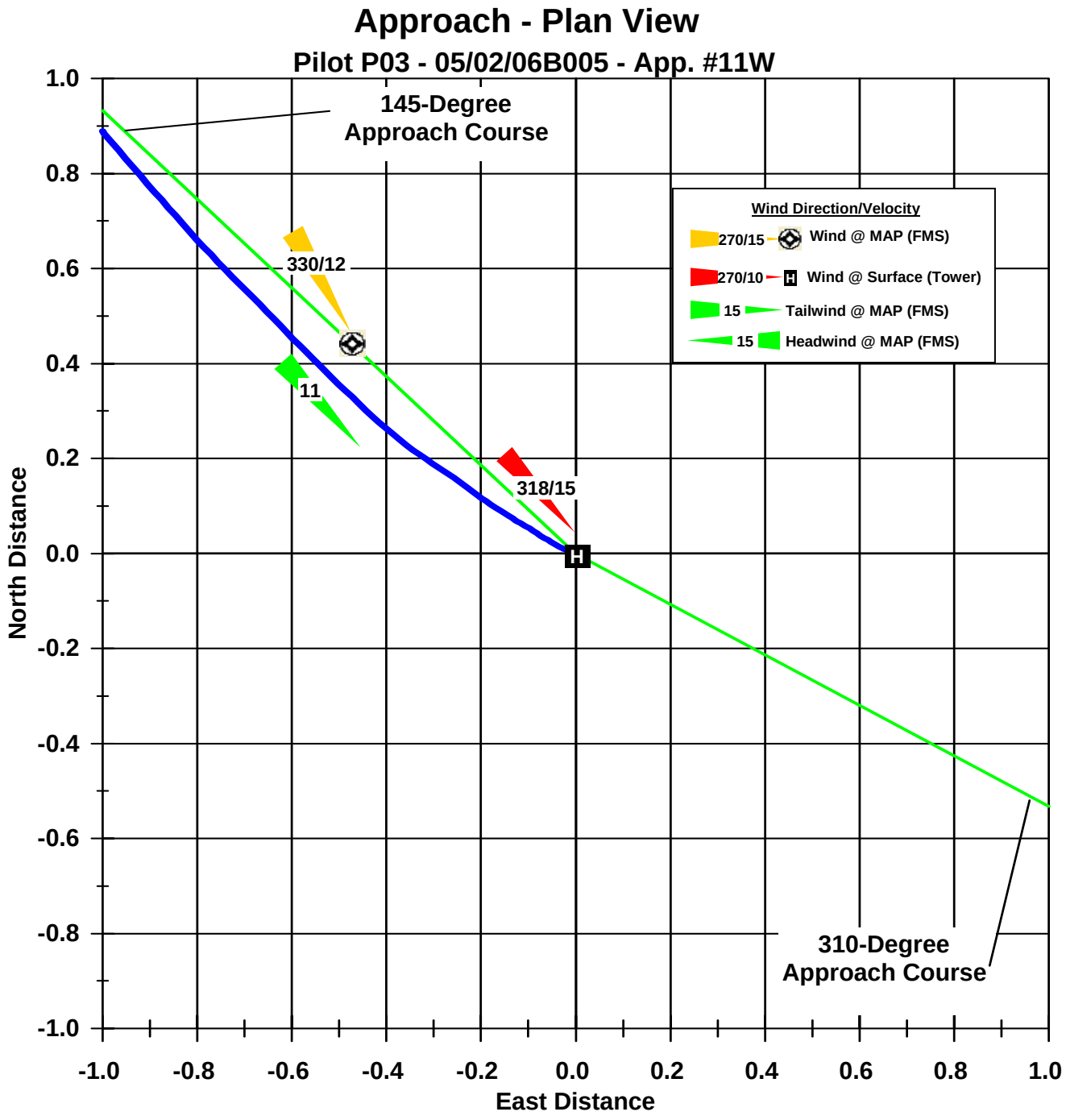


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06B004 - App. #10X

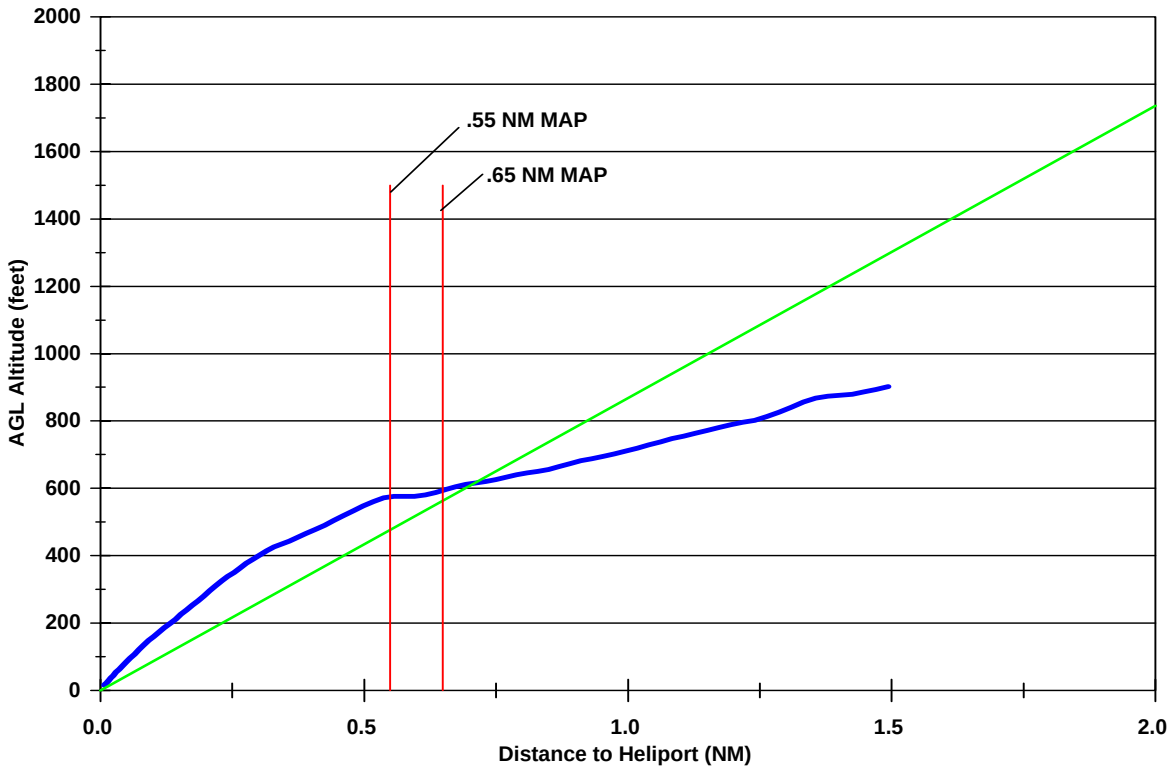


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06B004 - App. #10X

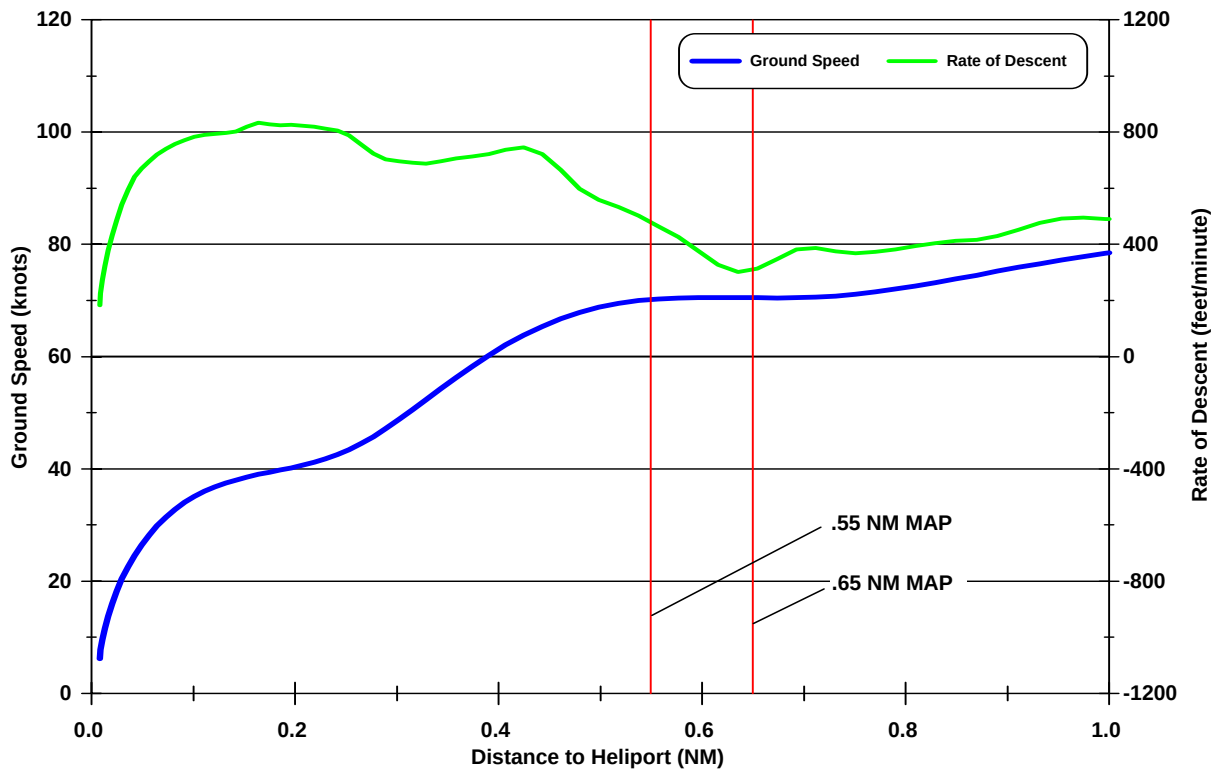



Approach - Plan View
Pilot P03 - 05/02/06B005 - App. #11W
145-Degree
Approach Course
310-Degree
Approach Course
330/12
11
318/15
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

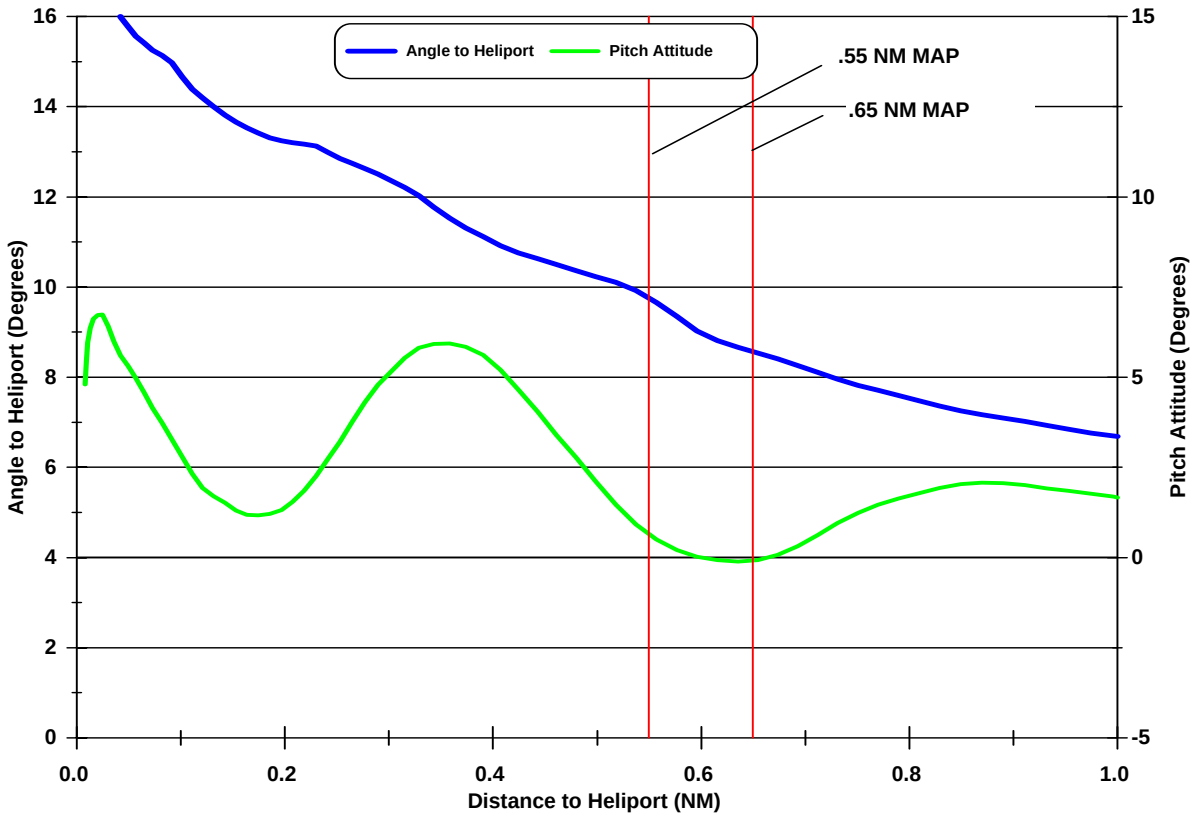
Profile View
Pilot P03 - 05/02/06B005 - App. #11W



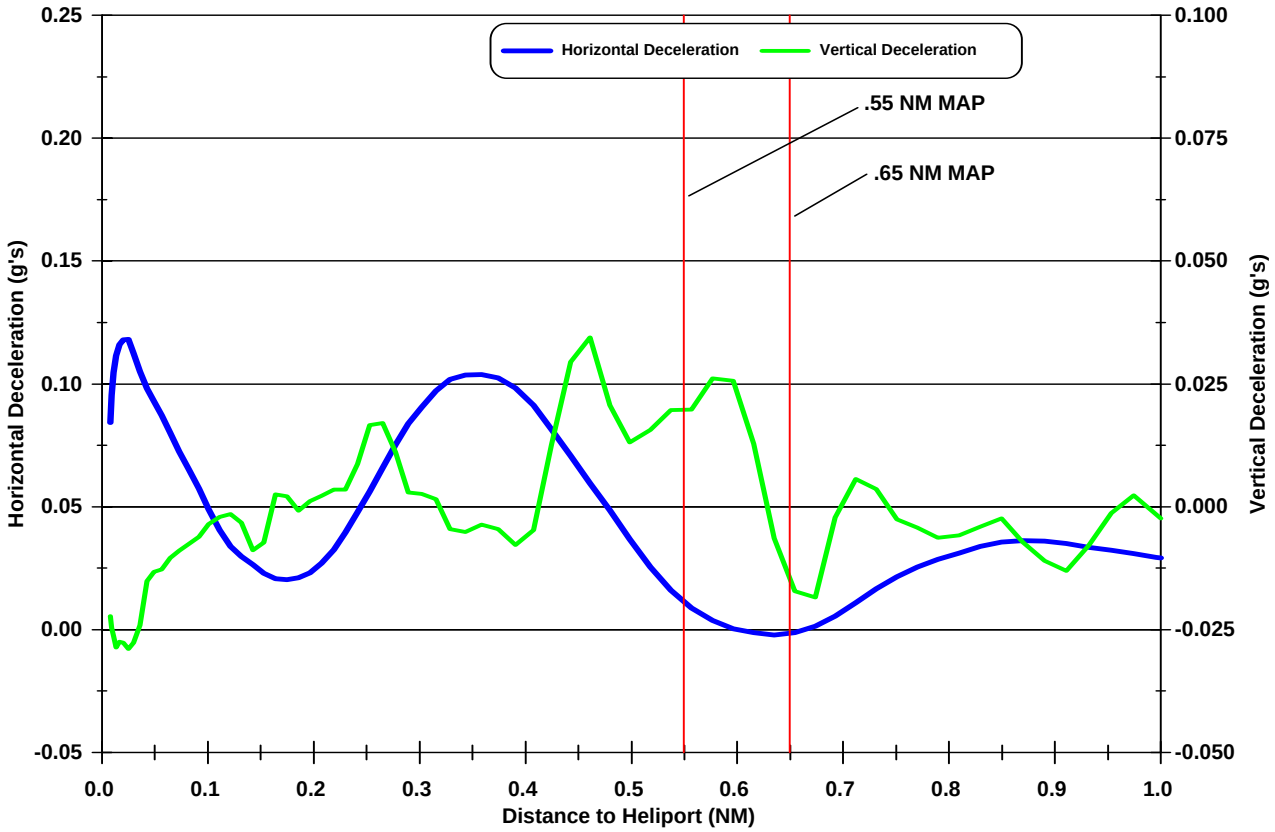
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06B005 - App. #11W

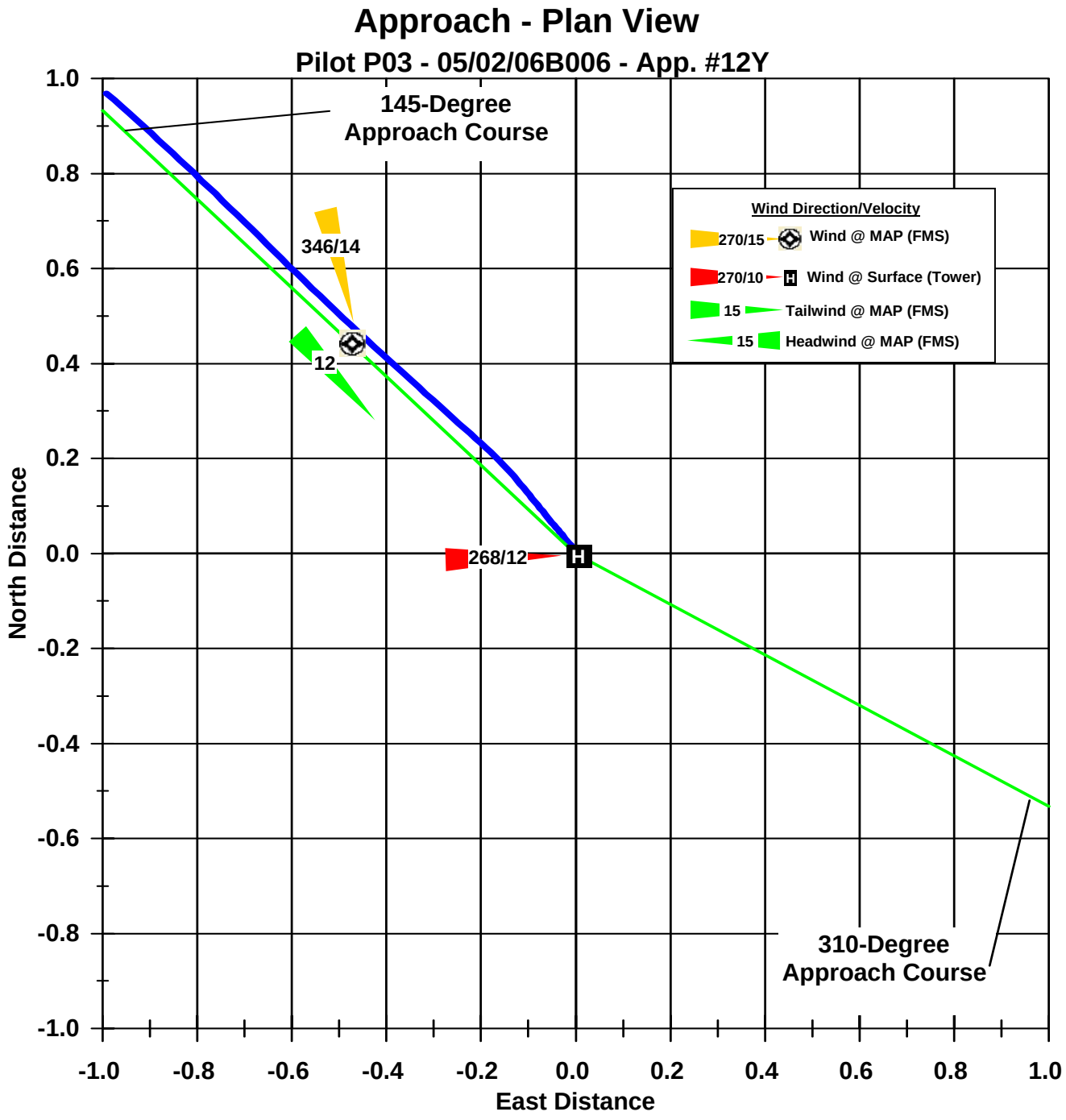


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06B005 - App. #11W

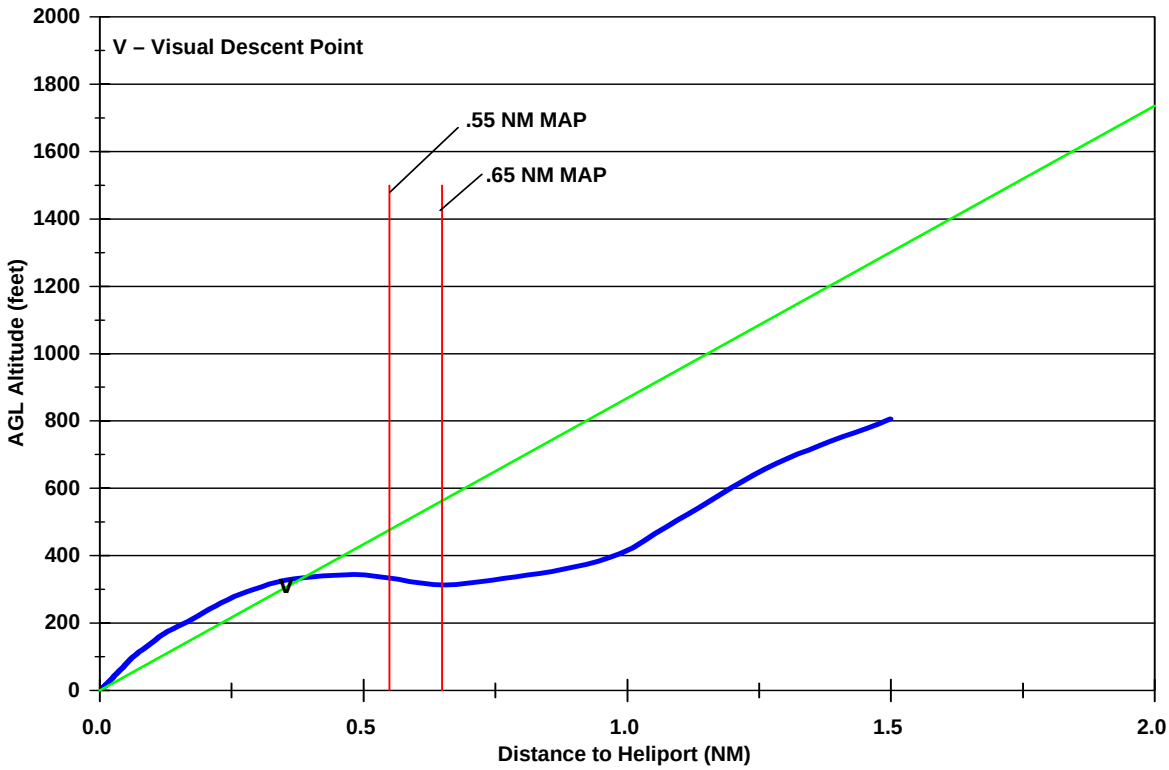


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06B005 - App. #11W

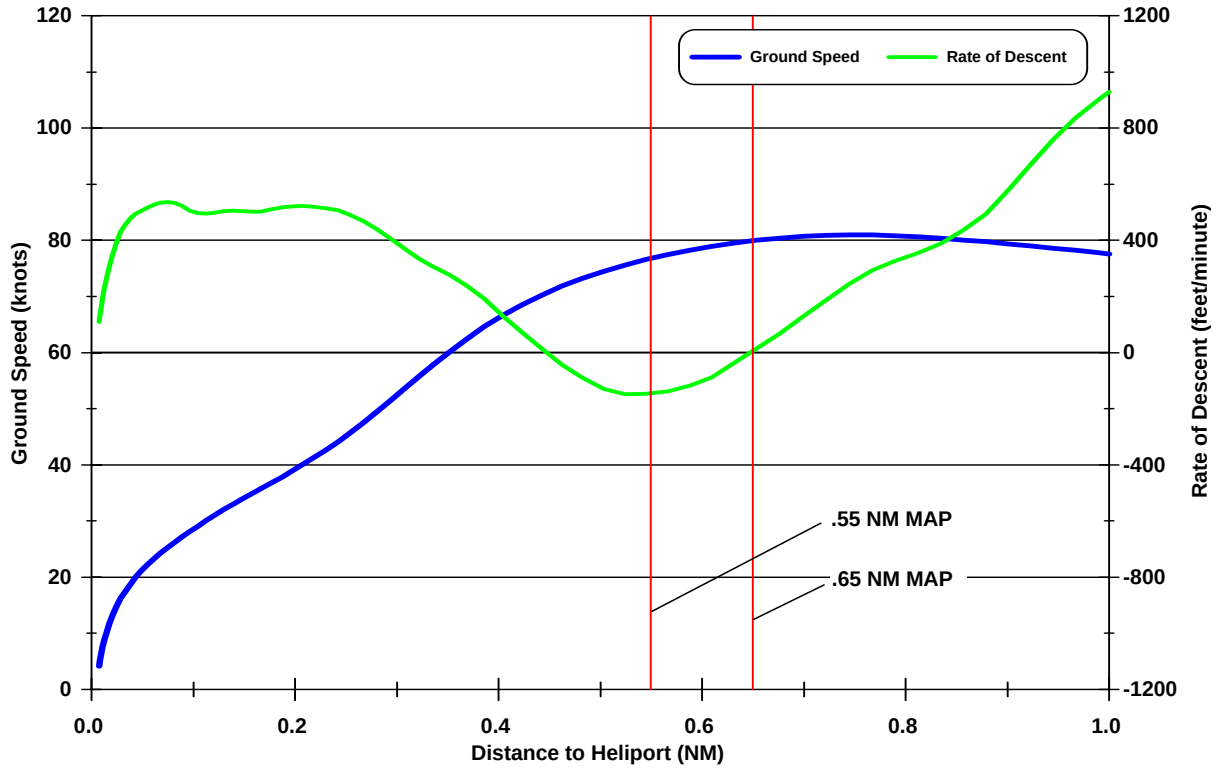



Approach - Plan View
Pilot P03 - 05/02/06B006 - App. #12Y
145-Degree
Approach Course
310-Degree
Approach Course
346/14
12
268/12
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

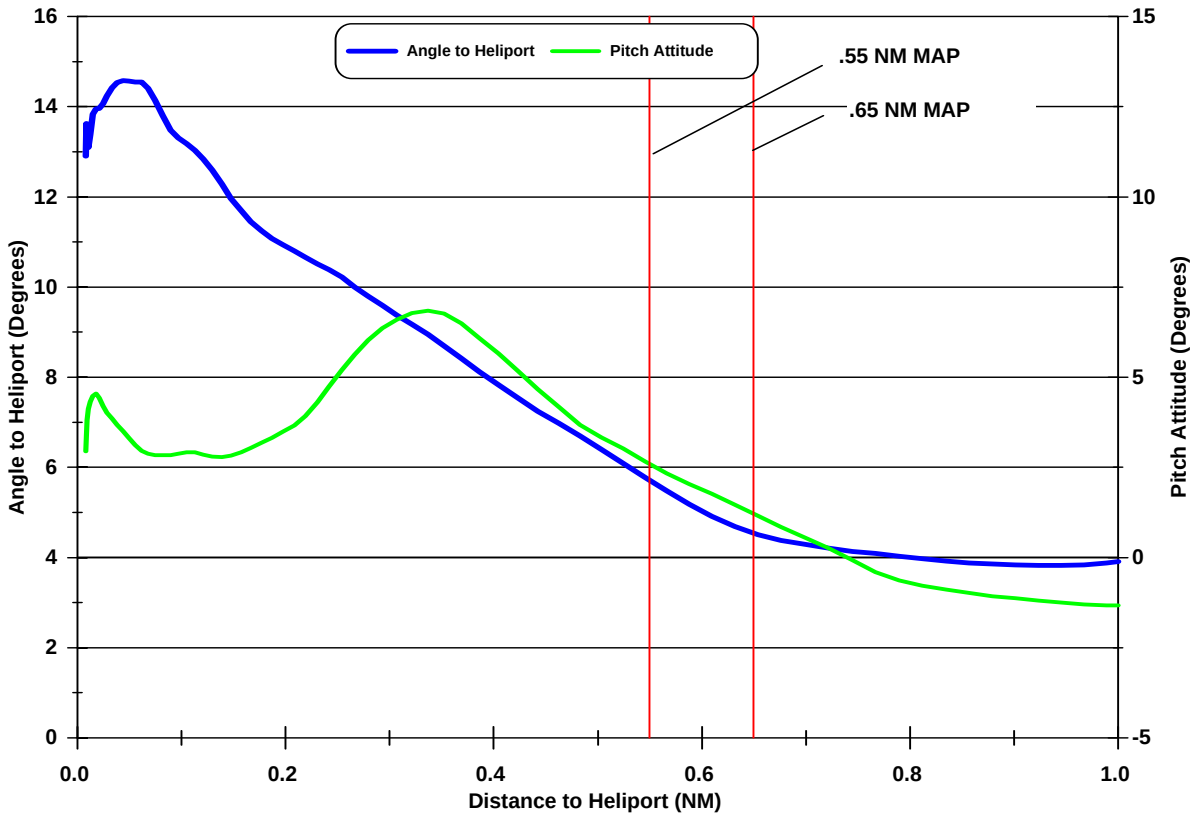
Profile View
Pilot P03 - 05/02/06B006 - App. #12Y



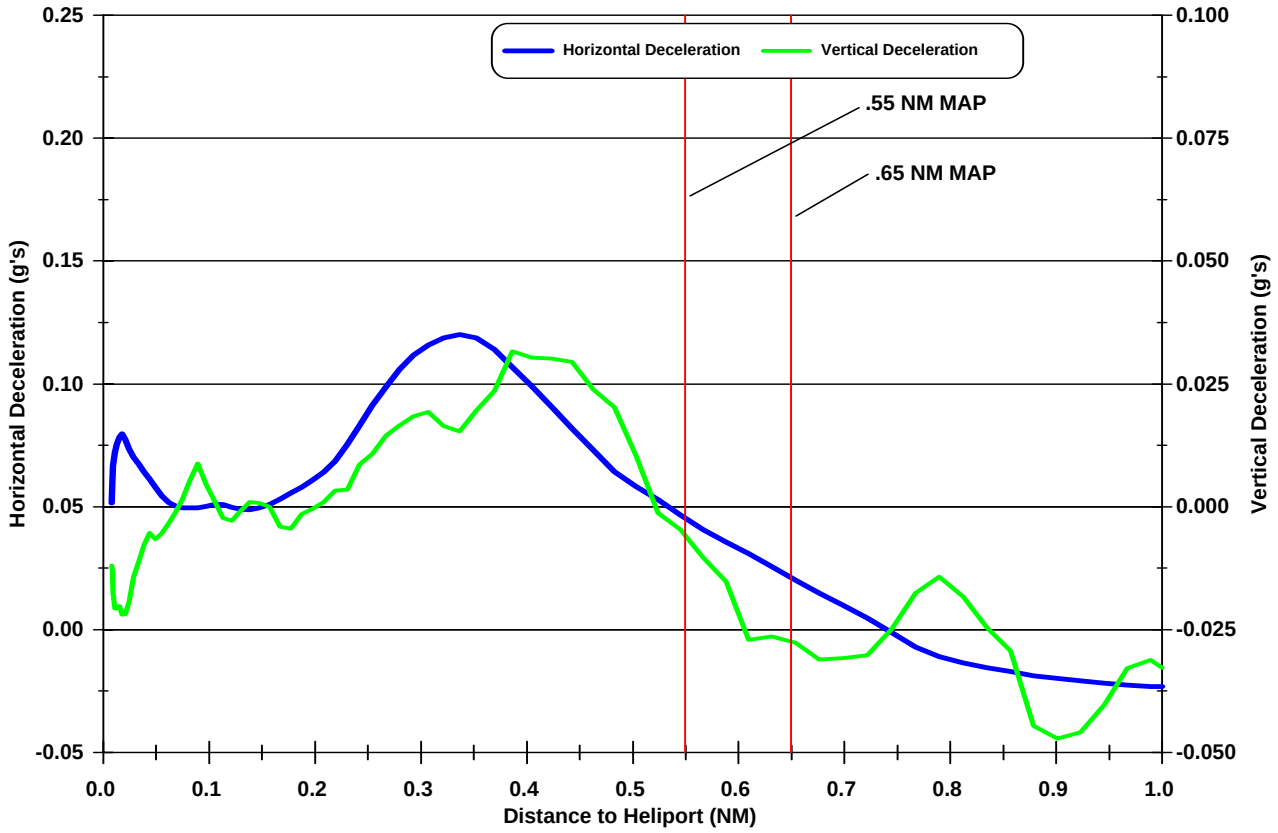
Ground Speed and Rate of Descent
Pilot P03 - 05/02/06B006 - App. #12Y

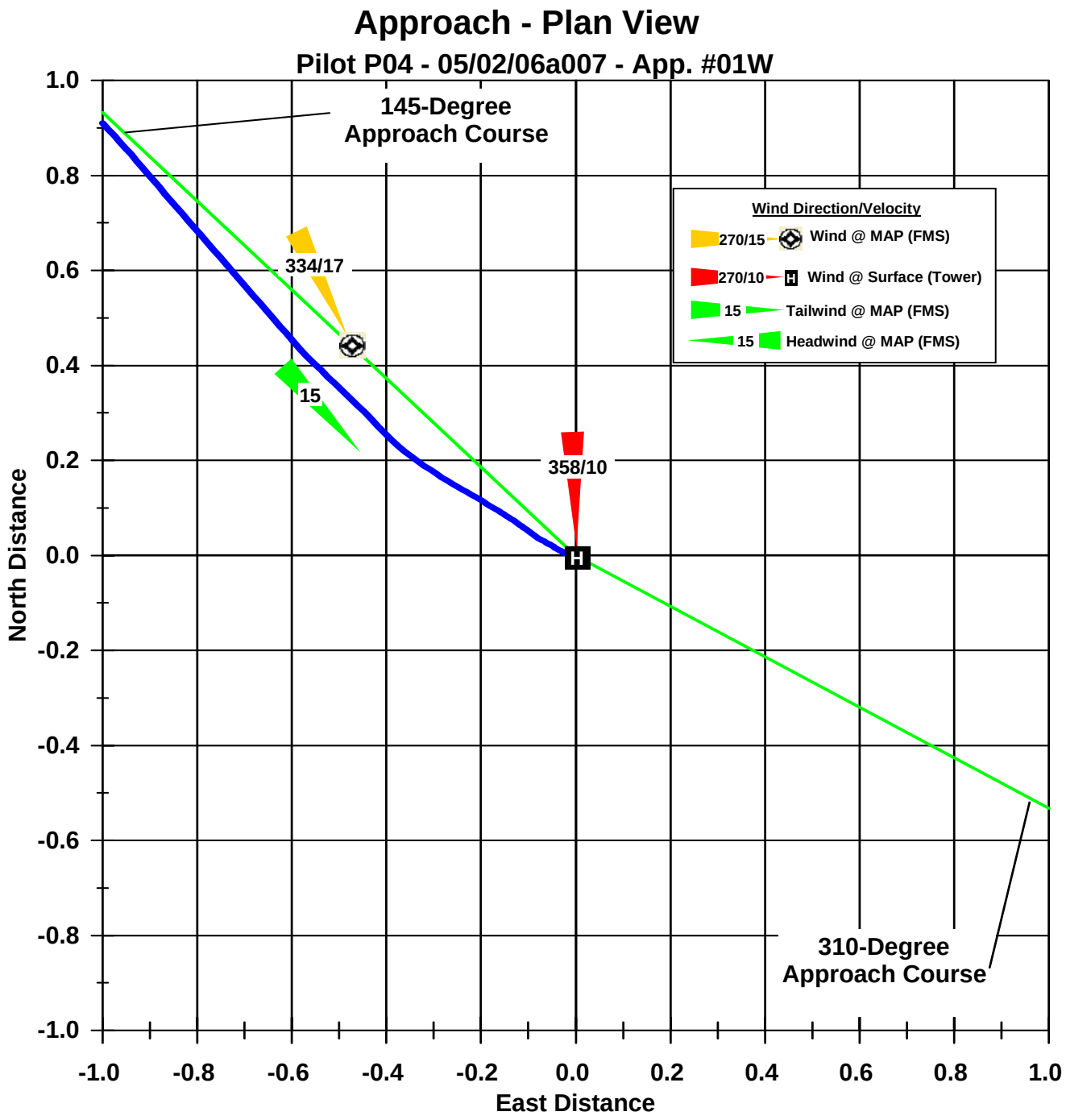


Angle to Heliport and Pitch Attitude
Pilot P03 - 05/02/06B006 - App. #12Y

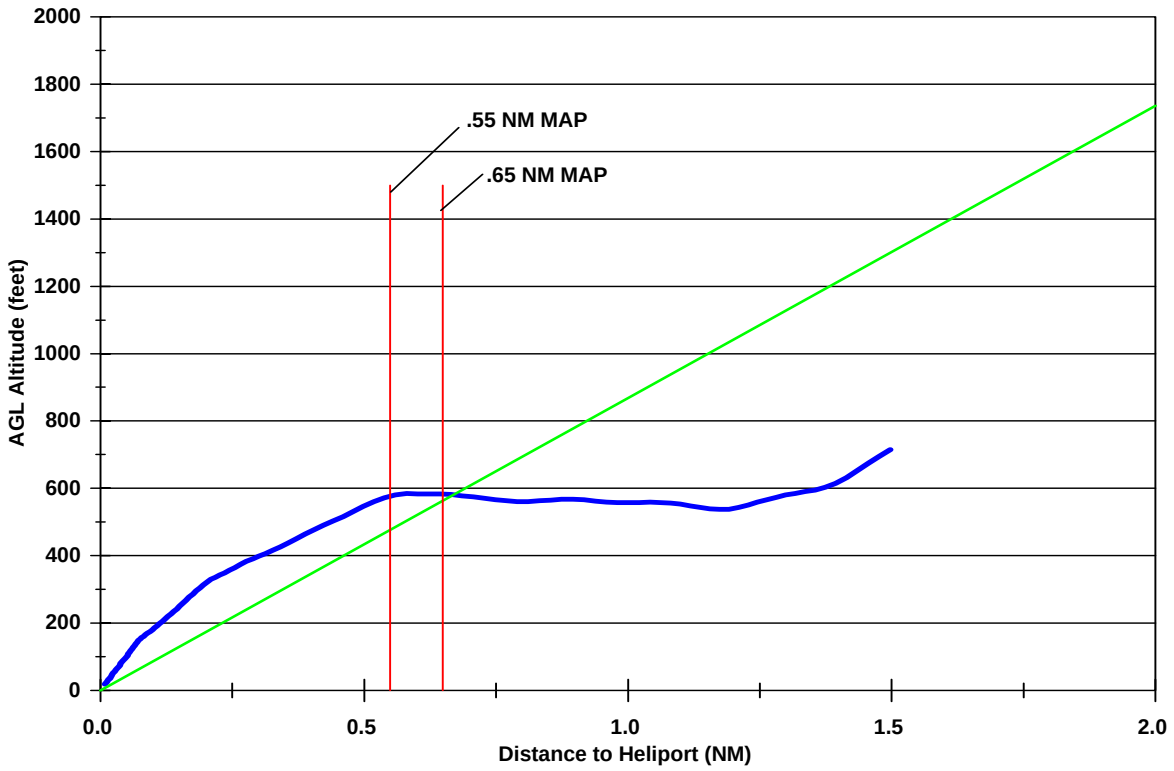


Horizontal and Vertical Deceleration
Pilot P03 - 05/02/06B006 - App. #12Y

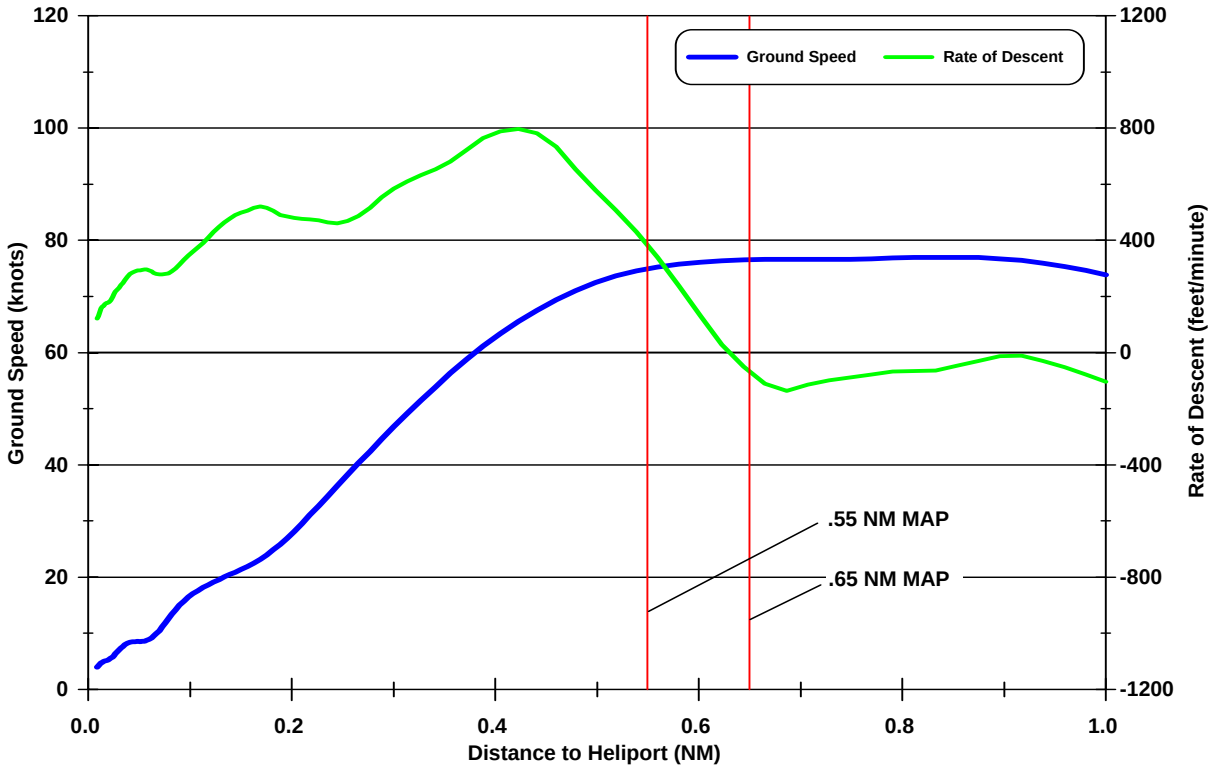



Approach - Plan View
Pilot P04 - 05/02/06a007 - App. #01W
145-Degree
Approach Course
310-Degree
Approach Course
334/17
15
358/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

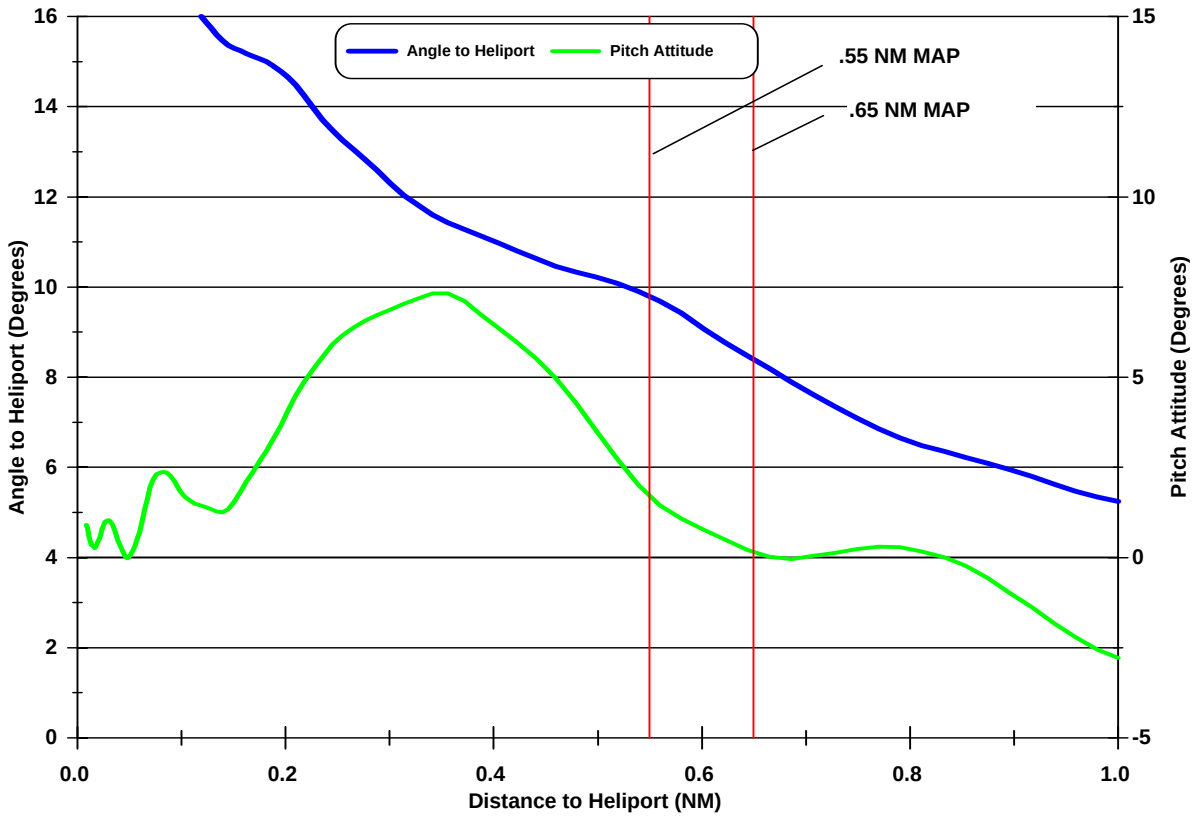
Profile View
Pilot P04 - 05/02/06a007 - App. #01W



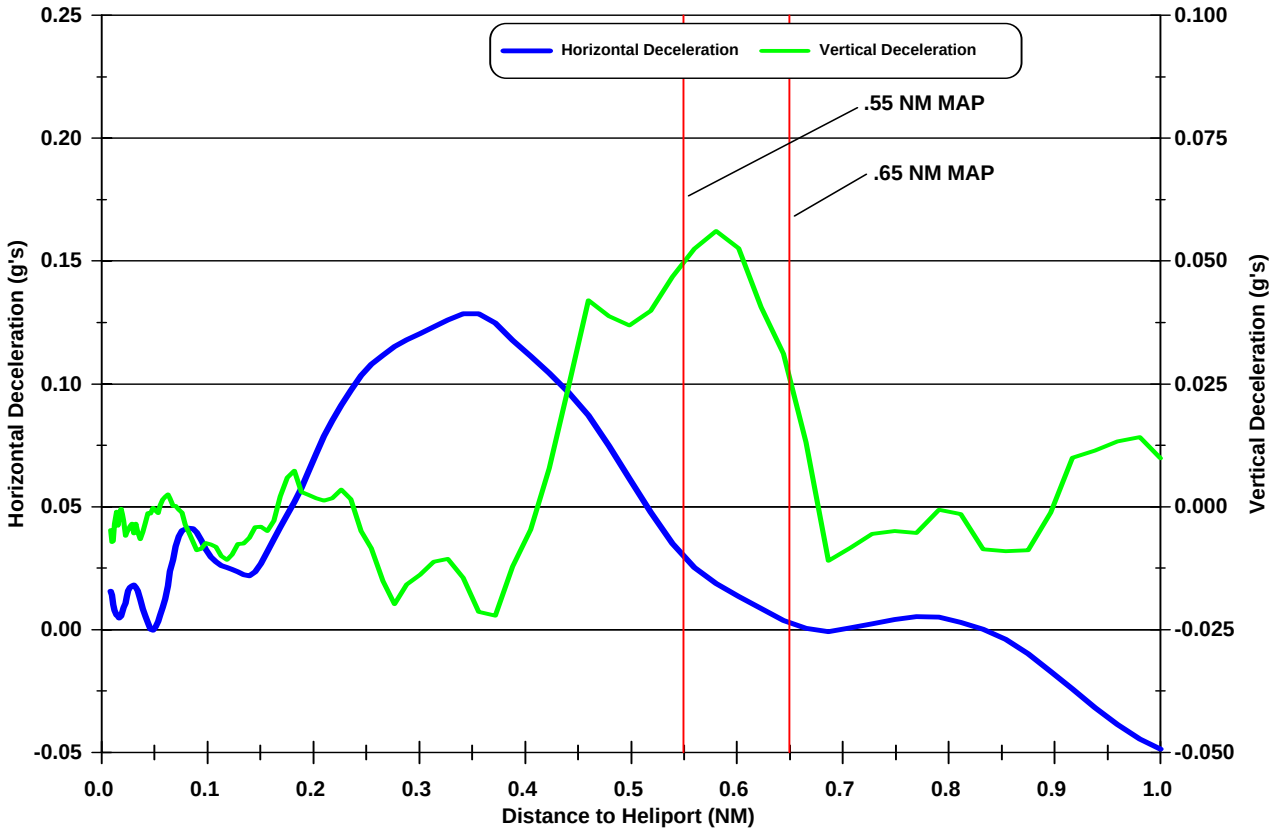
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06a007 - App. #01W

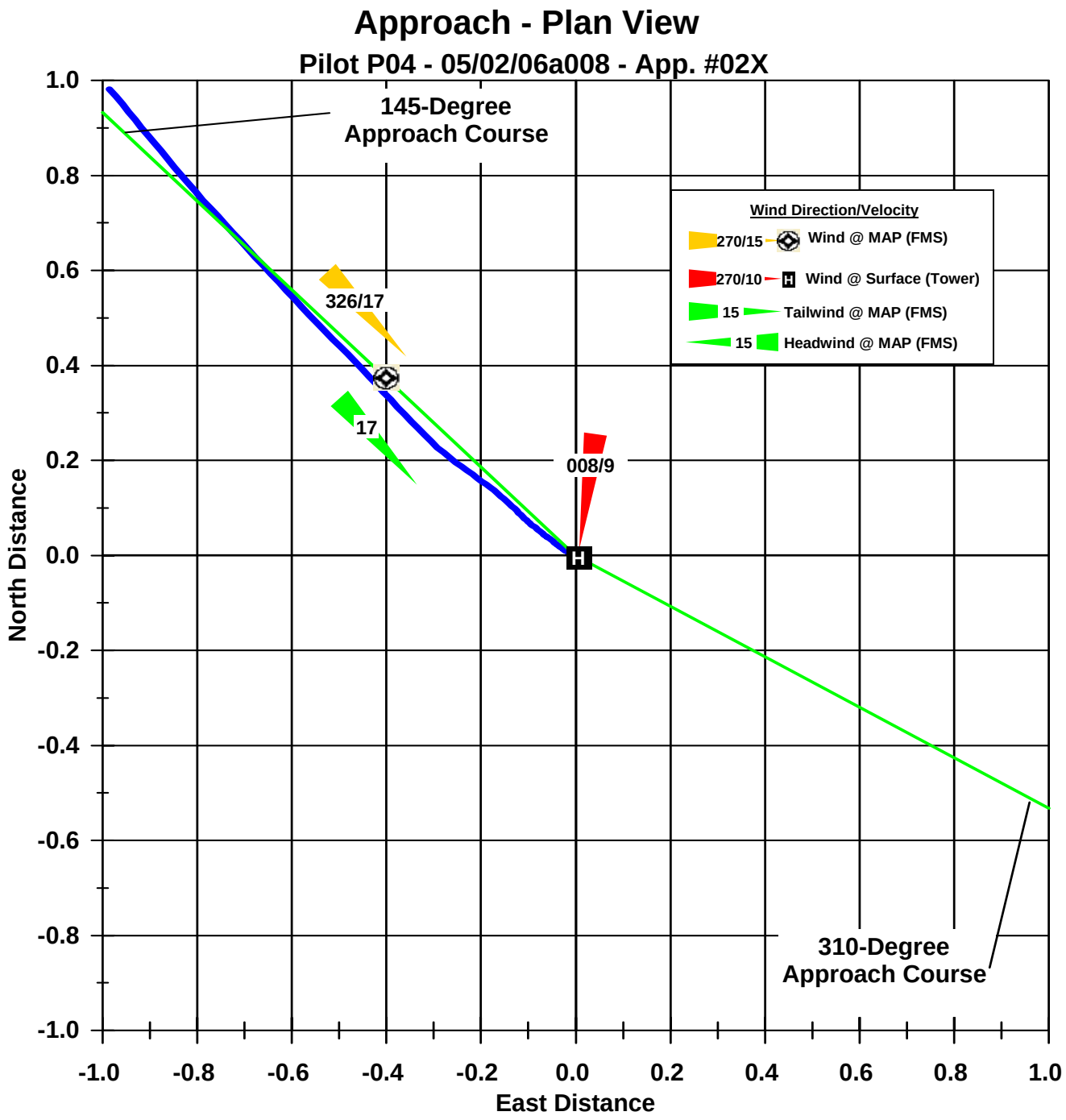


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06a007 - App. #01W

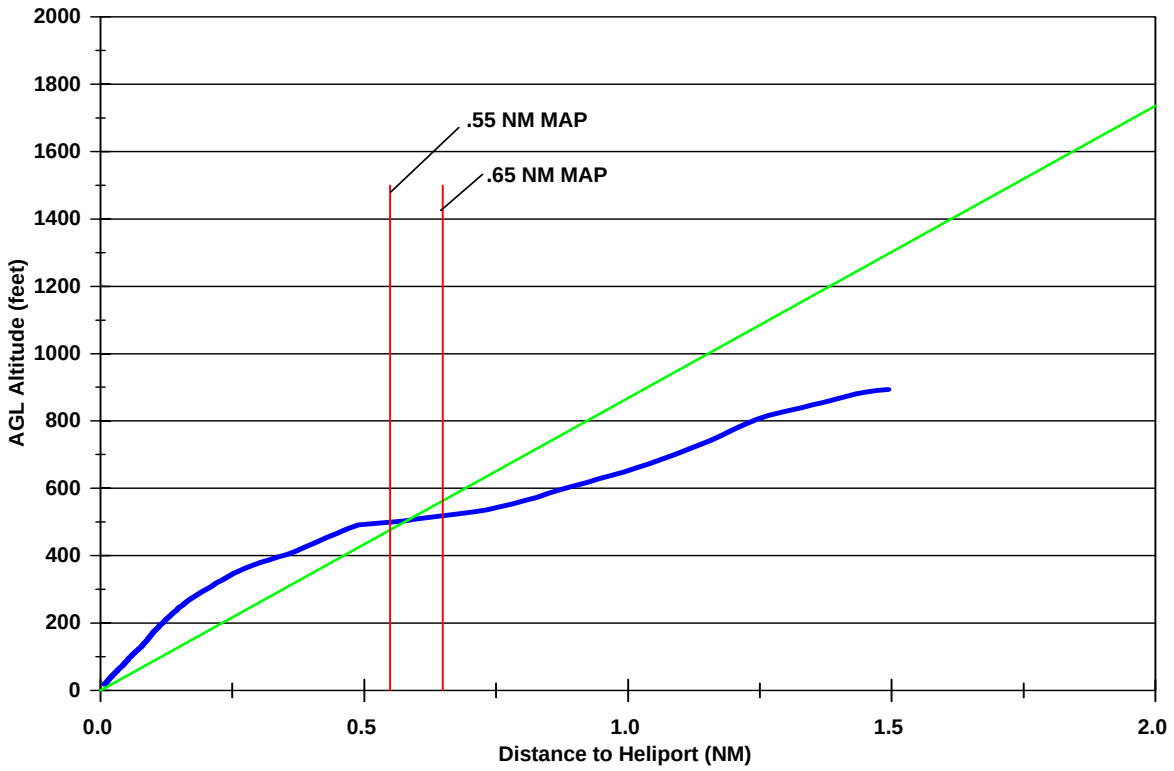


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06a007 - App. #01W

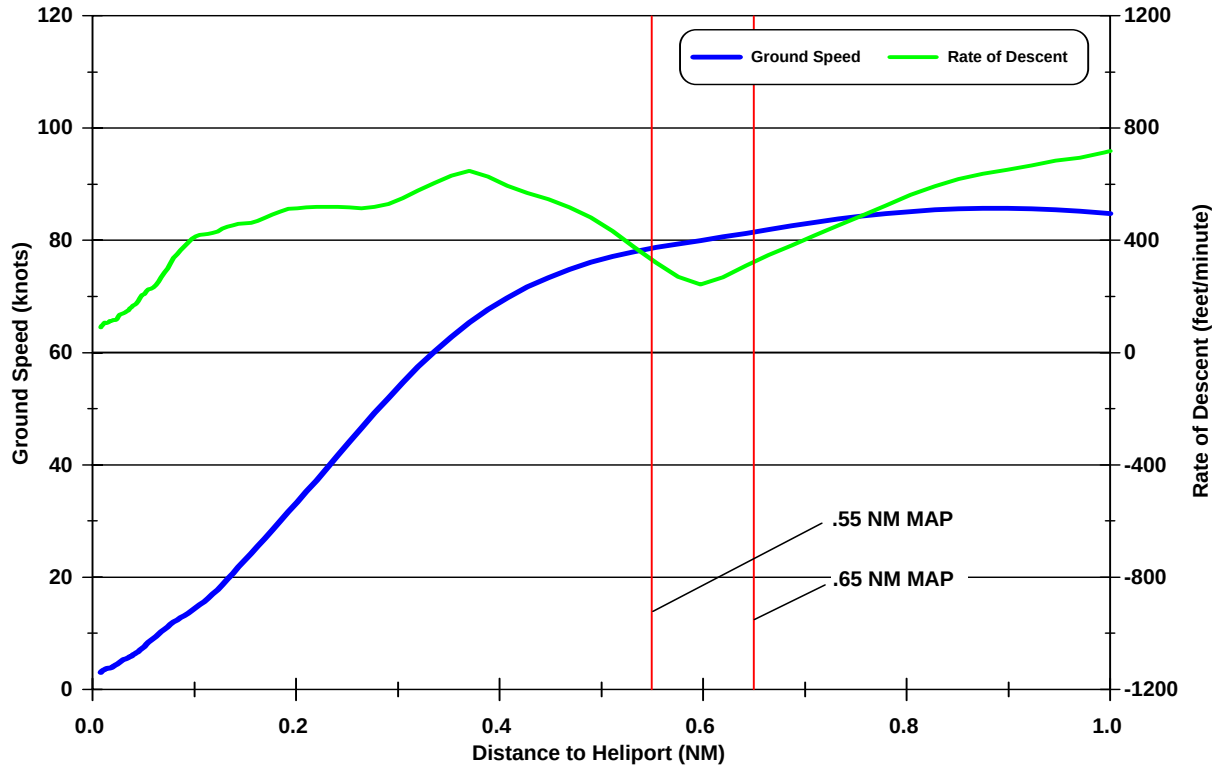



Approach - Plan View
Pilot P04 - 05/02/06a008 - App. #02X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
326/17
17
008/9
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

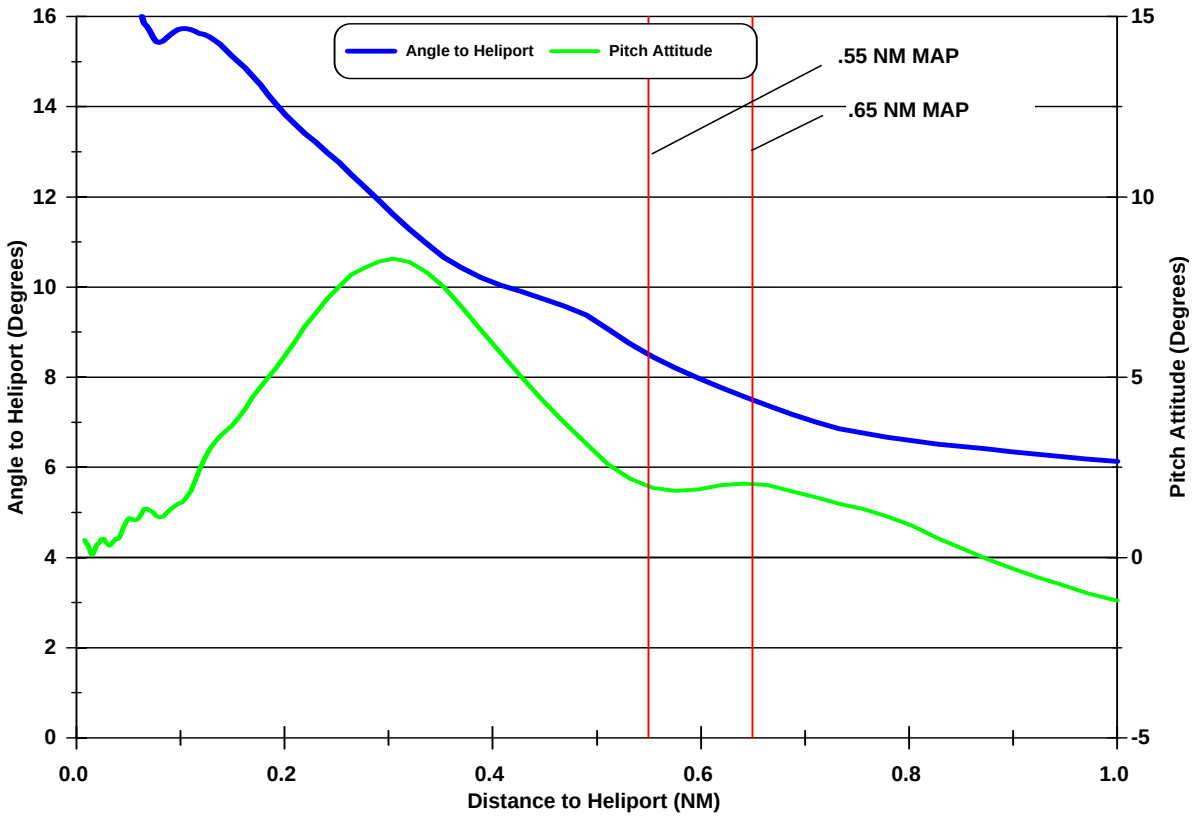
Profile View
Pilot P04 - 05/02/06a008 - App. #02X



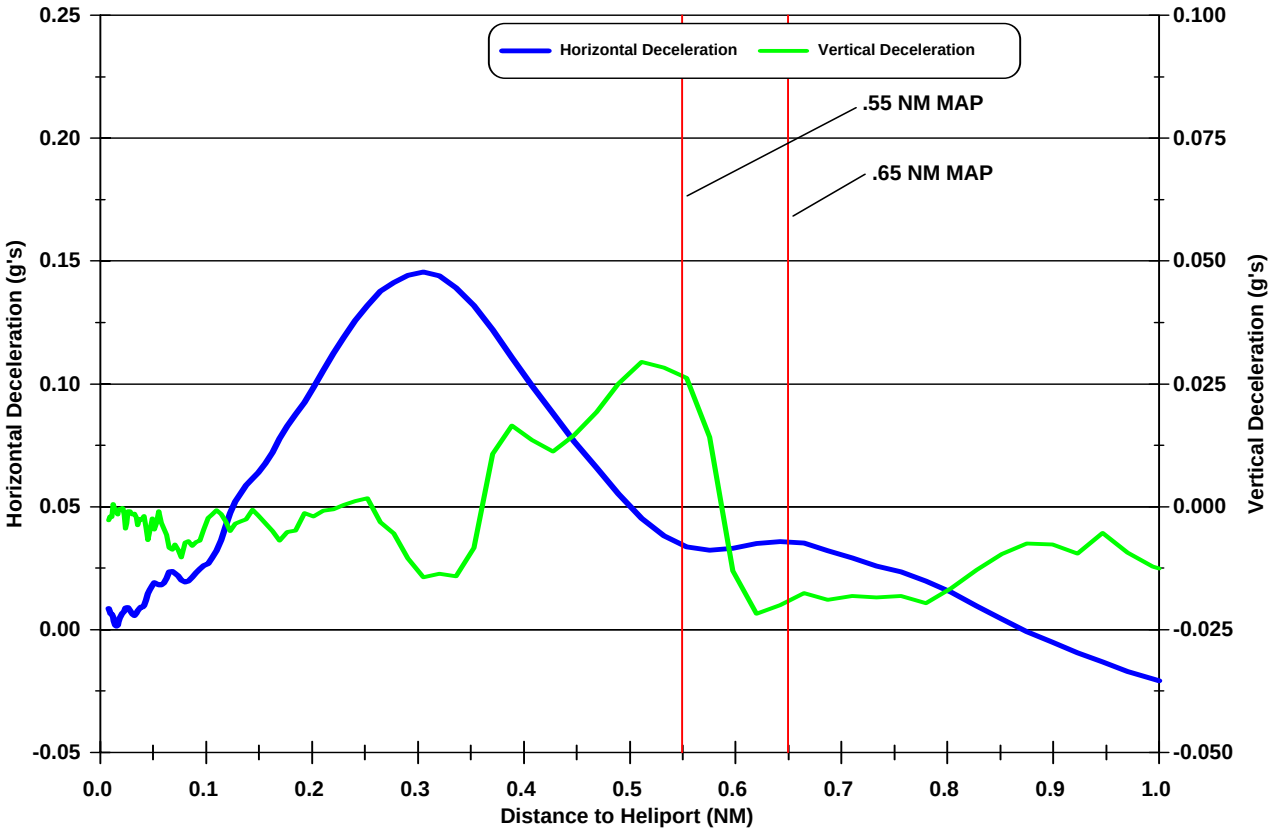
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06a008 - App. #02X

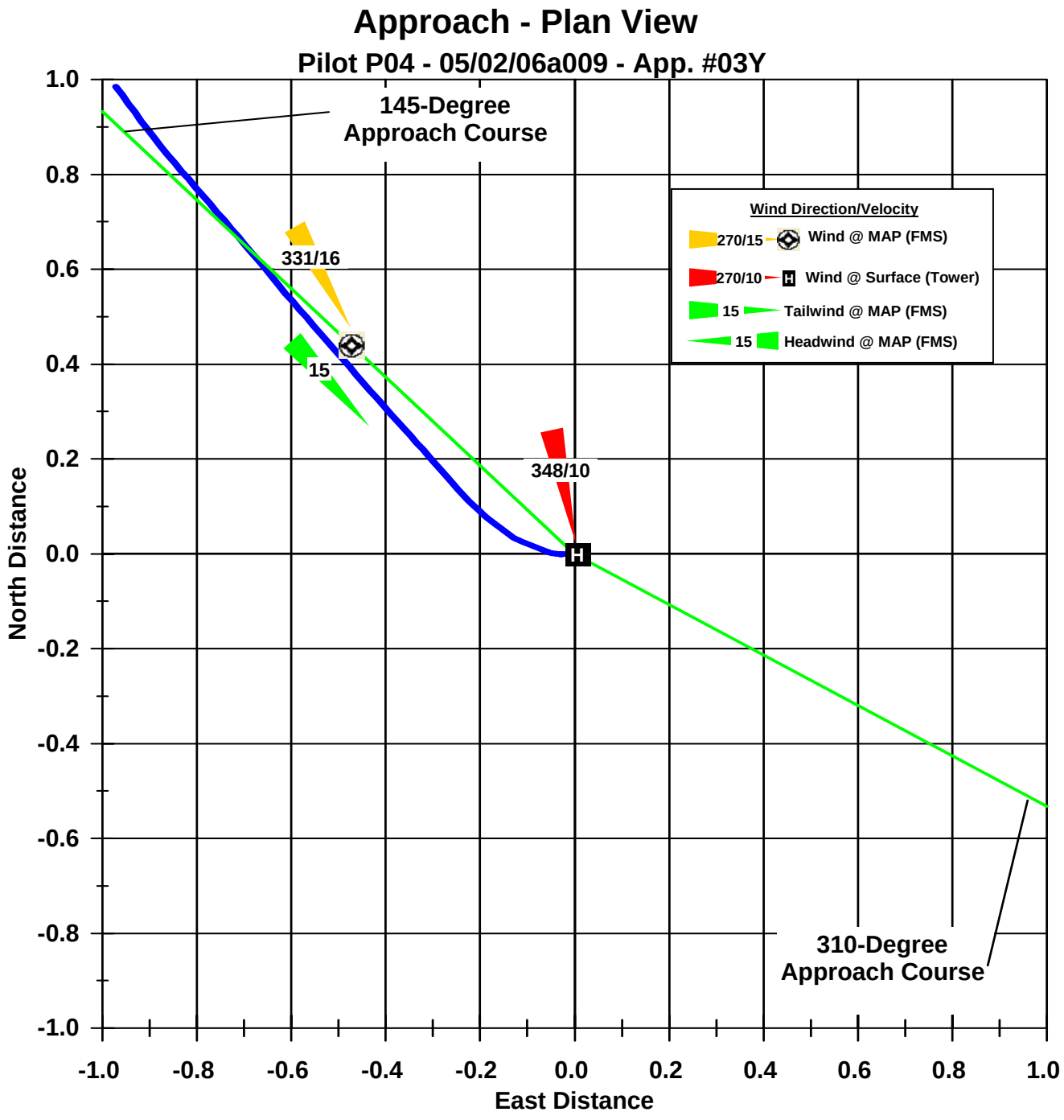


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06a008 - App. #02X

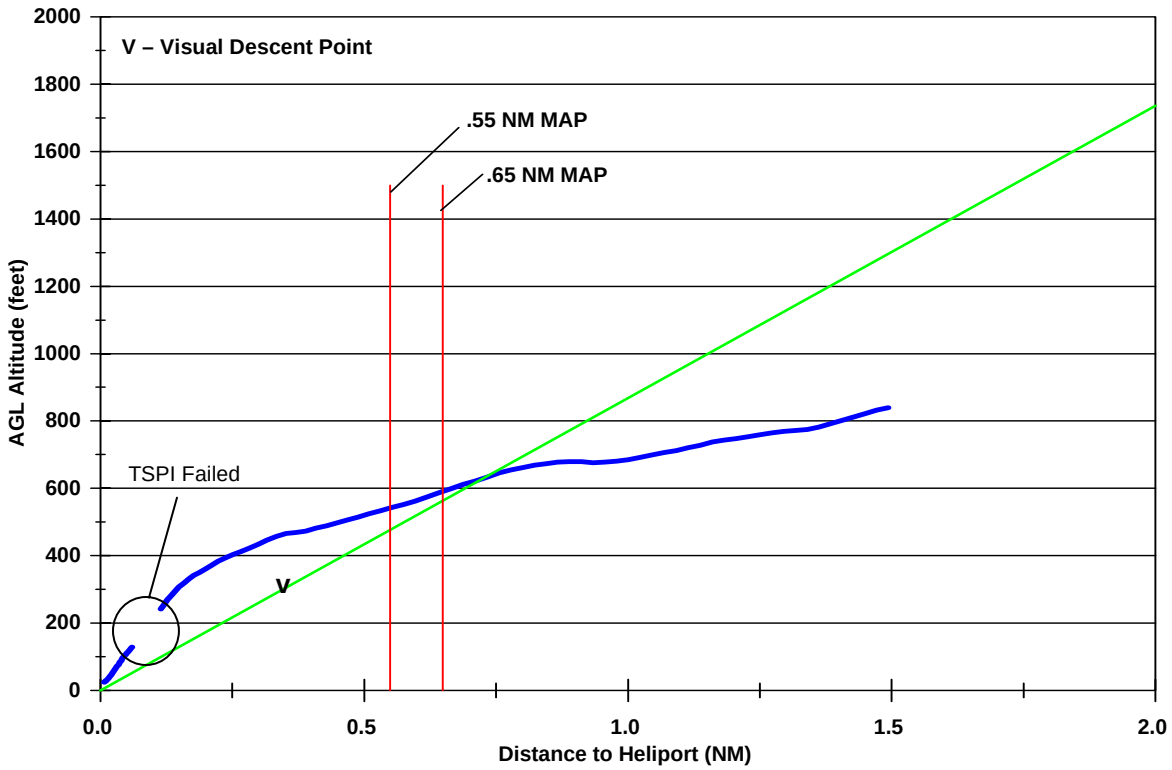


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06a008 - App. #02X

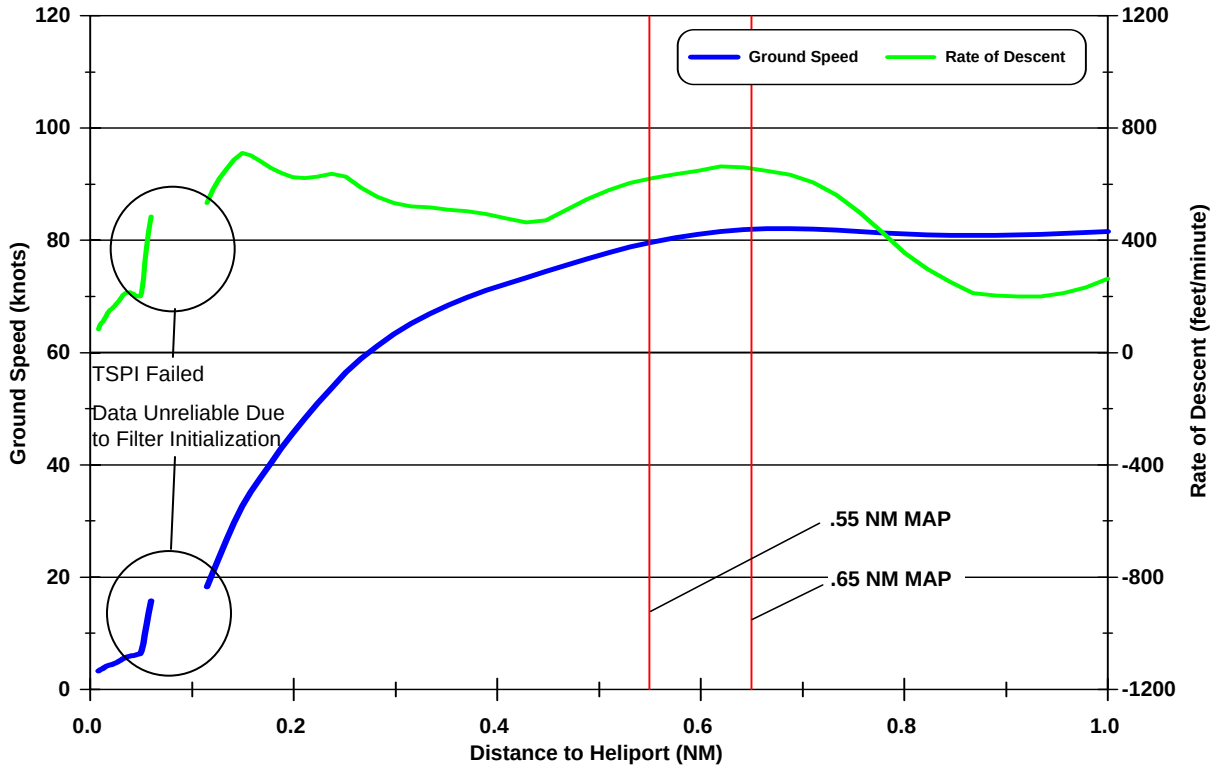



Approach - Plan View
Pilot P04 - 05/02/06a009 - App. #03Y
145-Degree
Approach Course
310-Degree
Approach Course
331/16
15
348/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

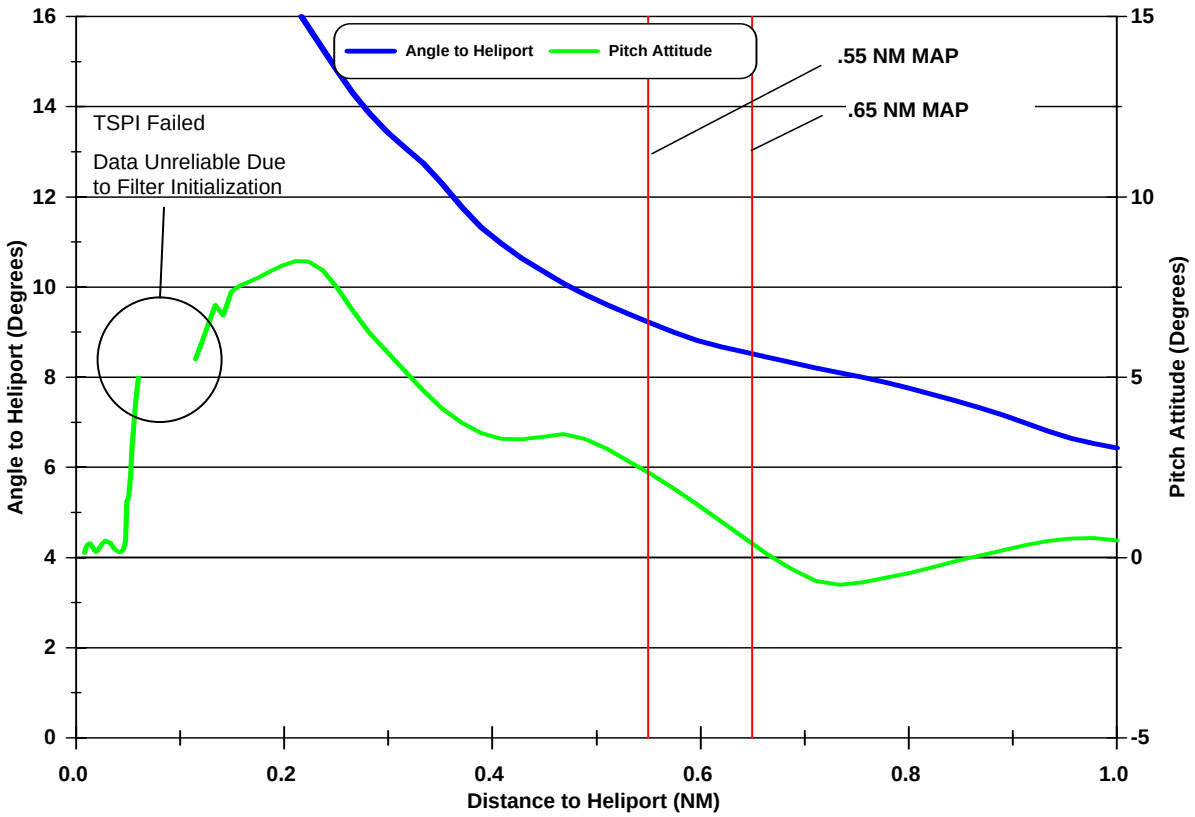
Profile View
Pilot P04 - 05/02/06a009 - App. #03Y



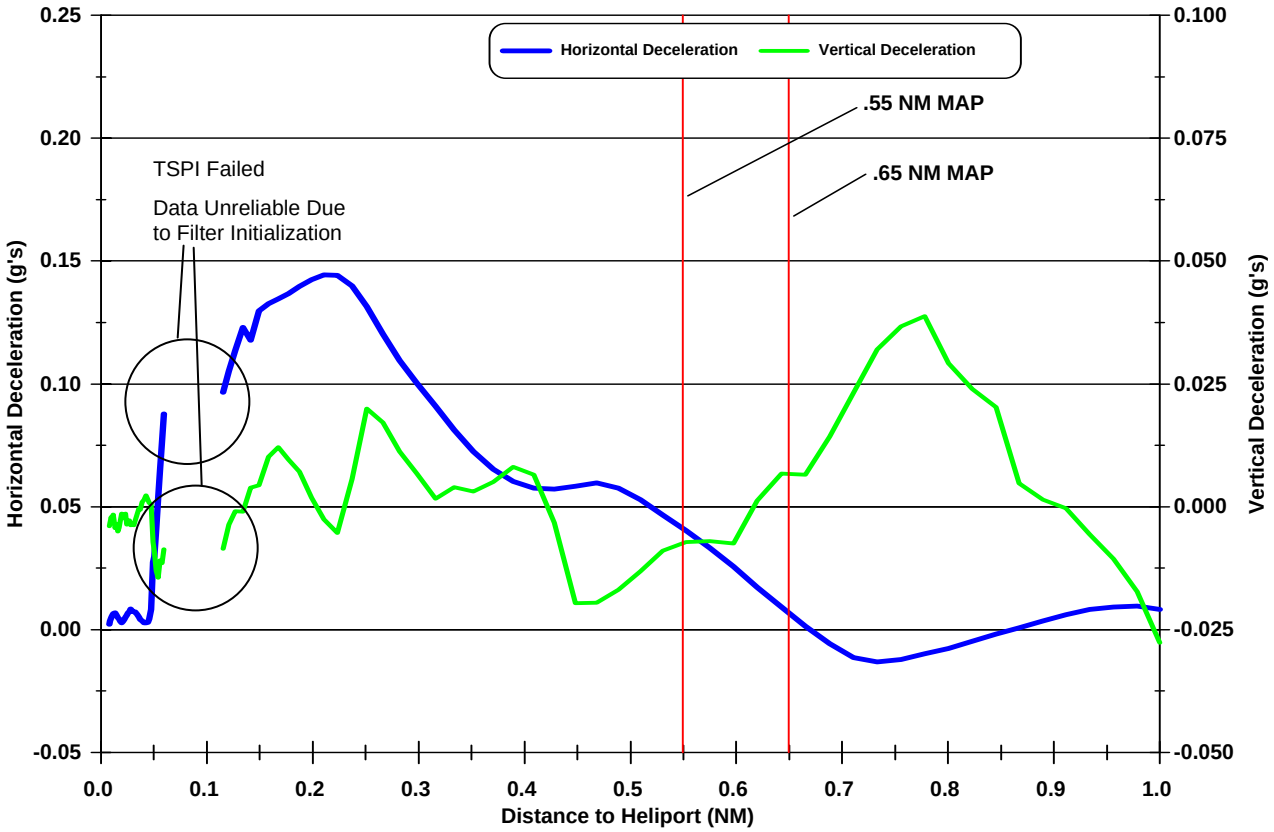
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06a009 - App. #03Y

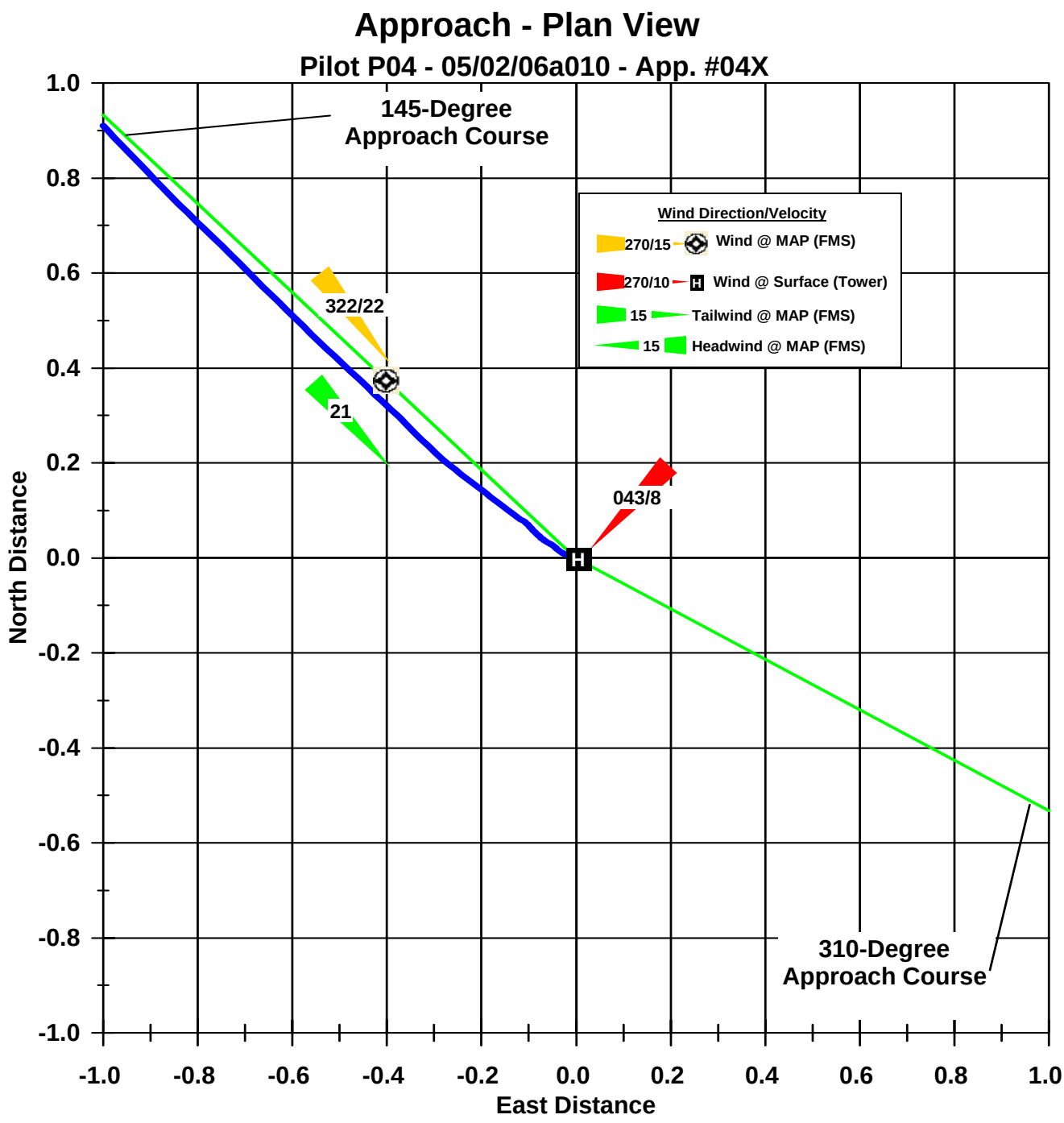


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06a009 - App. #03Y

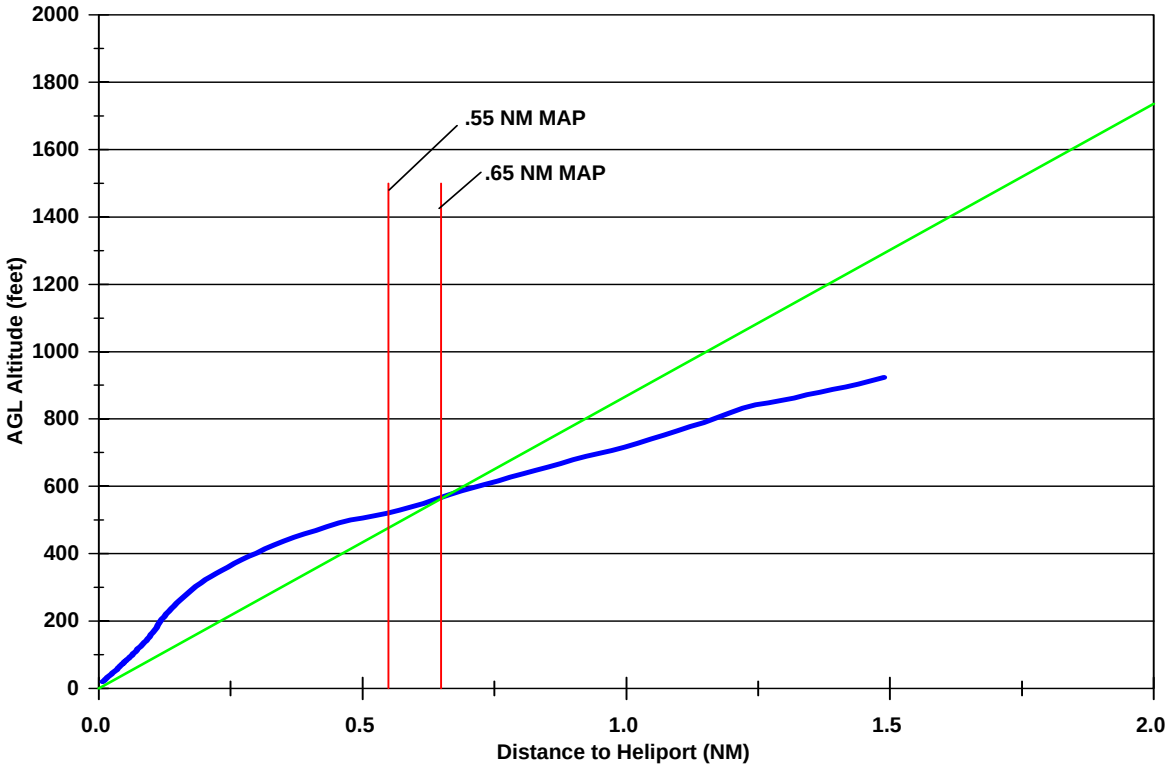


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06a009 - App. #03Y

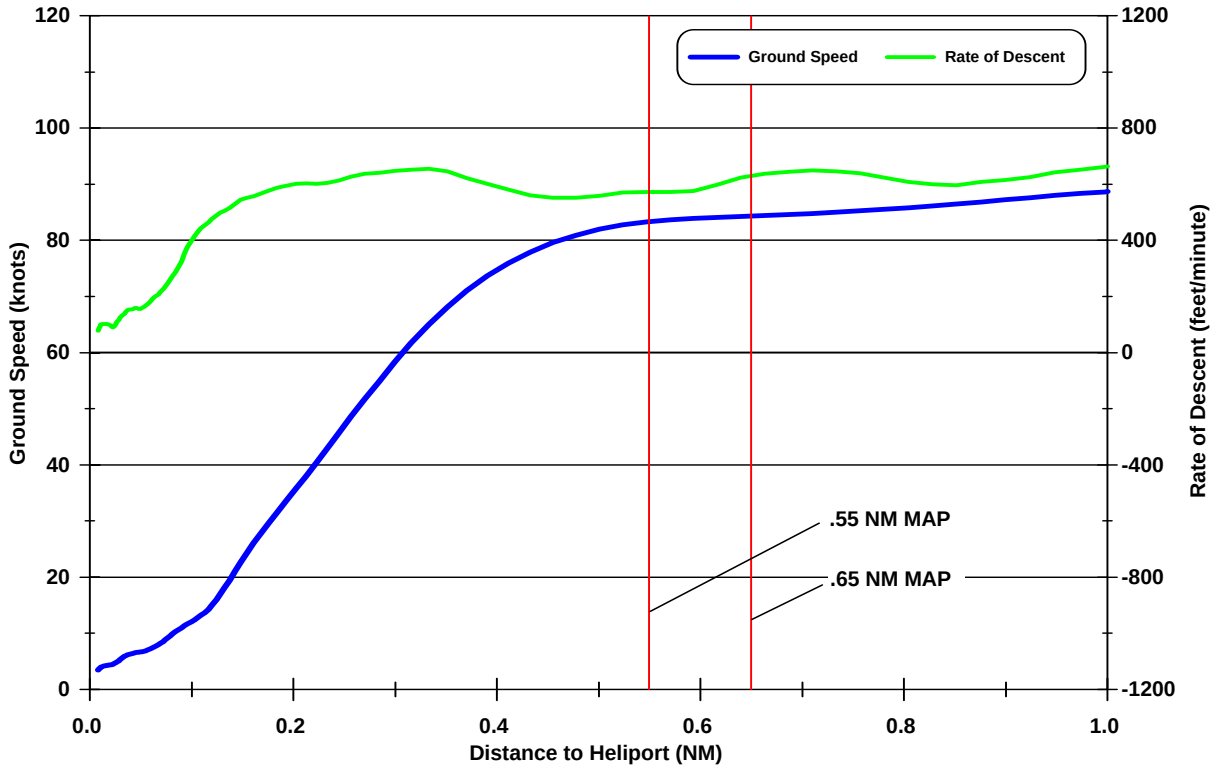



Approach - Plan View
Pilot P04 - 05/02/06a010 - App. #04X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
322/22
21
043/8
H
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

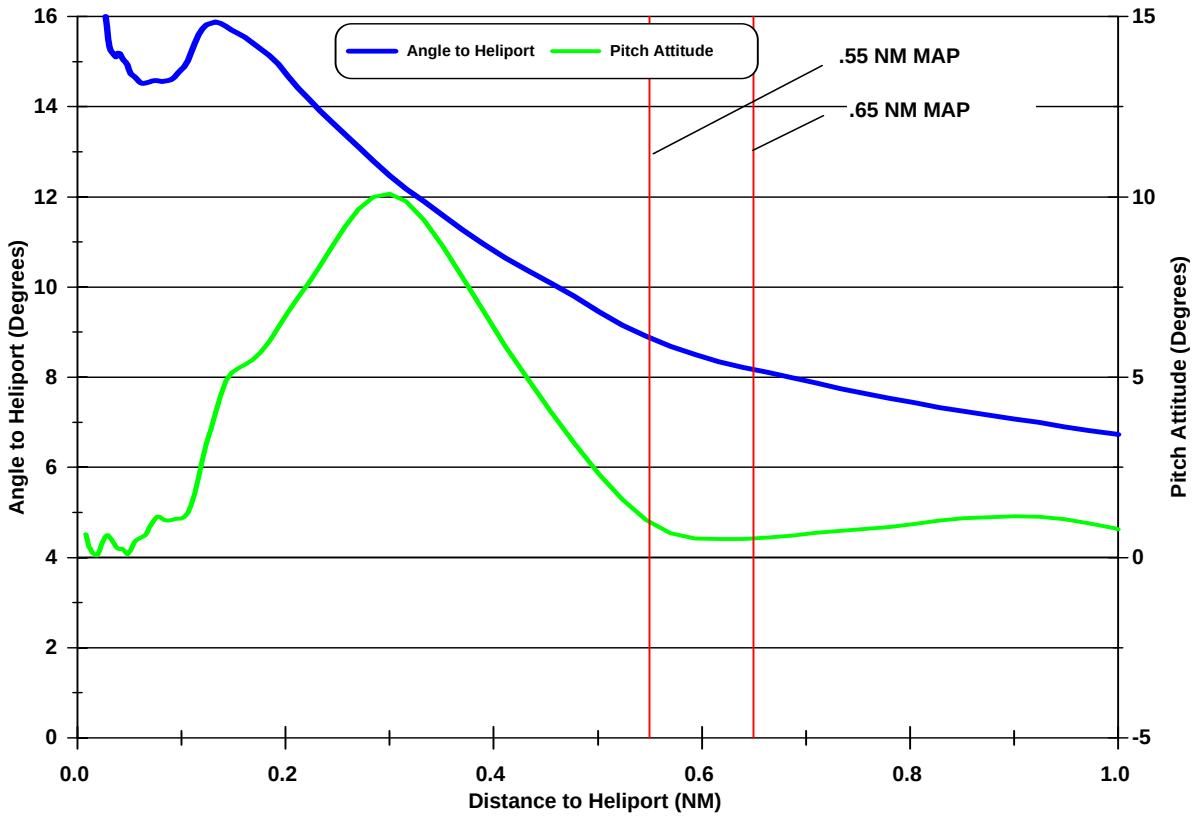
Profile View
Pilot P04 - 05/02/06a010 - App. #04X



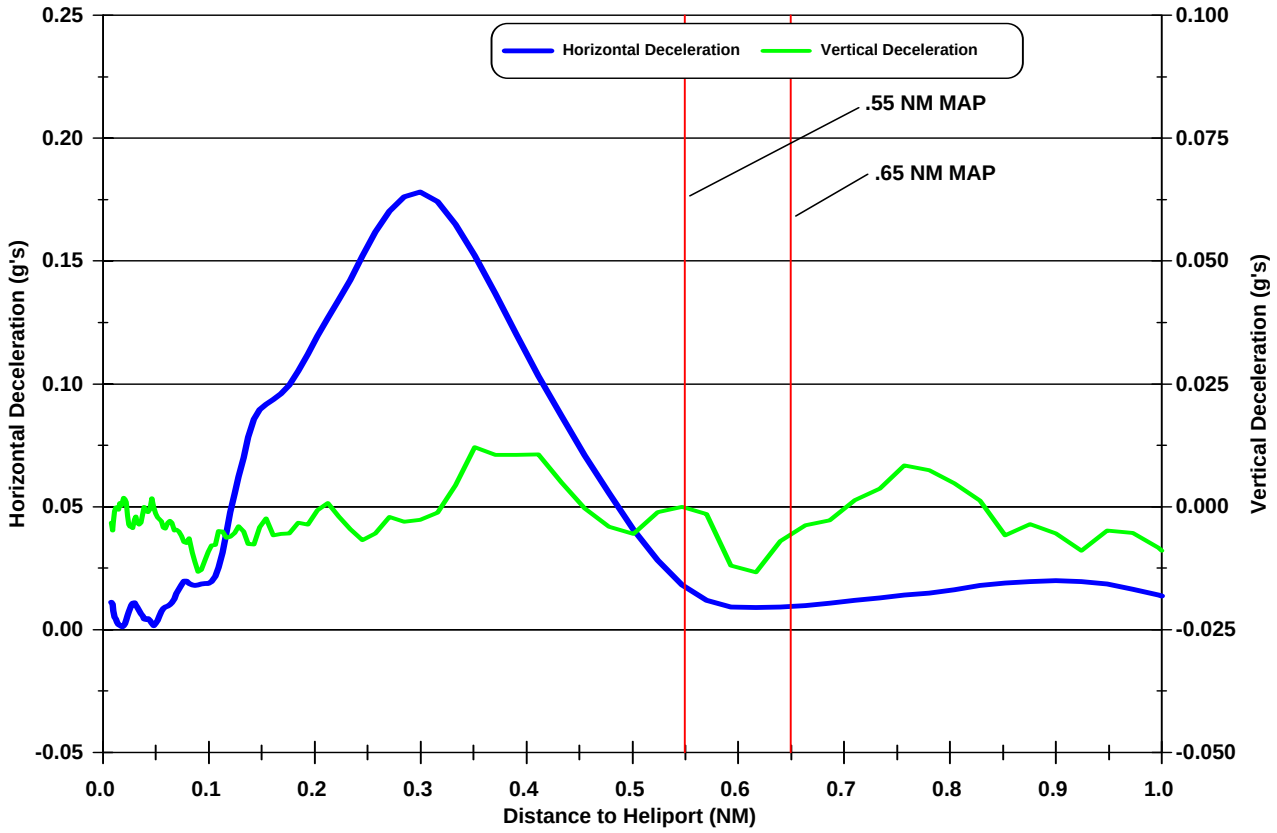
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06a010 - App. #04X

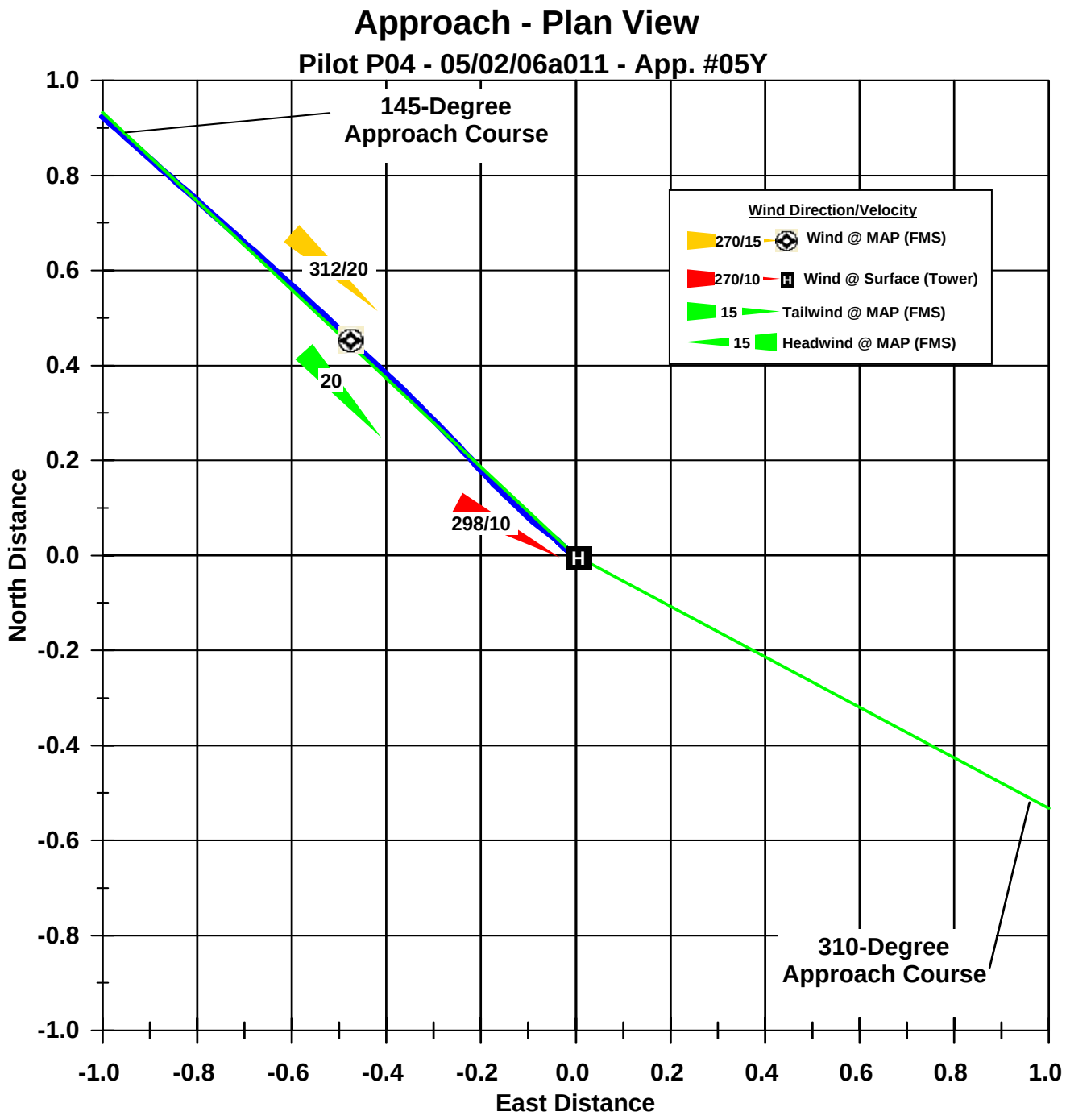


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06a010 - App. #04X

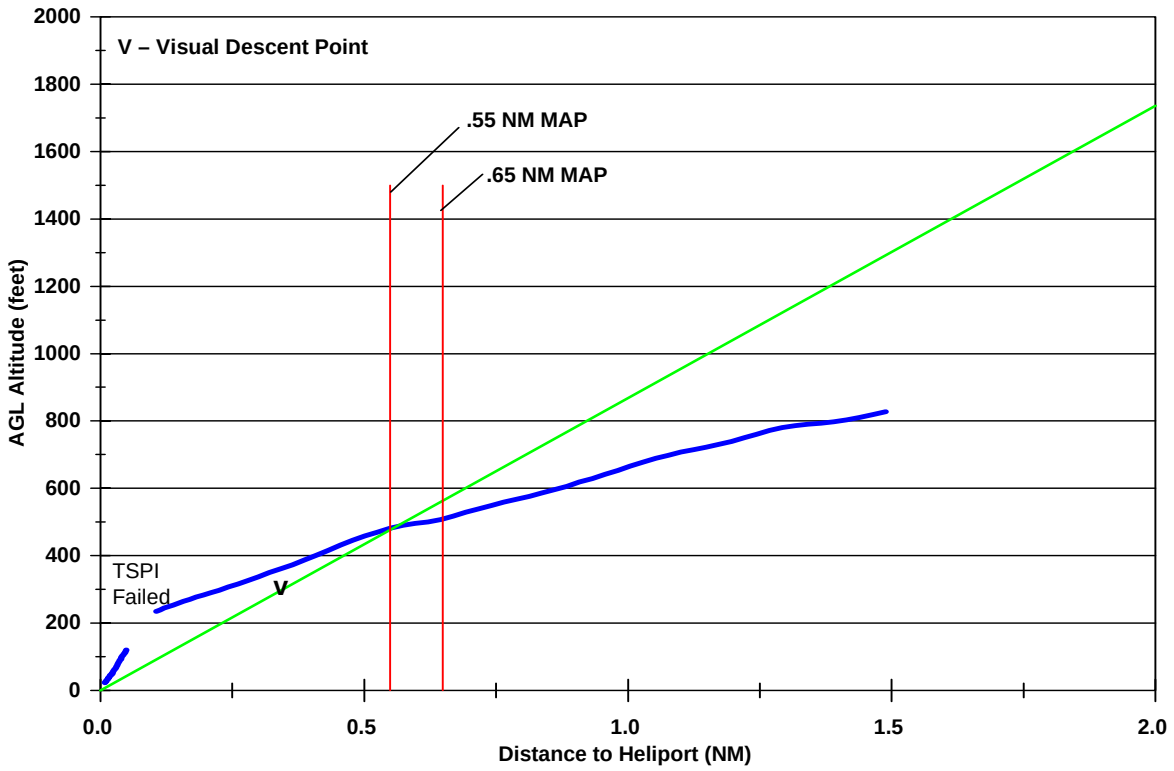


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06a010 - App. #04X

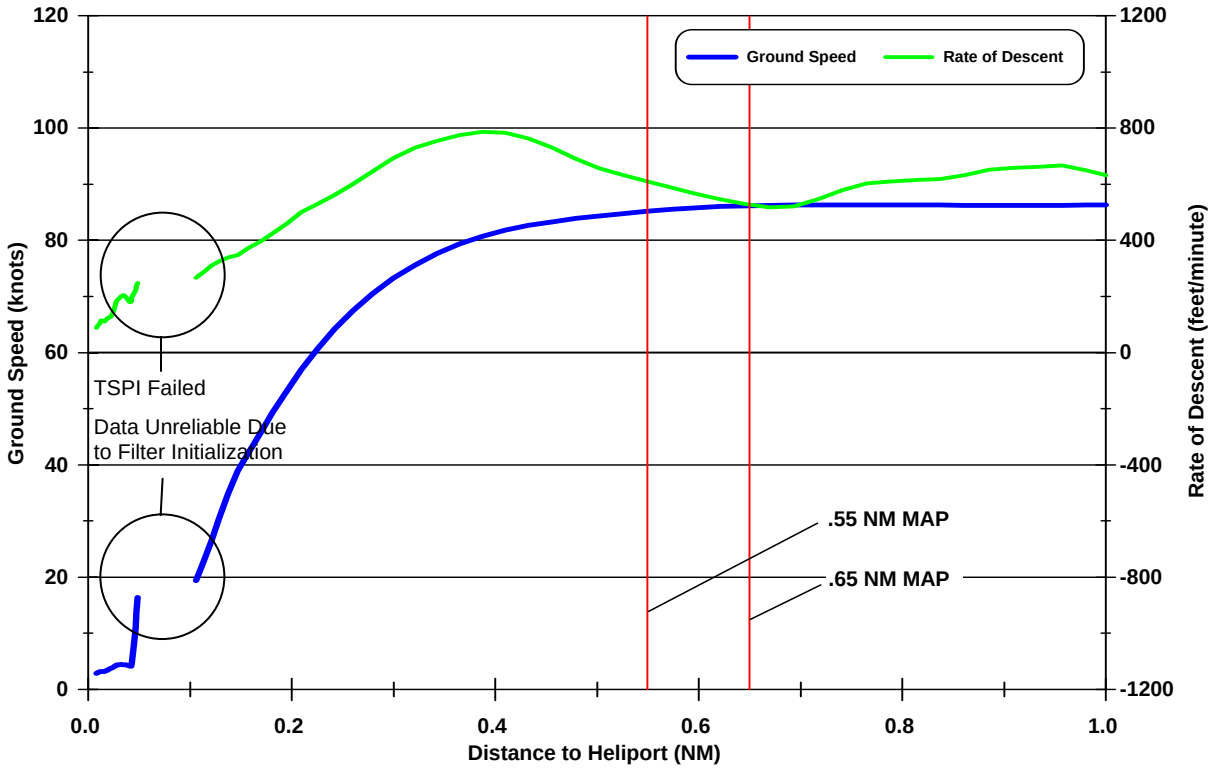



Approach - Plan View
Pilot P04 - 05/02/06a011 - App. #05Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
312/20
20
298/10
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

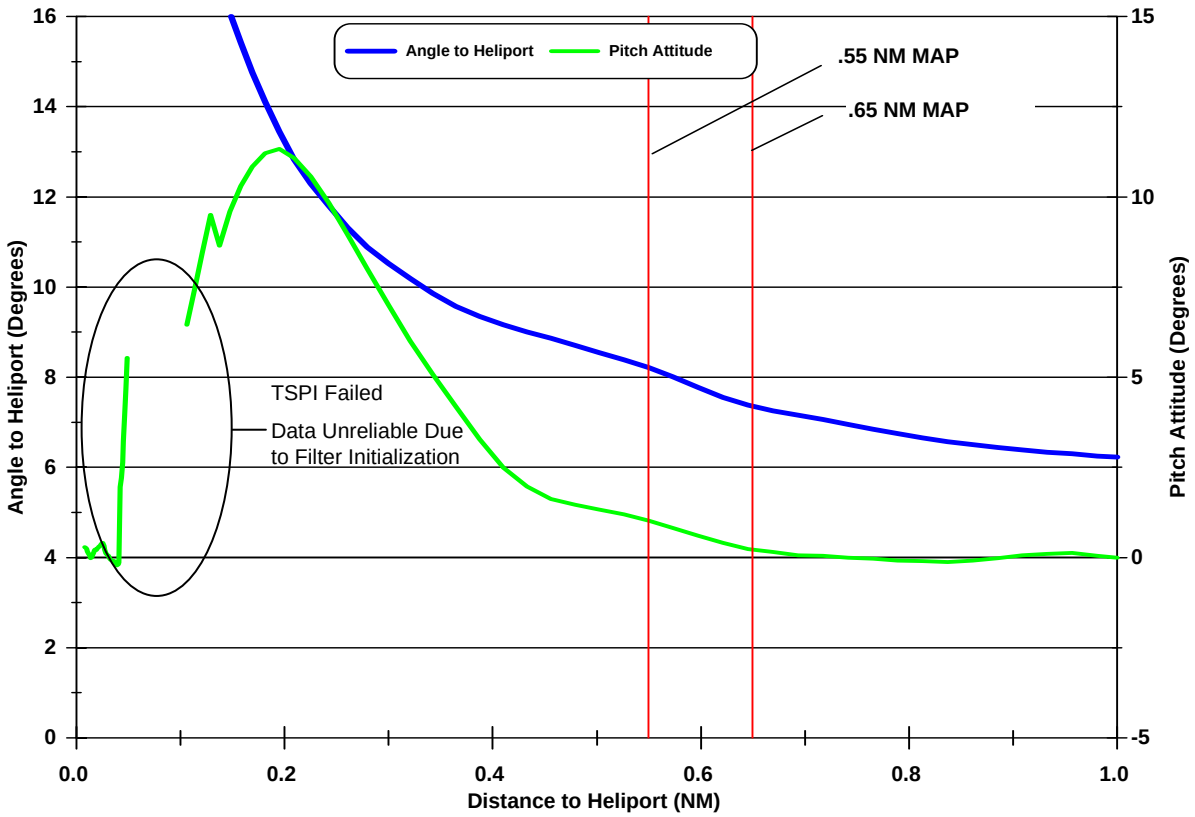
Profile View
Pilot P04 - 05/02/06a011 - App. #05Y



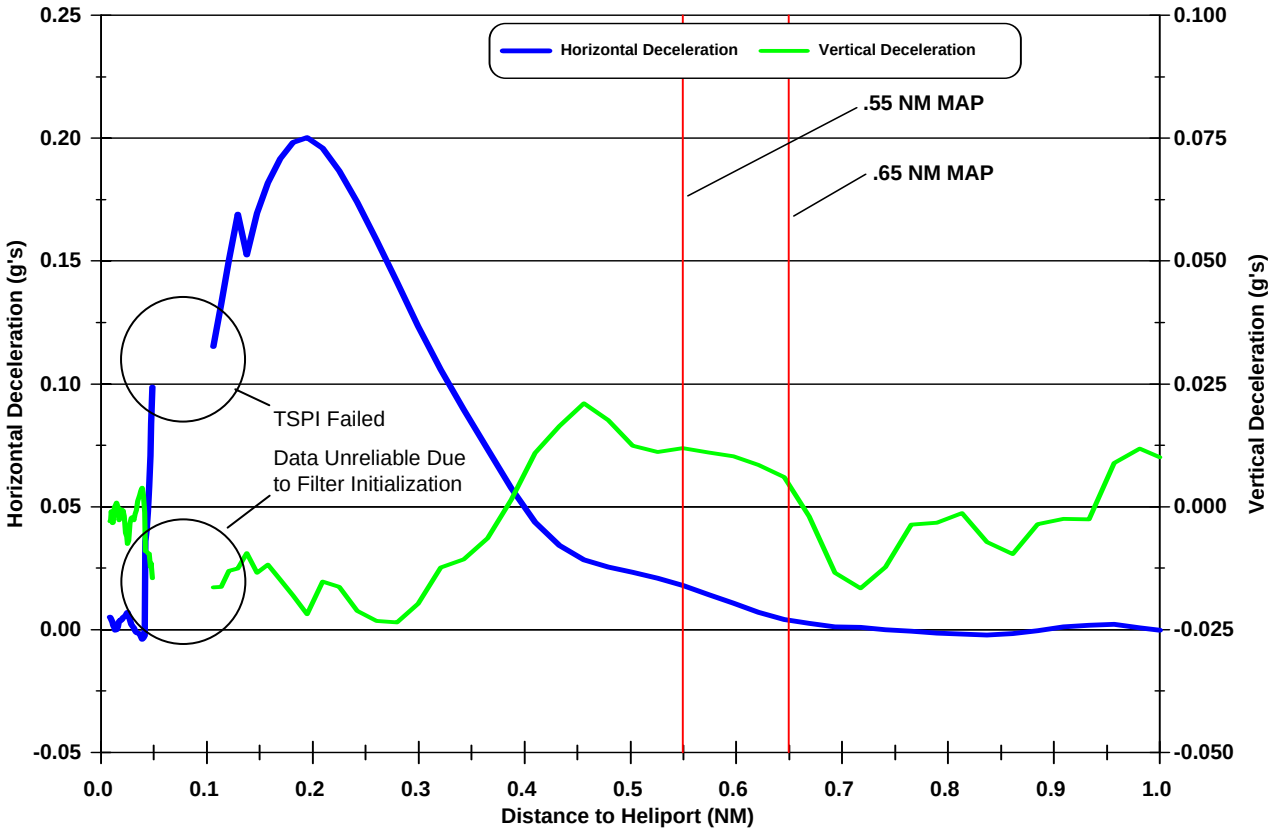
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06a011 - App. #05Y

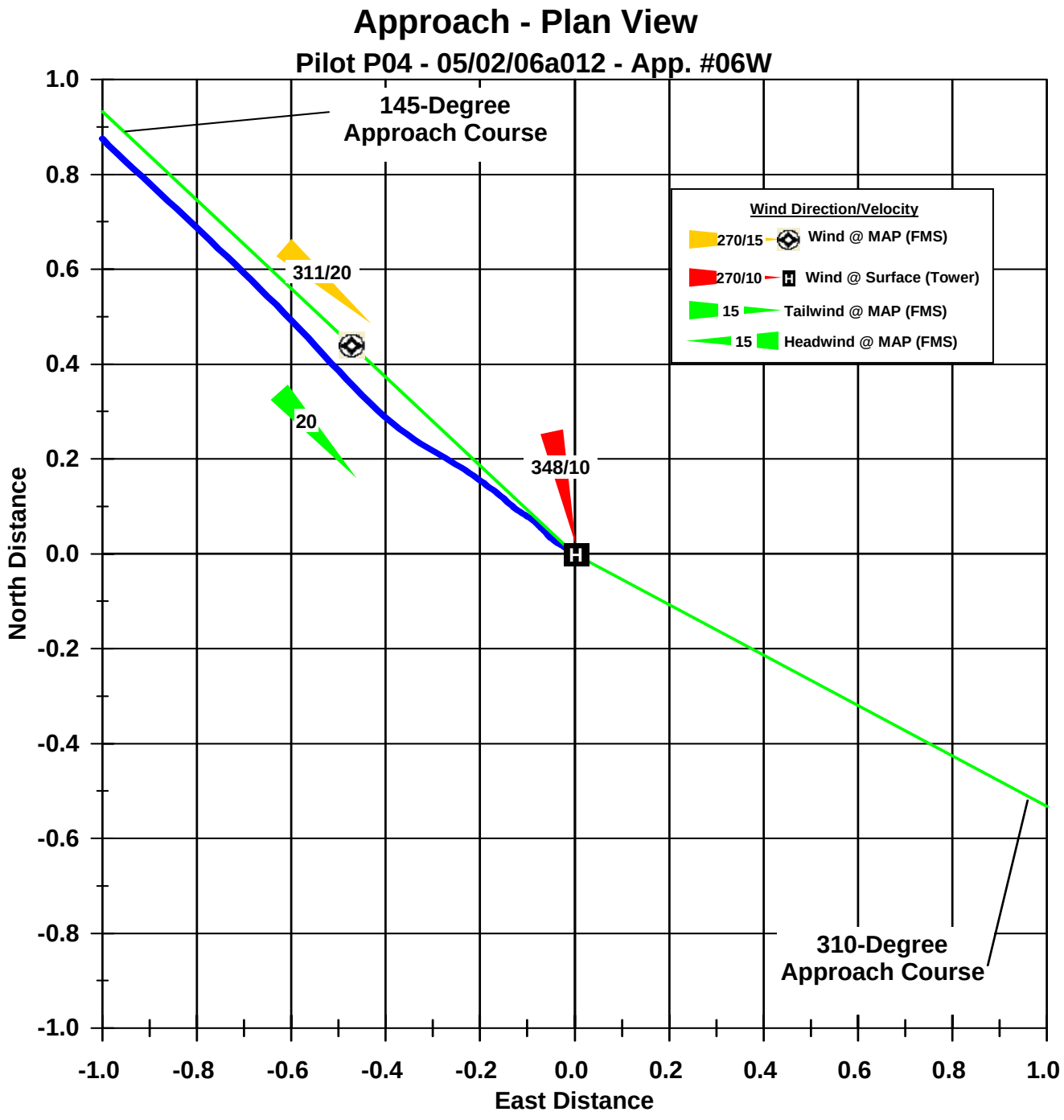


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06a011 - App. #05Y

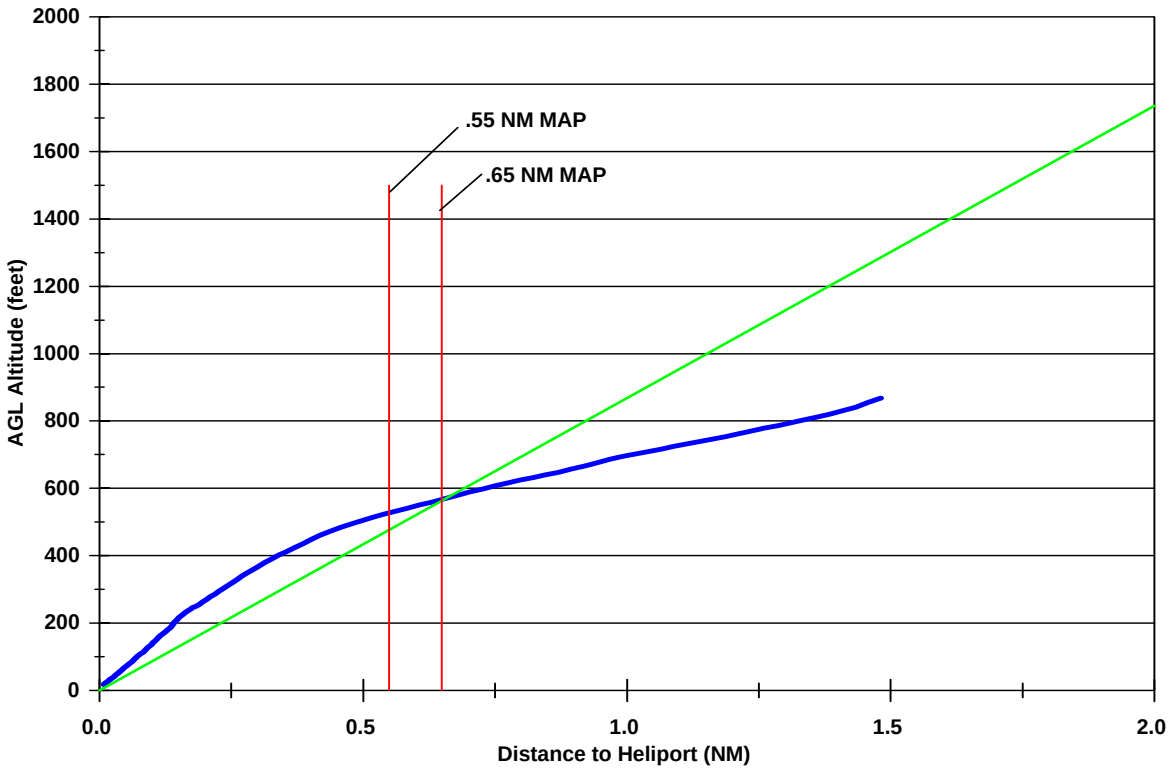


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06a011 - App. #05Y

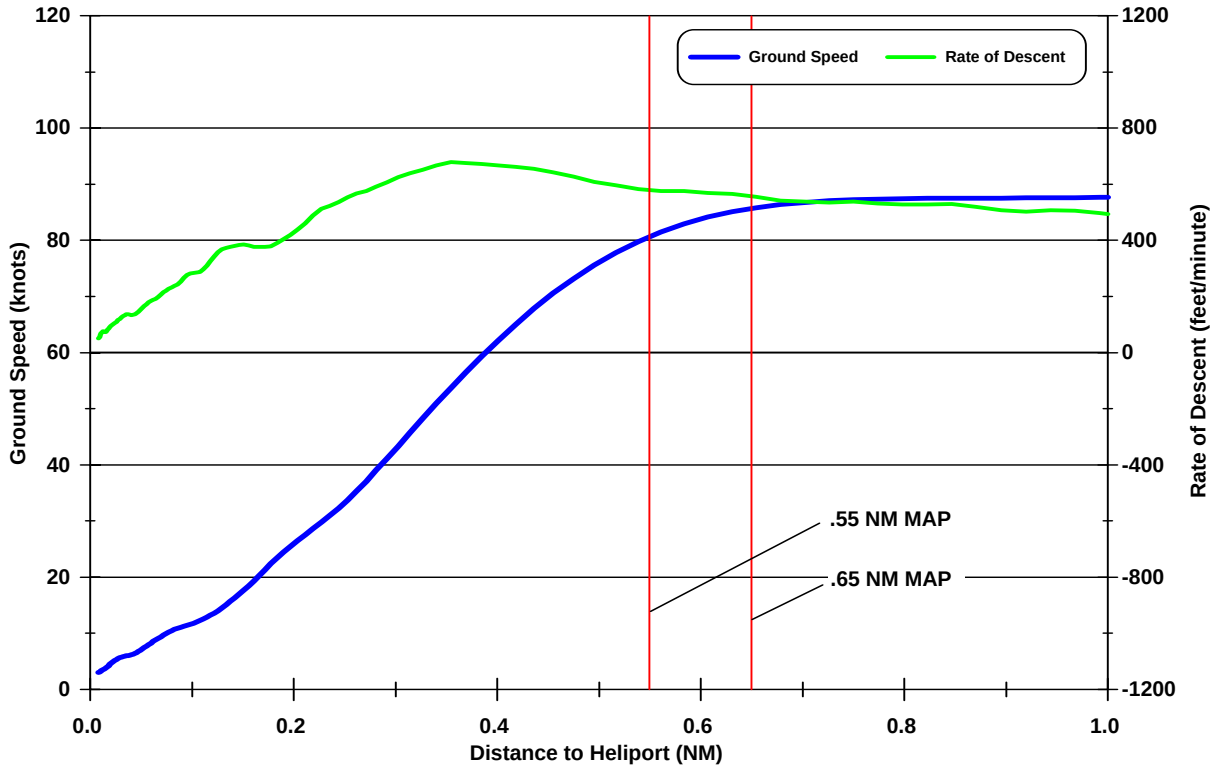



Approach - Plan View
Pilot P04 - 05/02/06a012 - App. #06W
145-Degree
Approach Course
310-Degree
Approach Course
311/20
20
348/10
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

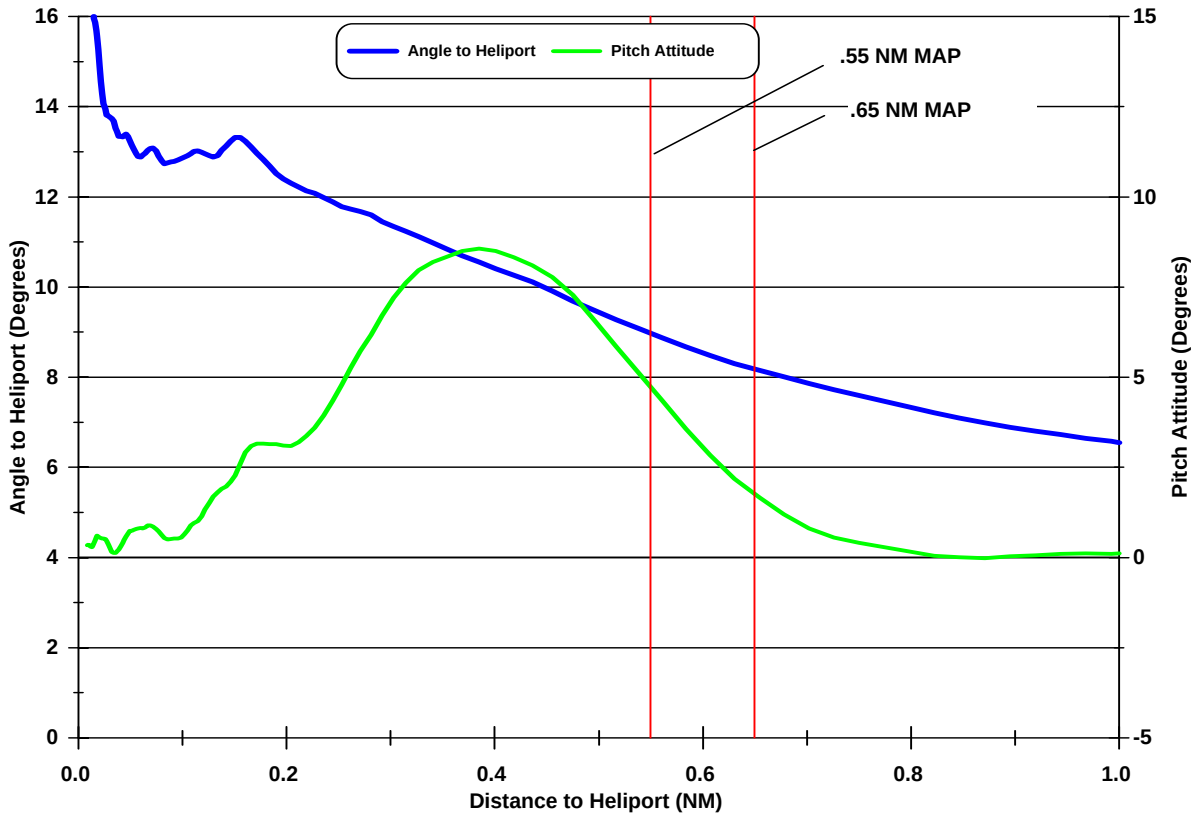
Profile View
Pilot P04 - 05/02/06a012 - App. #06W



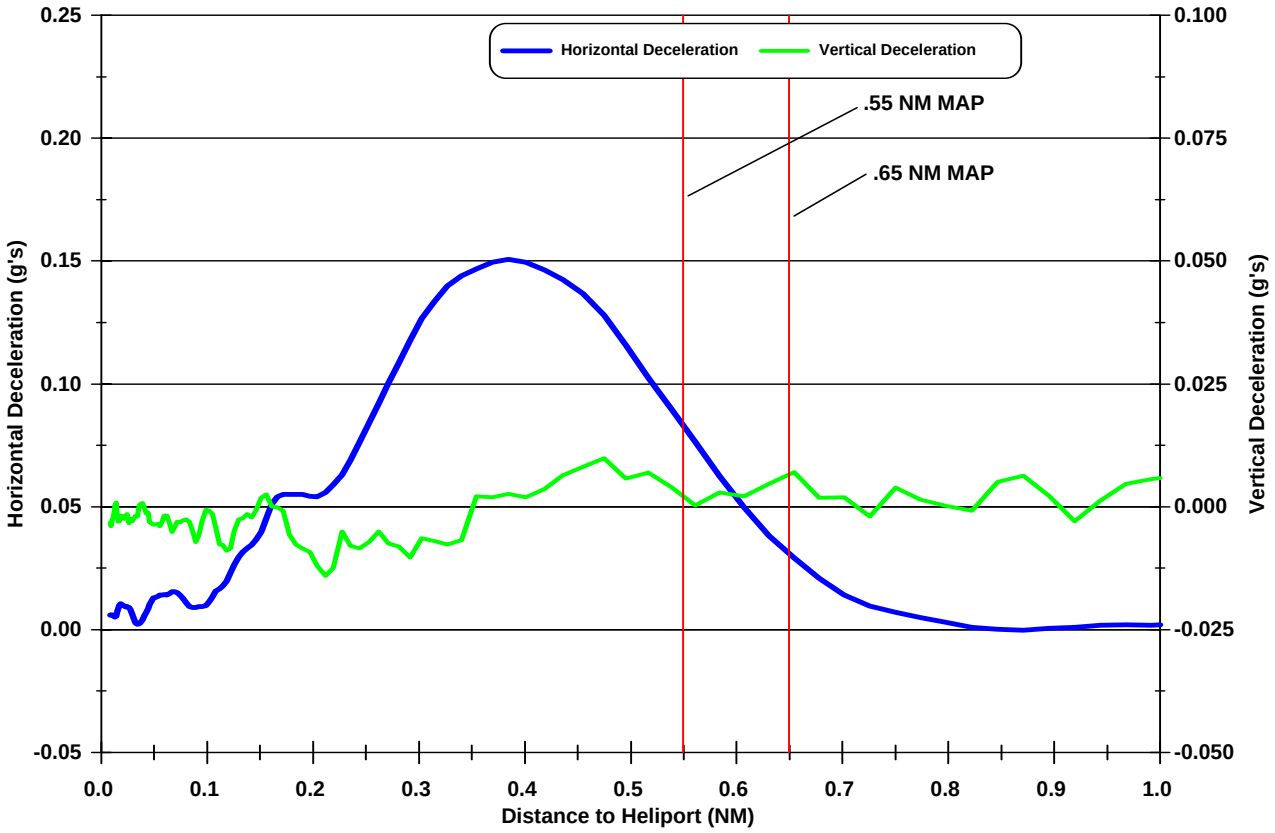
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06a012 - App. #06W

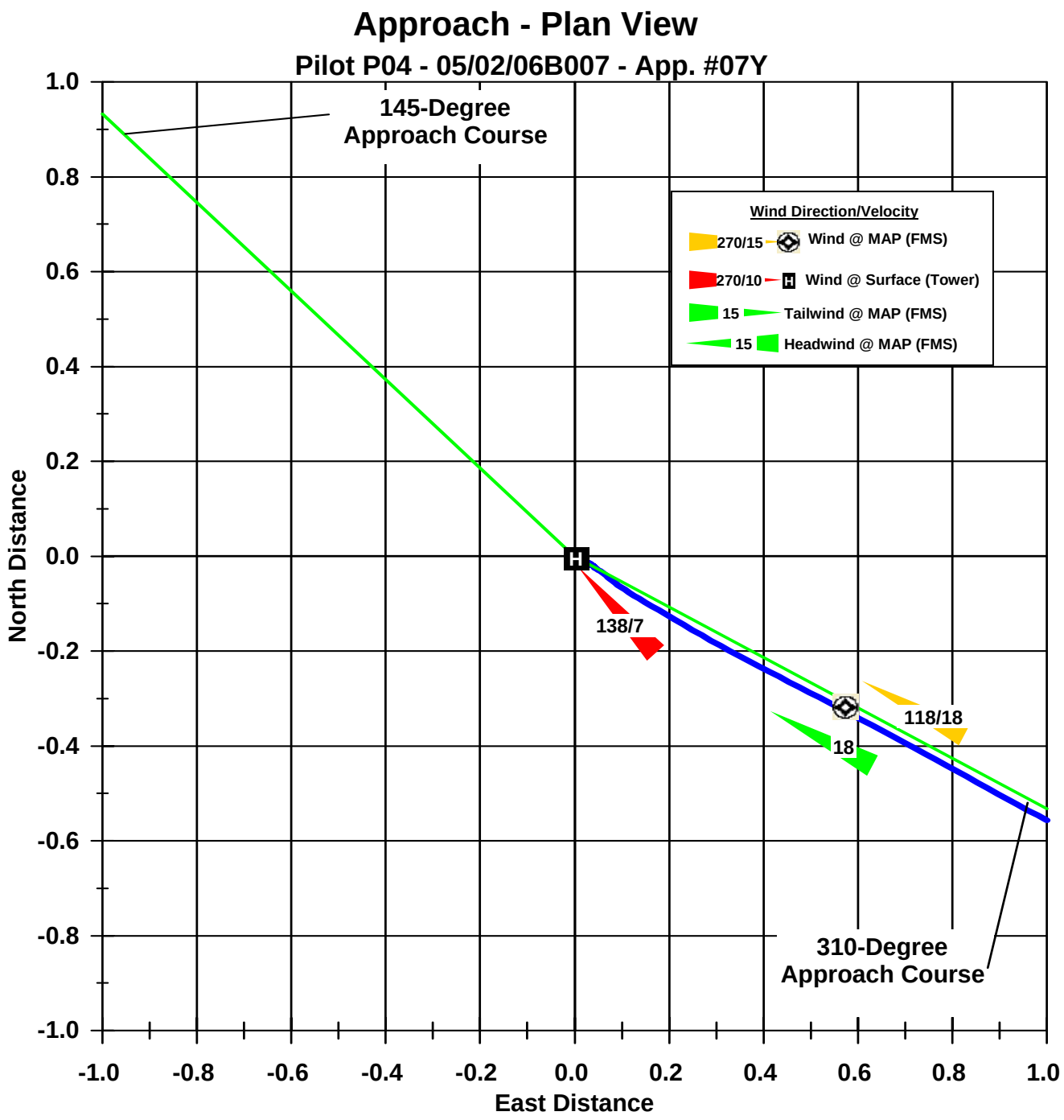


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06a012 - App. #06W

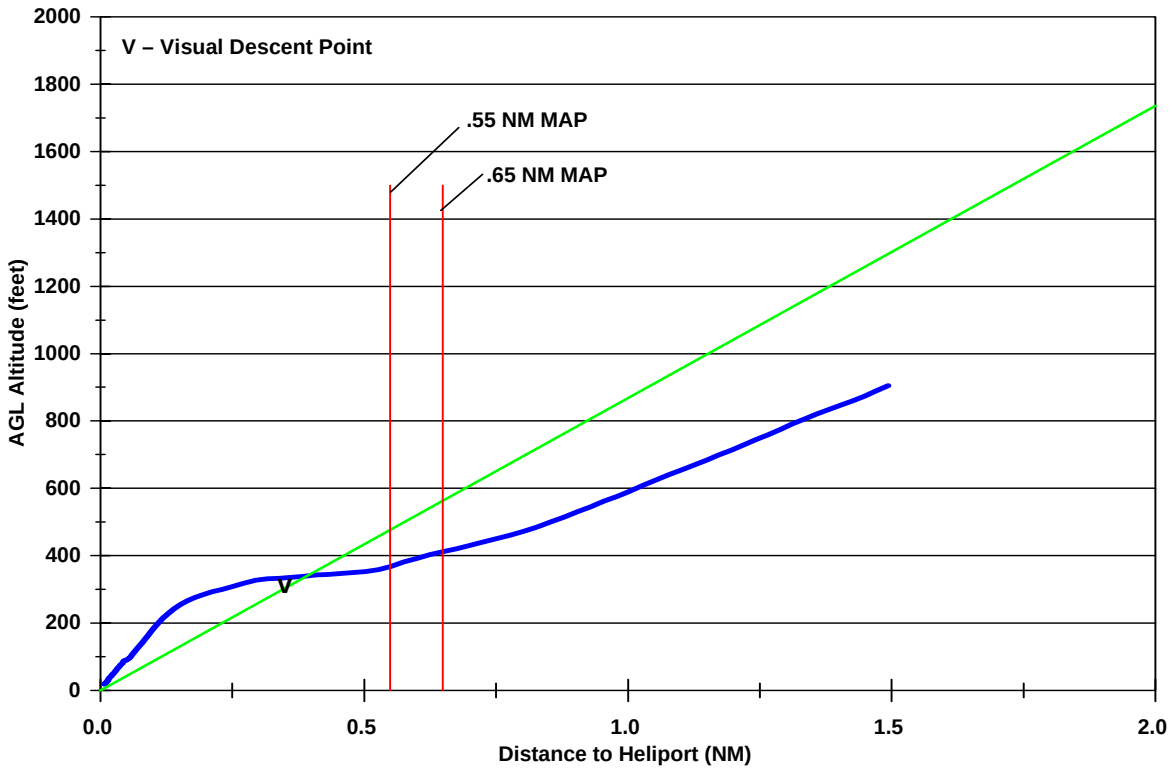


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06a012 - App. #06W

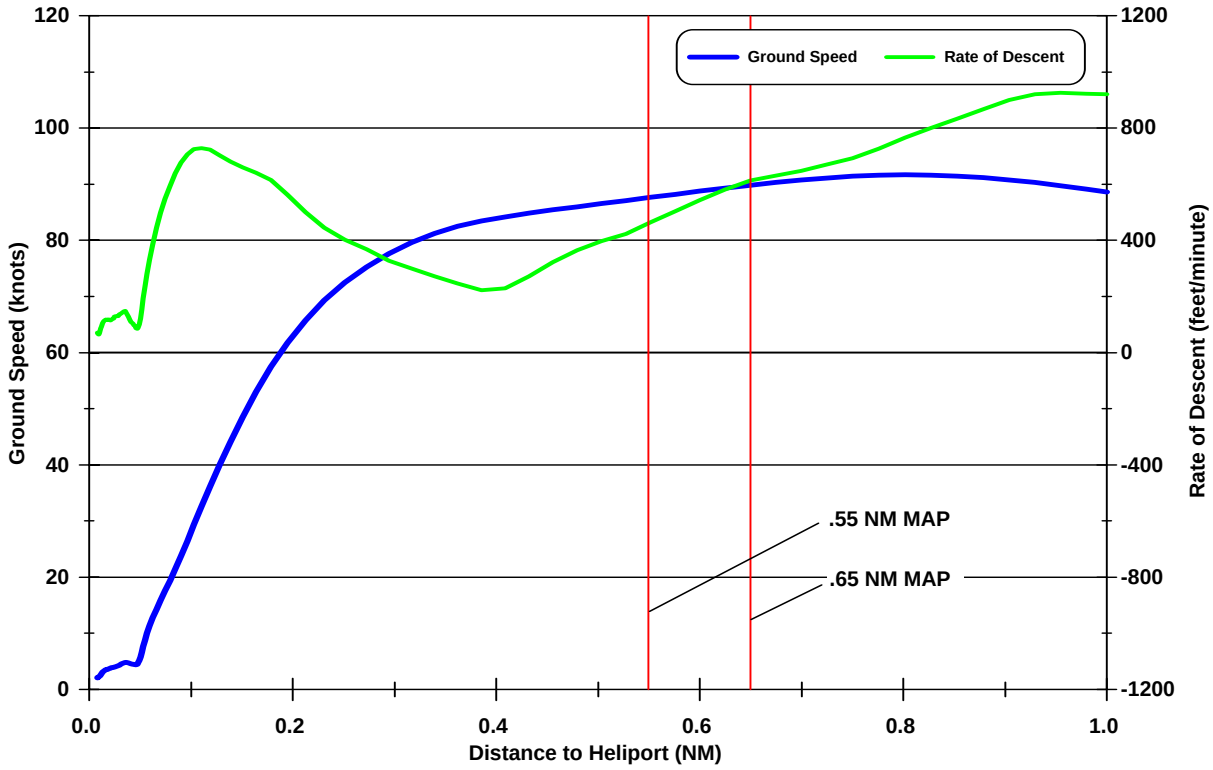



Approach - Plan View
Pilot P04 - 05/02/06B007 - App. #07Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
138/7
118/18
18
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

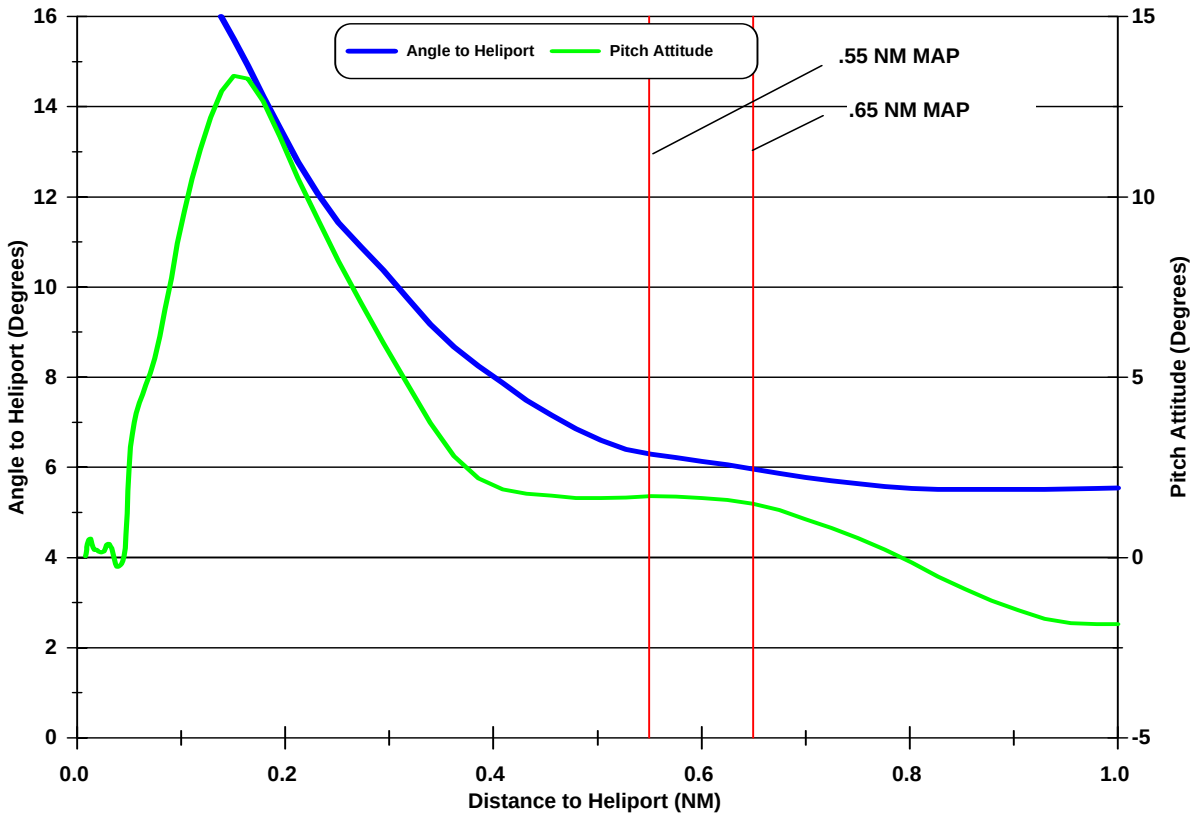
Profile View
Pilot P04 - 05/02/06B007 - App. #07Y



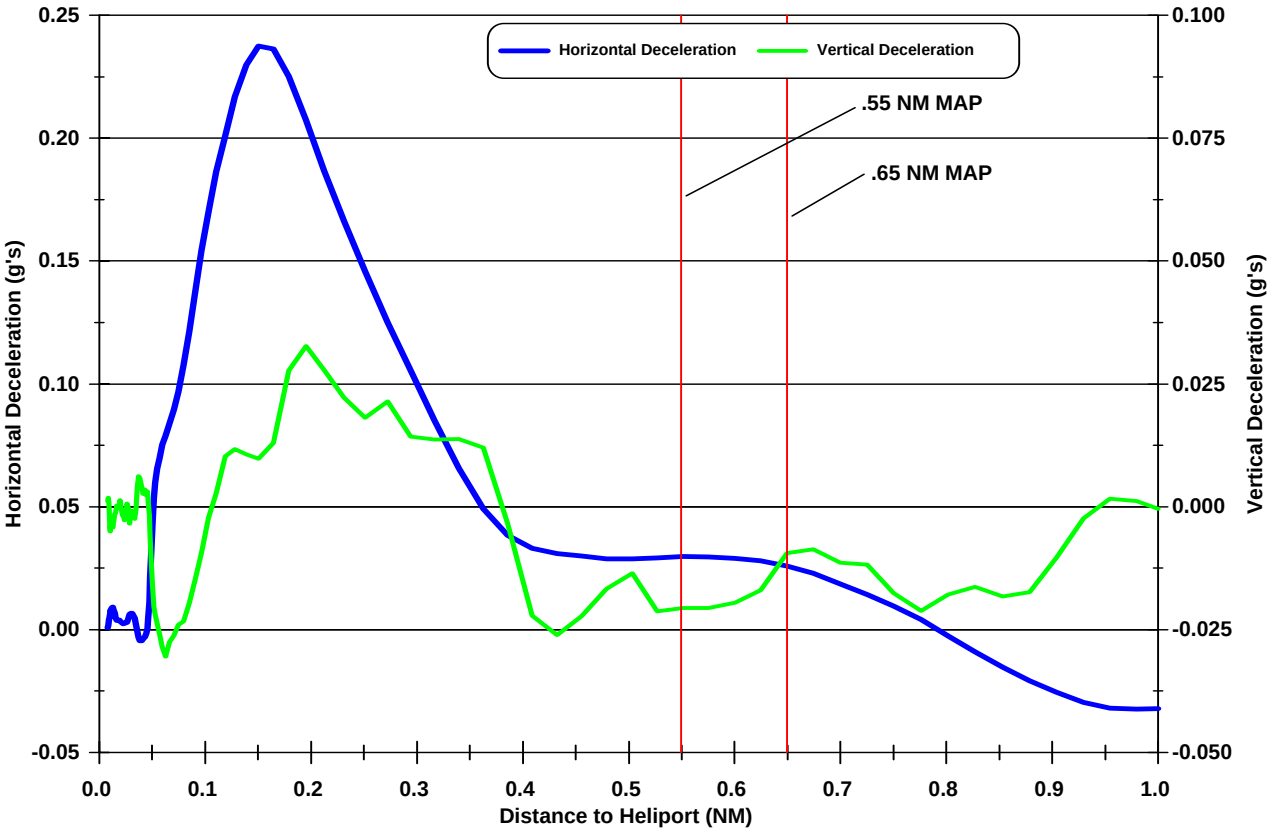
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06B007 - App. #07Y

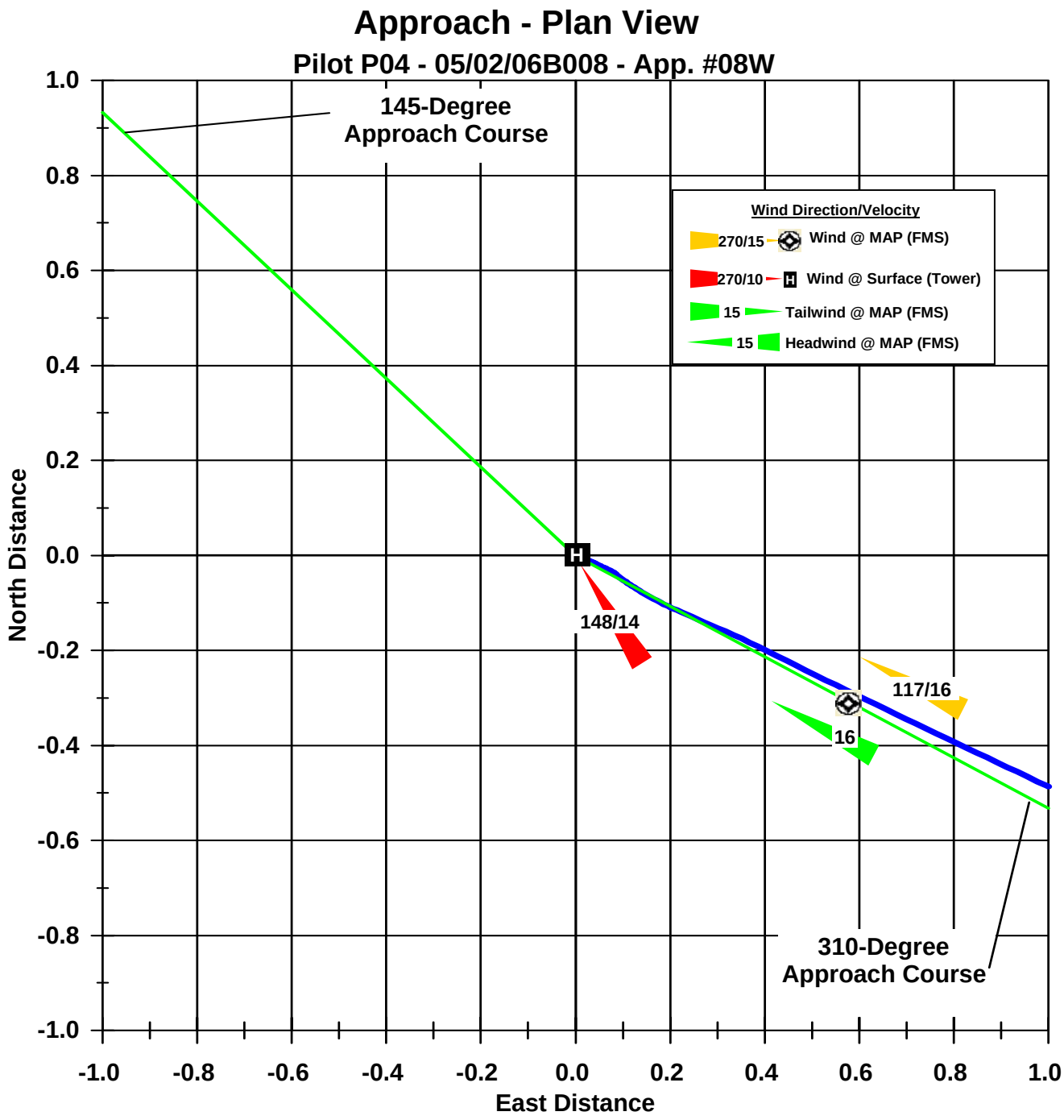


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06B007 - App. #07Y

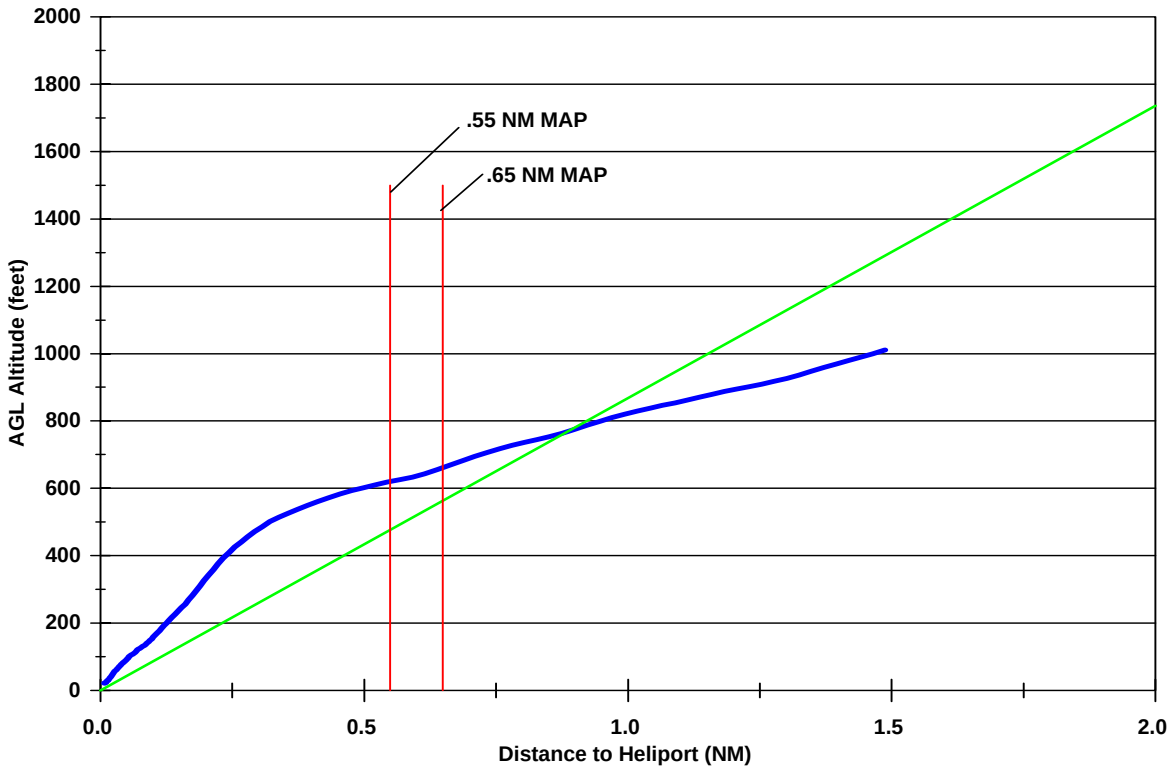


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06B007 - App. #07Y

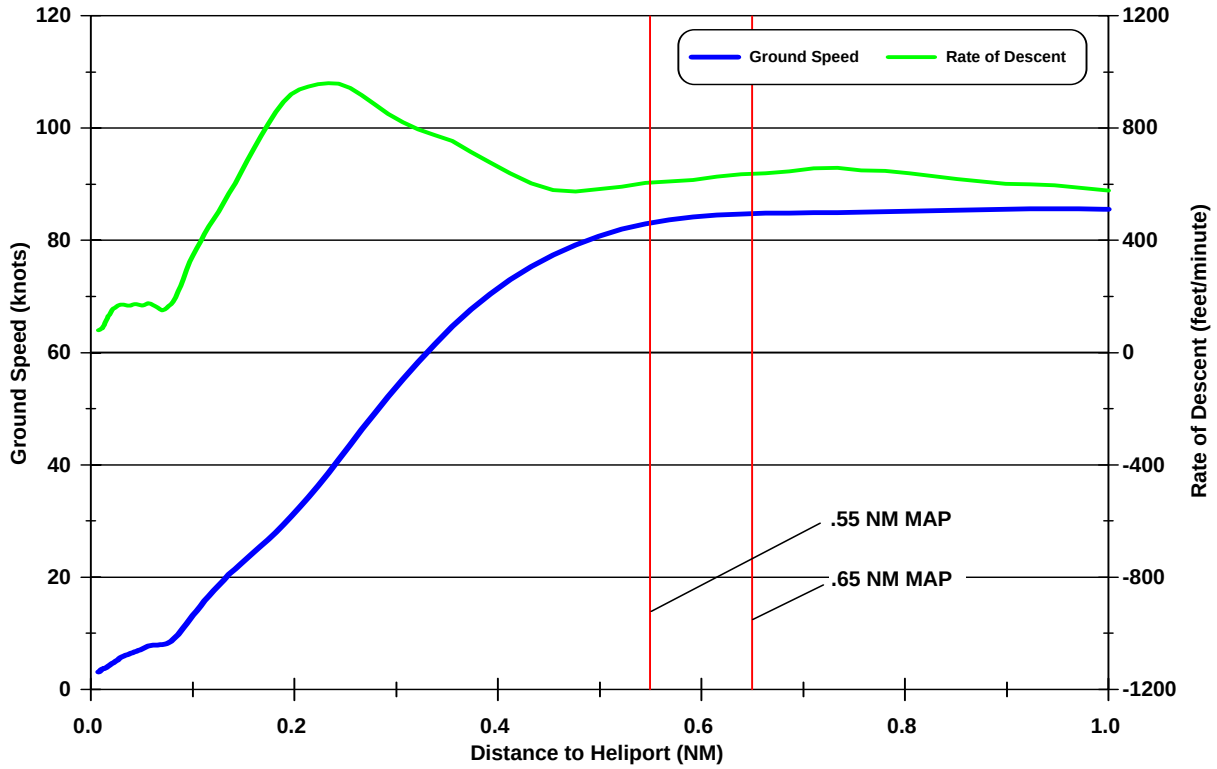



Approach - Plan View
Pilot P04 - 05/02/06B008 - App. #08W
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
148/14
117/16
16
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

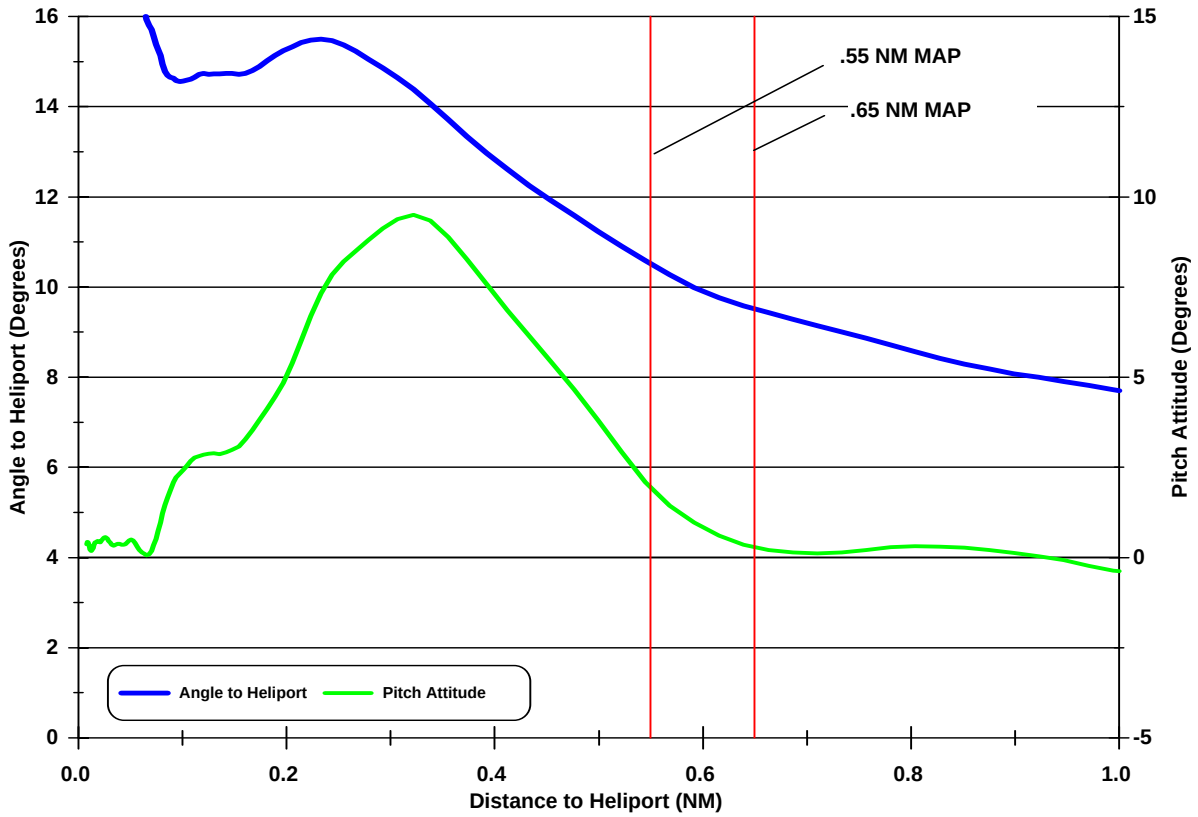
Profile View
Pilot P04 - 05/02/06B008 - App. #08W



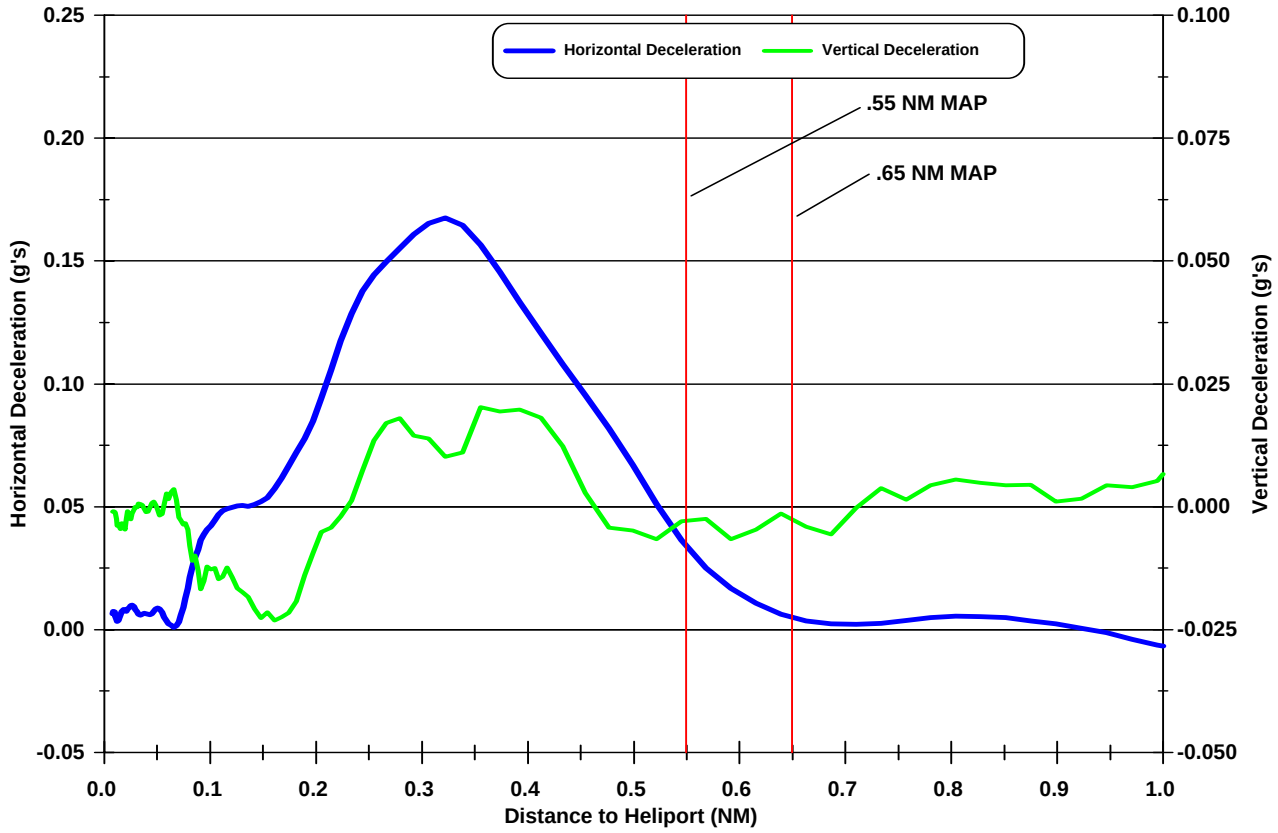
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06B008 - App. #08W

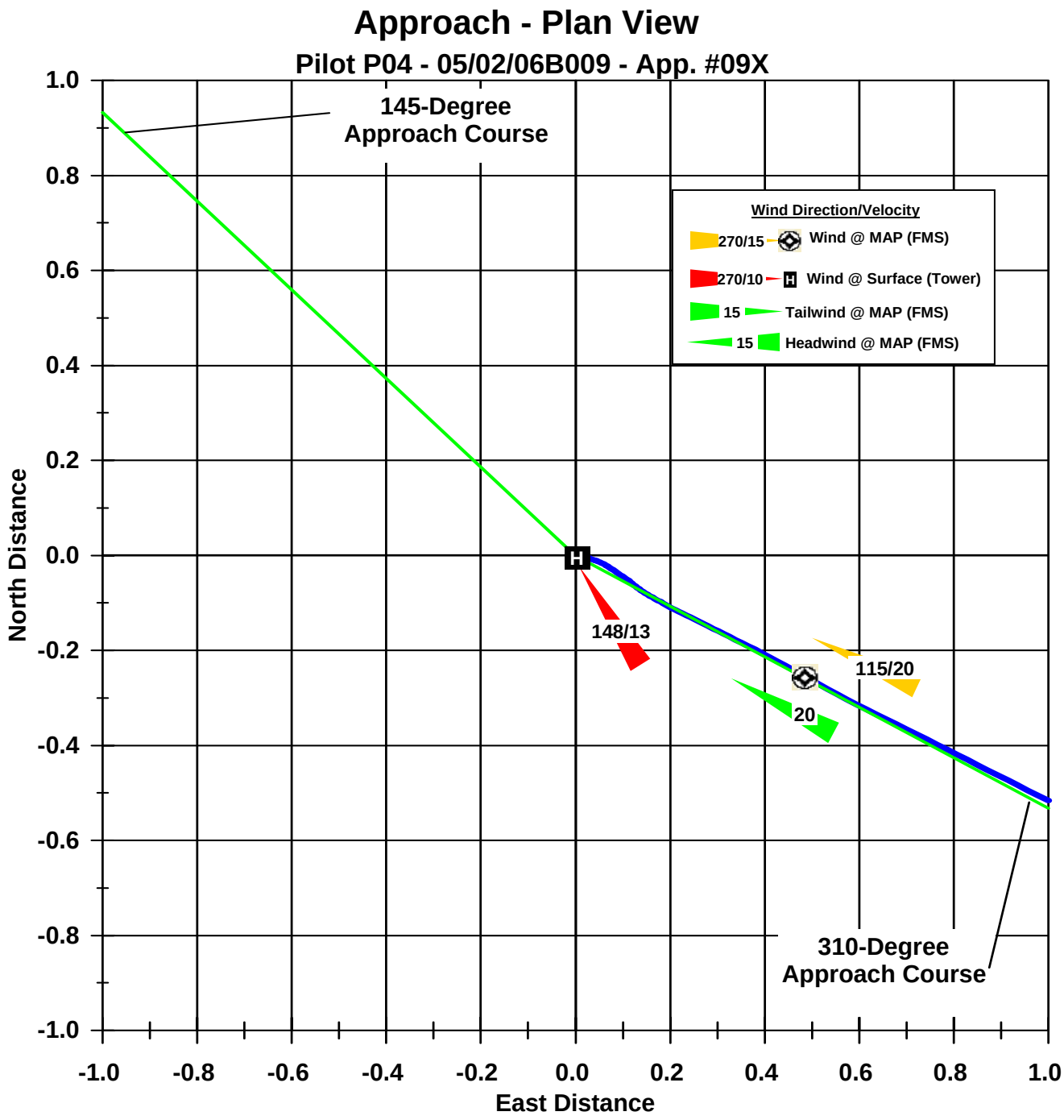


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06B008 - App. #08W

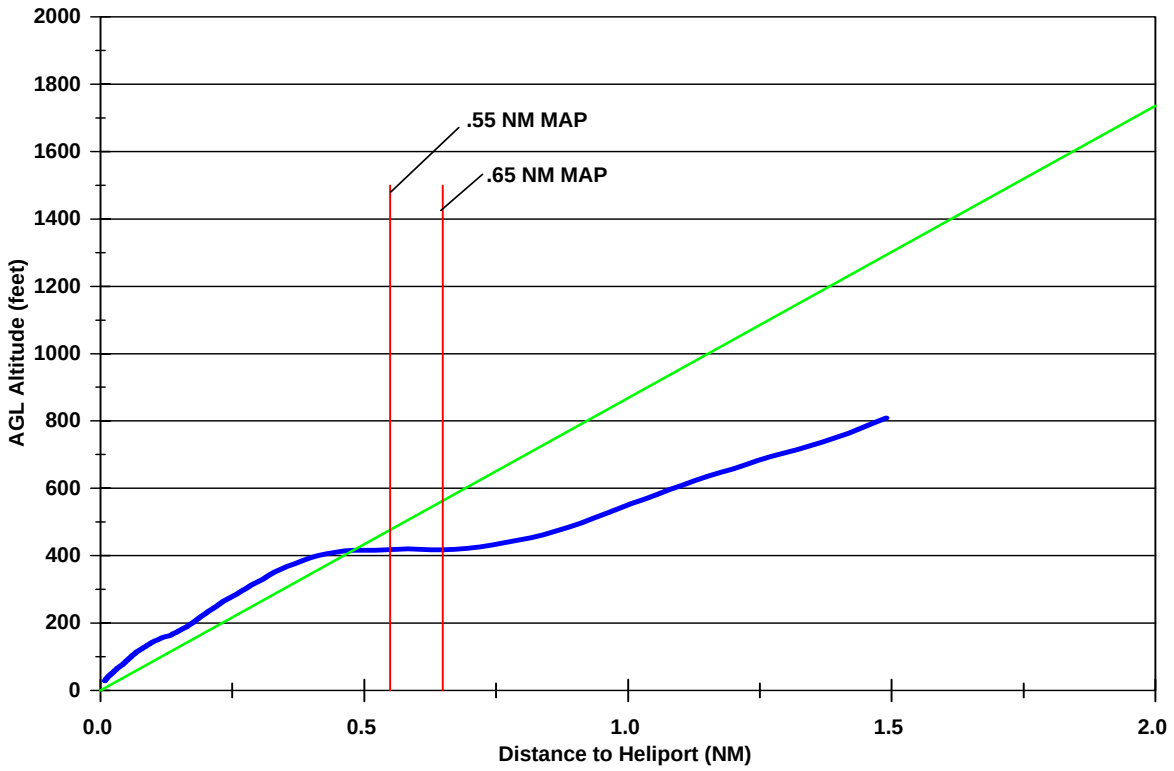


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06B008 - App. #08W

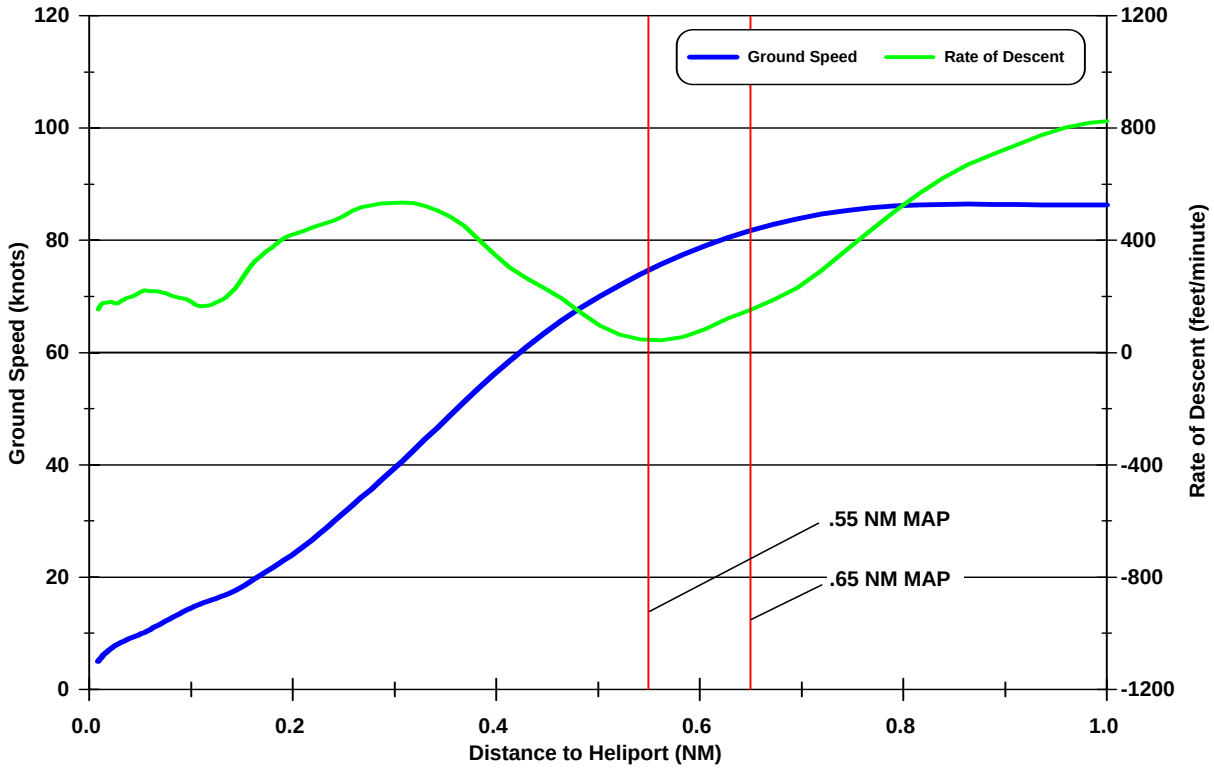



Approach - Plan View
Pilot P04 - 05/02/06B009 - App. #09X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
148/13
115/20
20
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

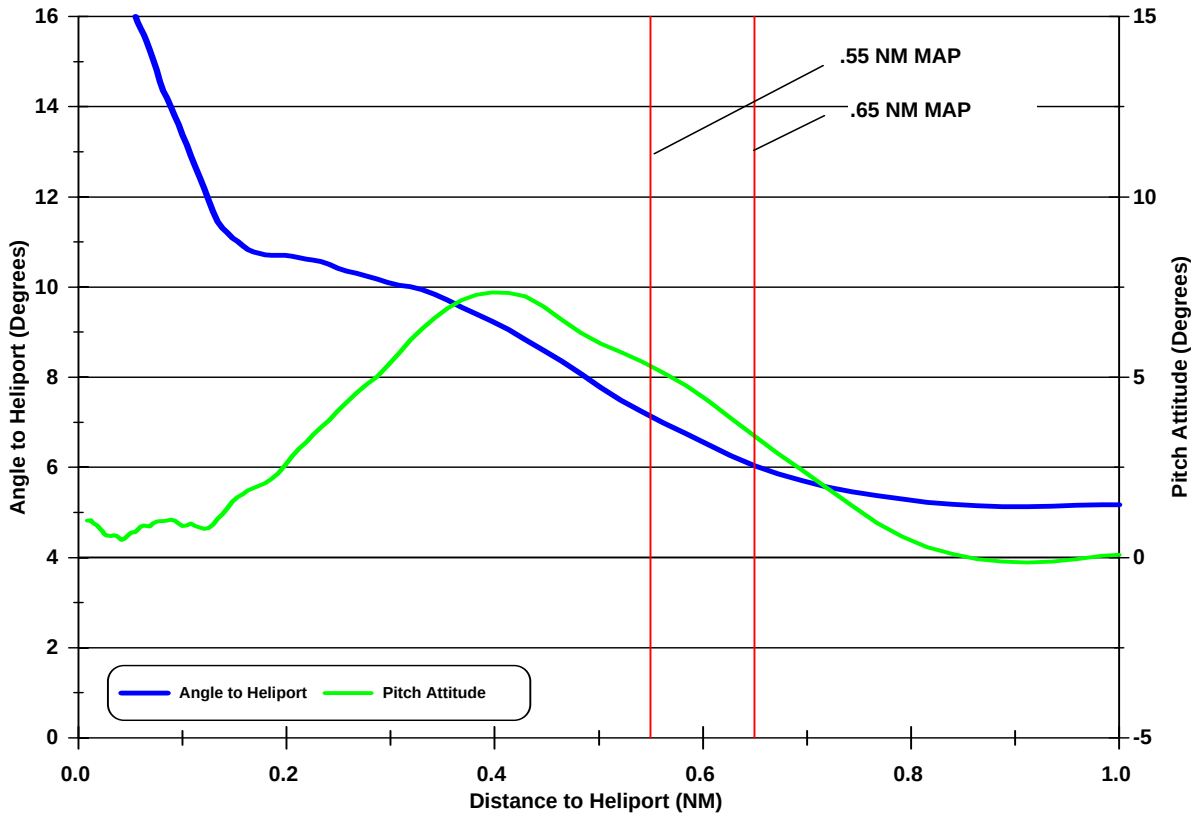
Profile View
Pilot P04 - 05/02/06B009 - App. #09X



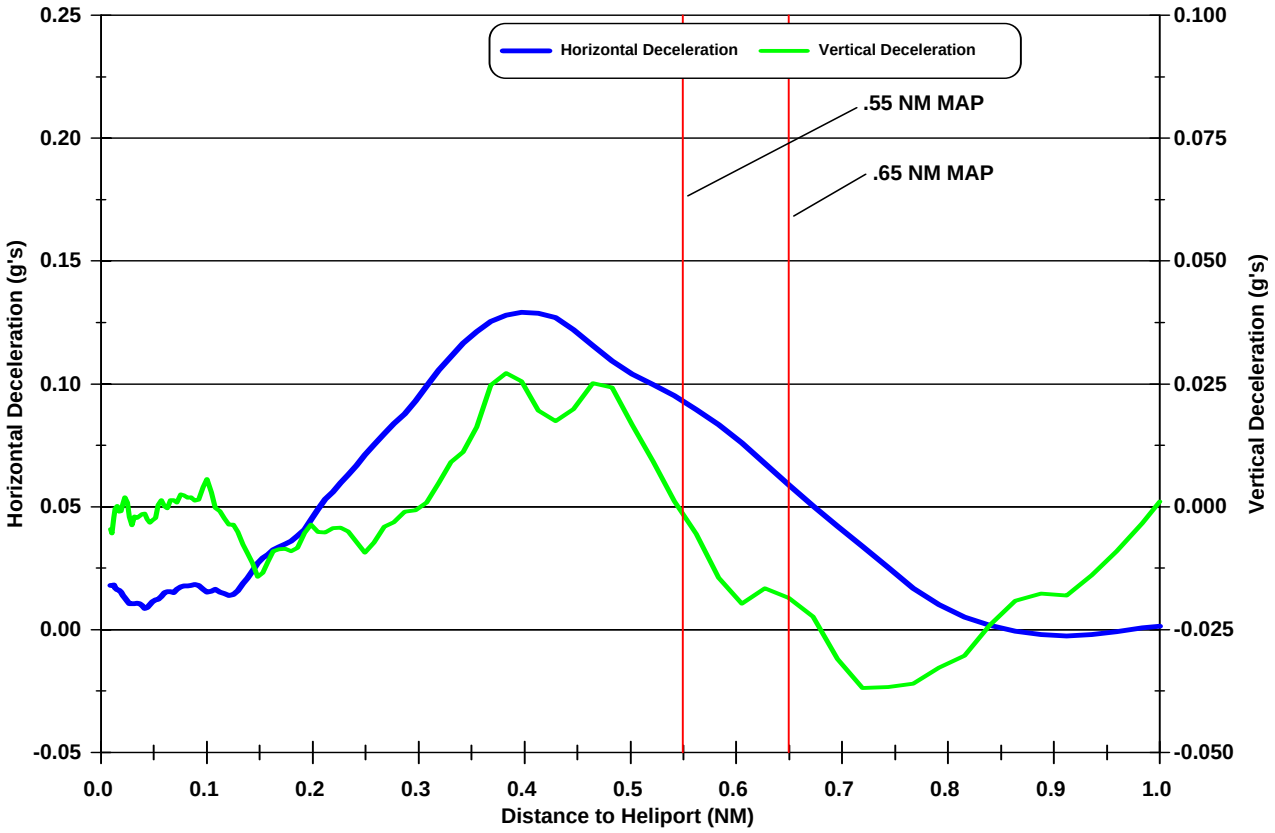
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06B009 - App. #09X

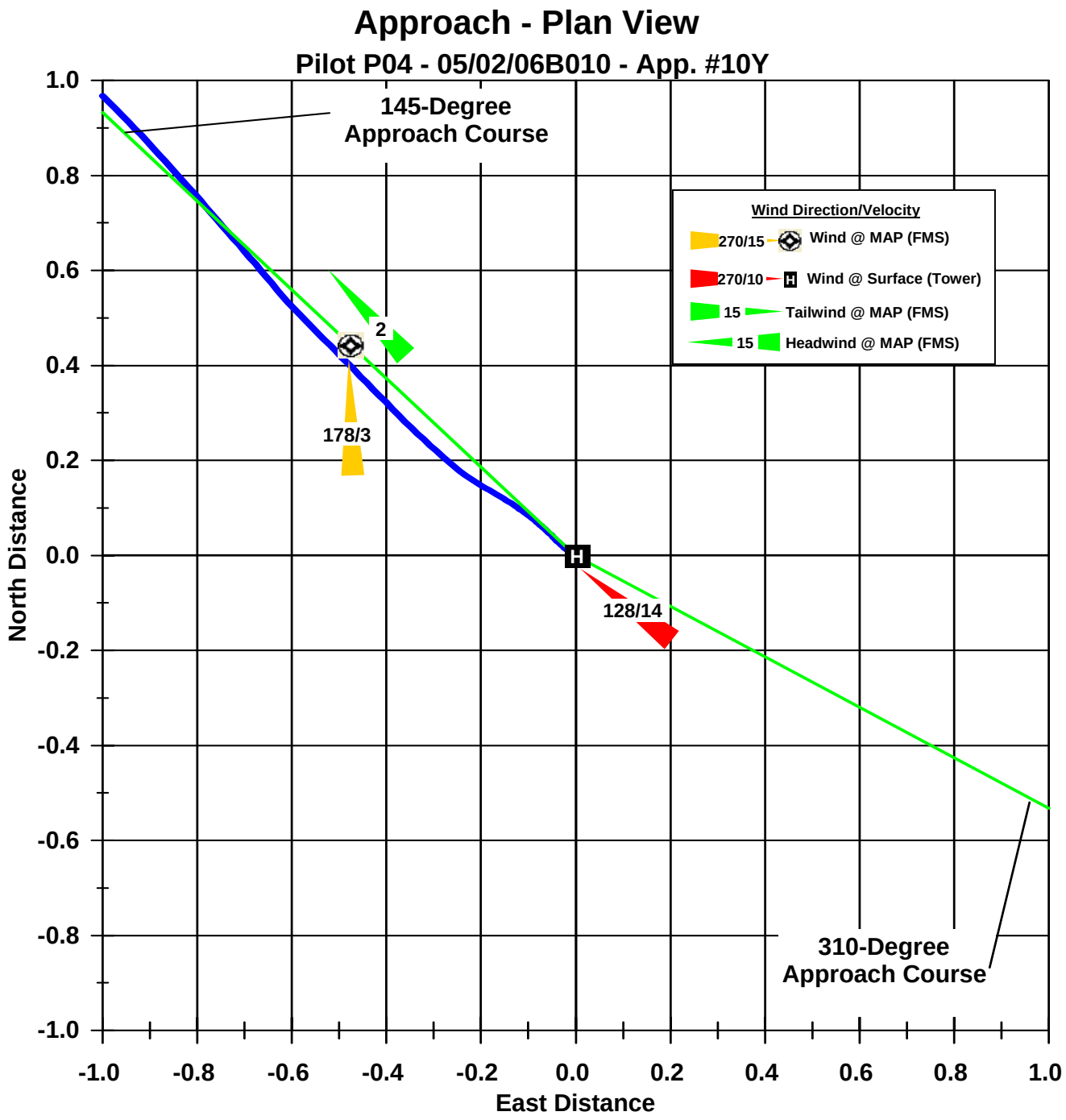


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06B009 - App. #09X

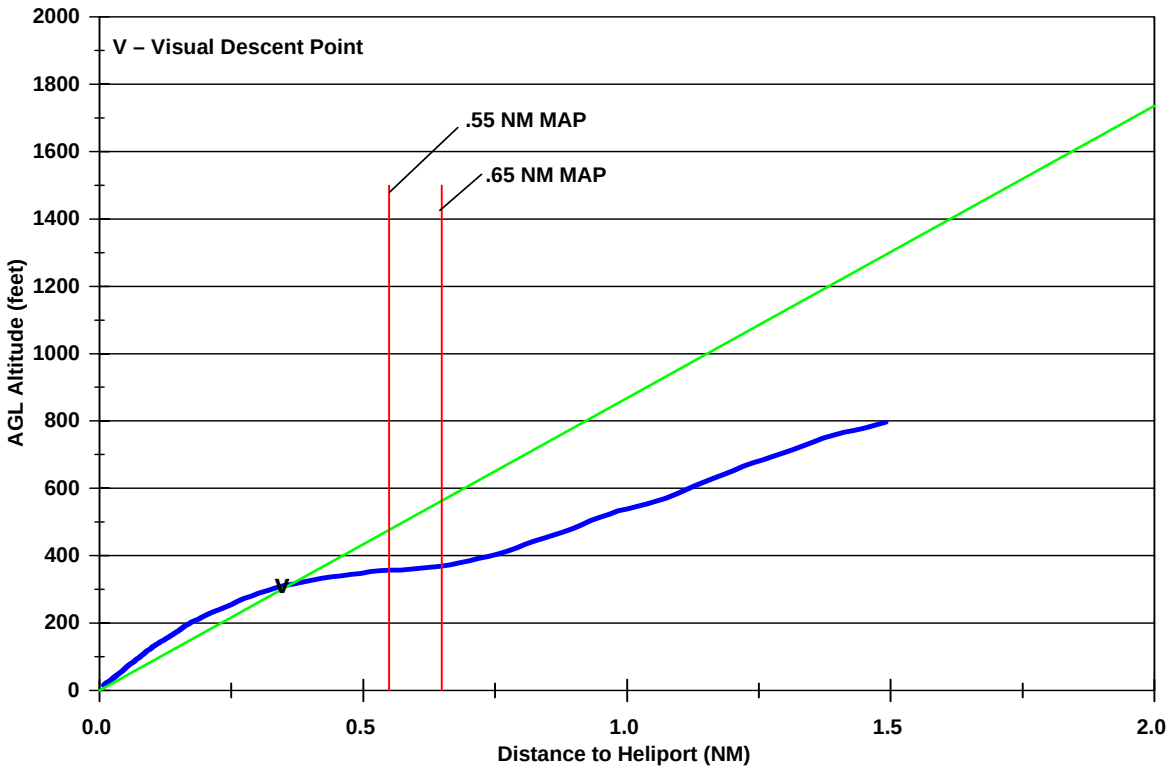


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06B009 - App. #09X

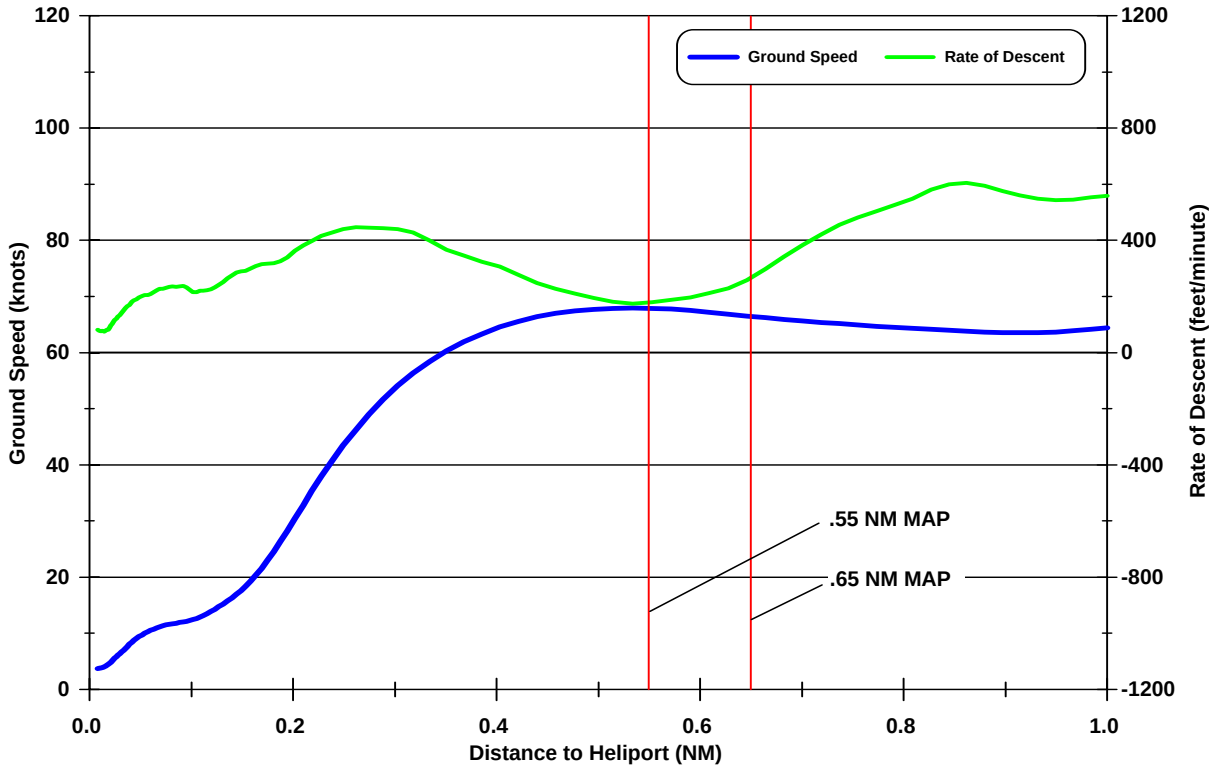



Approach - Plan View
Pilot P04 - 05/02/06B010 - App. #10Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
2
178/3
128/14
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

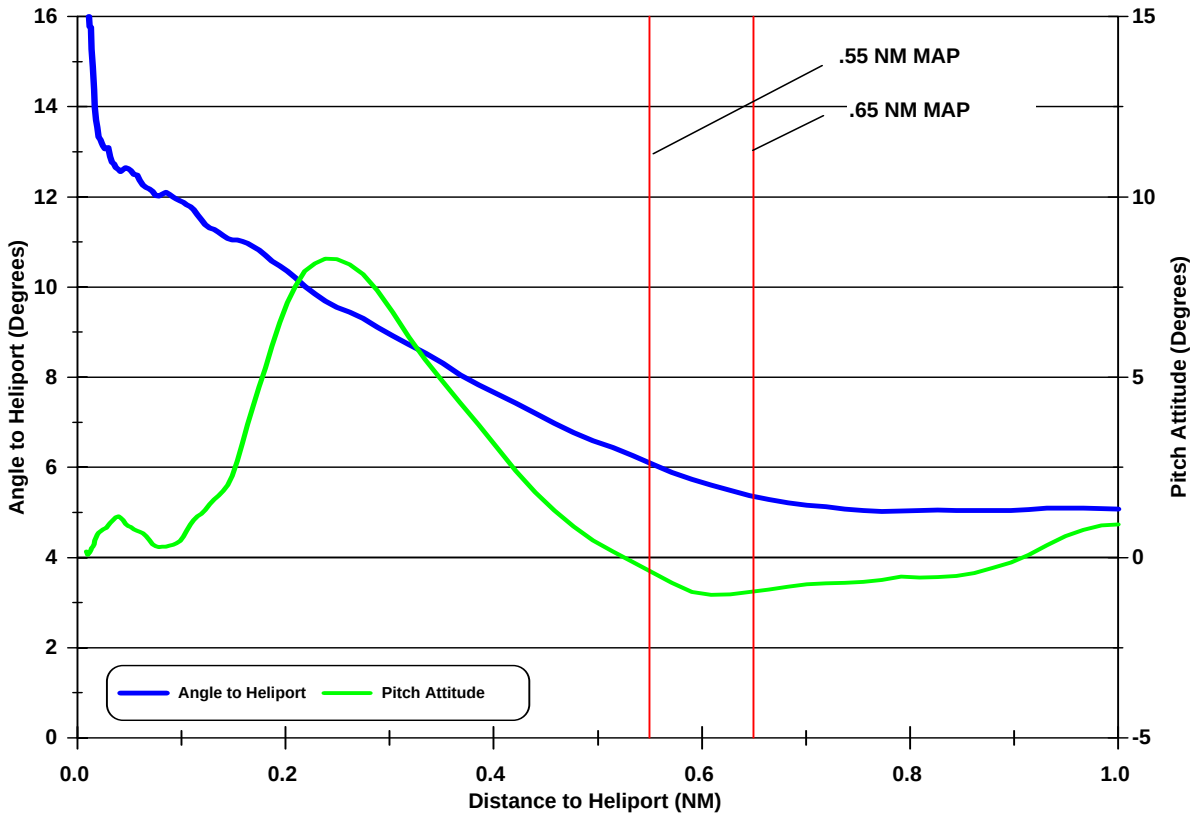
Profile View
Pilot P04 - 05/02/06B010 - App. #10Y



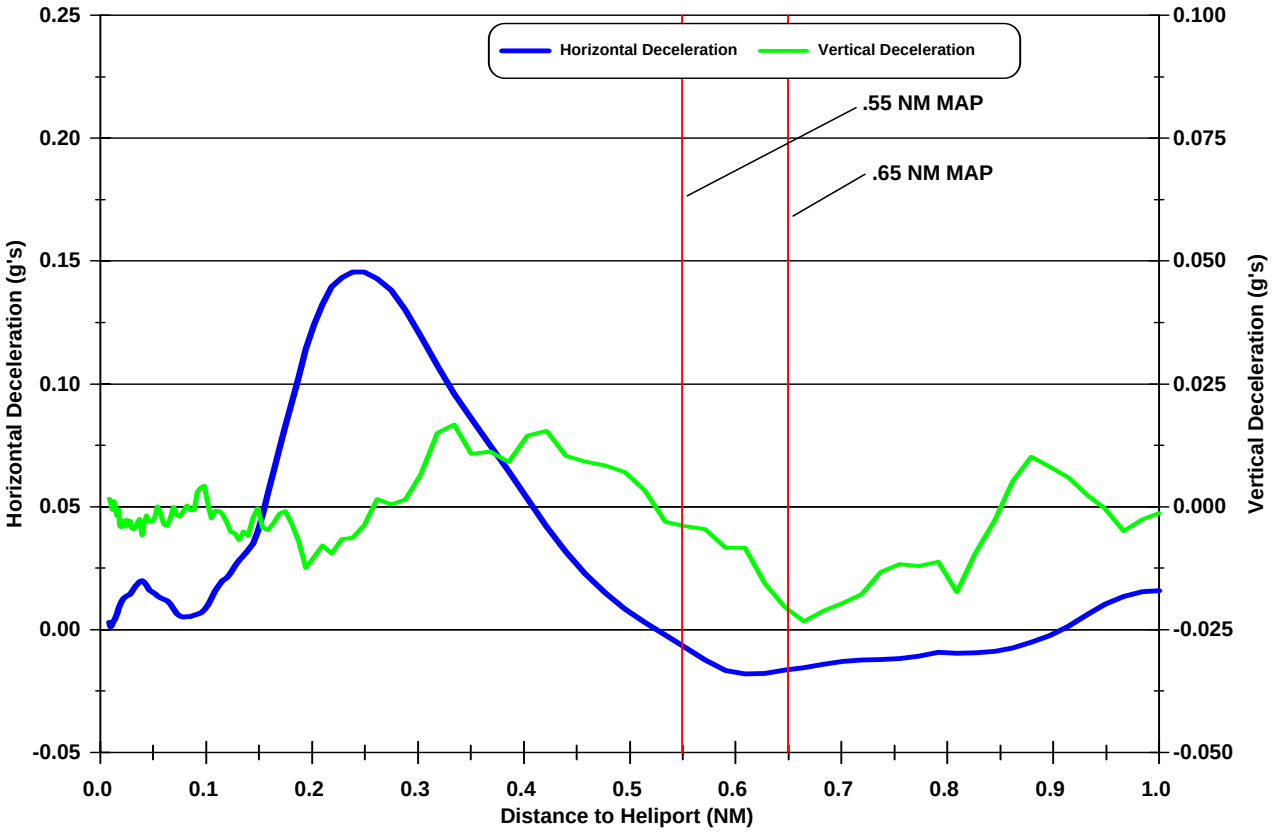
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06B010 - App. #10Y

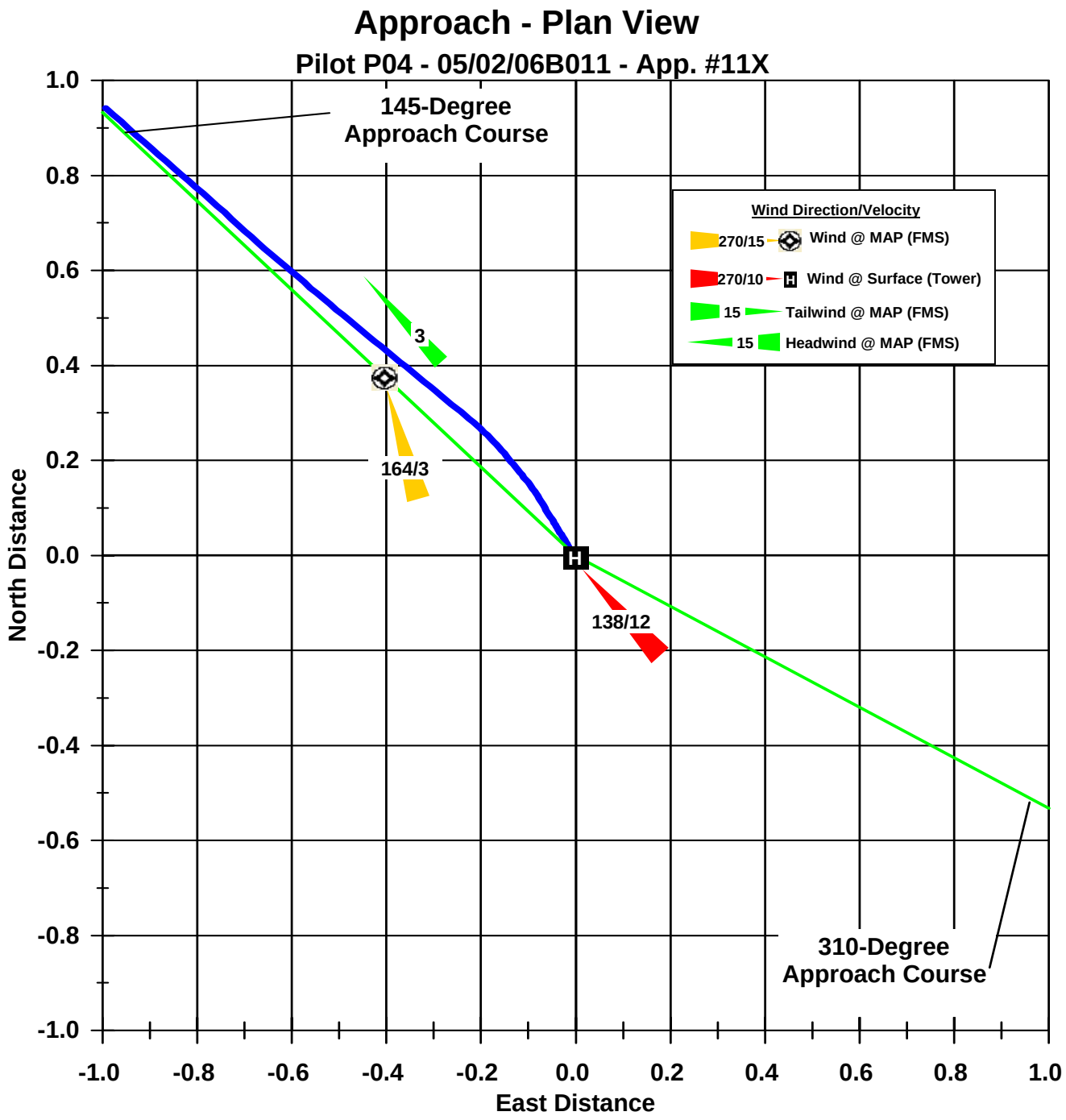


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06B010 - App. #10Y

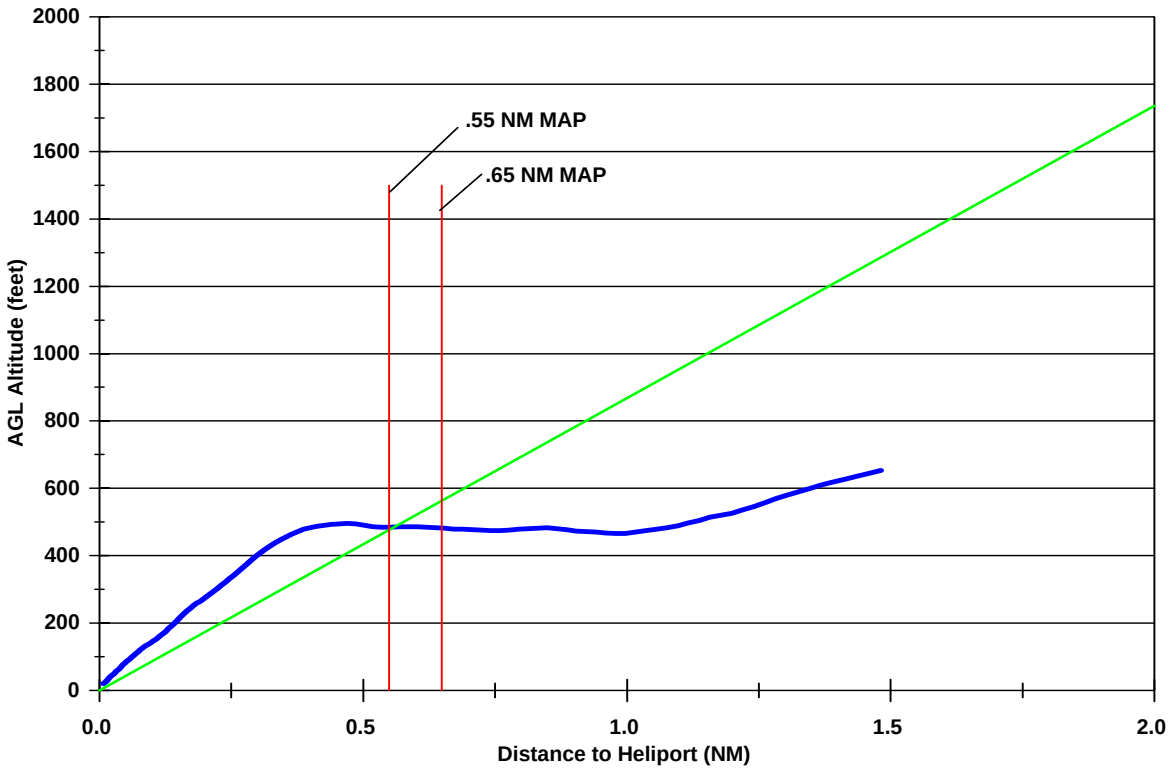


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06B010 - App. #10Y

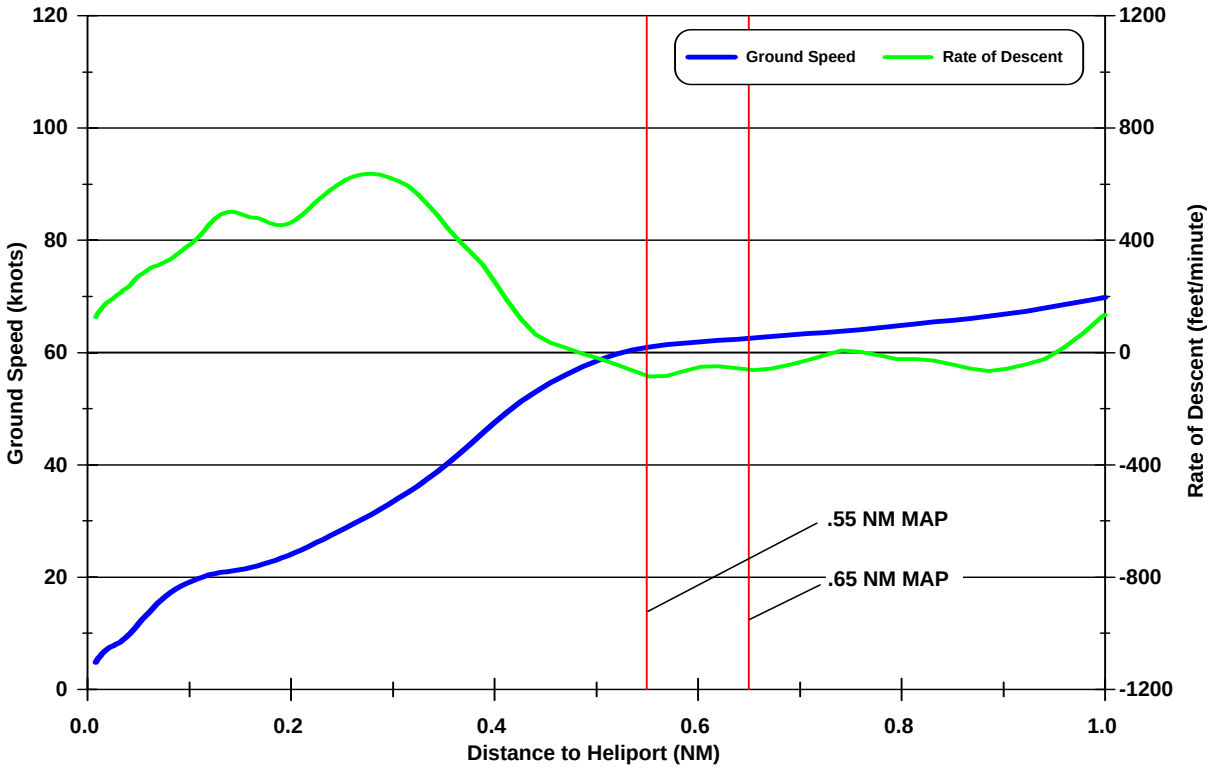



Approach - Plan View
Pilot P04 - 05/02/06B011 - App. #11X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
3
164/3
138/12
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

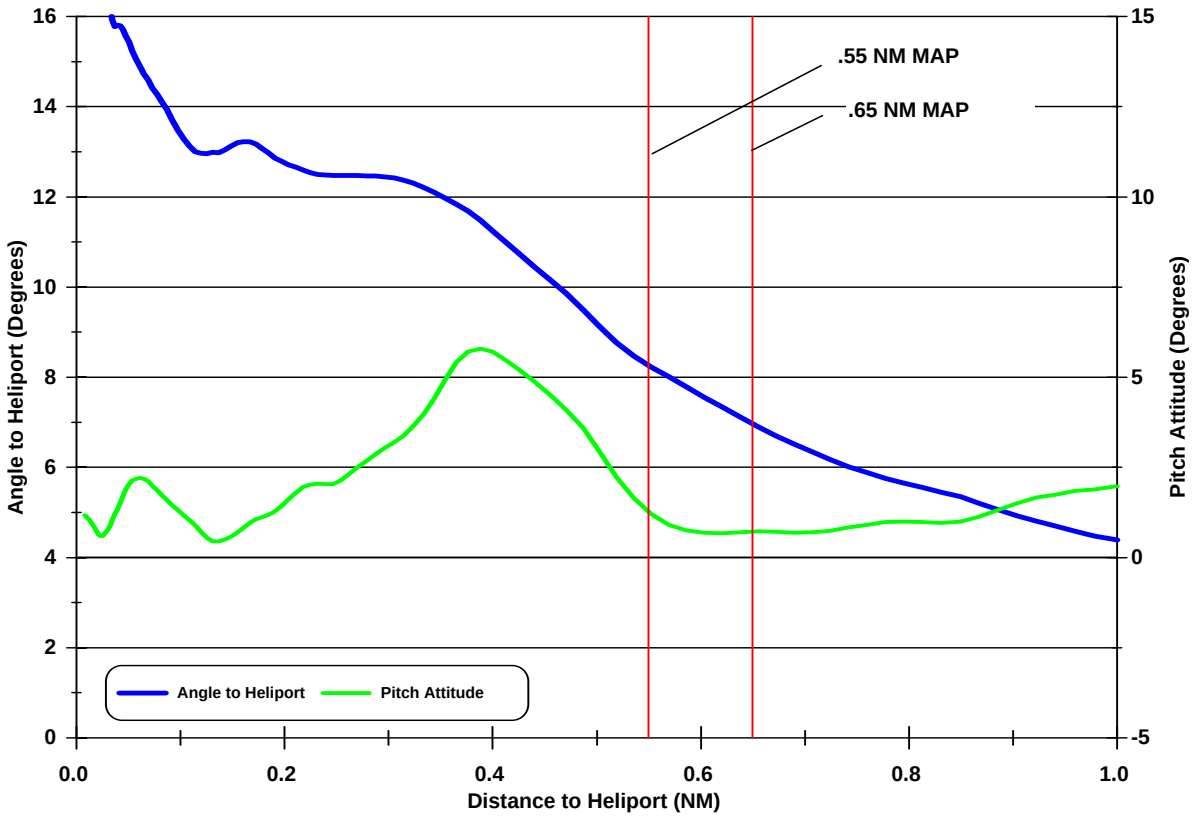
Profile View
Pilot P04 - 05/02/06B011 - App. #11X



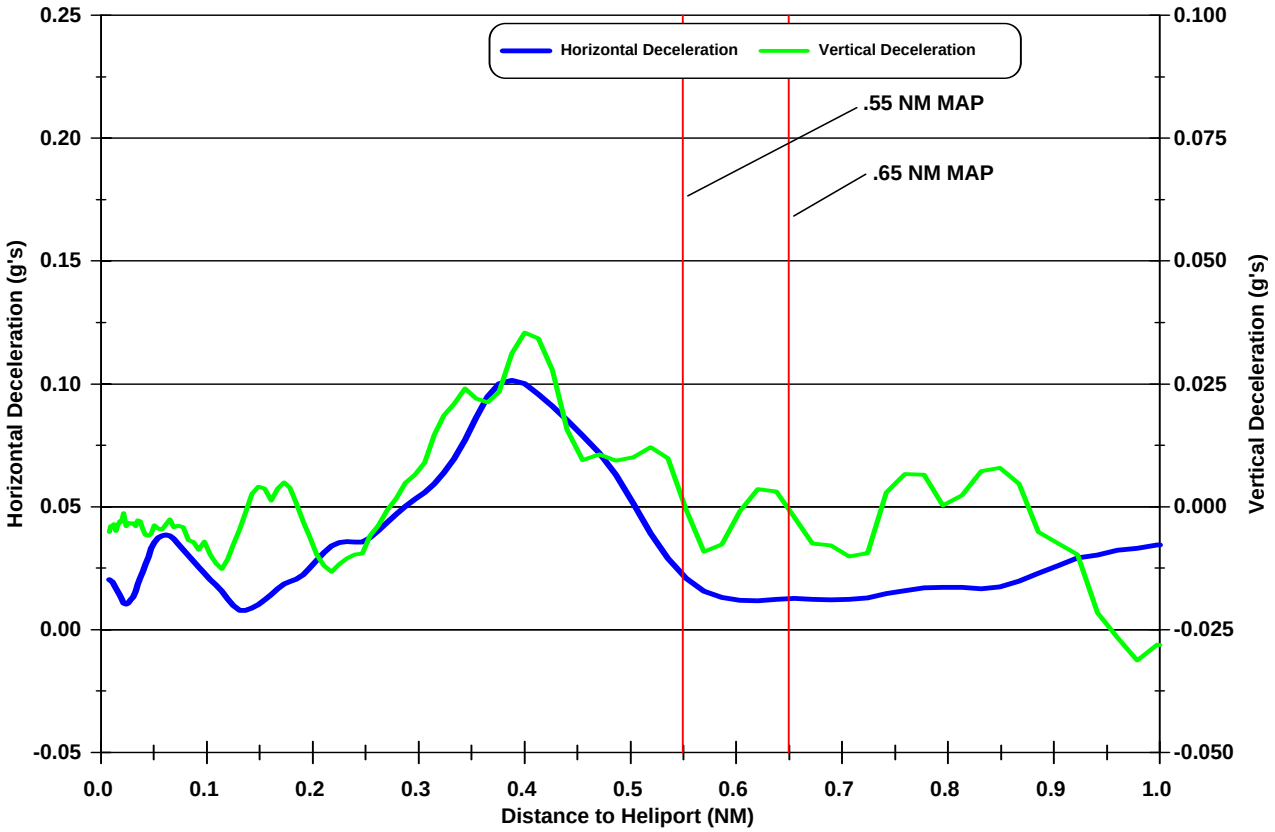
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06B011 - App. #11X

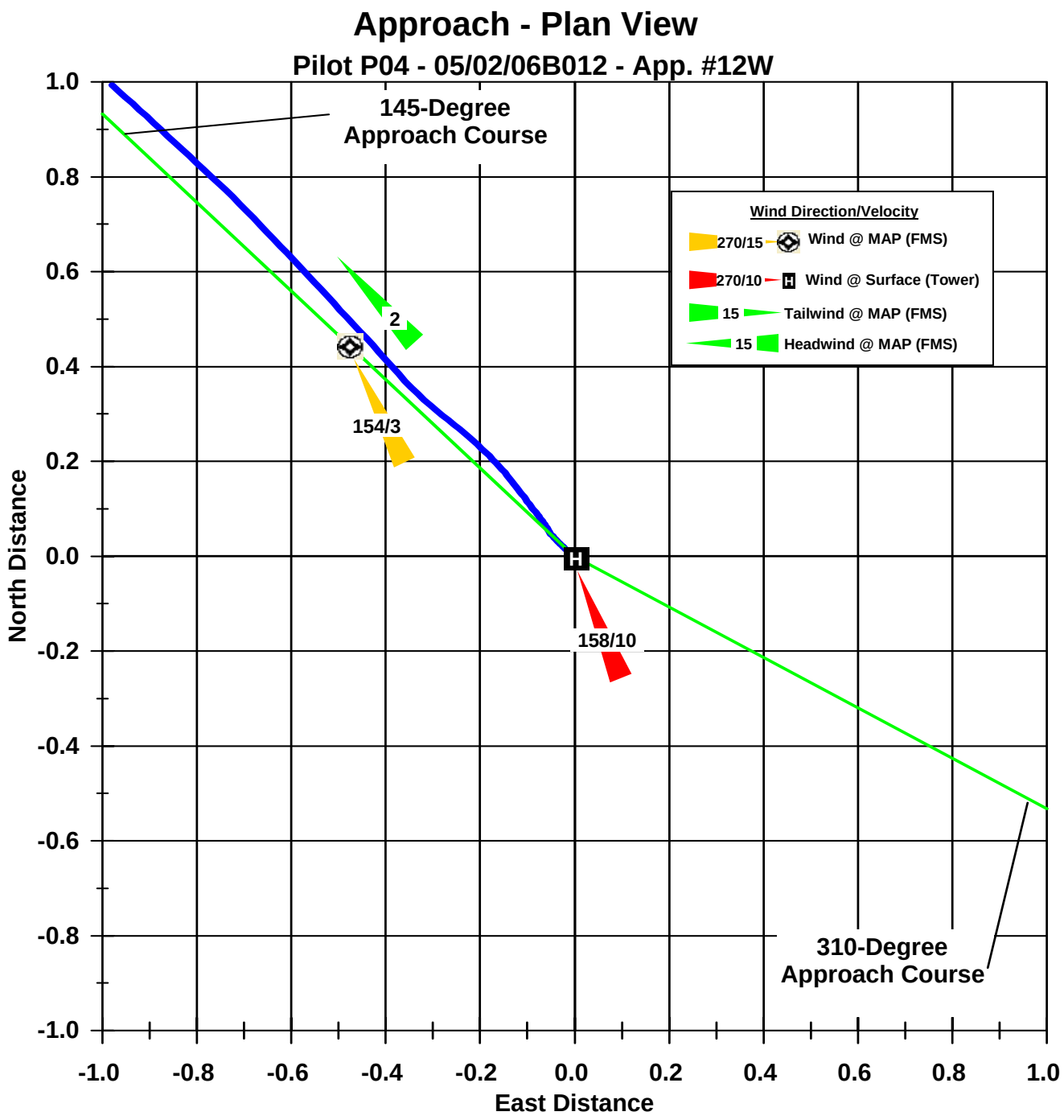


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06B011 - App. #11X

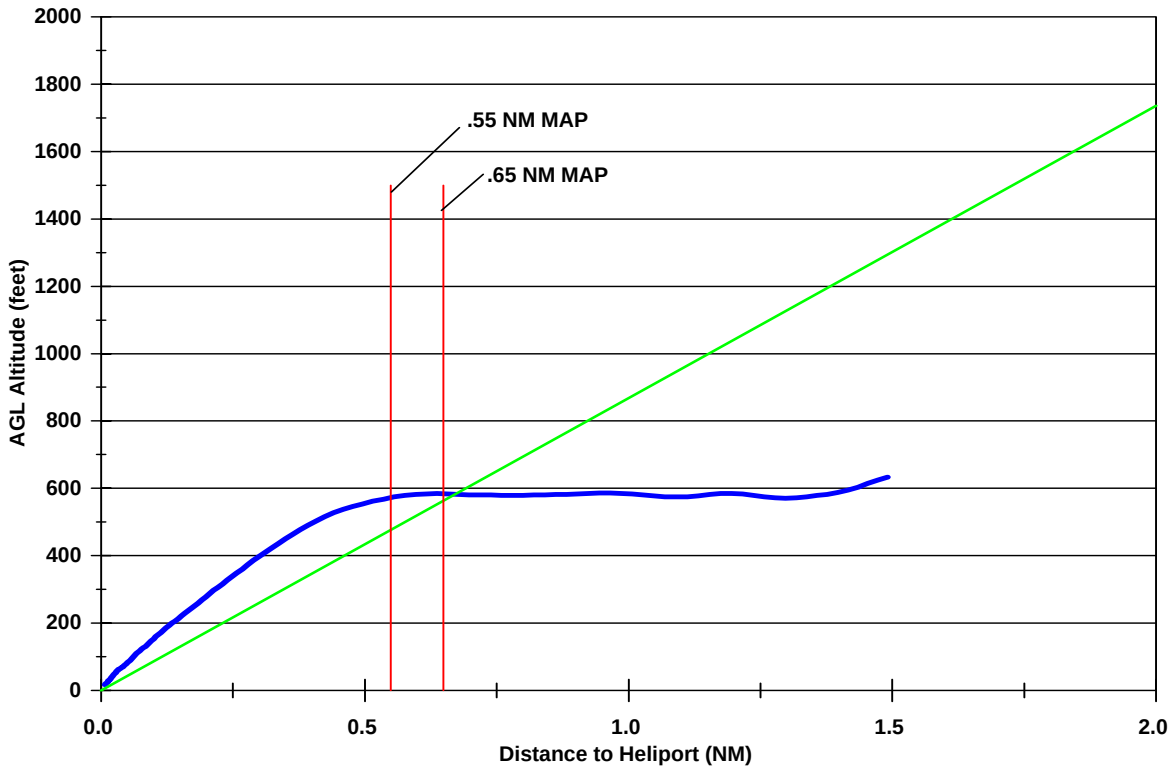


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06B011 - App. #11X

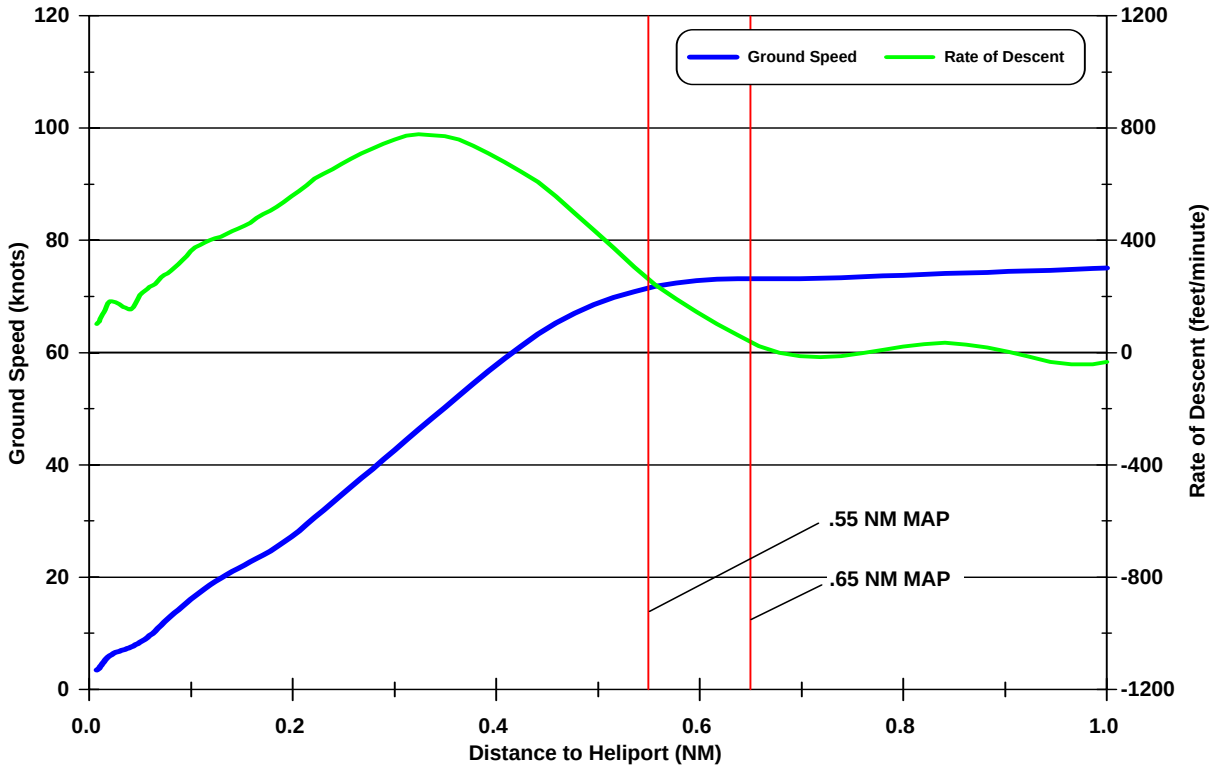



Approach - Plan View
Pilot P04 - 05/02/06B012 - App. #12W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
2
154/3
158/10
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

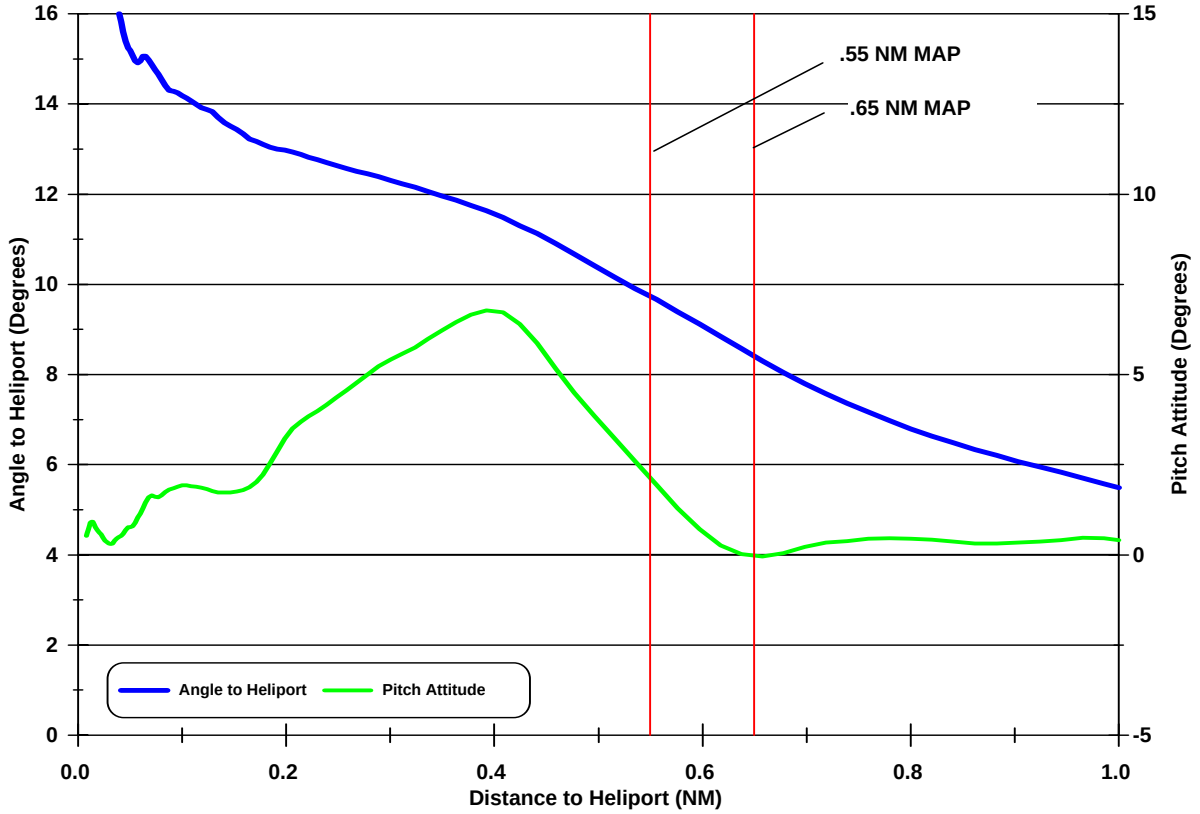
Profile View
Pilot P04 - 05/02/06B012 - App. #12W



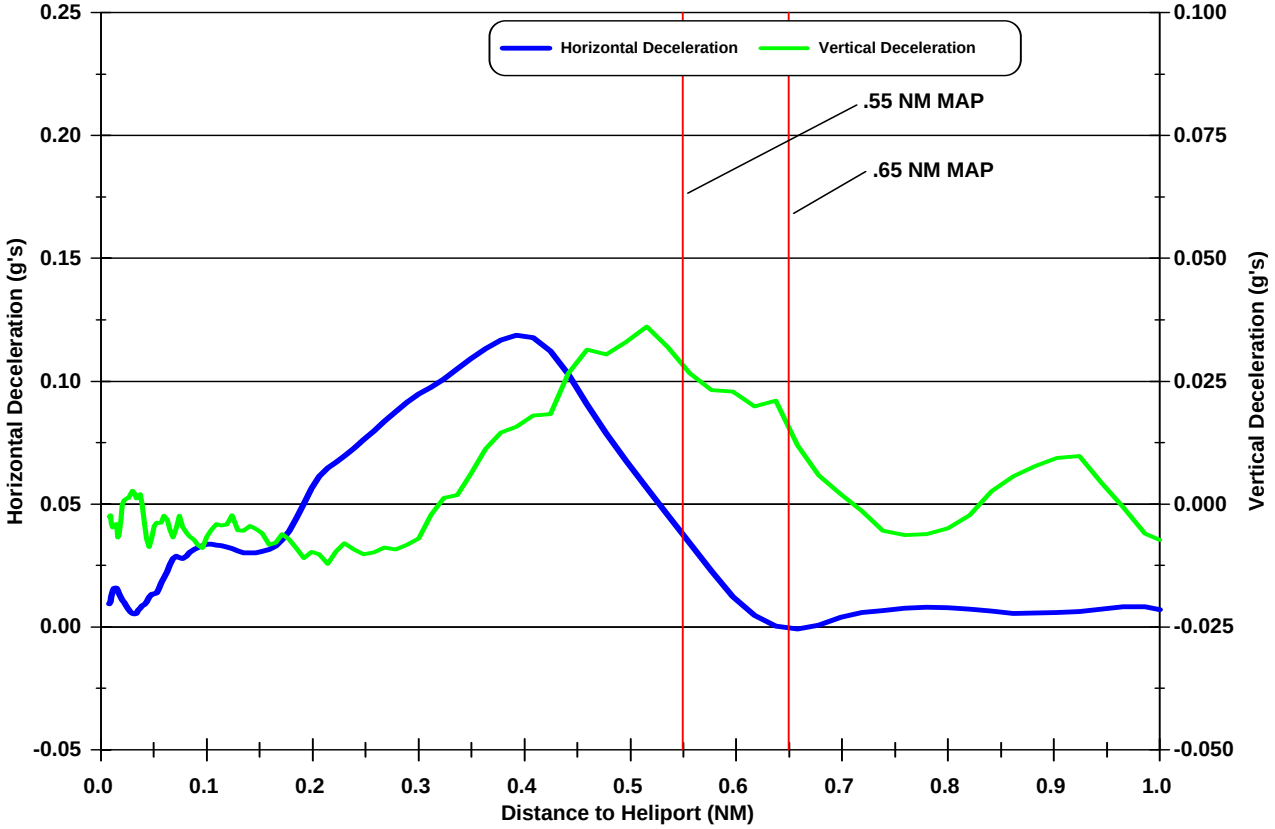
Ground Speed and Rate of Descent
Pilot P04 - 05/02/06B012 - App. #12W

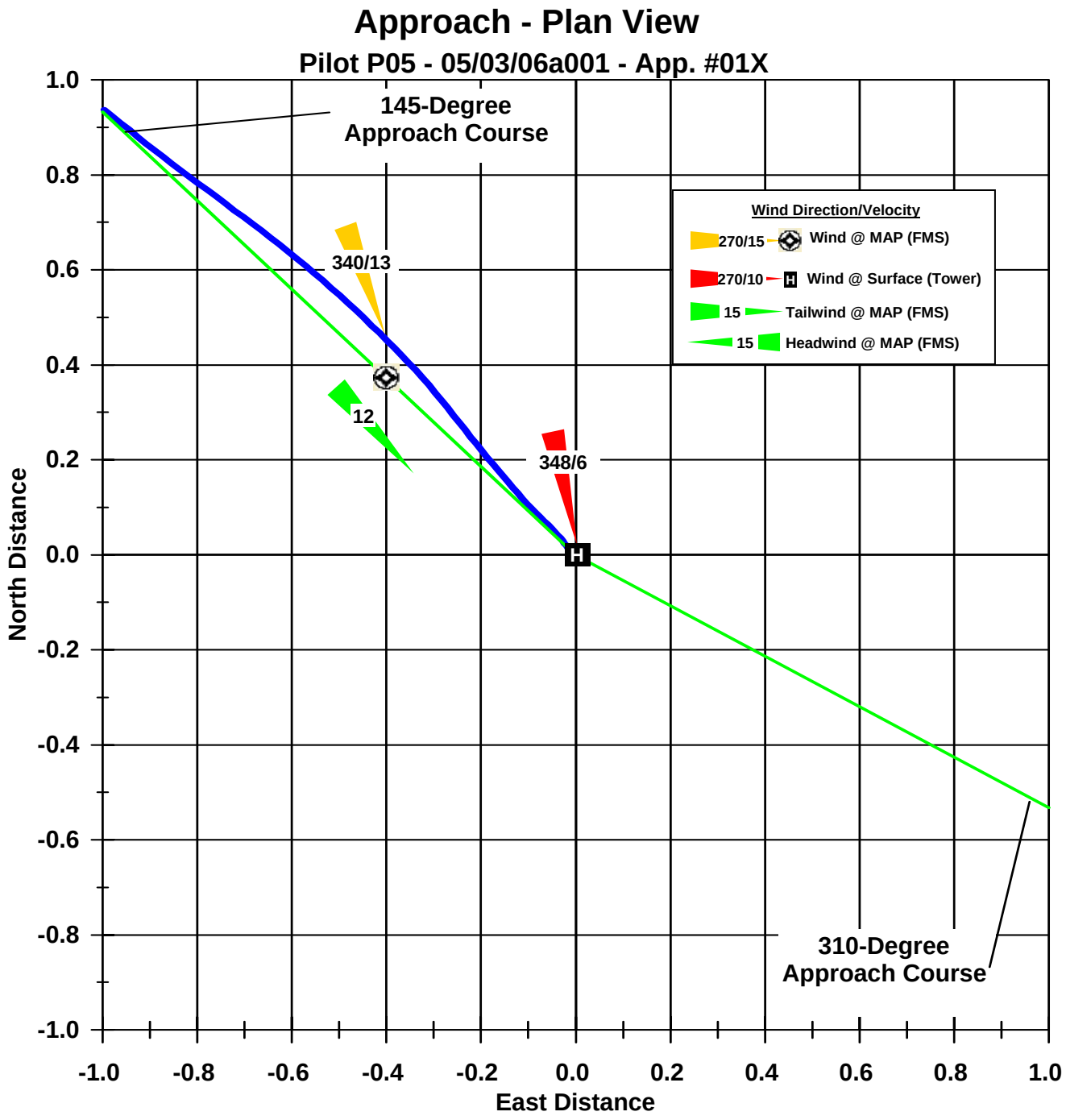


Angle to Heliport and Pitch Attitude
Pilot P04 - 05/02/06B012 - App. #12W

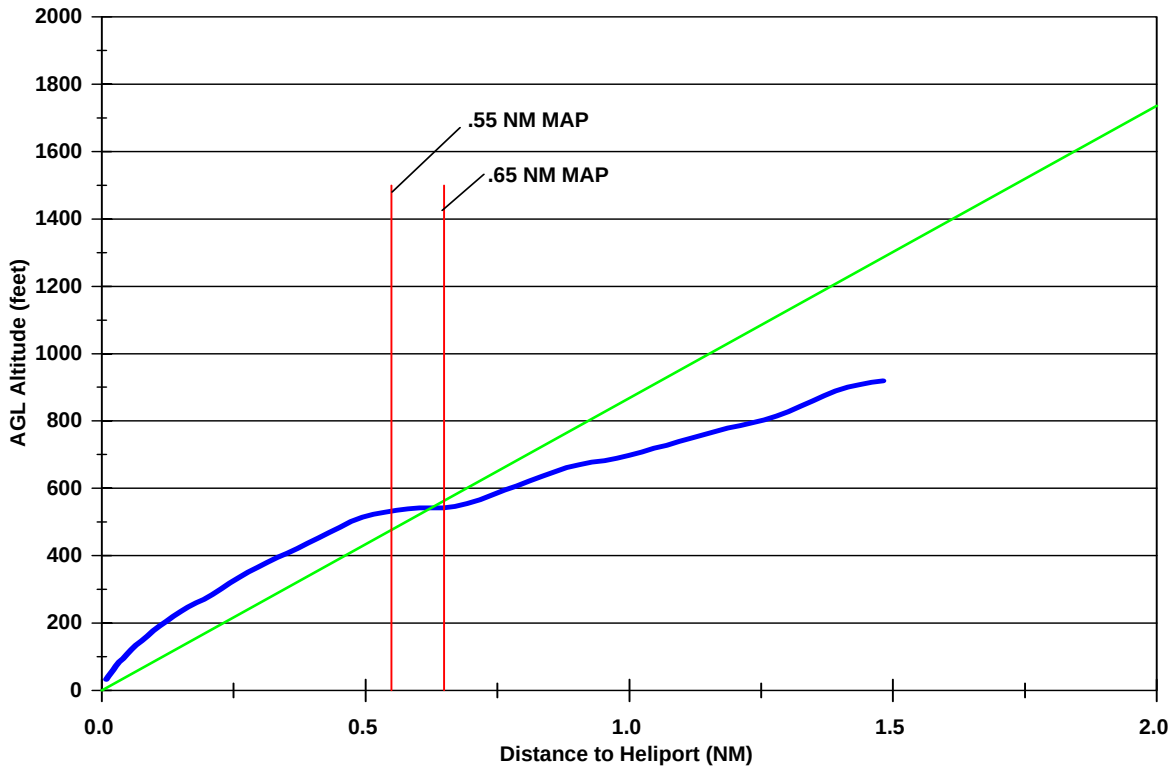


Horizontal and Vertical Deceleration
Pilot P04 - 05/02/06B012 - App. #12W

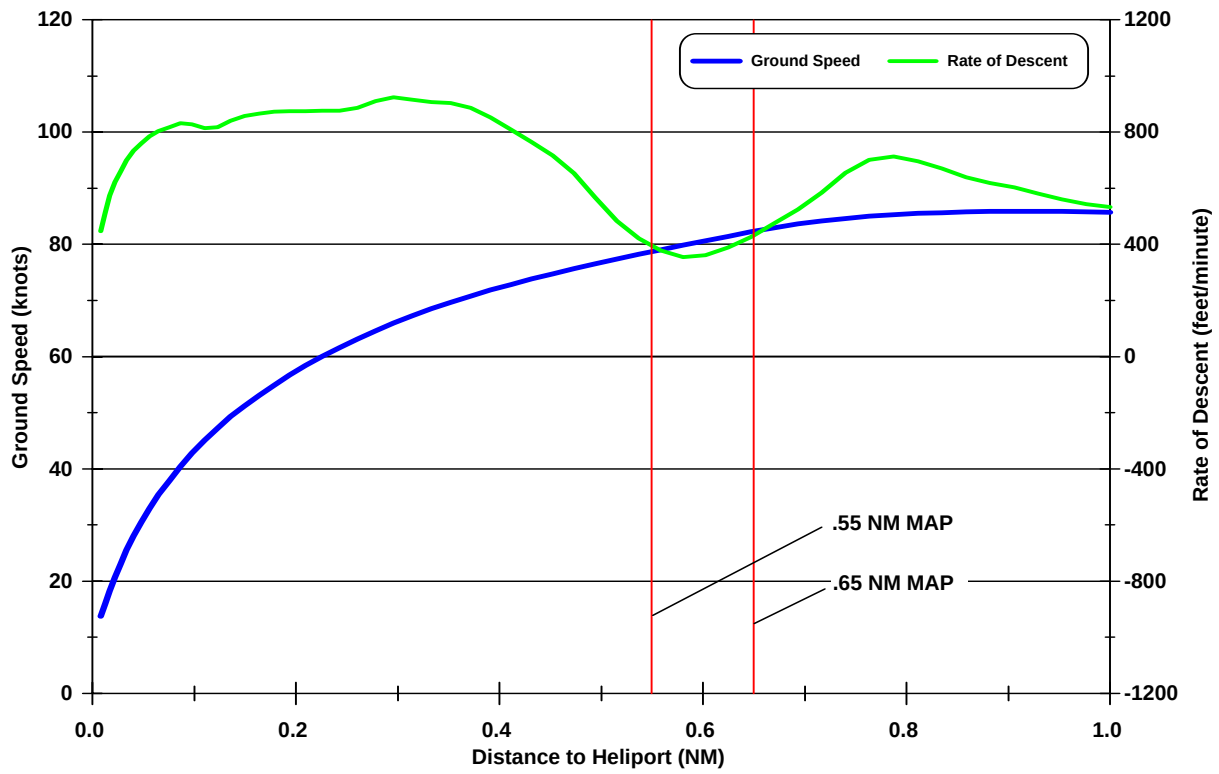



Approach - Plan View
Pilot P05 - 05/03/06a001 - App. #01X
145-Degree
Approach Course
310-Degree
Approach Course
340/13
12
348/6
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

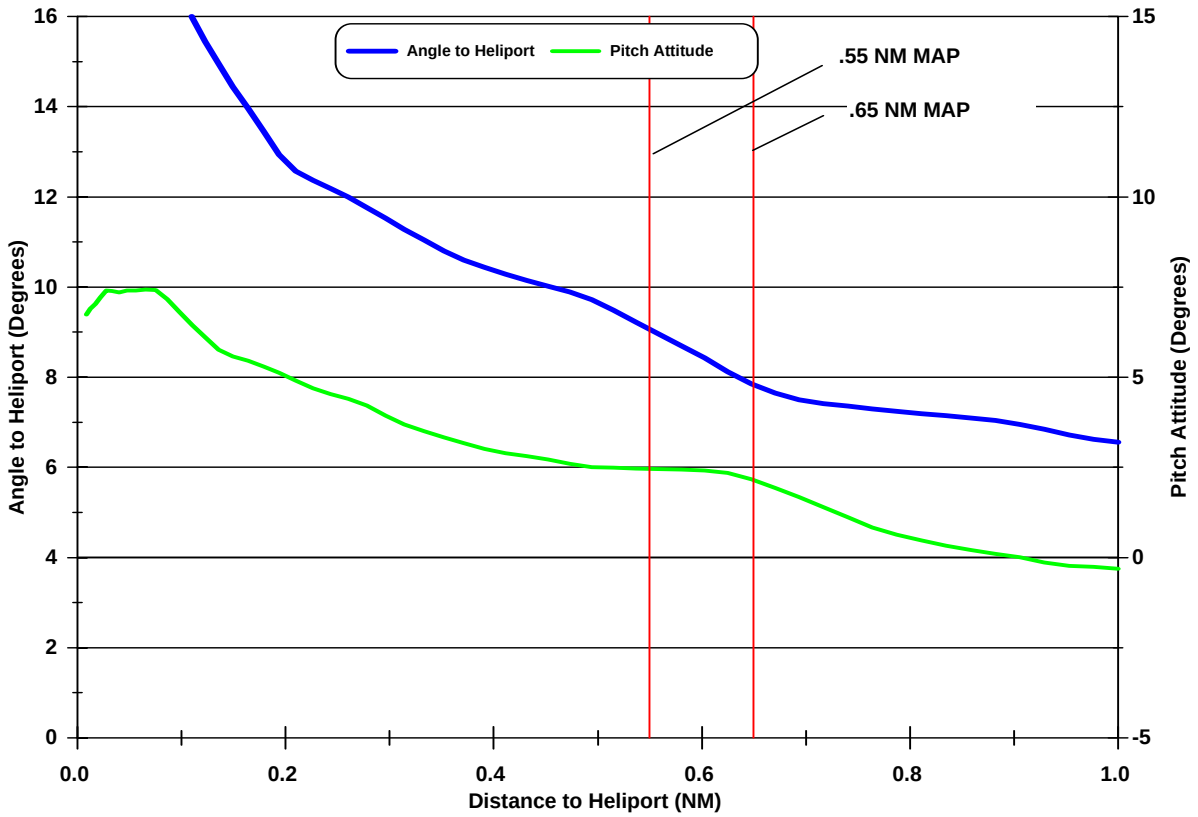
Profile View
Pilot P05 - 05/03/06a001 - App. #01X



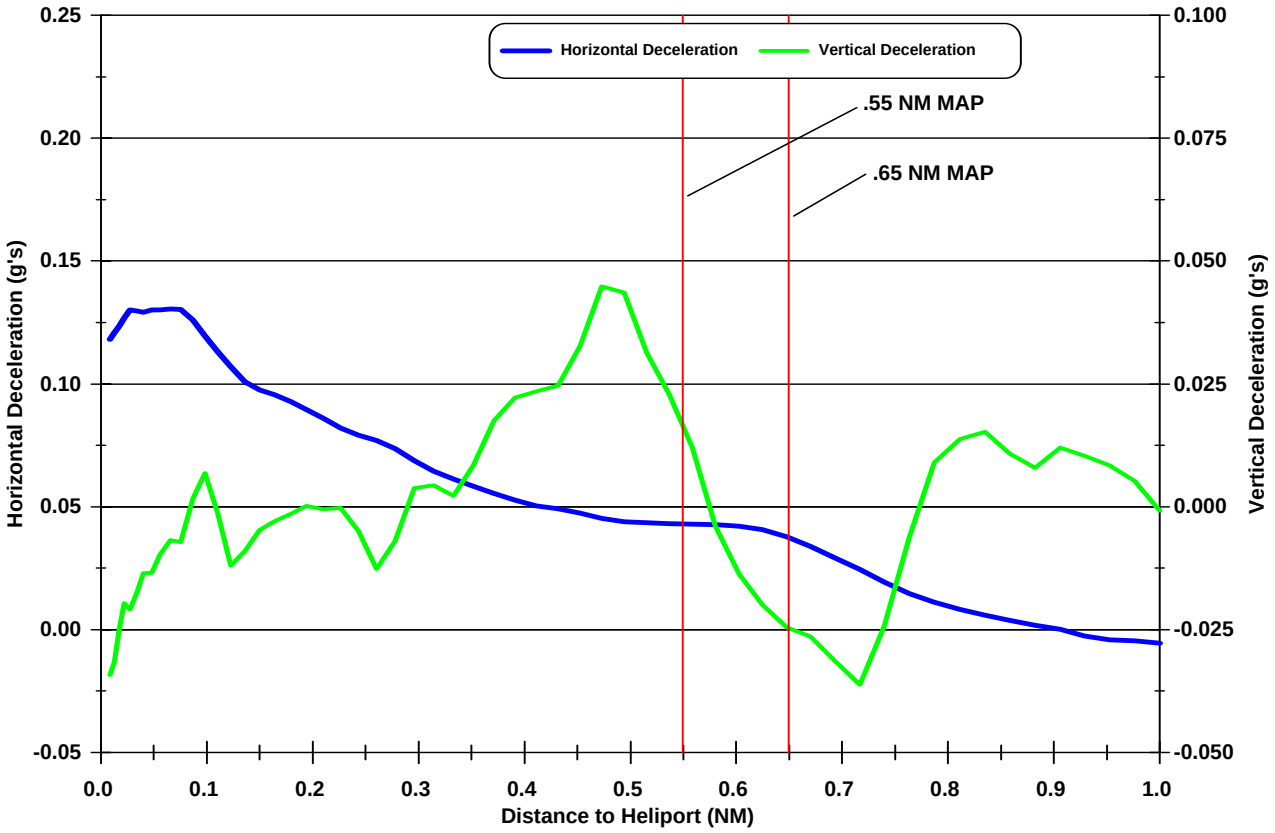
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06a001 - App. #01X

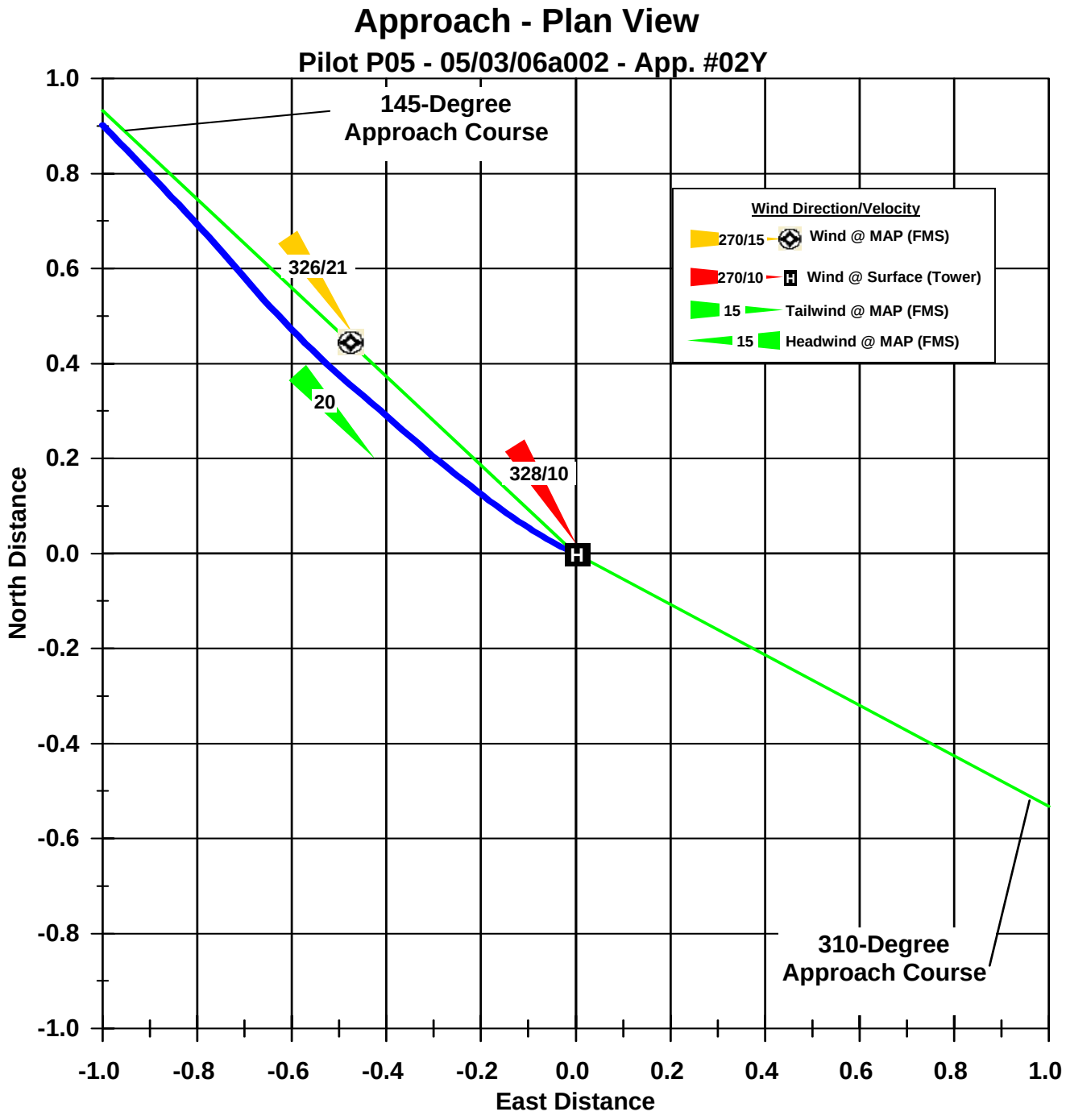


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06a001 - App. #01X

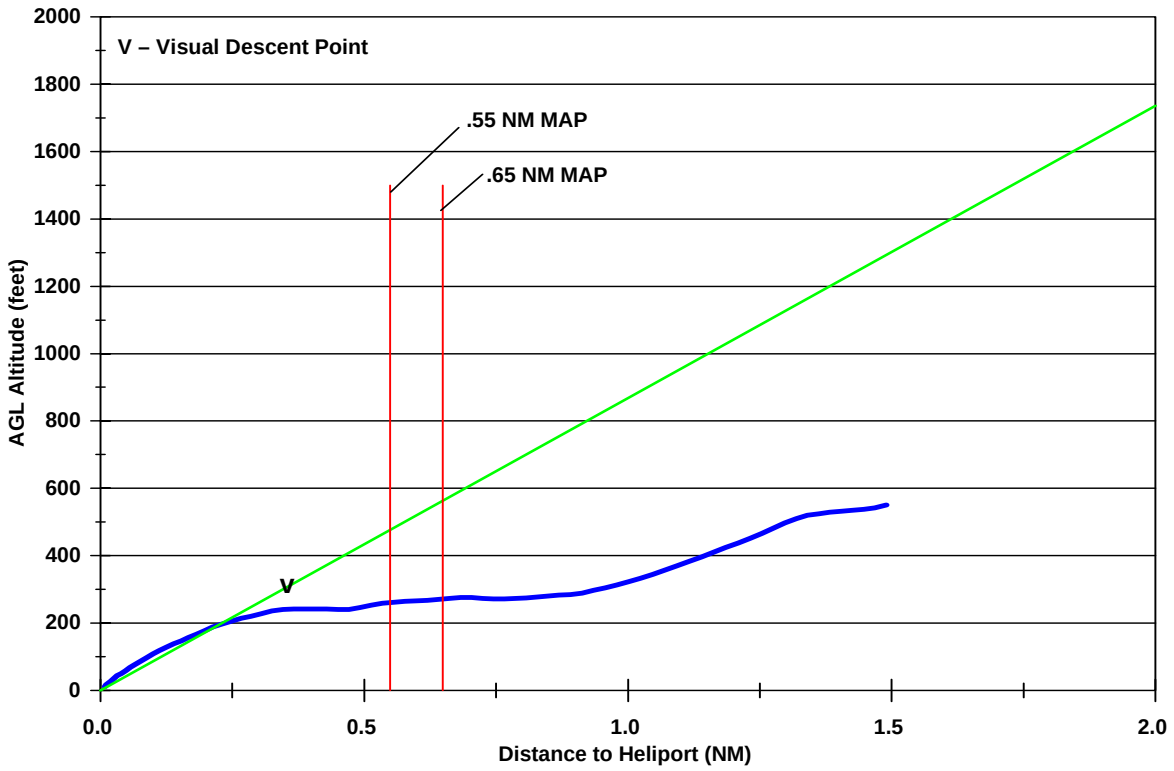


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06a001 - App. #01X

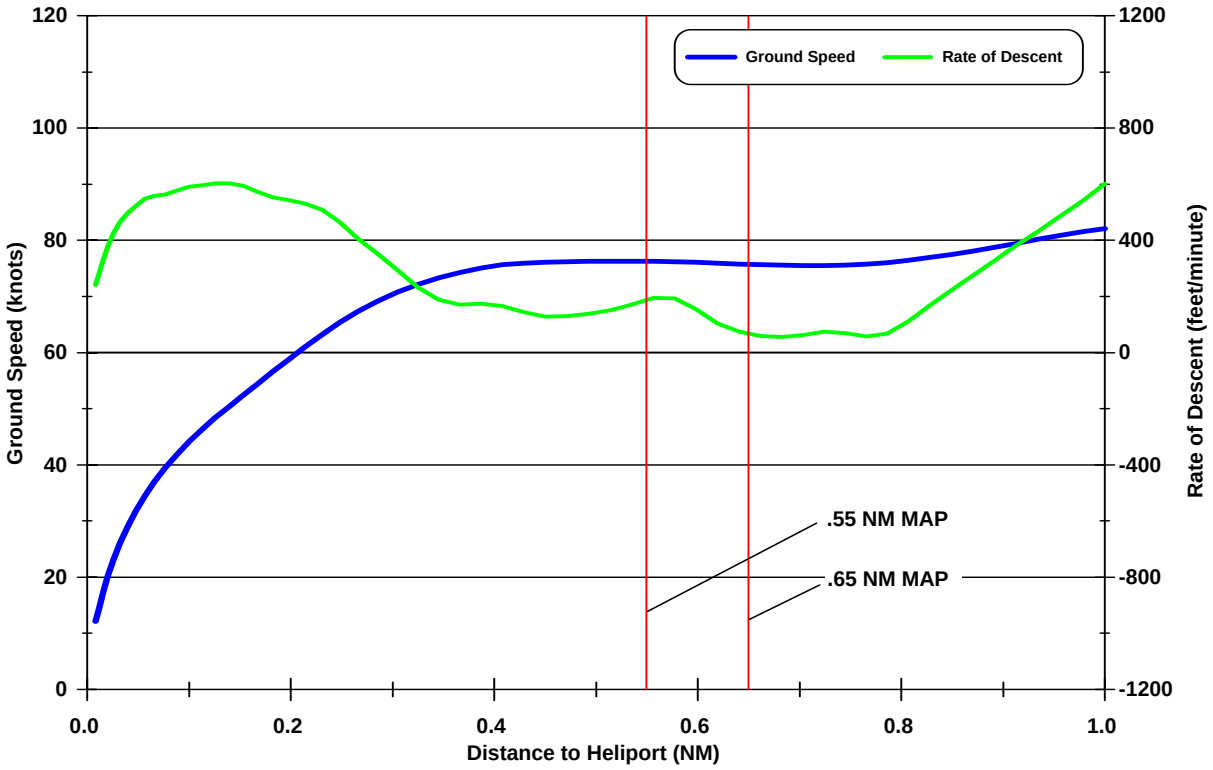



Approach - Plan View
Pilot P05 - 05/03/06a002 - App. #02Y
145-Degree
Approach Course
310-Degree
Approach Course
326/21
20
328/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

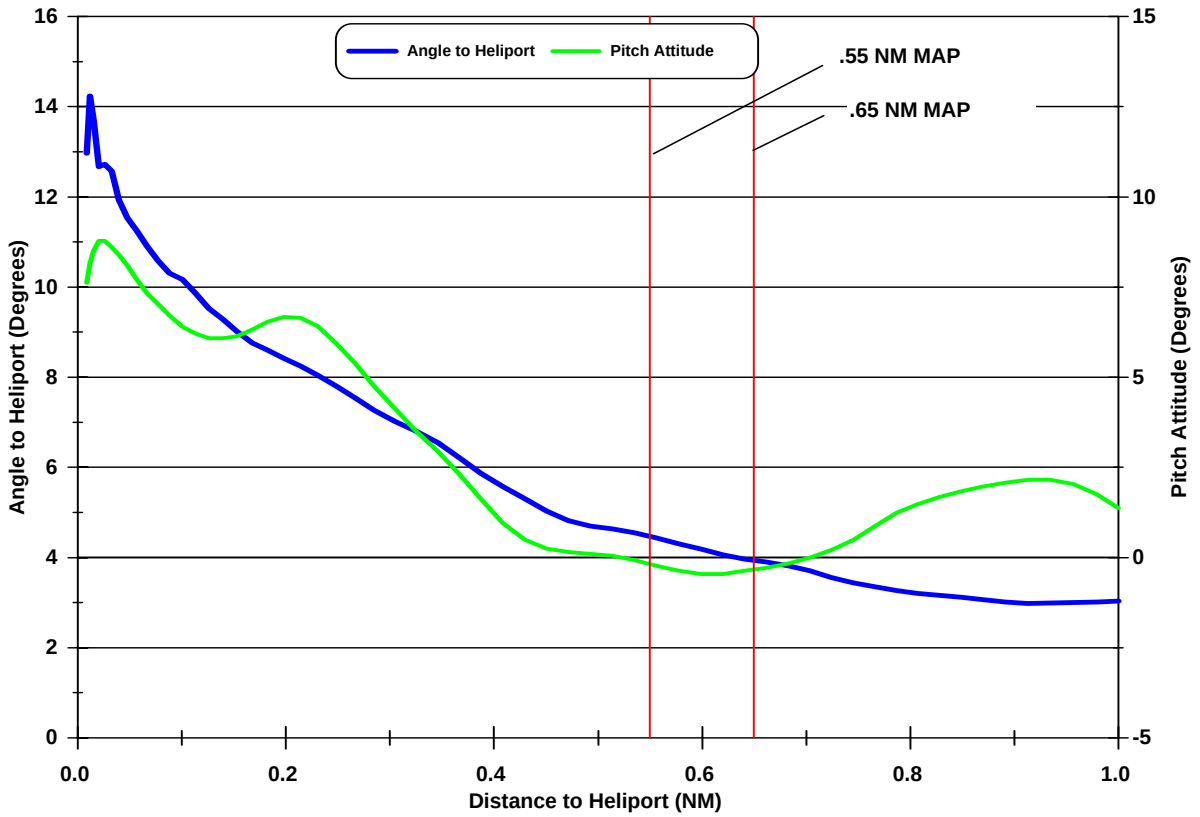
Profile View
Pilot P05 - 05/03/06a002 - App. #02Y



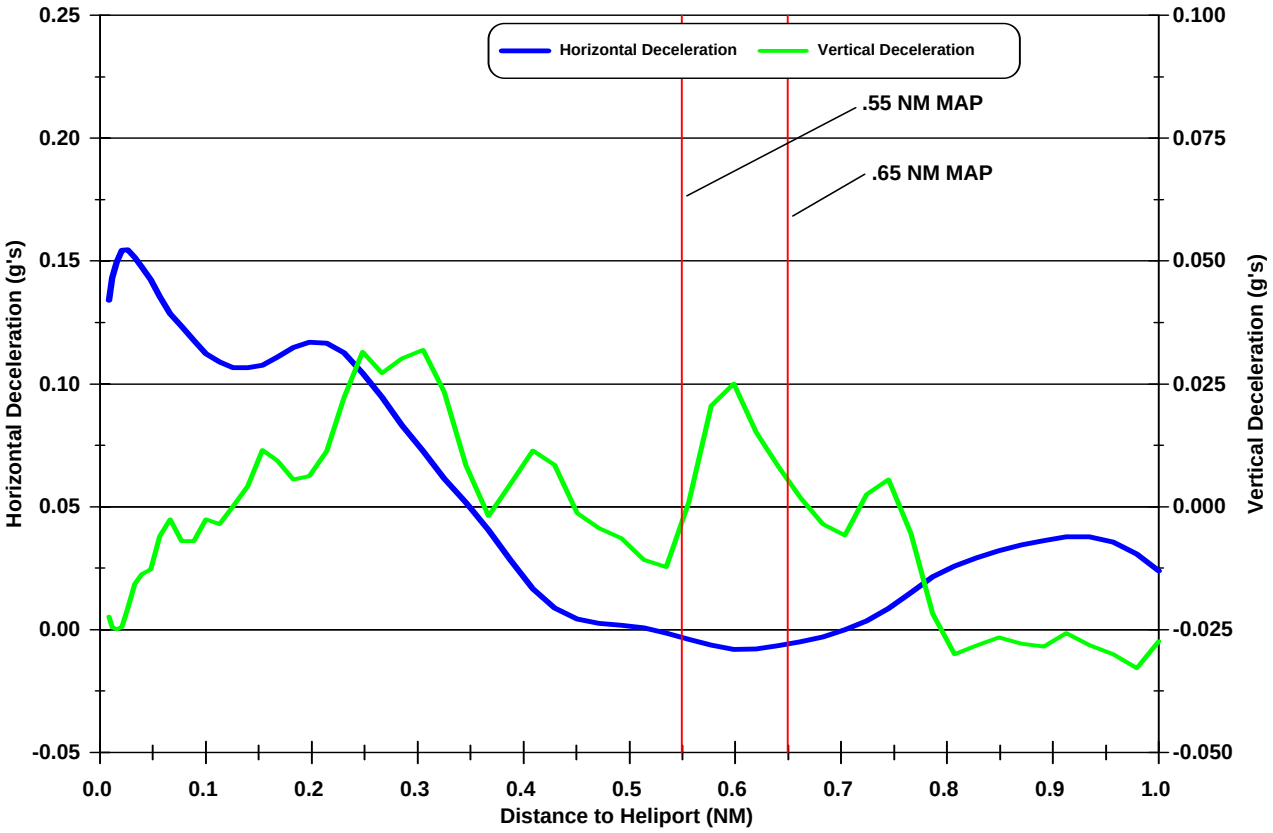
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06a002 - App. #02Y

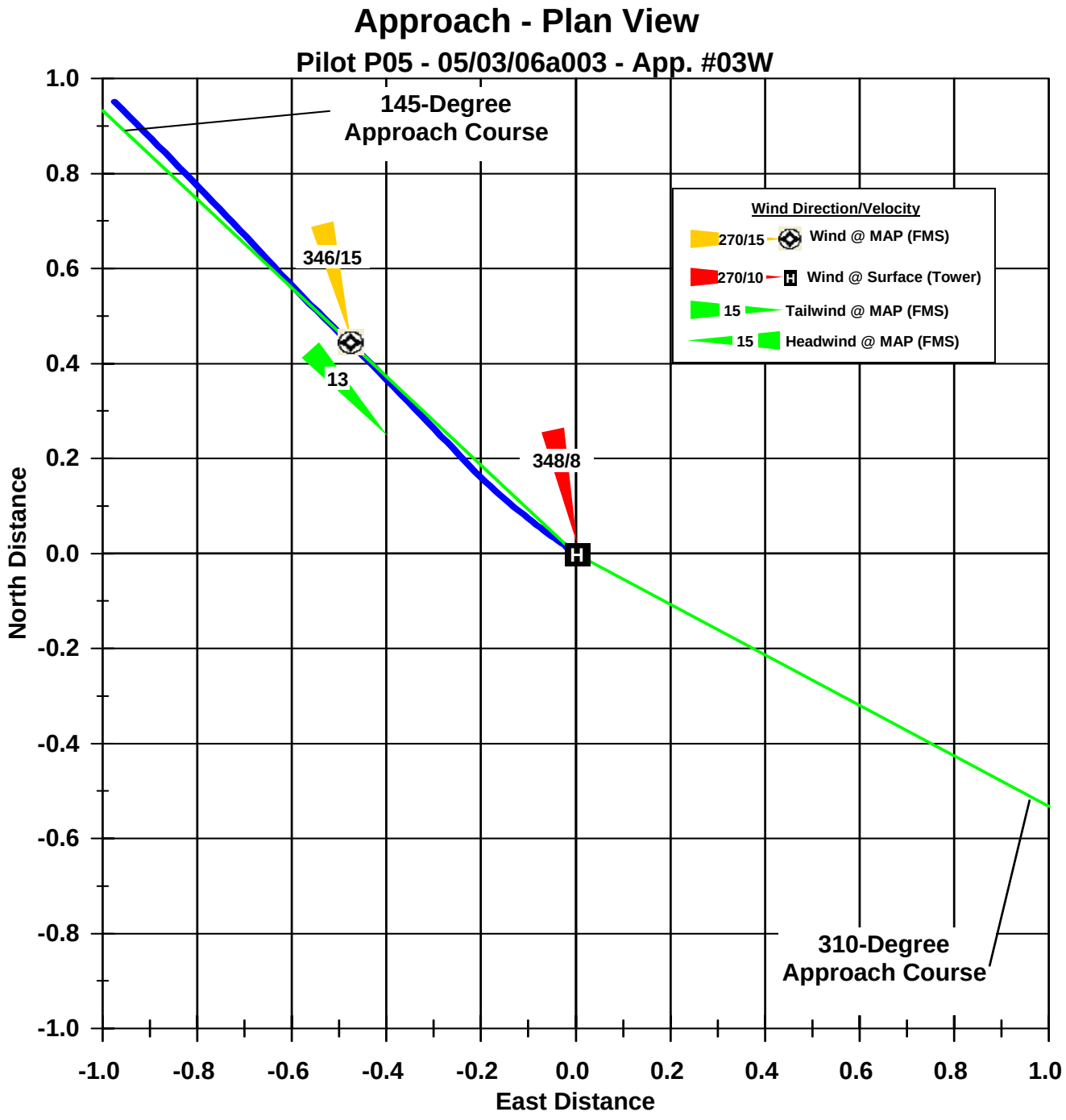


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06a002 - App. #02Y

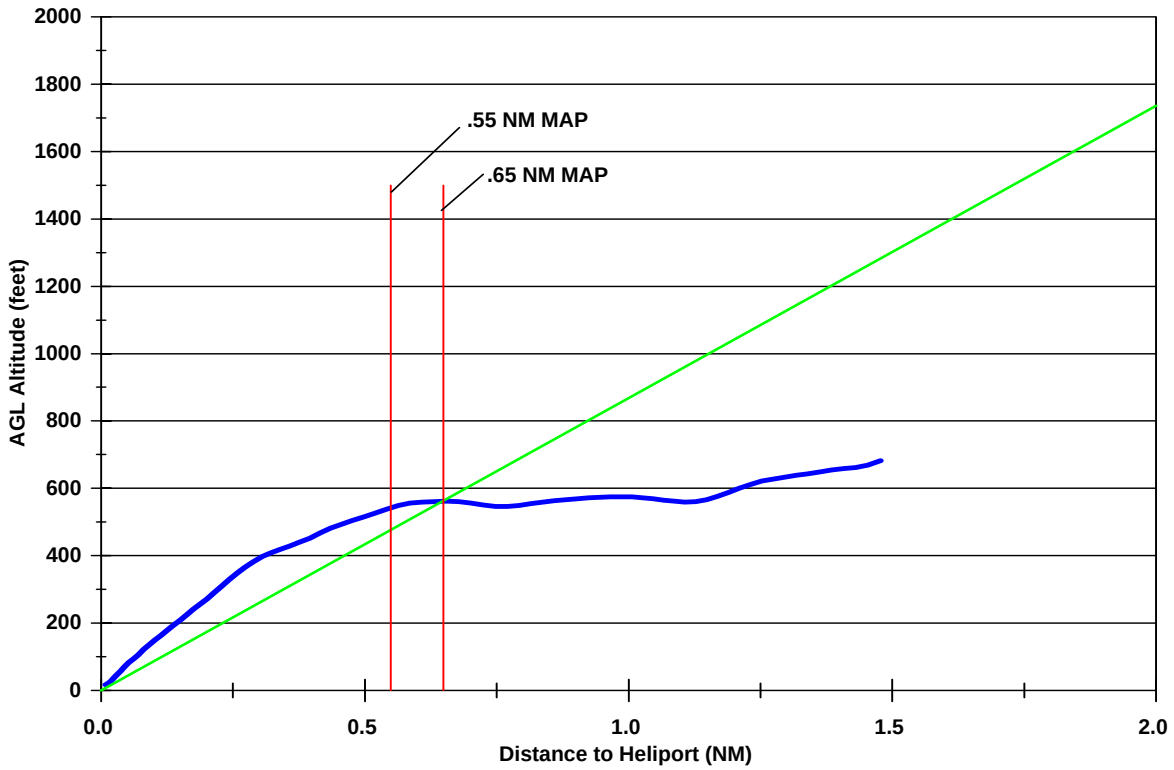


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06a002 - App. #02Y

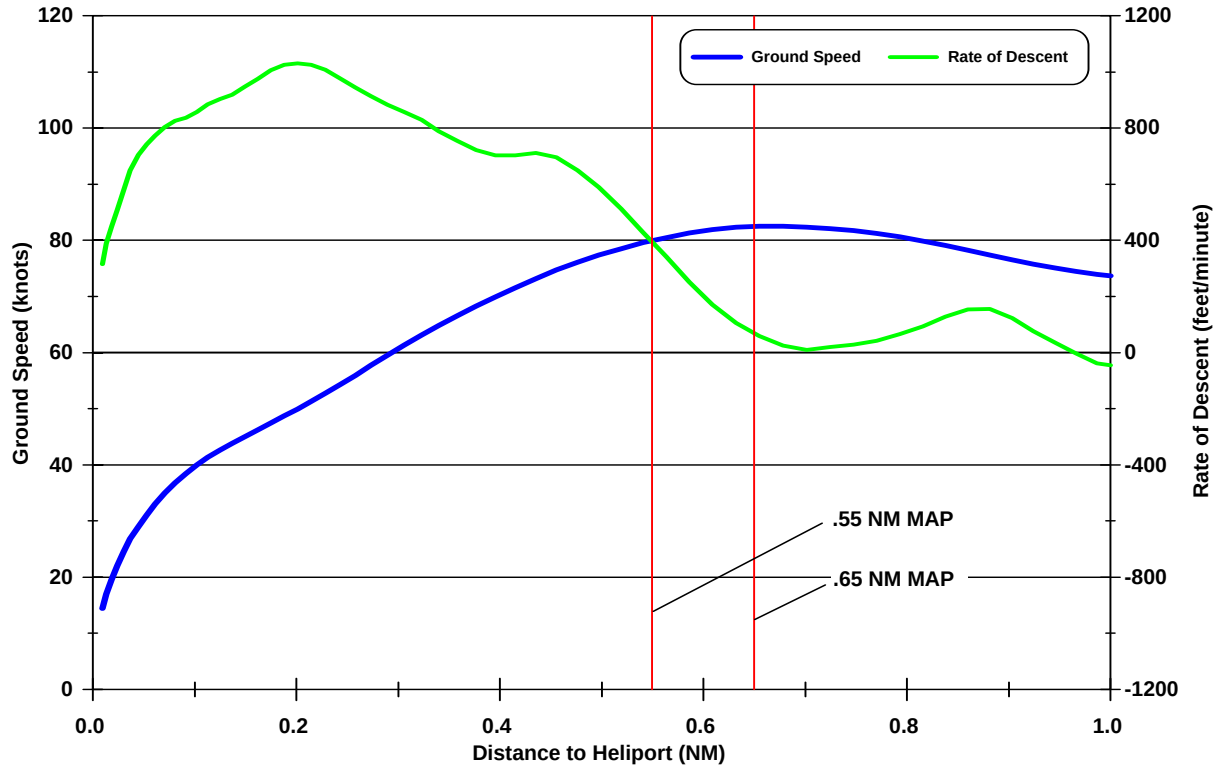



Approach - Plan View
Pilot P05 - 05/03/06a003 - App. #03W
145-Degree
Approach Course
310-Degree
Approach Course
346/15
13
348/8
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

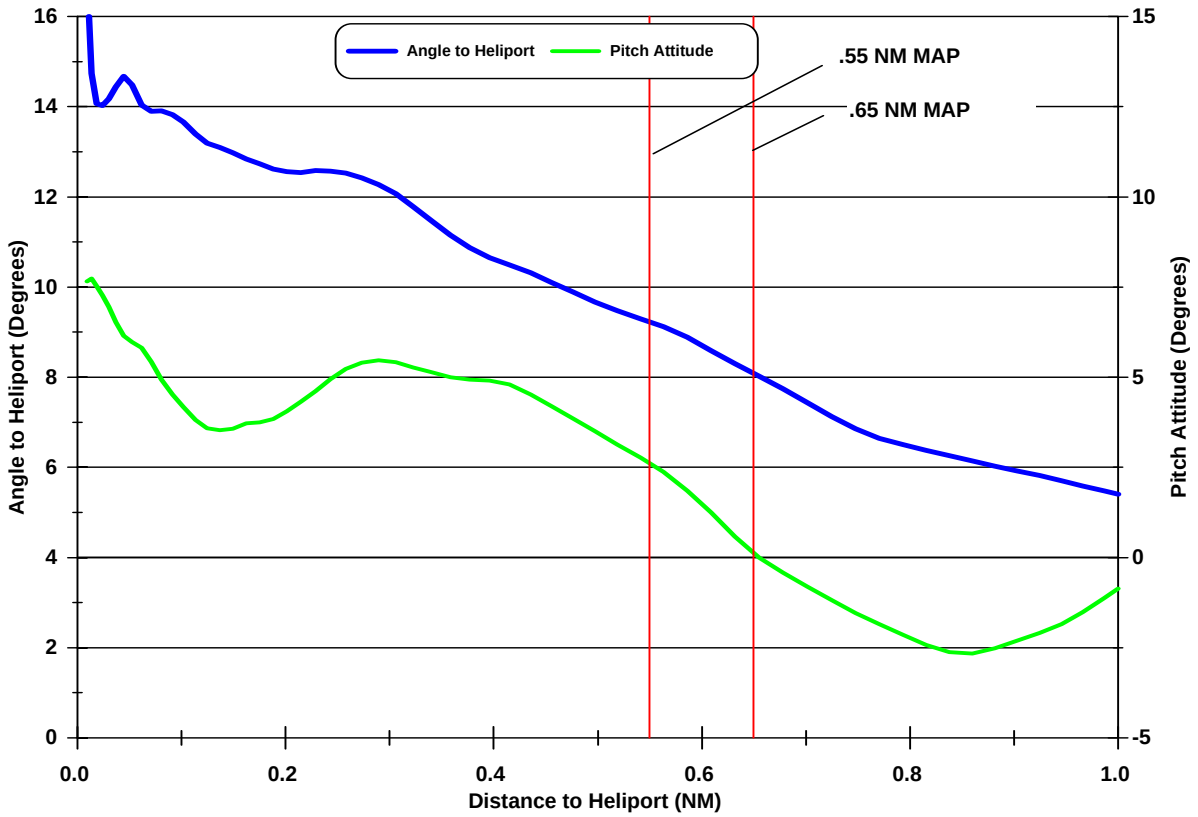
Profile View
Pilot P05 - 05/03/06a003 - App. #03W



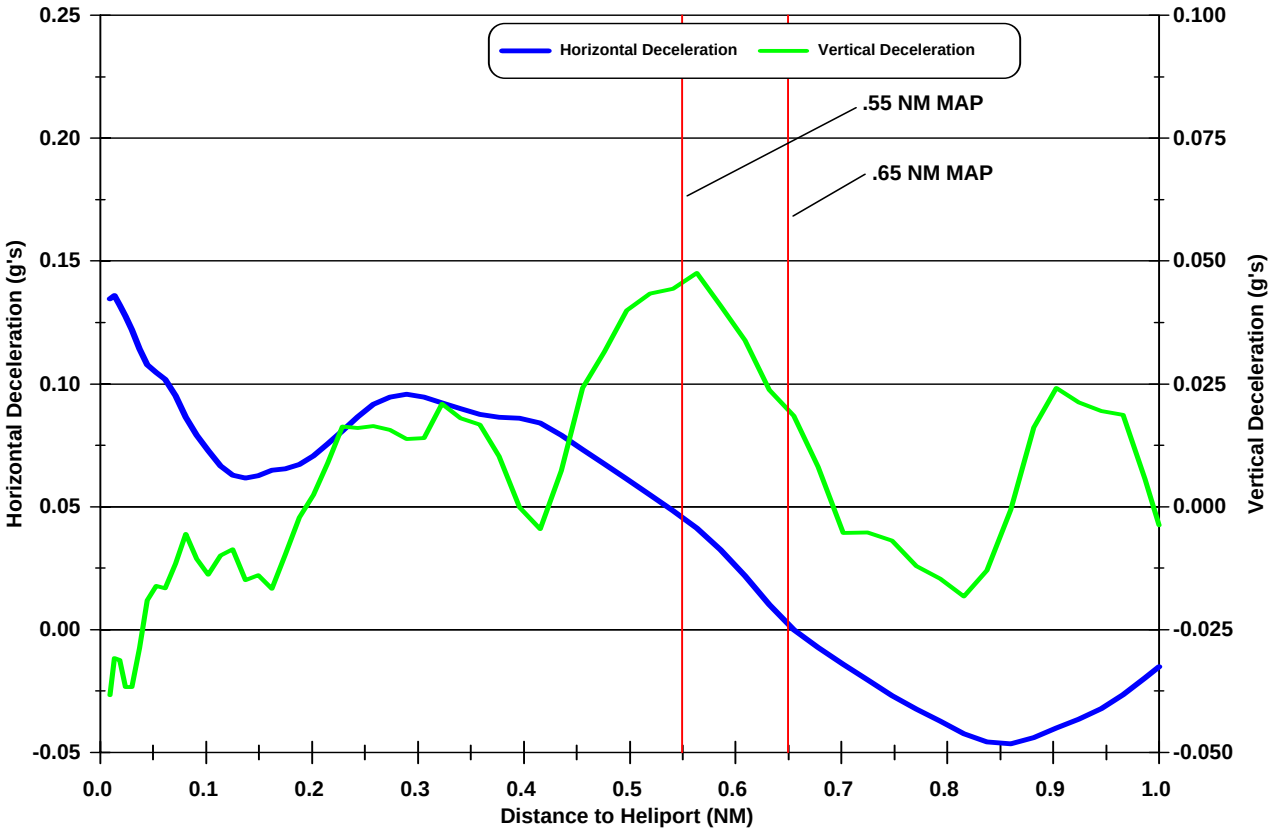
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06a003 - App. #03W

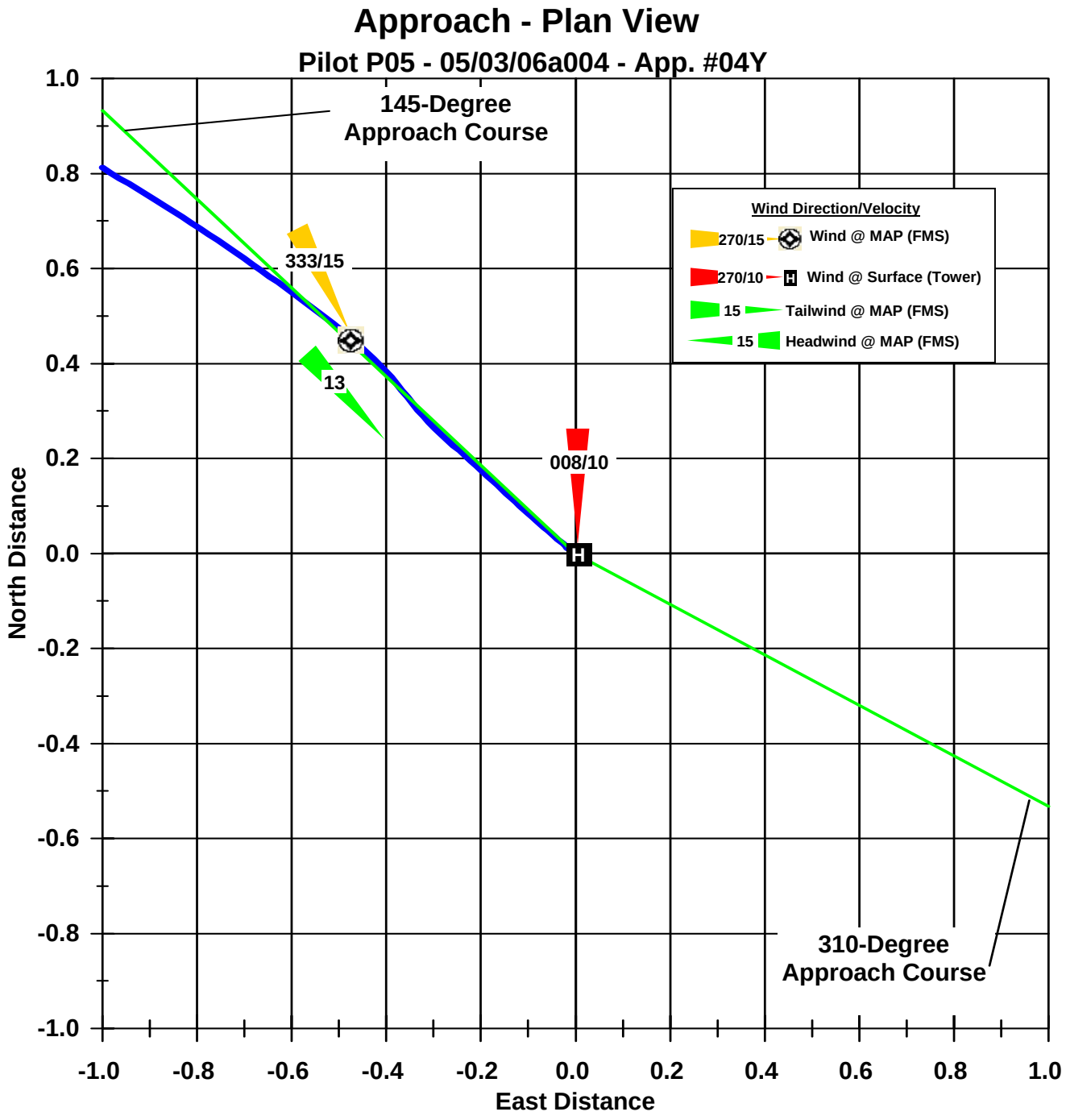


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06a003 - App. #03W

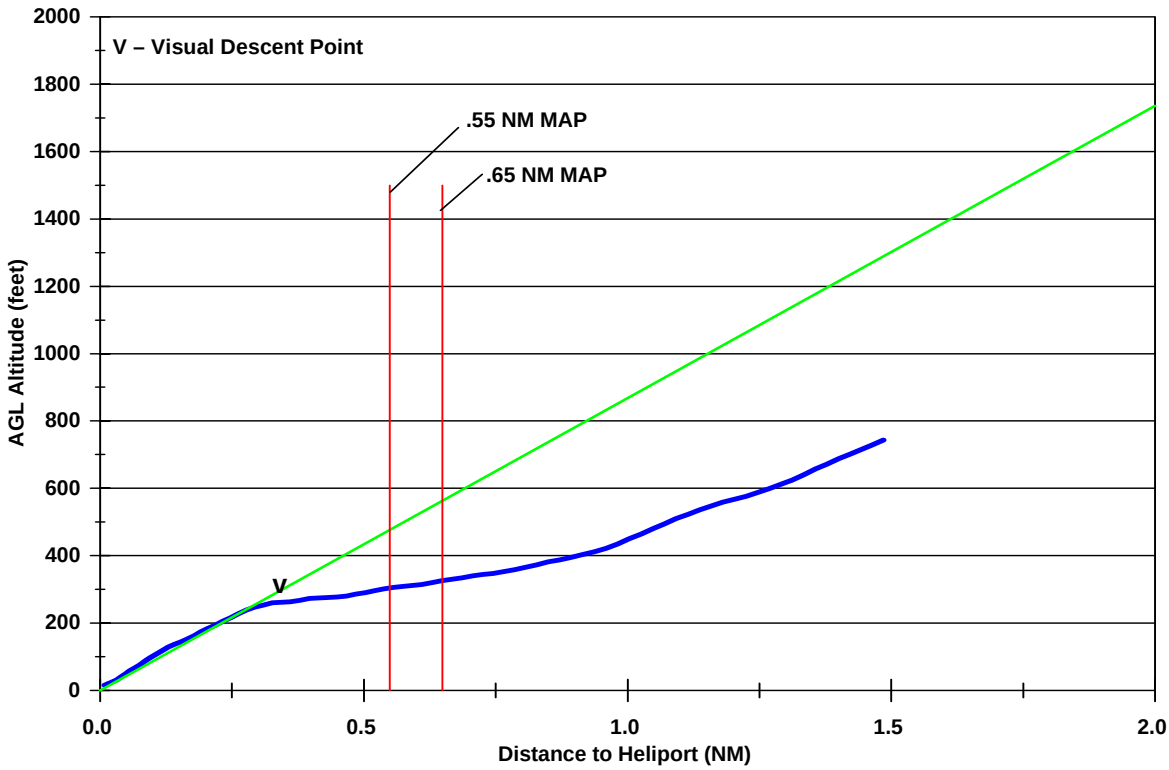


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06a003 - App. #03W

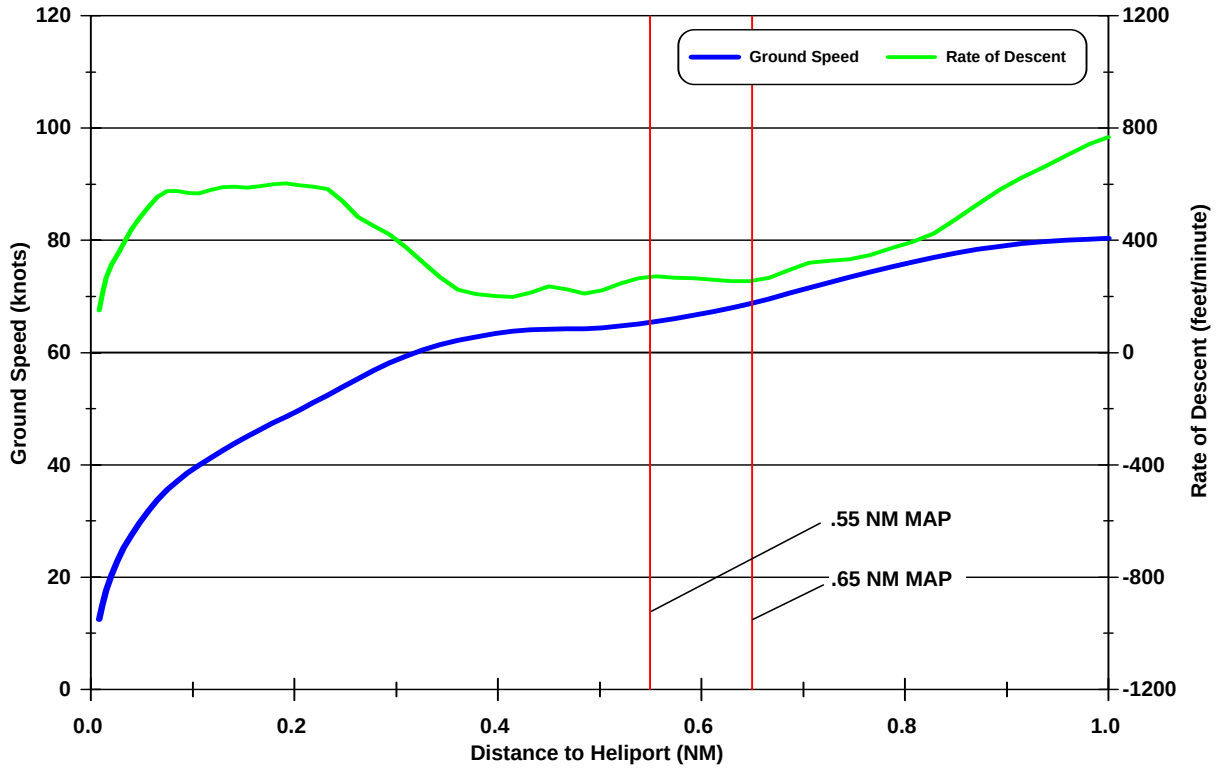



Approach - Plan View
Pilot P05 - 05/03/06a004 - App. #04Y
145-Degree
Approach Course
310-Degree
Approach Course
333/15
13
008/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

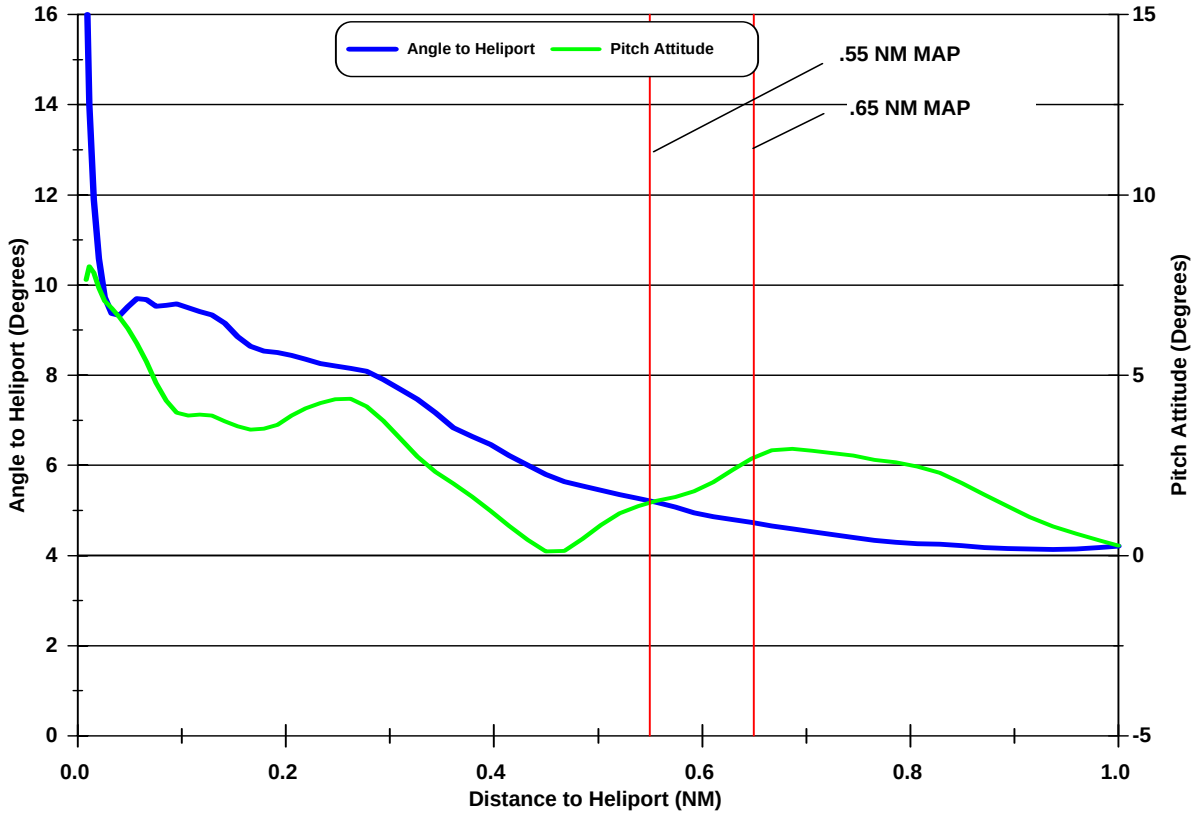
Profile View
Pilot P05 - 05/03/06a004 - App. #04Y



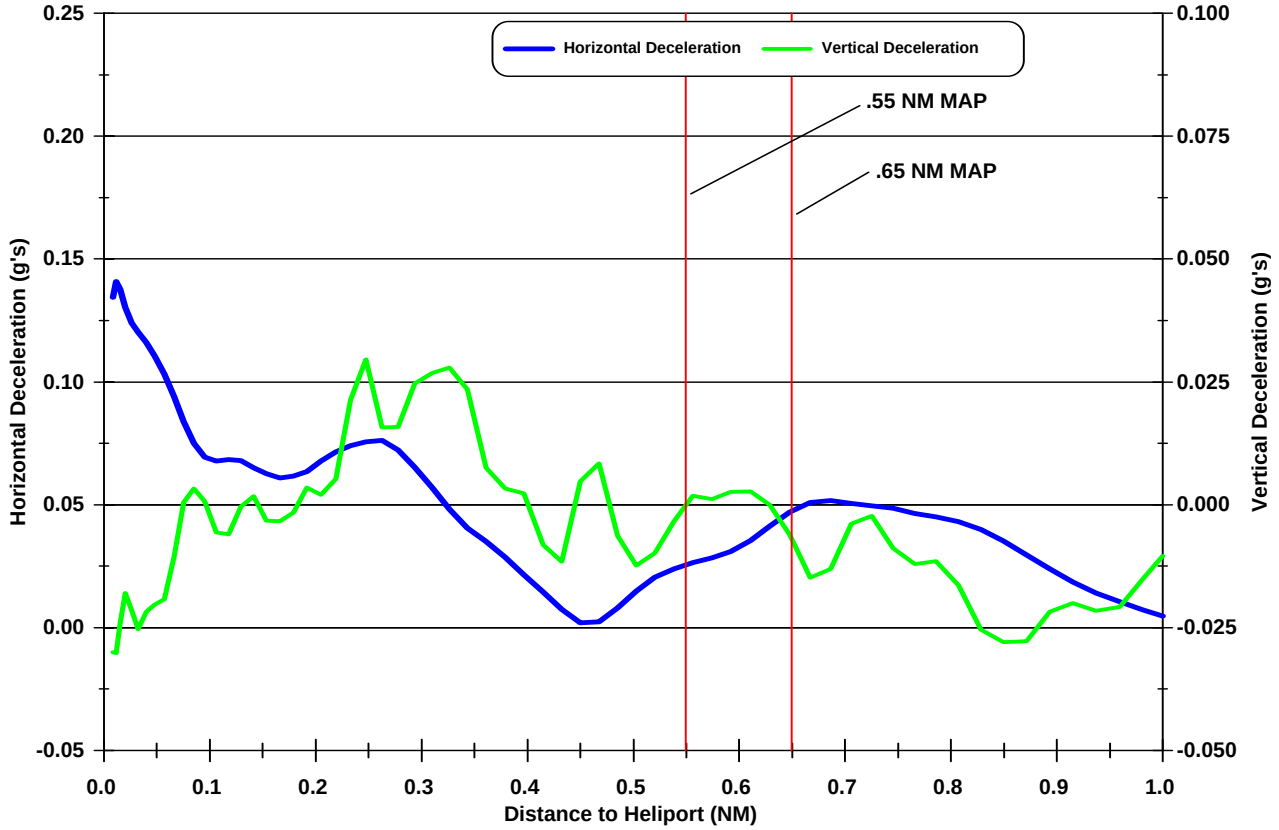
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06a004 - App. #04Y

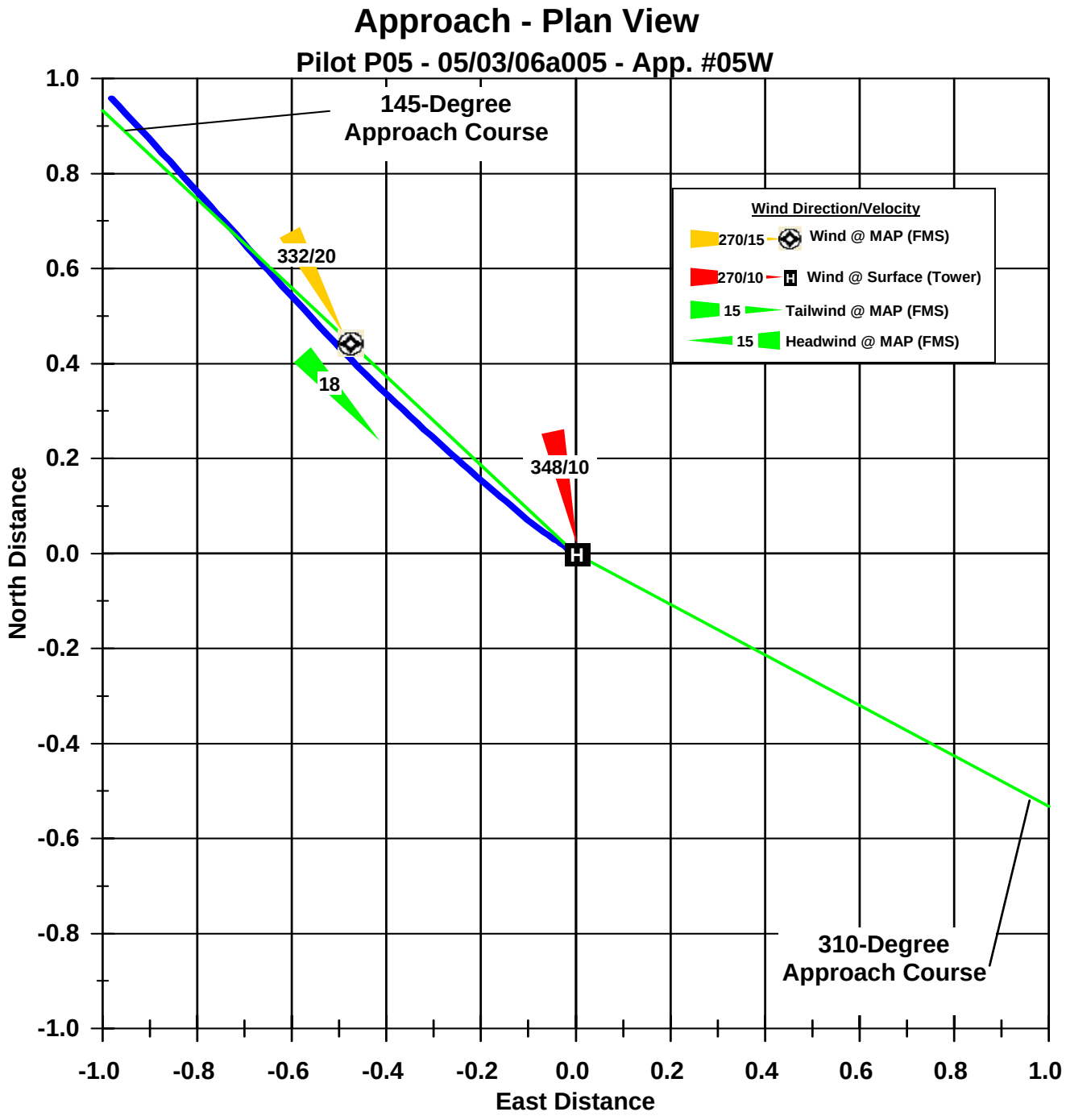


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06a004 - App. #04Y

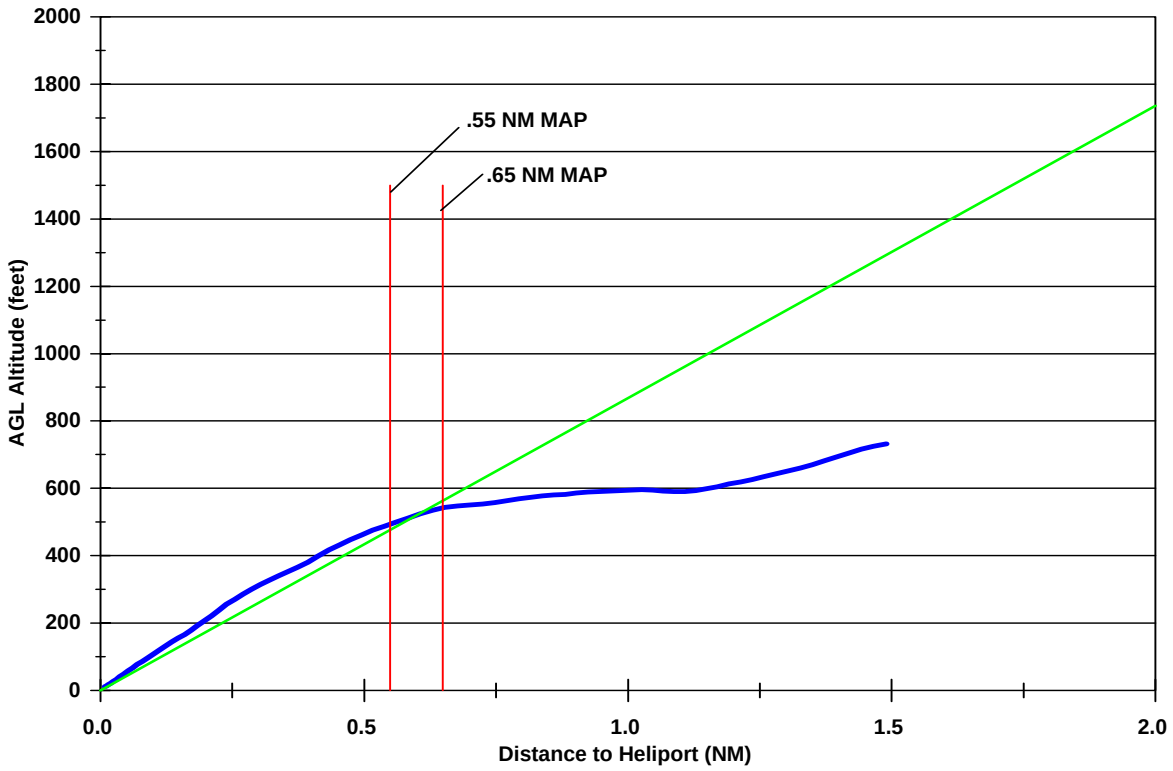


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06a004 - App. #04Y

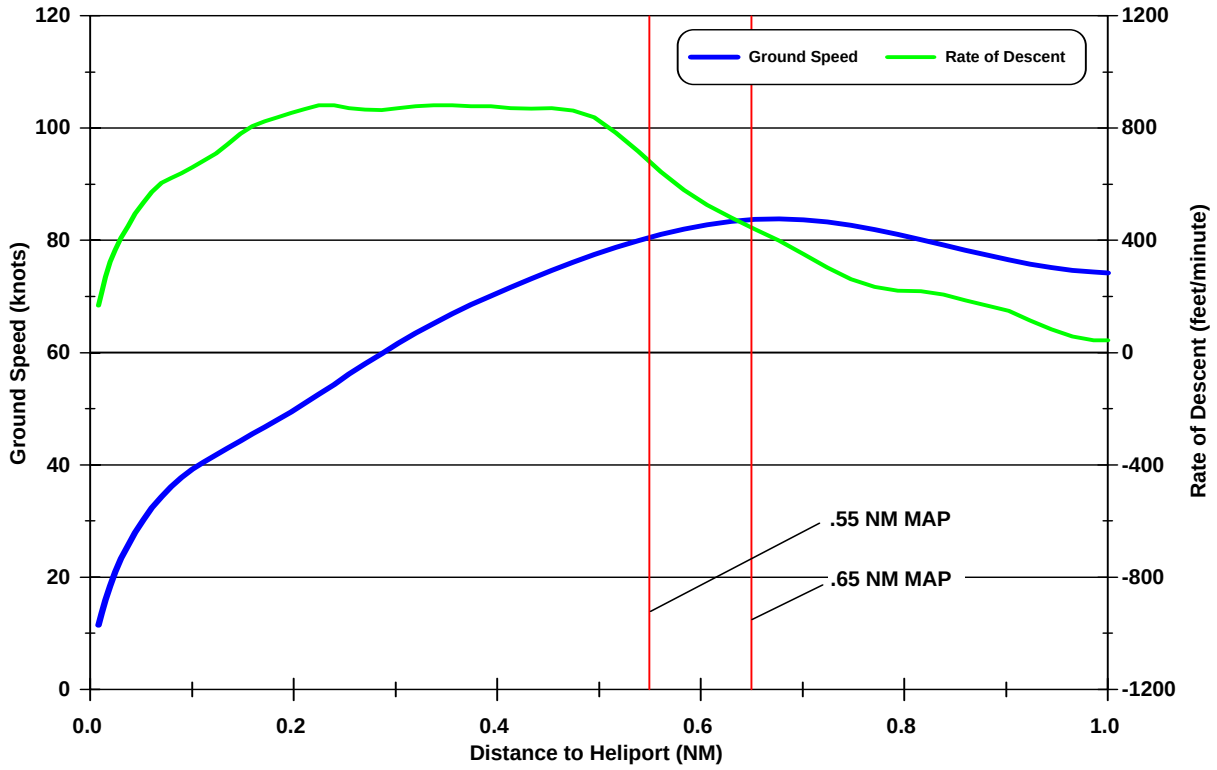



Approach - Plan View
Pilot P05 - 05/03/06a005 - App. #05W
145-Degree
Approach Course
310-Degree
Approach Course
332/20
18
348/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

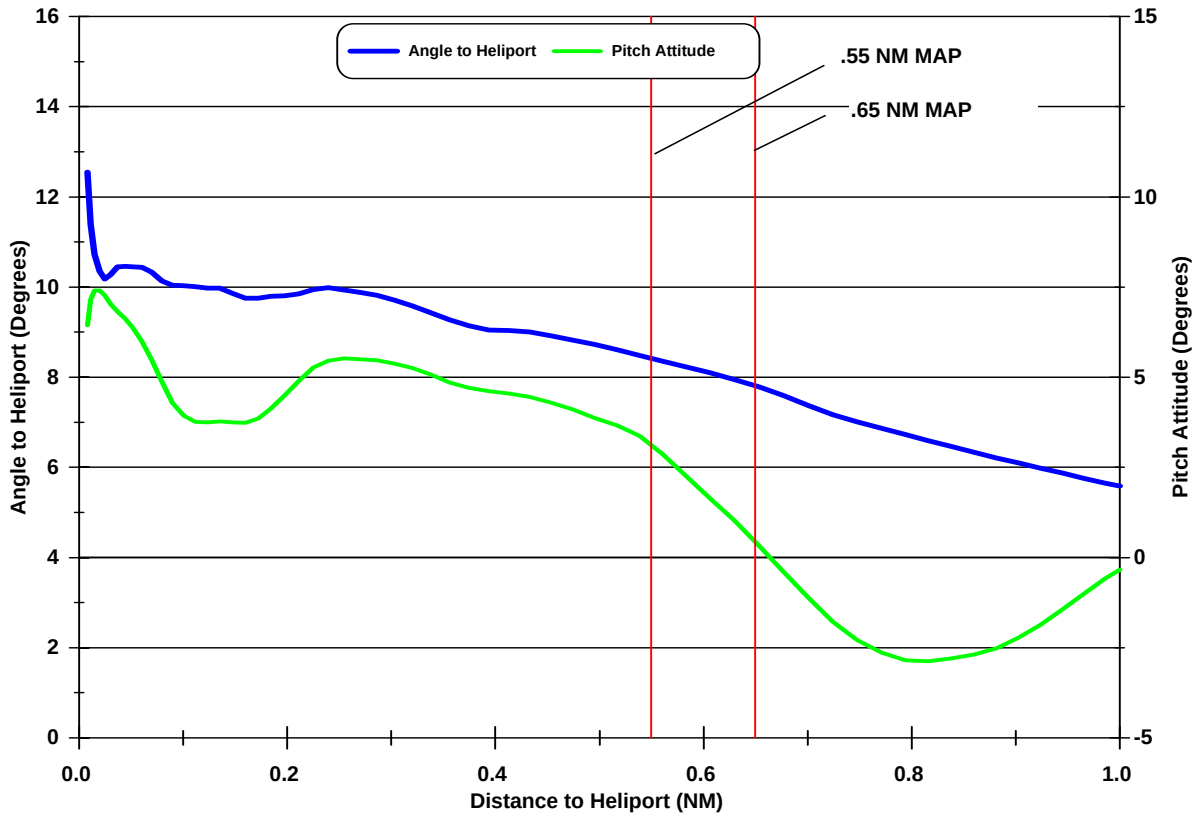
Profile View
Pilot P05 - 05/03/06a005 - App. #05W



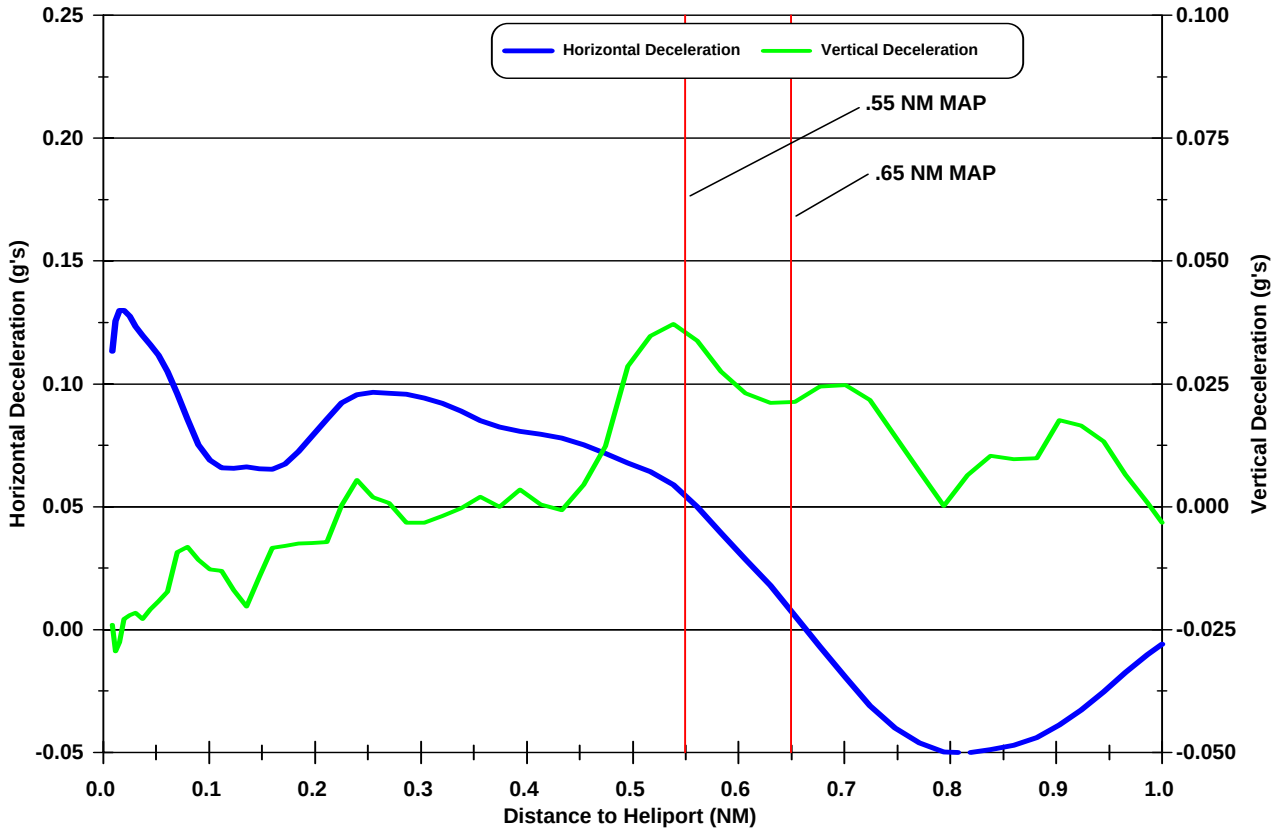
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06a005 - App. #05W

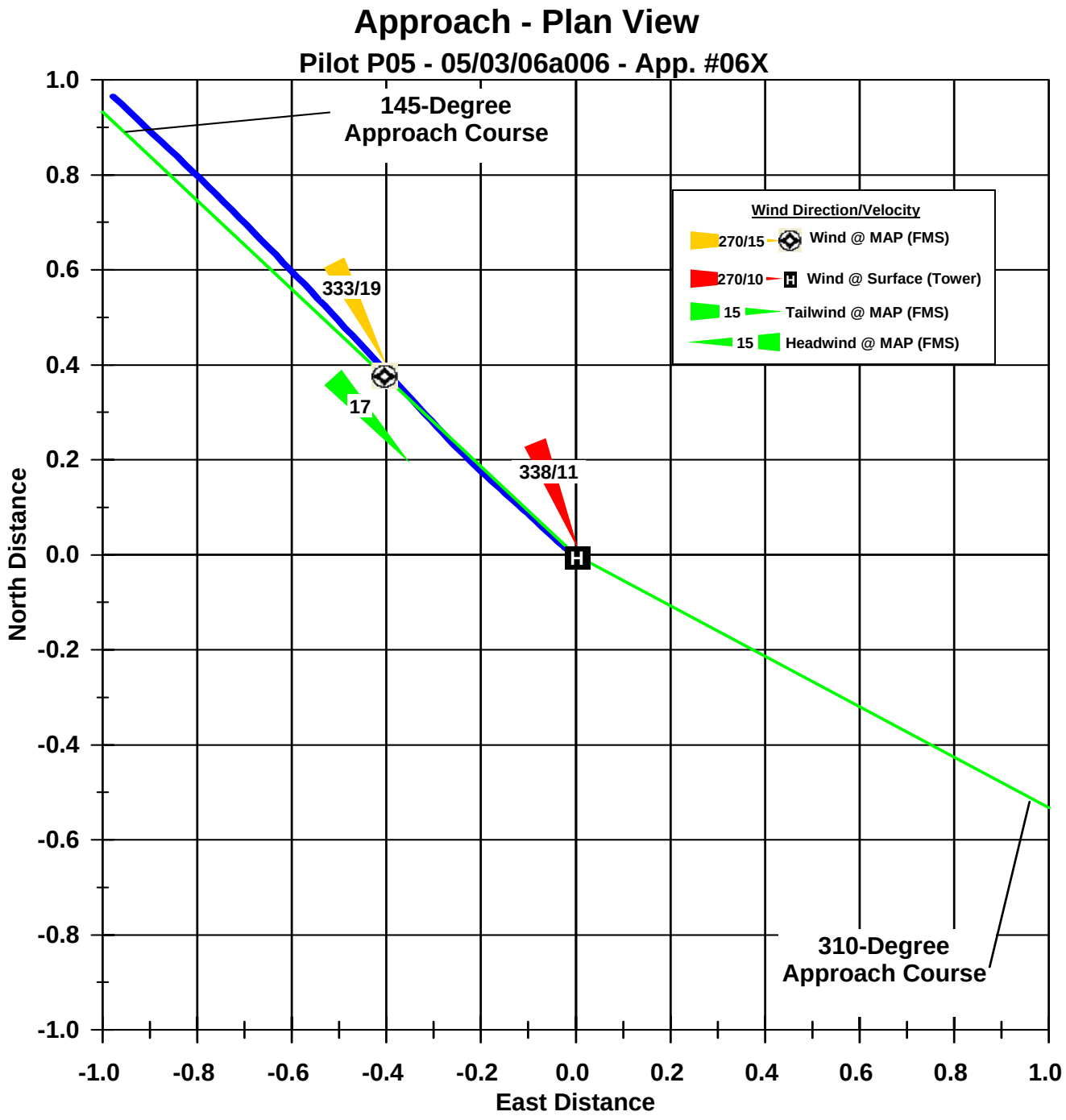


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06a005 - App. #05W

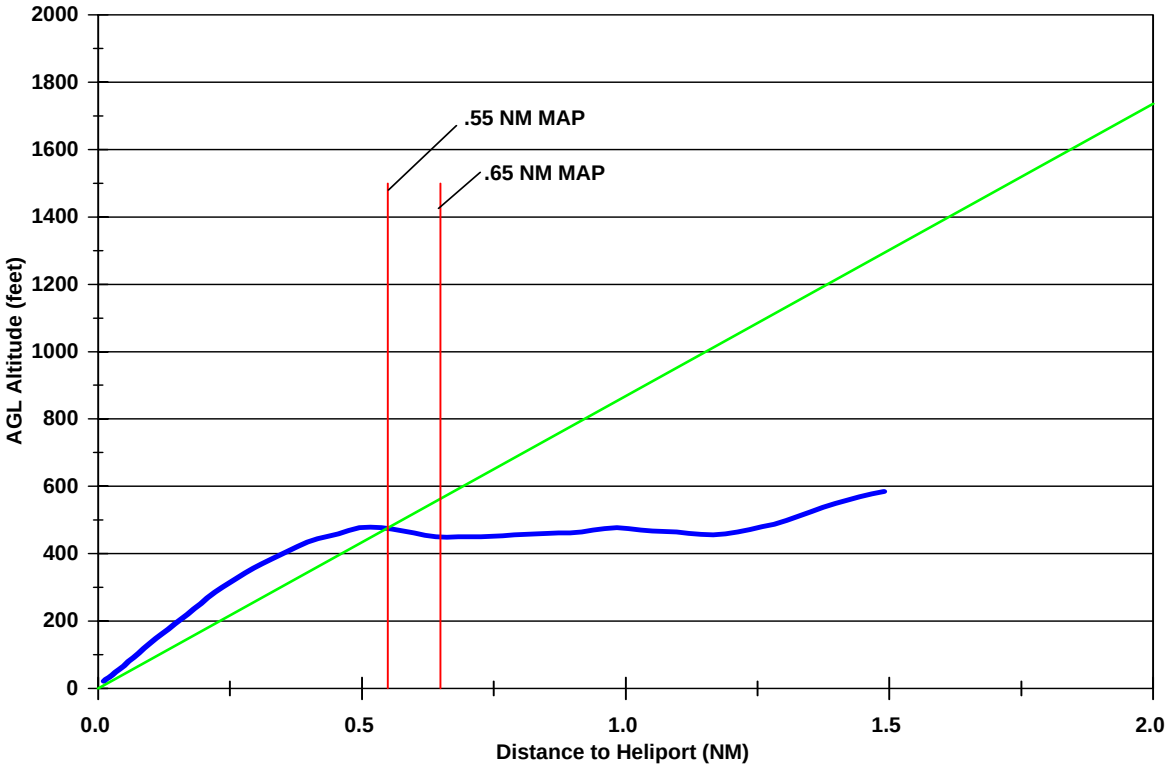


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06a005 - App. #05W

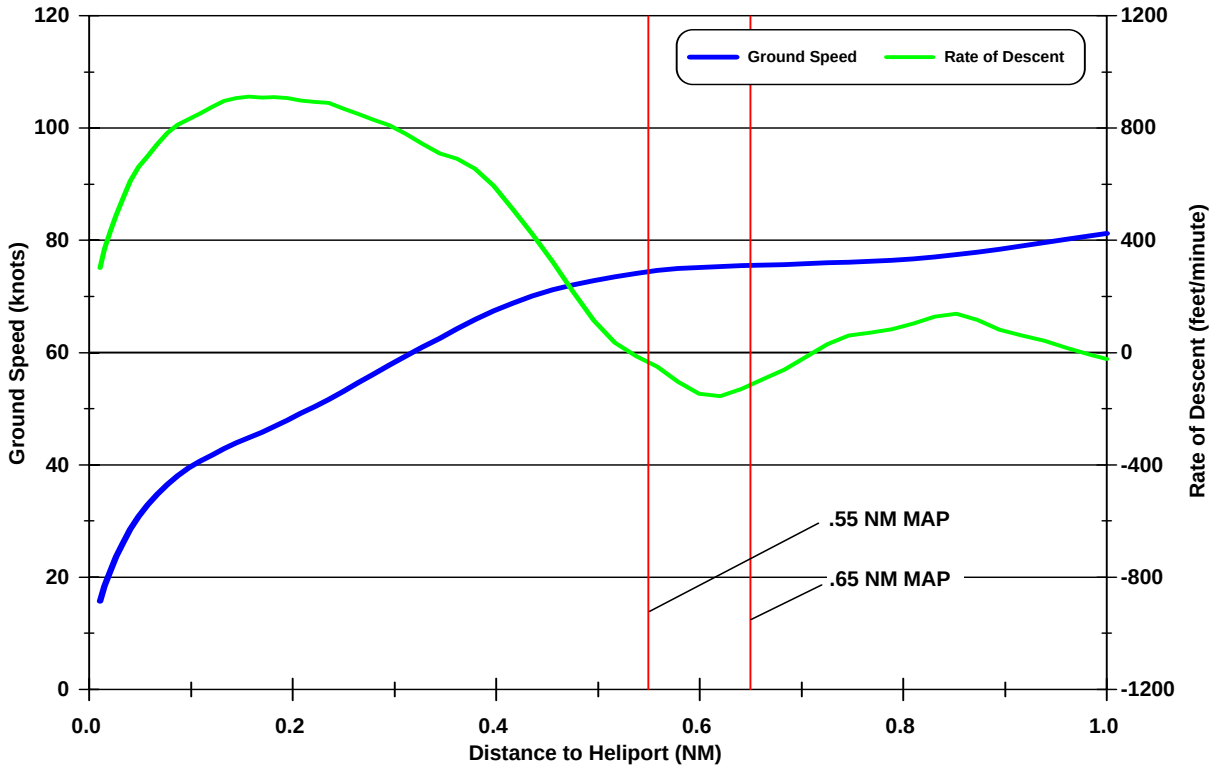



Approach - Plan View
Pilot P05 - 05/03/06a006 - App. #06X
145-Degree
Approach Course
310-Degree
Approach Course
333/19
17
338/11
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

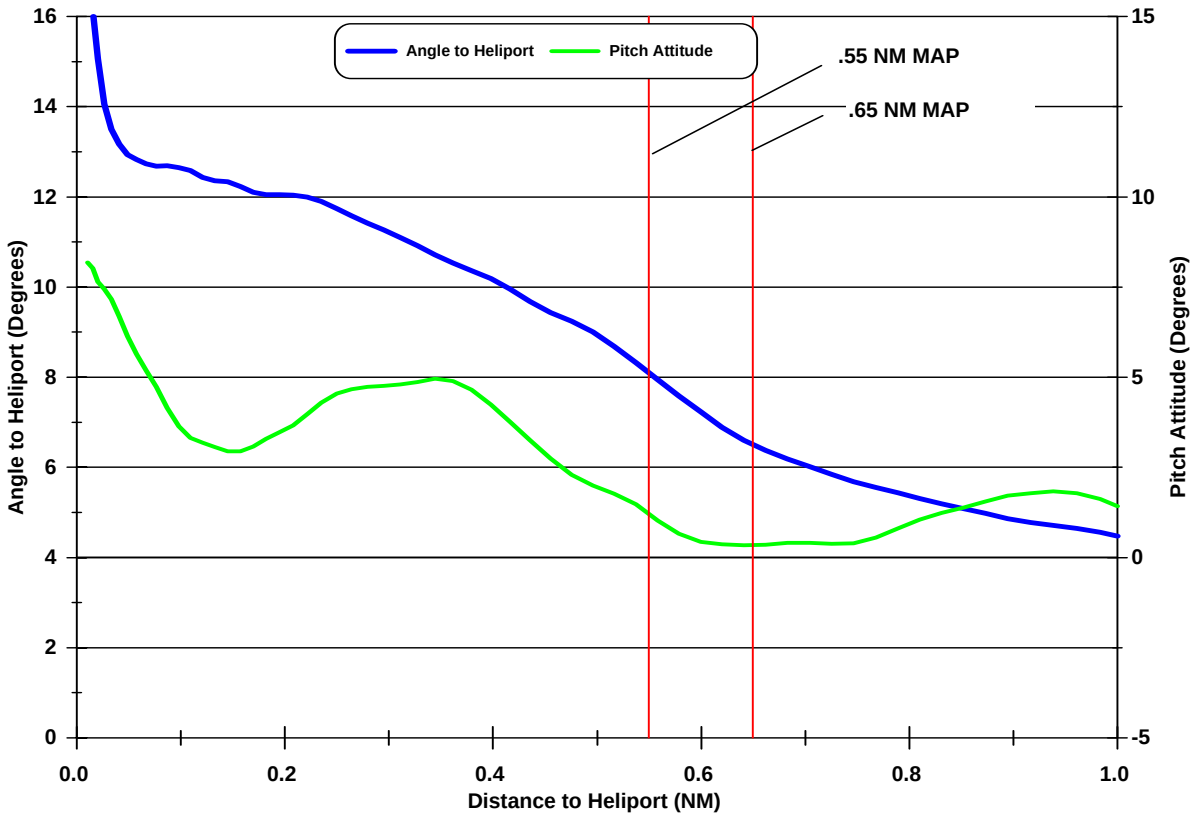
Profile View
Pilot P05 - 05/03/06a006 - App. #06X



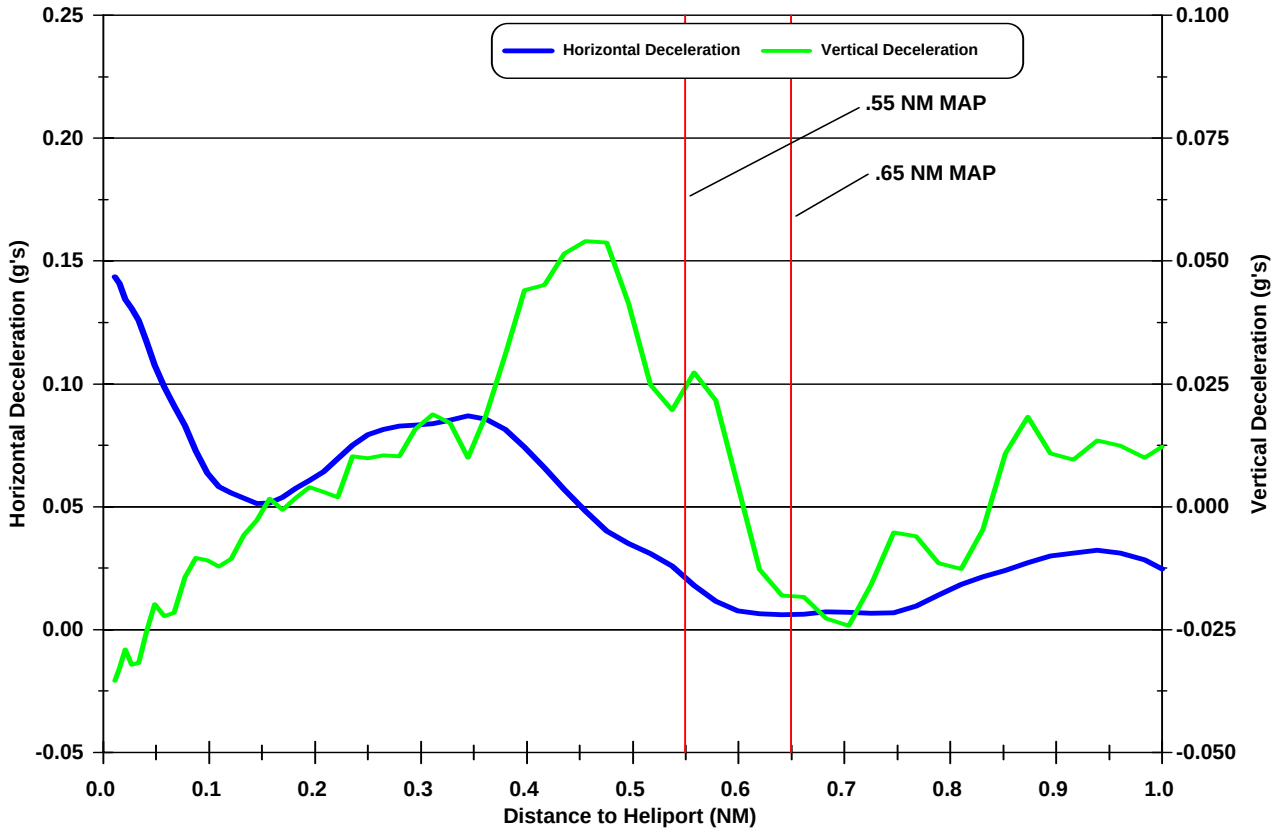
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06a006 - App. #06X

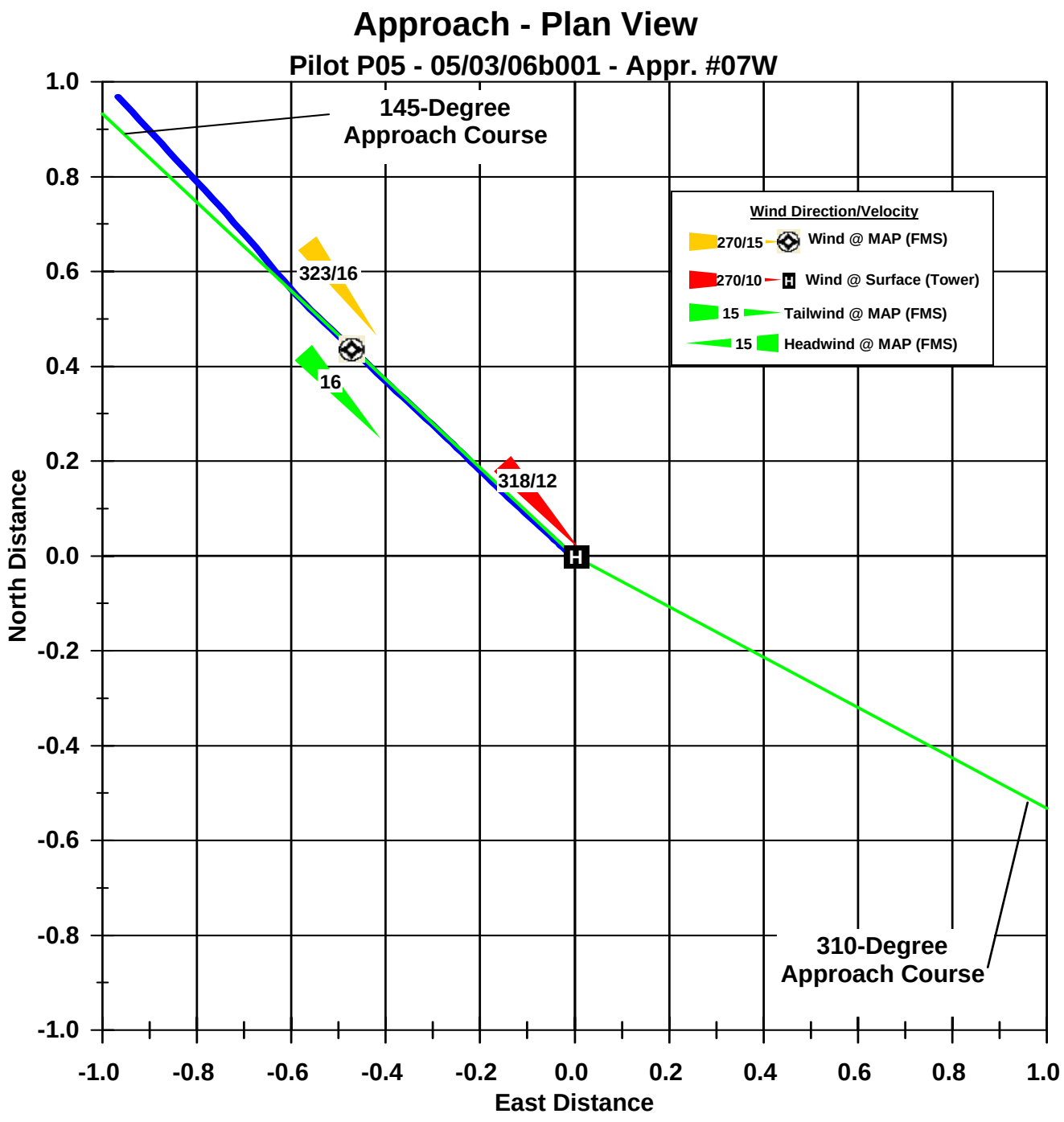


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06a006 - App. #06X

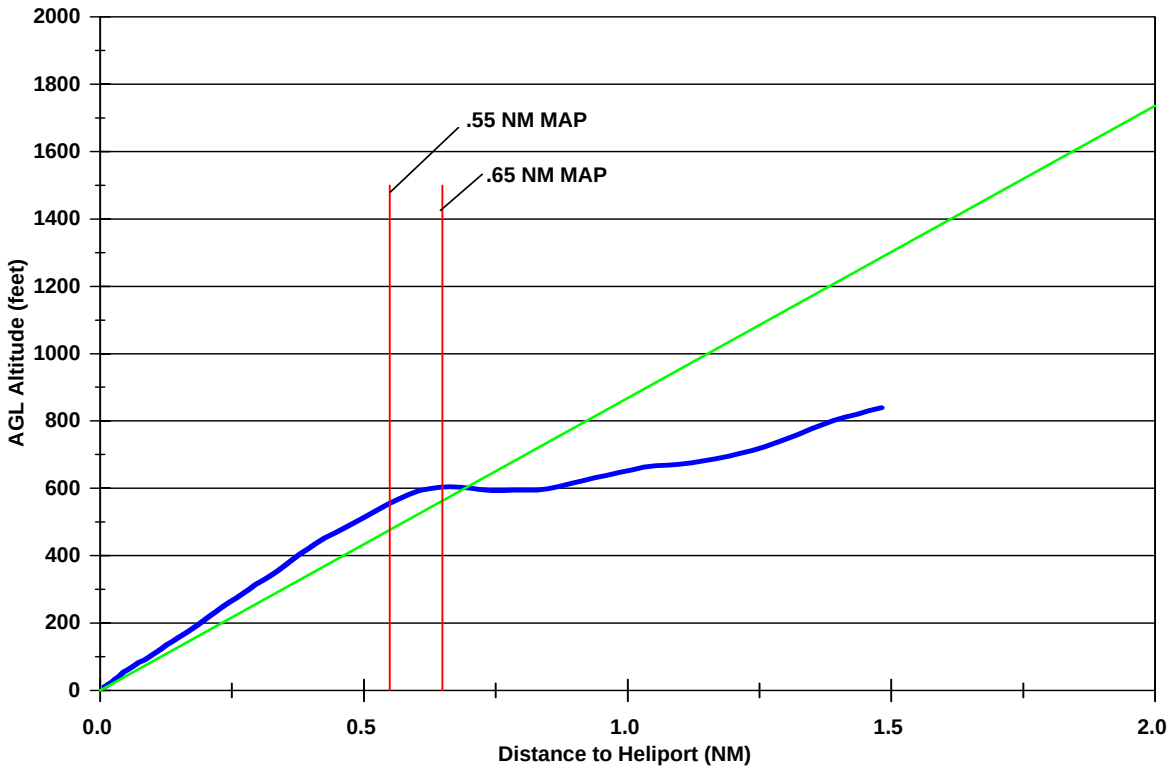


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06a006 - App. #06X

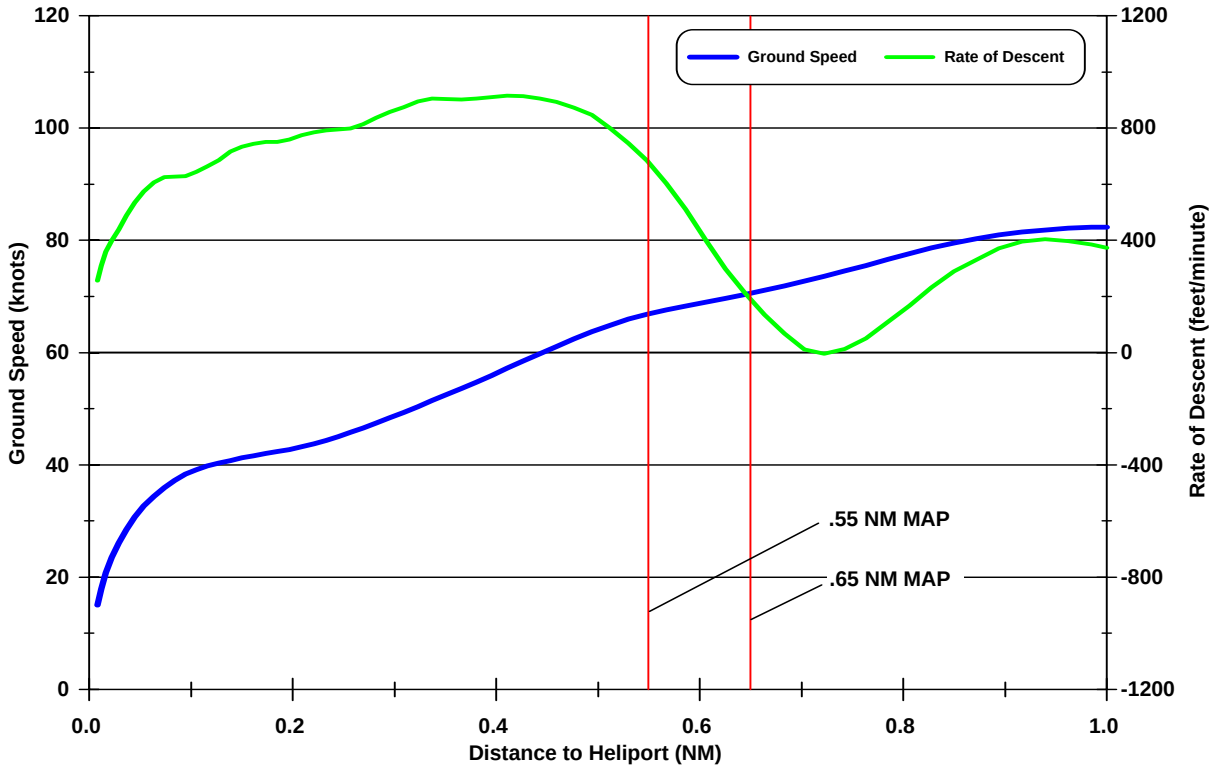



Approach - Plan View
Pilot P05 - 05/03/06b001 - Appr. #07W
145-Degree
Approach Course
310-Degree
Approach Course
323/16
16
318/12
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

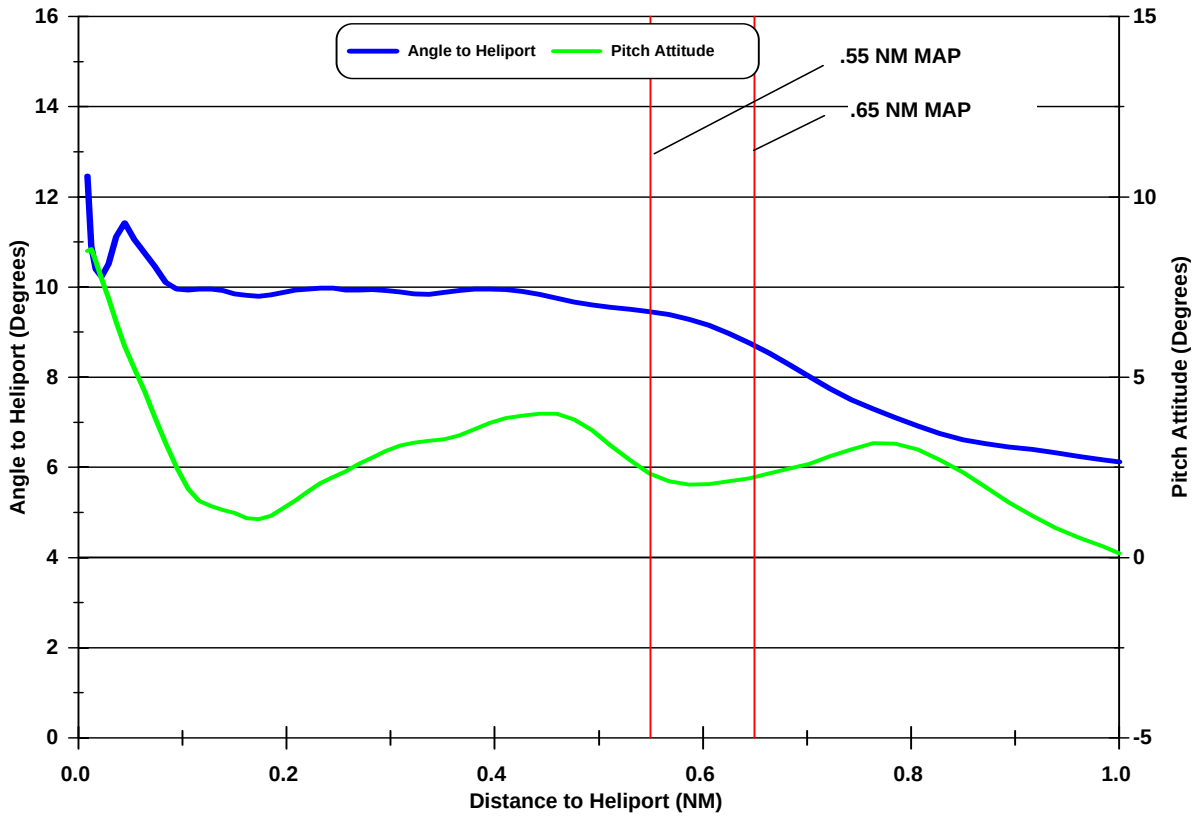
Profile View
Pilot P05 - 05/03/06b001 - Appr. #07W



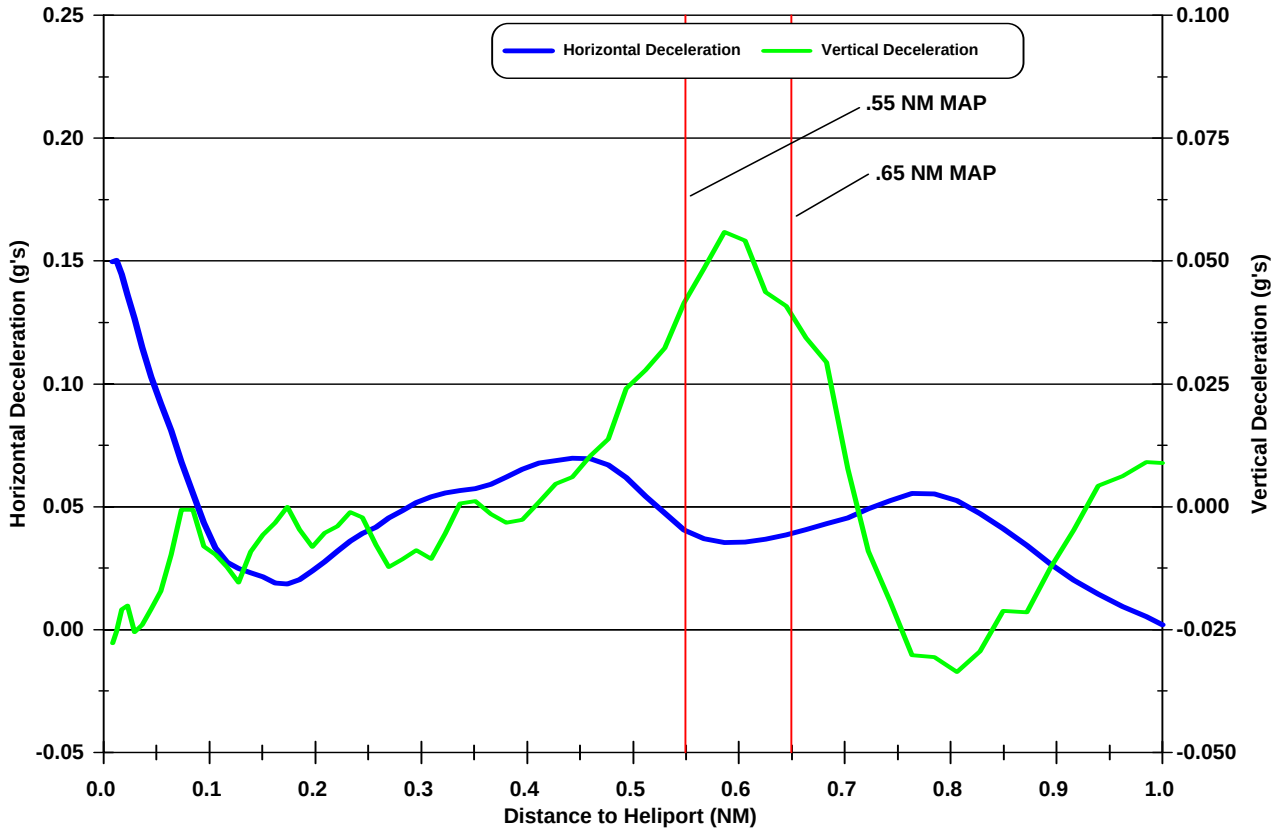
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06b001 - Appr. #07W

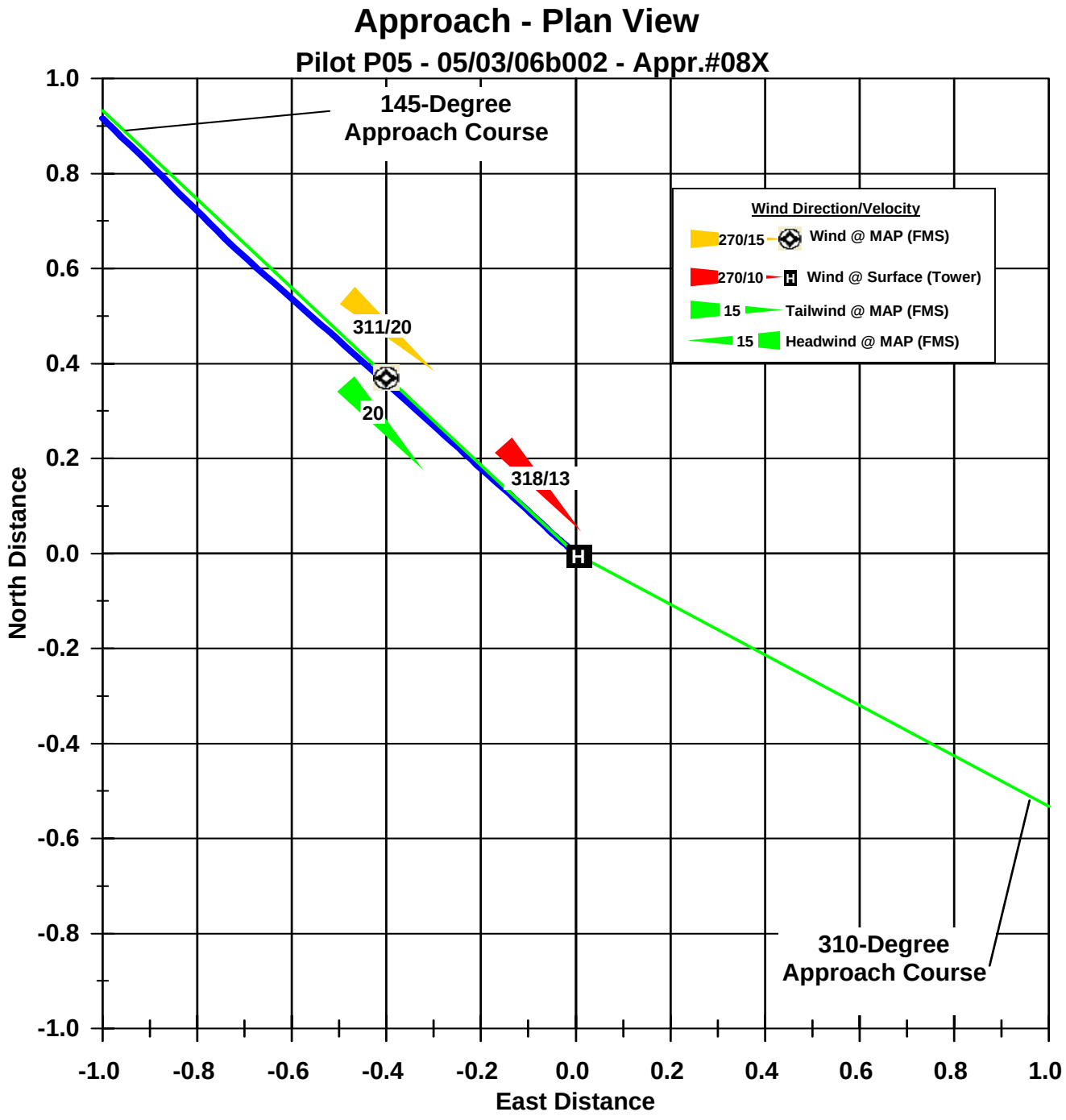


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06b001 - Appr. #07W

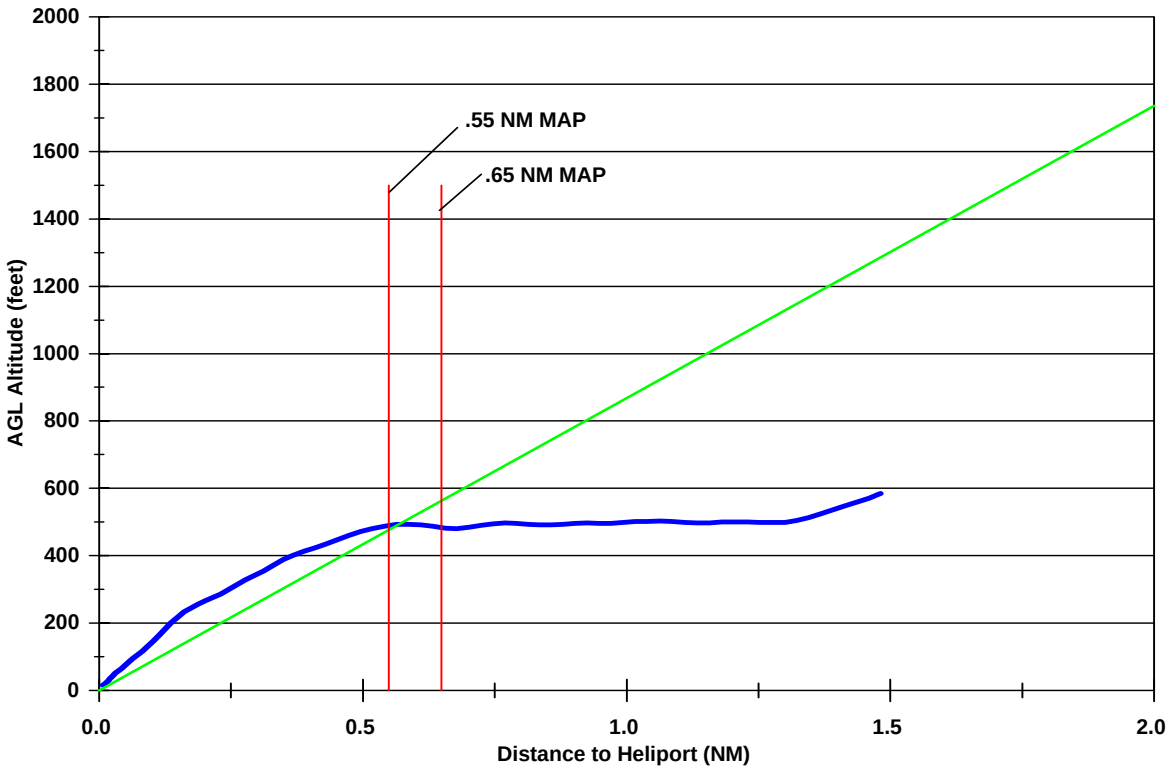


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06b001 - Appr. #07W

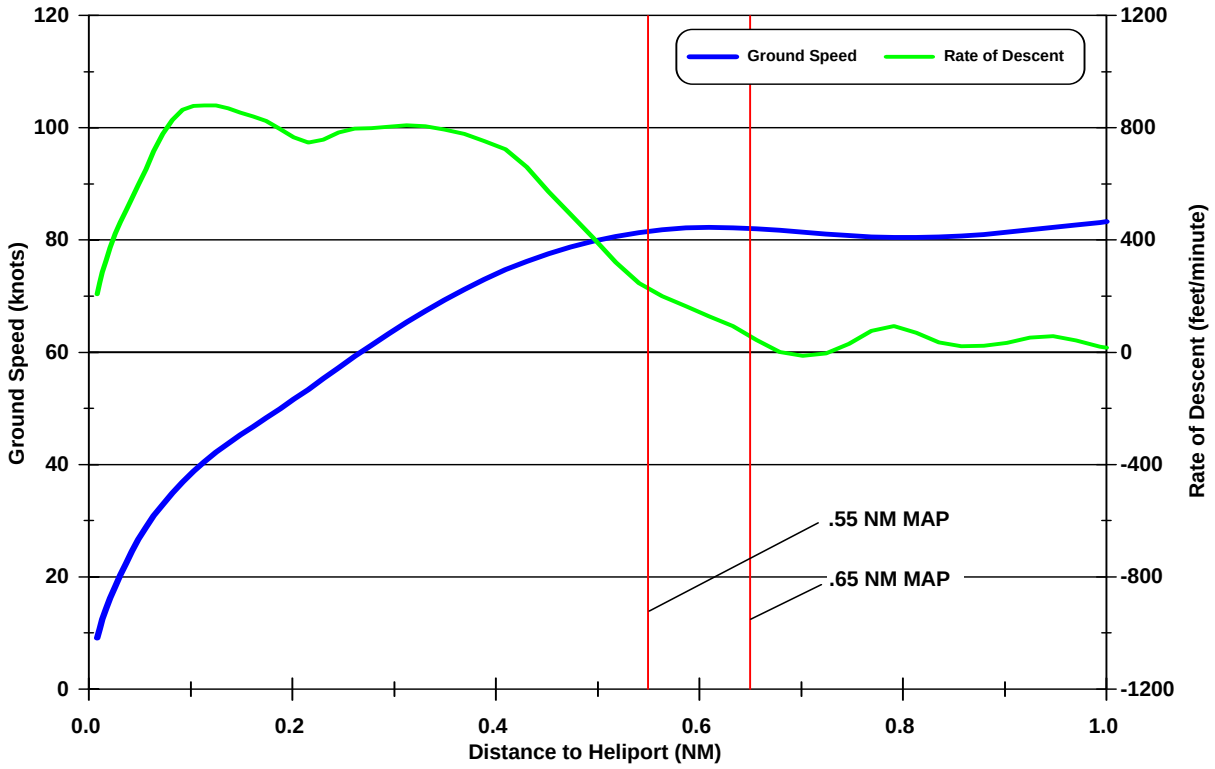



Approach - Plan View
Pilot P05 - 05/03/06b002 - Appr.#08X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
311/20
20
318/13
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

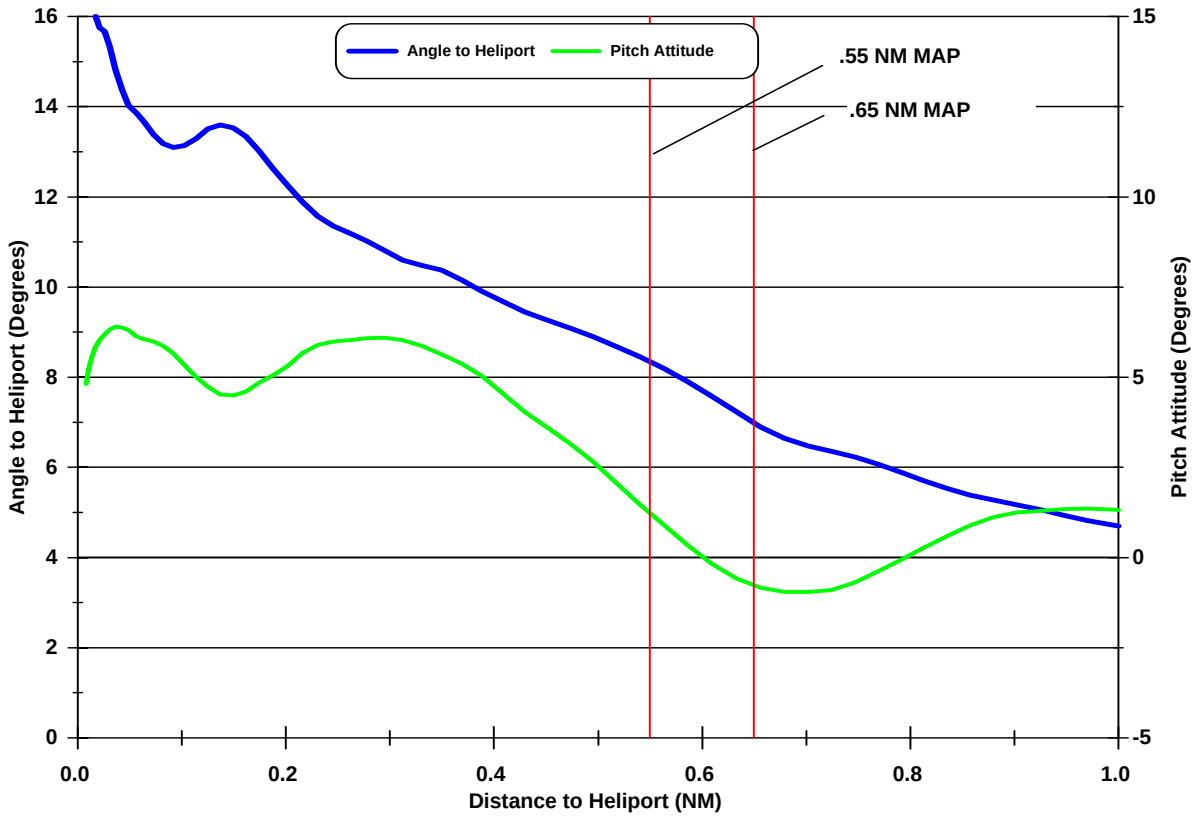
Profile View
Pilot P05 - 05/03/06b002 - Appr. #08X



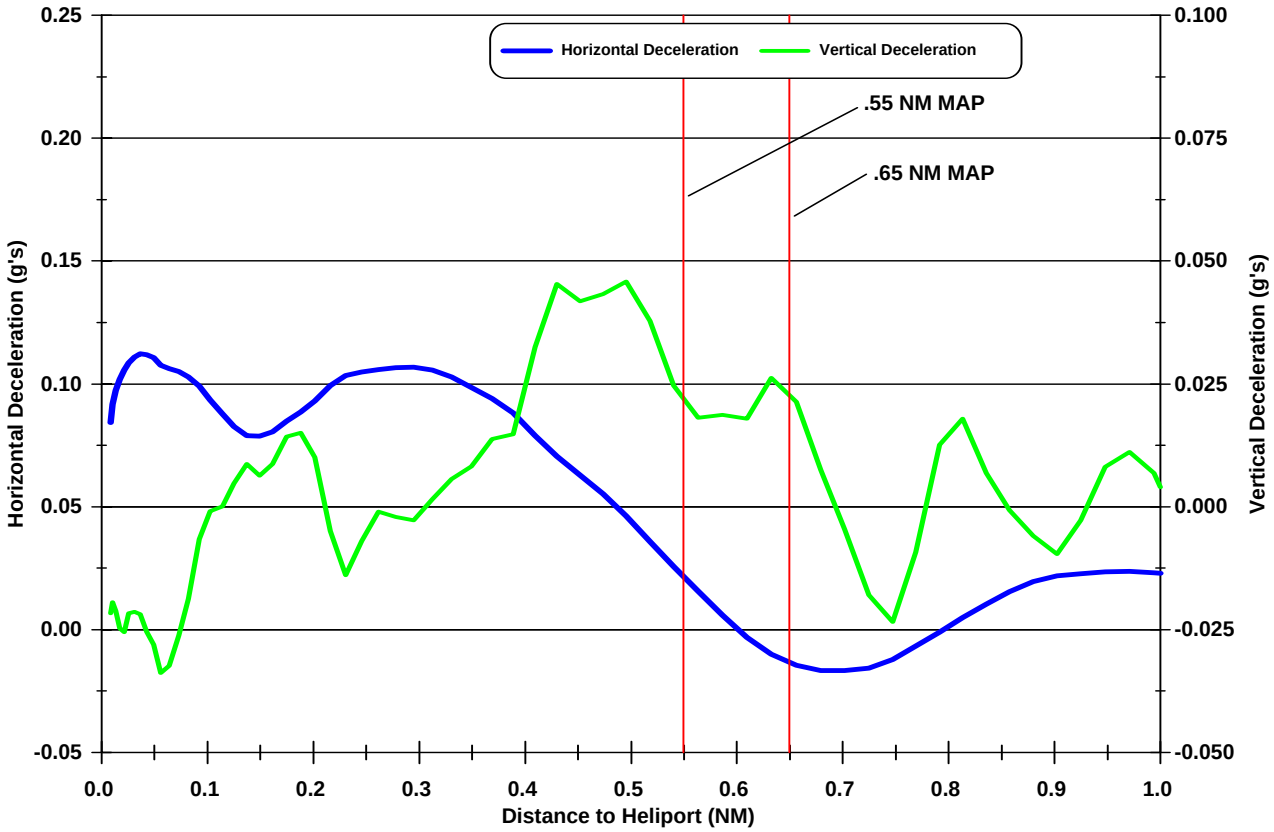
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06b002 - Appr. #08X

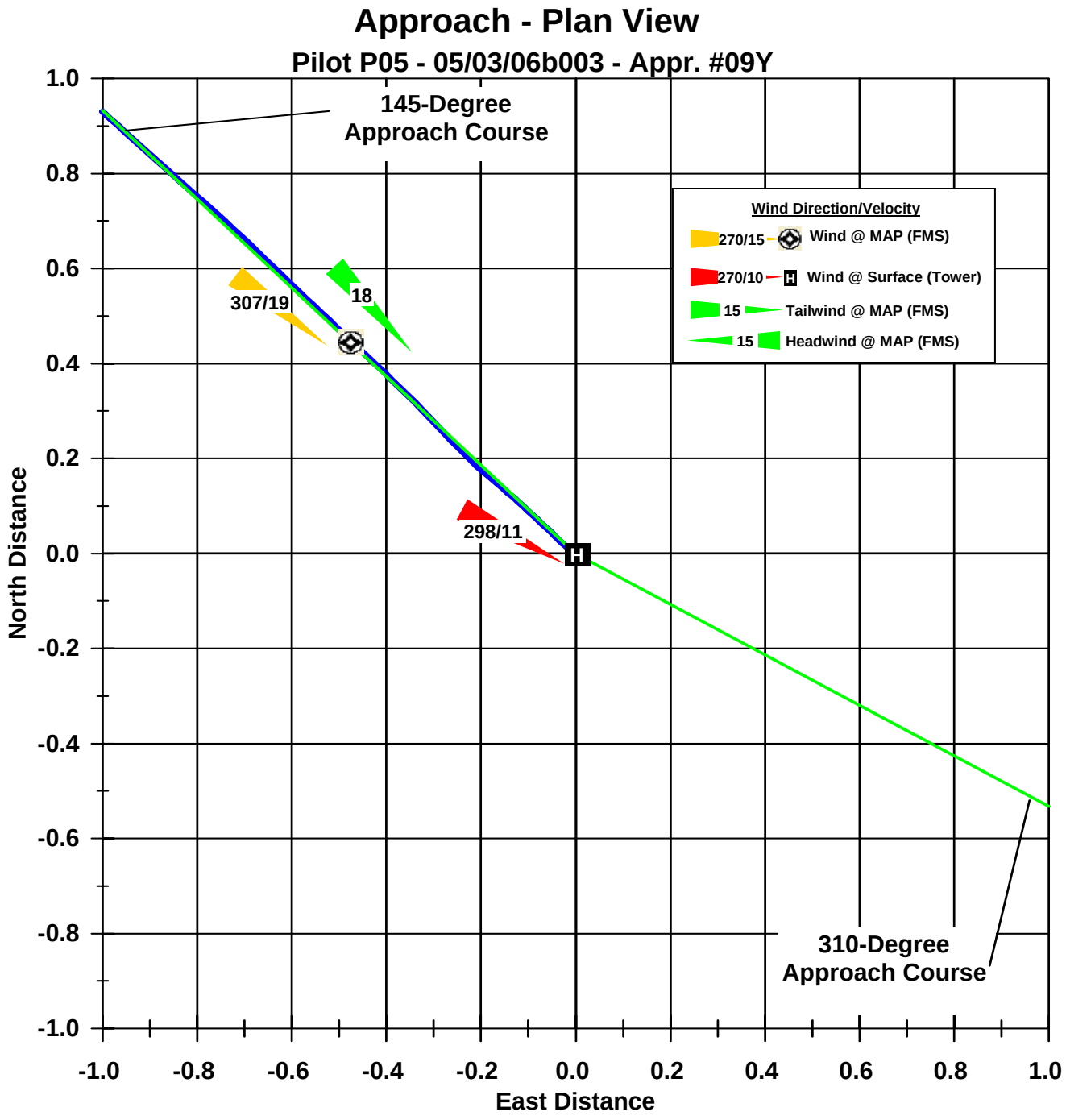


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06b002 - Appr. #08X

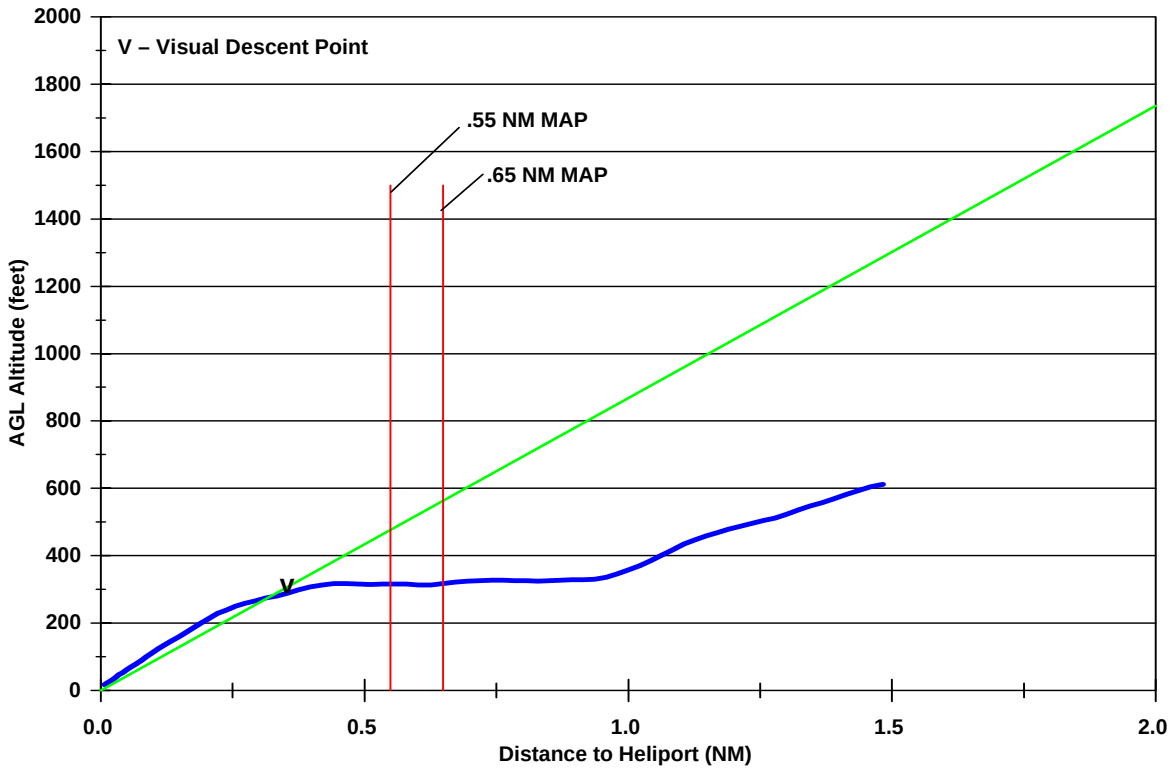


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06b002 - Appr. #08X

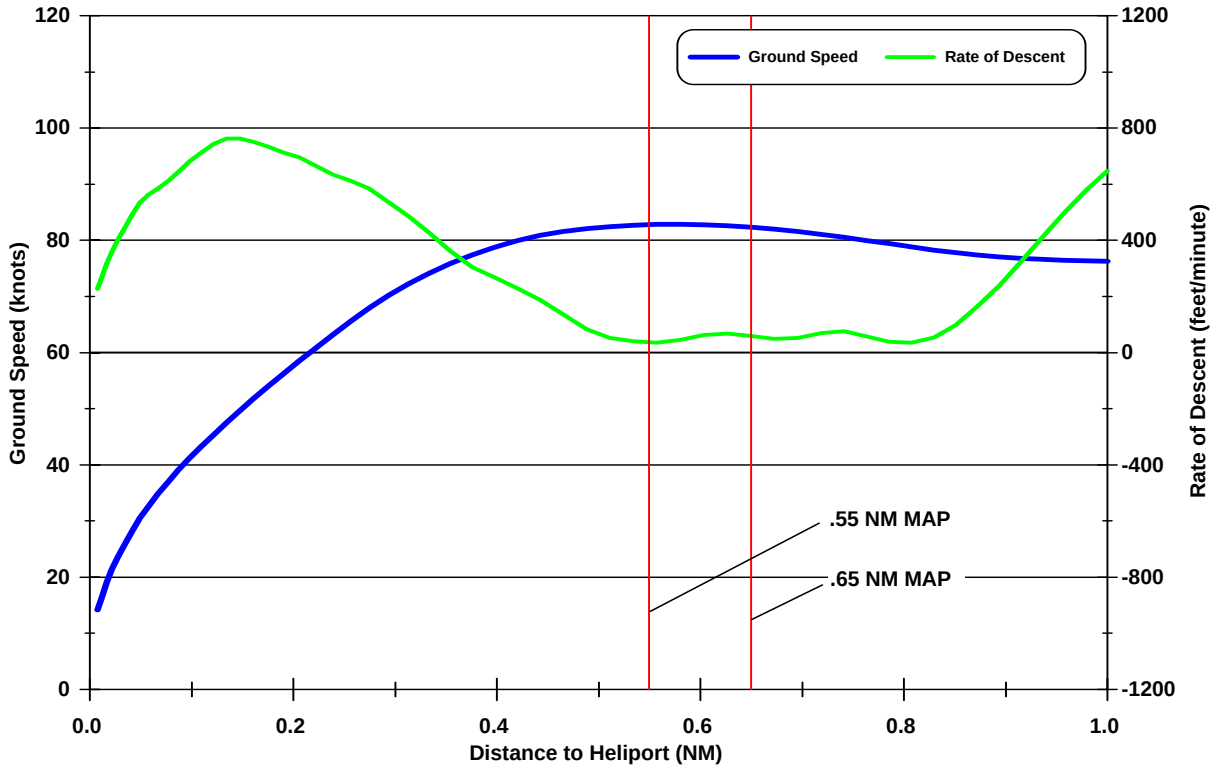



Approach - Plan View
Pilot P05 - 05/03/06b003 - Appr. #09Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
307/19
18
298/11
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

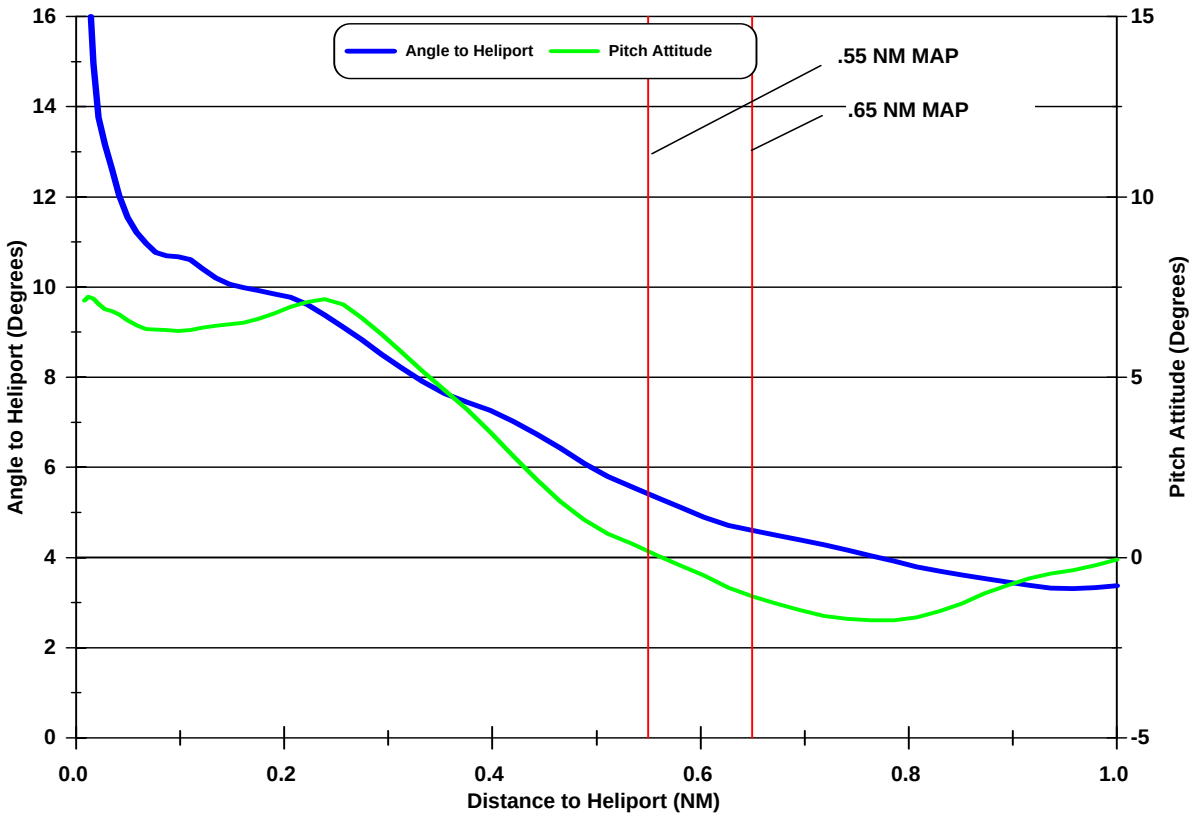
Profile View
Pilot P05 - 05/03/06b003 - Appr. #09Y



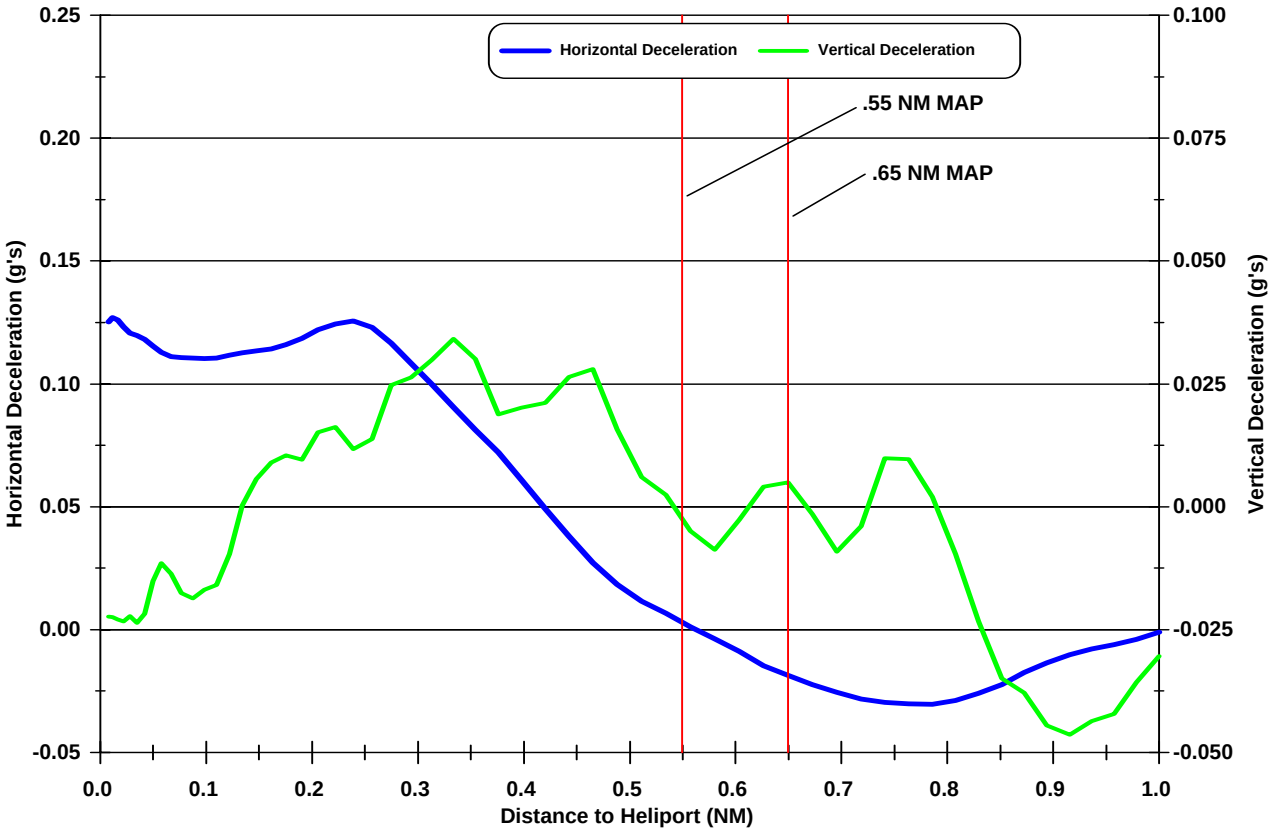
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06b003 - Appr. #09Y

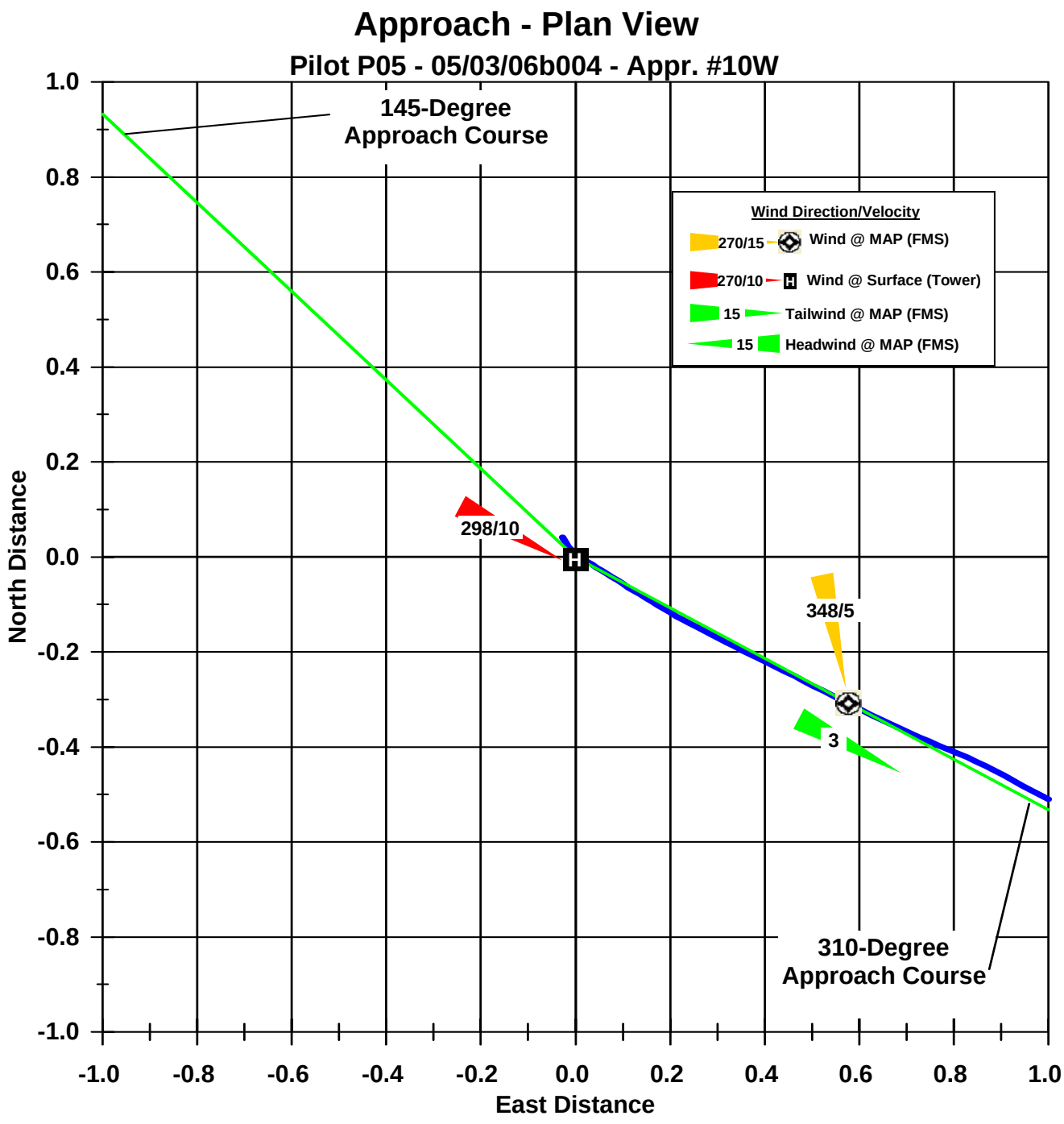


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06b003 - Appr. #09Y

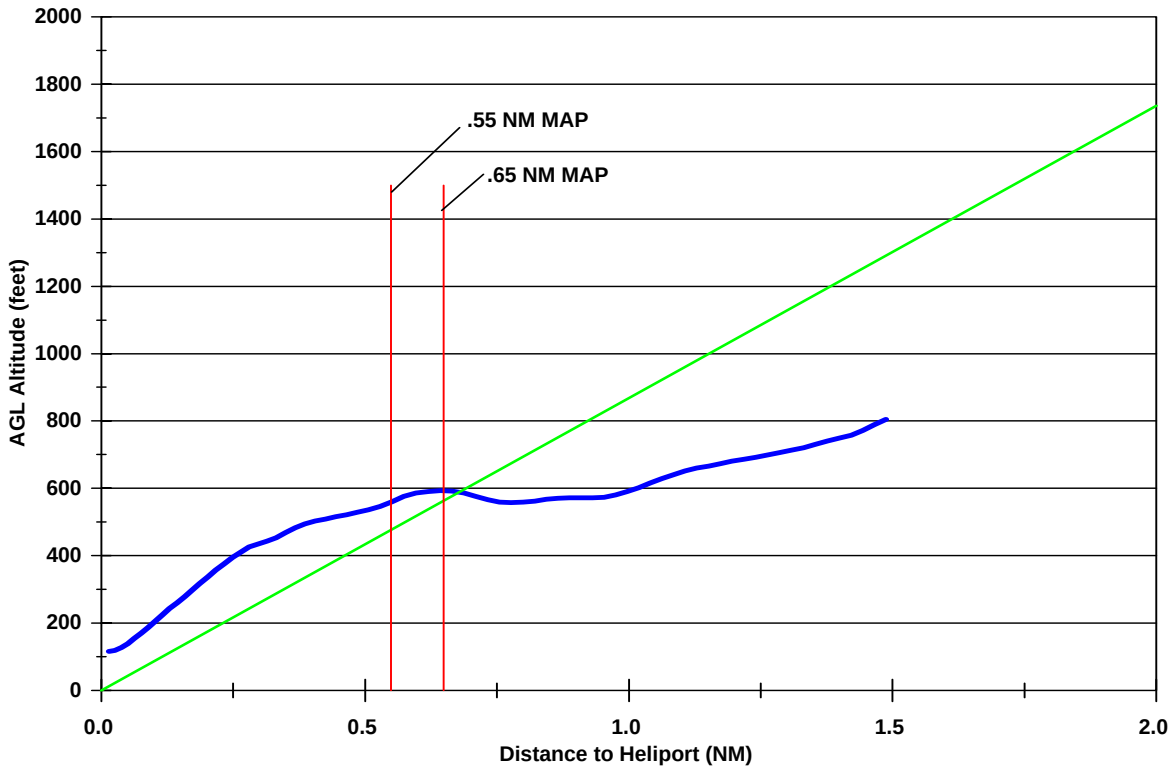


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06b003 - Appr. #09Y

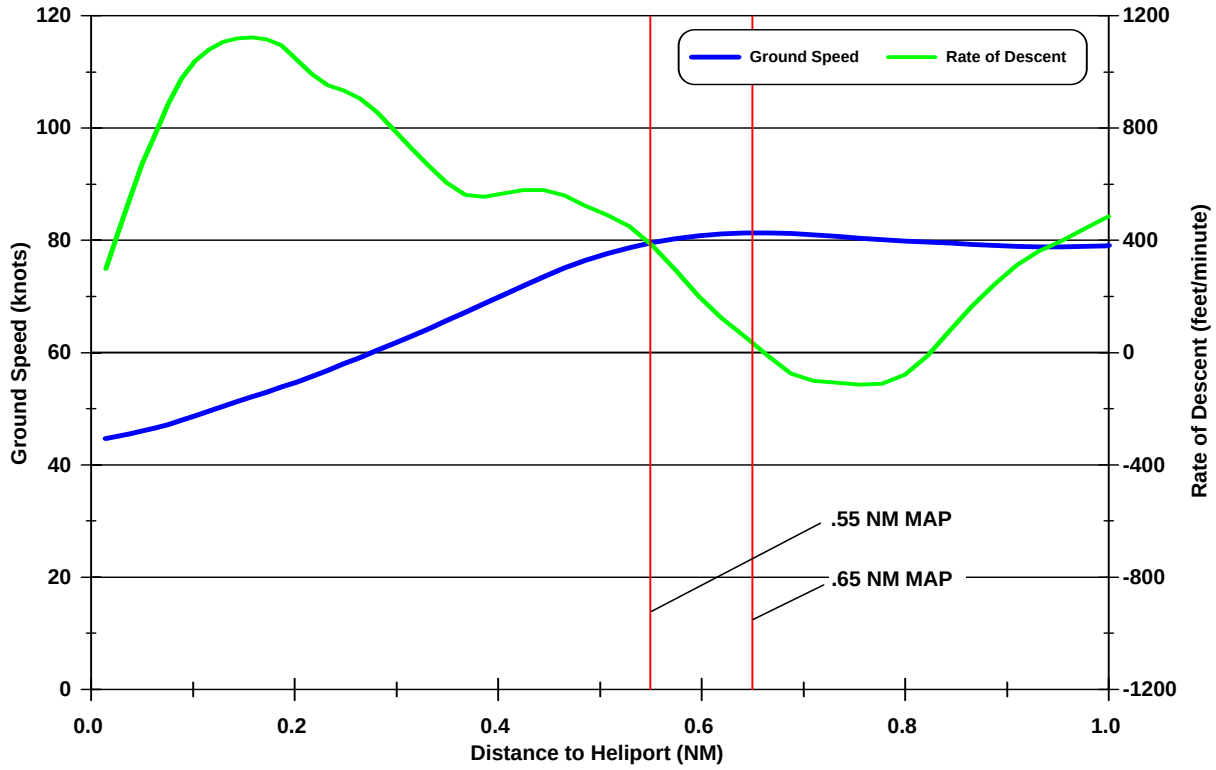



Approach - Plan View
Pilot P05 - 05/03/06b004 - Appr. #10W
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
298/10
348/5
3
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

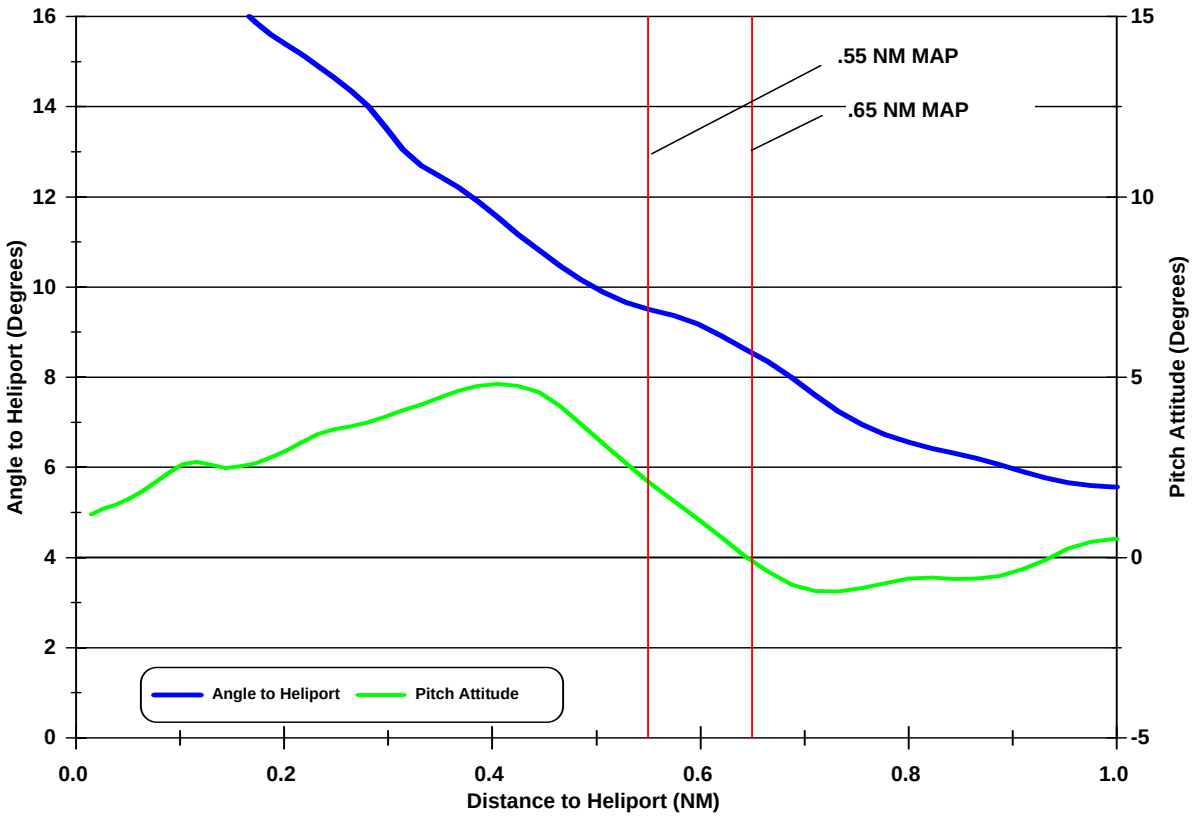
Profile View
Pilot P05 - 05/03/06b004 - Appr. #10W



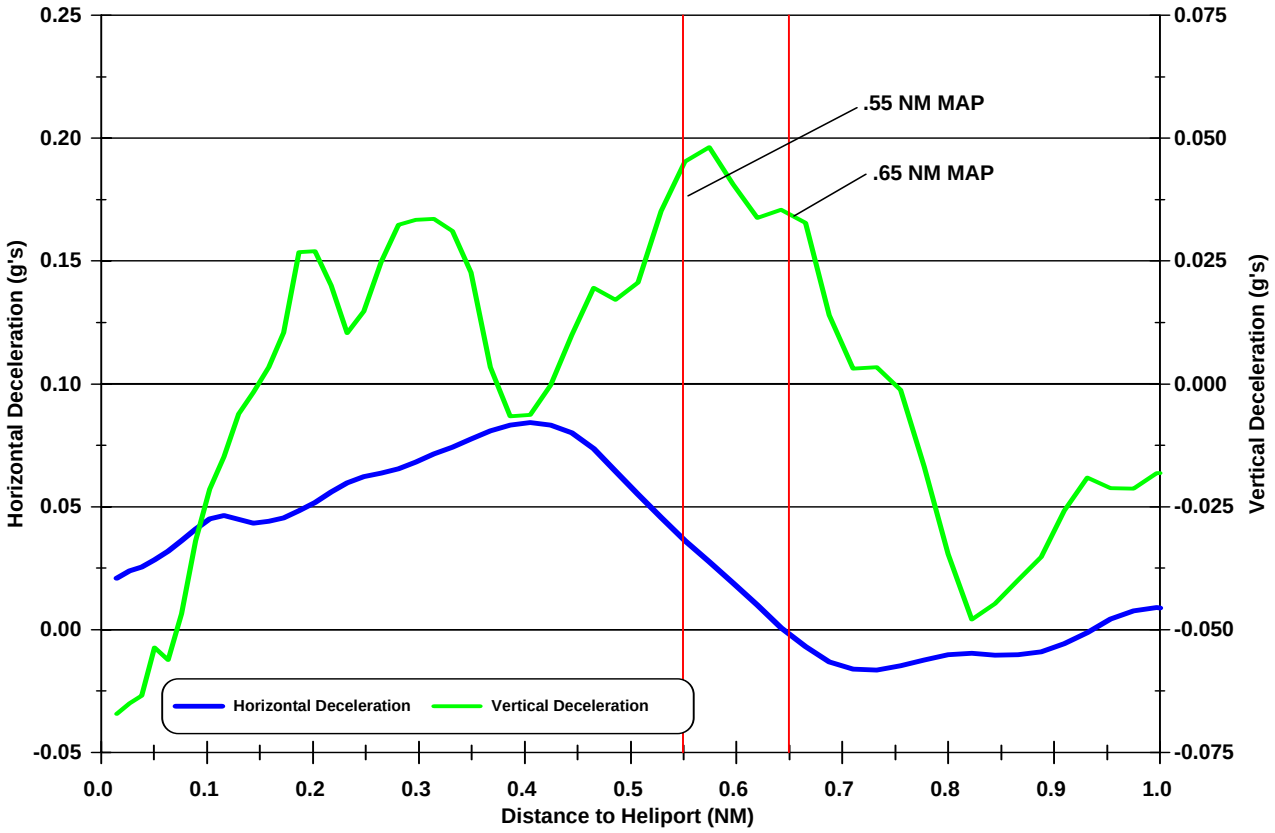
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06b004 - Appr. #10W

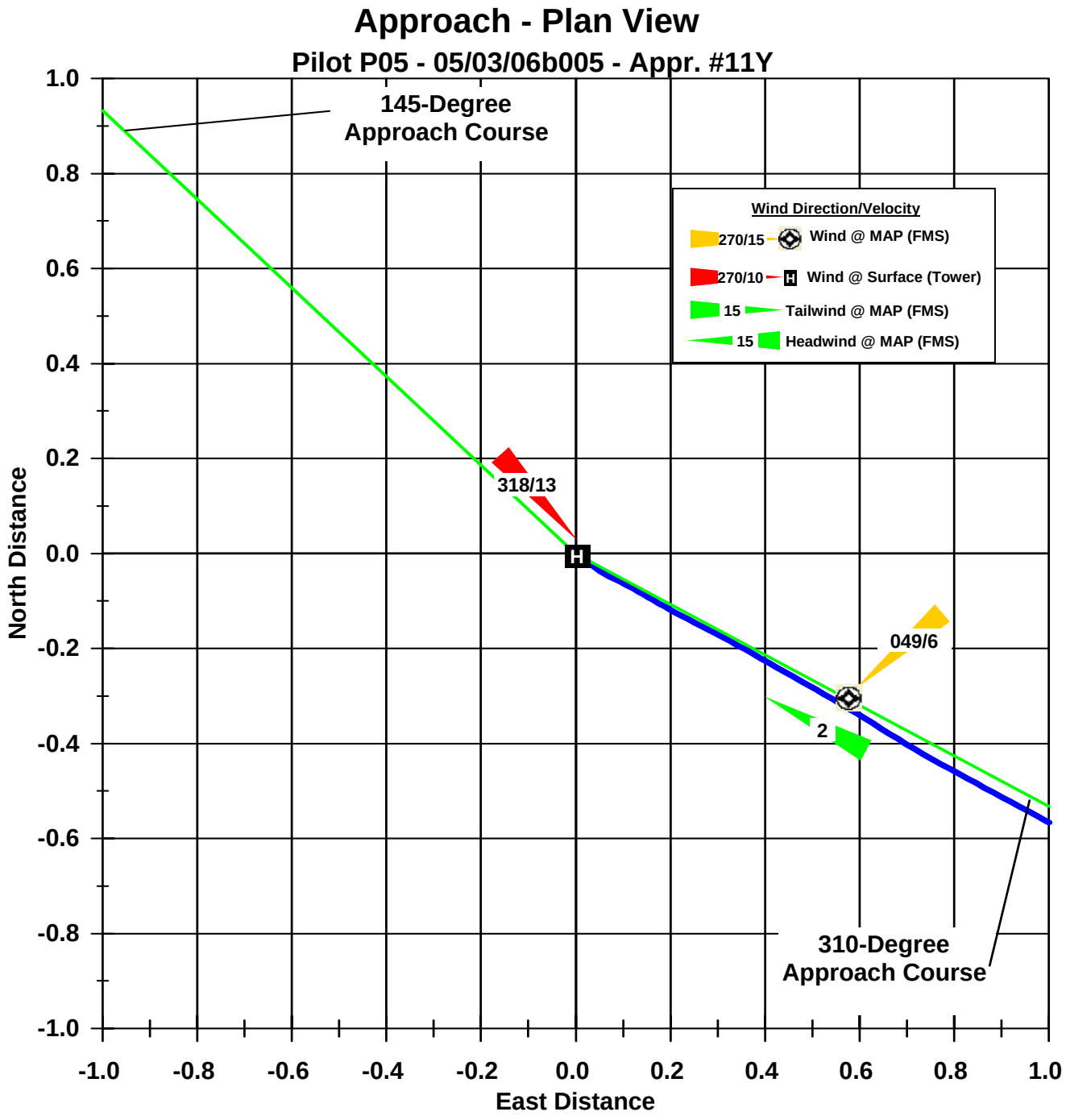


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06b004 - Appr. #10W

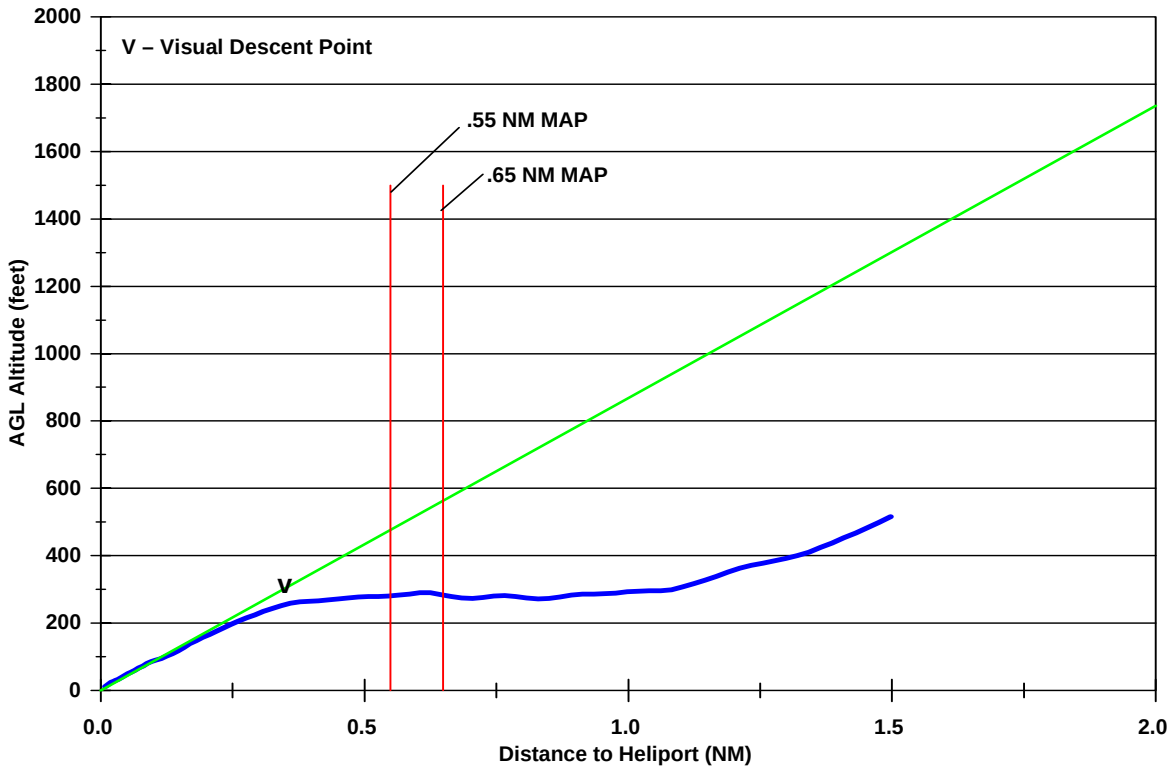


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06b004 - Appr. #10W

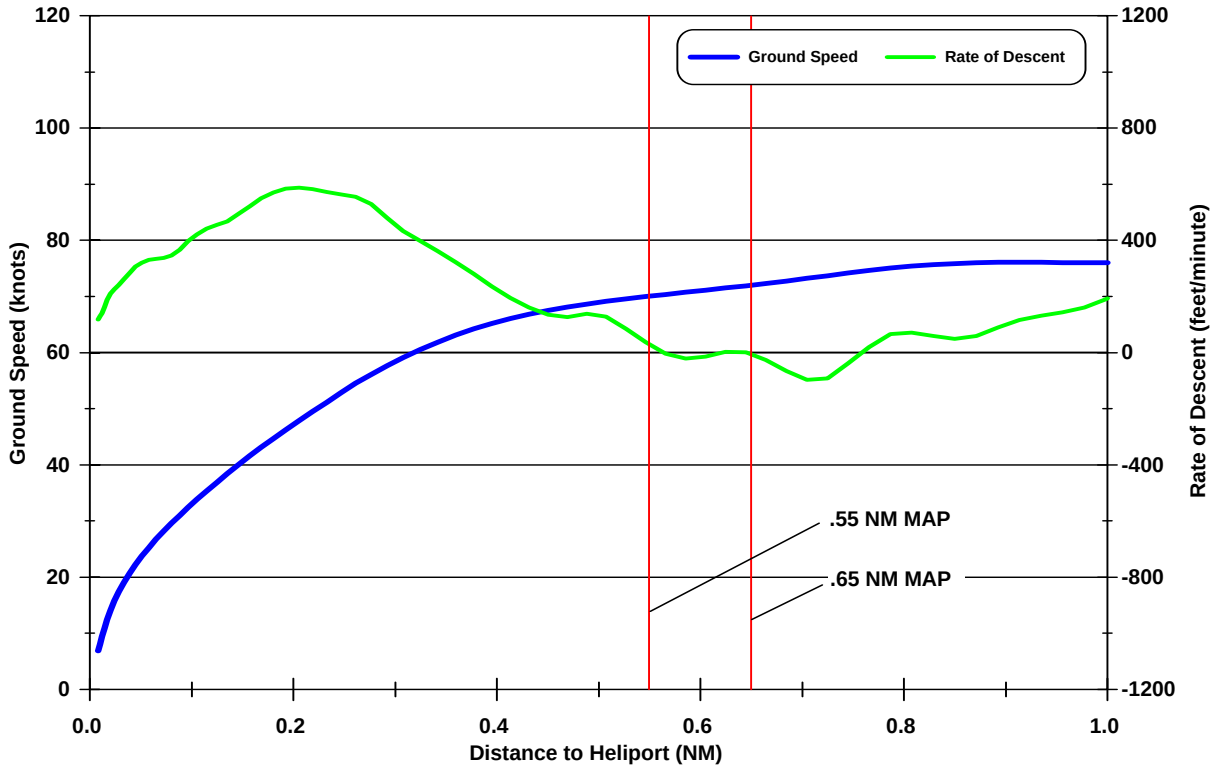



Approach - Plan View
Pilot P05 - 05/03/06b005 - Appr. #11Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
318/13
049/6
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

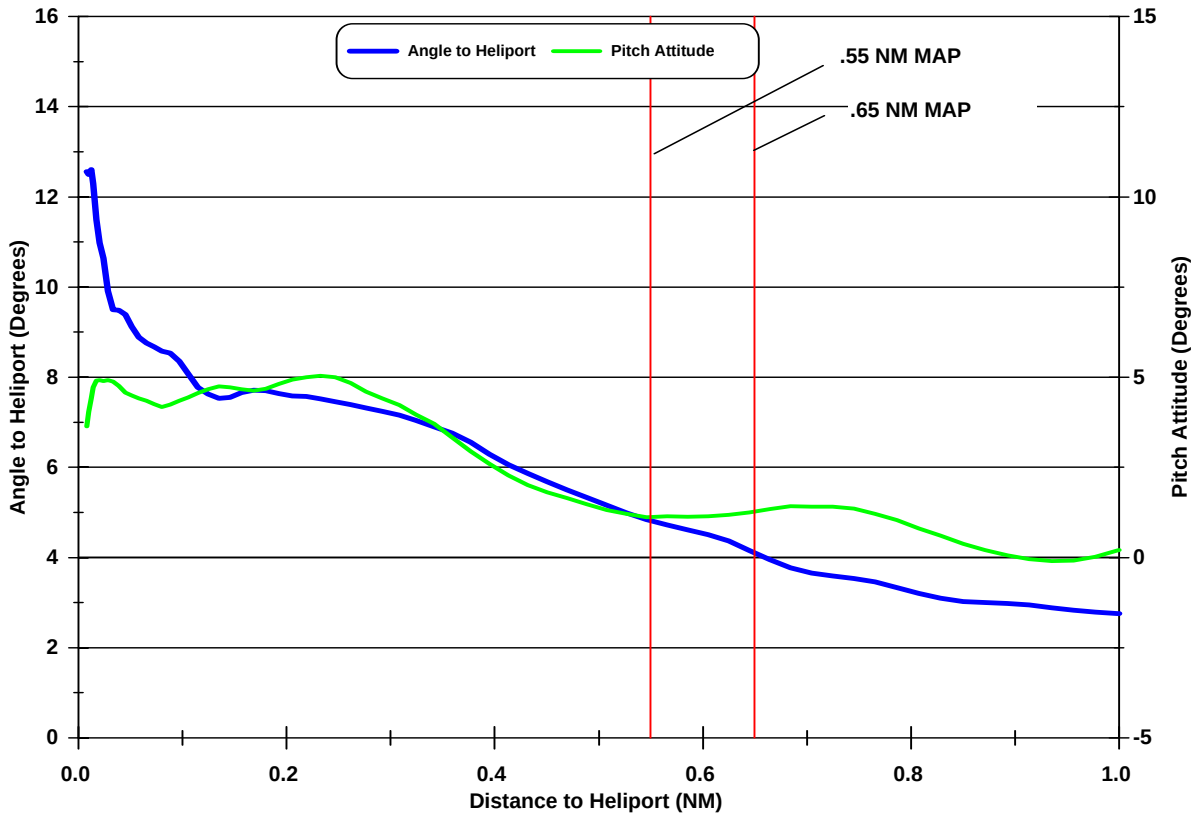
Profile View
Pilot P05 - 05/03/06b005 - Appr. #11Y



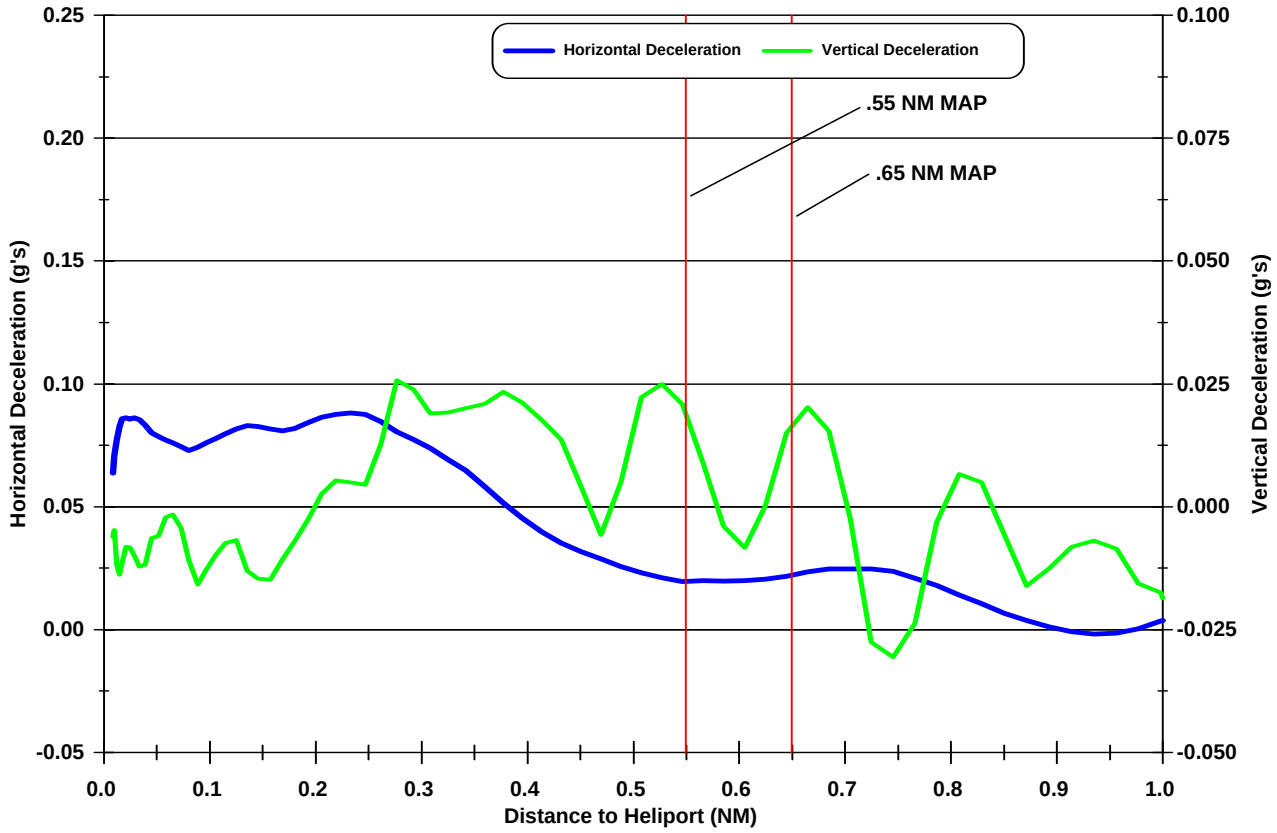
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06b005 - Appr. #11Y

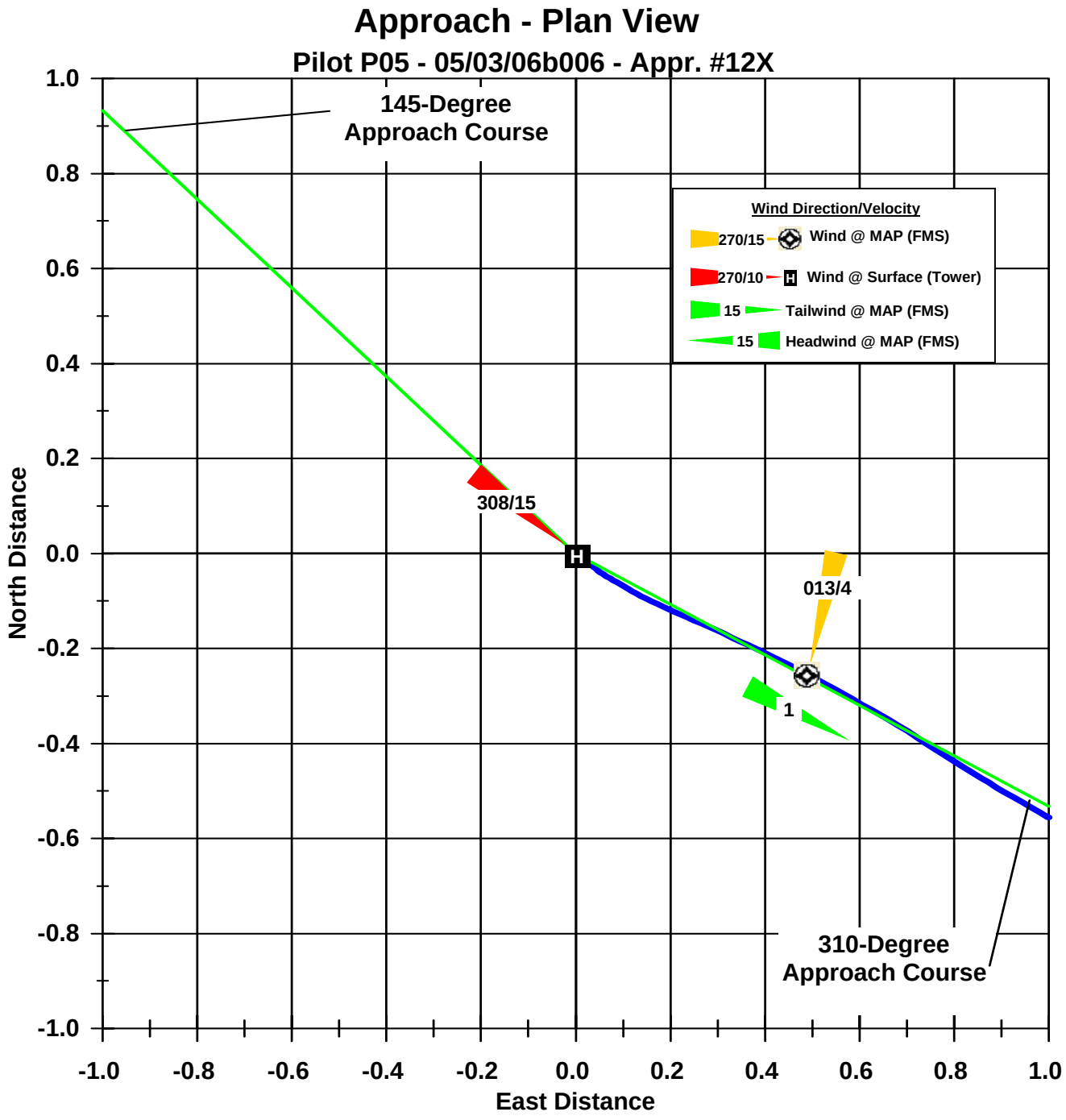


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06b005 - Appr. #11Y

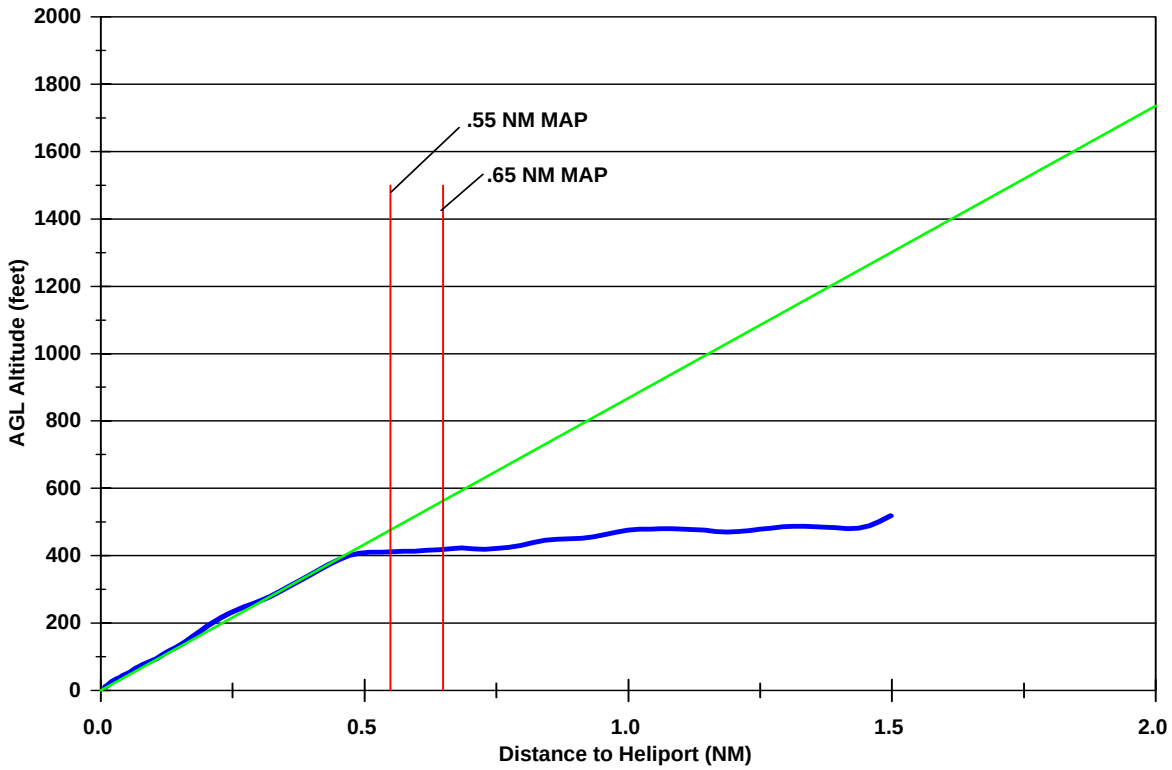


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06b005 - Appr. #11Y

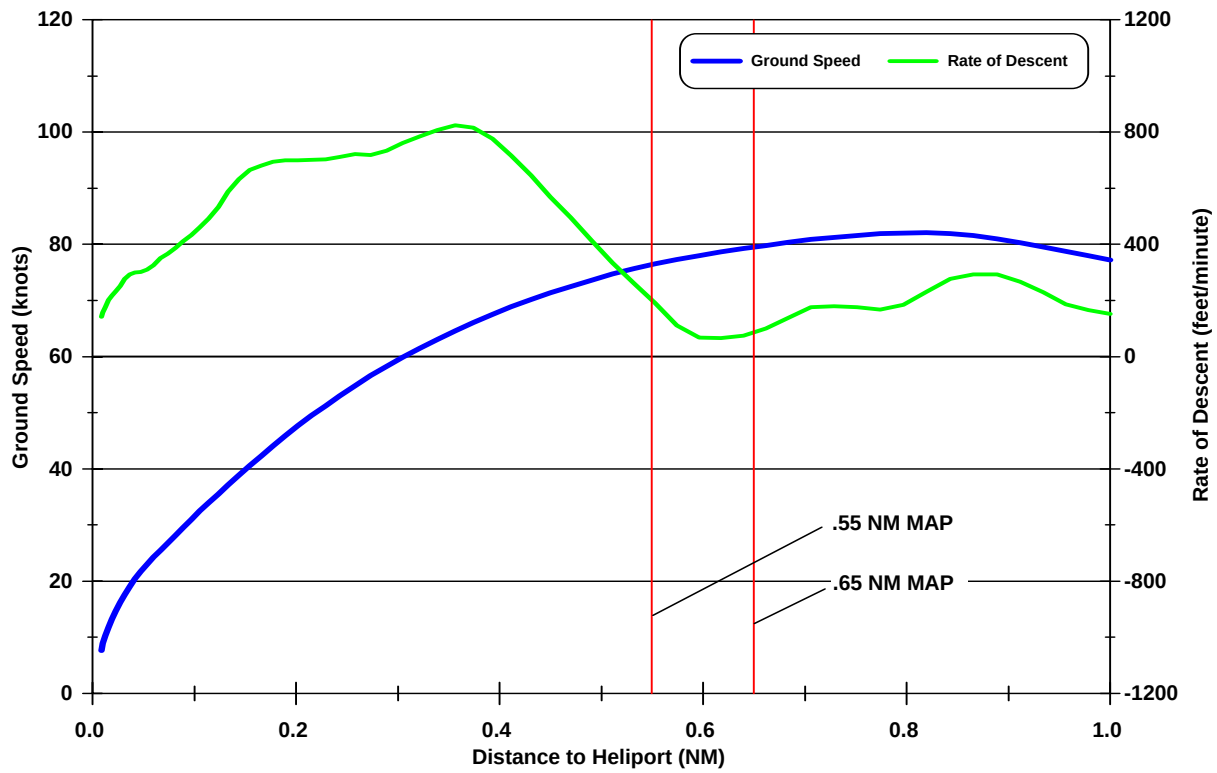



Approach - Plan View
Pilot P05 - 05/03/06b006 - Appr. #12X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
308/15
013/4
1
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

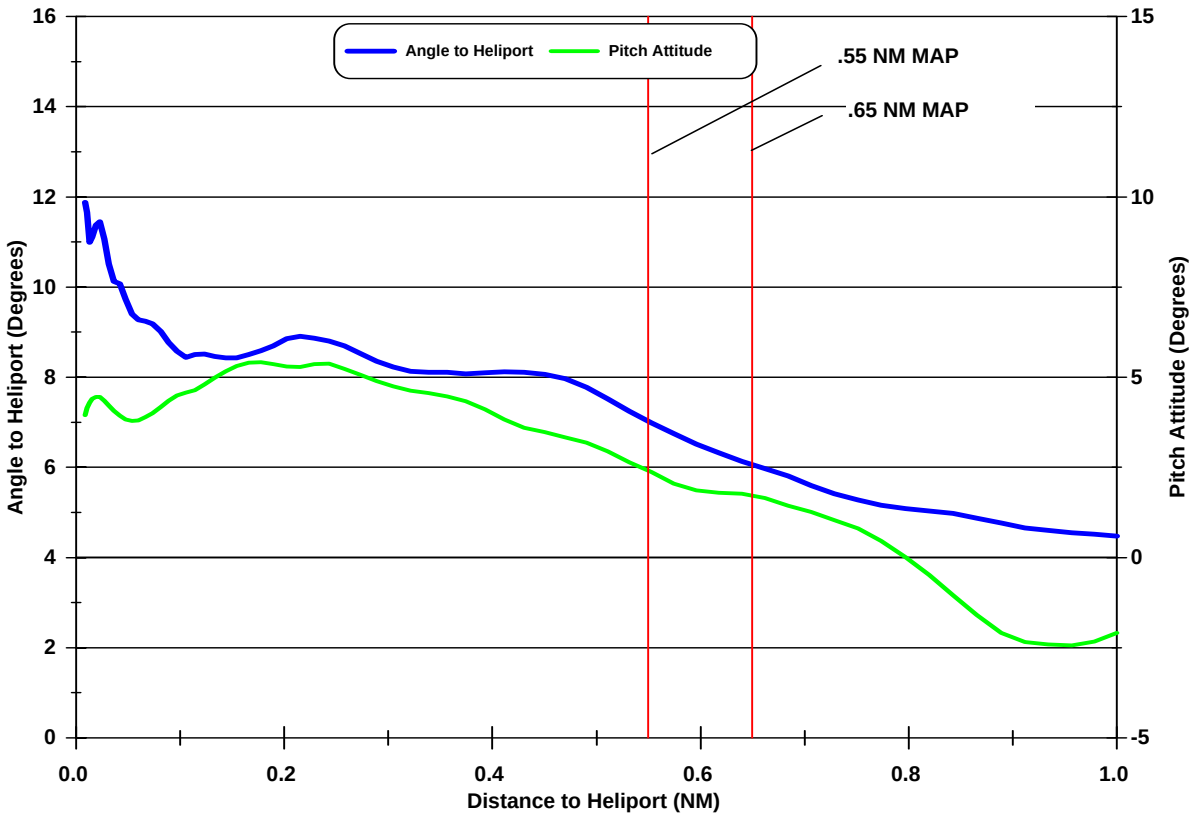
Profile View
Pilot P05 - 05/03/06b006 - Appr. #12X



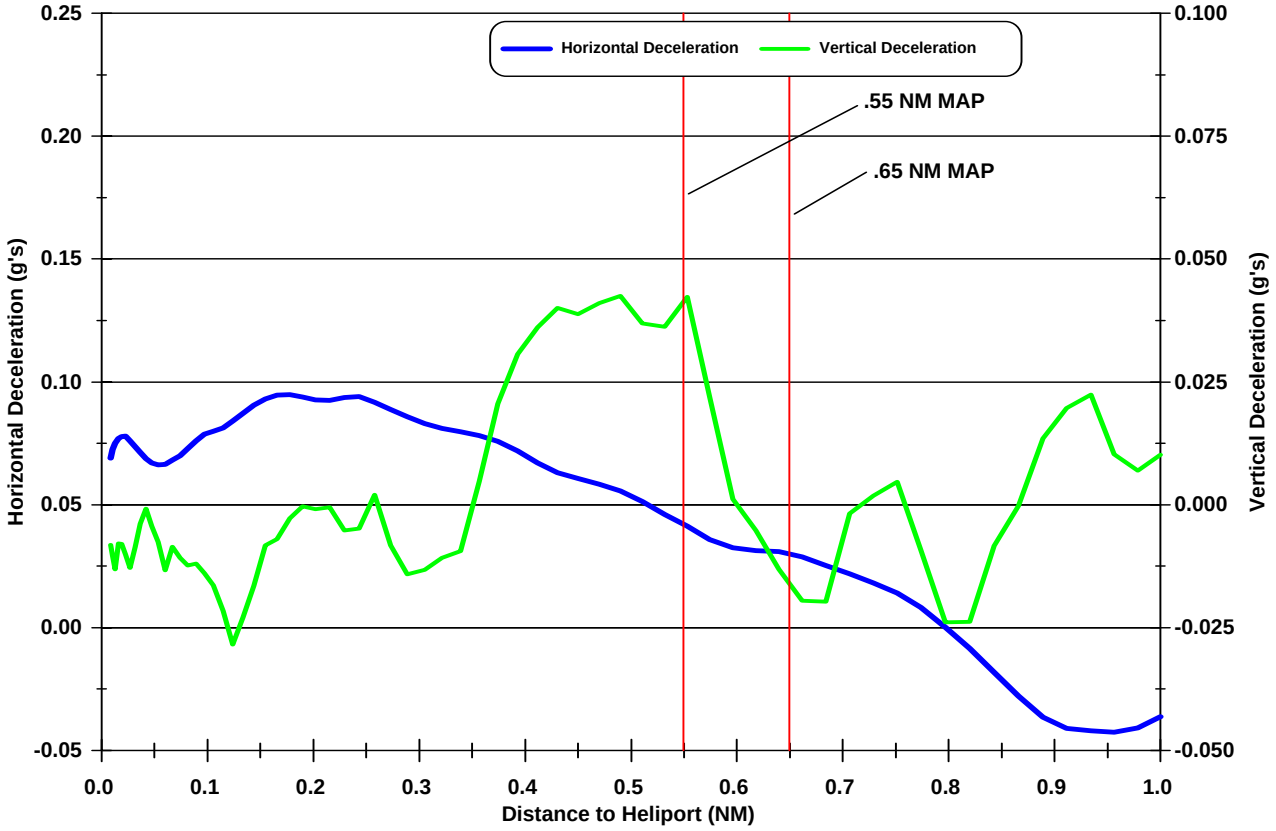
Ground Speed and Rate of Descent
Pilot P05 - 05/03/06b006 - Appr. #12X

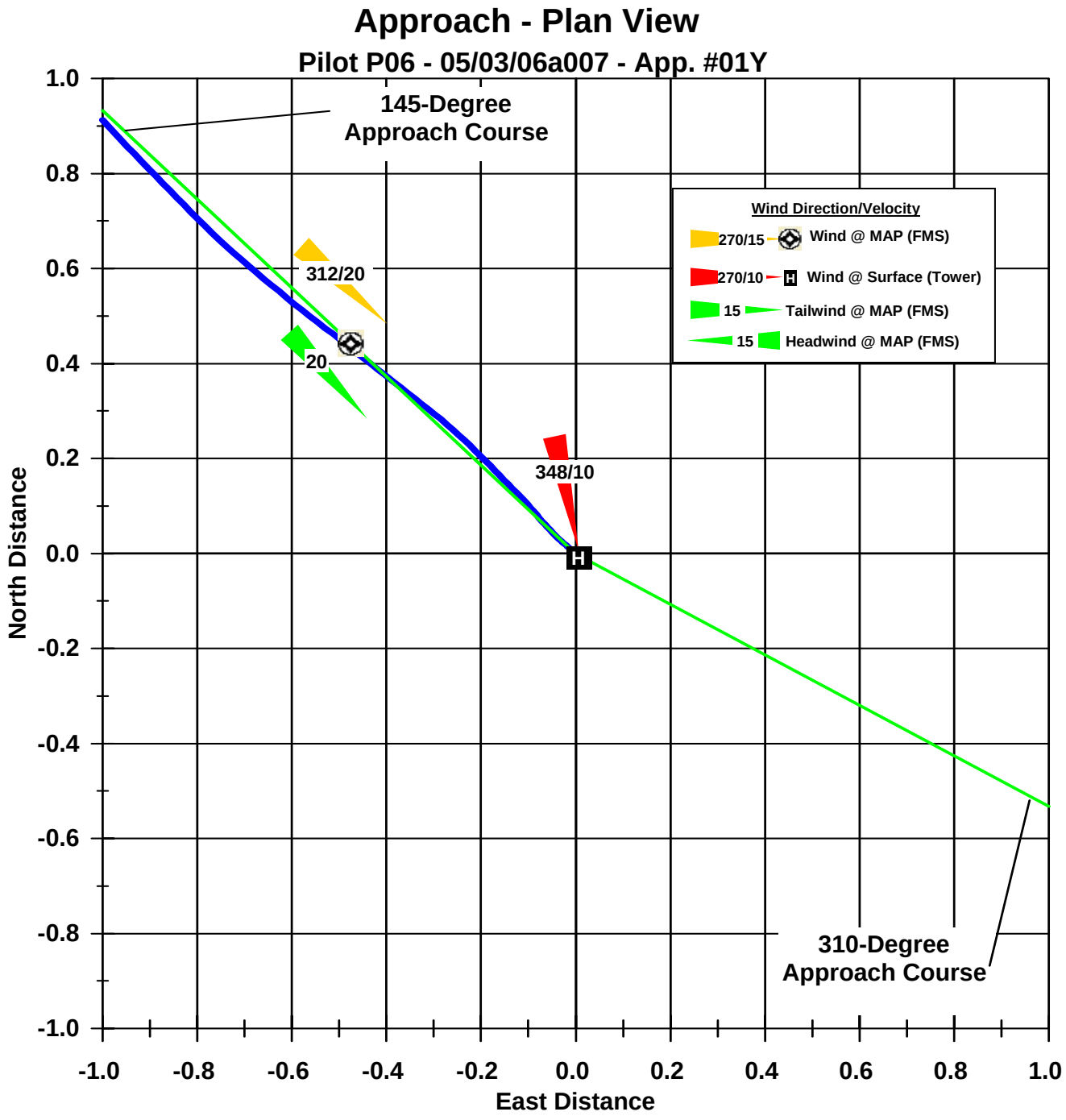


Angle to Heliport and Pitch Attitude
Pilot P05 - 05/03/06b006 - Appr. #12X

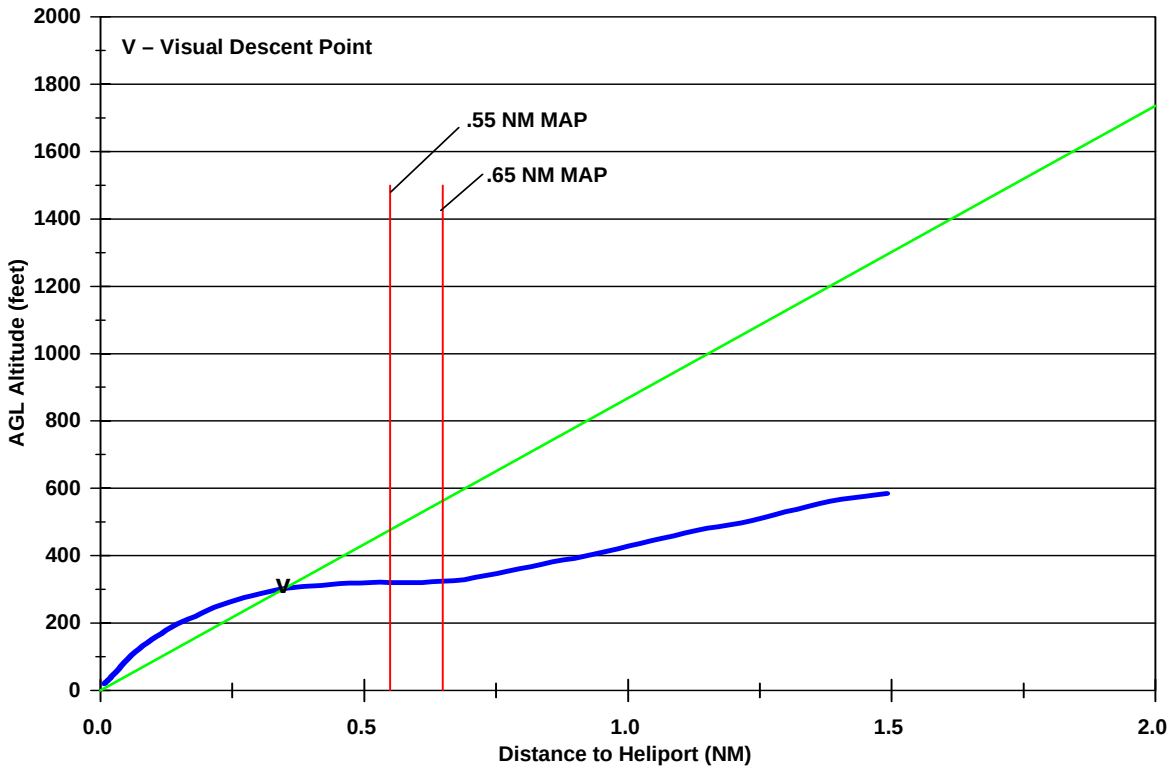


Horizontal and Vertical Deceleration
Pilot P05 - 05/03/06b006 - Appr. #12X

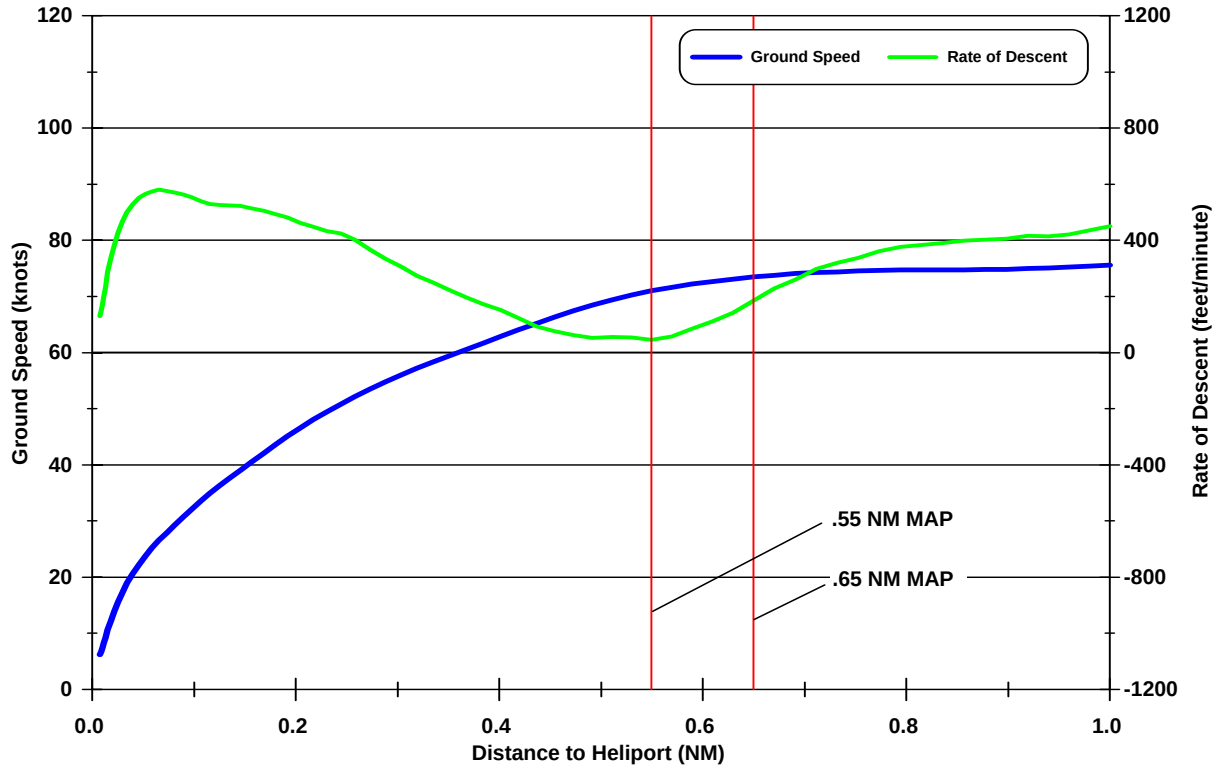



Approach - Plan View
Pilot P06 - 05/03/06a007 - App. #01Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
312/20
20
348/10
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

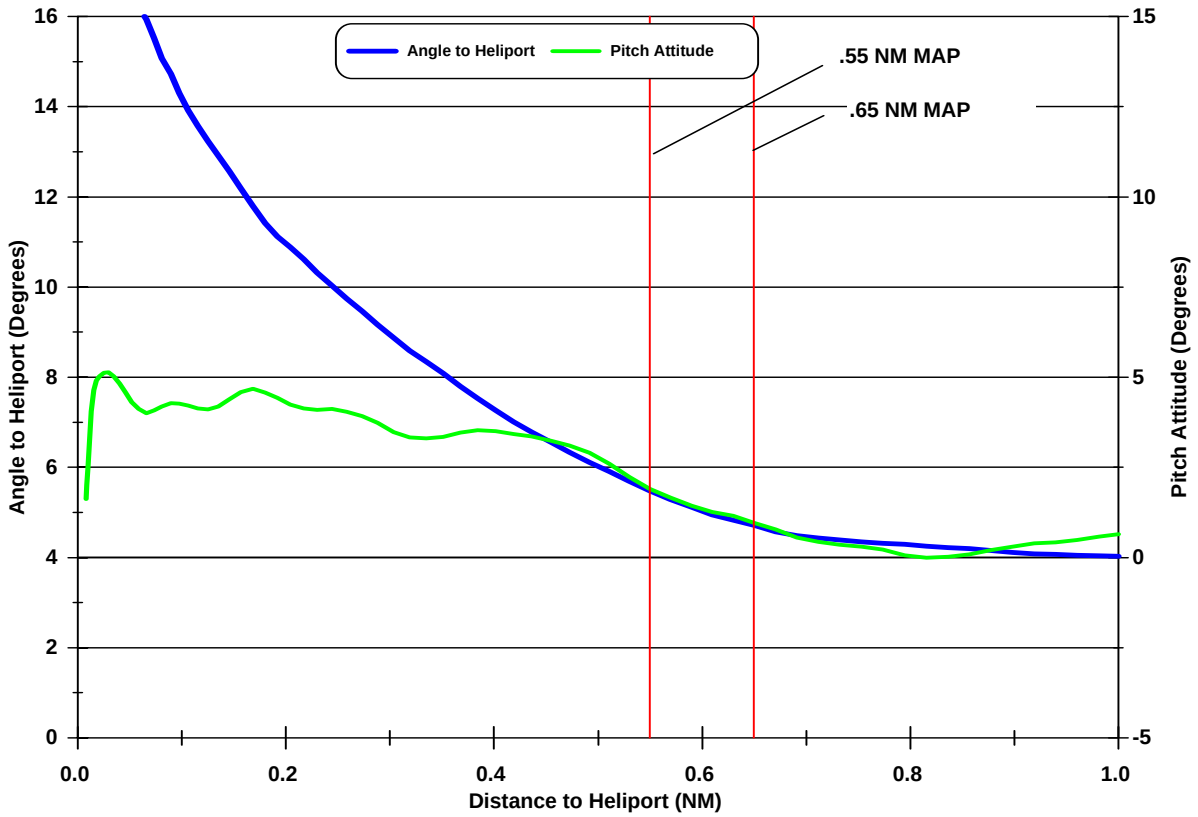
Profile View
Pilot P06 - 05/03/06a007 - App. #01Y



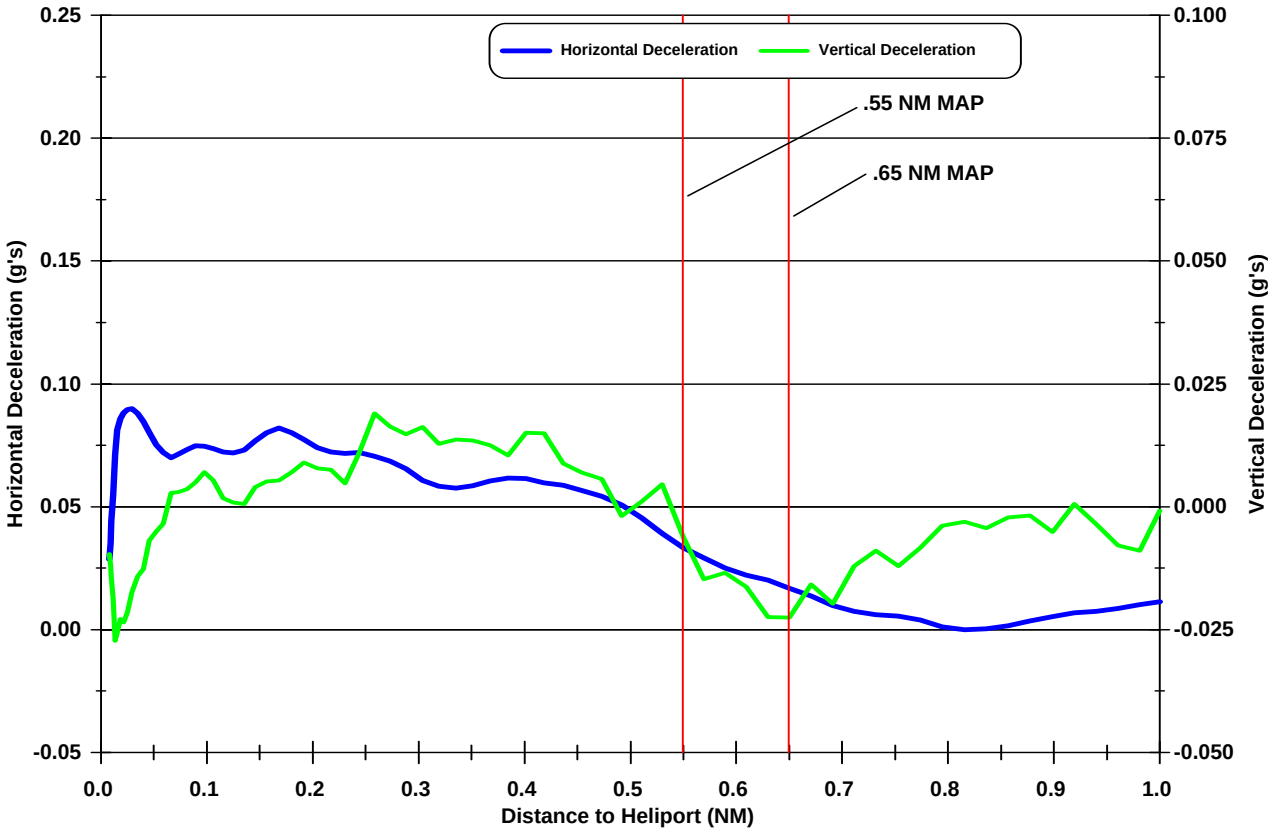
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06a007 - App. #01Y

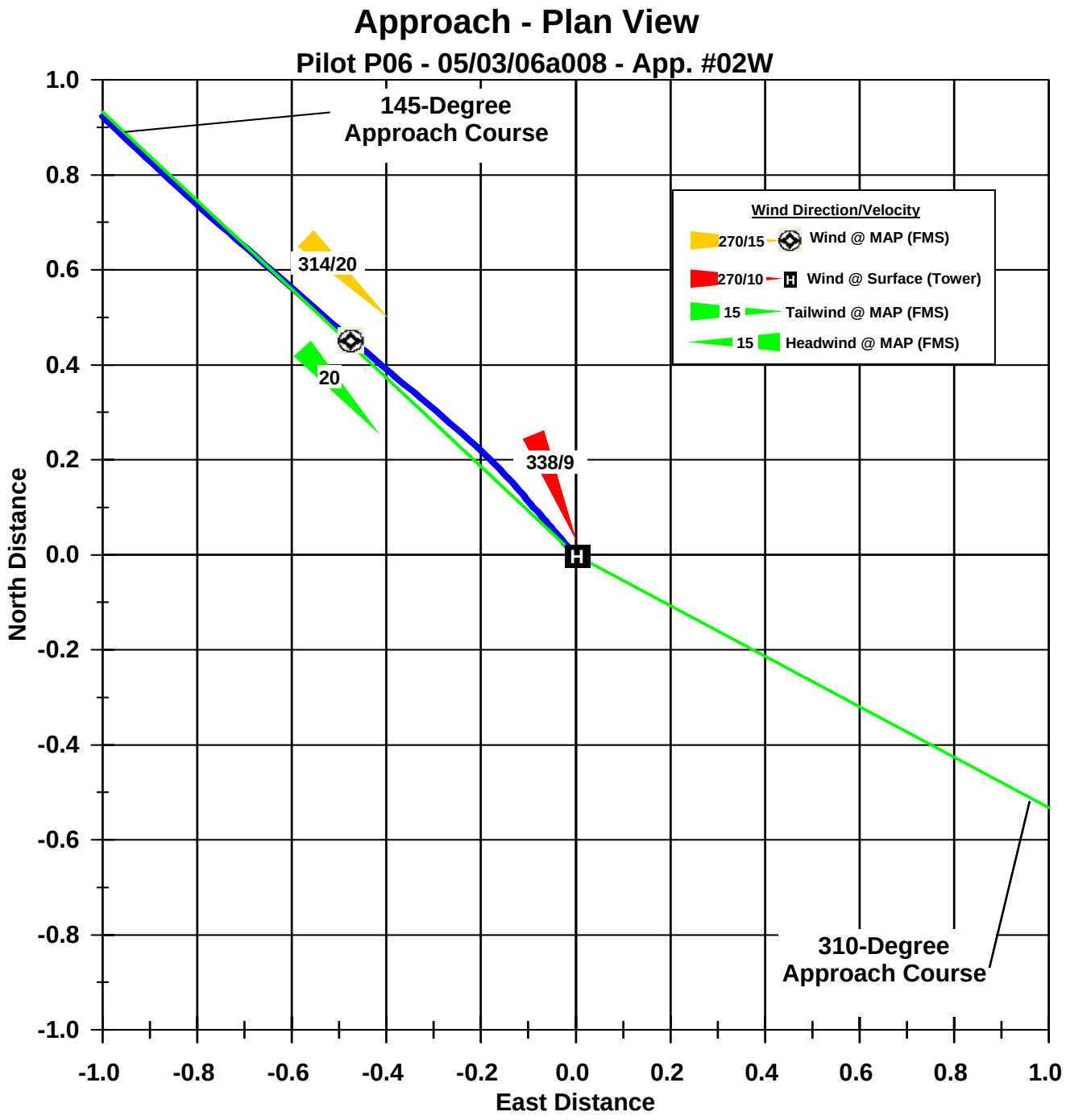


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06a007 - App. #01Y

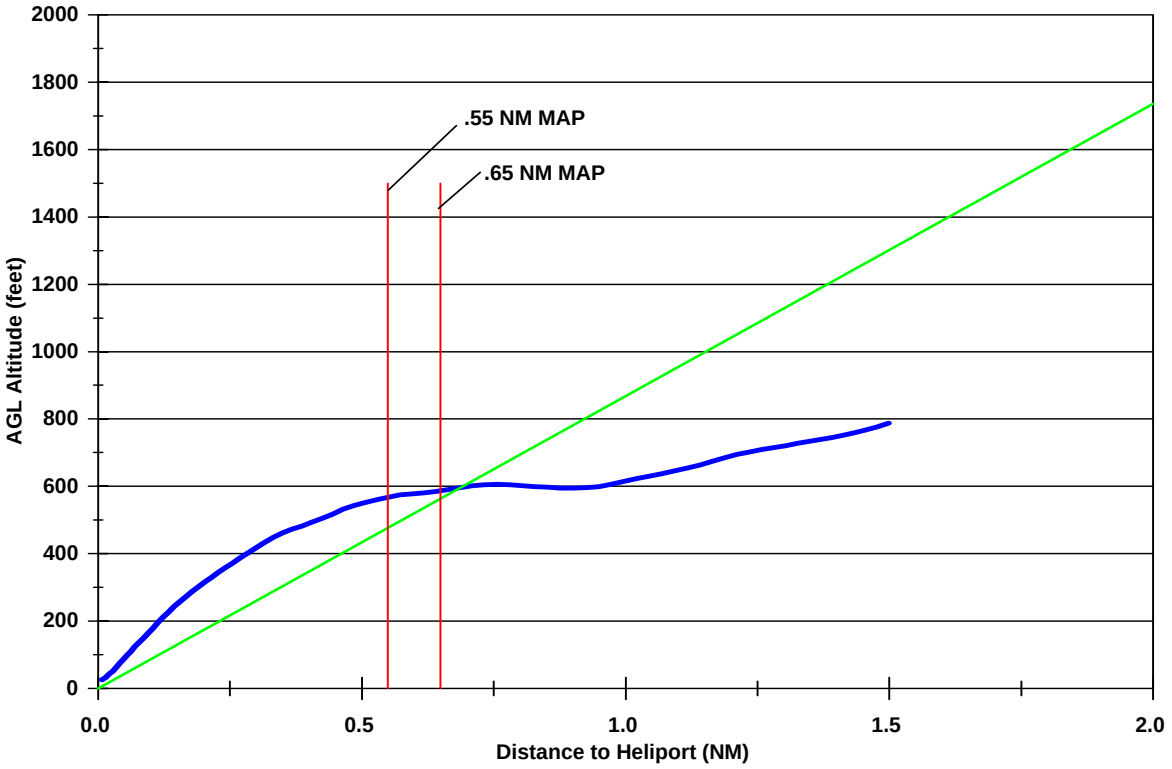


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06a007 - App. #01Y

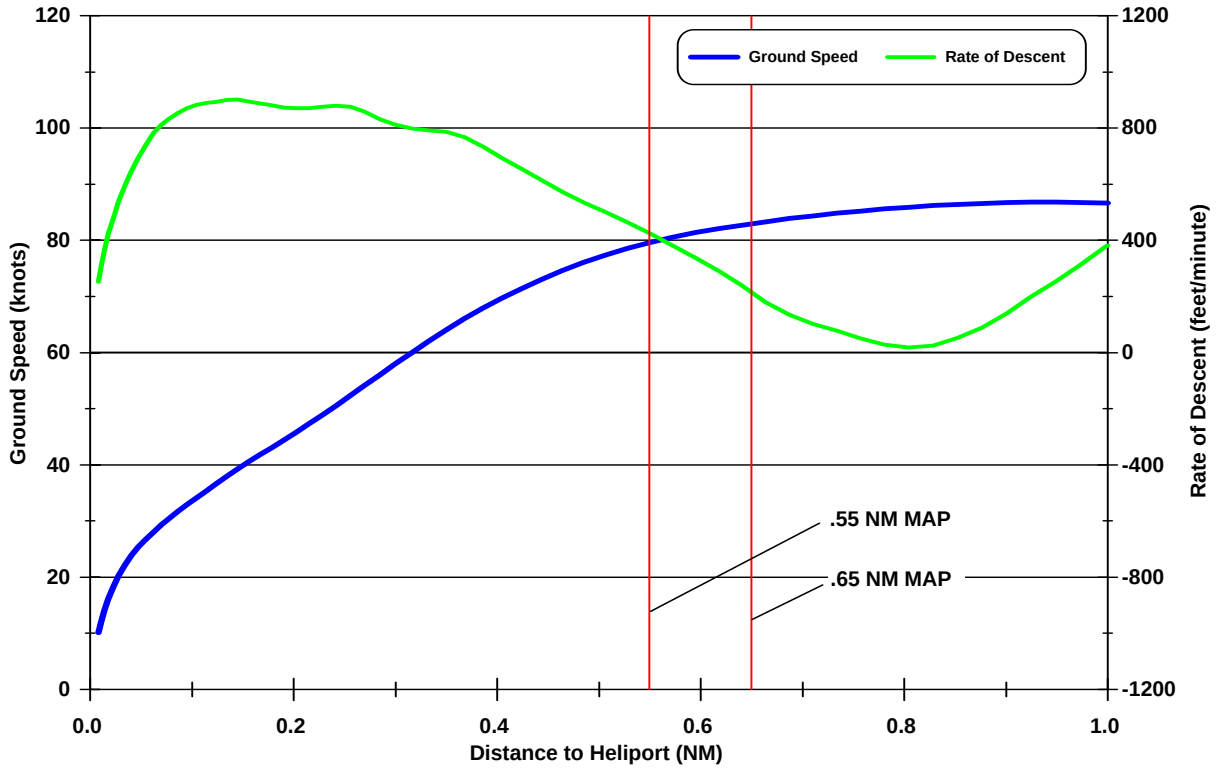



Approach - Plan View
Pilot P06 - 05/03/06a008 - App. #02W
145-Degree
Approach Course
310-Degree
Approach Course
314/20
20
338/9
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

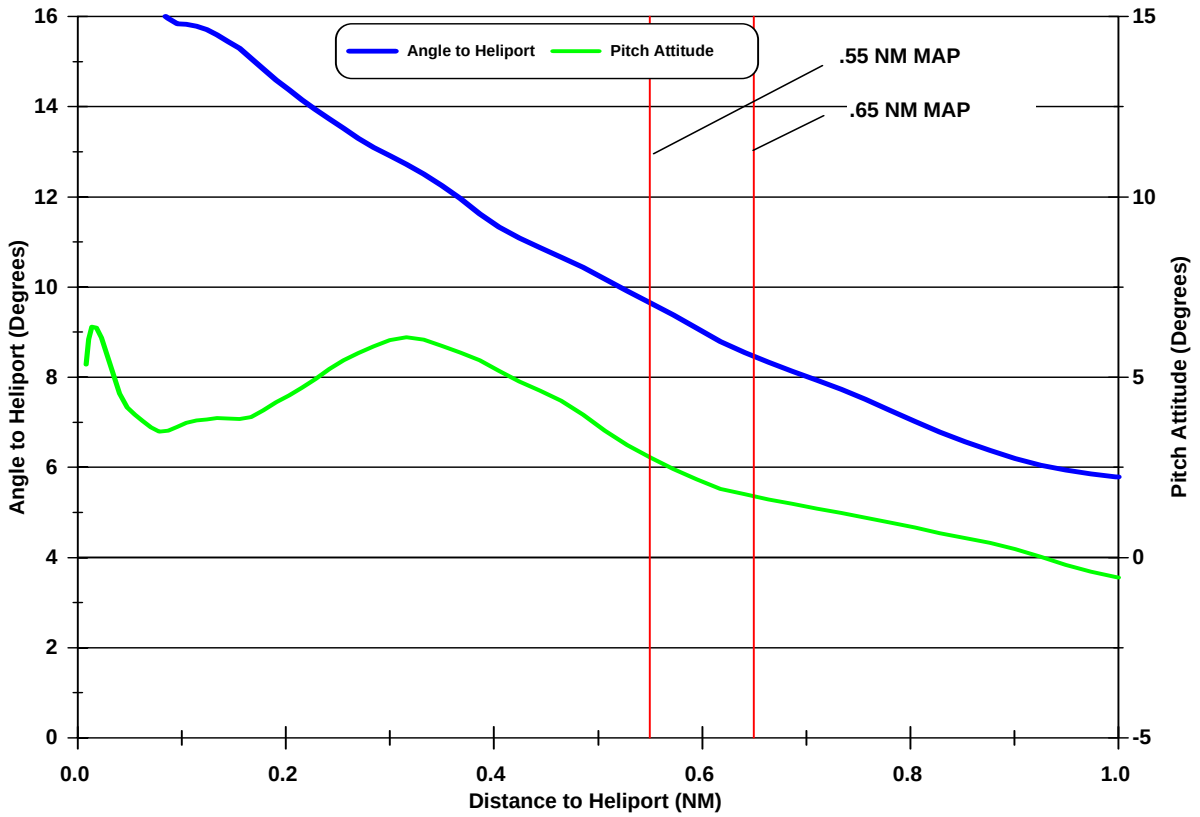
Profile View
Pilot P06 - 05/03/06a008 - App. #02W



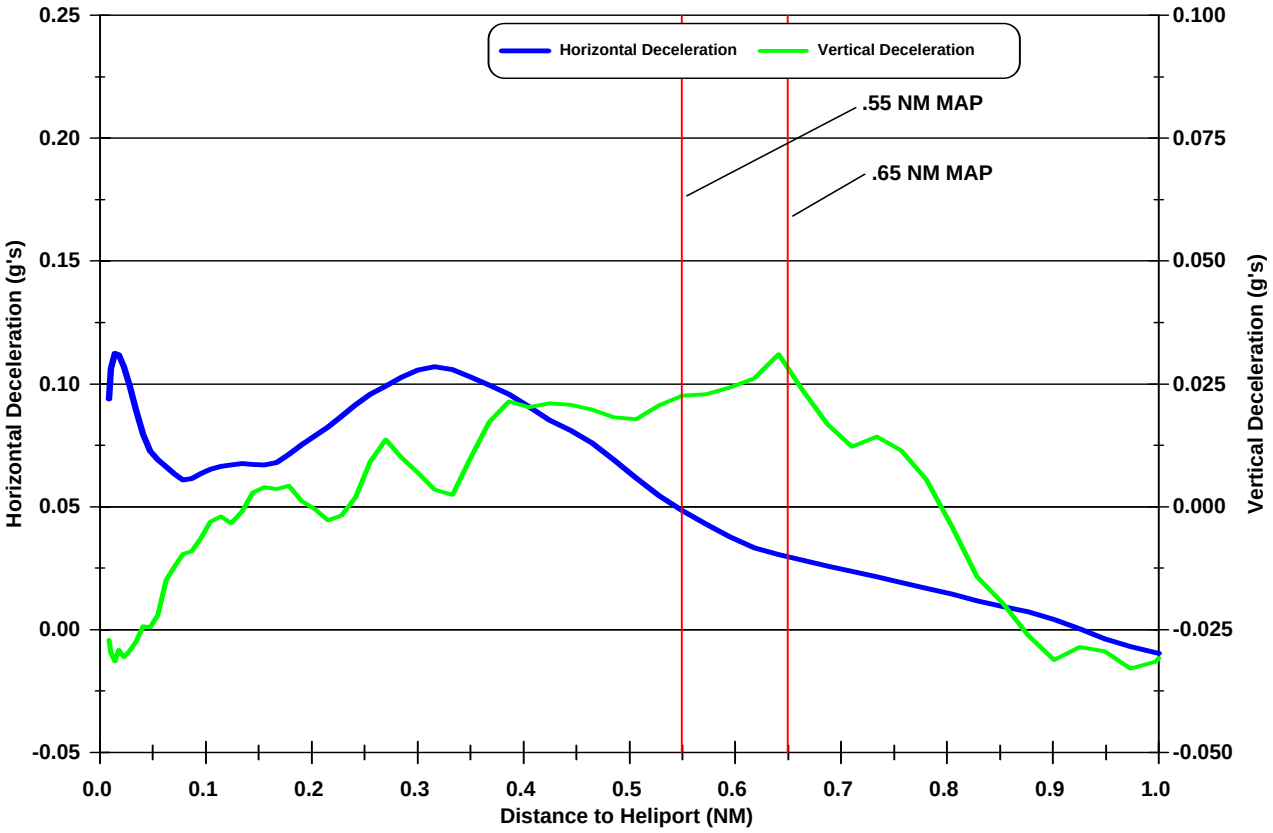
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06a008 - App. #02W

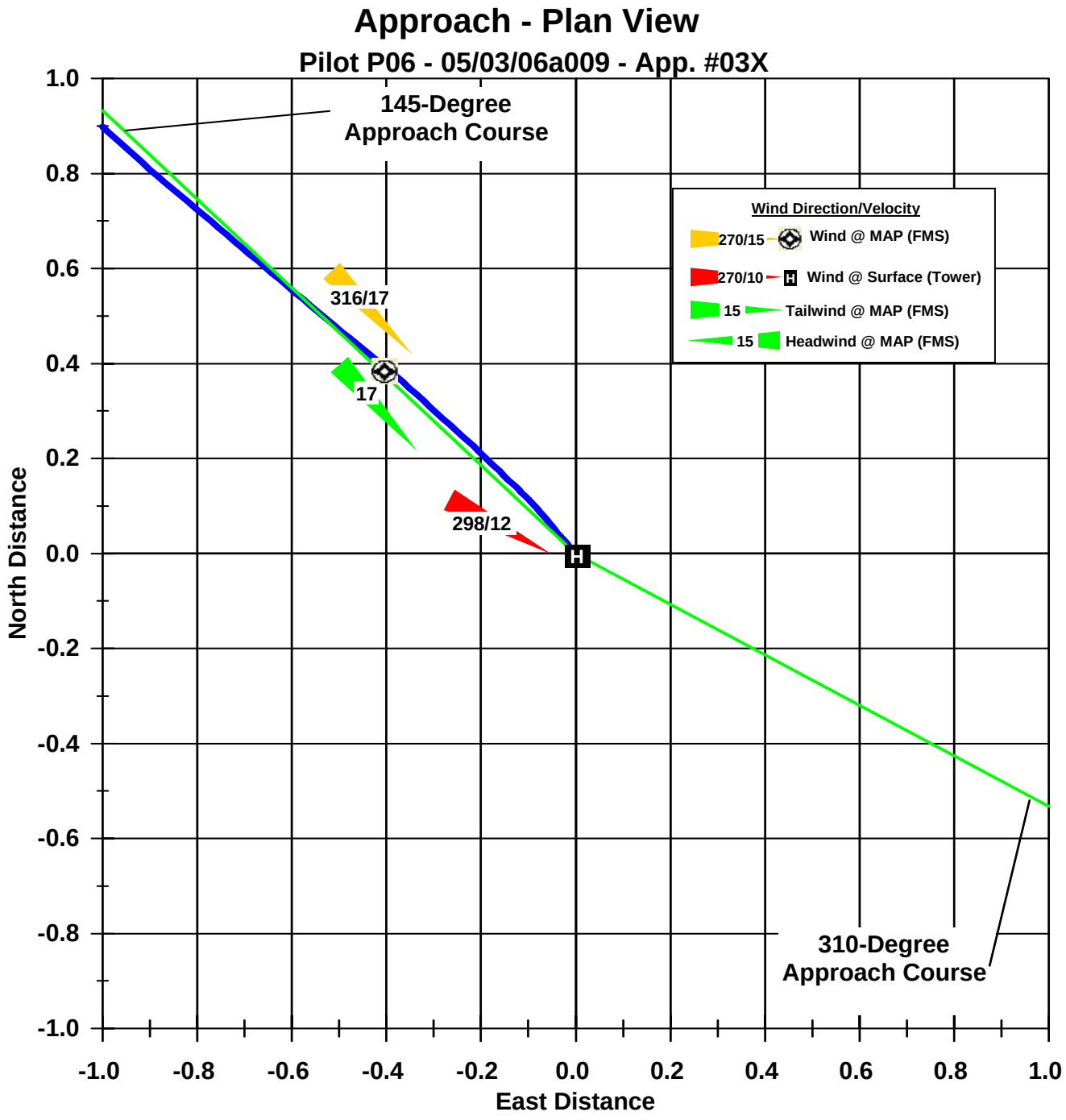


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06a008 - App. #02W

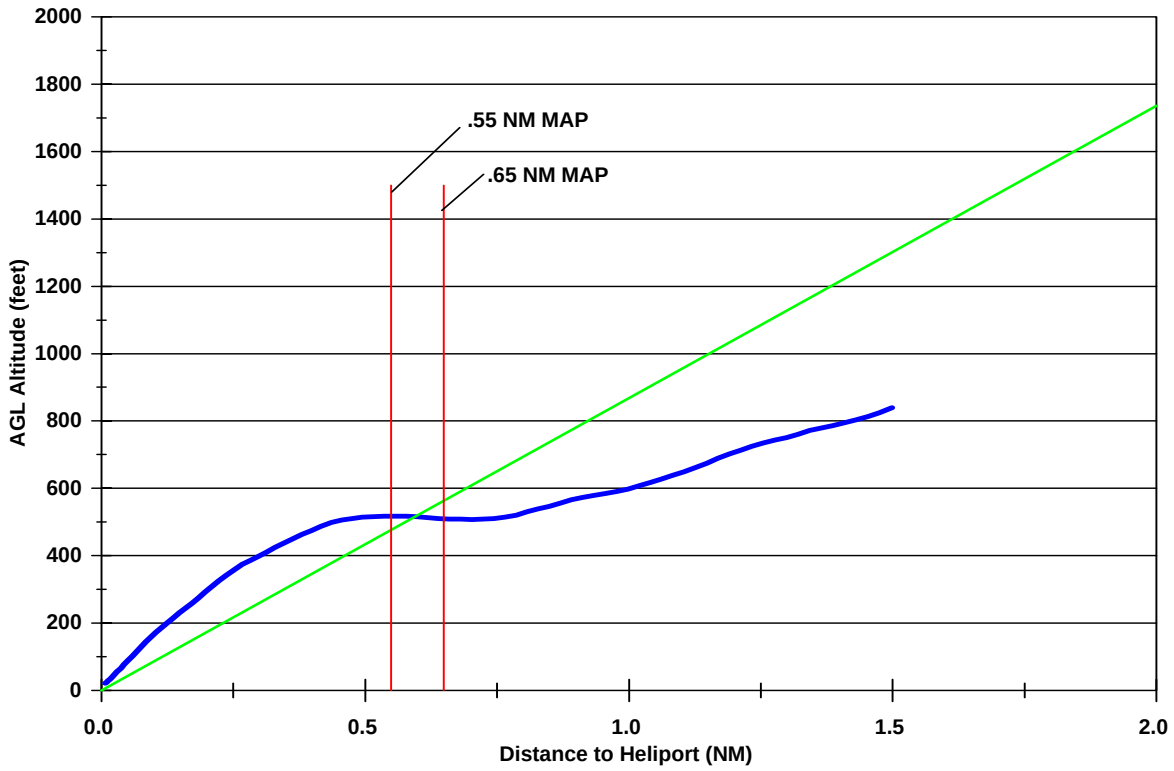


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06a008 - App. #02W

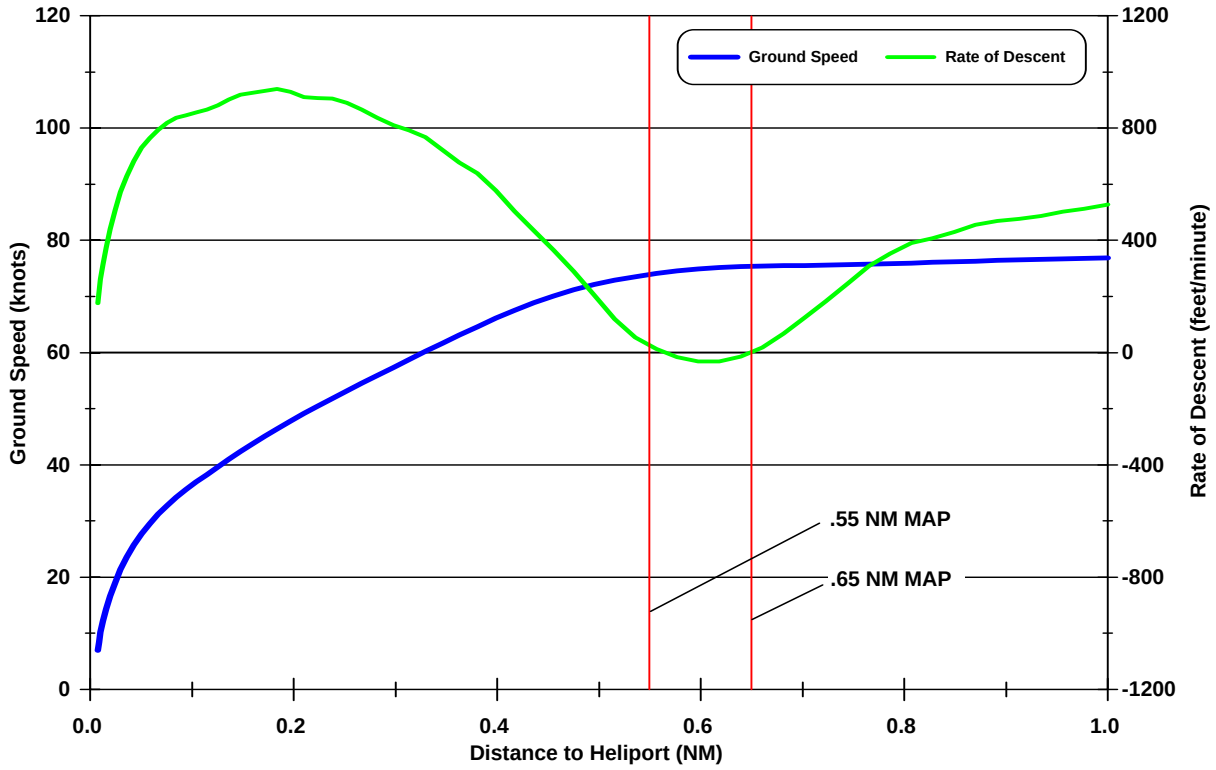



Approach - Plan View
Pilot P06 - 05/03/06a009 - App. #03X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
316/17
17
298/12
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

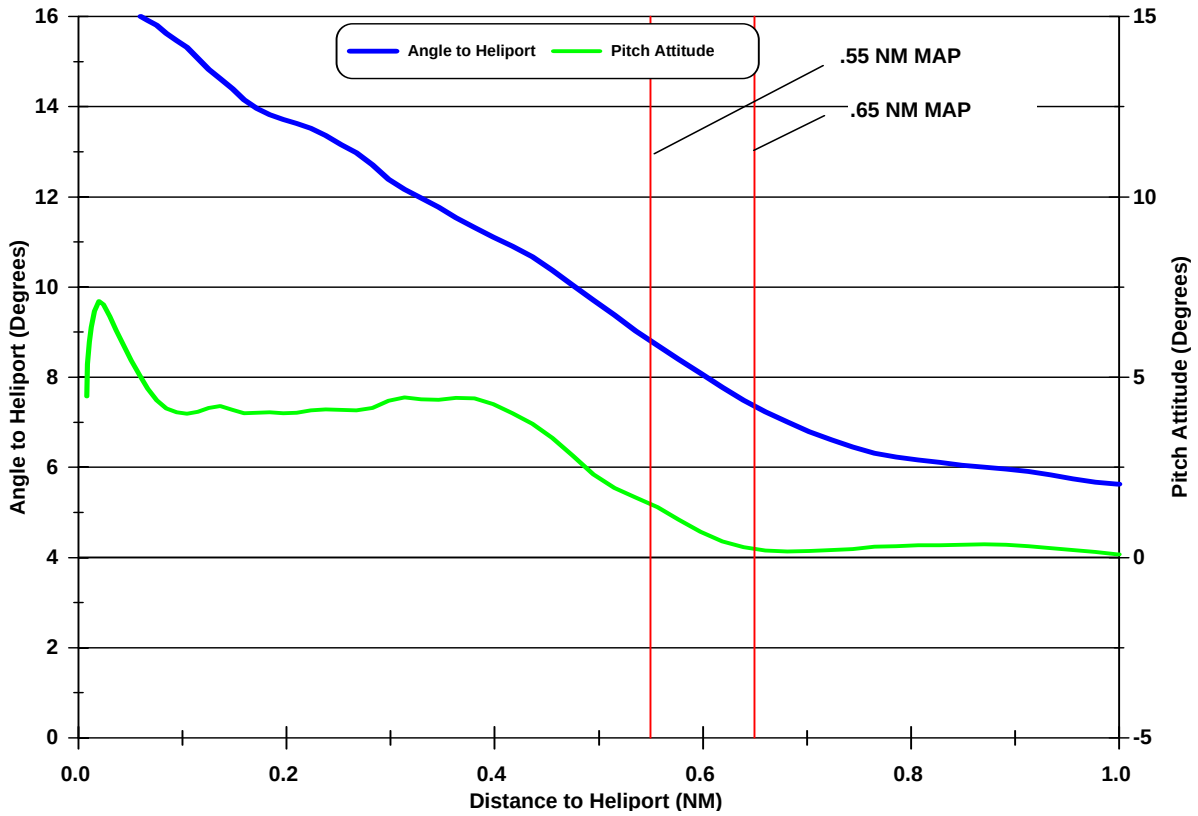
Profile View
Pilot P06 - 05/03/06a009 - App. #03X



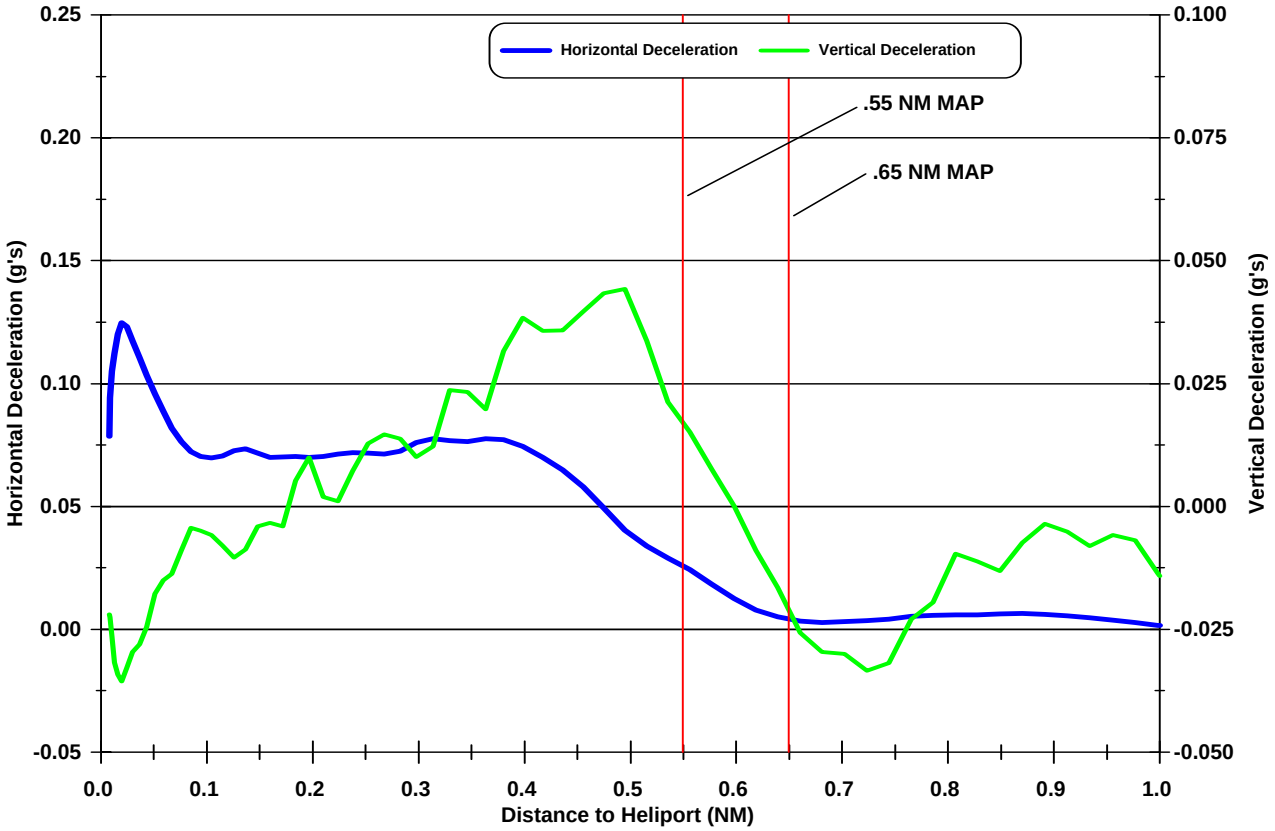
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06a009 - App. #03X

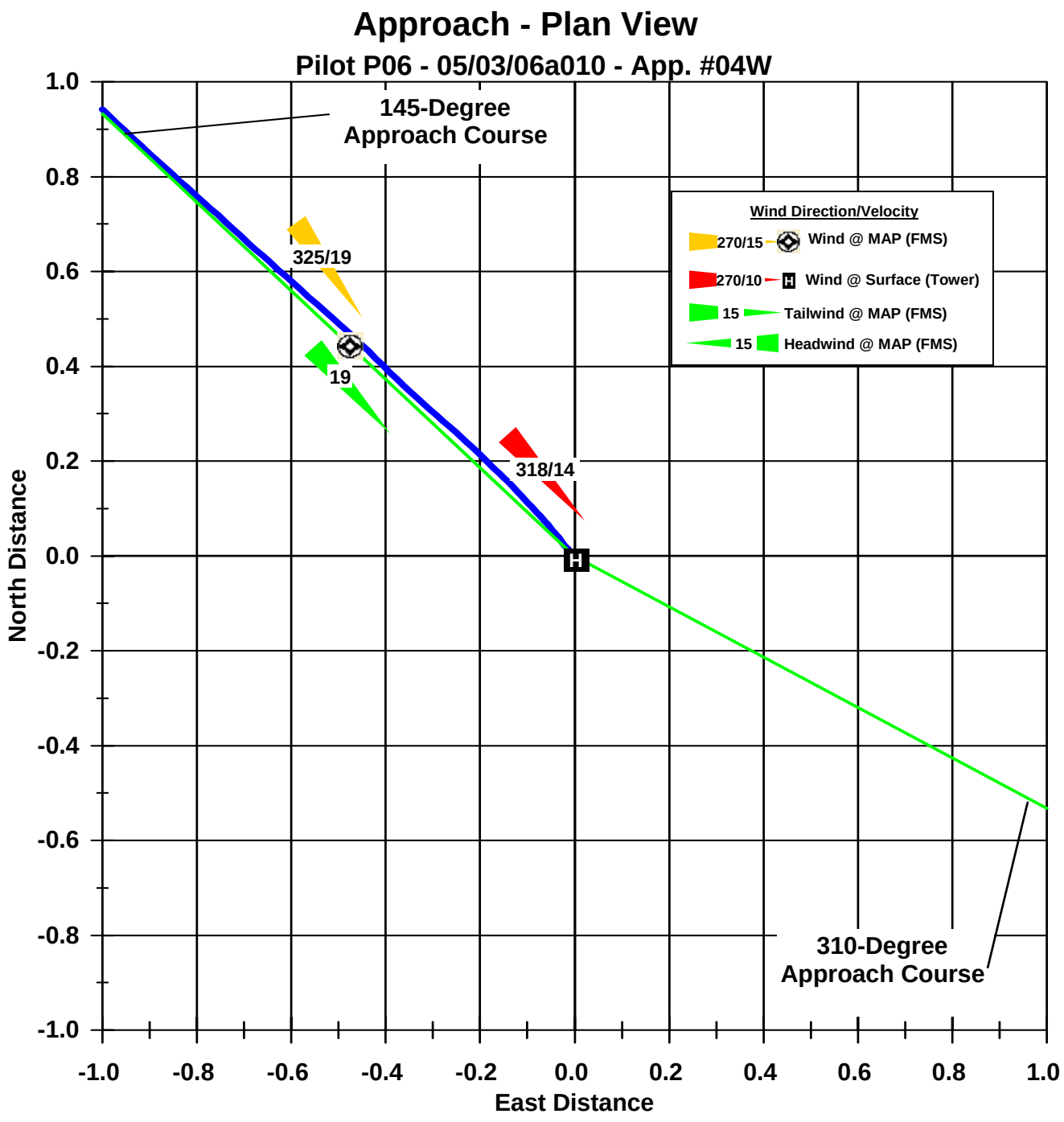


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06a009 - App. #03X

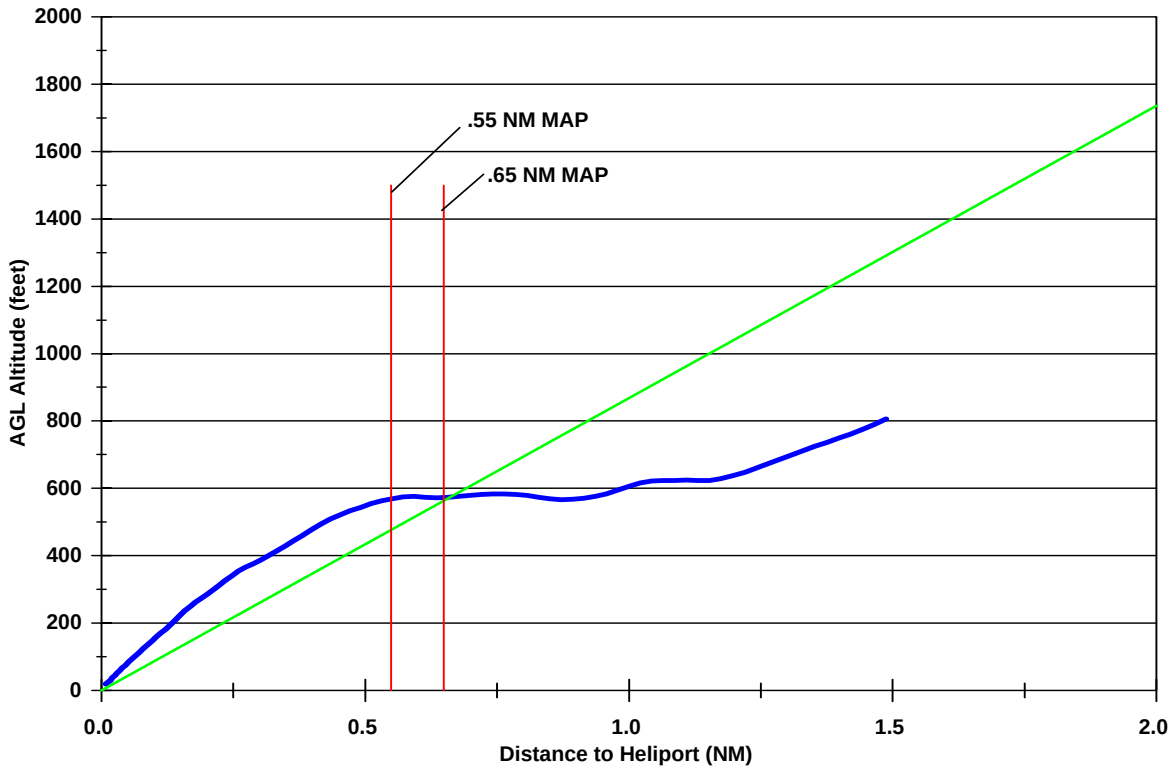


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06a009 - App. #03X

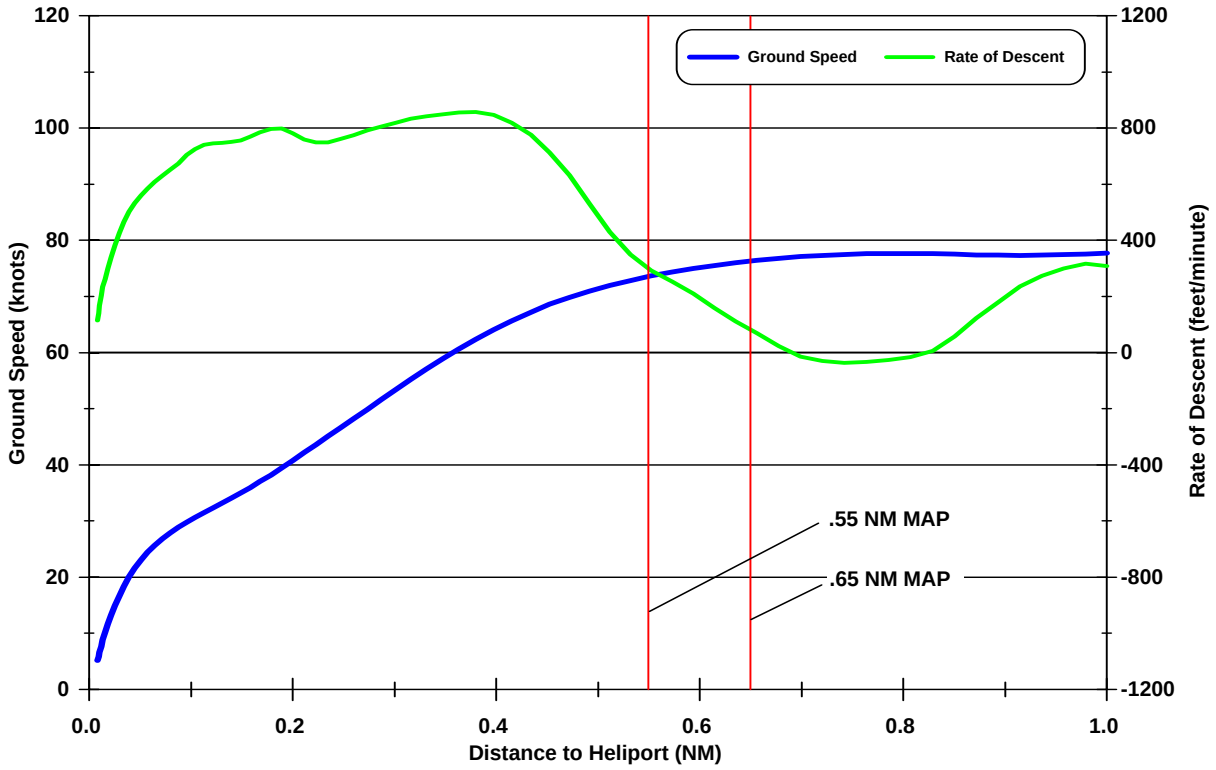



Approach - Plan View
Pilot P06 - 05/03/06a010 - App. #04W
145-Degree
Approach Course
310-Degree
Approach Course
325/19
19
318/14
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

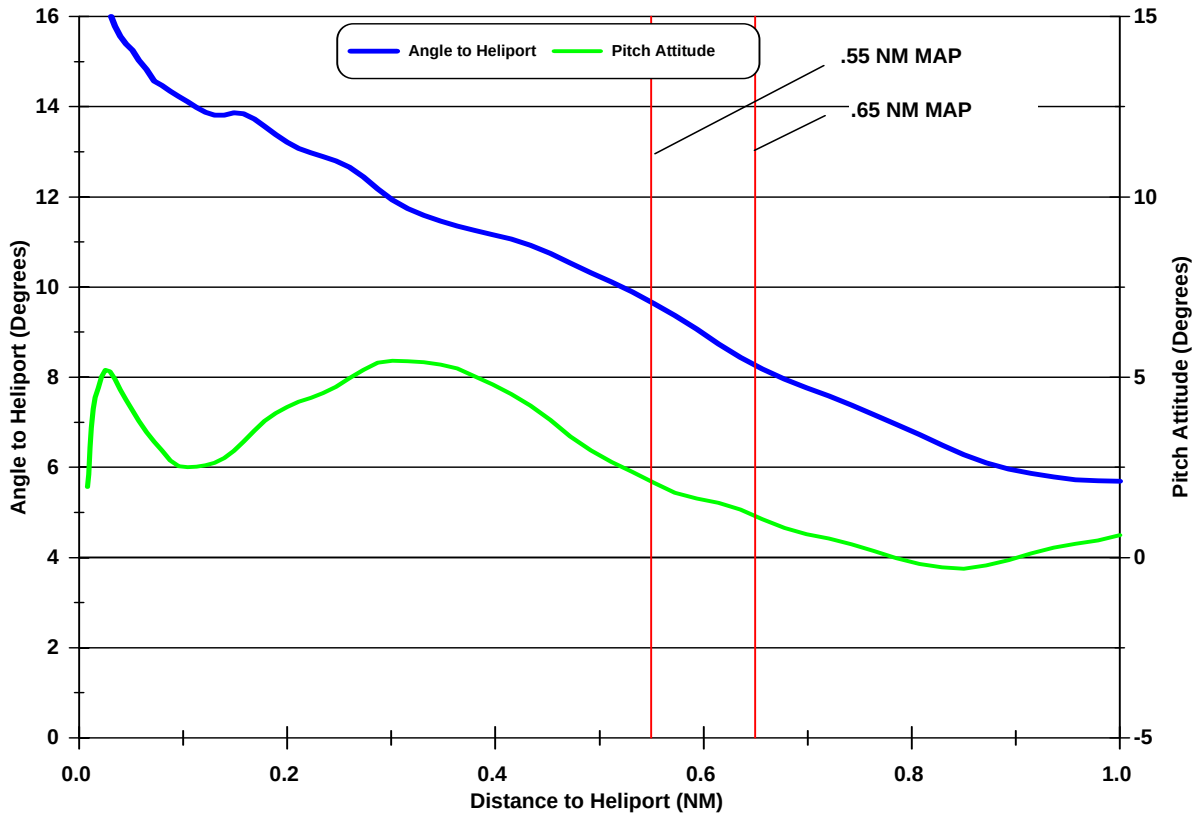
Profile View
Pilot P06 - 05/03/06a010 - App. #04W



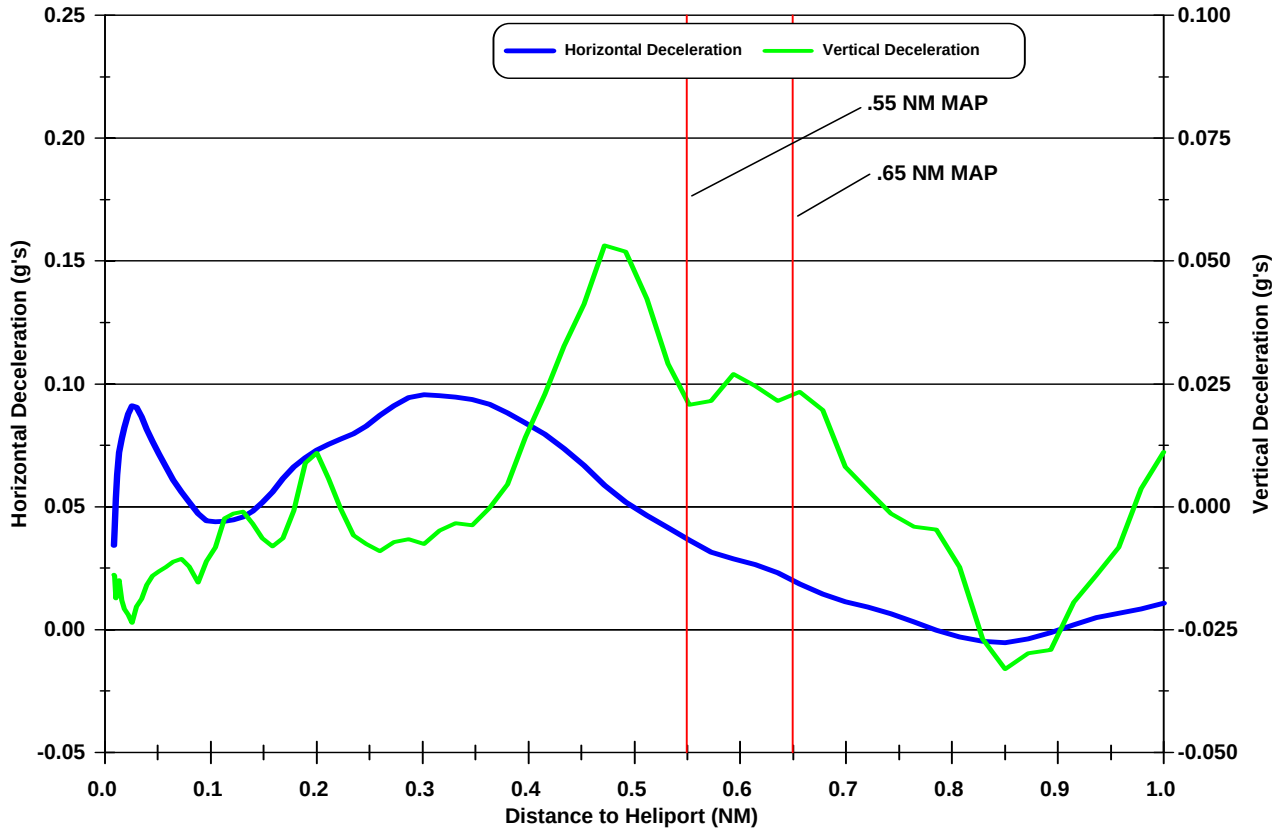
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06a010 - App. #04W

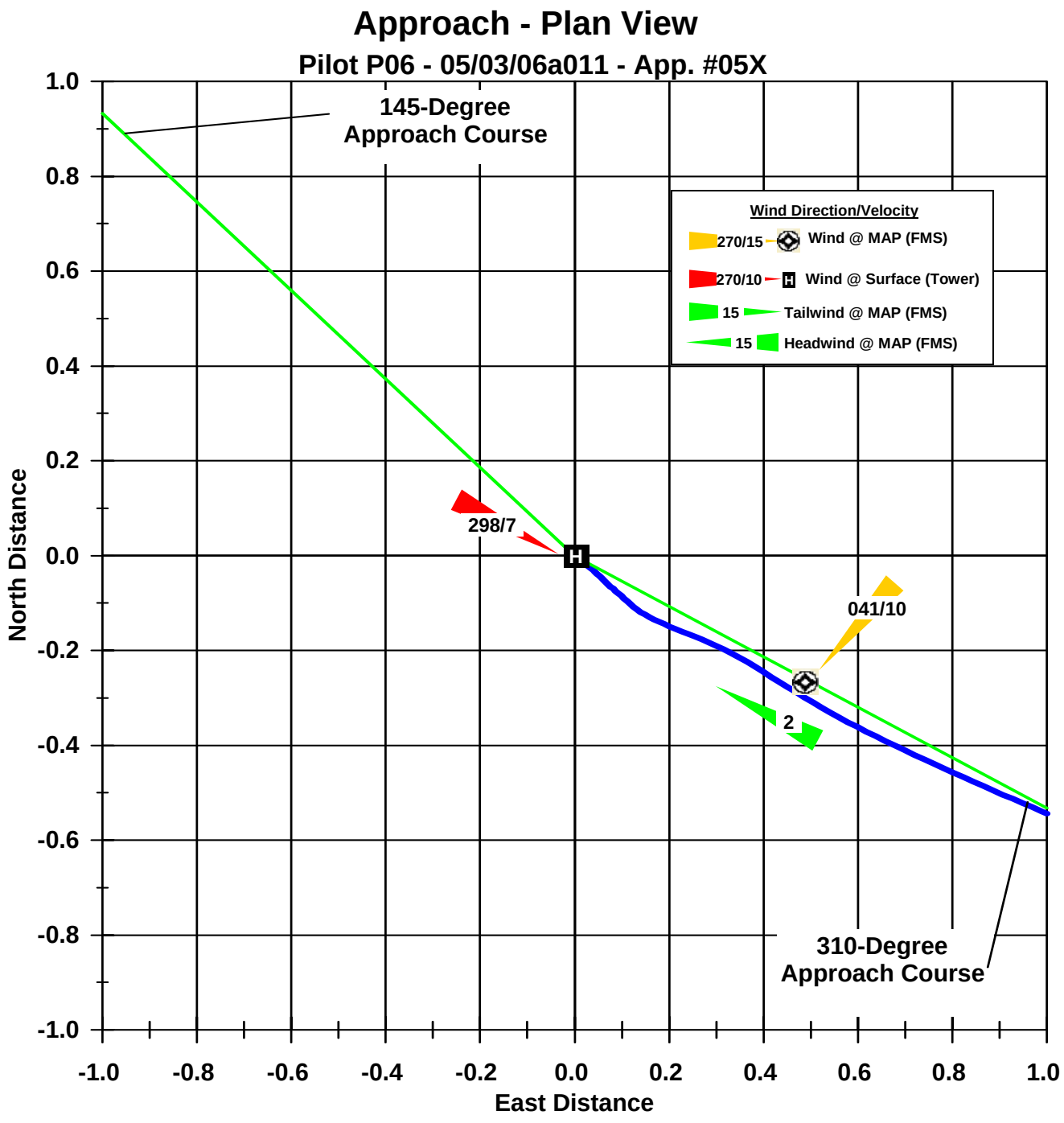


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06a010 - App. #04W

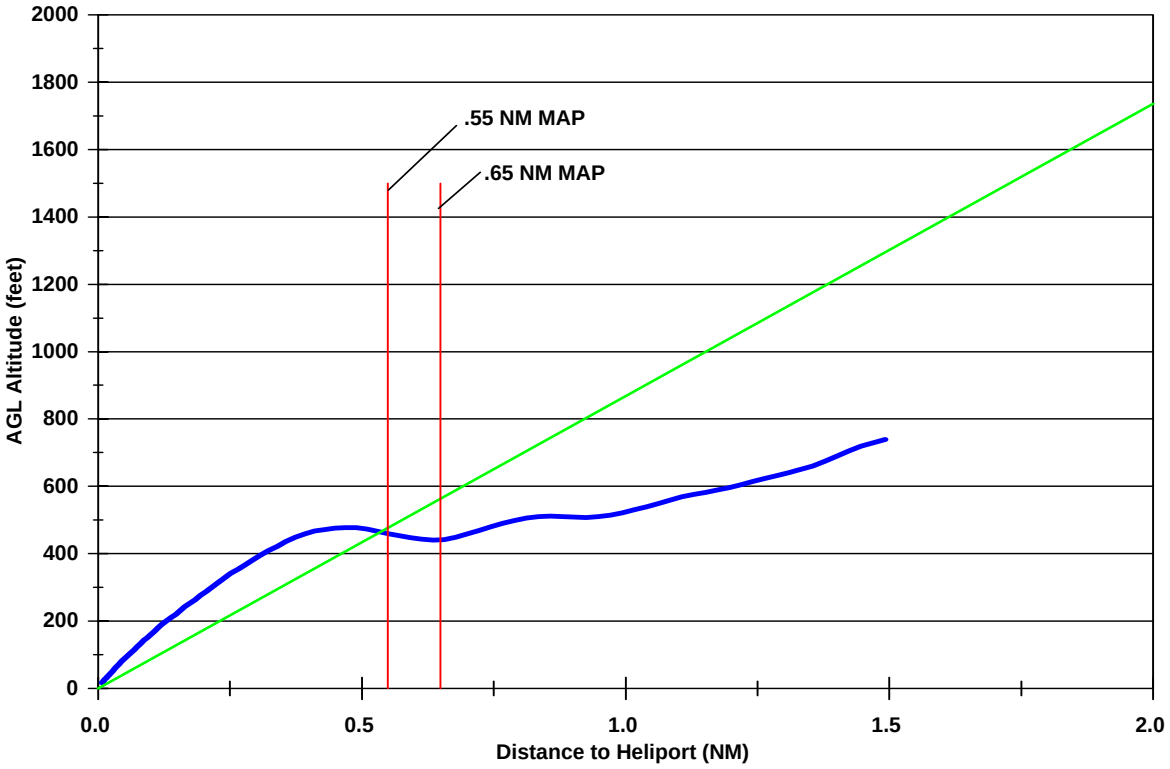


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06a010 - App. #04W

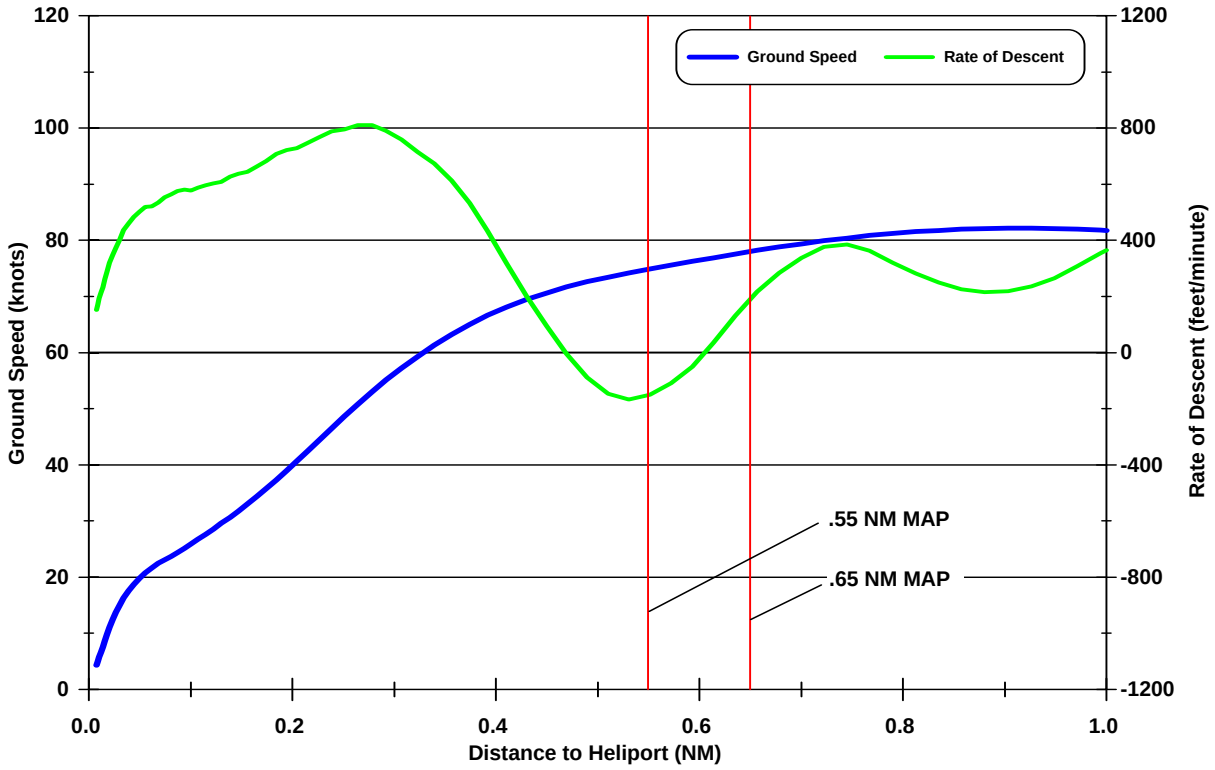



Approach - Plan View
Pilot P06 - 05/03/06a011 - App. #05X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
298/7
041/10
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

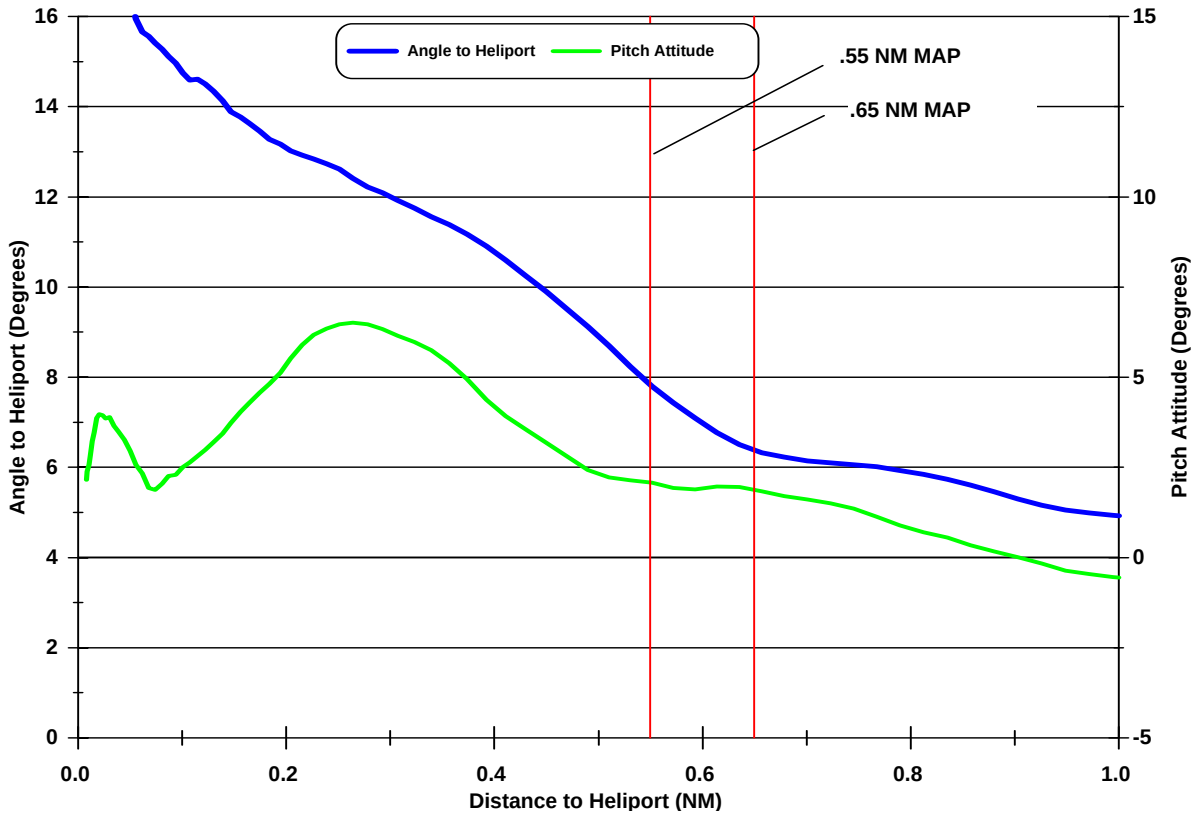
Profile View
Pilot P06 - 05/03/06a011 - App. #05X



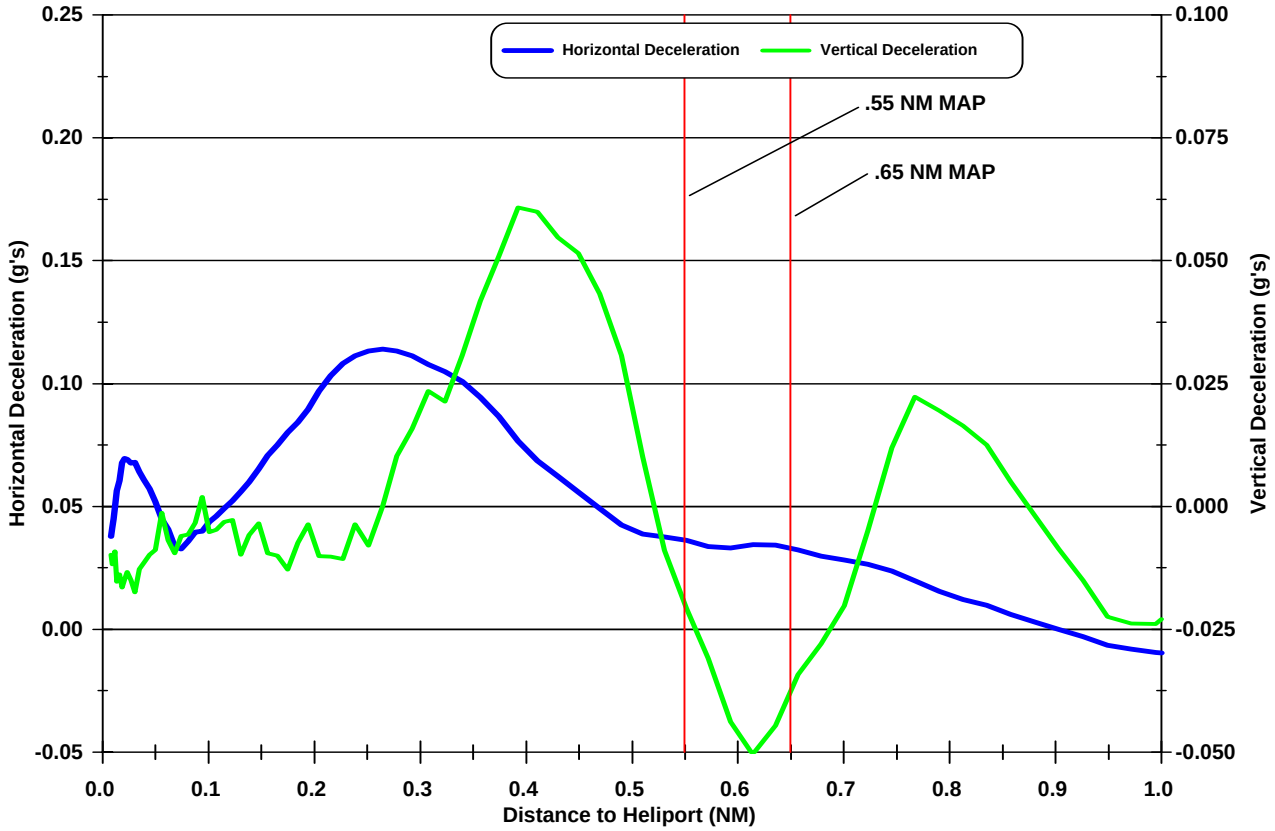
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06a011 - App. #05X

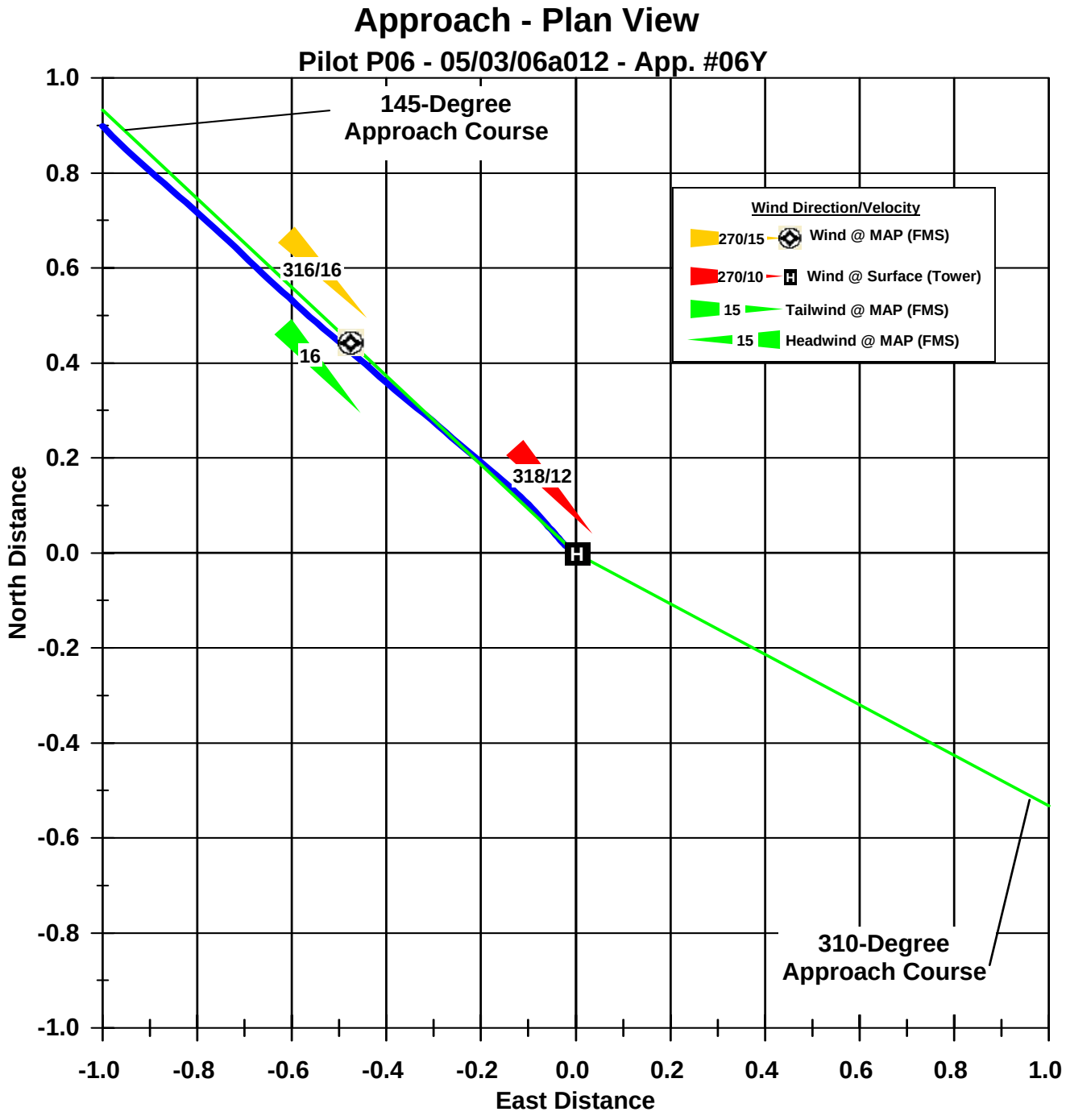


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06a011 - App. #05X

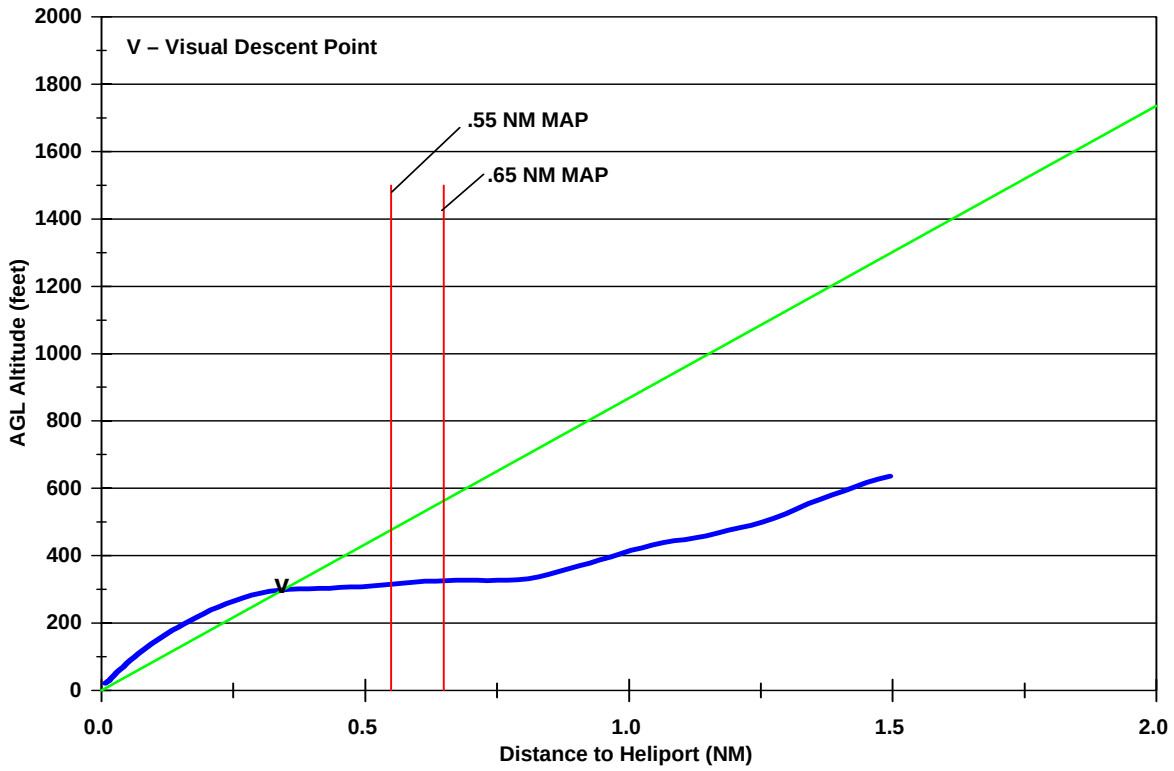


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06a011 - App. #05X

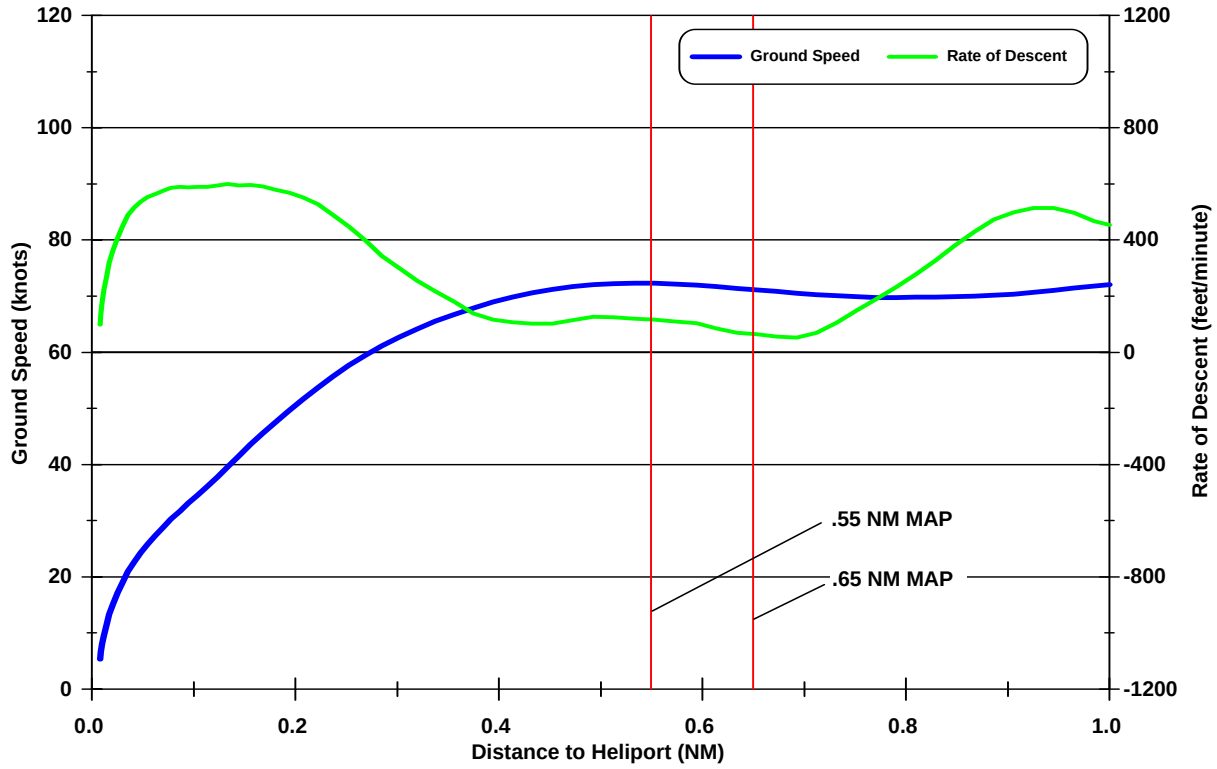



Approach - Plan View
Pilot P06 - 05/03/06a012 - App. #06Y
145-Degree
Approach Course
310-Degree
Approach Course
316/16
16
318/12
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

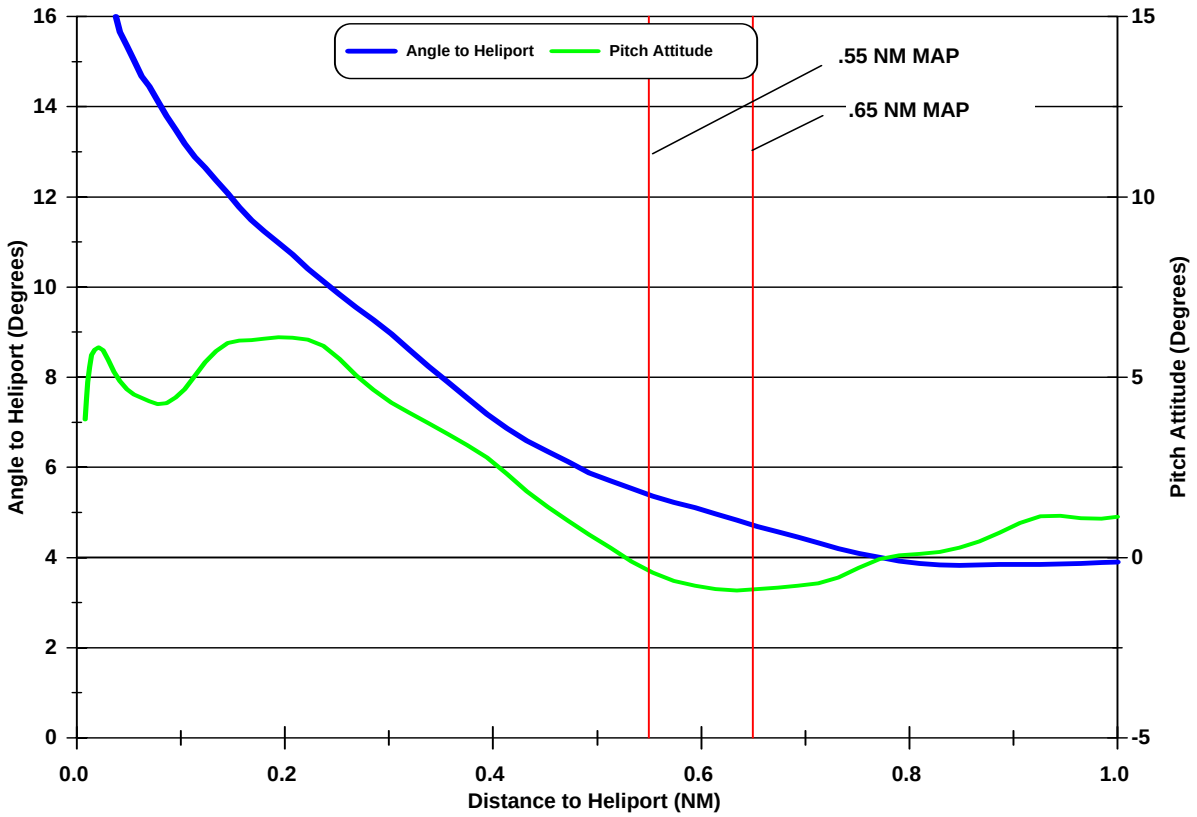
Profile View
Pilot P06 - 05/03/06a012 - App. #06Y



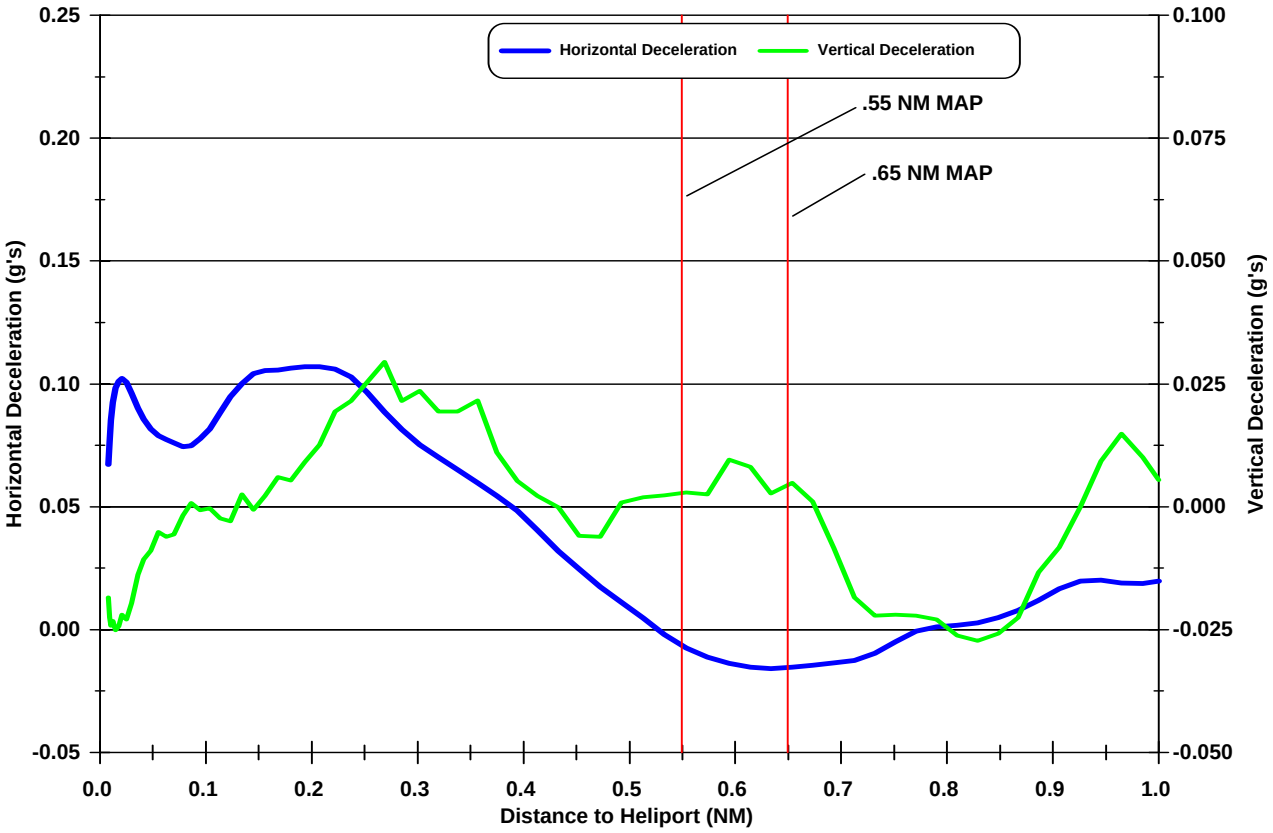
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06a012 - App. #06Y

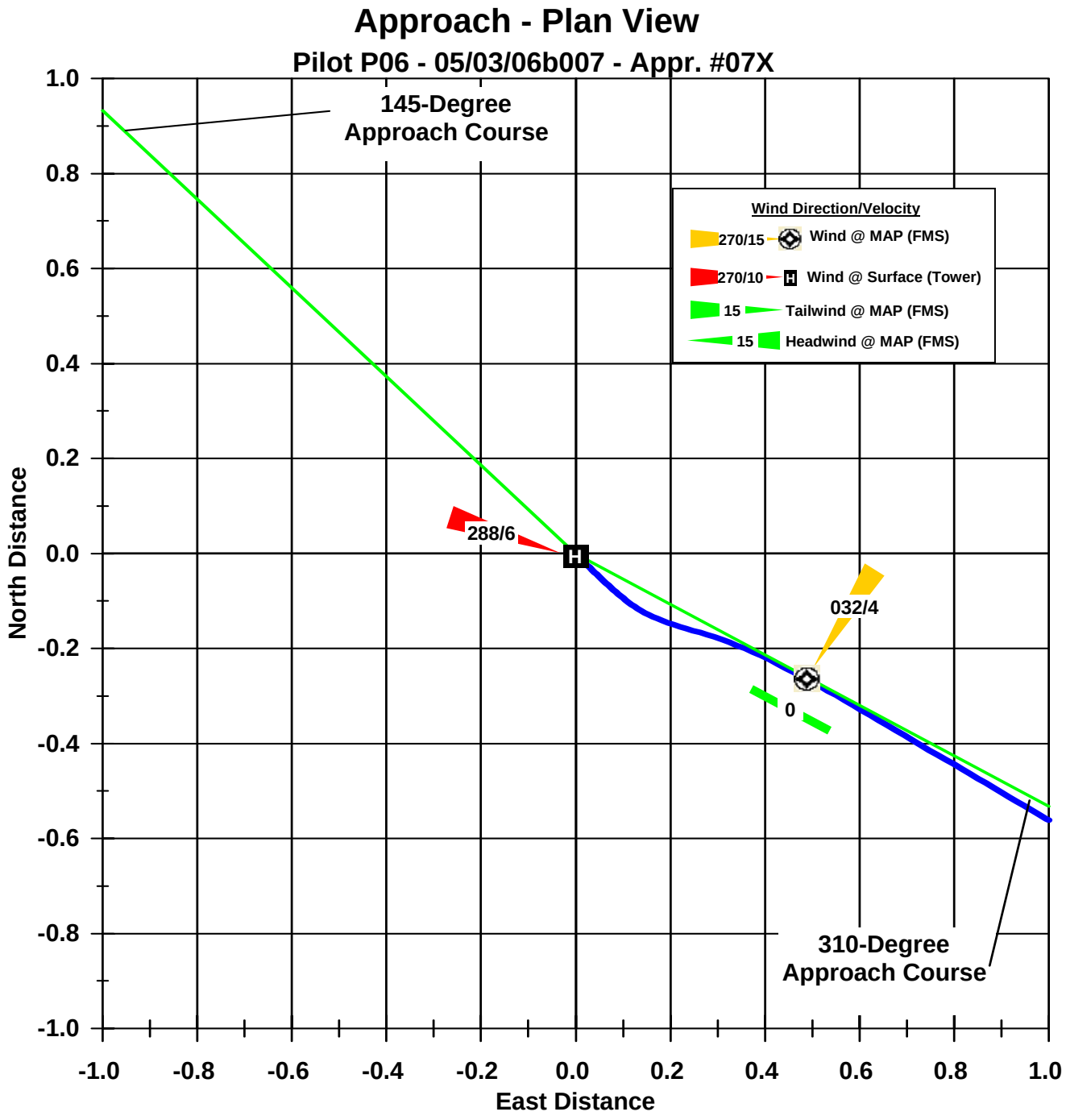


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06a012 - App. #06Y

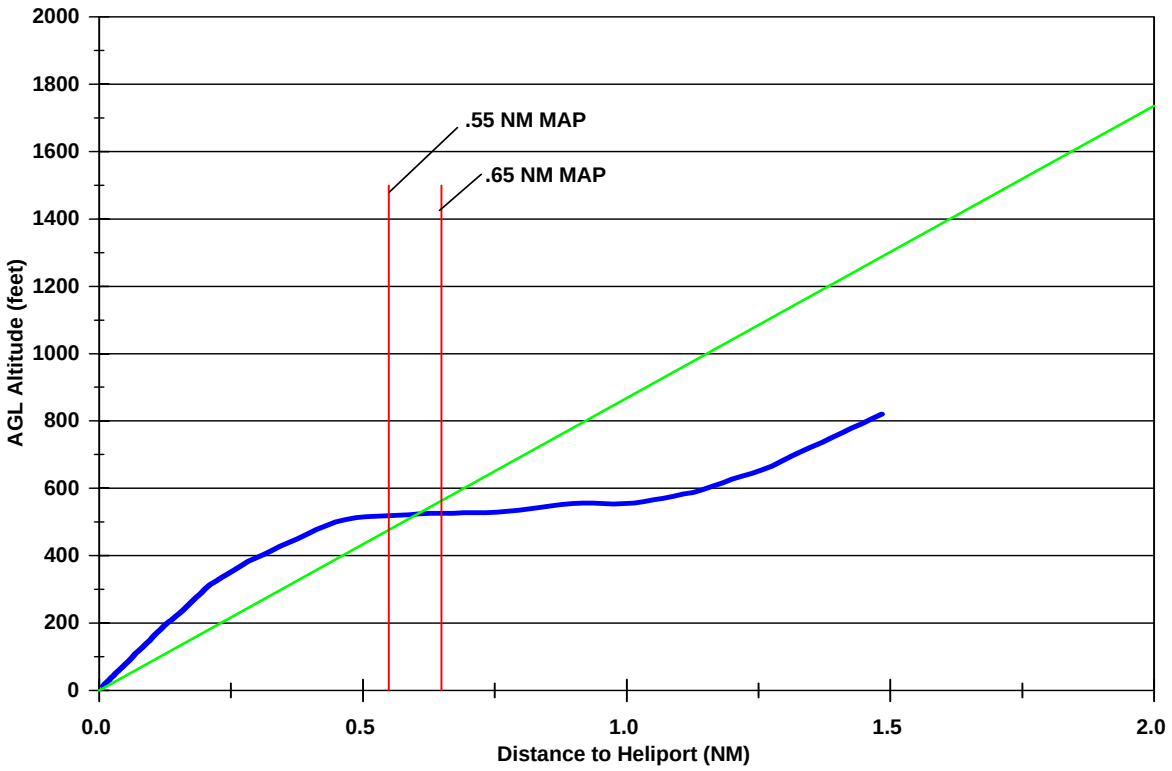


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06a012 - App. #06Y

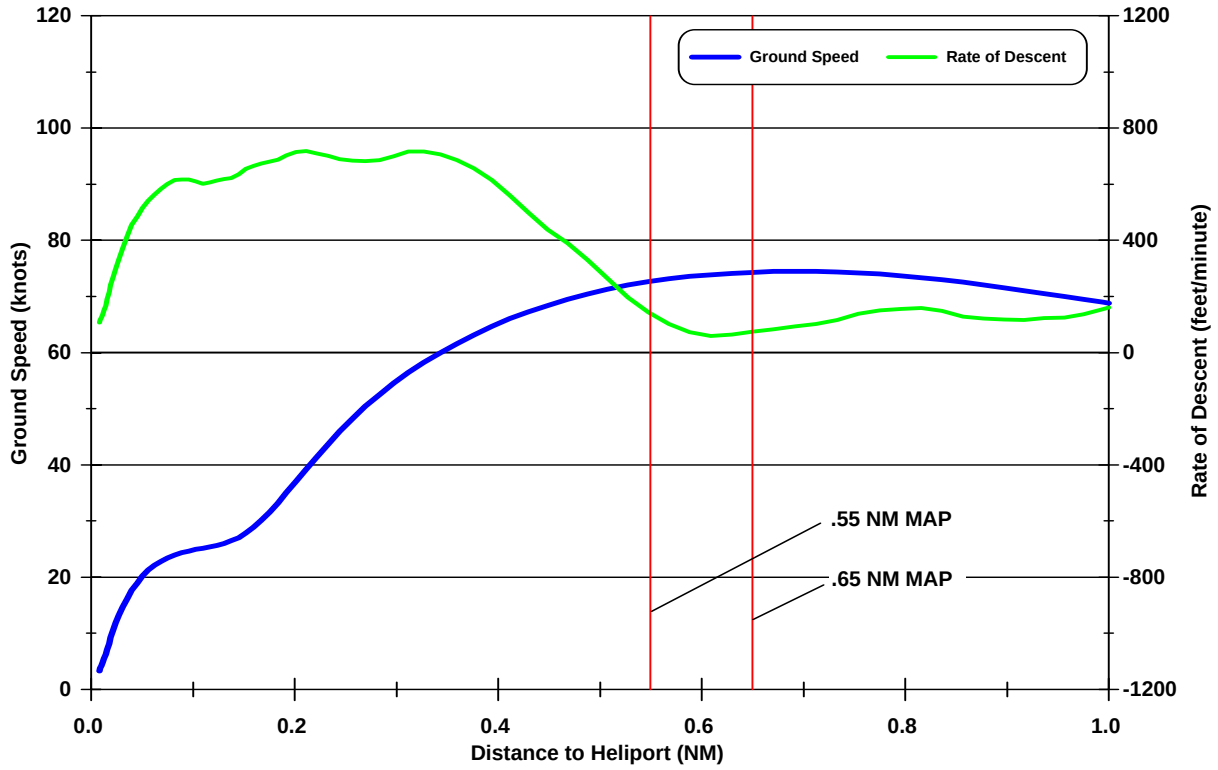



Approach - Plan View
Pilot P06 - 05/03/06b007 - Appr. #07X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
288/6
032/4
0
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

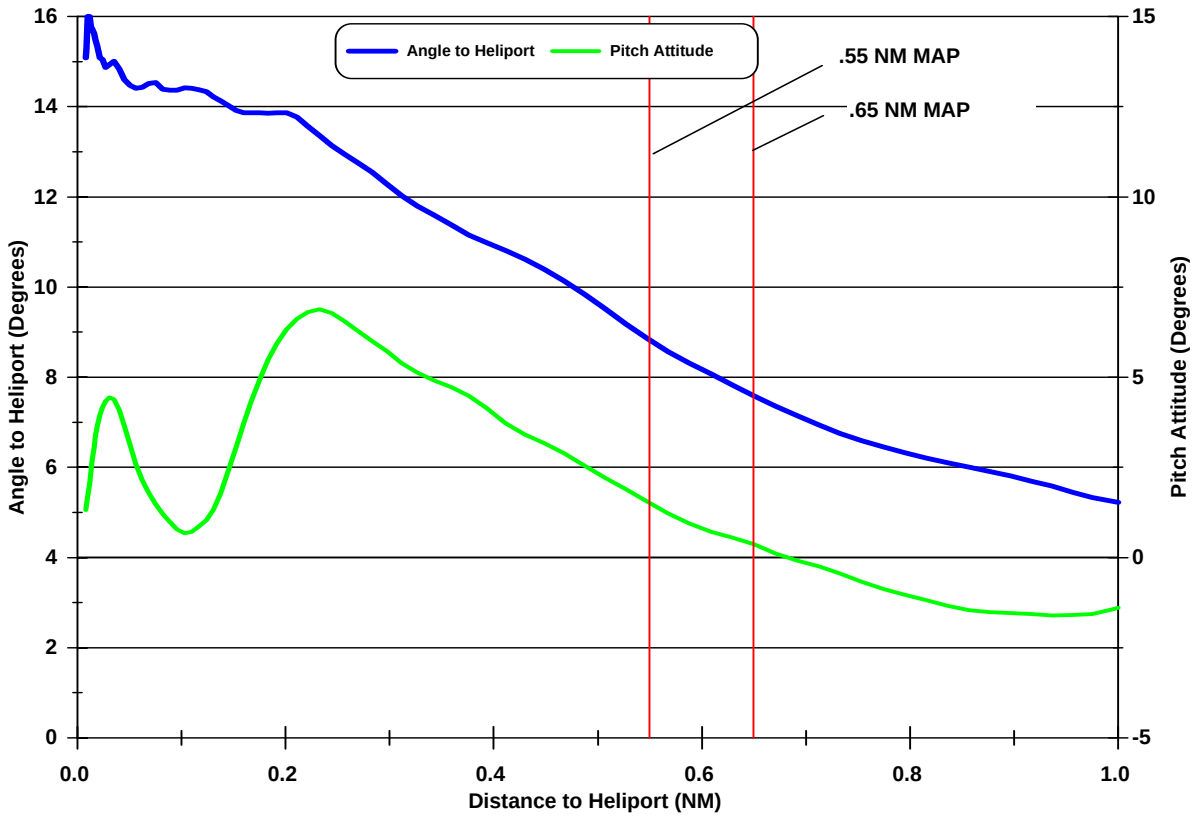
Profile View
Pilot P06 - 05/03/06b007 - Appr. #07X



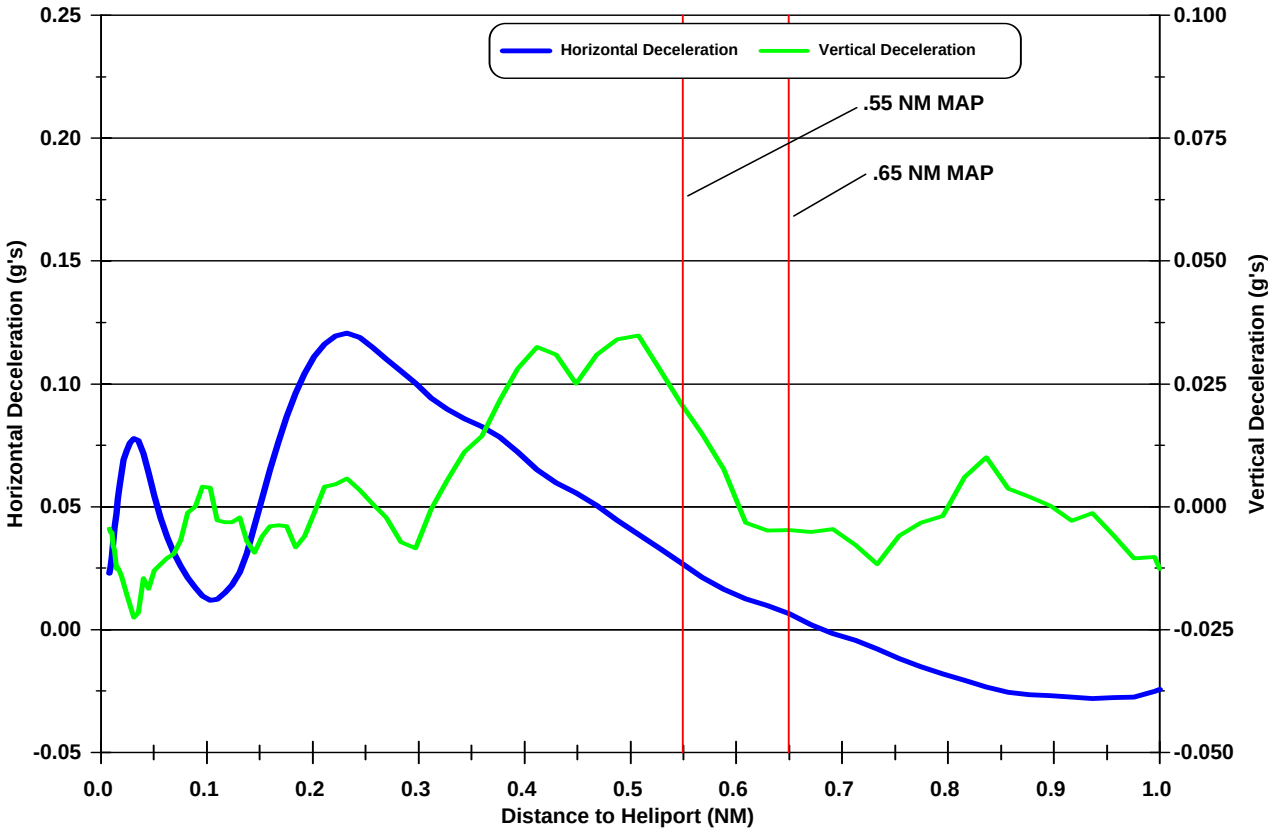
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06b007 - Appr. #07X

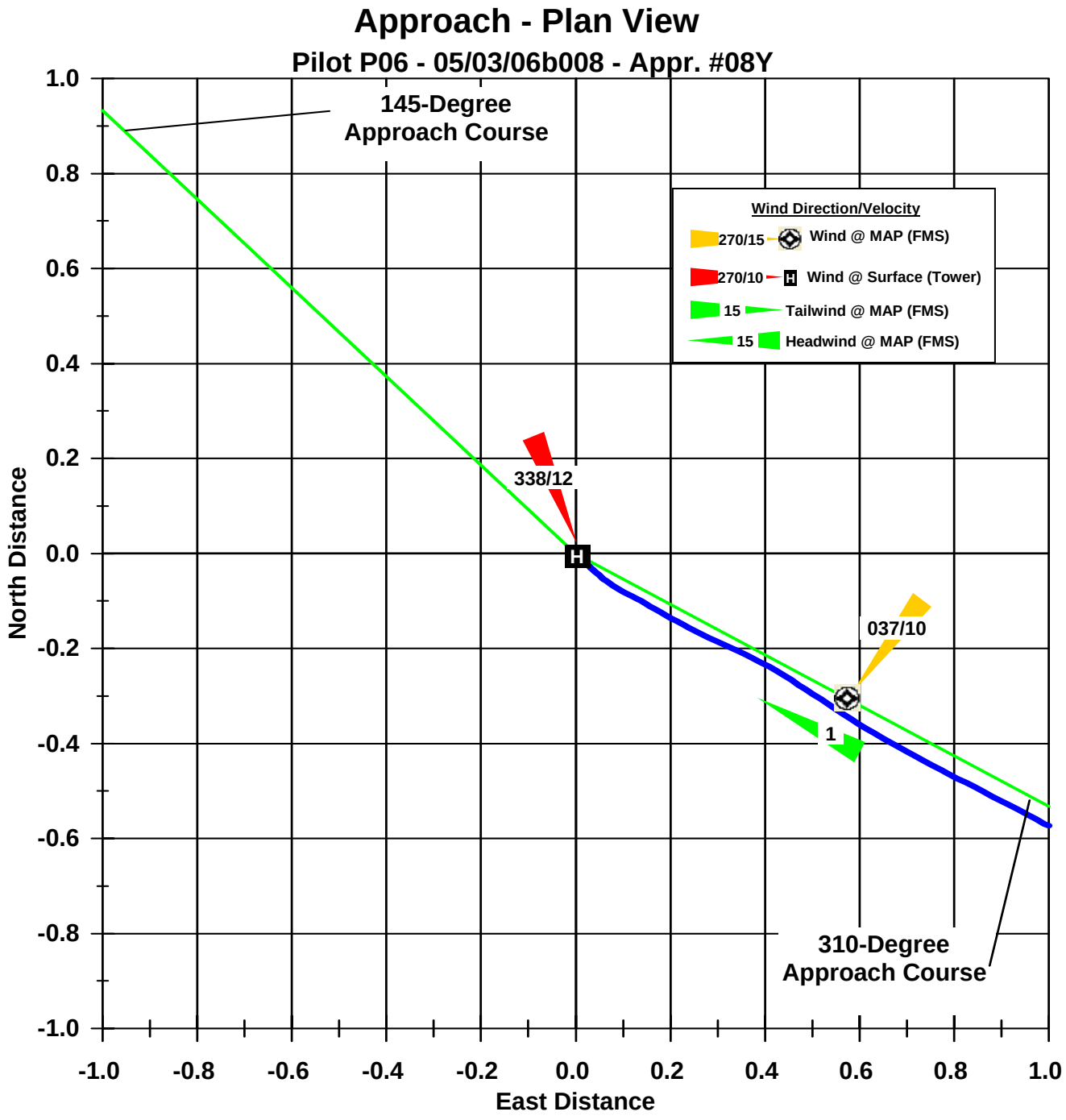


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06b007 - Appr. #07X

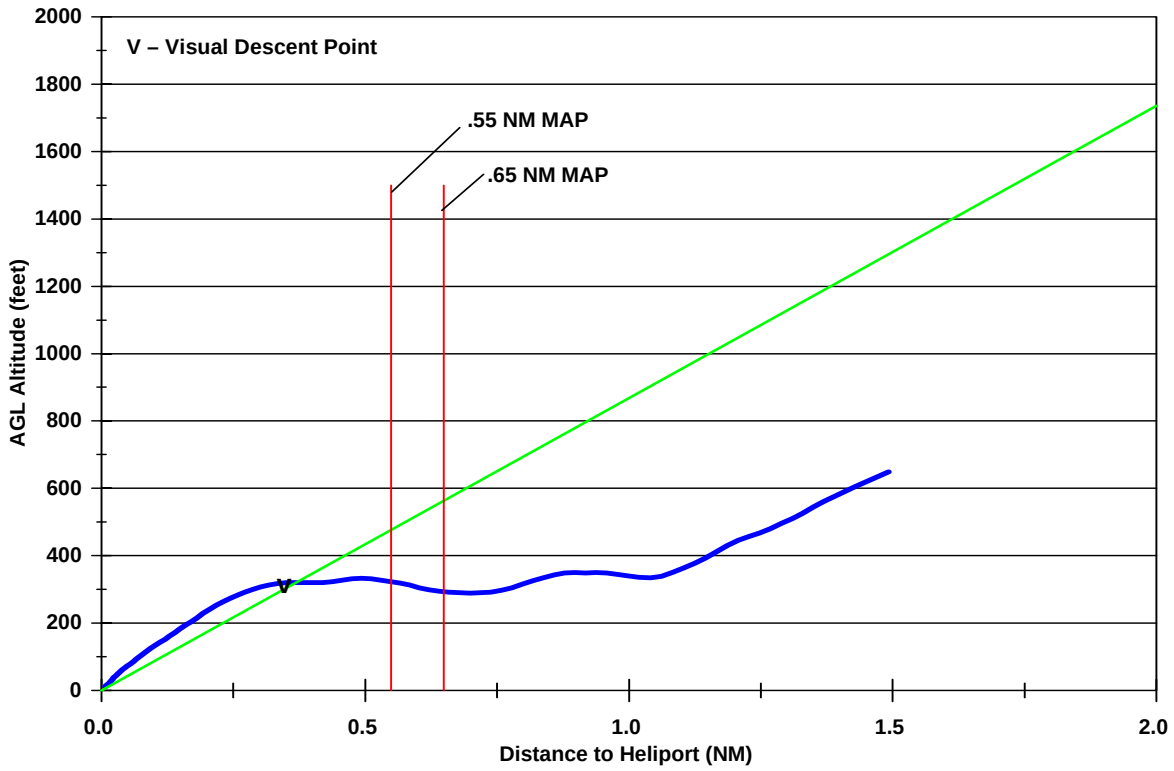


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06b007 - Appr. #07X

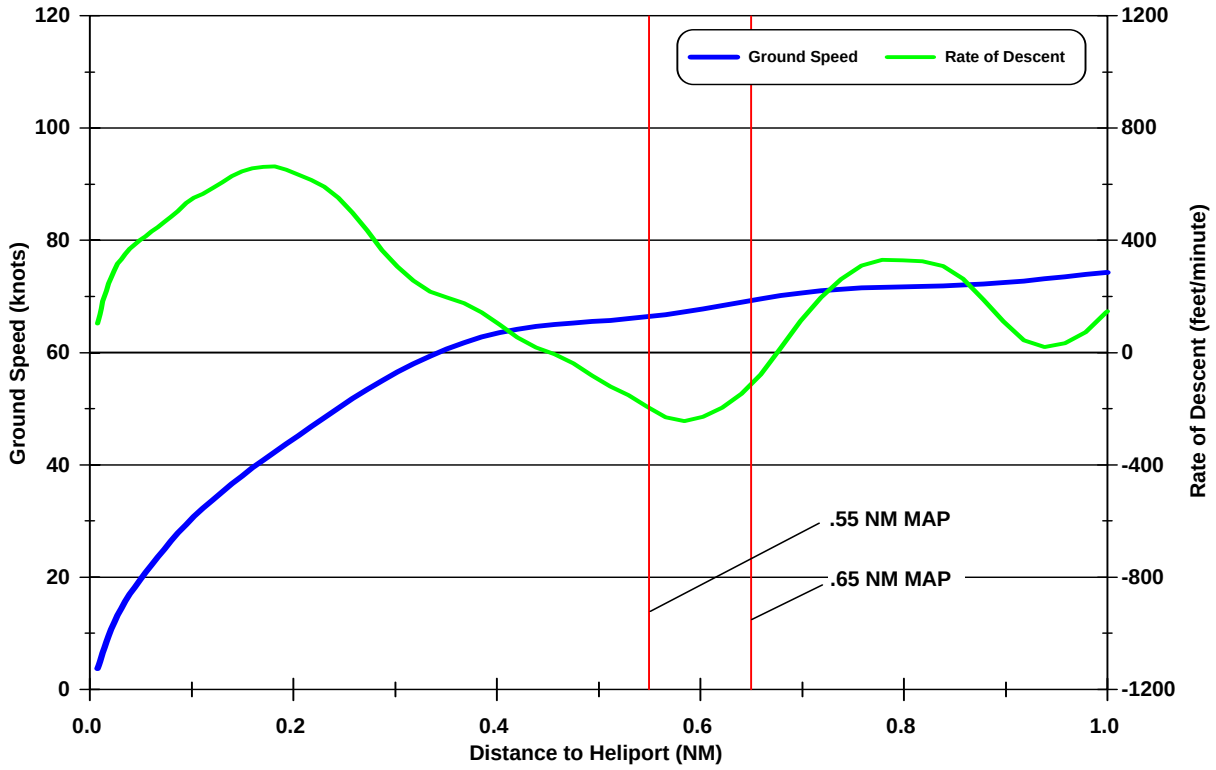



Approach - Plan View
Pilot P06 - 05/03/06b008 - Appr. #08Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
338/12
037/10
1
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

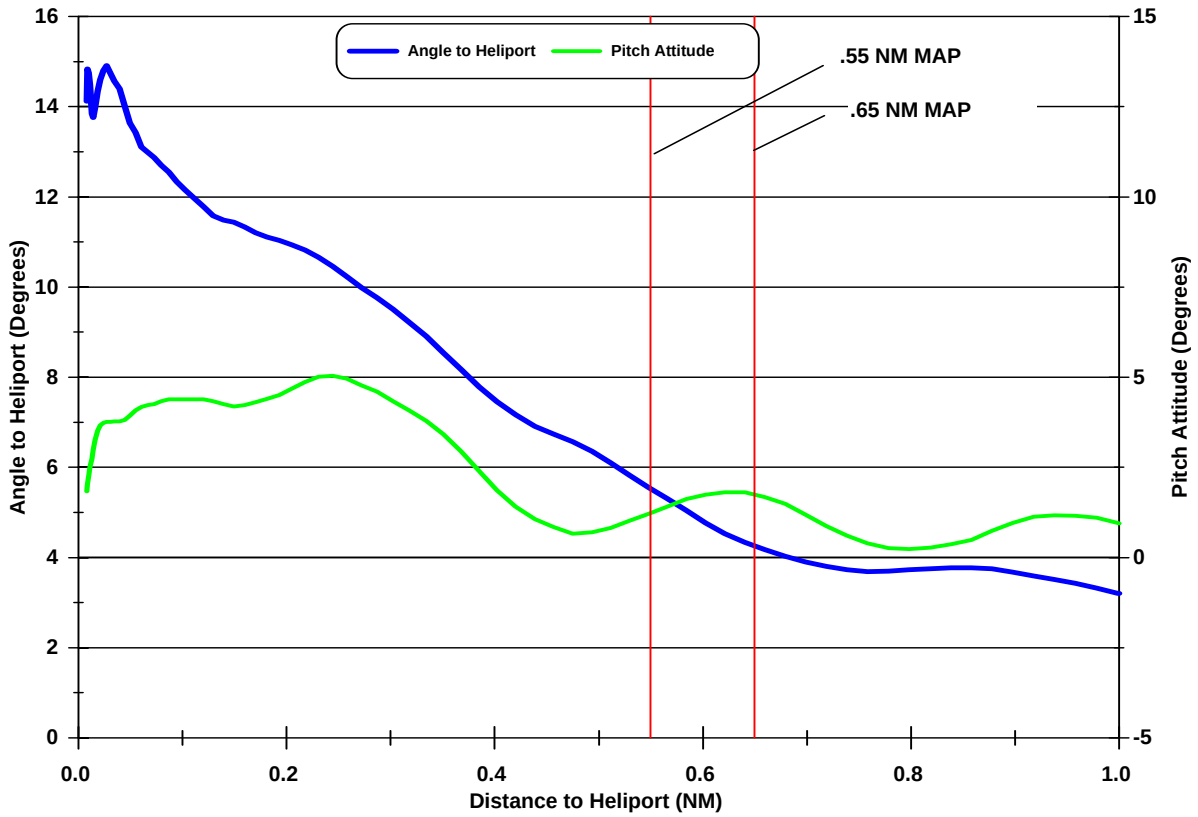
Profile View
Pilot P06 - 05/03/06b008 - Appr. #08Y



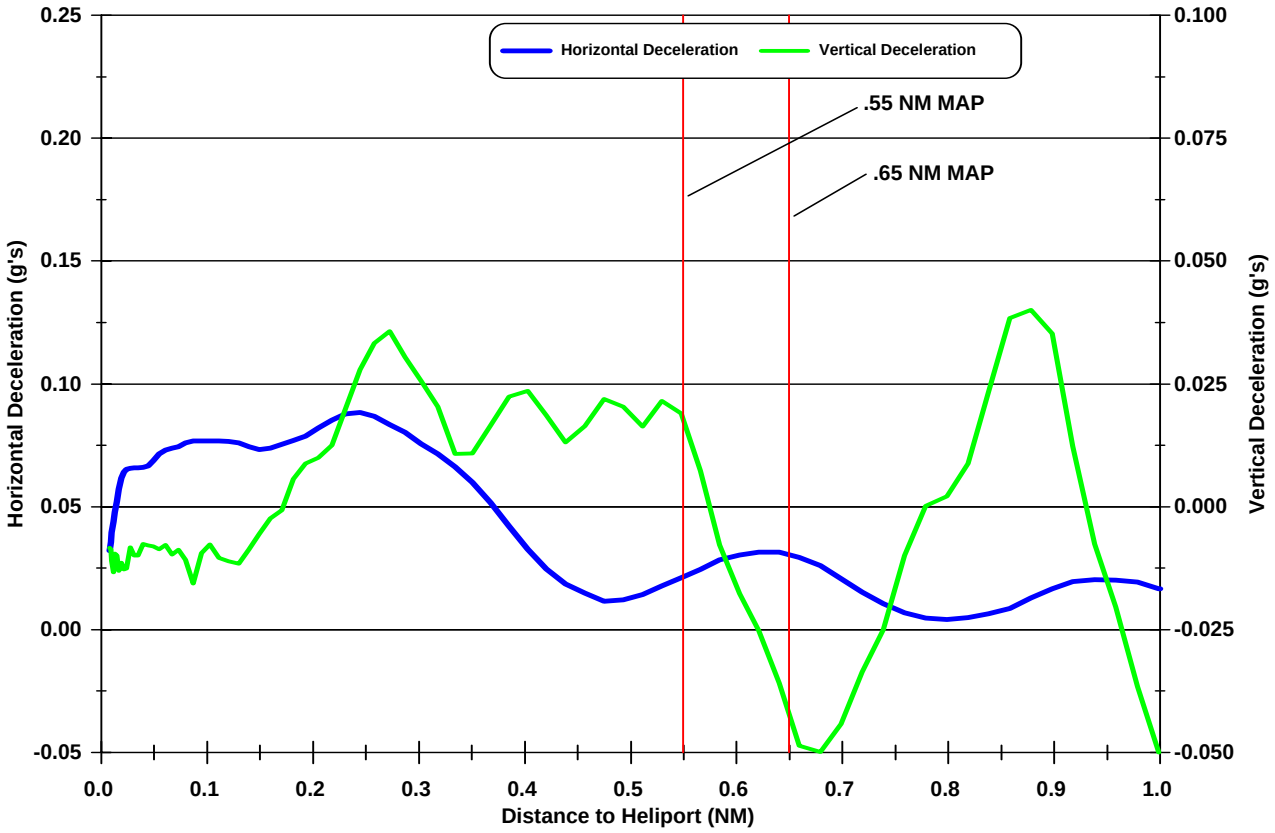
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06b008 - Appr. #08Y

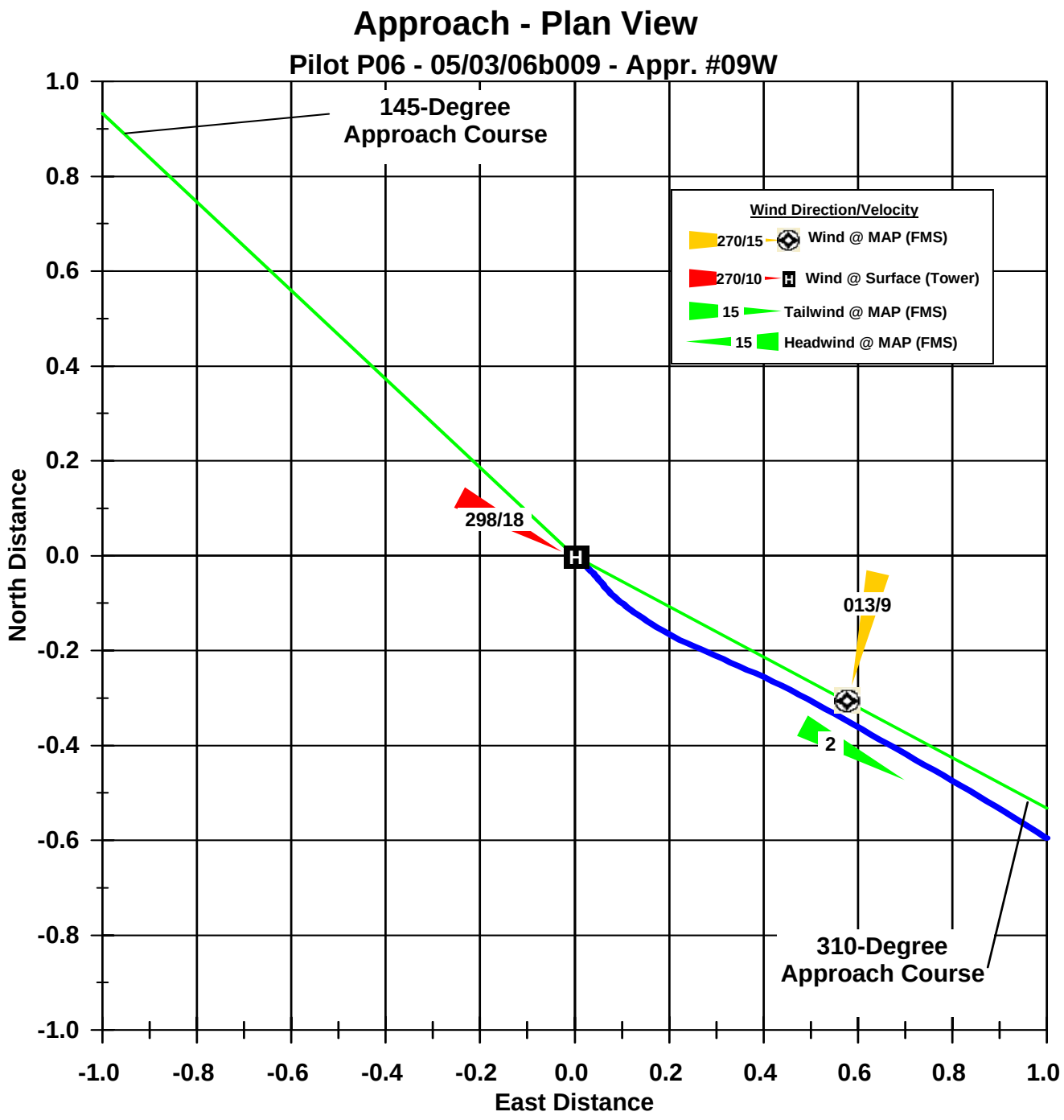


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06b008 - Appr. #08Y

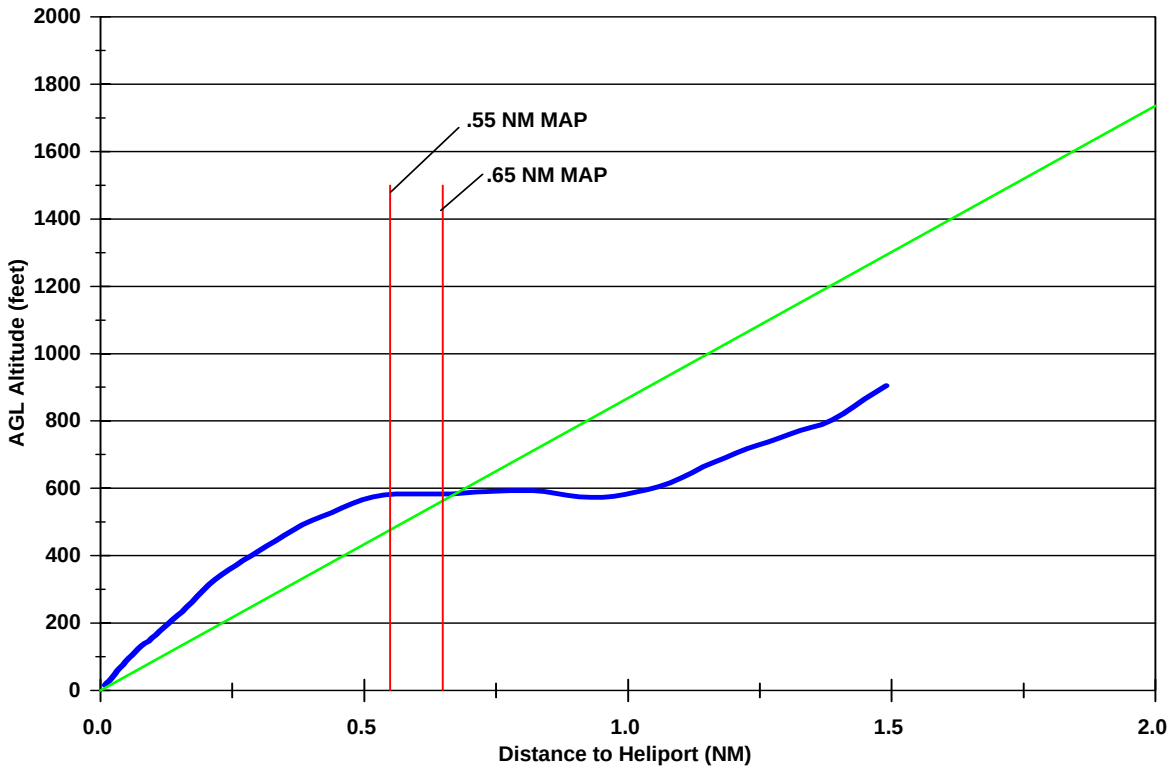


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06b008 - Appr. #08Y

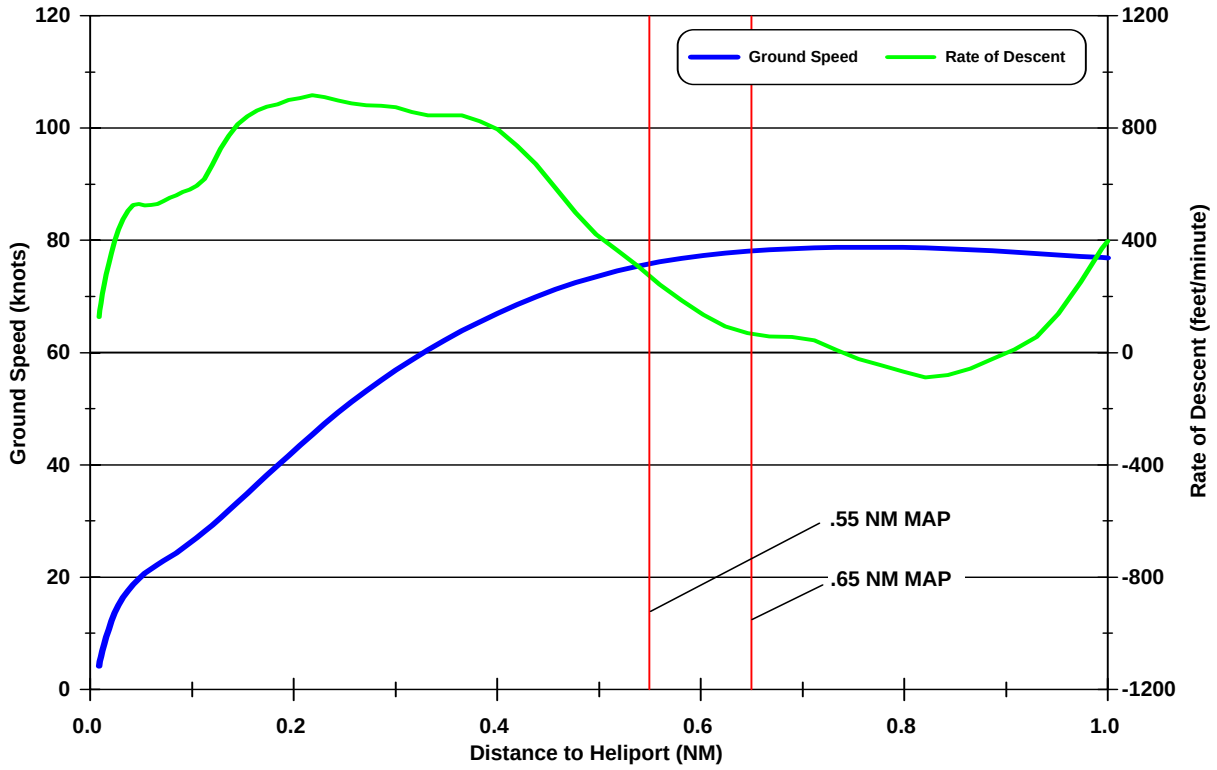



Approach - Plan View
Pilot P06 - 05/03/06b009 - Appr. #09W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
298/18
013/9
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

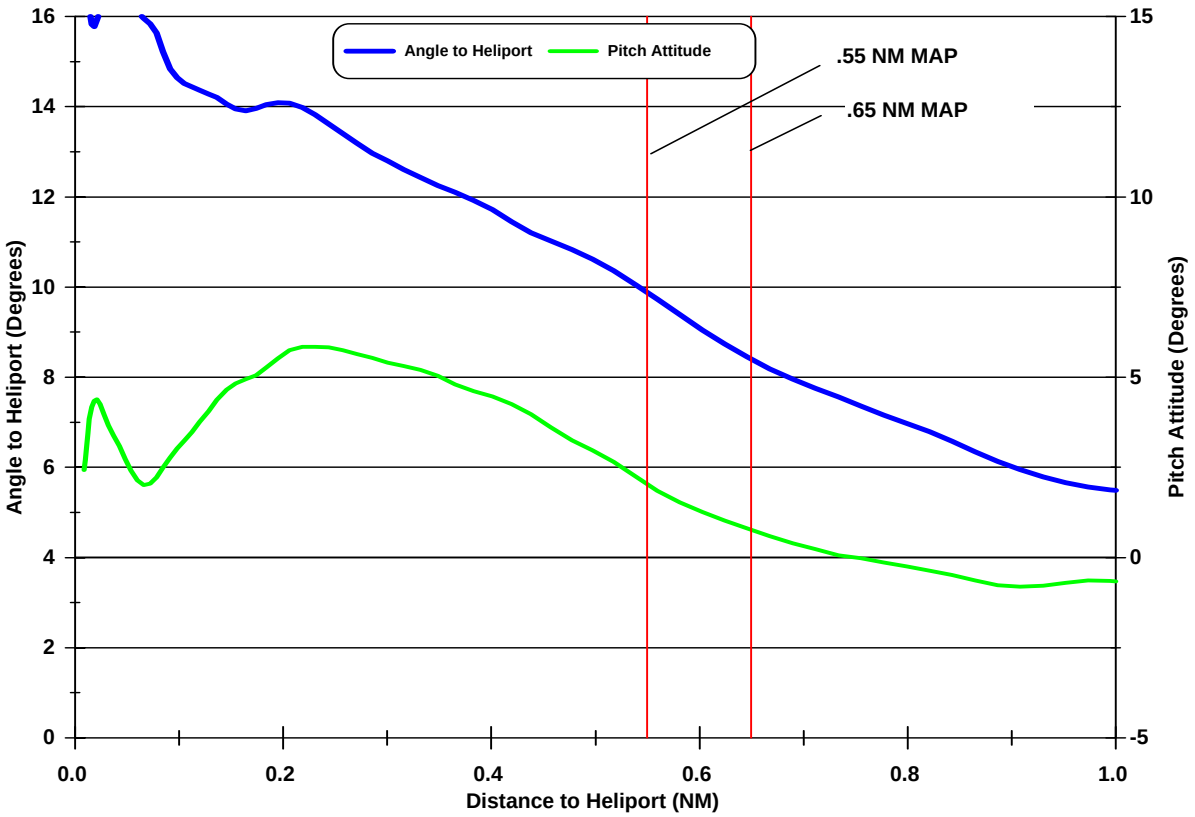
Profile View
Pilot P06 - 05/03/06b009 - Appr. #09W



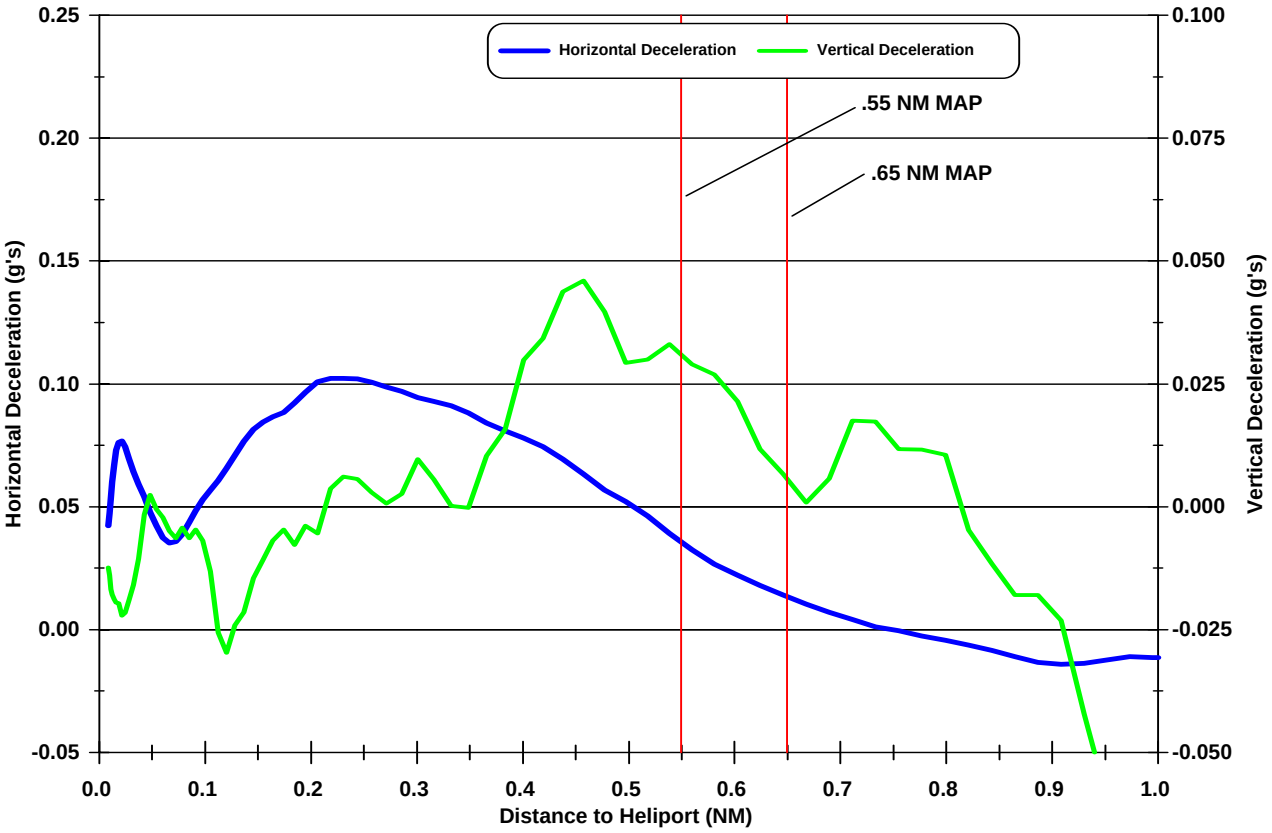
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06b009 - Appr. #09W

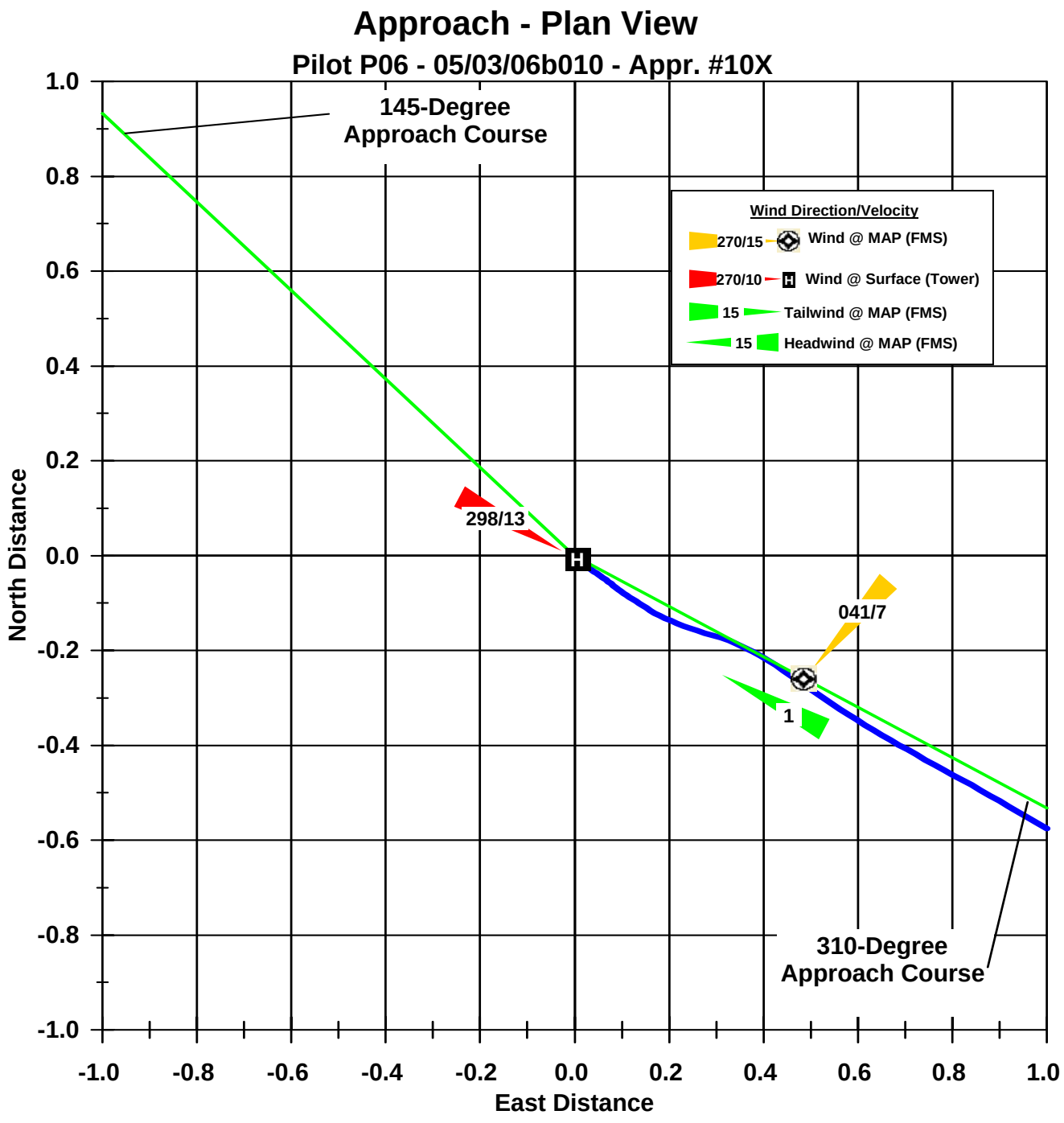


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06b009 - Appr. #09W

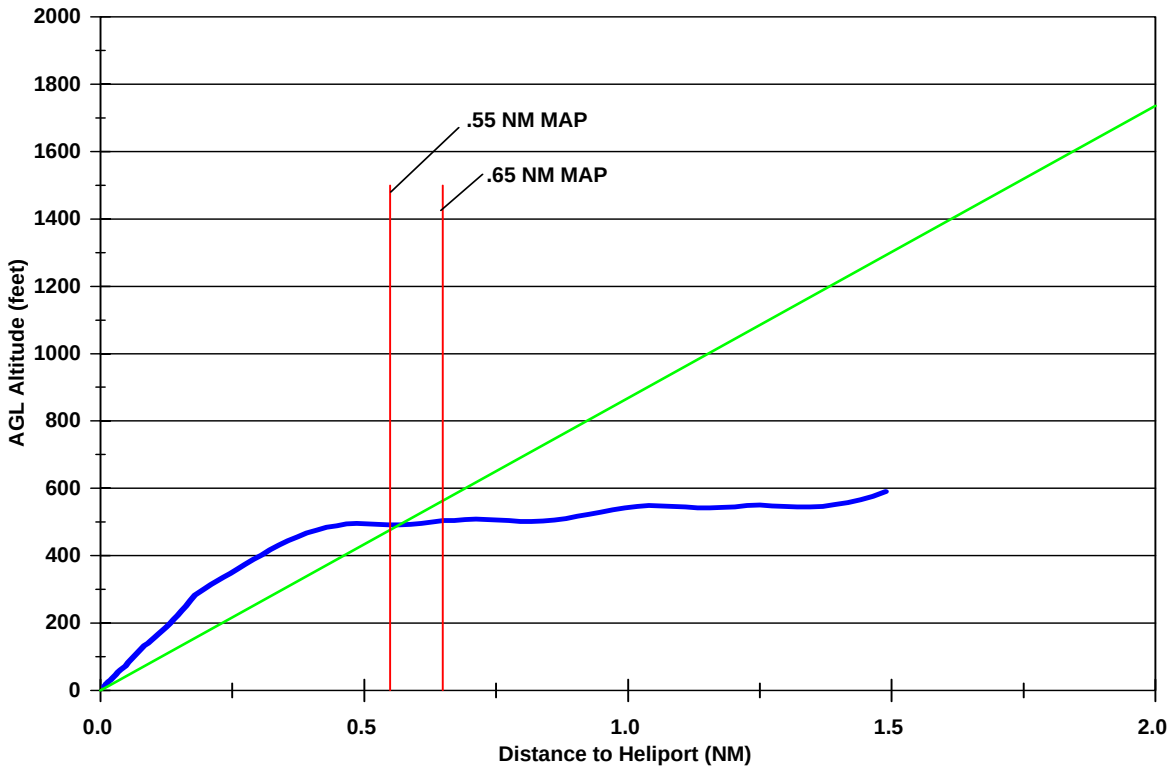


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06b009 - Appr. #09W

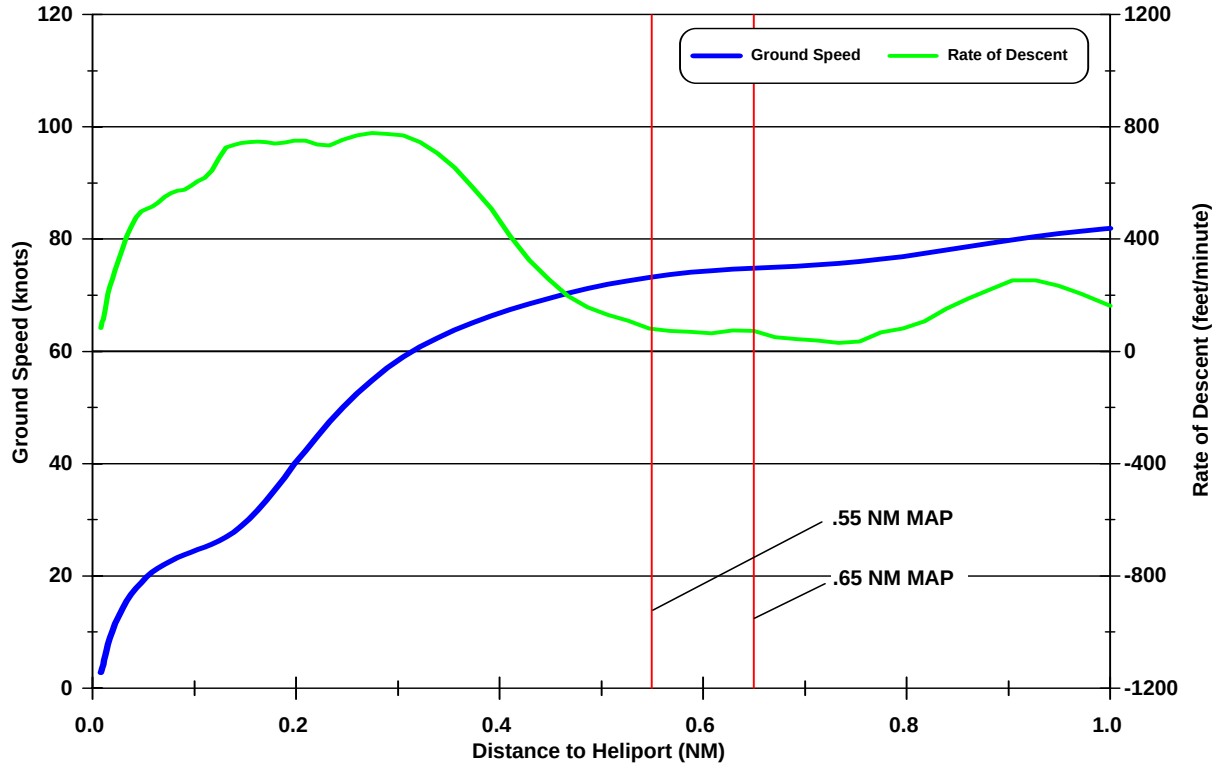



Approach - Plan View
Pilot P06 - 05/03/06b010 - Appr. #10X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
298/13
041/7
1
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

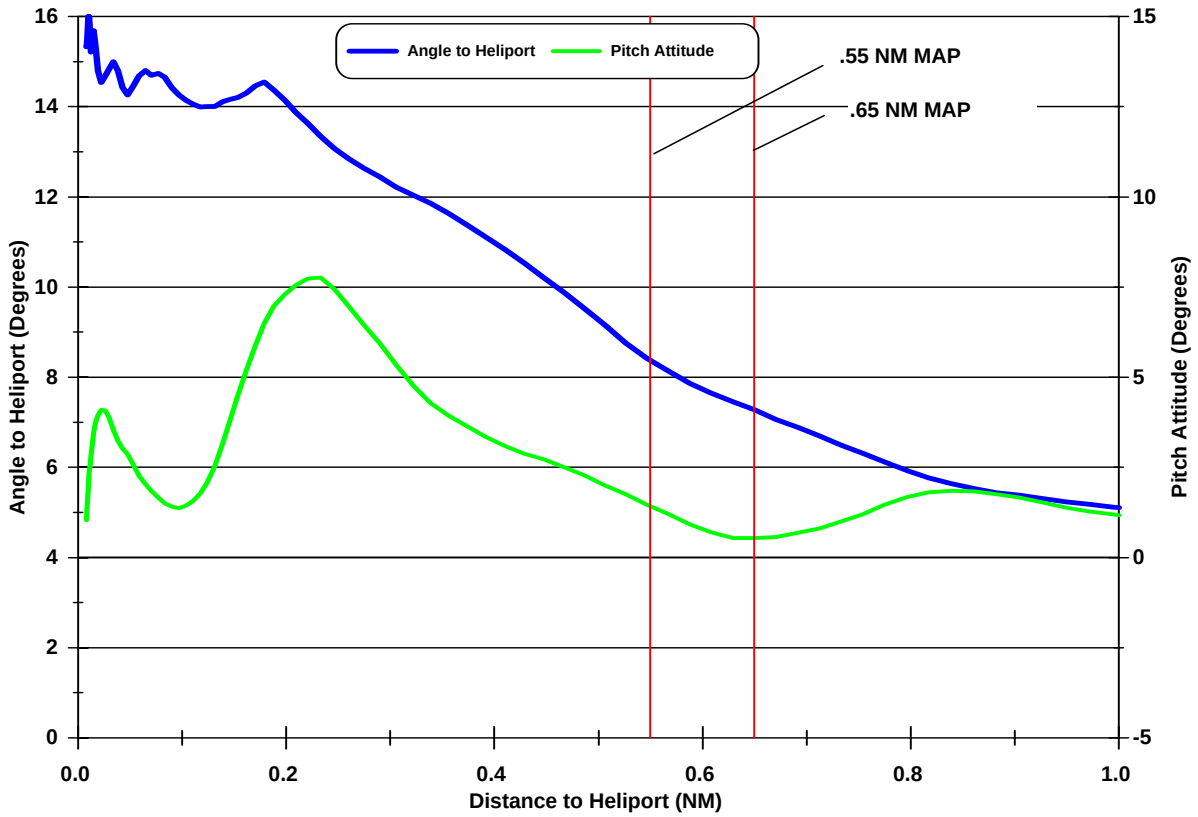
Profile View
Pilot P06 - 05/03/06b010 - Appr. #10X



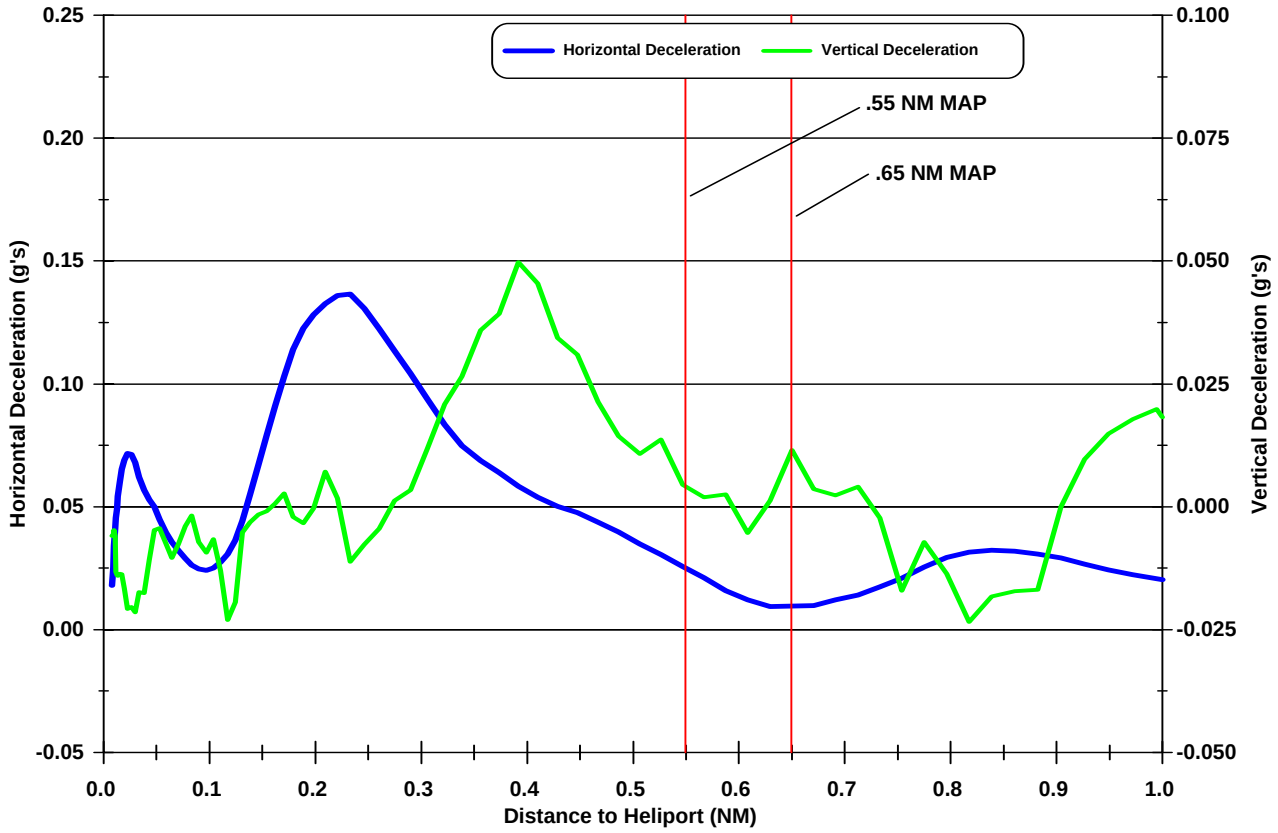
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06b010 - Appr. #10X

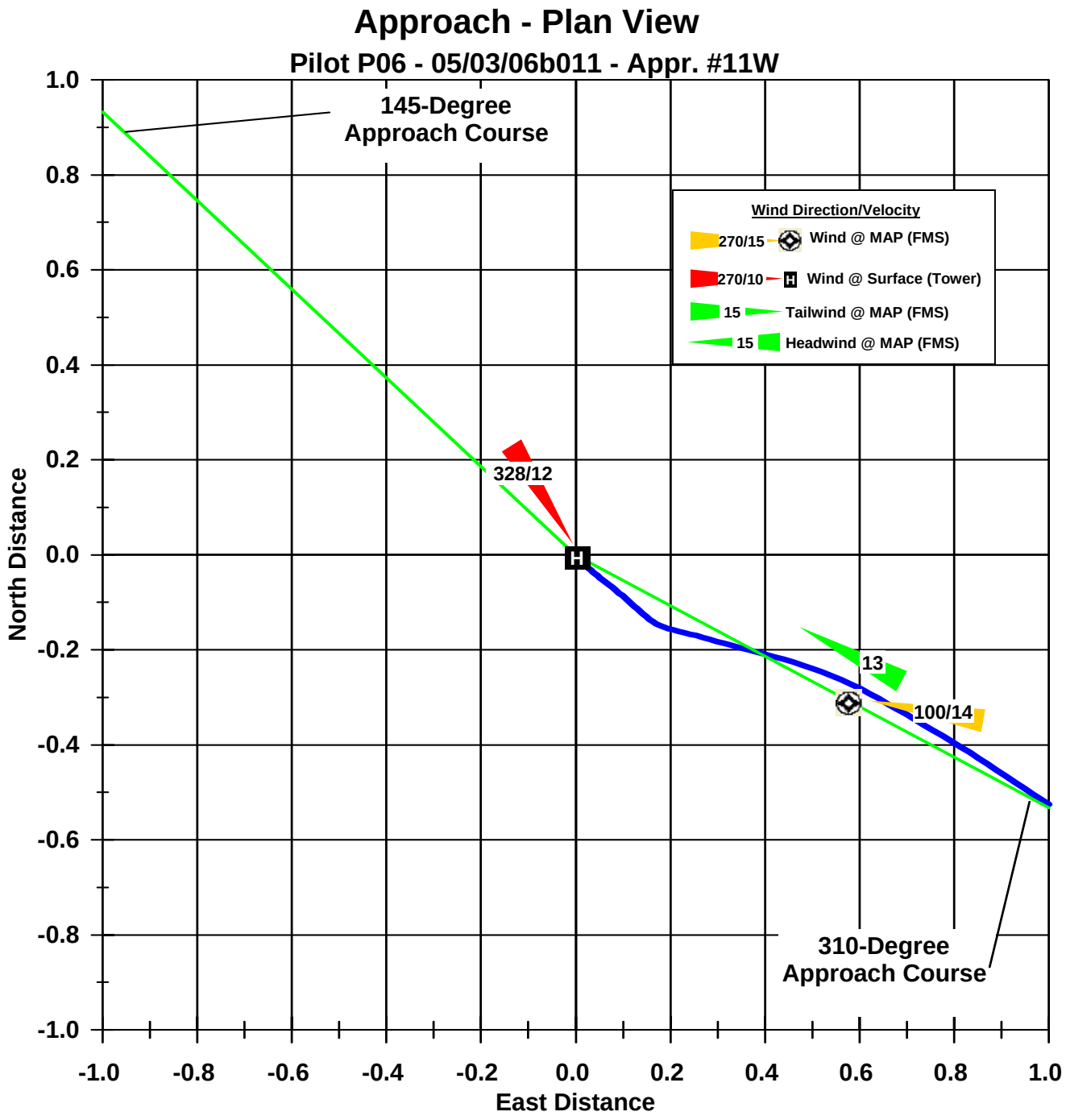


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06b010 - Appr. #10X

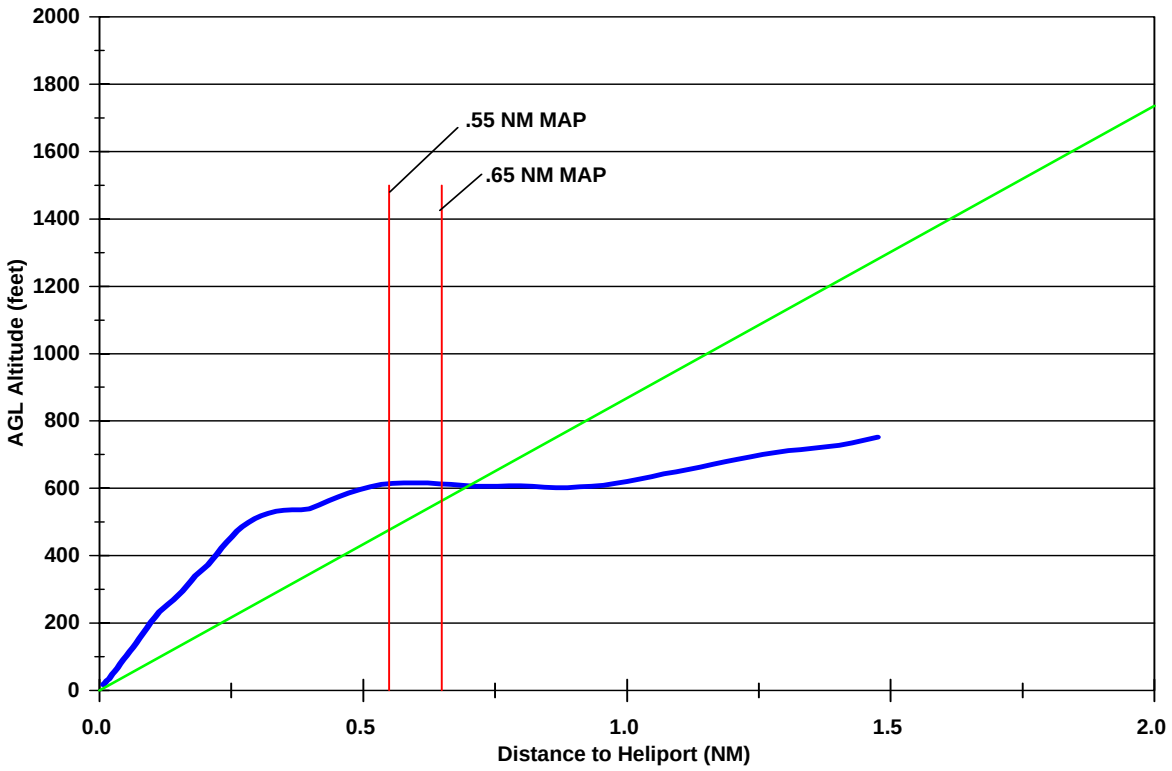


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06b010 - Appr. #10X

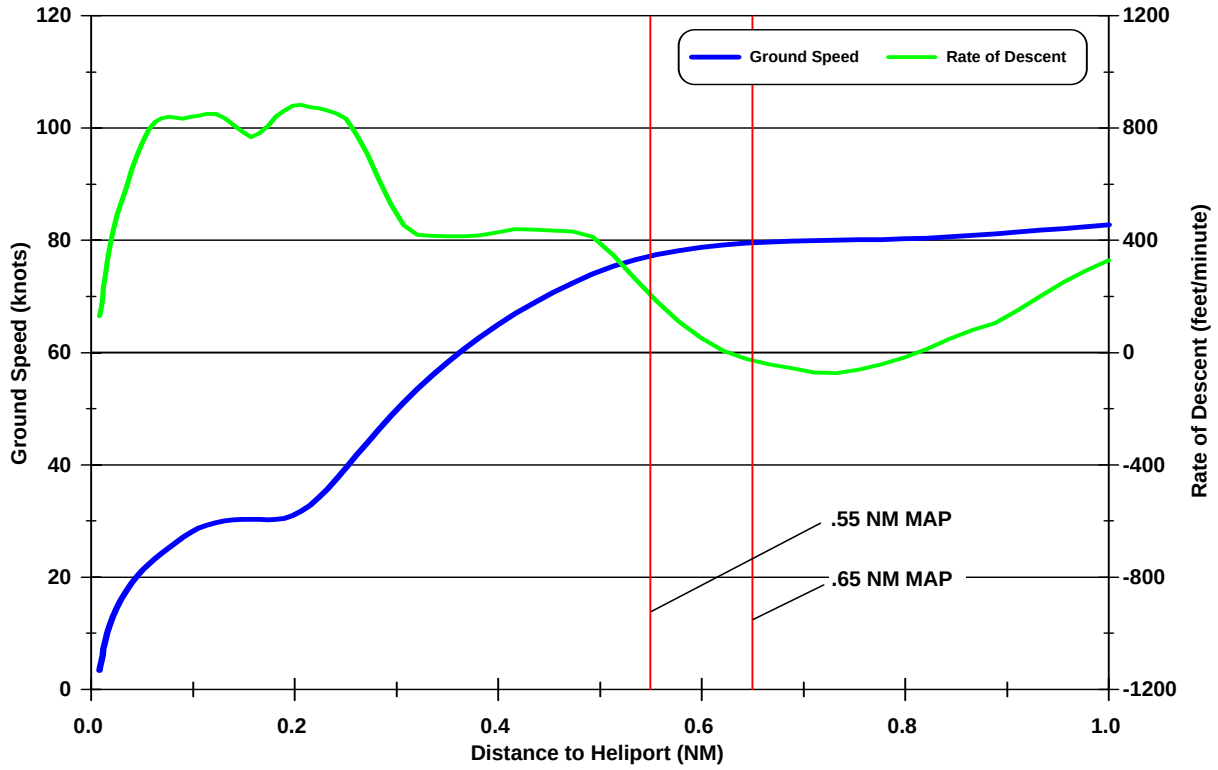



Approach - Plan View
Pilot P06 - 05/03/06b011 - Appr. #11W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
328/12
13
100/14
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

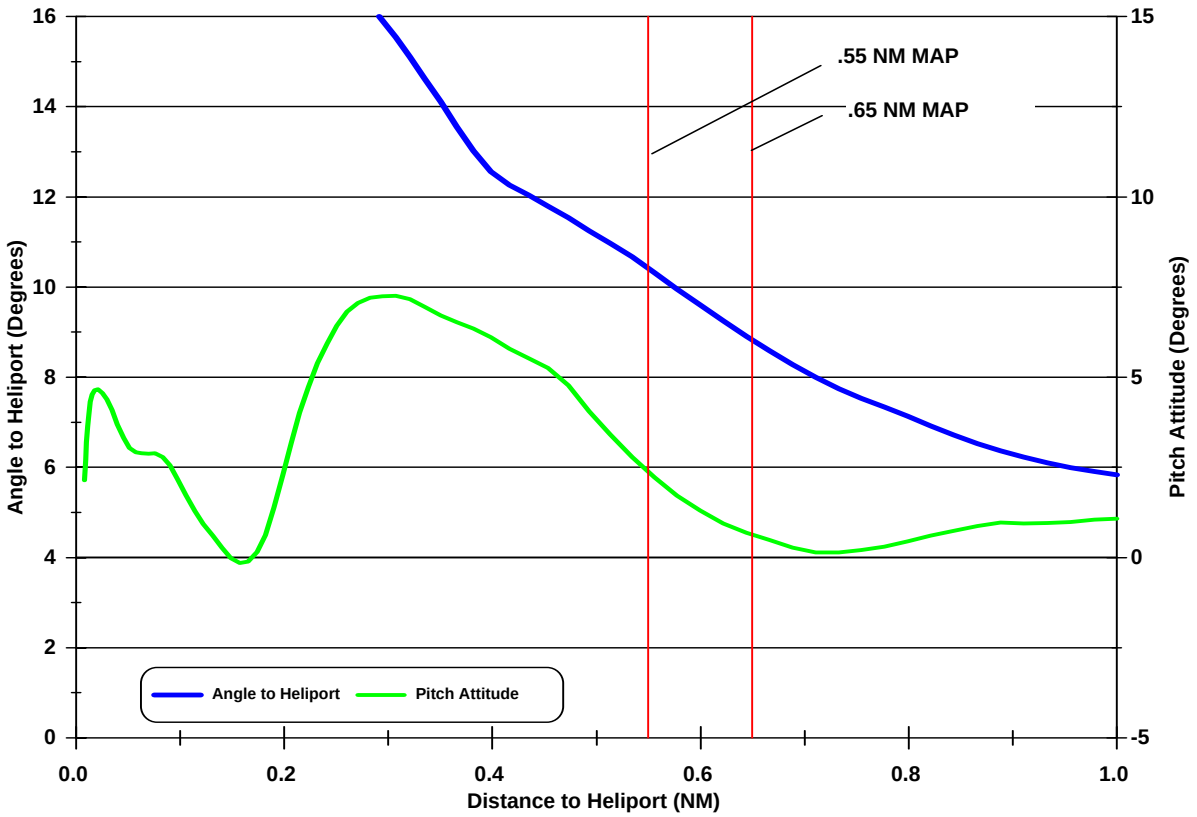
Profile View
Pilot P06 - 05/03/06b011 - Appr. #11W



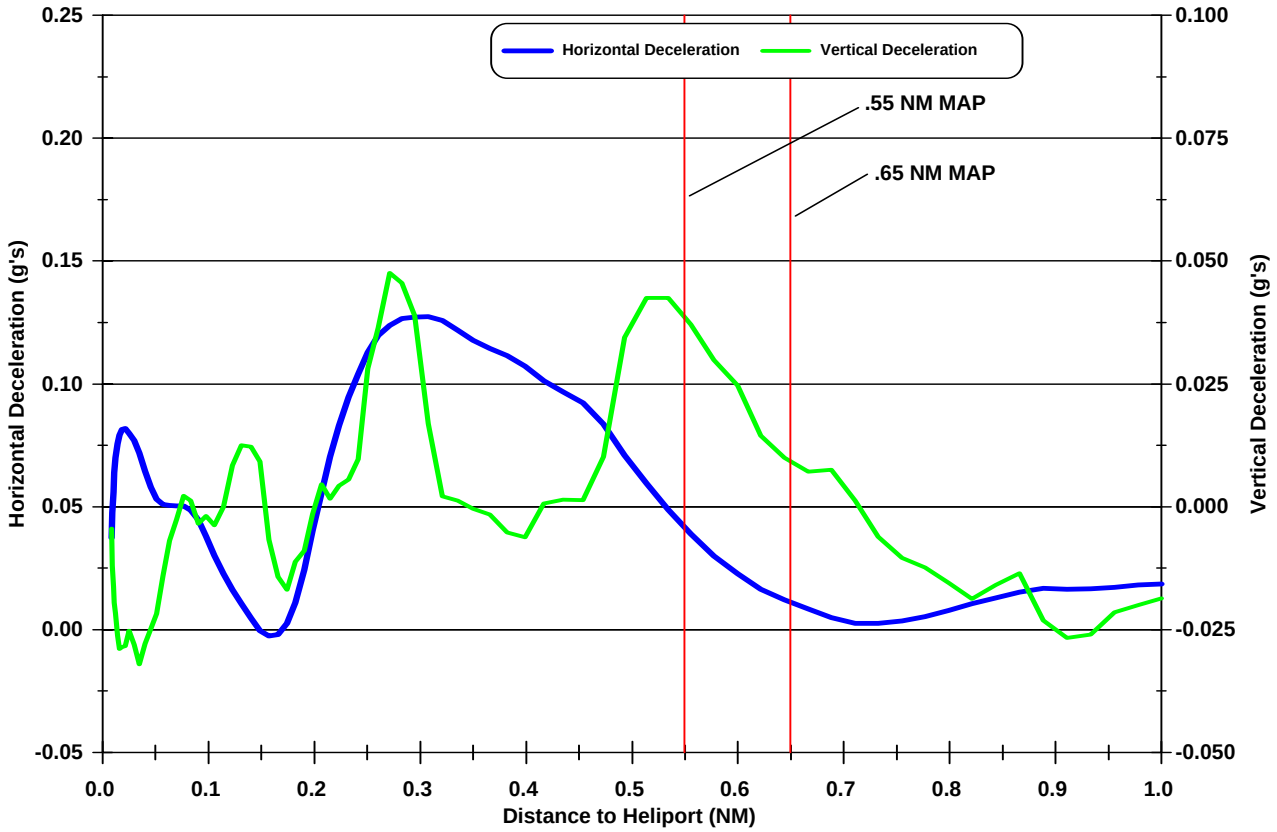
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06b011 - Appr. #11W

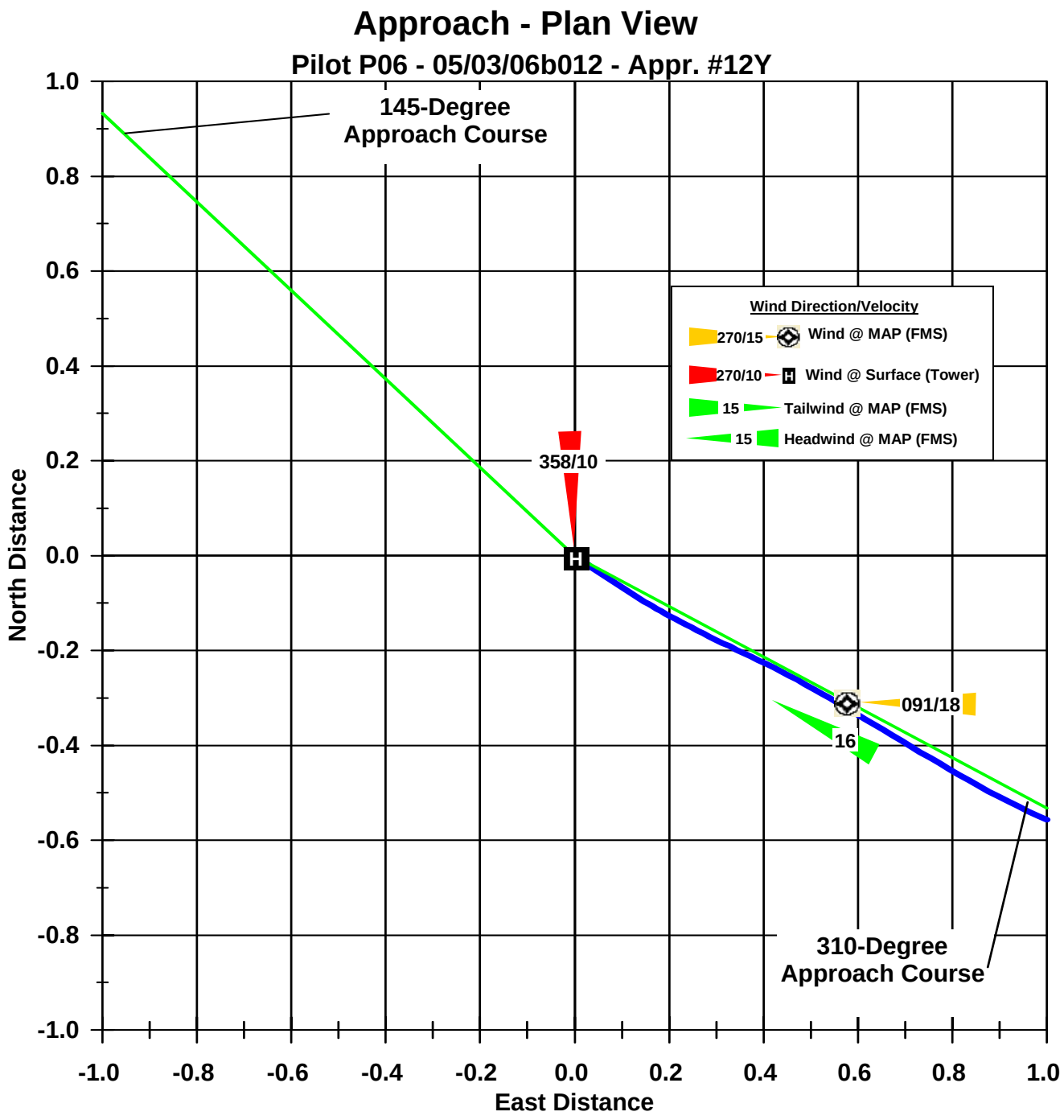


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06b011 - Appr. #11W

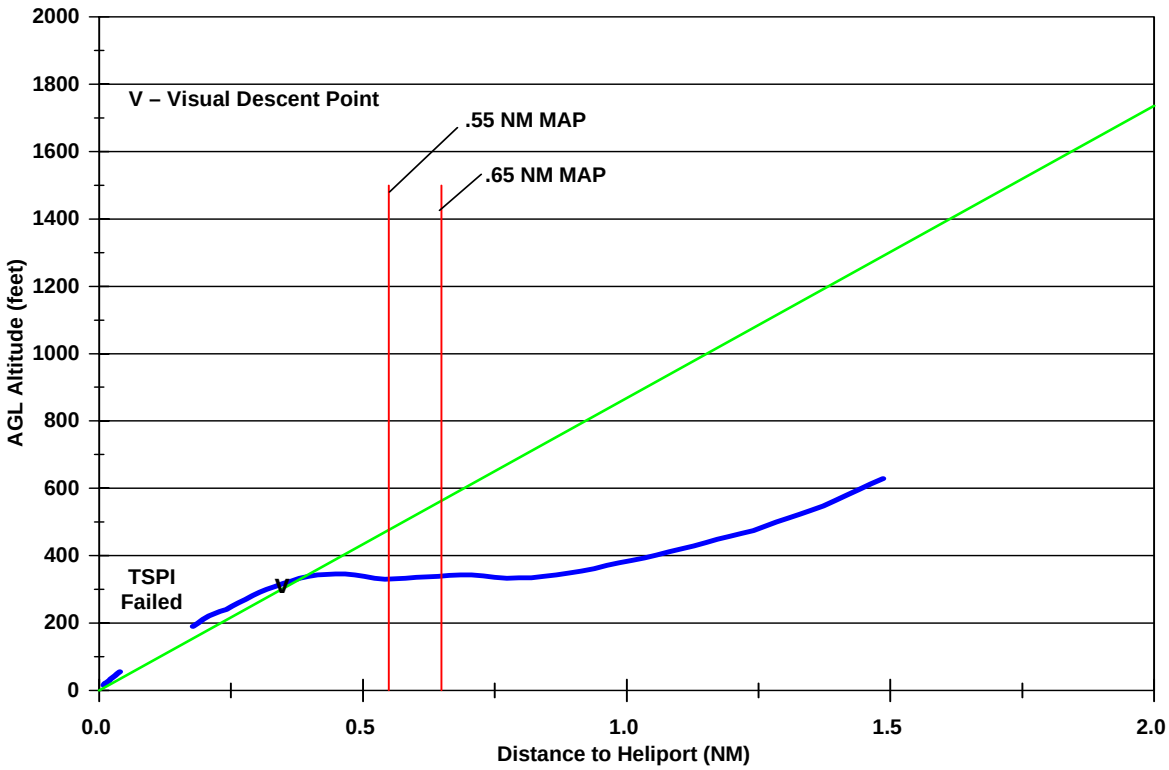


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06b011 - Appr. #11W

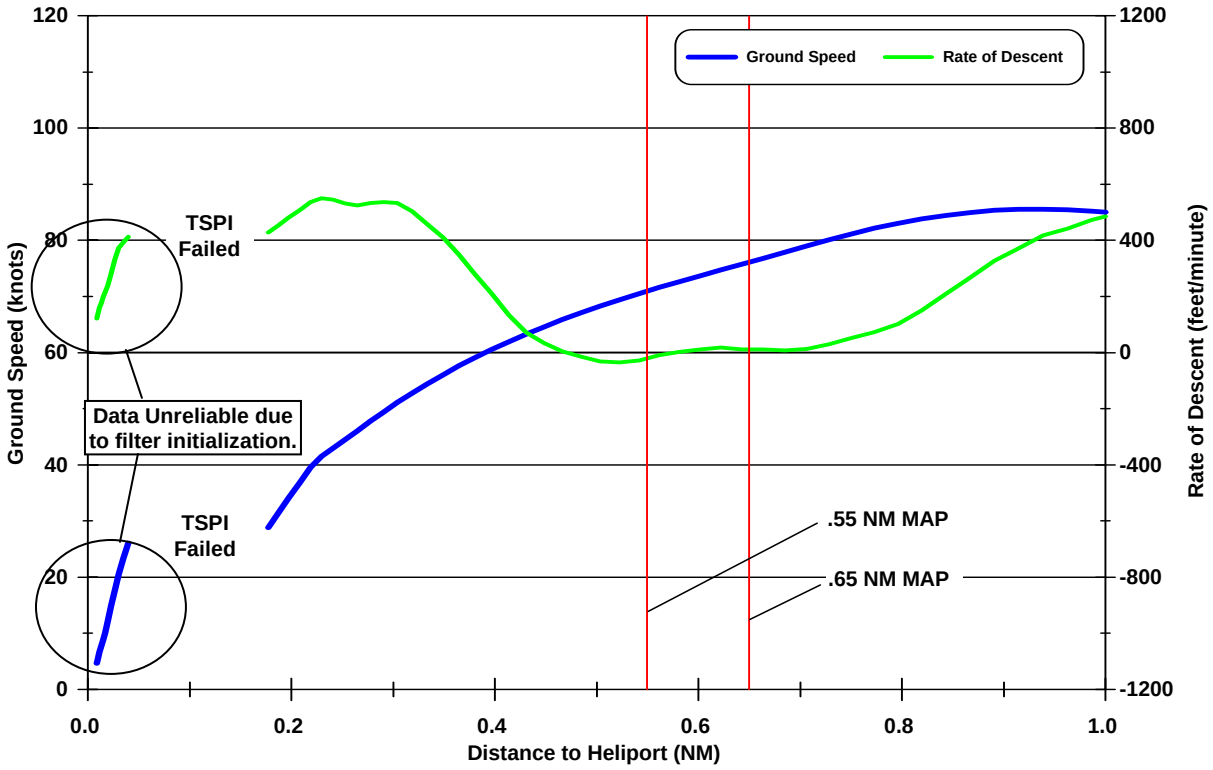



Approach - Plan View
Pilot P06 - 05/03/06b012 - Appr. #12Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
358/10
091/18
16
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

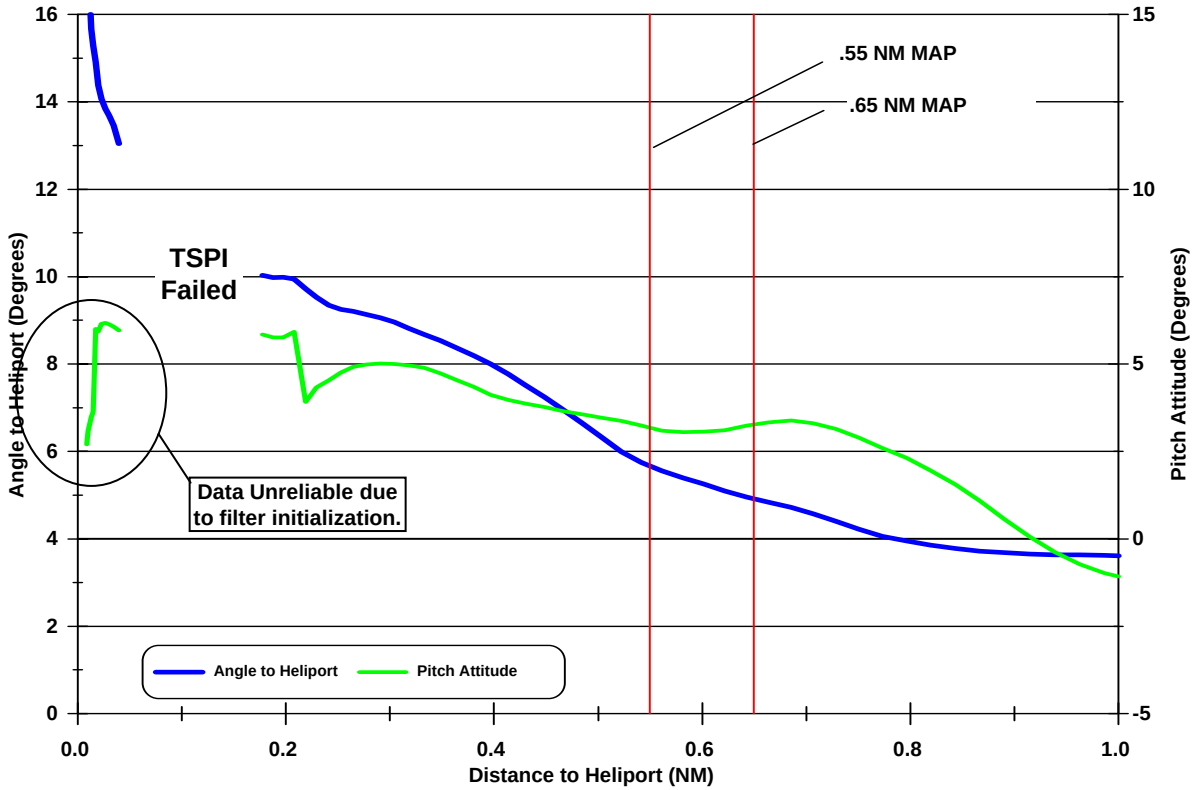
Profile View
Pilot P06 - 05/03/06b012 - Appr. #12Y



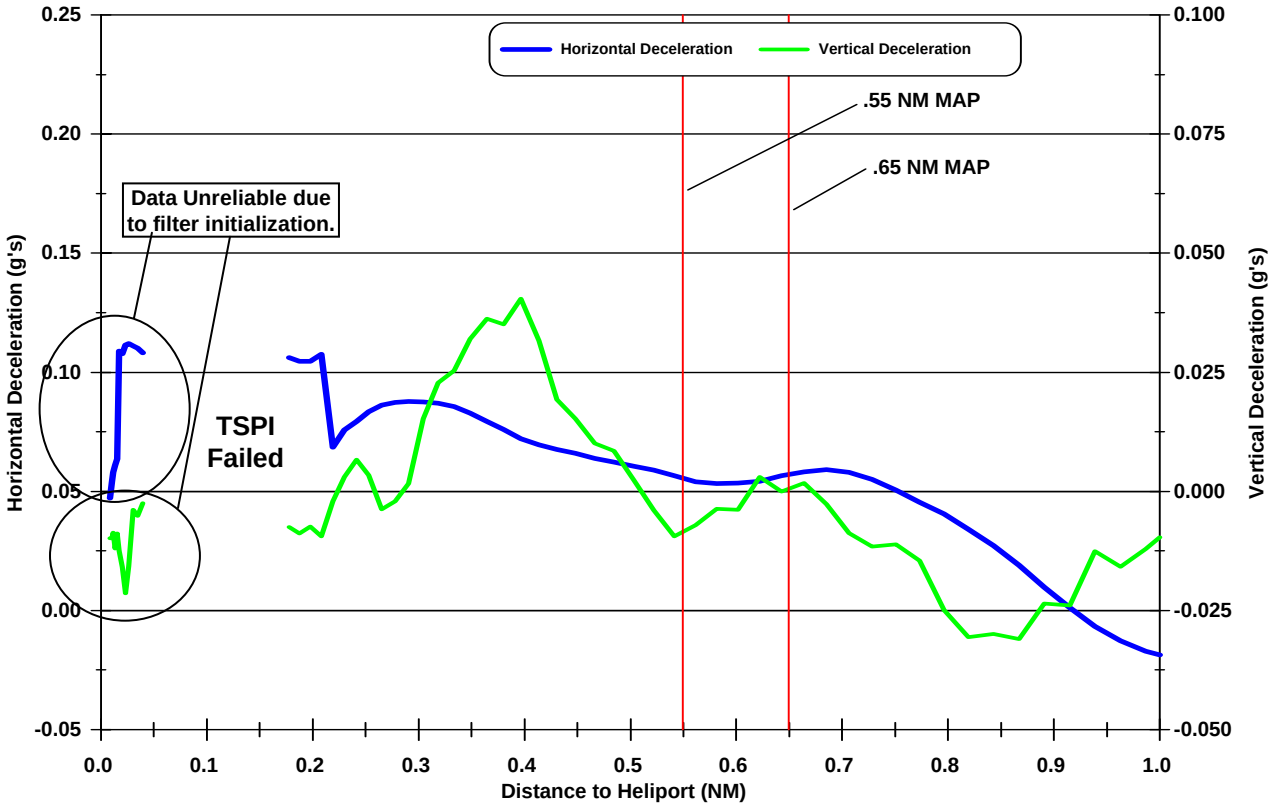
Ground Speed and Rate of Descent
Pilot P06 - 05/03/06b012 - Appr. #12Y

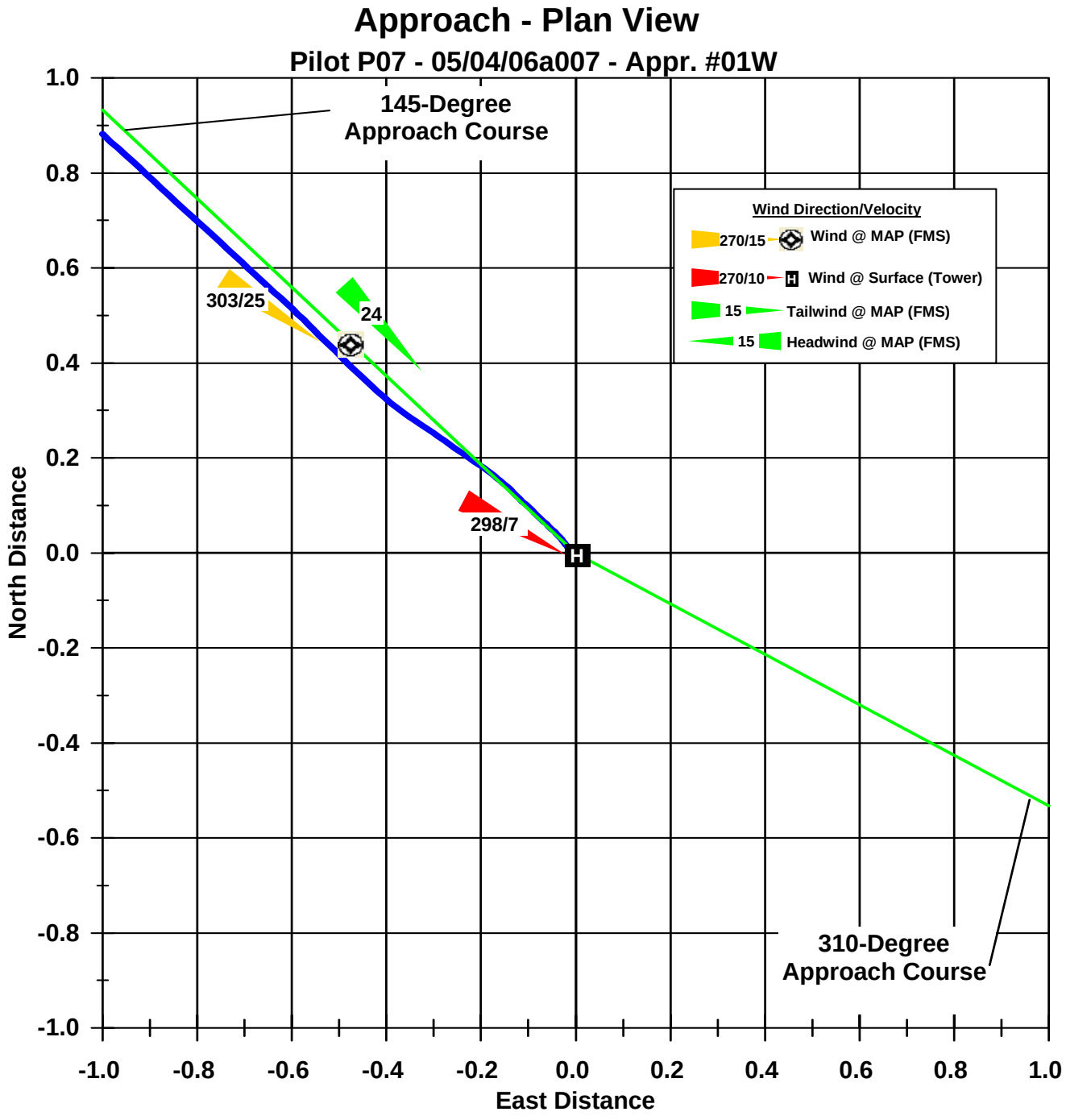


Angle to Heliport and Pitch Attitude
Pilot P06 - 05/03/06b012 - Appr. #12Y

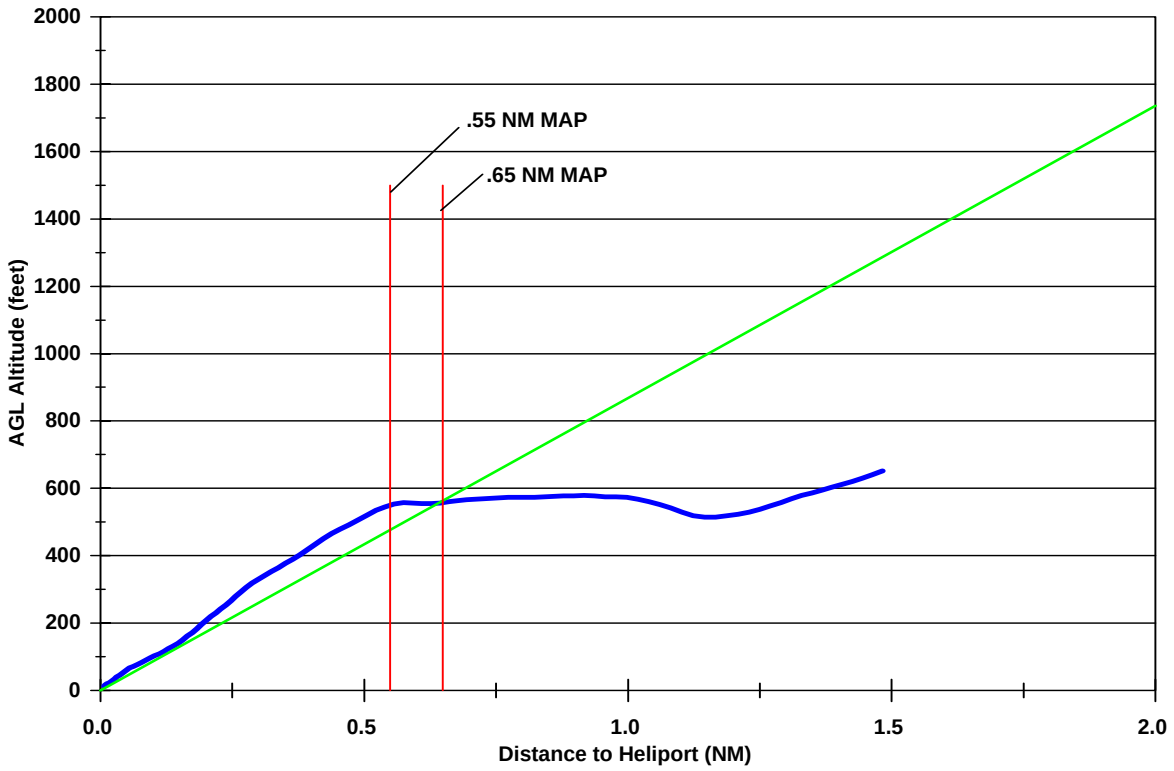


Horizontal and Vertical Deceleration
Pilot P06 - 05/03/06b012 - Appr. #12Y

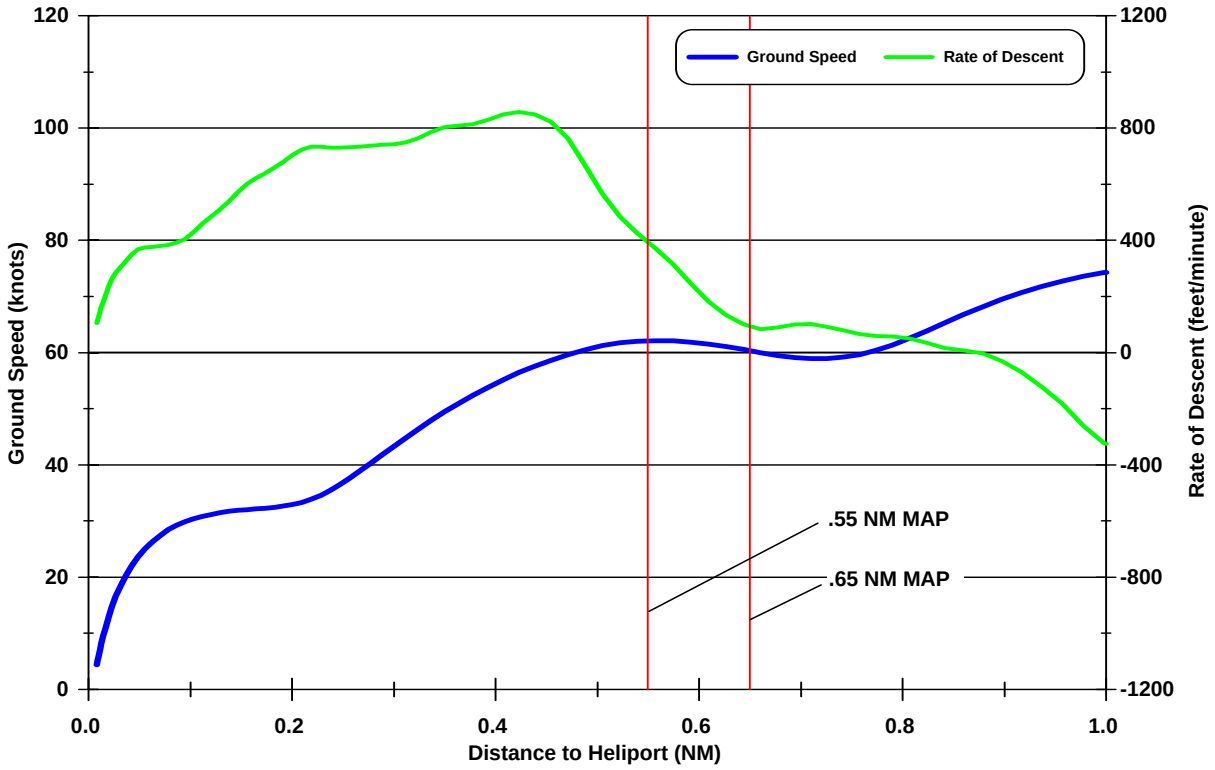



Approach - Plan View
Pilot P07 - 05/04/06a007 - Appr. #01W
145-Degree
Approach Course
310-Degree
Approach Course
303/25
24
298/7
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

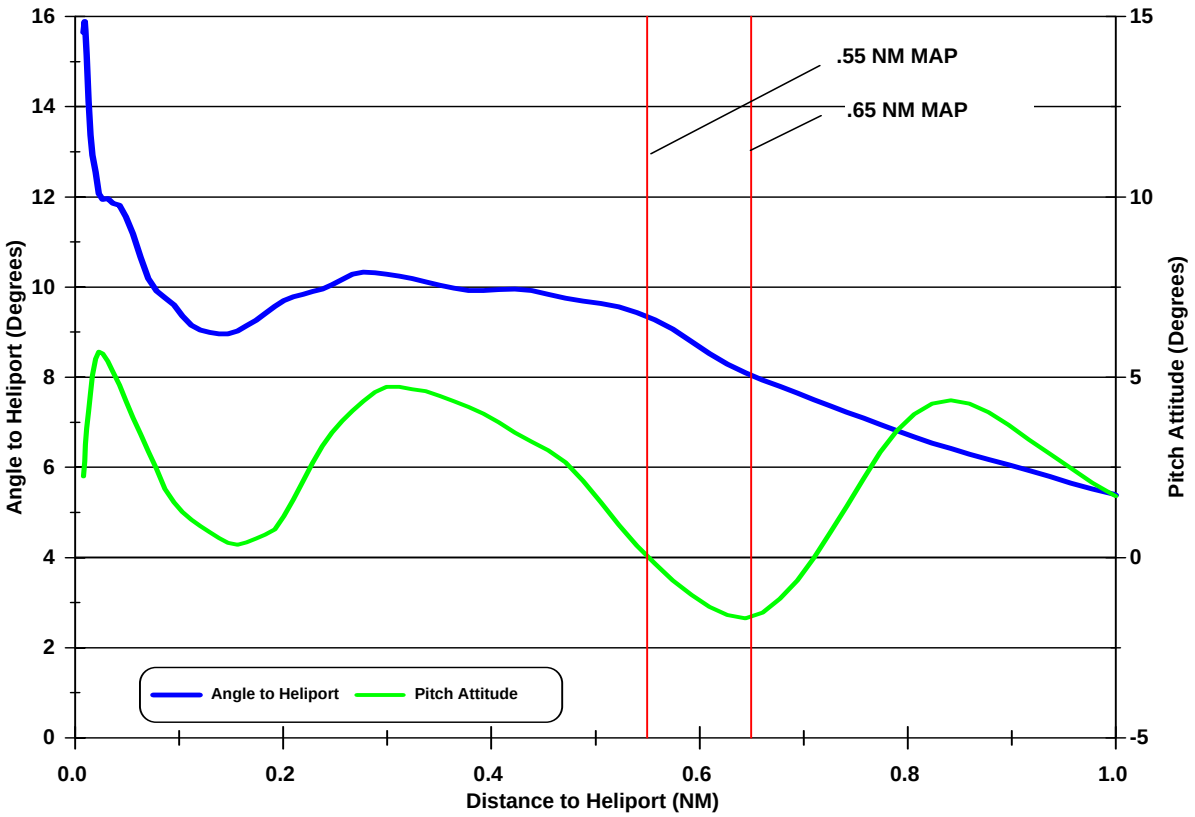
Profile View
Pilot P07 - 05/04/06a007 - Appr. #01W



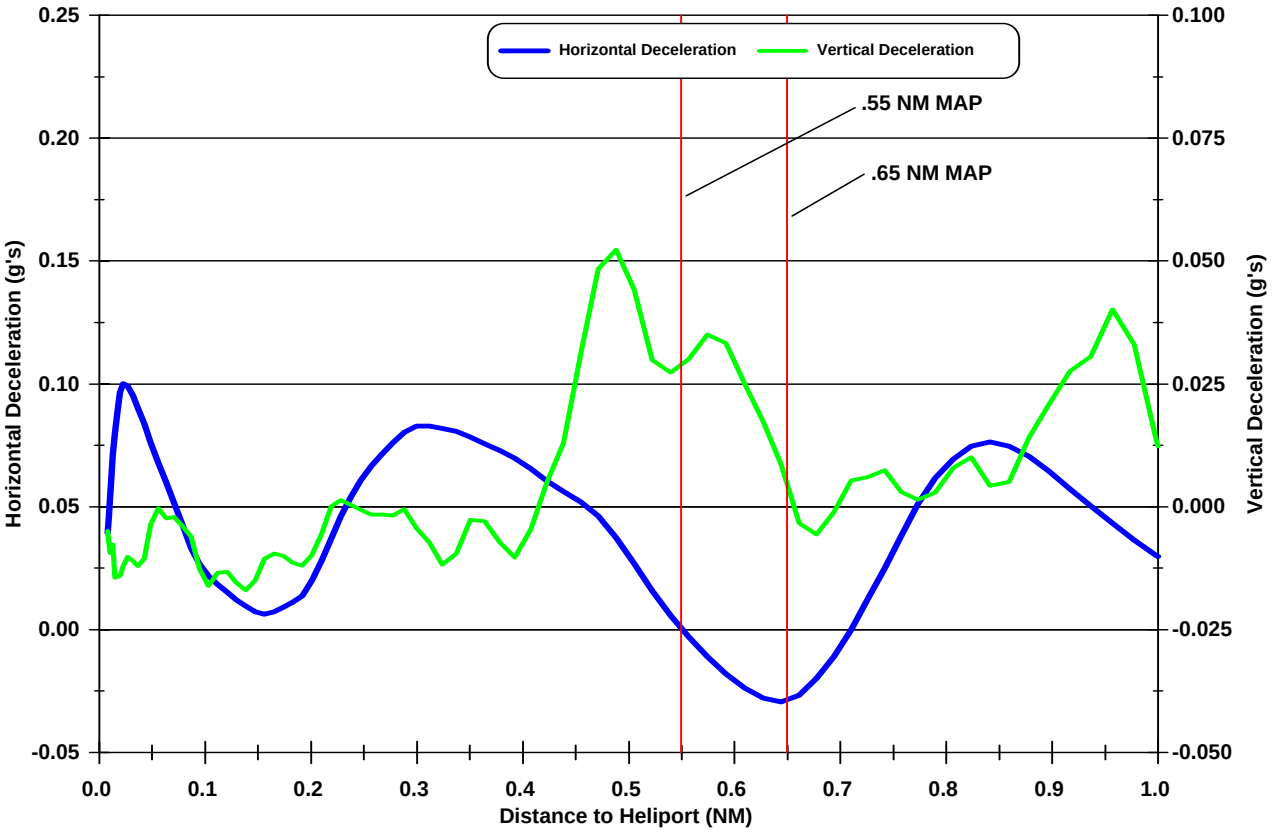
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06a007 - Appr. #01W

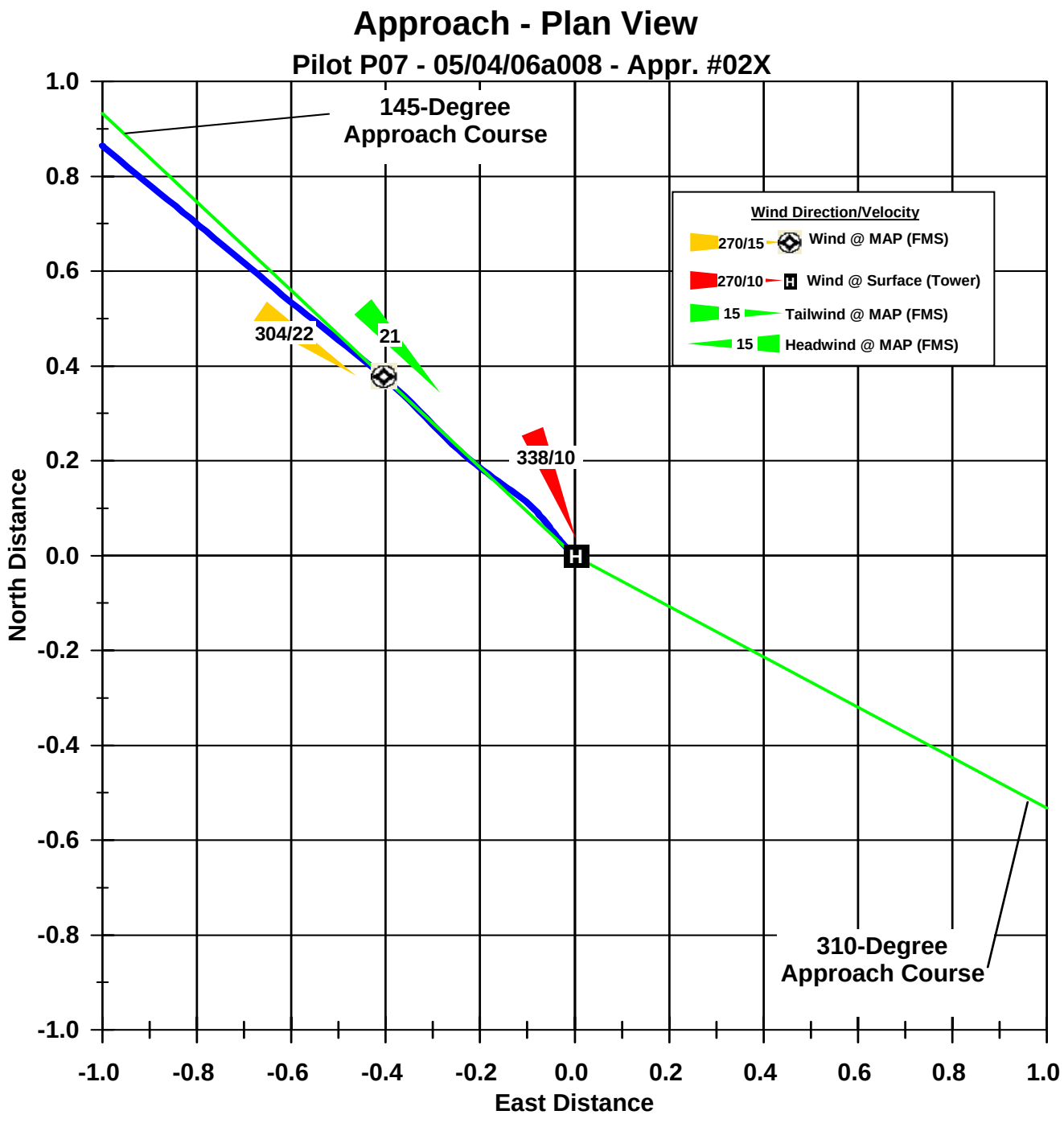


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06a007 - Appr. #01W

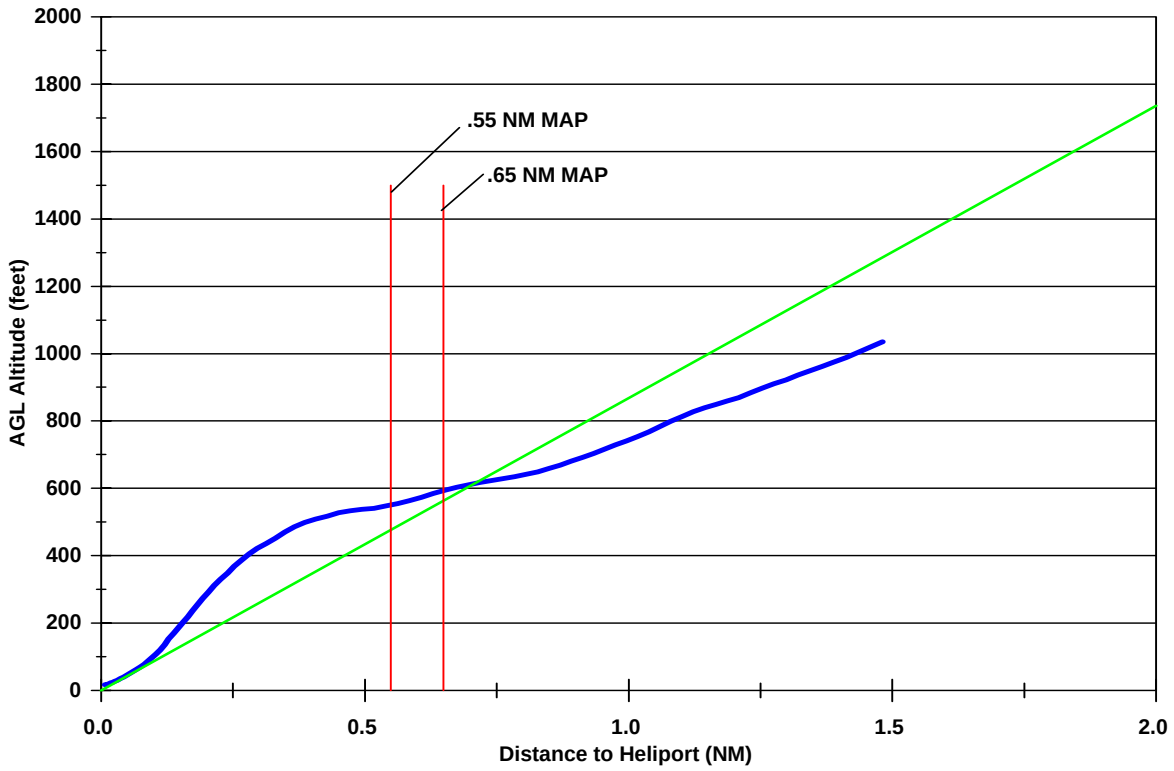


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06a007 - Appr. #01W

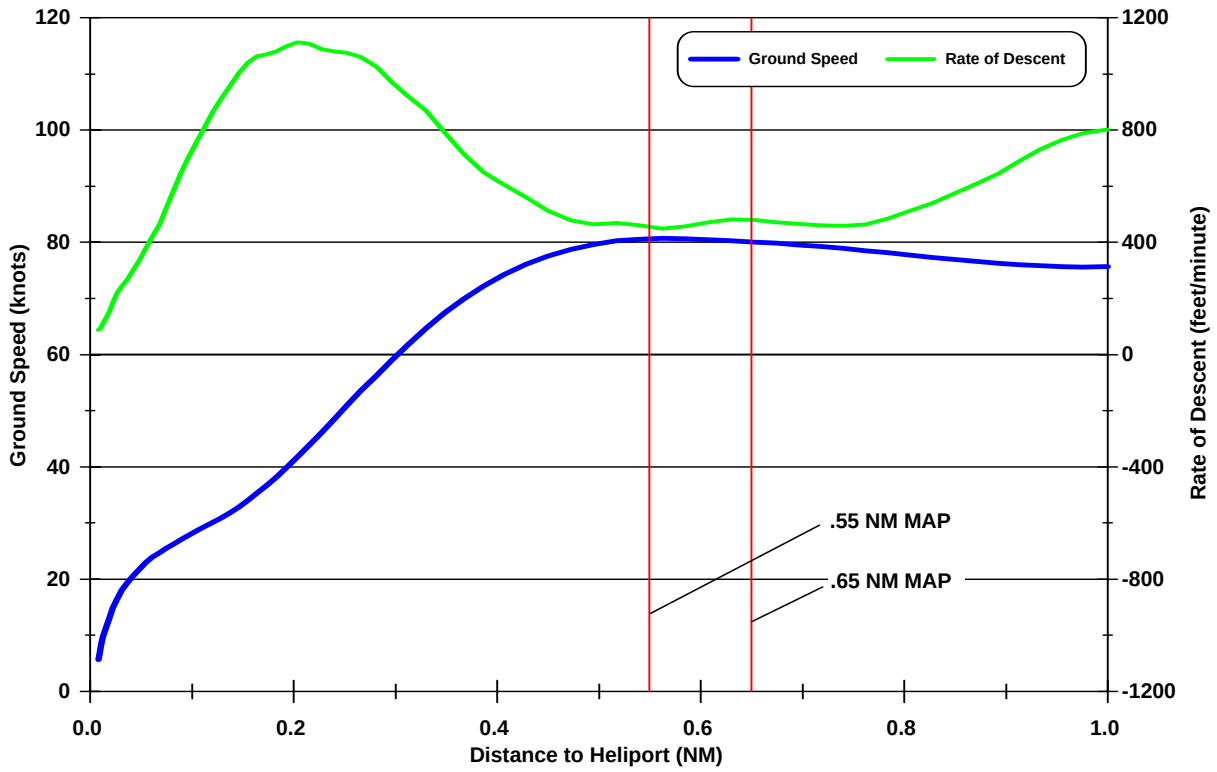



Approach - Plan View
Pilot P07 - 05/04/06a008 - Appr. #02X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
304/22
21
338/10
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

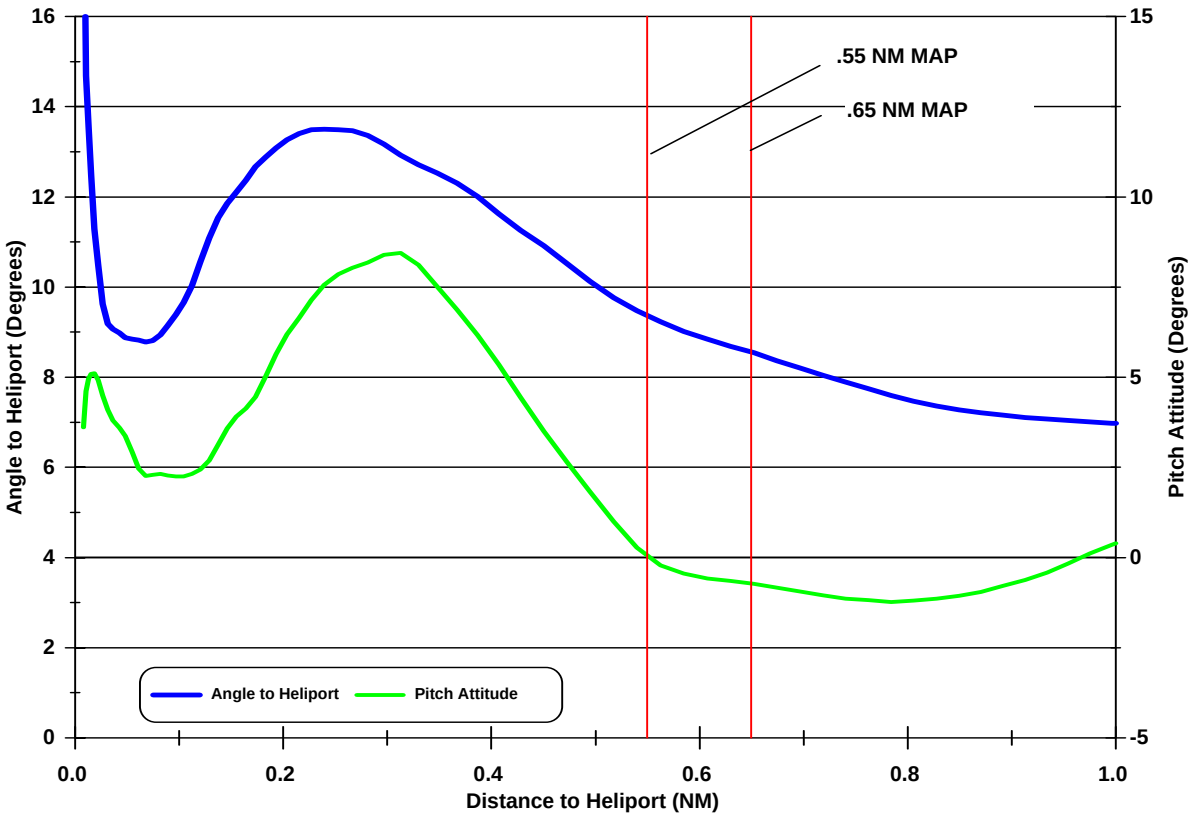
Profile View
Pilot P07 - 05/04/06a008 - Appr. #02X



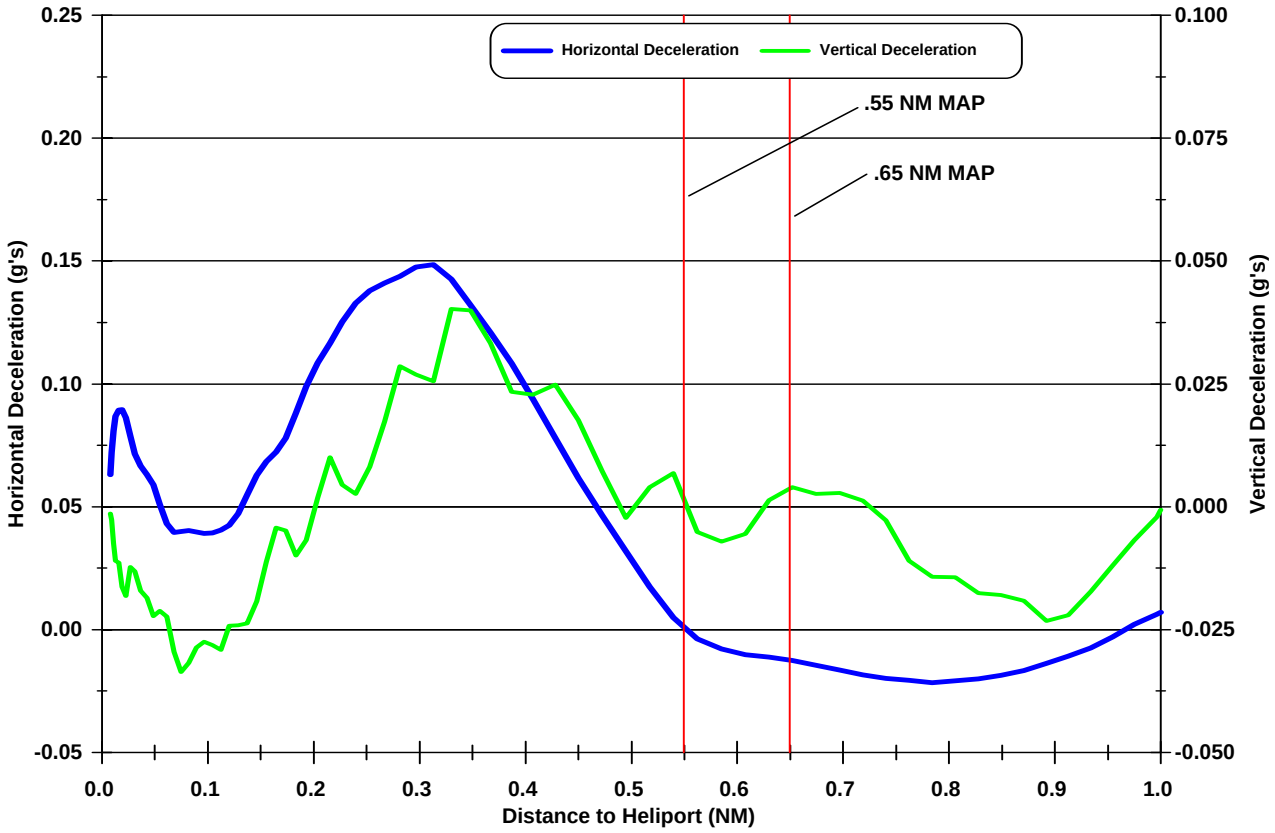
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06a008 - Appr. #02X

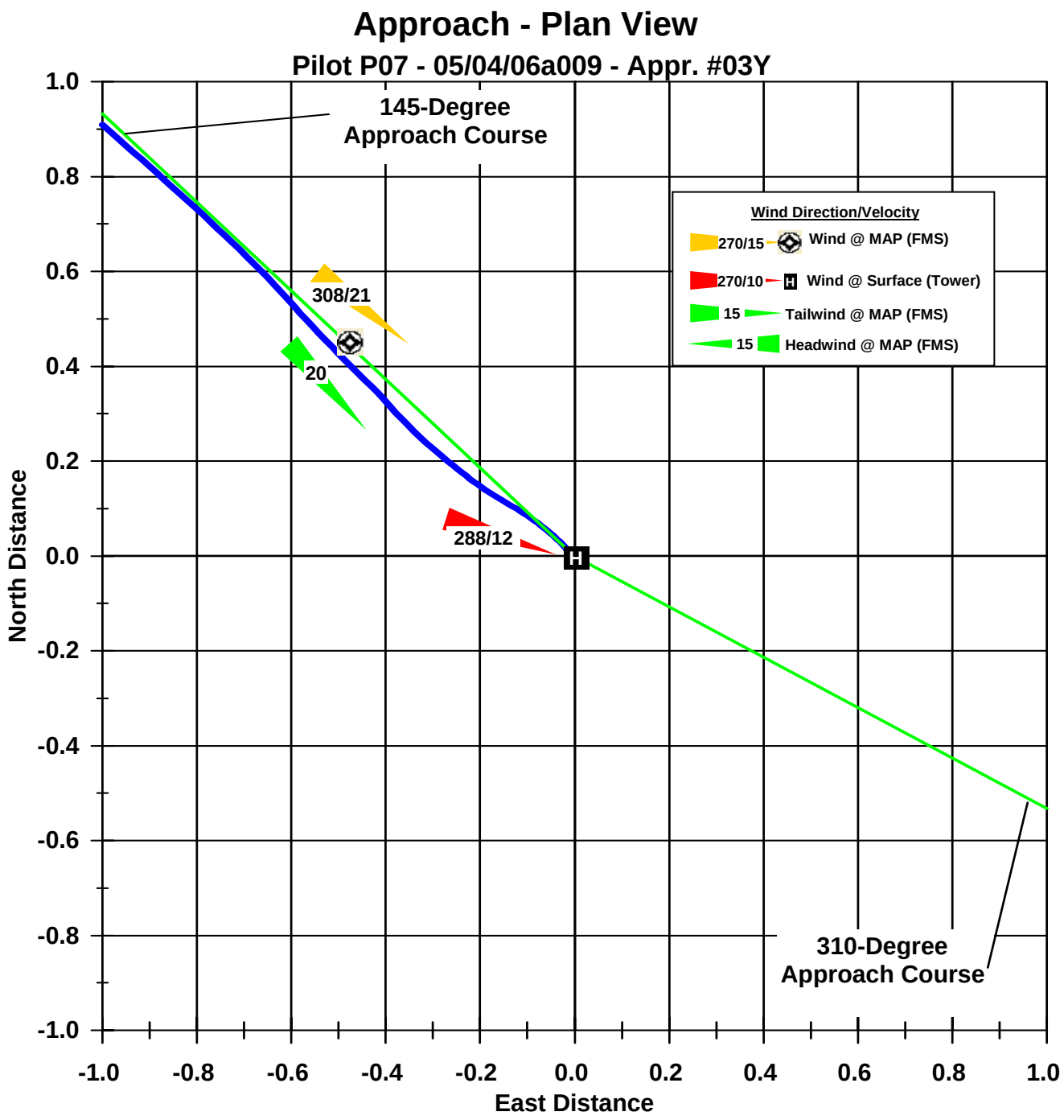


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06a008 - Appr. #02X

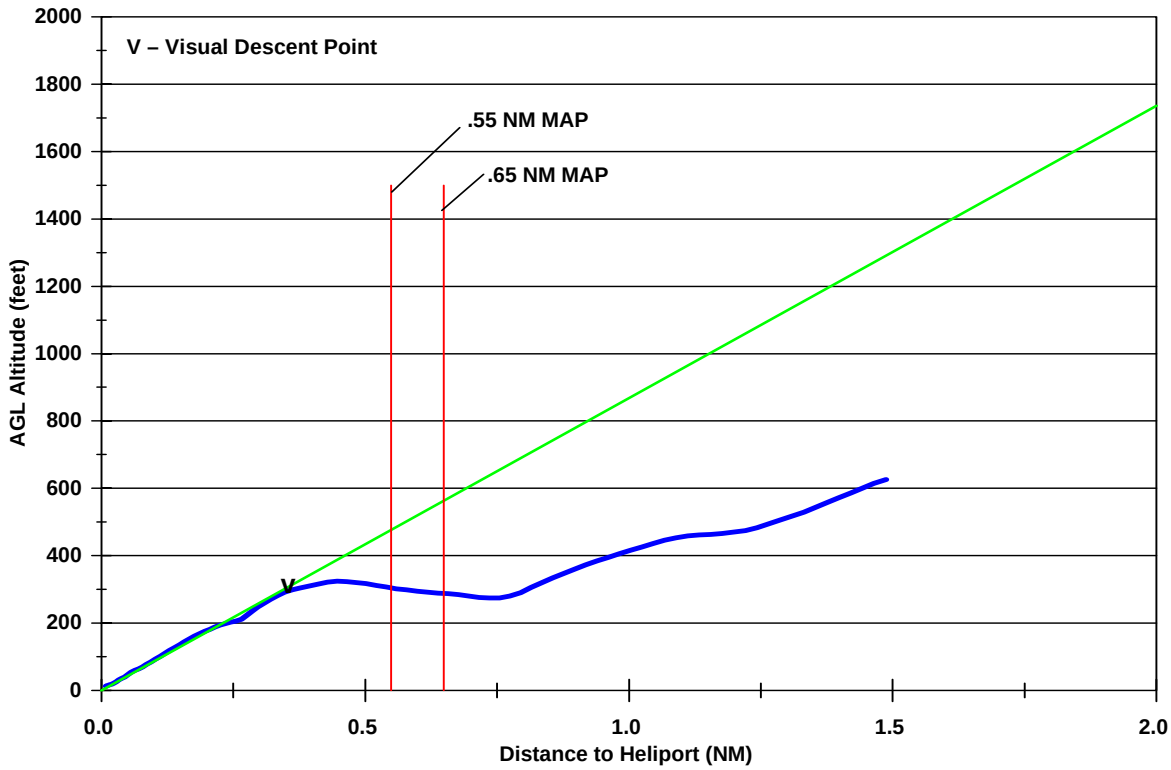


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06a008 - Appr. #02X

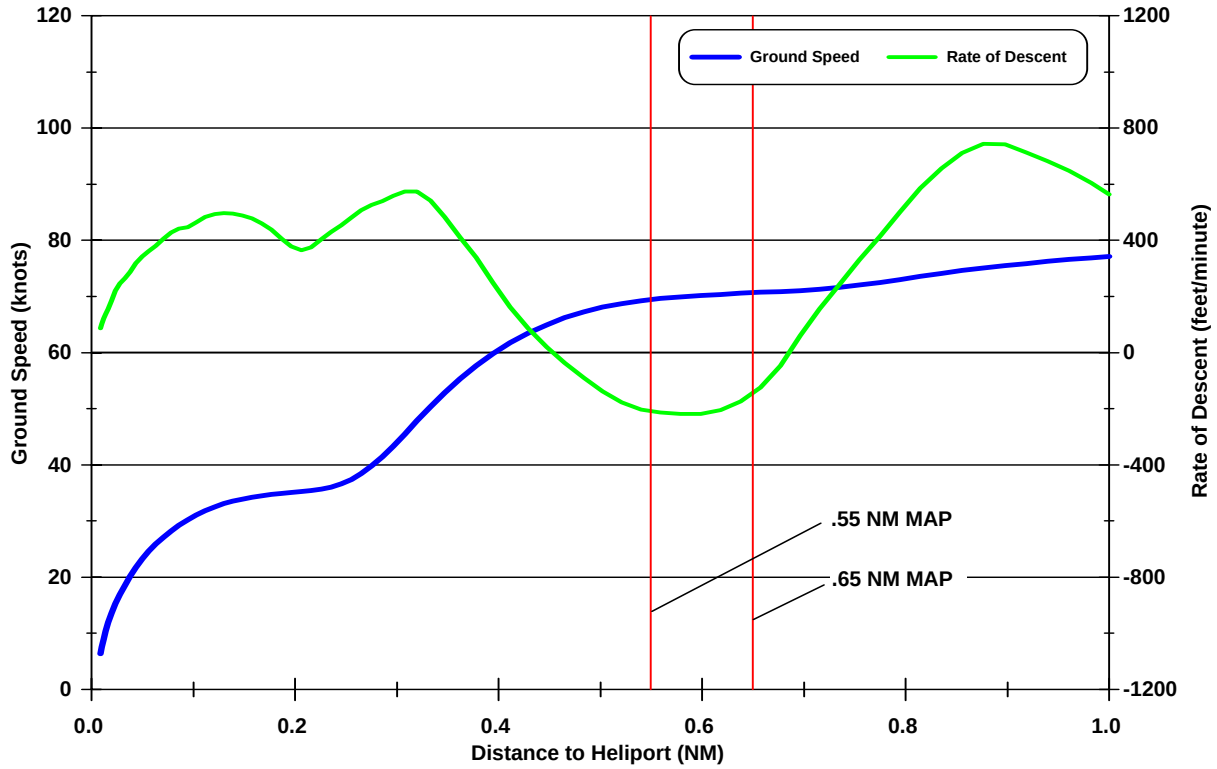



Approach - Plan View
Pilot P07 - 05/04/06a009 - Appr. #03Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
308/21
20
288/12
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

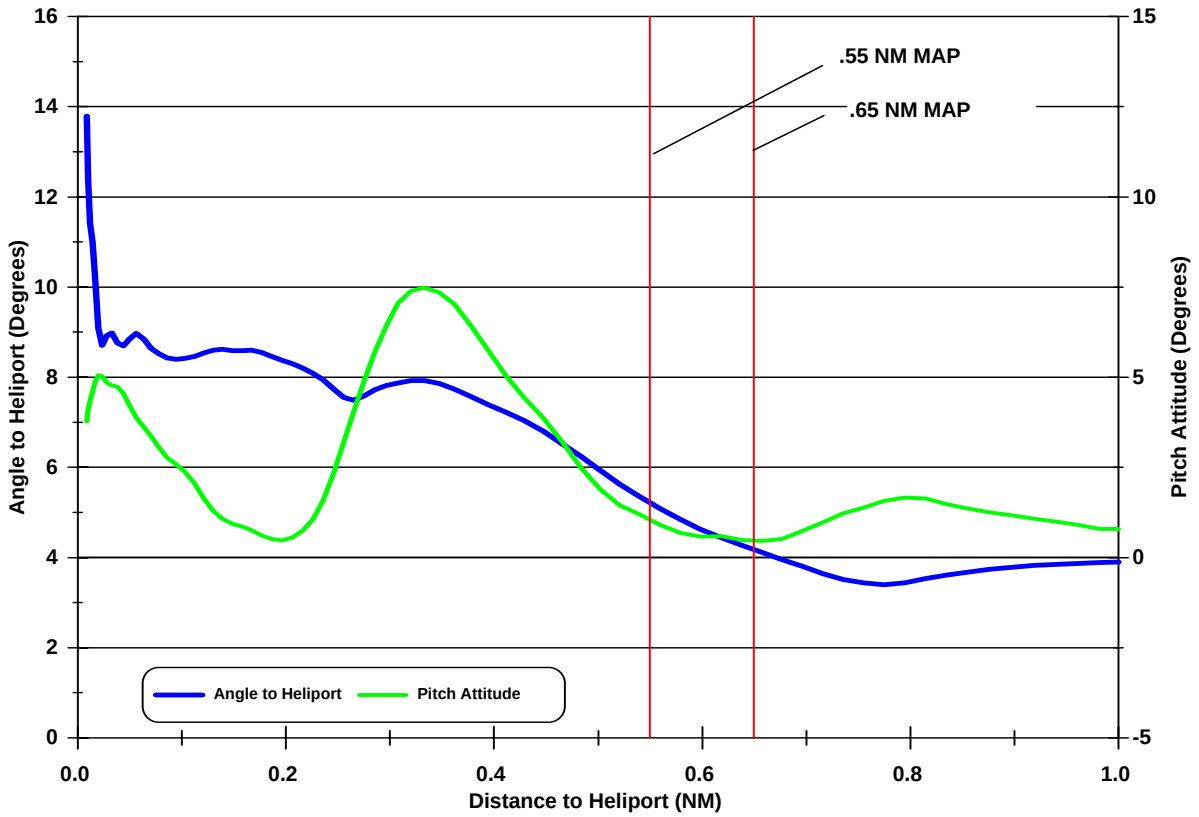
Profile View
Pilot P07 - 05/04/06a009 - Appr. #03Y



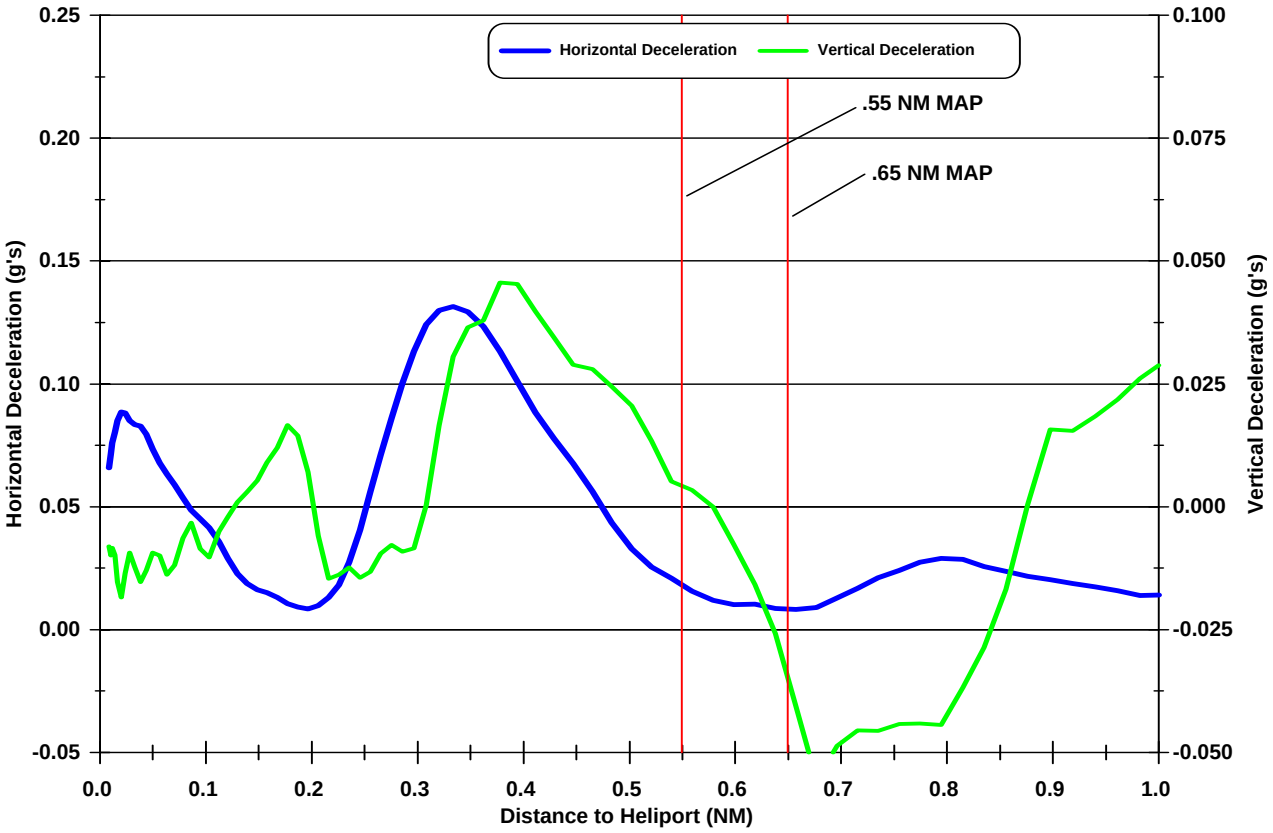
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06a009 - Appr. #03Y

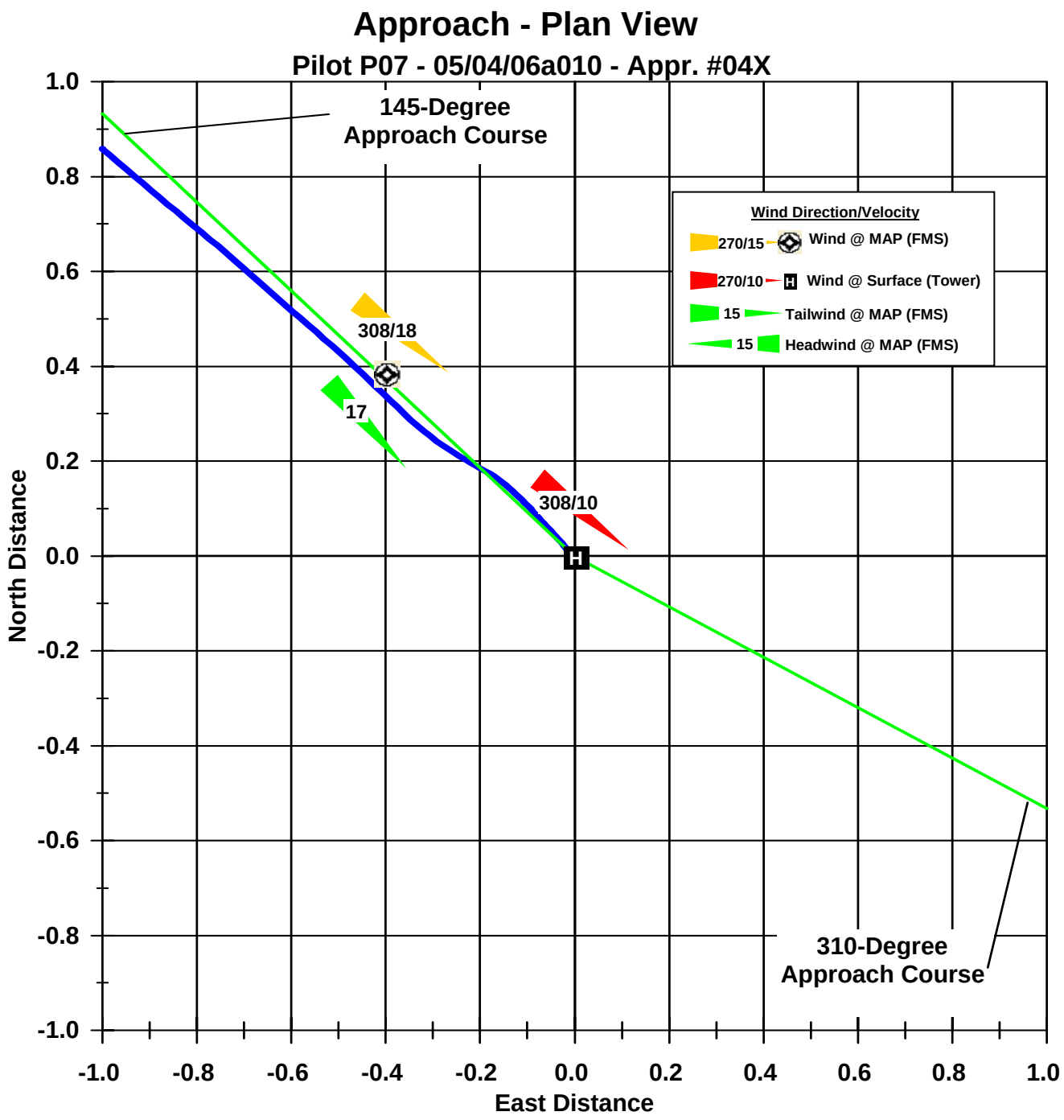


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06a009 - Appr. #03Y

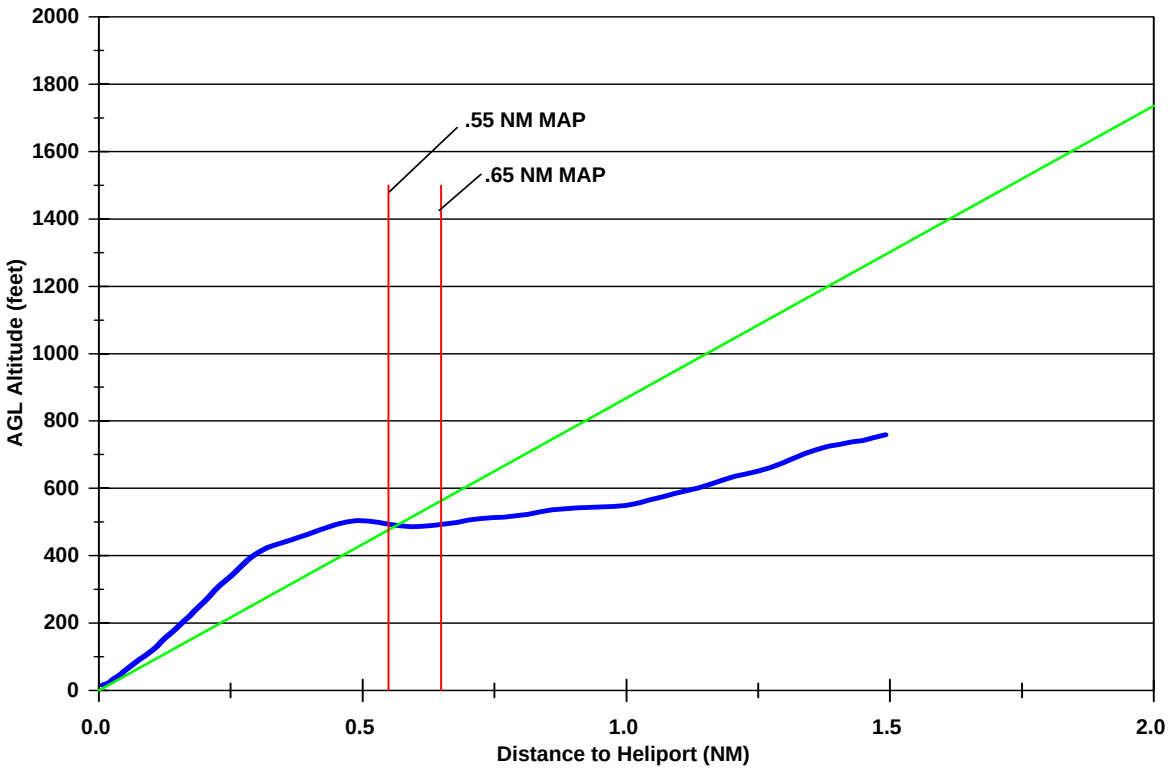


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06a009 - Appr. #03Y

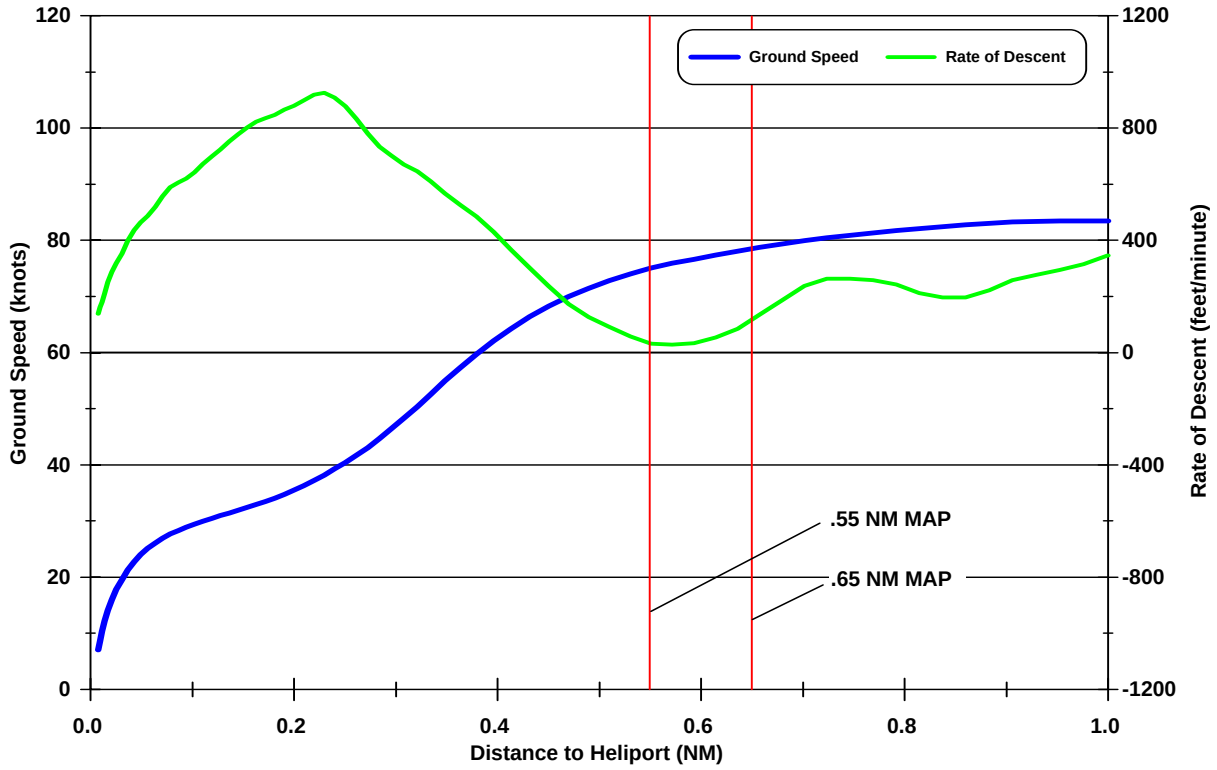



Approach - Plan View
Pilot P07 - 05/04/06a010 - Appr. #04X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
308/18
17
308/10
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

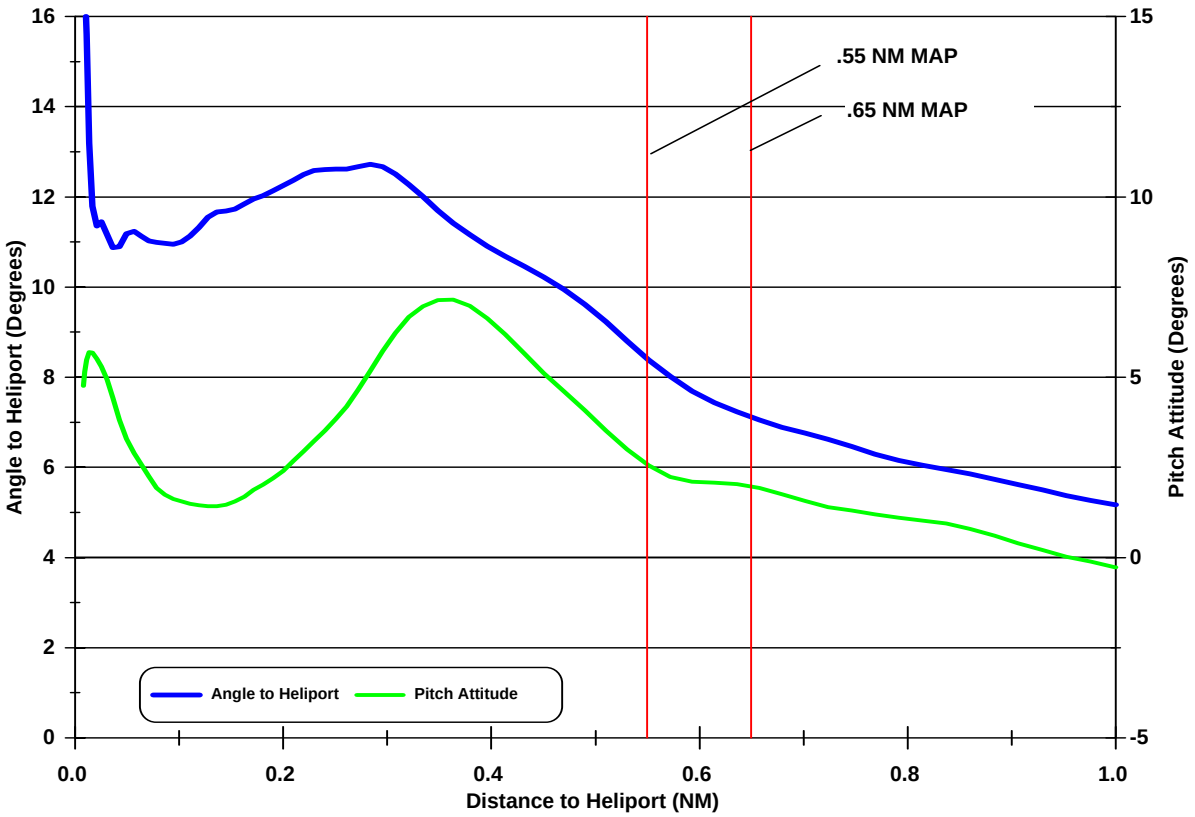
Profile View
Pilot P07 - 05/04/06a010 - Appr. #04X



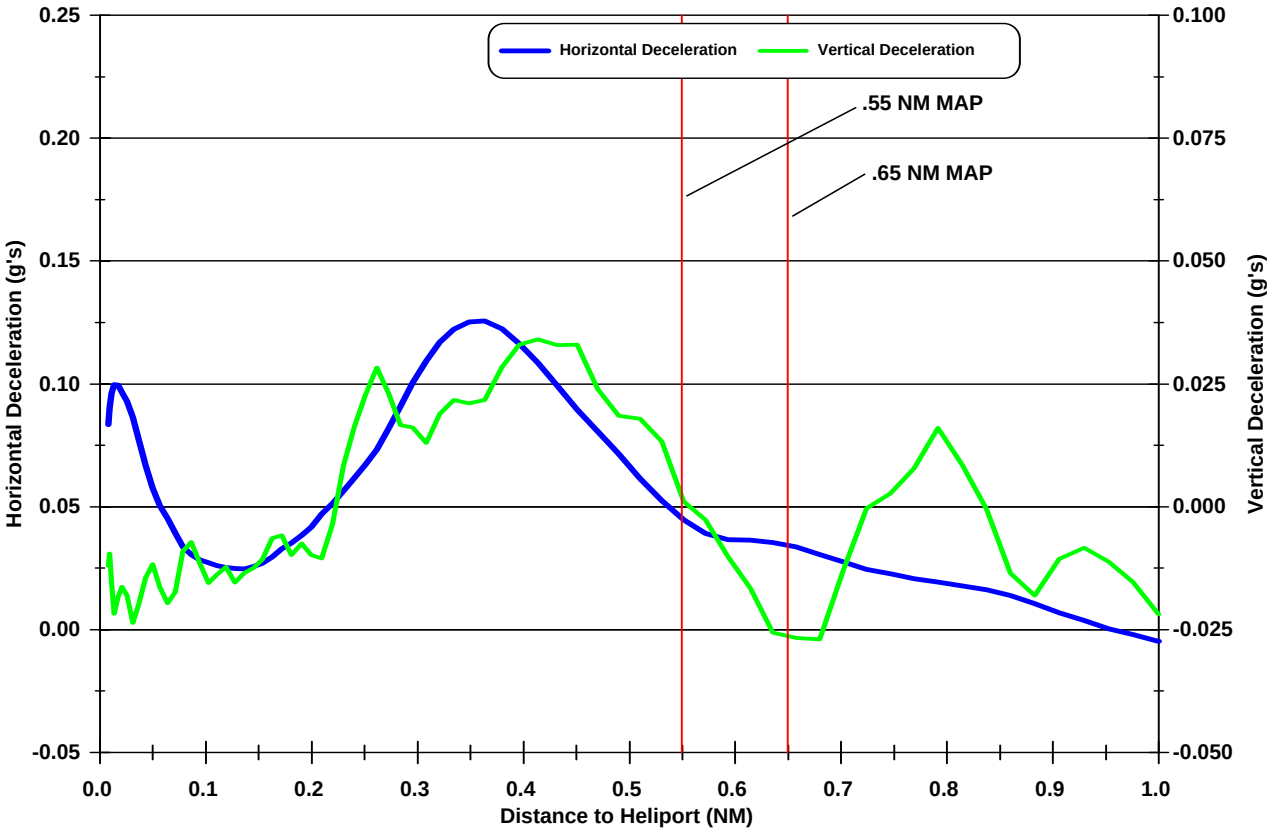
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06a010 - Appr. #04X

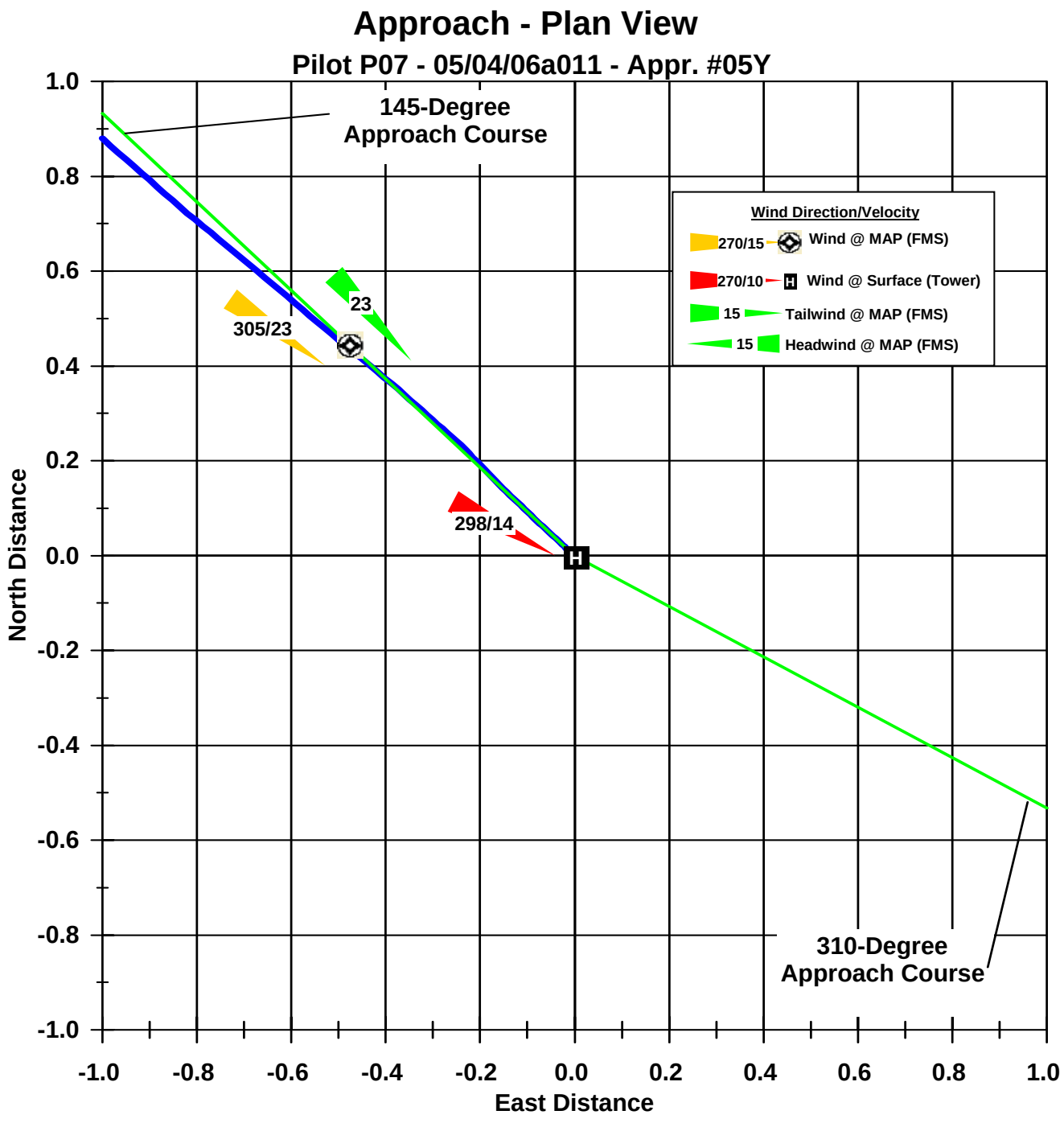


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06a010 - Appr. #04X

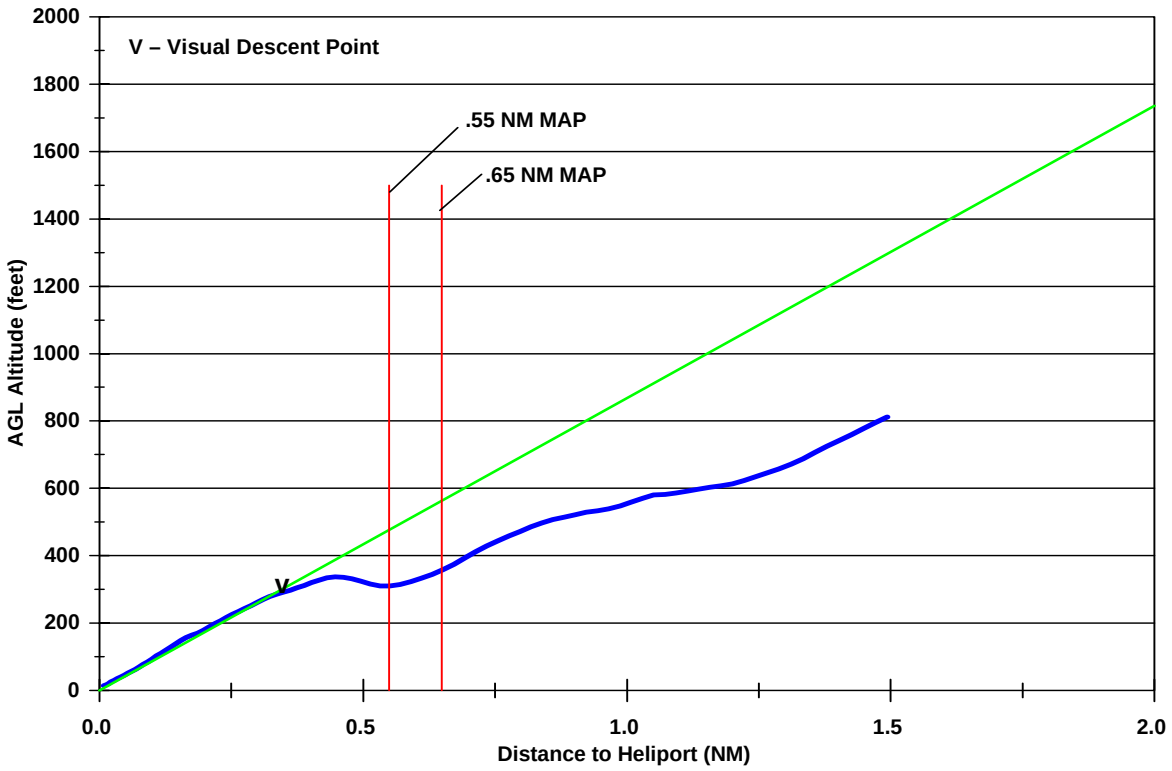


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06a010 - Appr. #04X

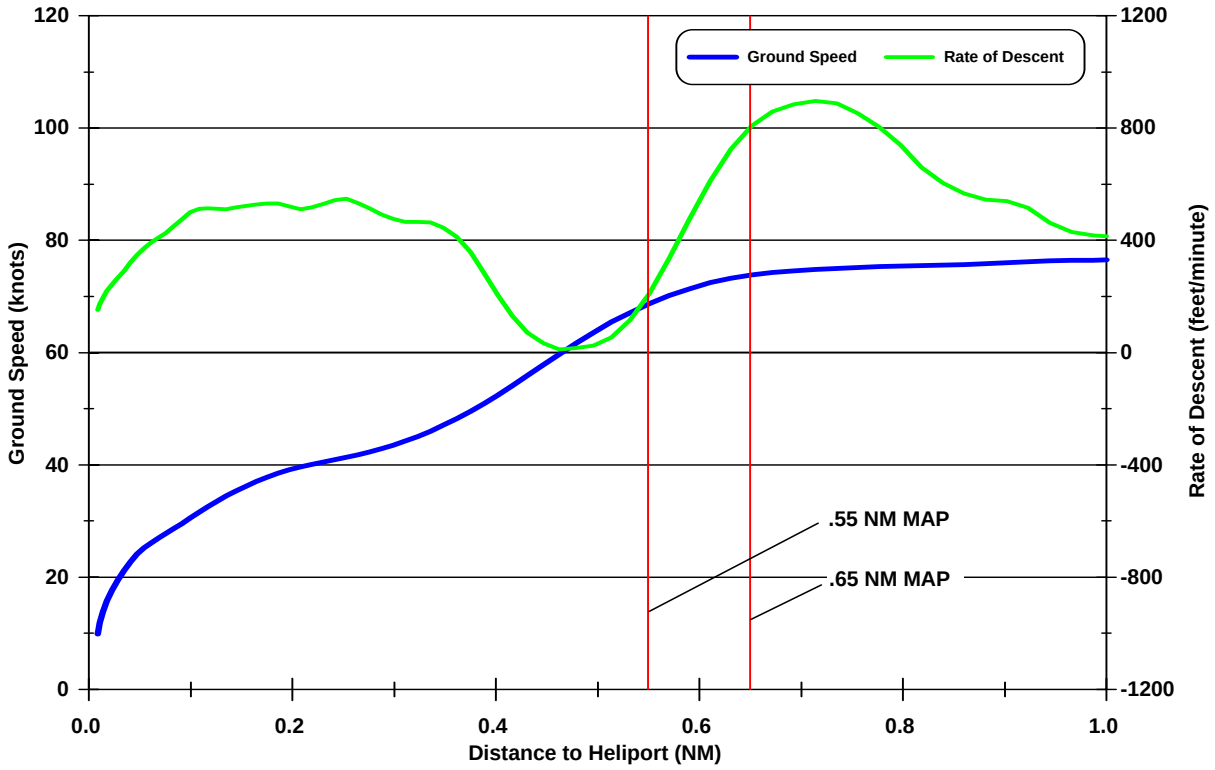



Approach - Plan View
Pilot P07 - 05/04/06a011 - Appr. #05Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
305/23
23
298/14
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

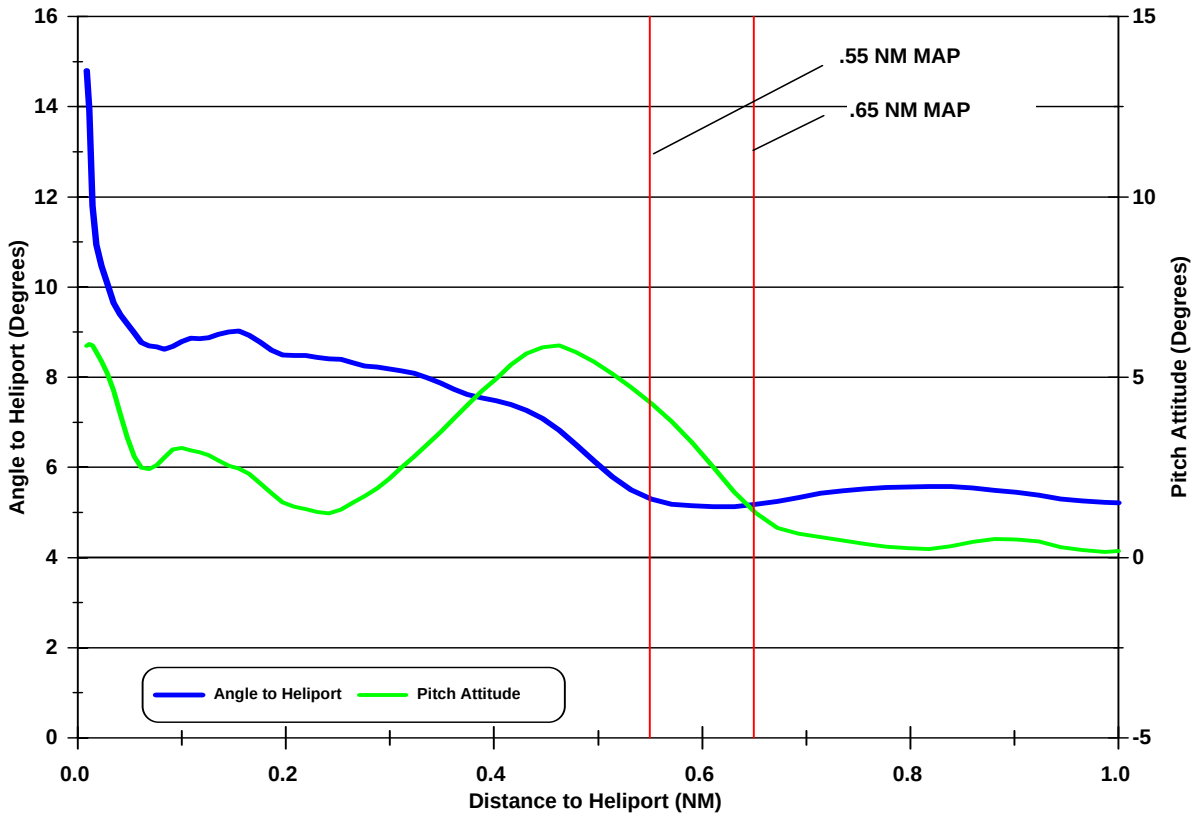
Profile View
Pilot P07 - 05/04/06a011 - Appr. #05Y



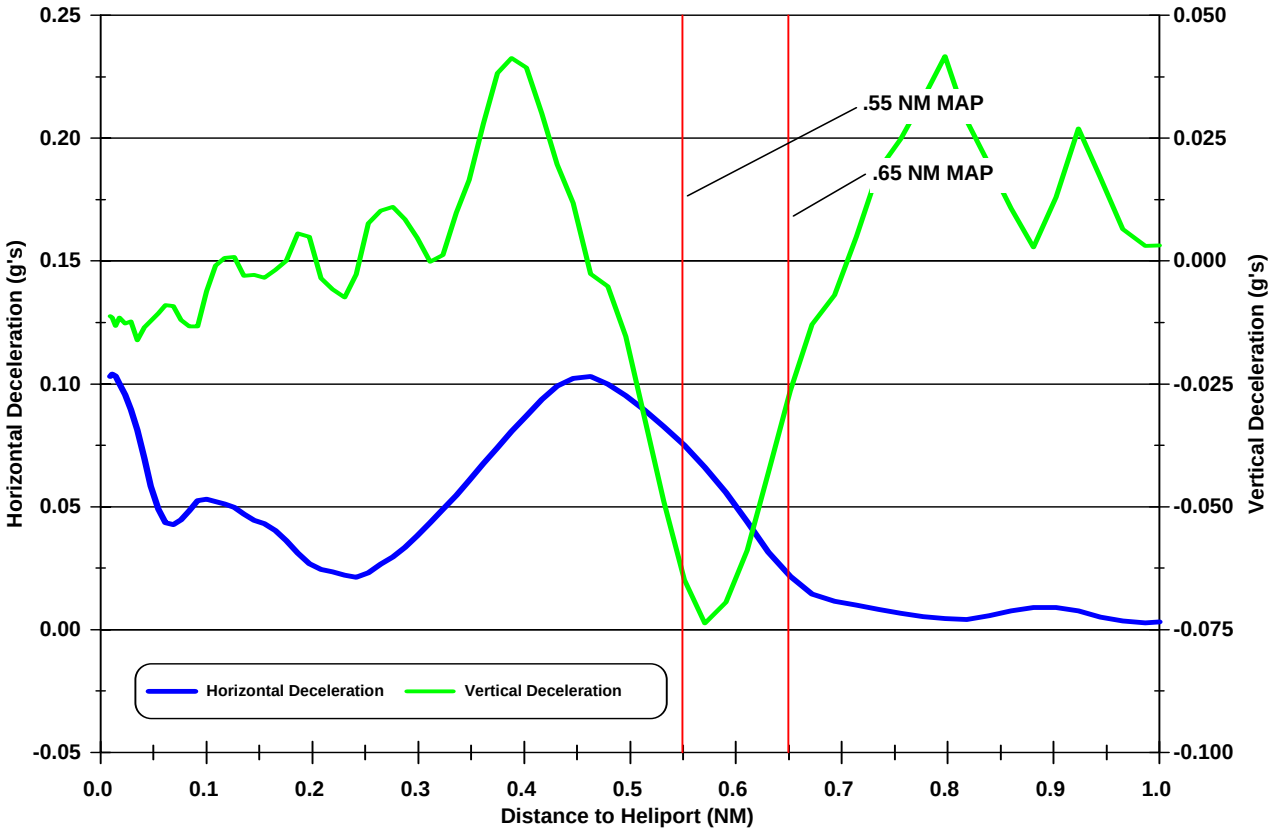
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06a011 - Appr. #05Y

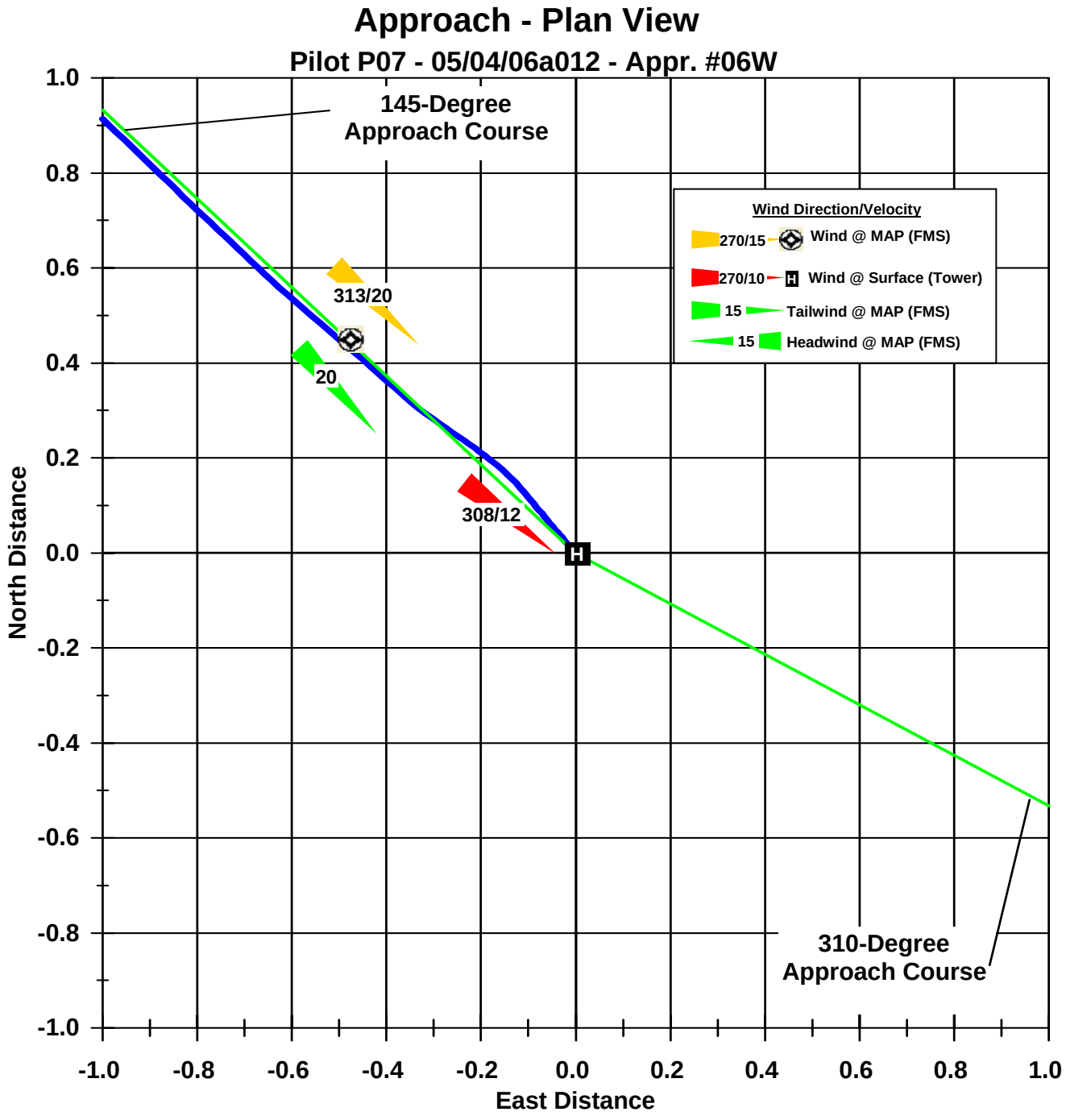


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06a011 - Appr. #05Y

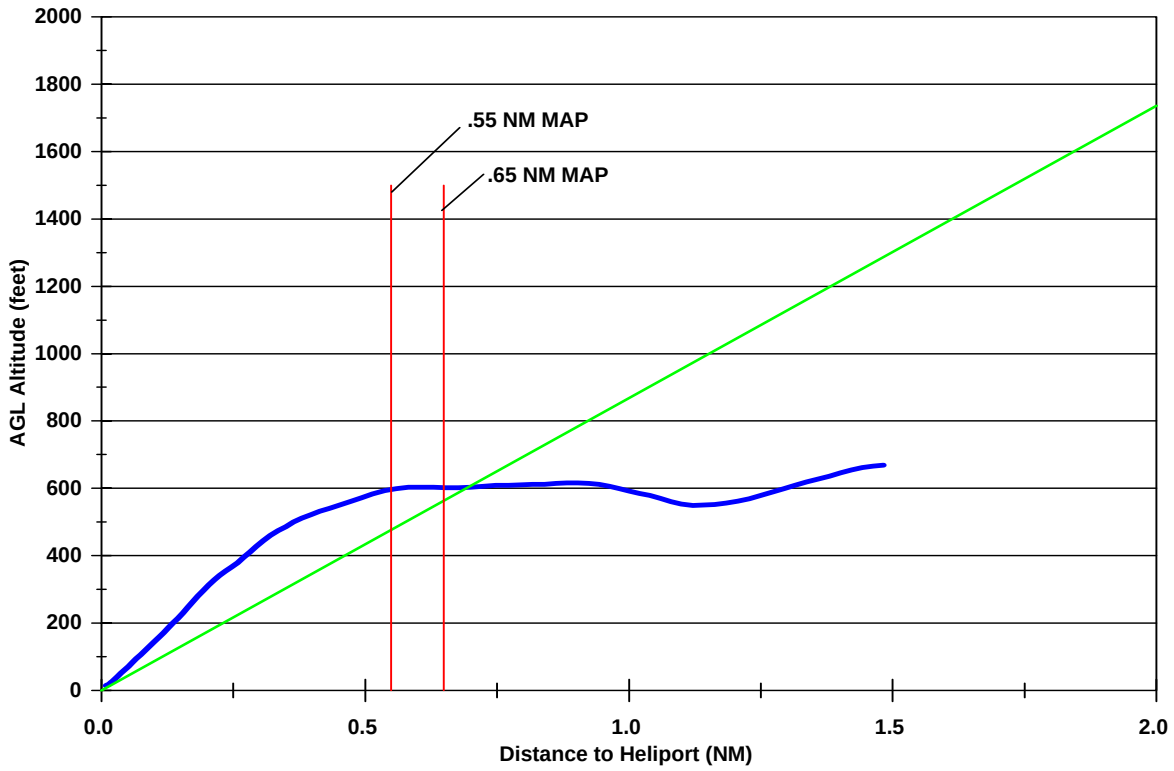


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06a011 - Appr. #05Y

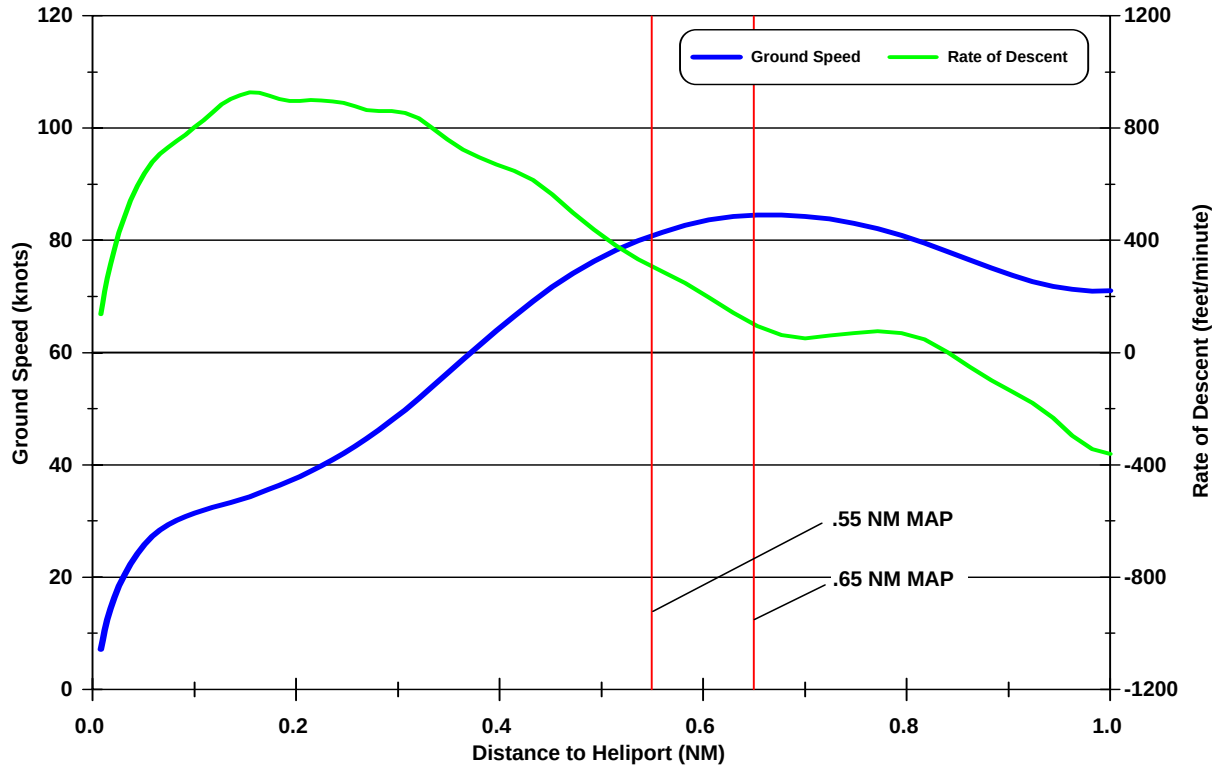



Approach - Plan View
Pilot P07 - 05/04/06a012 - Appr. #06W
145-Degree
Approach Course
310-Degree
Approach Course
313/20
20
308/12
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

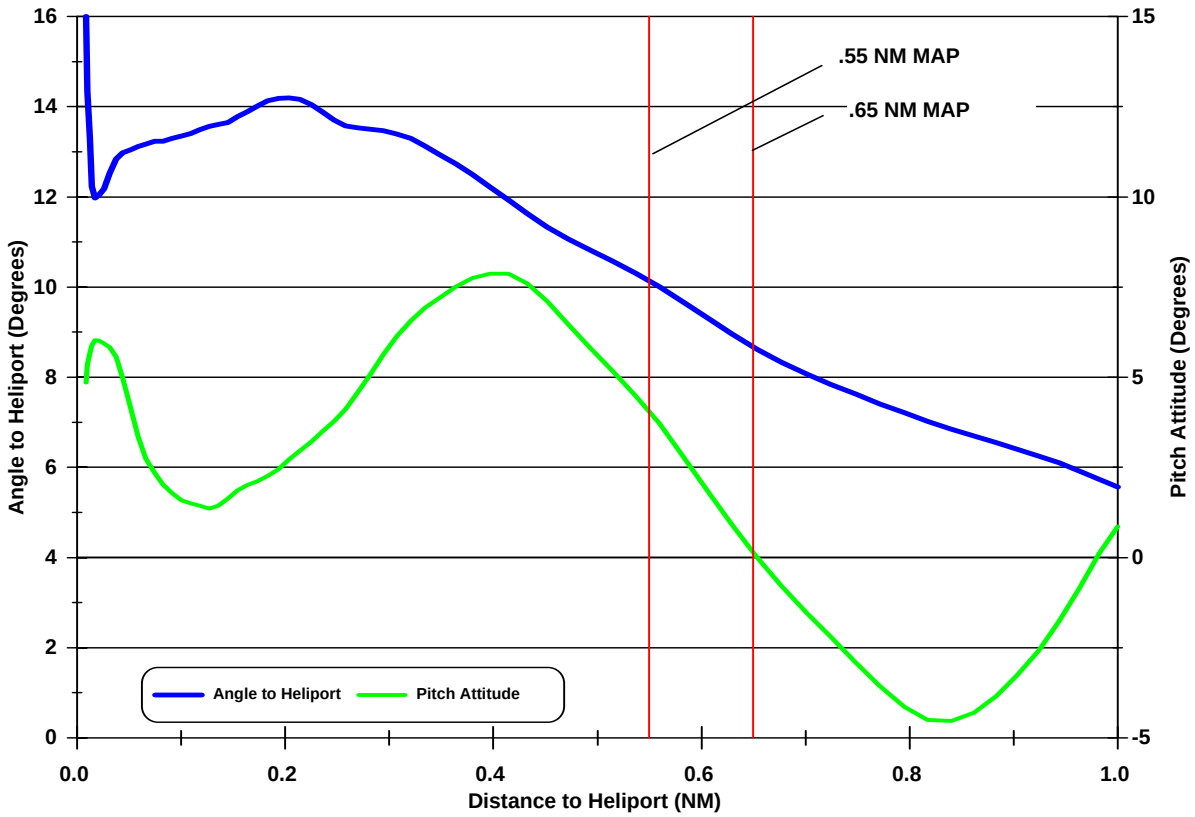
Profile View
Pilot P07 - 05/04/06a012 - Appr. #06W



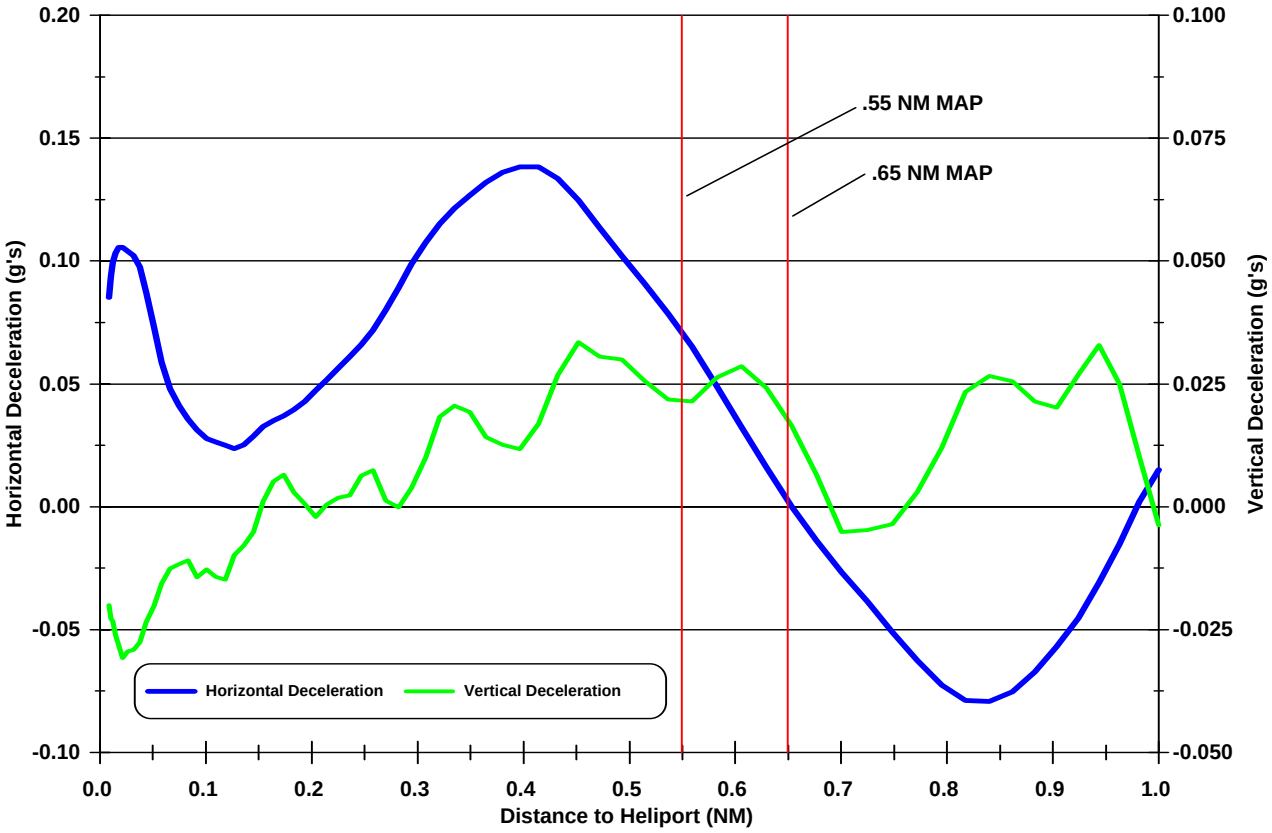
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06a012 - Appr. #06W

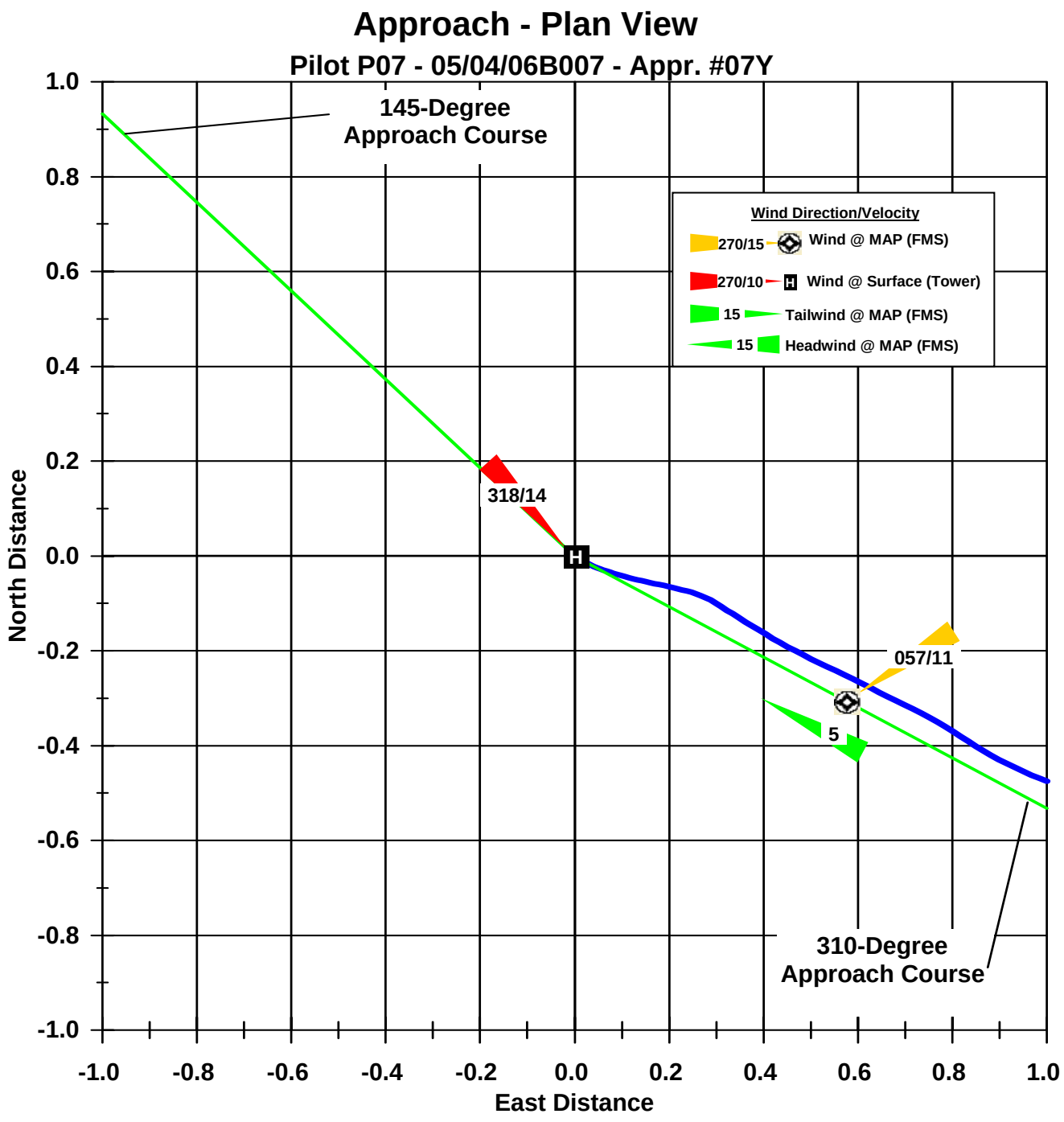


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06a012 - Appr. #06W

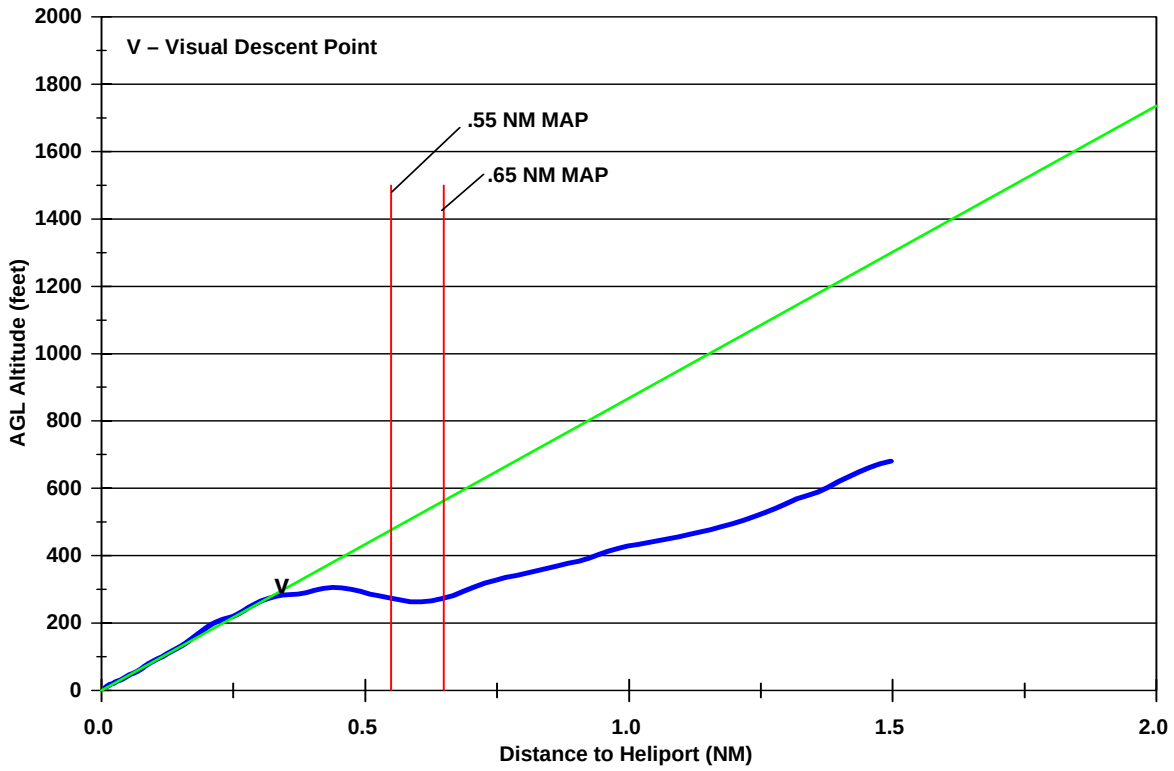


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06a012 - Appr. #06W

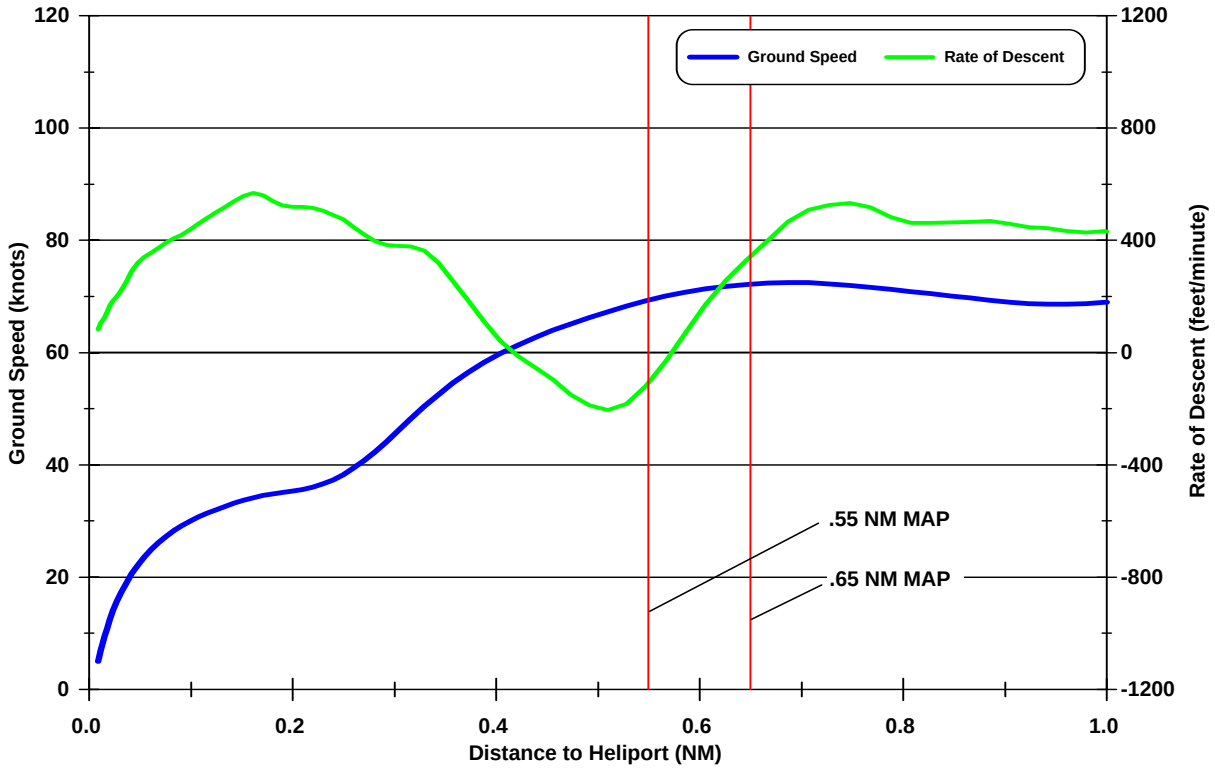



Approach - Plan View
Pilot P07 - 05/04/06B007 - Appr. #07Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
318/14
057/11
5
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

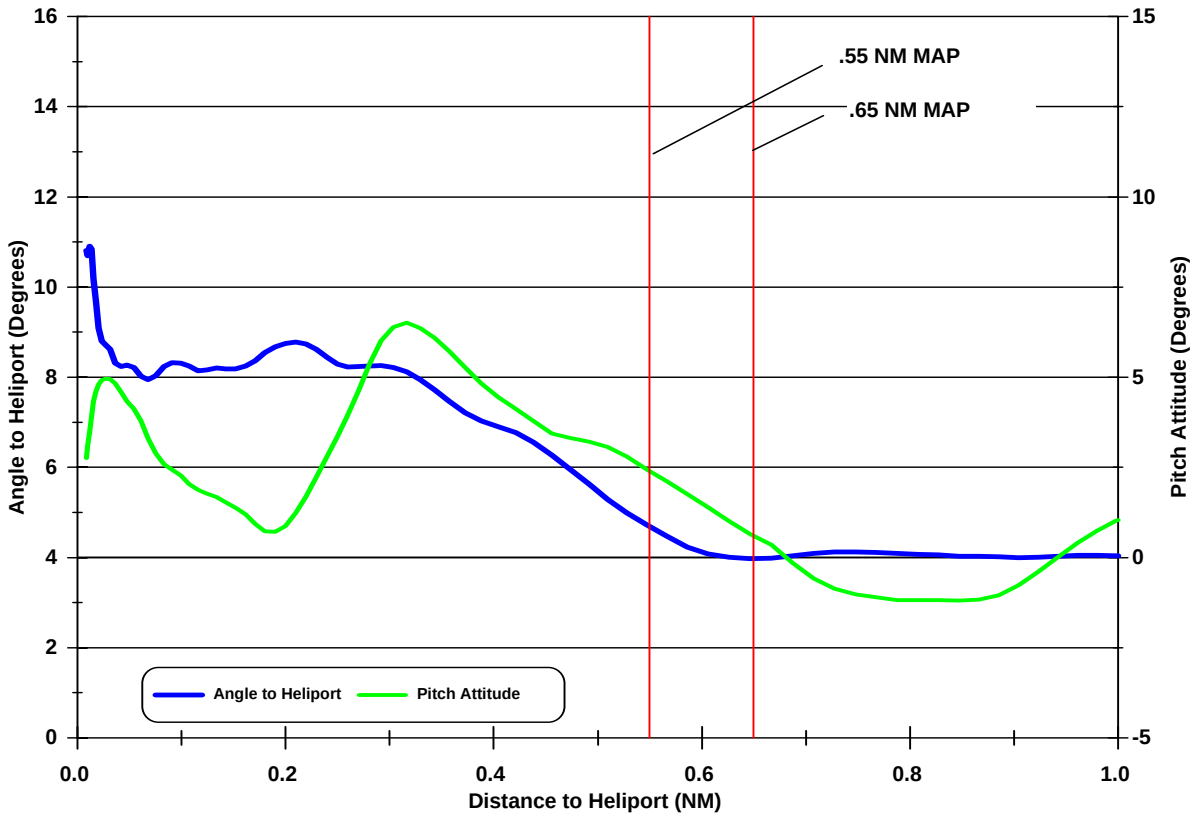
Profile View
Pilot P07 - 05/04/06B007 - Appr. #07Y



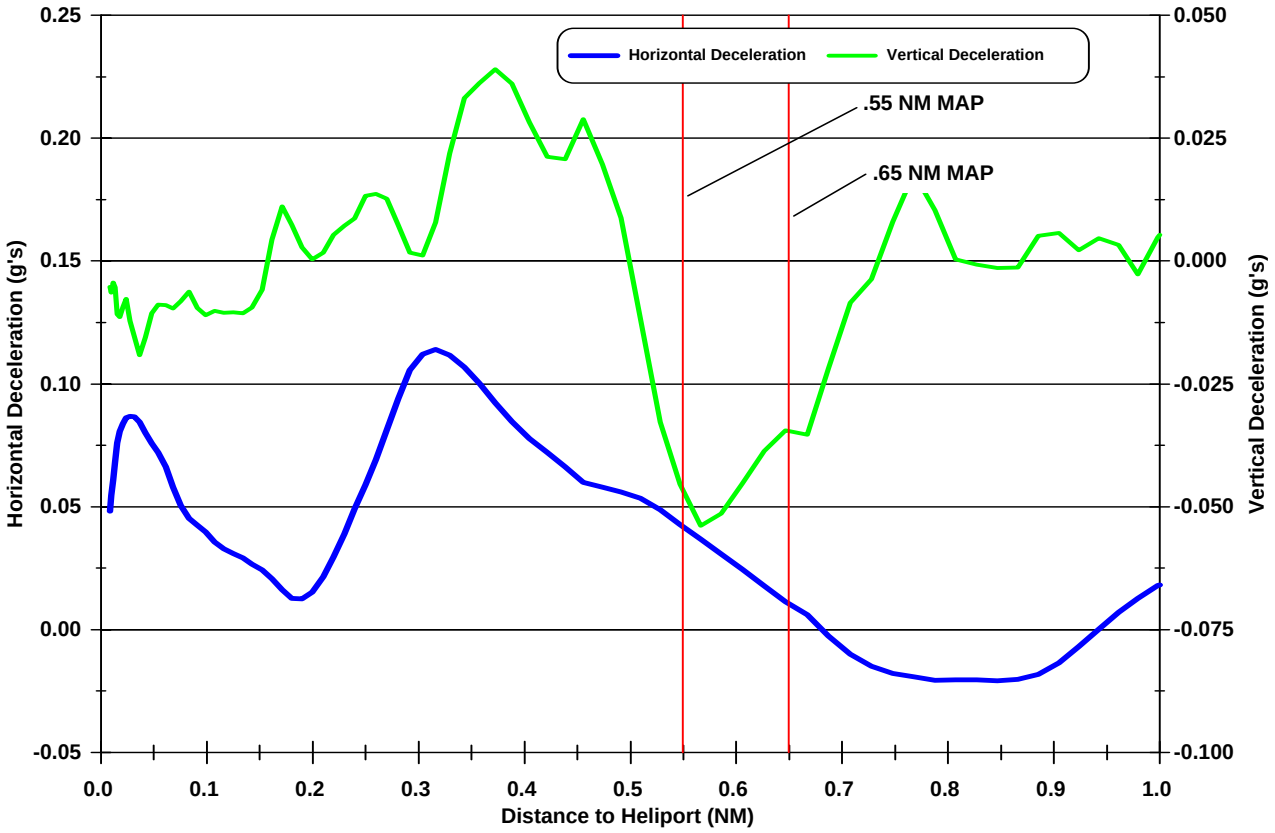
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06B007 - Appr. #07Y

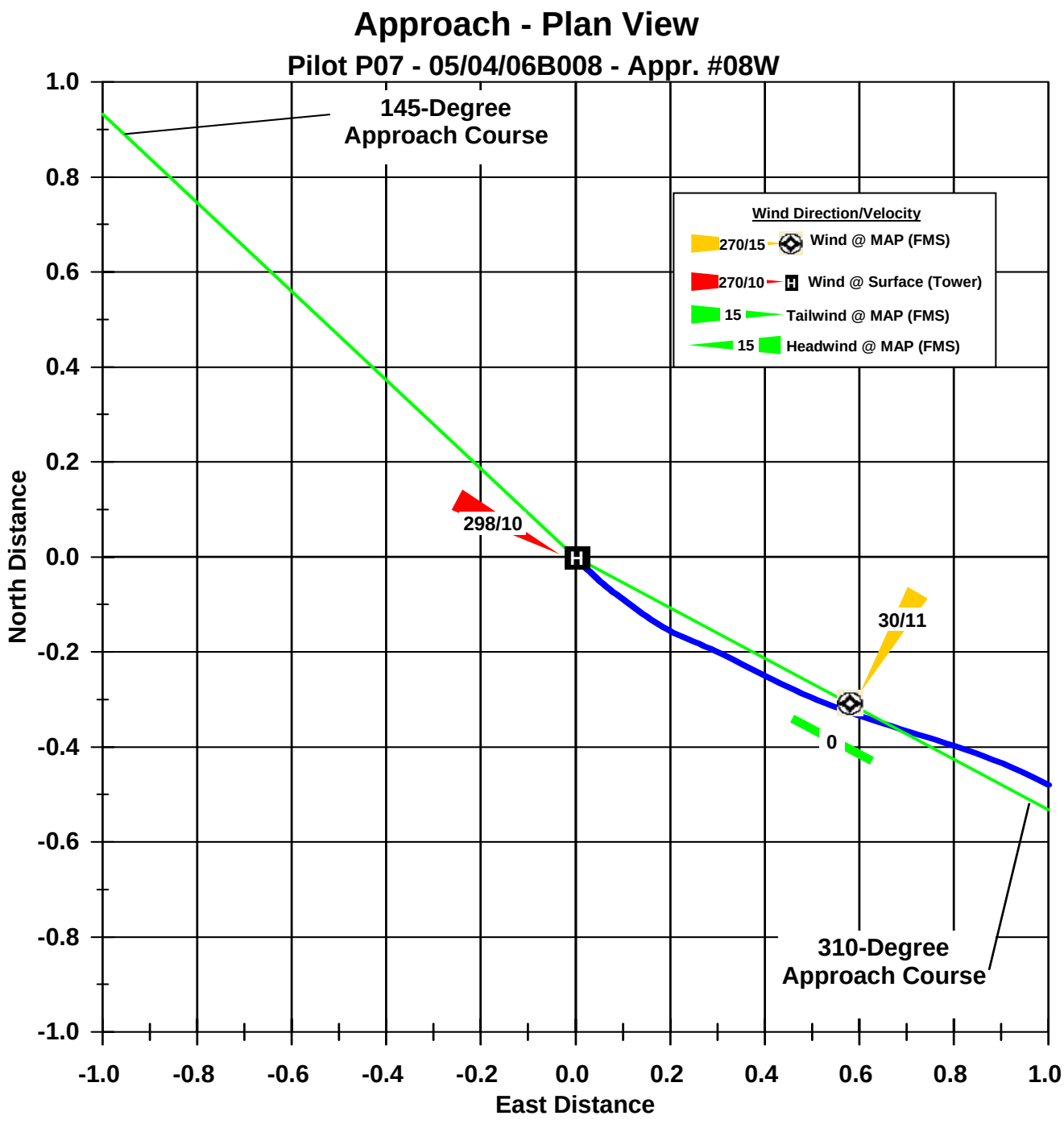


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06B007 - Appr. #07Y

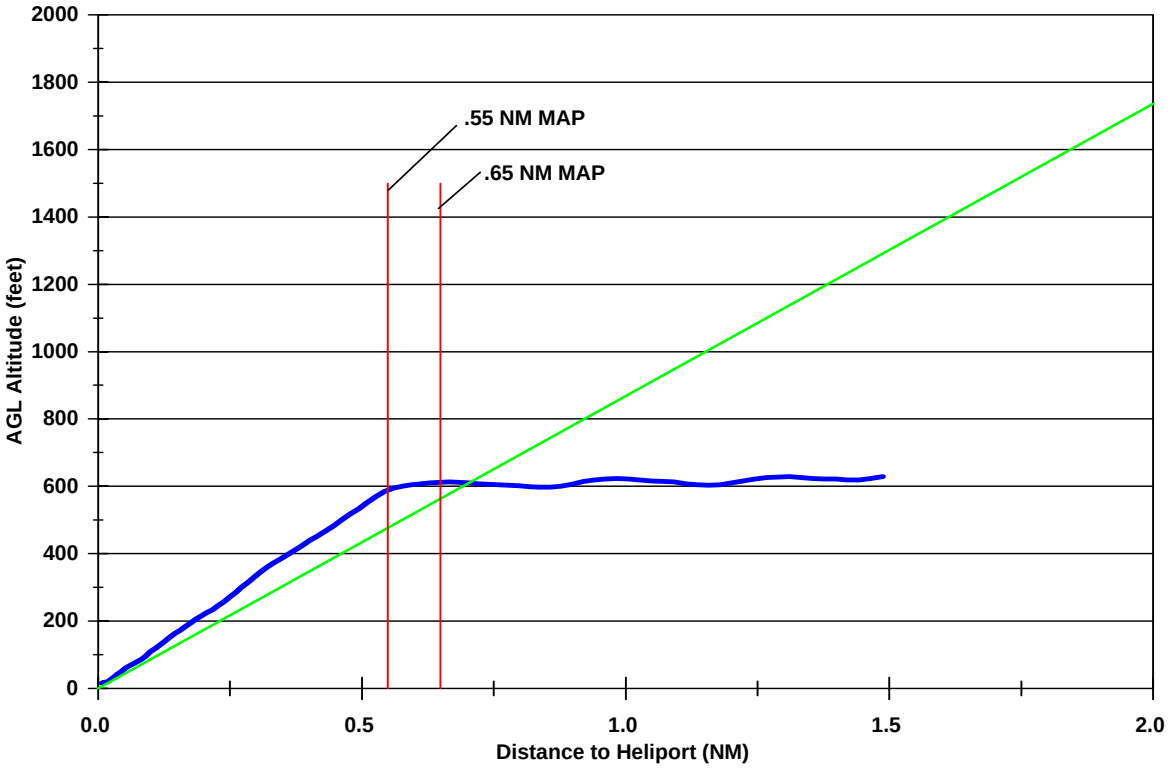


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06B007 - Appr. #07Y

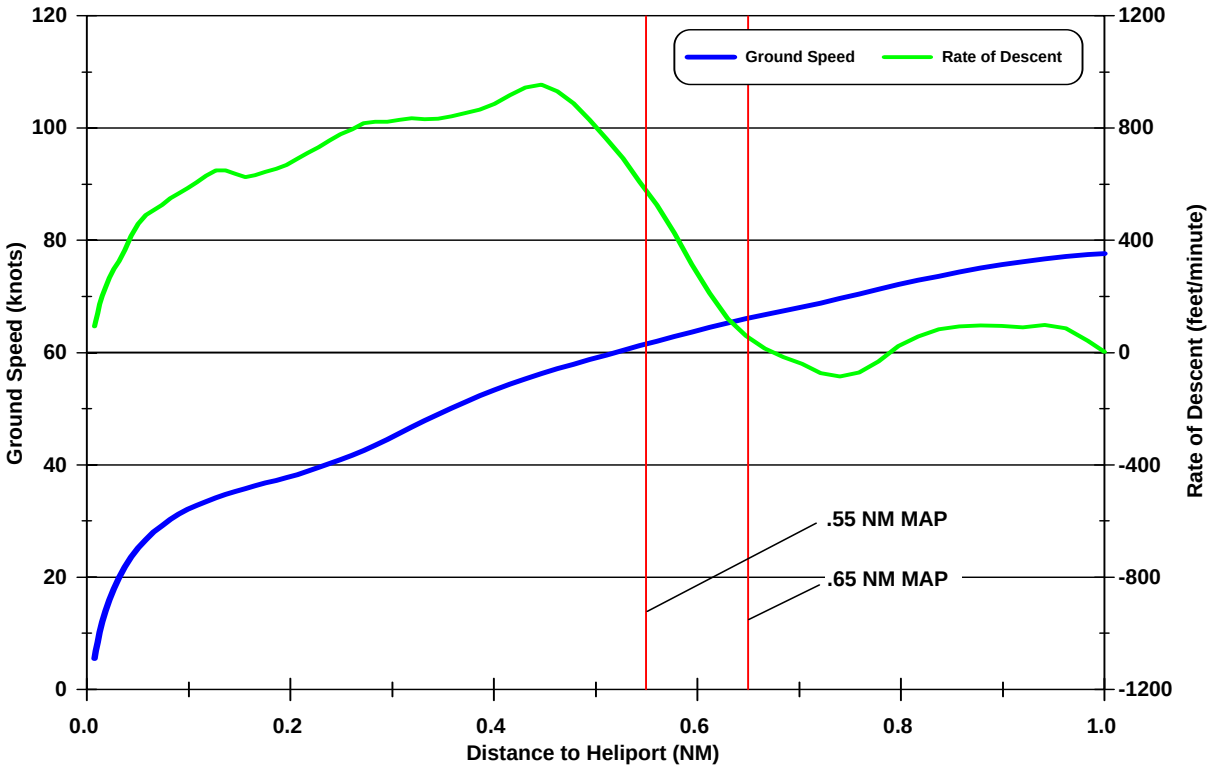



Approach - Plan View
Pilot P07 - 05/04/06B008 - Appr. #08W
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
298/10
30/11
0
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

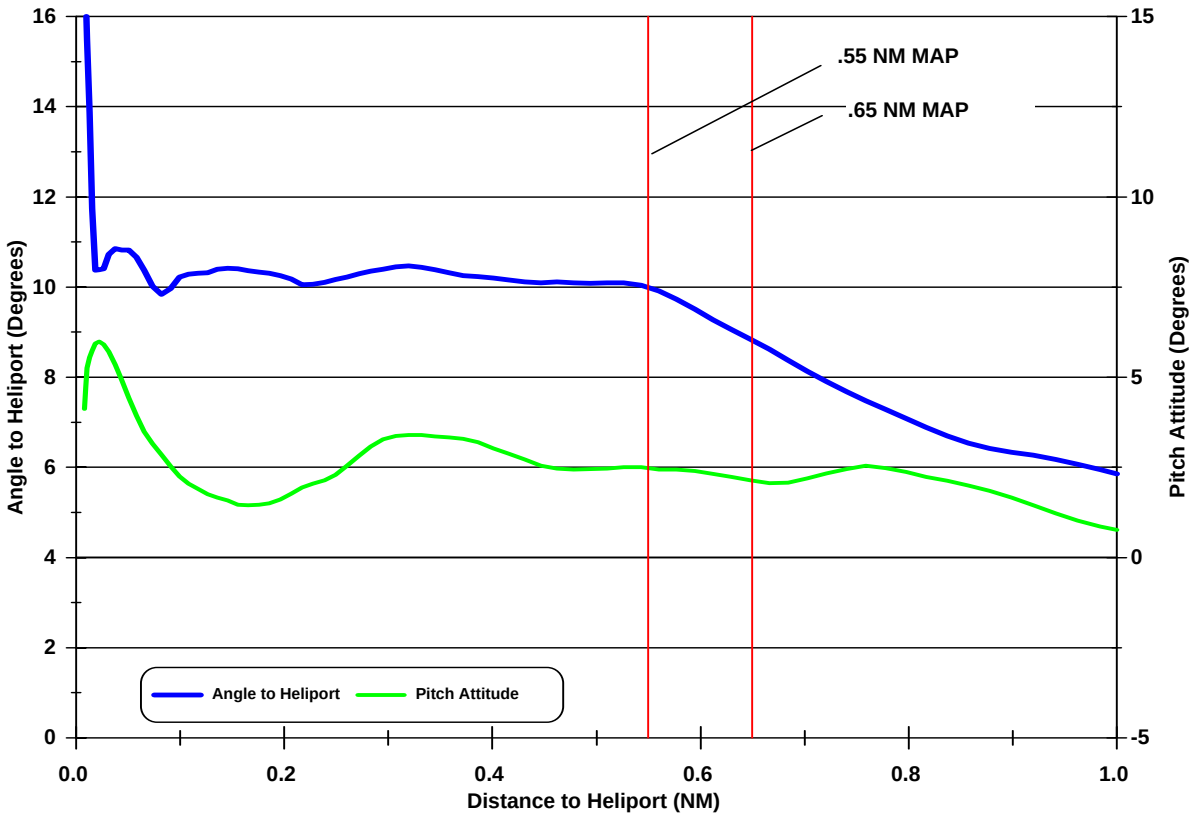
Profile View
Pilot P07 - 05/04/06B008 - Appr. #08W



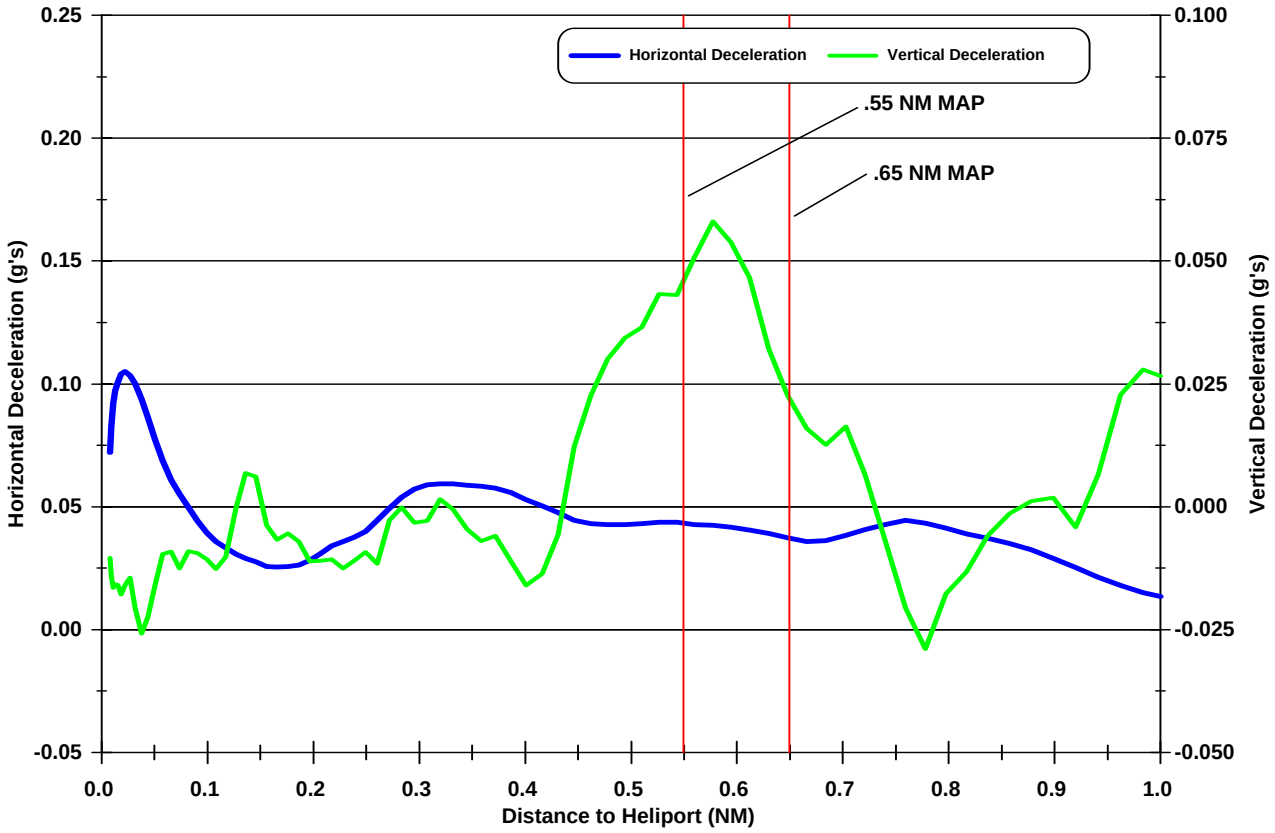
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06B008 - Appr. #08W

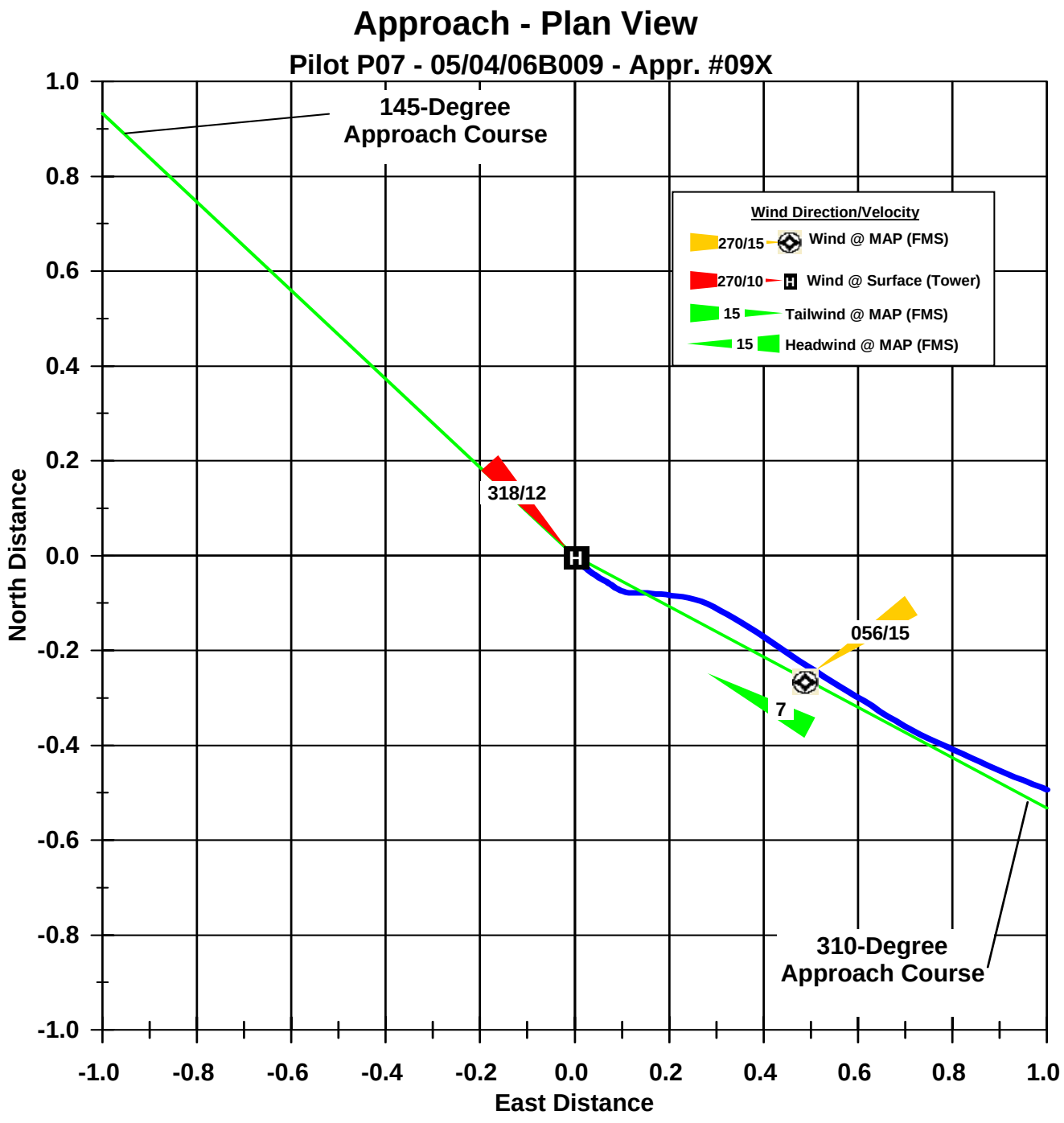


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06B008 - Appr. #08W

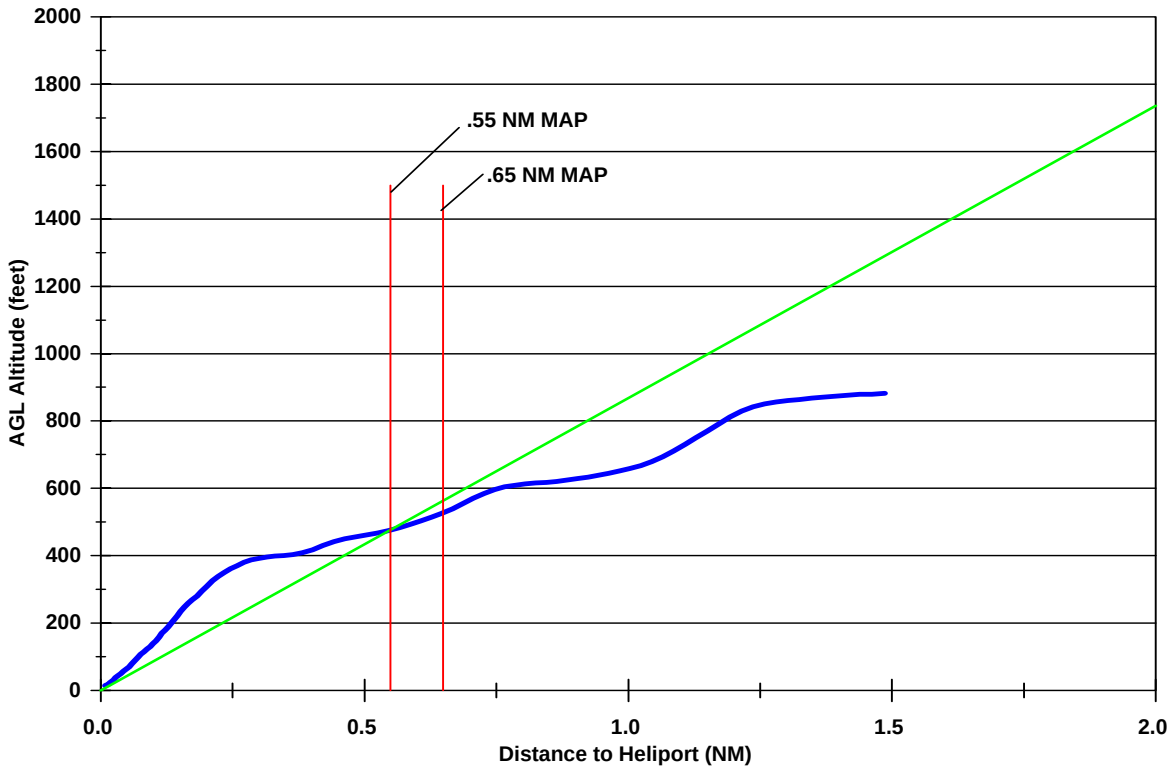


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06B008 - Appr. #08W

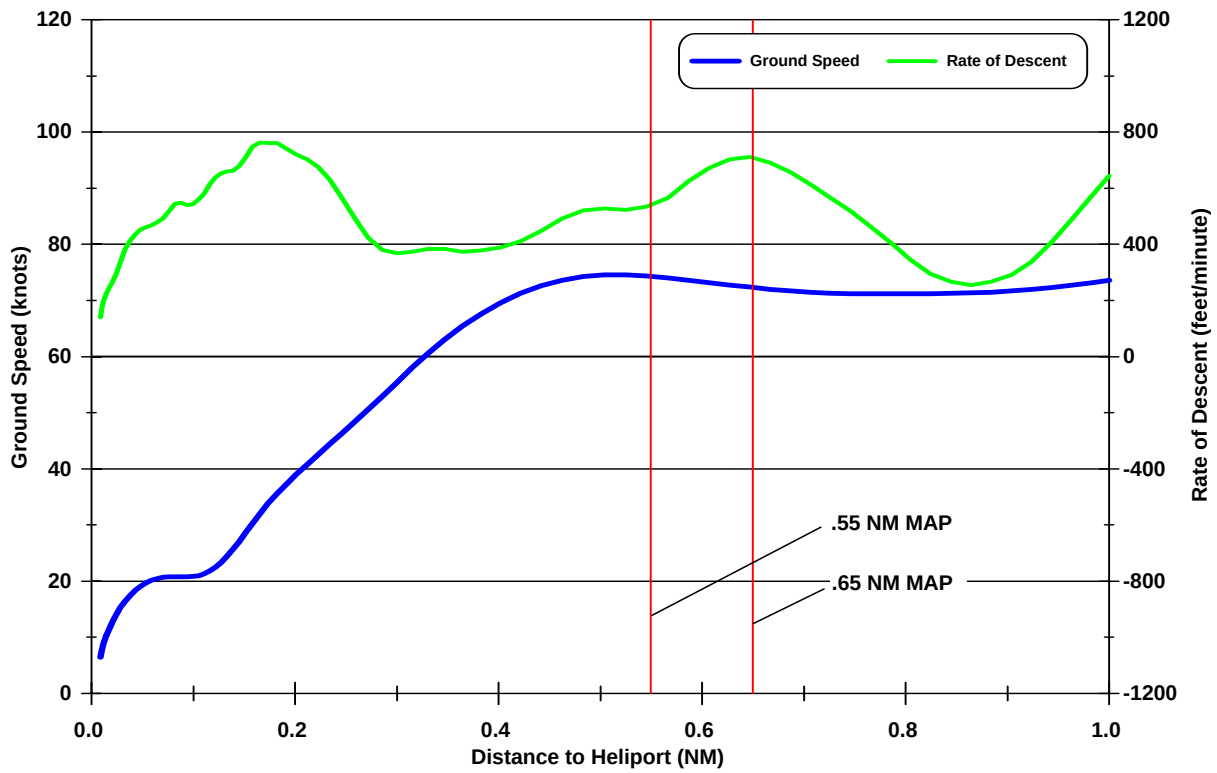



Approach - Plan View
Pilot P07 - 05/04/06B009 - Appr. #09X
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
318/12
056/15
7
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

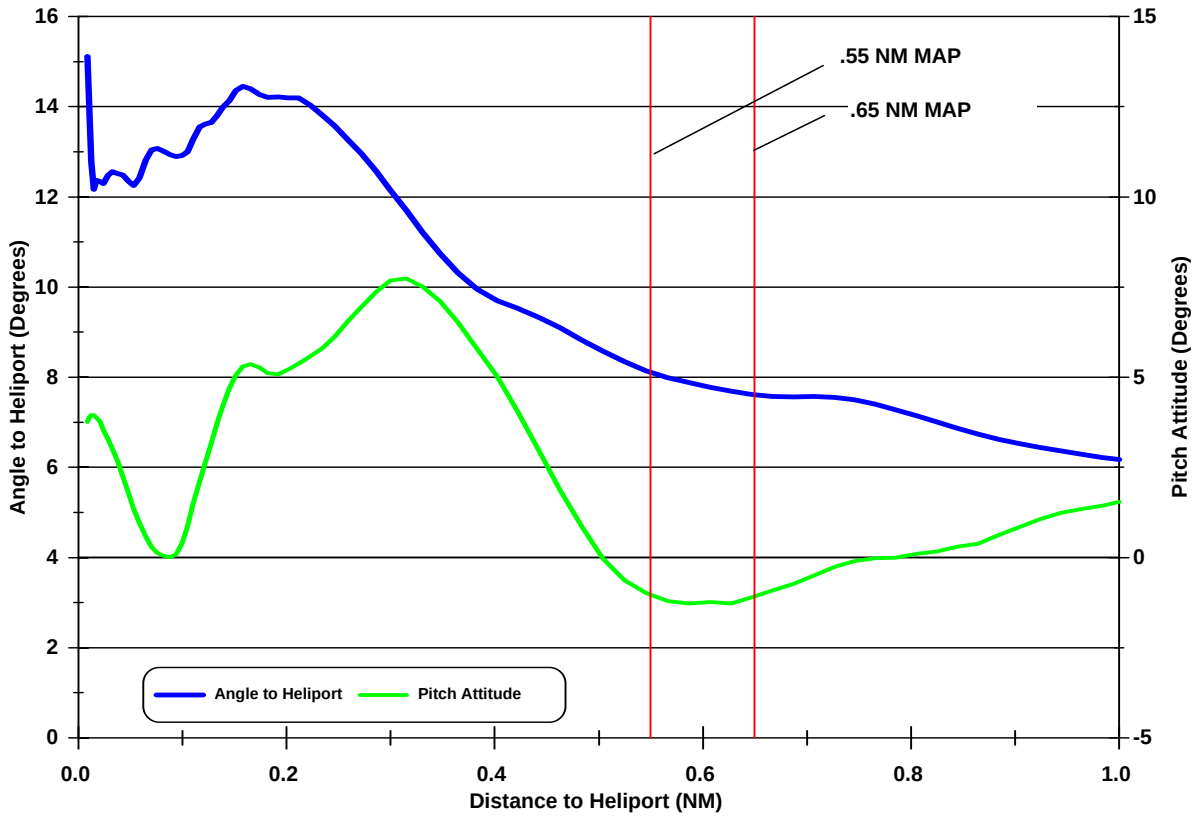
Profile View
Pilot P07 - 05/04/06B009 - Appr. #09X



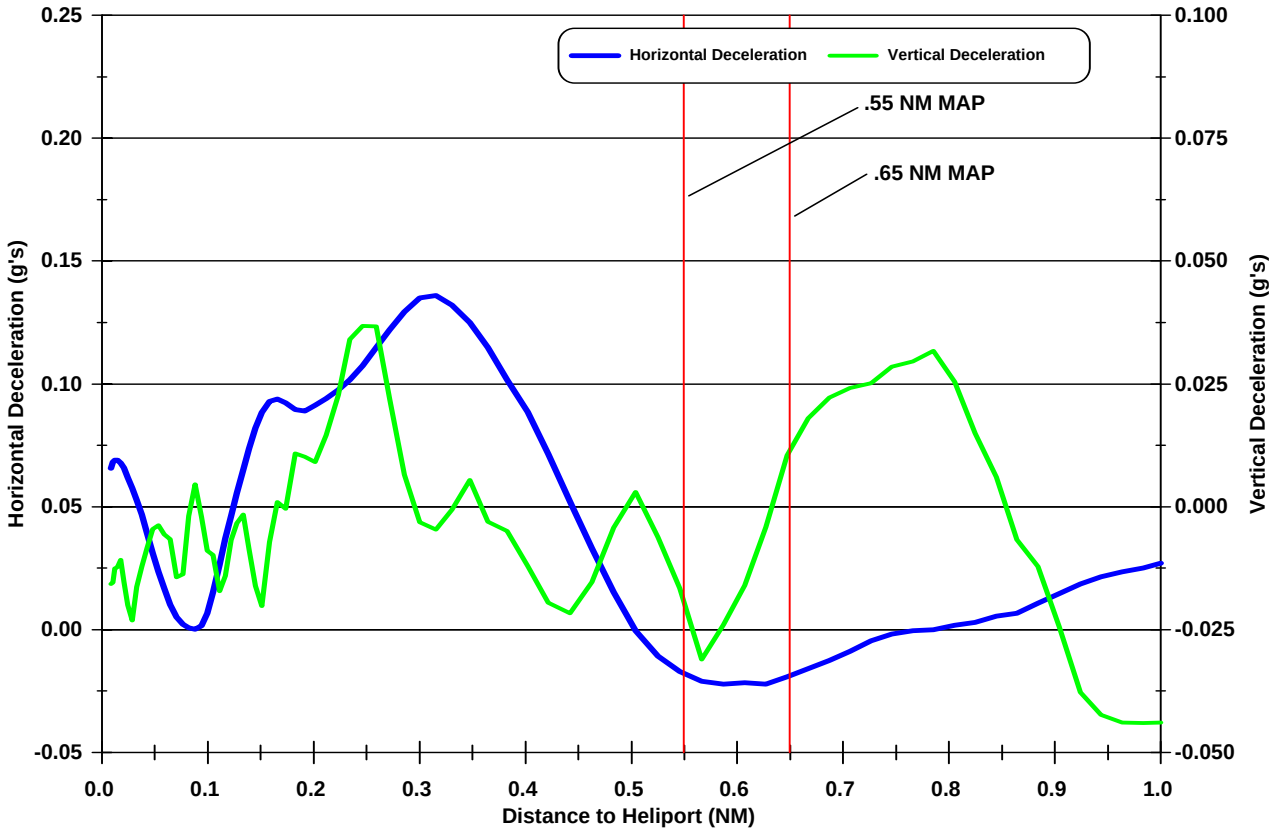
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06B009 - Appr. #09X

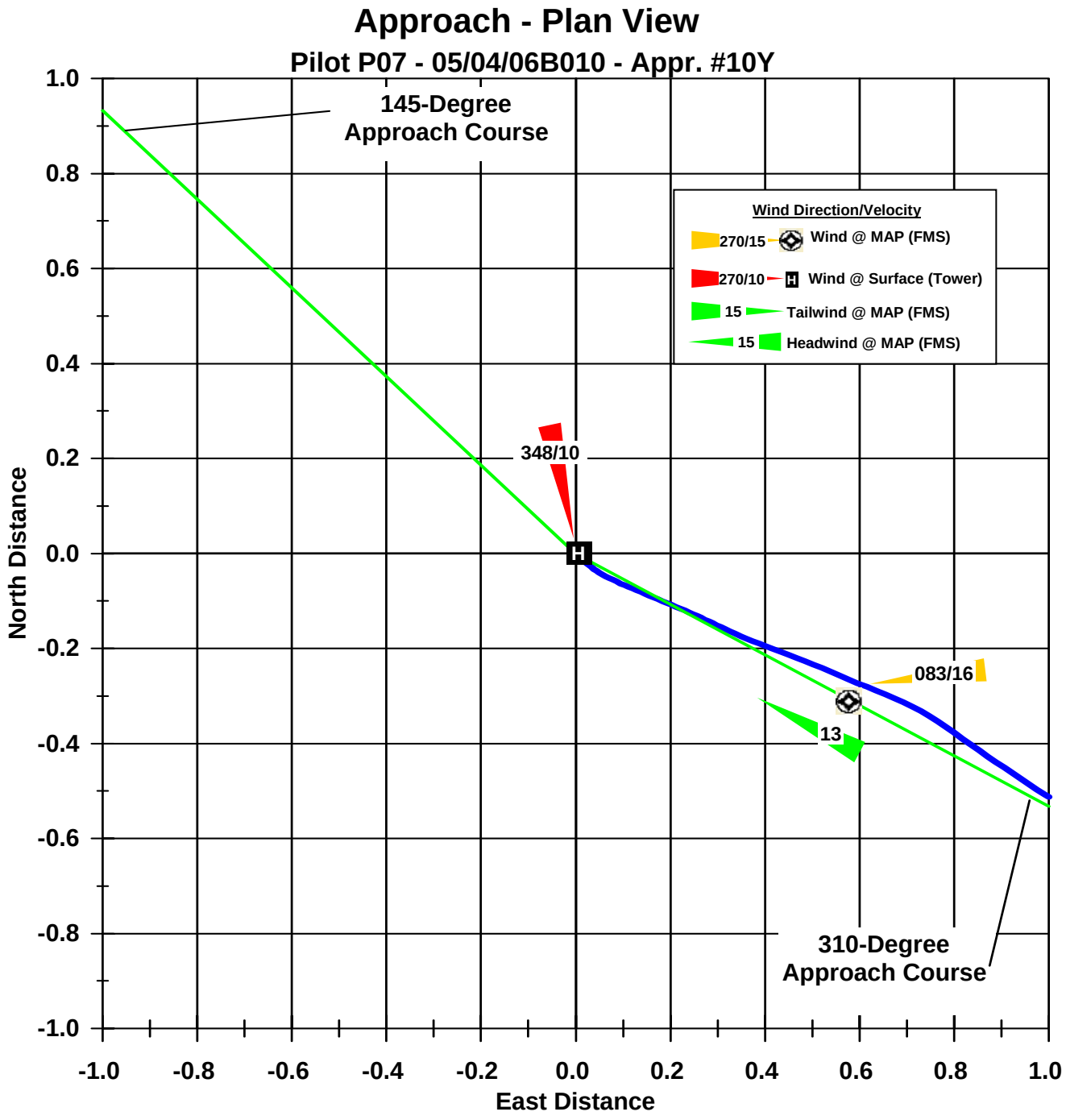


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06B009 - Appr. #09X

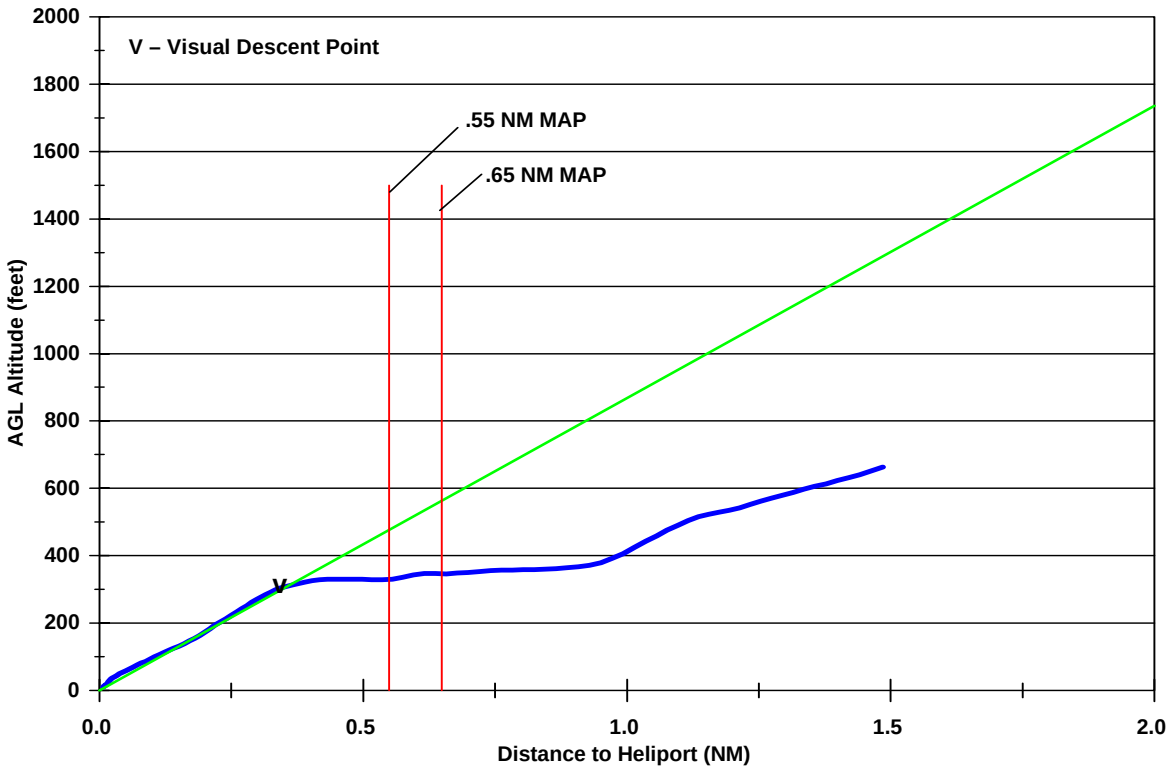


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06B009 - Appr. #09X

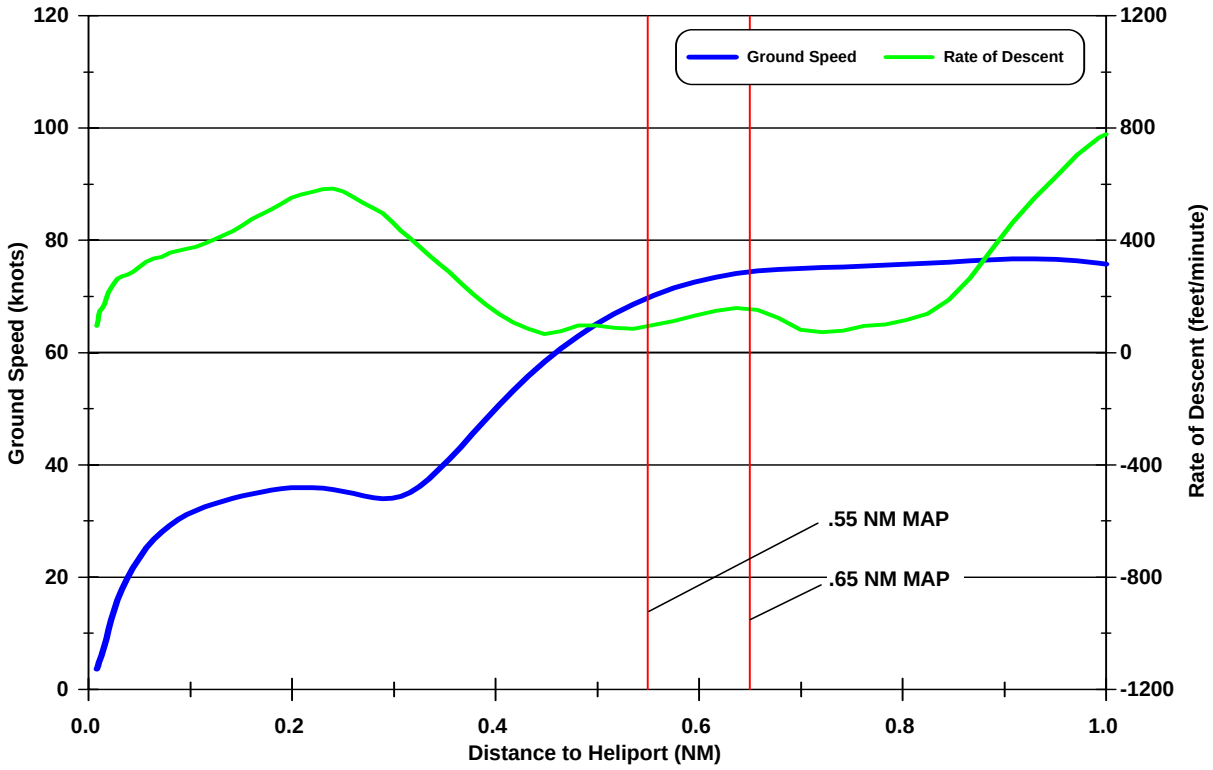



Approach - Plan View
Pilot P07 - 05/04/06B010 - Appr. #10Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
348/10
083/16
13
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

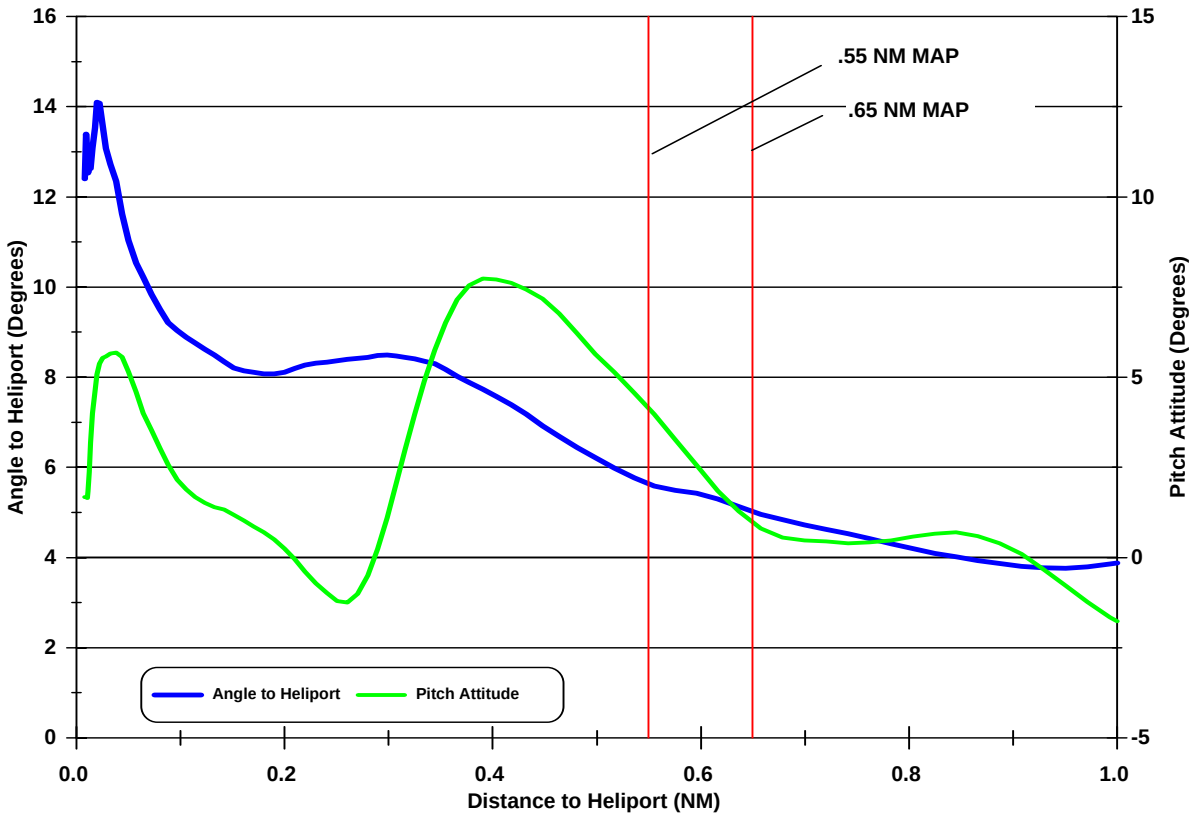
Profile View
Pilot P07 - 05/04/06B010 - Appr. #10Y



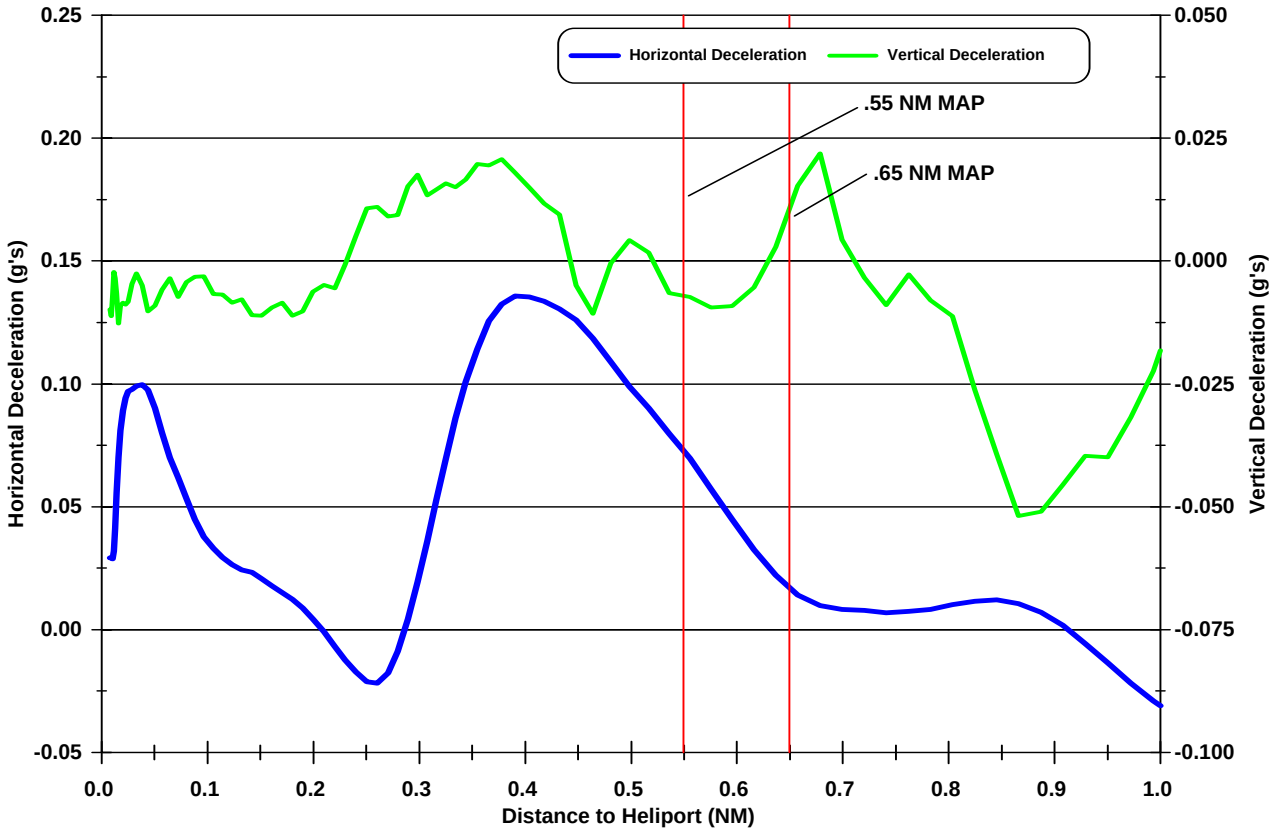
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06B010 - Appr. #10Y

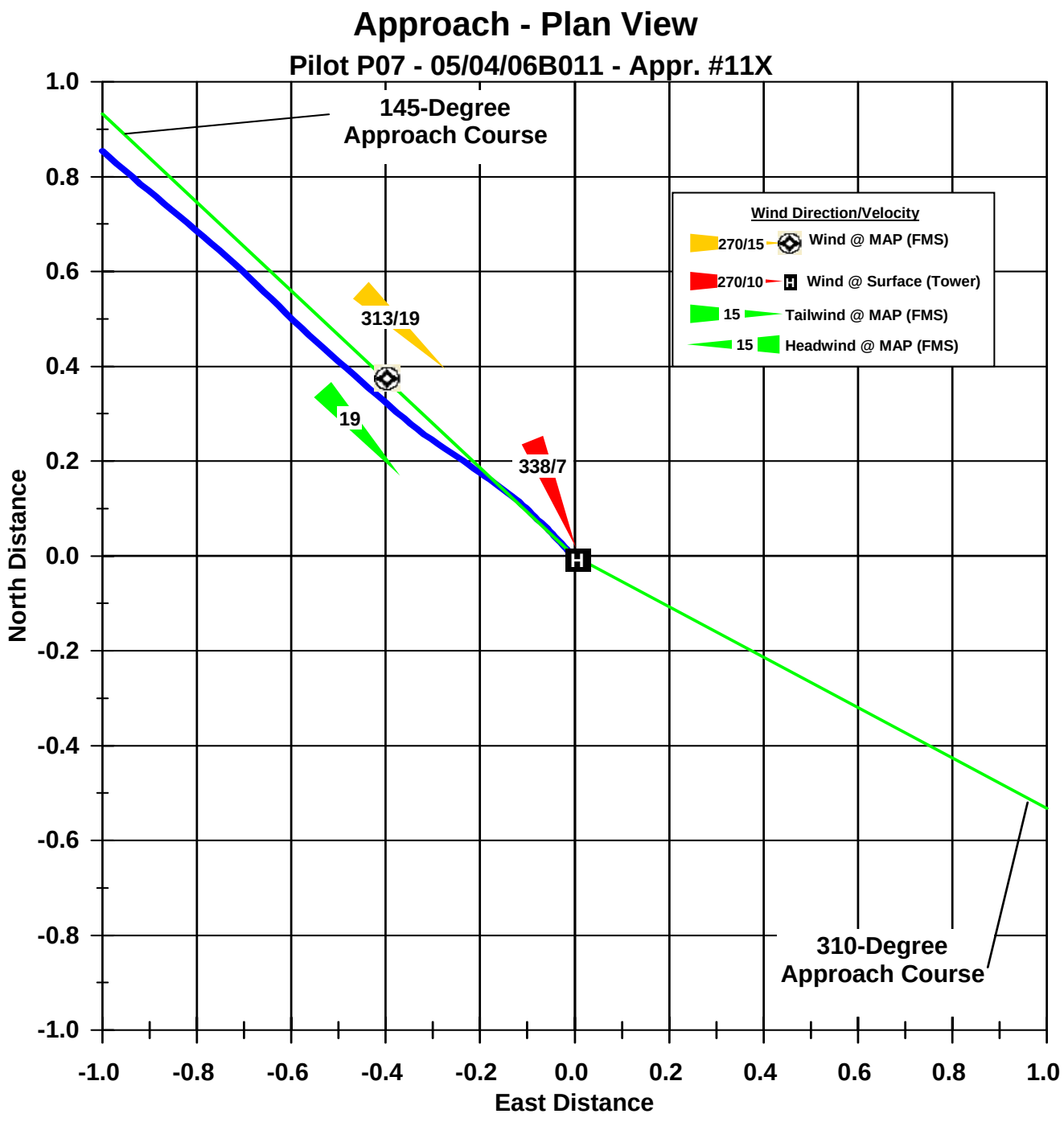


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06B010 - Appr. #10Y

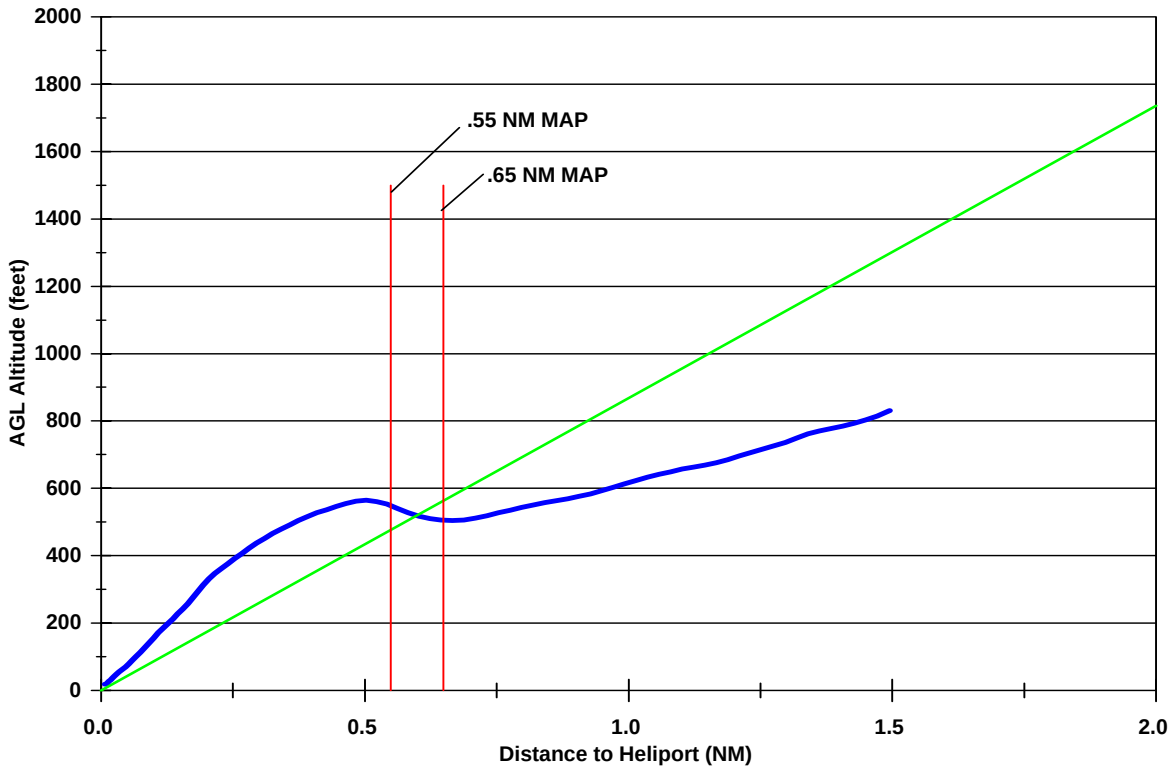


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06B010 - Appr. #10Y

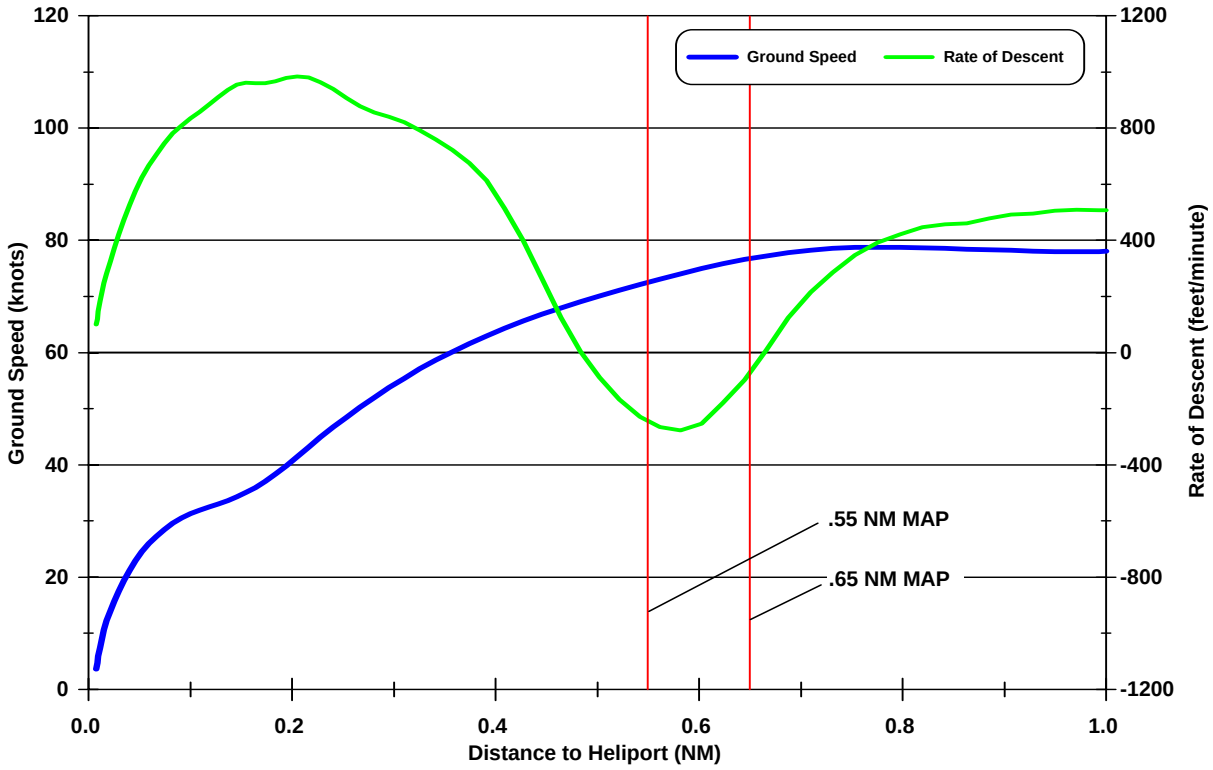



Approach - Plan View
Pilot P07 - 05/04/06B011 - Appr. #11X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
313/19
19
338/7
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

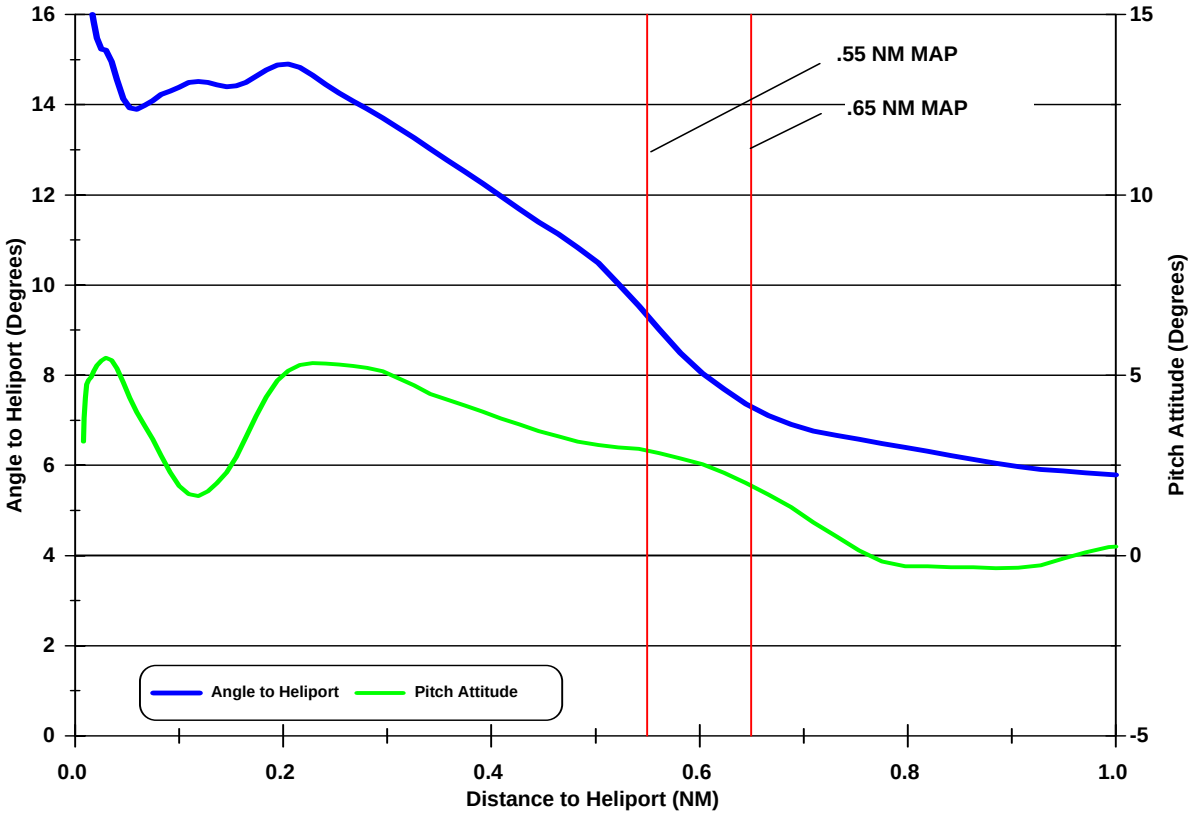
Profile View
Pilot P07 - 05/04/06B011 - Appr. #11X



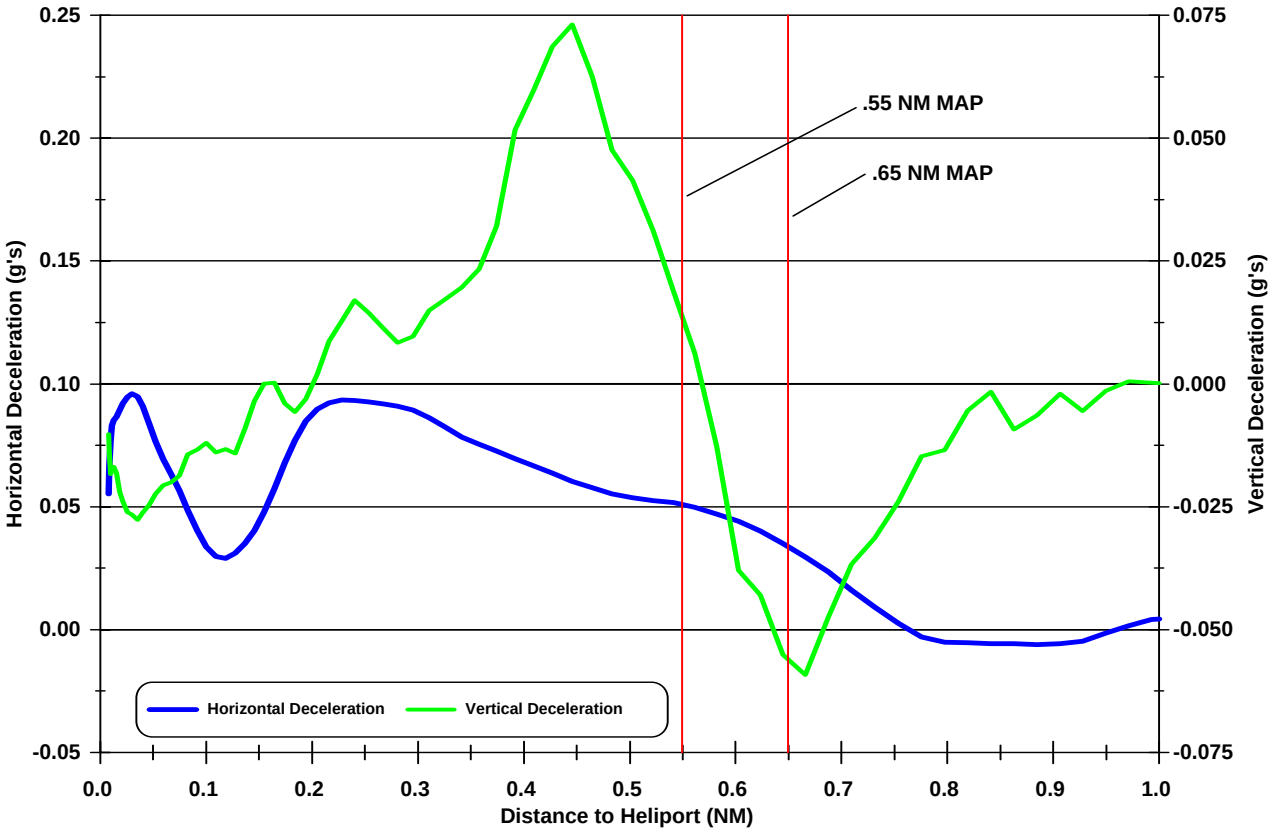
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06B011 - Appr. #11X

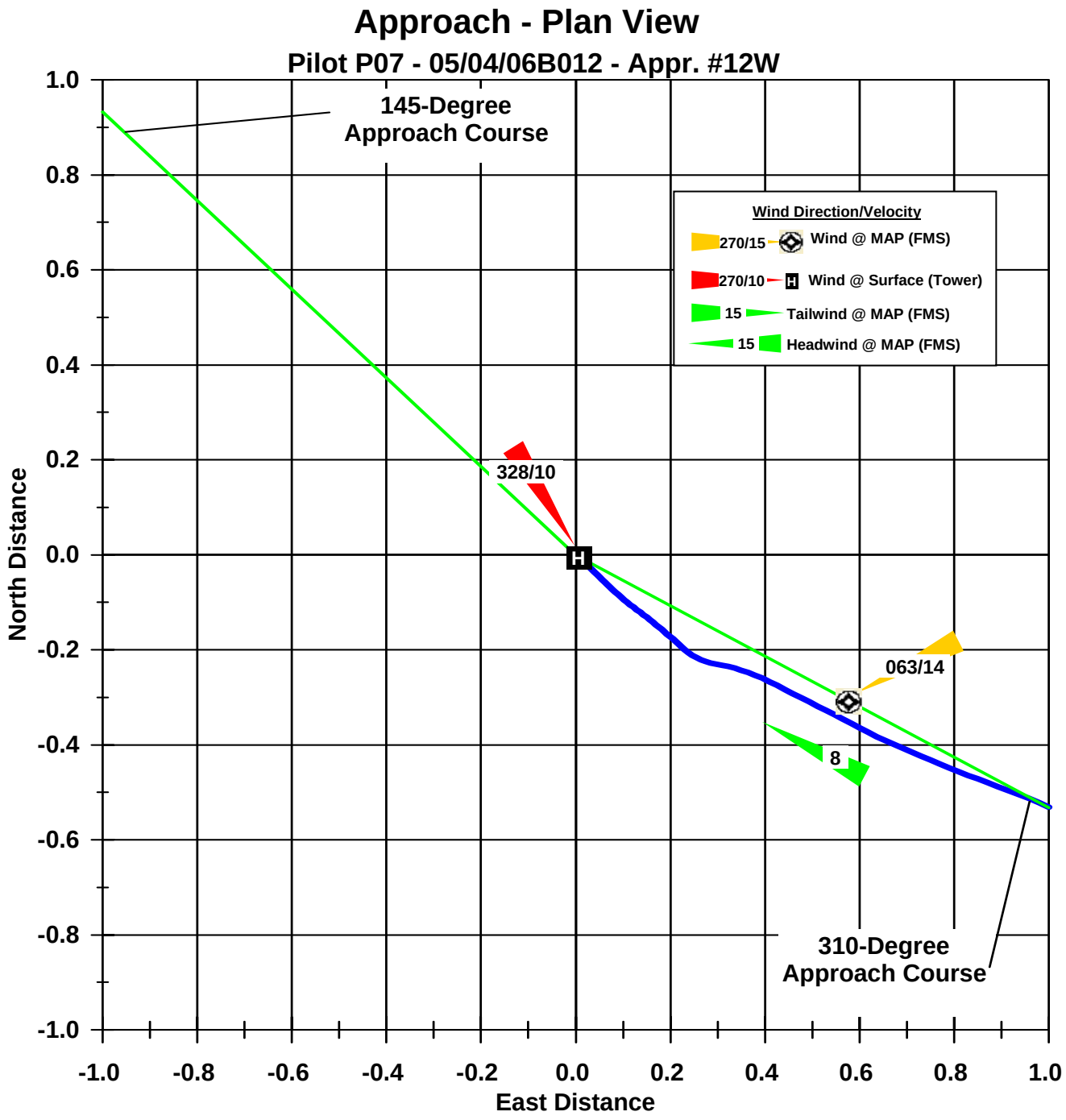


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06B011 - Appr. #11X

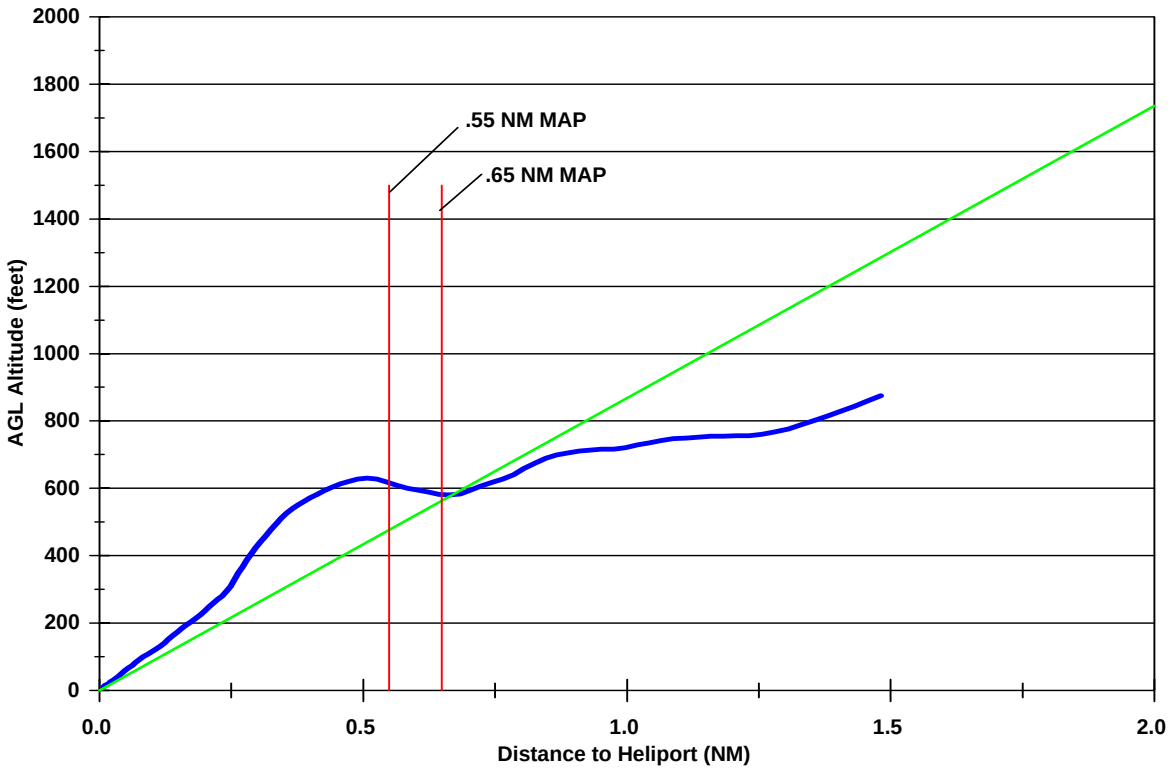


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06B011 - Appr. #11X

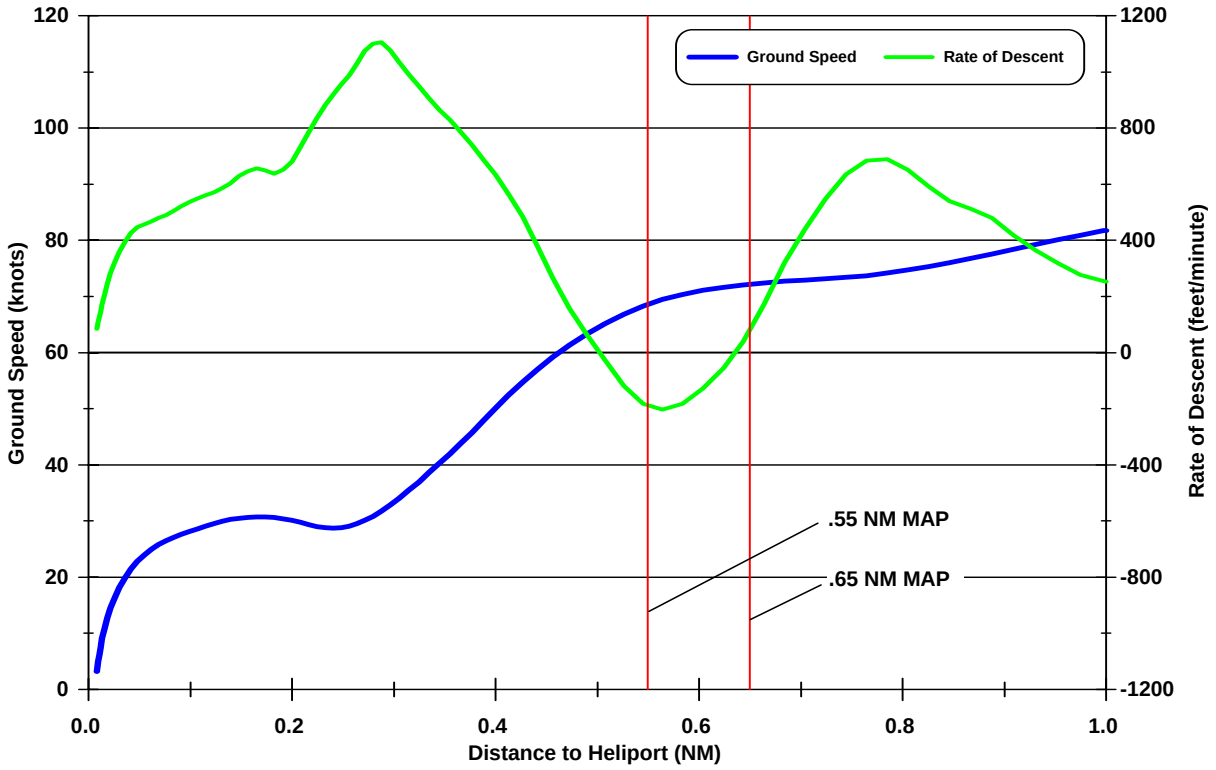



Approach - Plan View
Pilot P07 - 05/04/06B012 - Appr. #12W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
328/10
063/14
8
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

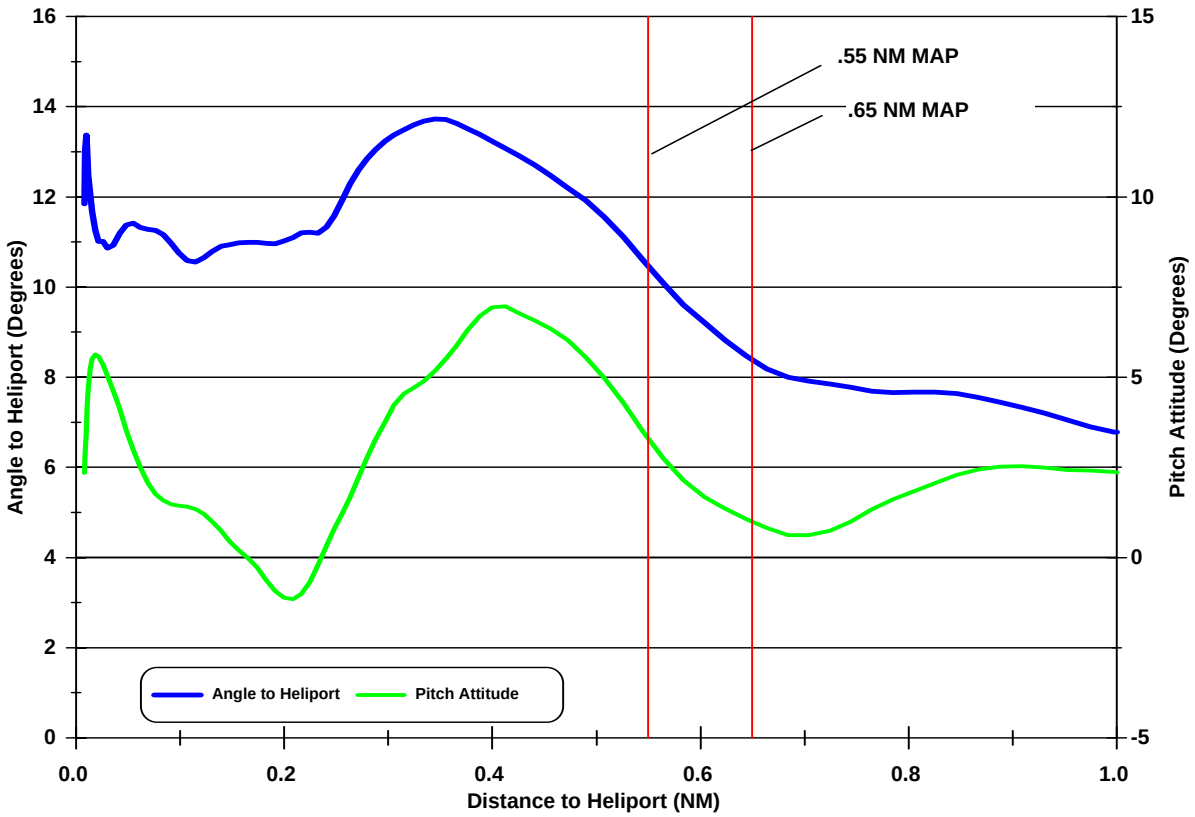
Profile View
Pilot P07 - 05/04/06B012 - Appr. #12W



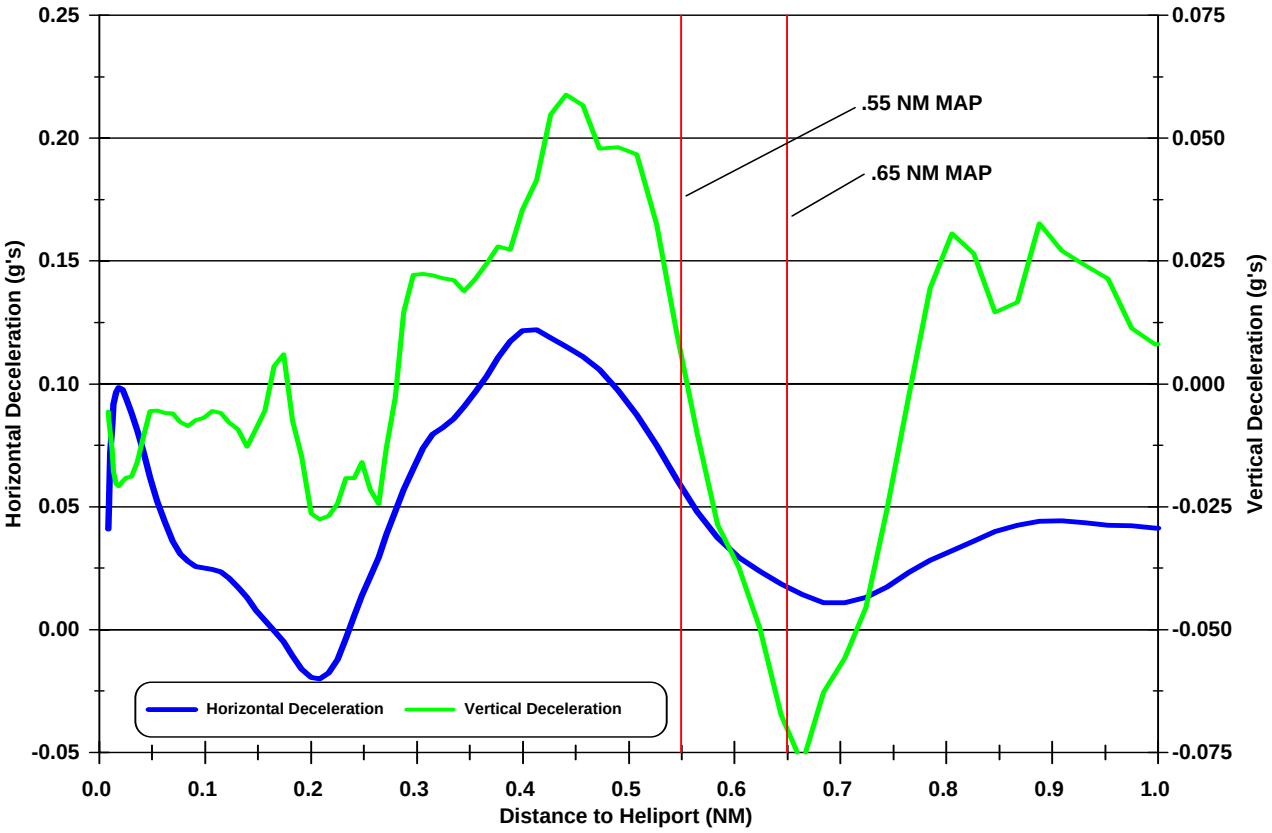
Ground Speed and Rate of Descent
Pilot P07 - 05/04/06B012 - Appr. #12W

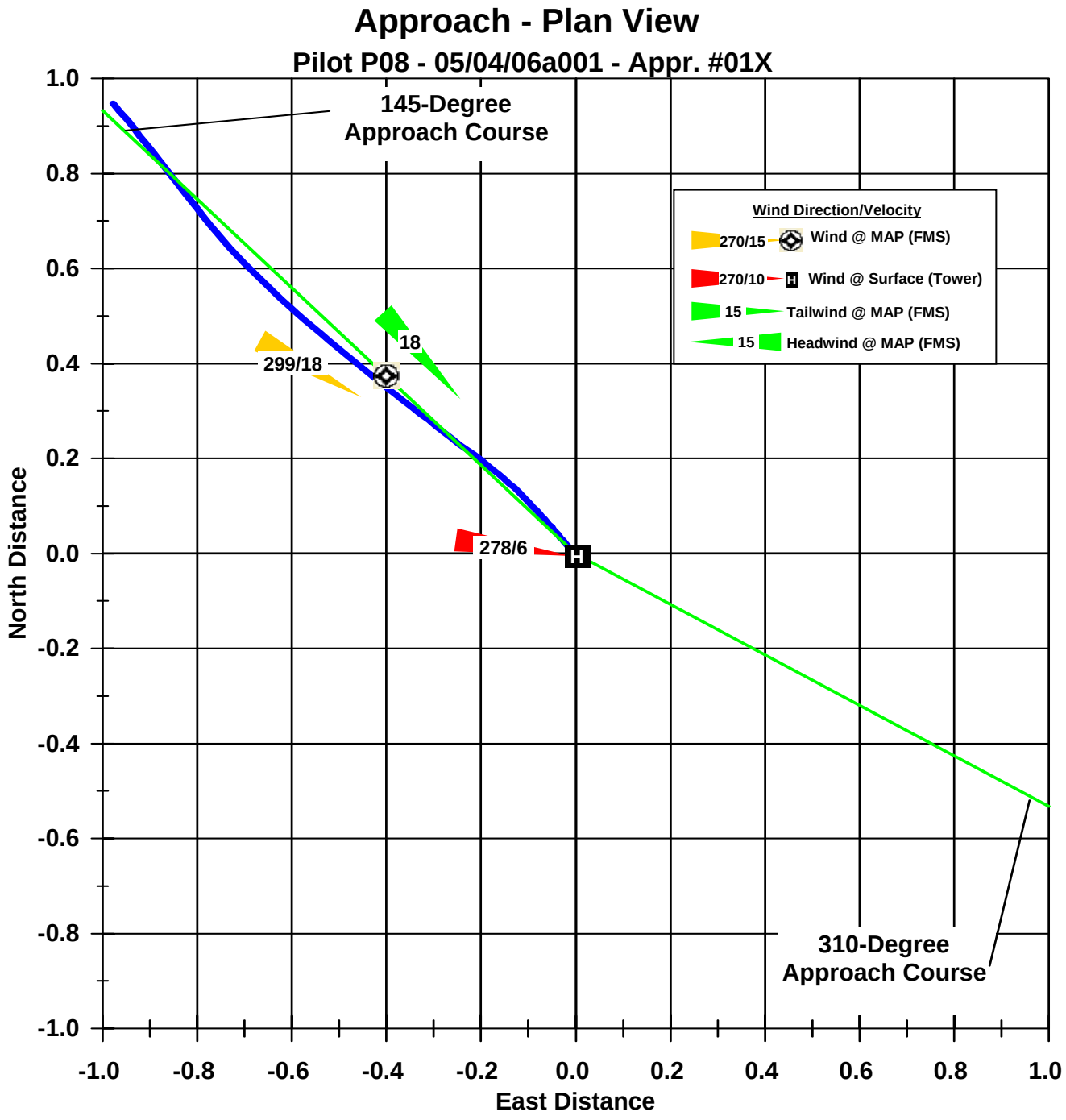


Angle to Heliport and Pitch Attitude
Pilot P07 - 05/04/06B012 - Appr. #12W

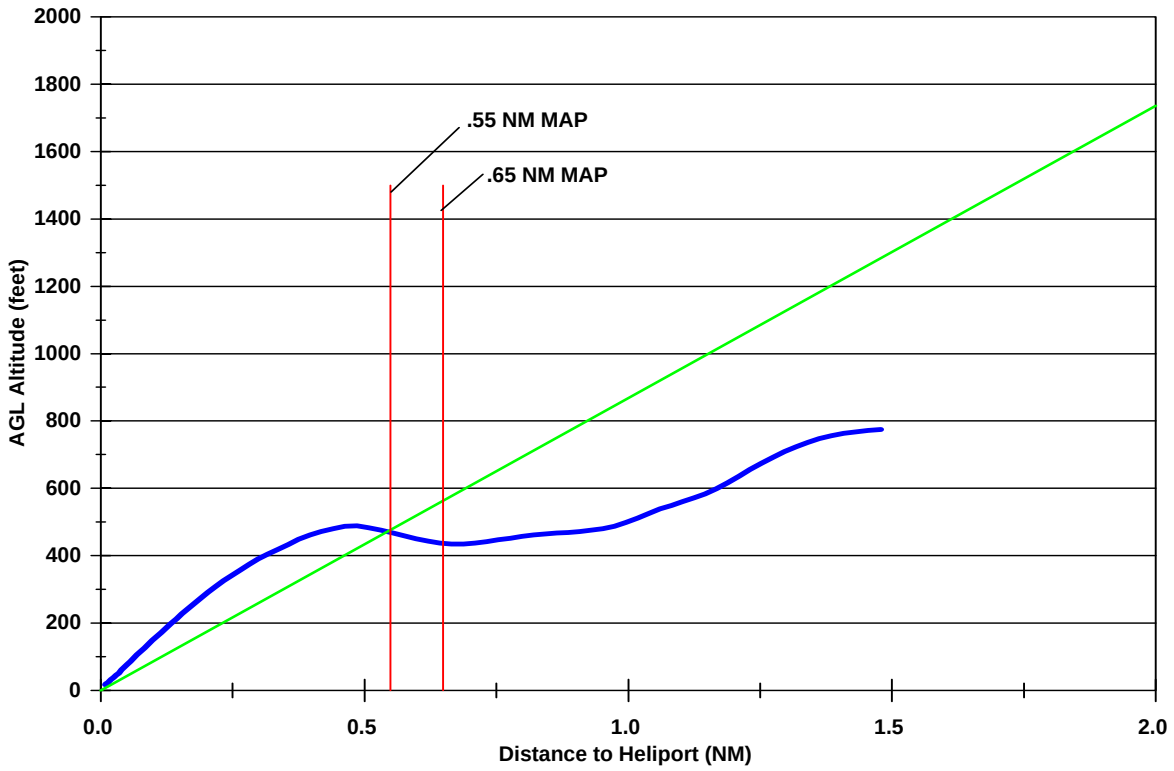


Horizontal and Vertical Deceleration
Pilot P07 - 05/04/06B012 - Appr. #12W

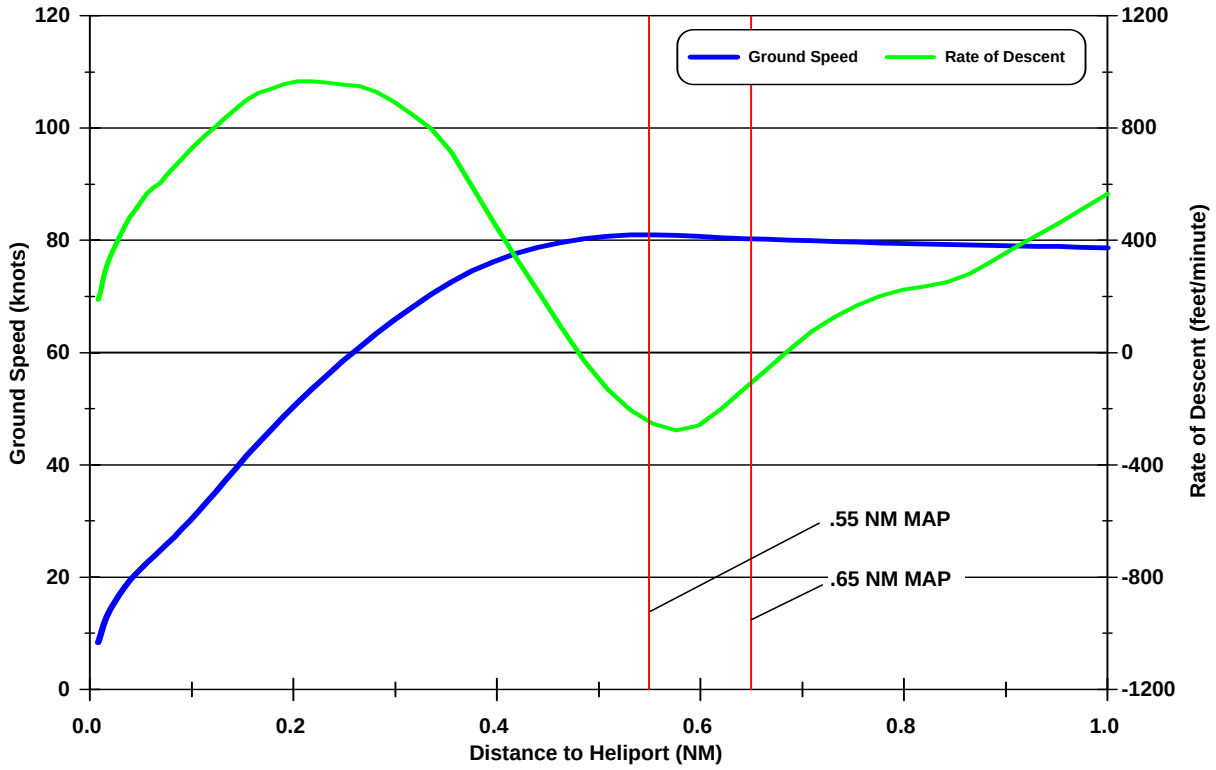



Approach - Plan View
Pilot P08 - 05/04/06a001 - Appr. #01X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
299/18
18
278/6
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

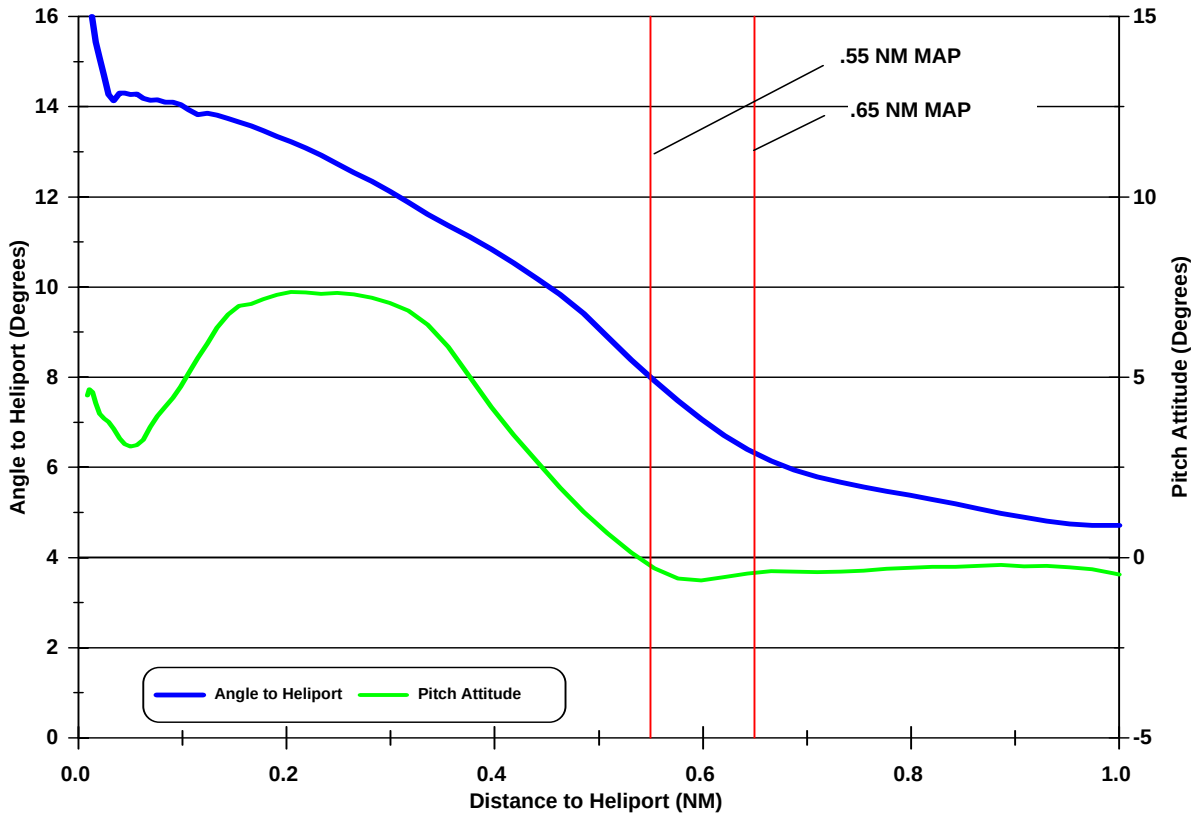
Profile View
Pilot P08 - 05/04/06a001 - Appr. #01X



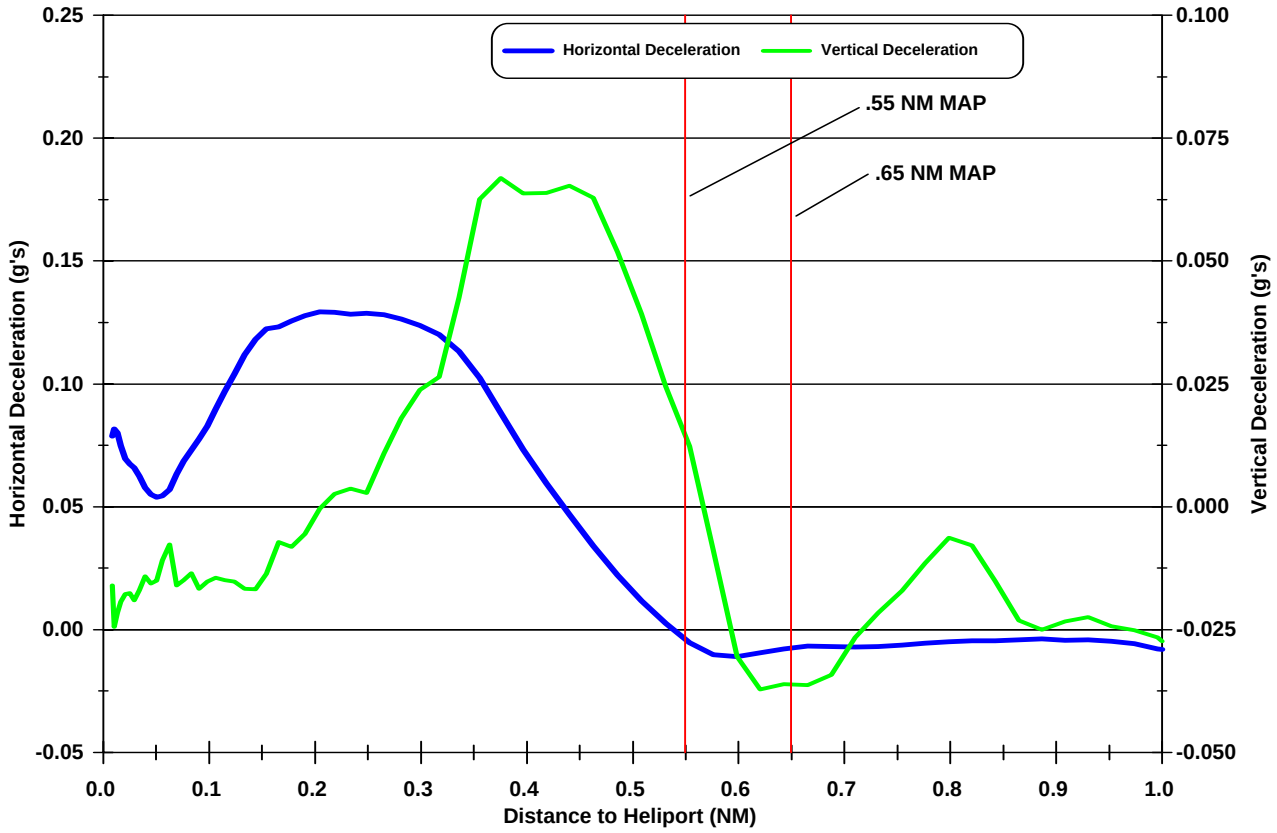
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06a001 - Appr. #01X

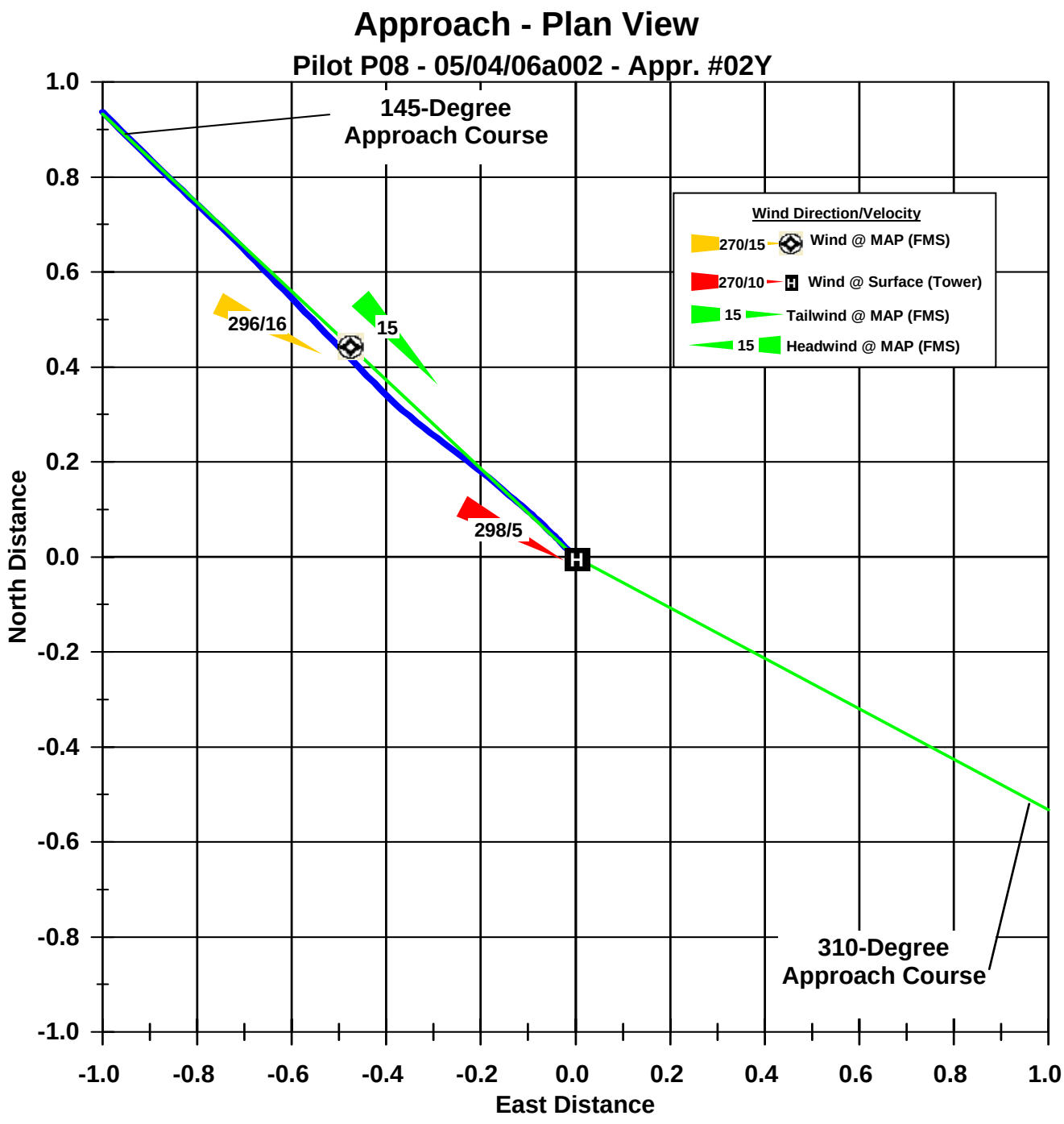


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06a001 - Appr. #01X

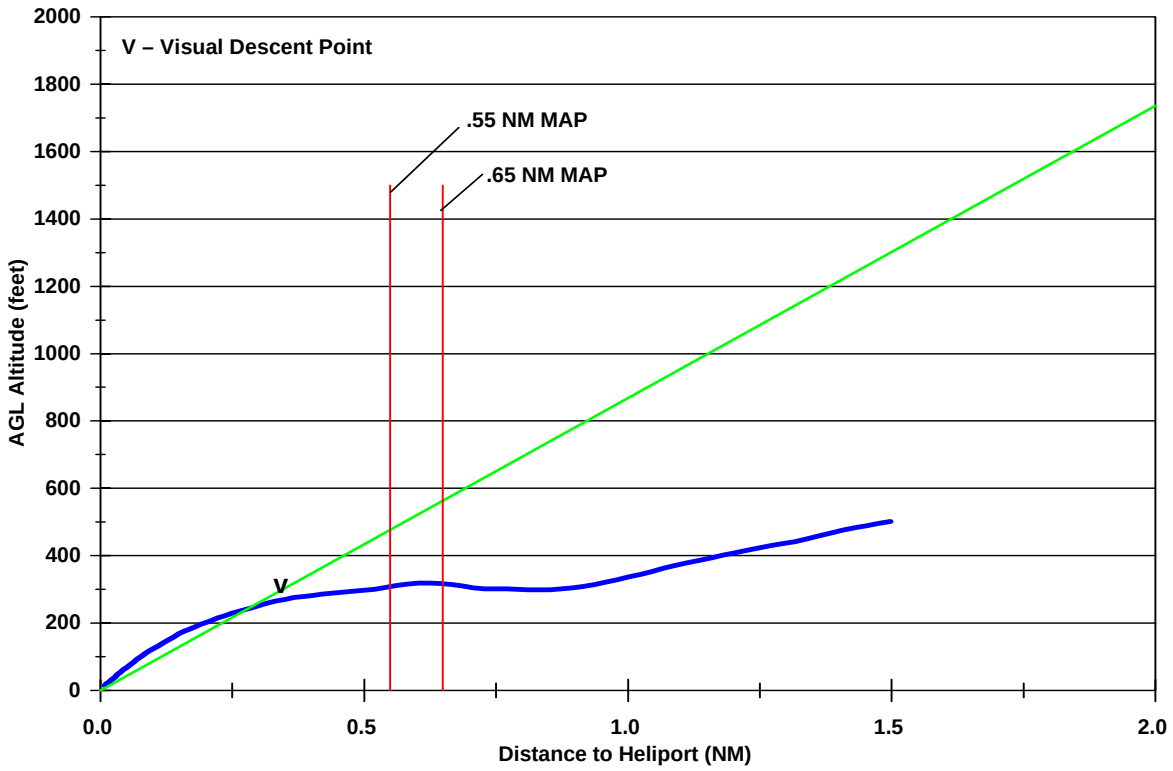


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06a001 - Appr. #01X

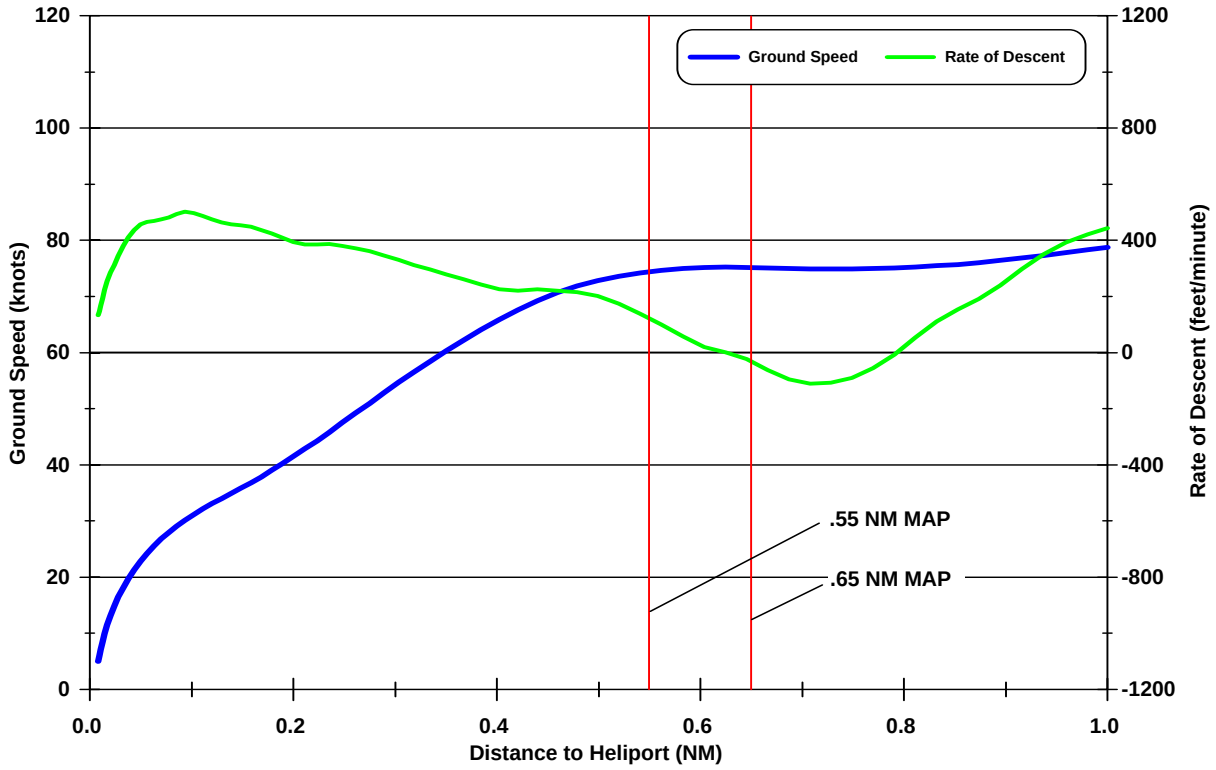



Approach - Plan View
Pilot P08 - 05/04/06a002 - Appr. #02Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
296/16
15
298/5
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

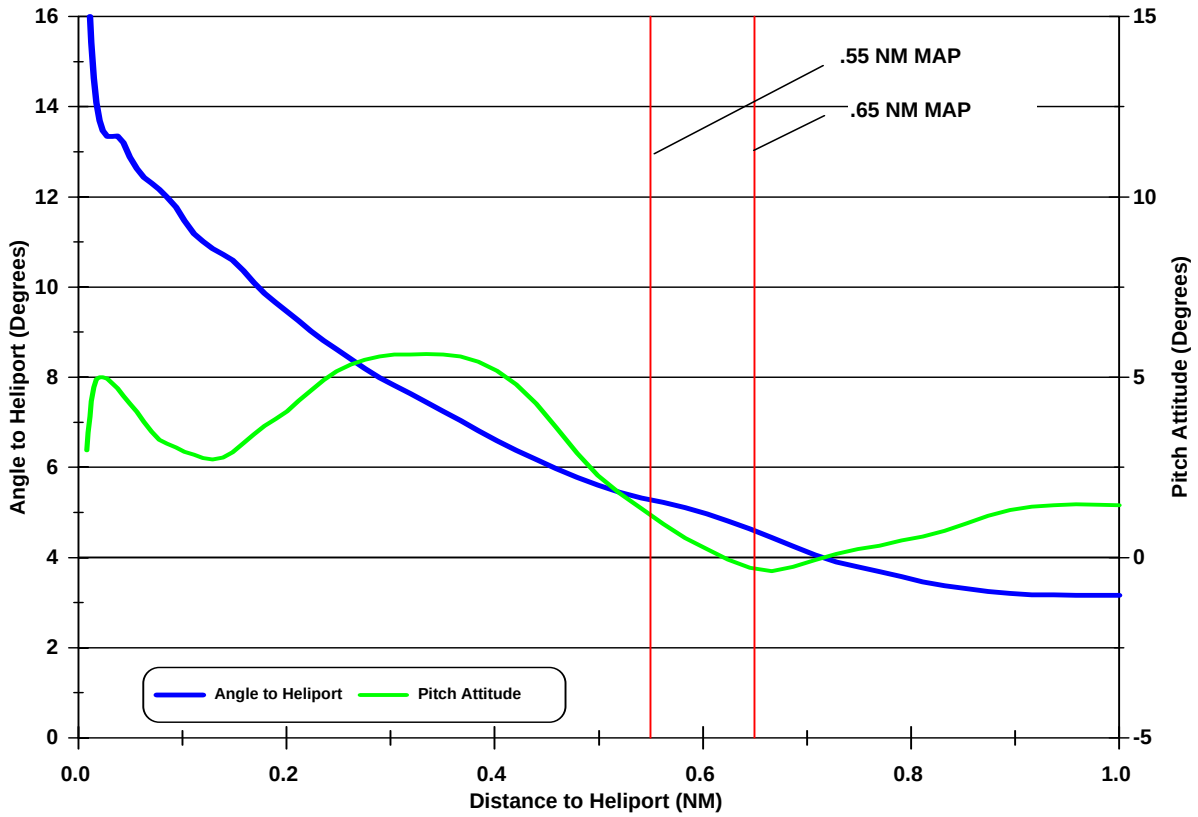
Profile View
Pilot P08 - 05/04/06a002 - Appr. #02Y



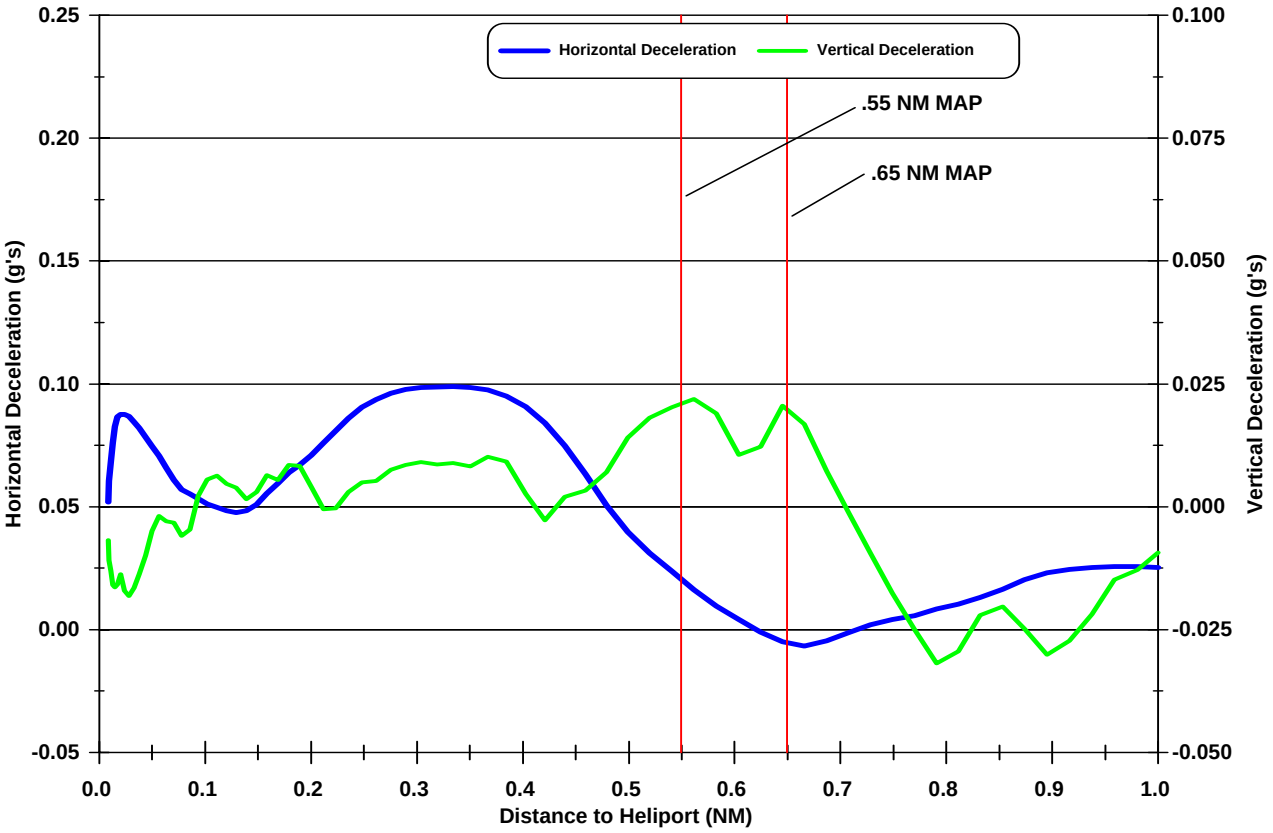
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06a002 - Appr. #02Y

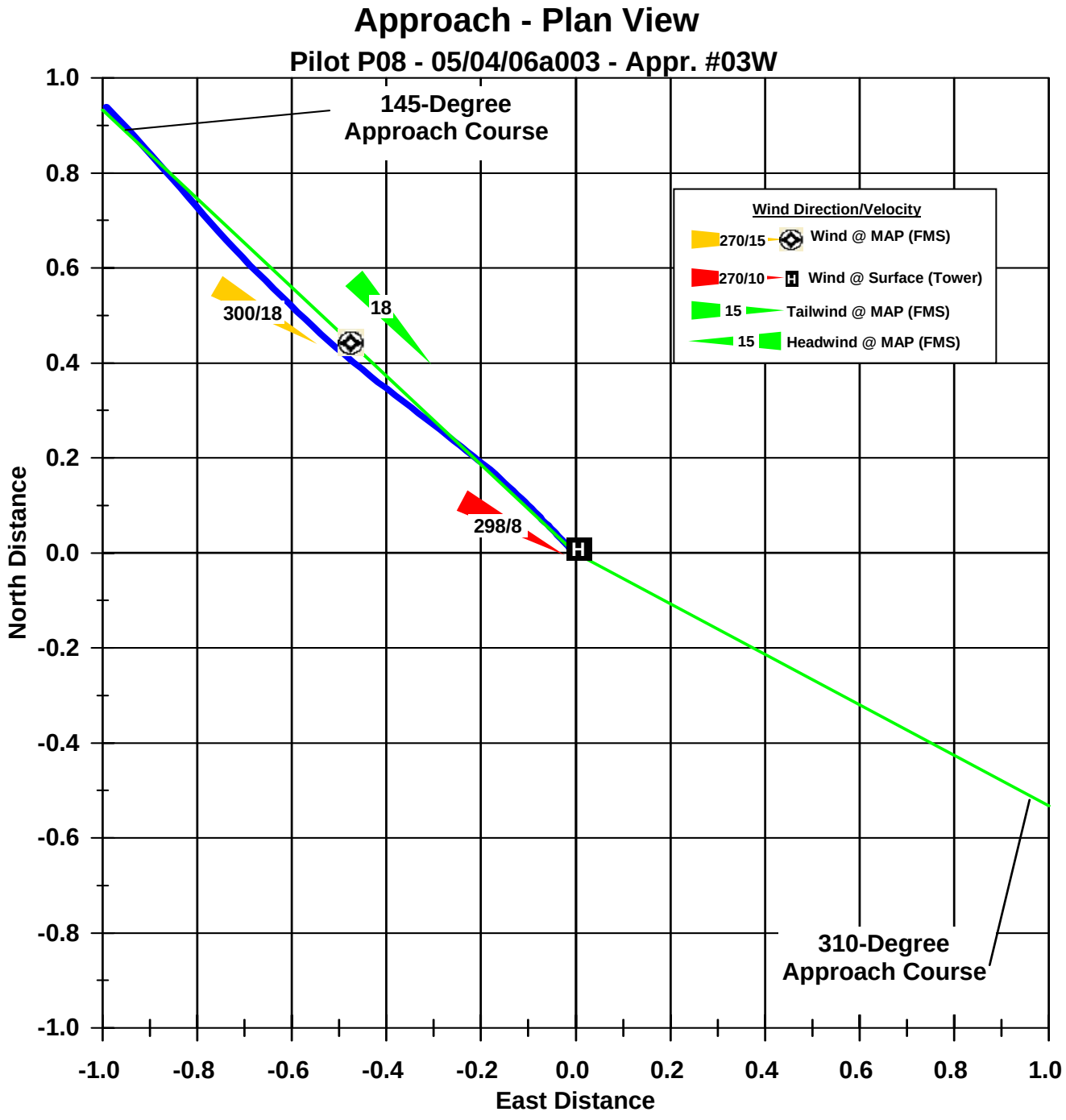


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06a002 - Appr. #02Y

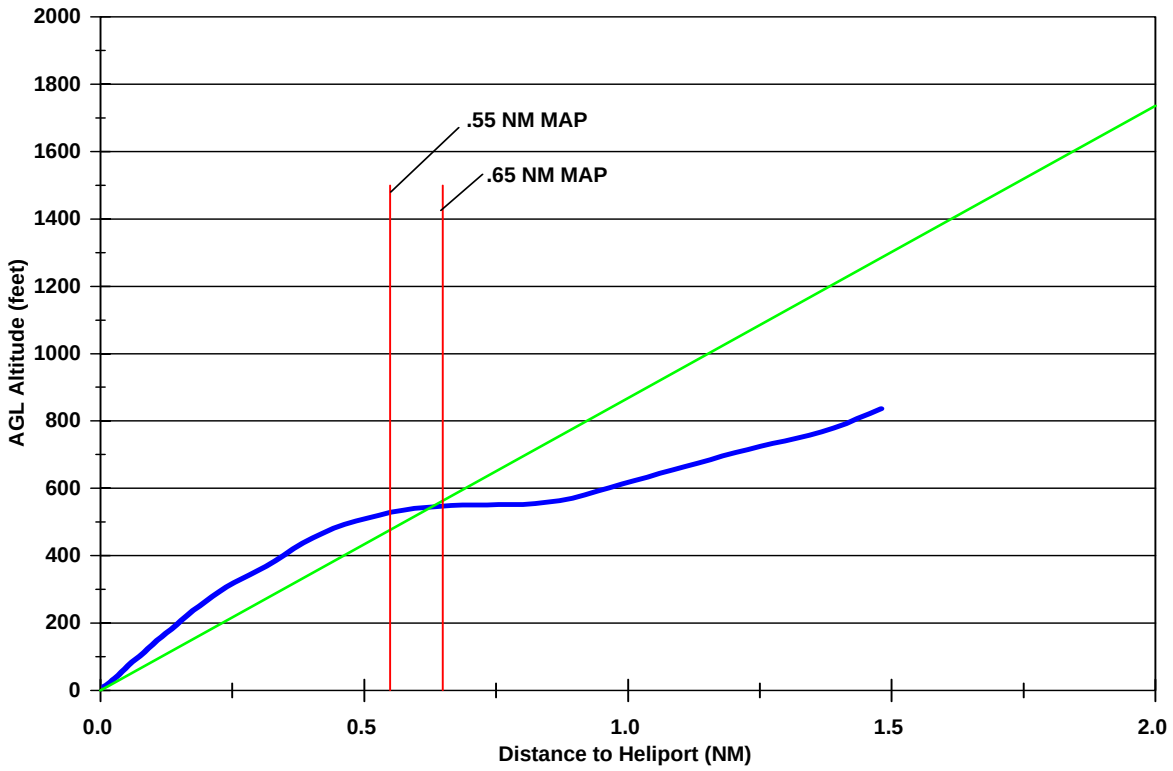


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06a002 - Appr. #02Y

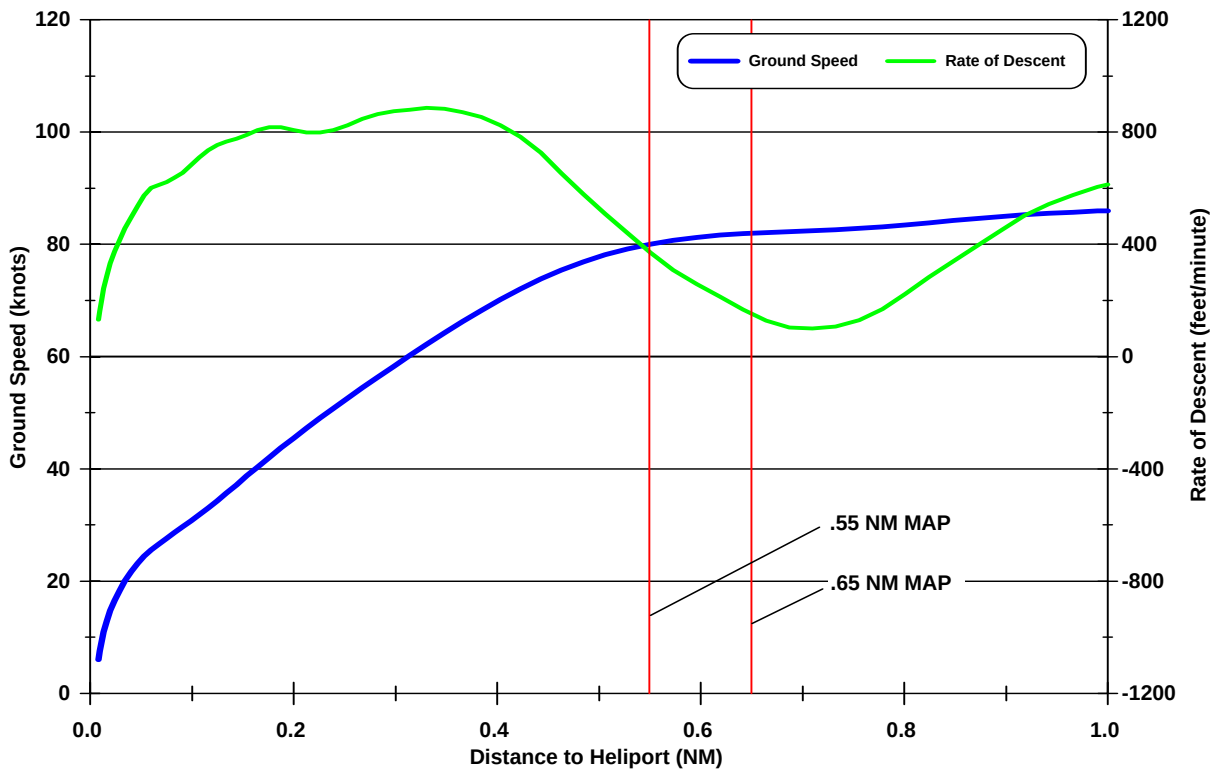



Approach - Plan View
Pilot P08 - 05/04/06a003 - Appr. #03W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
300/18
18
298/8
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

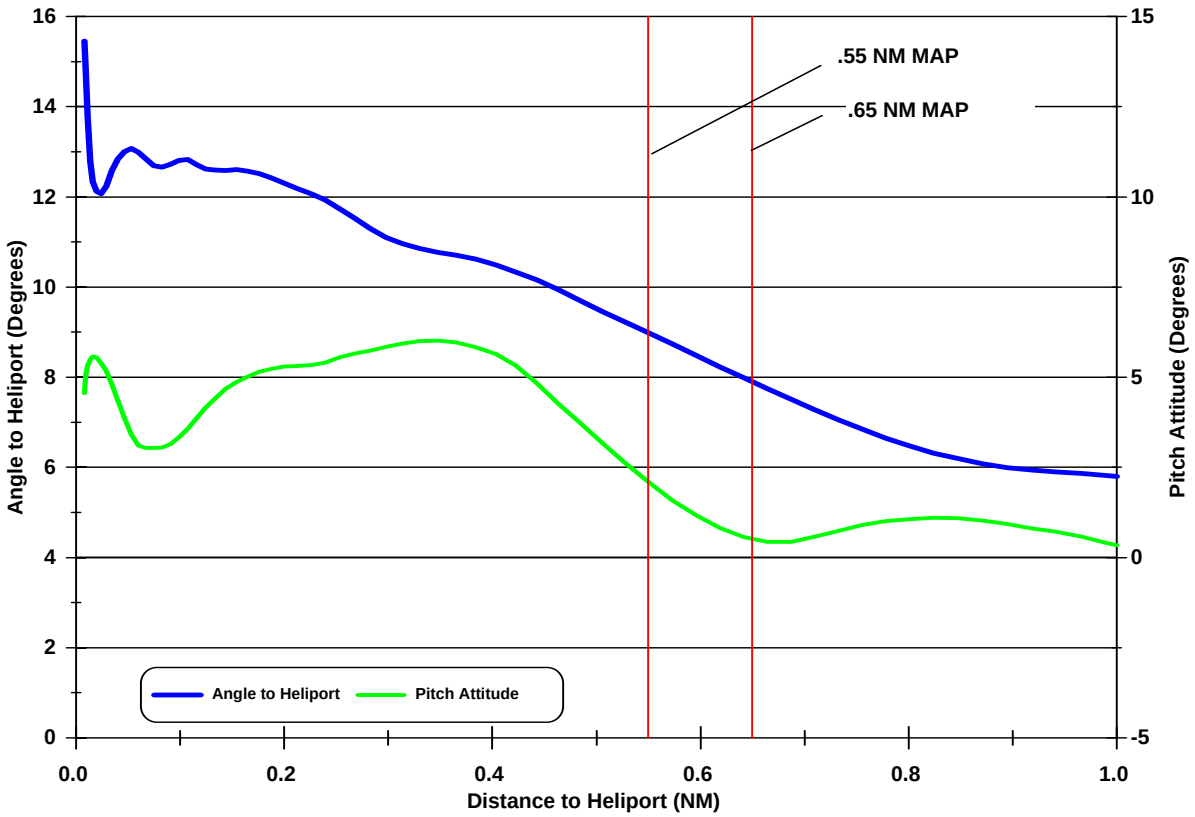
Profile View
Pilot P08 - 05/04/06a003 - Appr. #03W



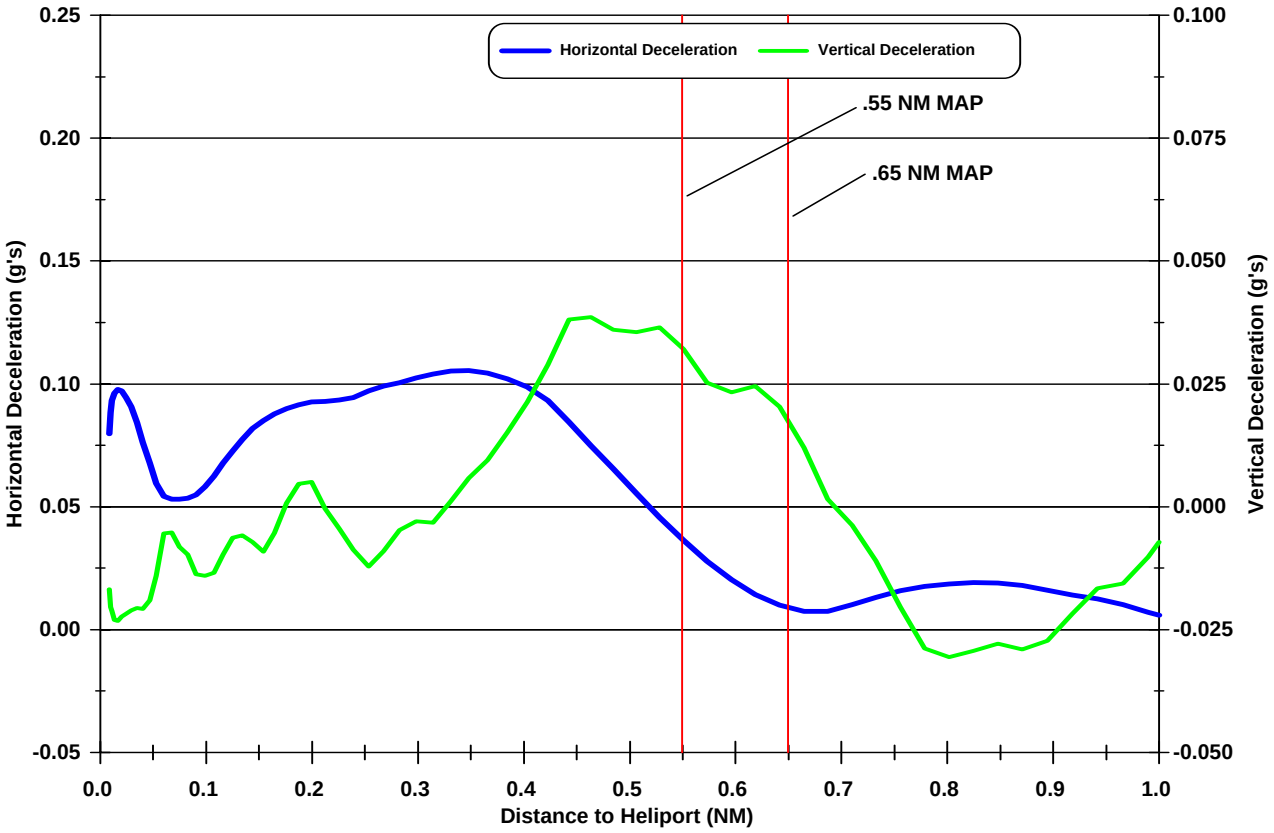
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06a003 - Appr. #03W

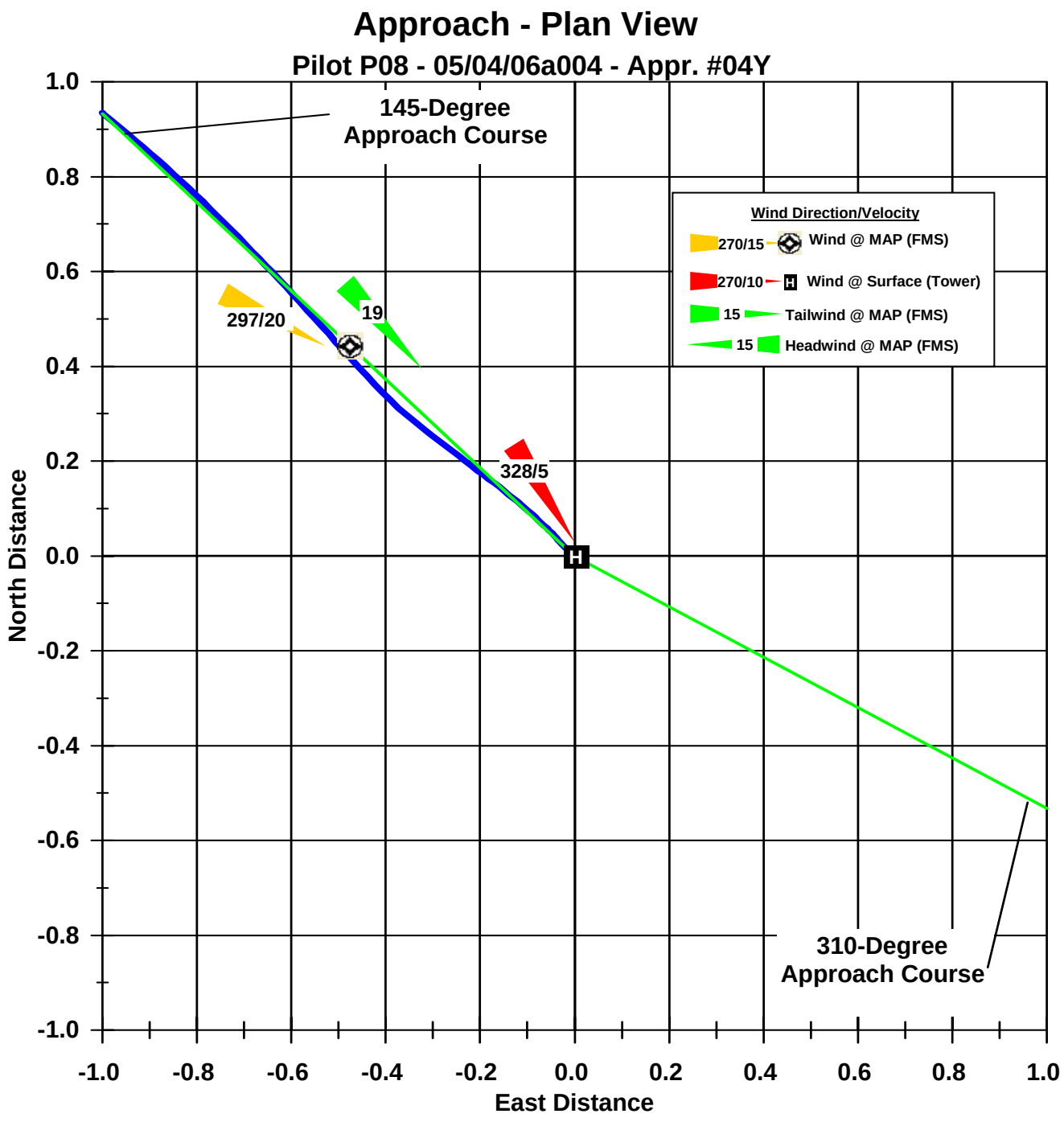


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06a003 - Appr. #03W

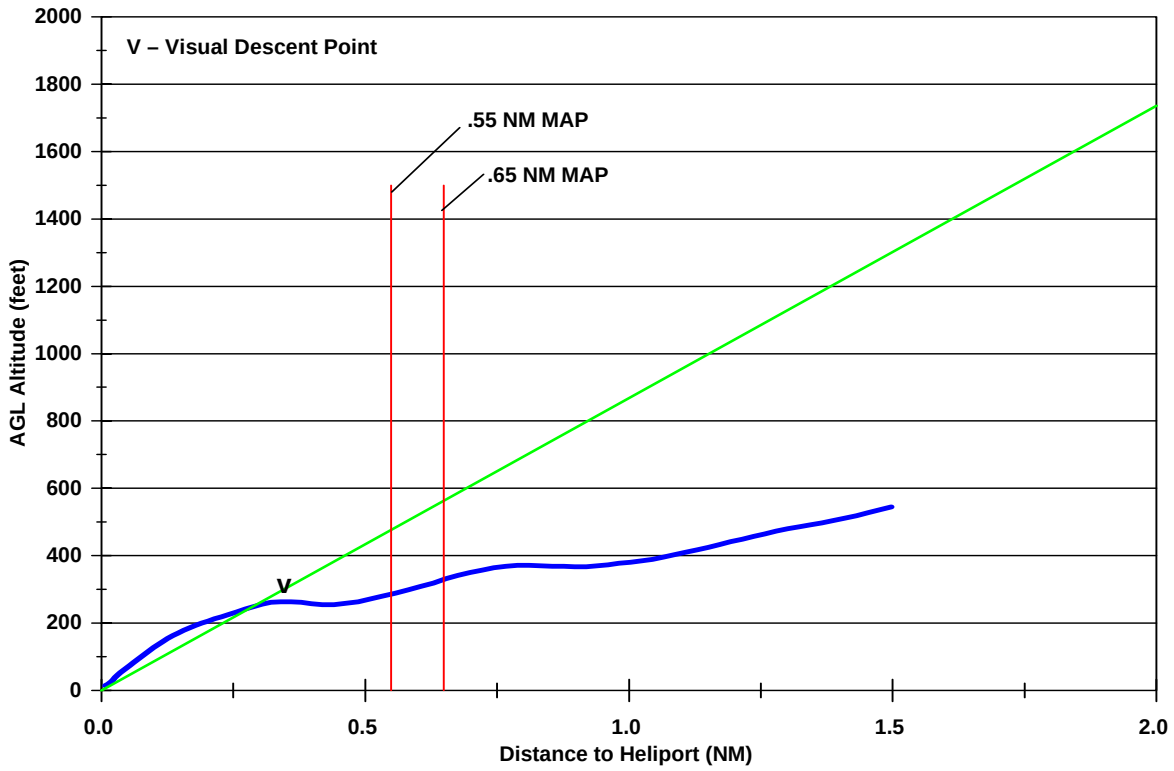


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06a003 - Appr. #03W

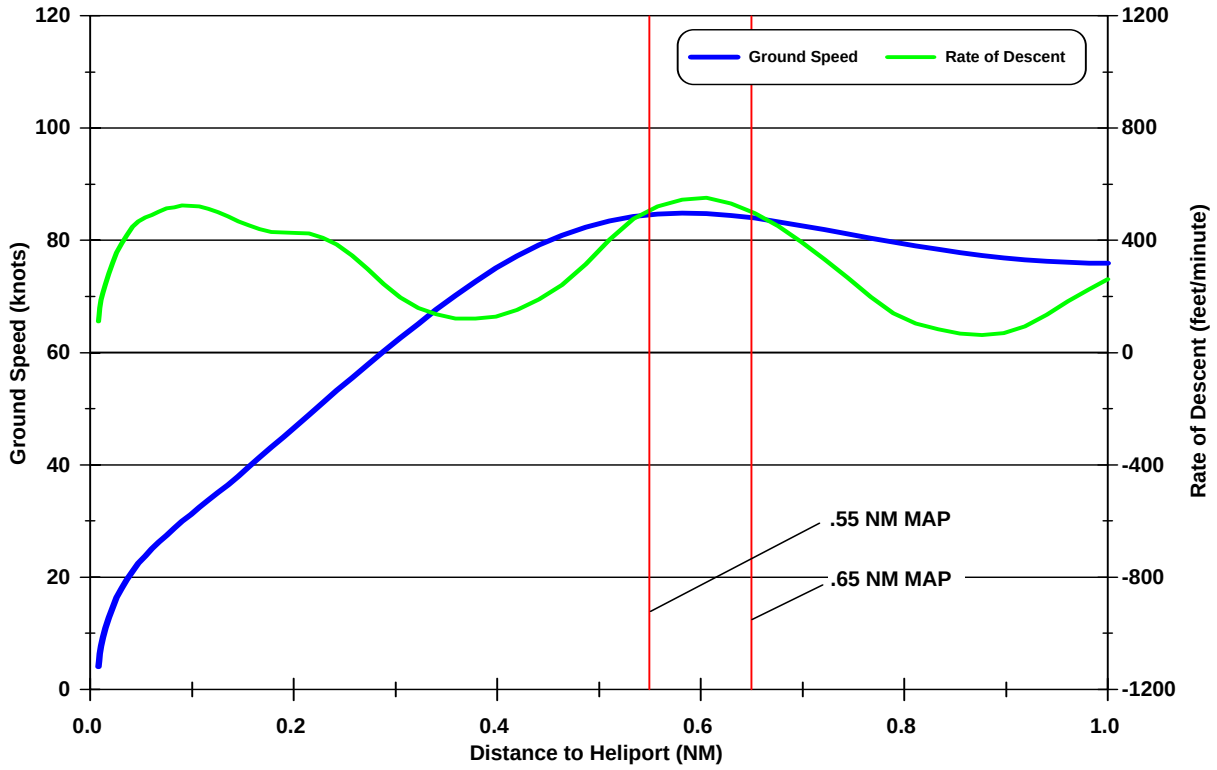



Approach - Plan View
Pilot P08 - 05/04/06a004 - Appr. #04Y
145-Degree
Approach Course
310-Degree
Approach Course
297/20
19
328/5
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

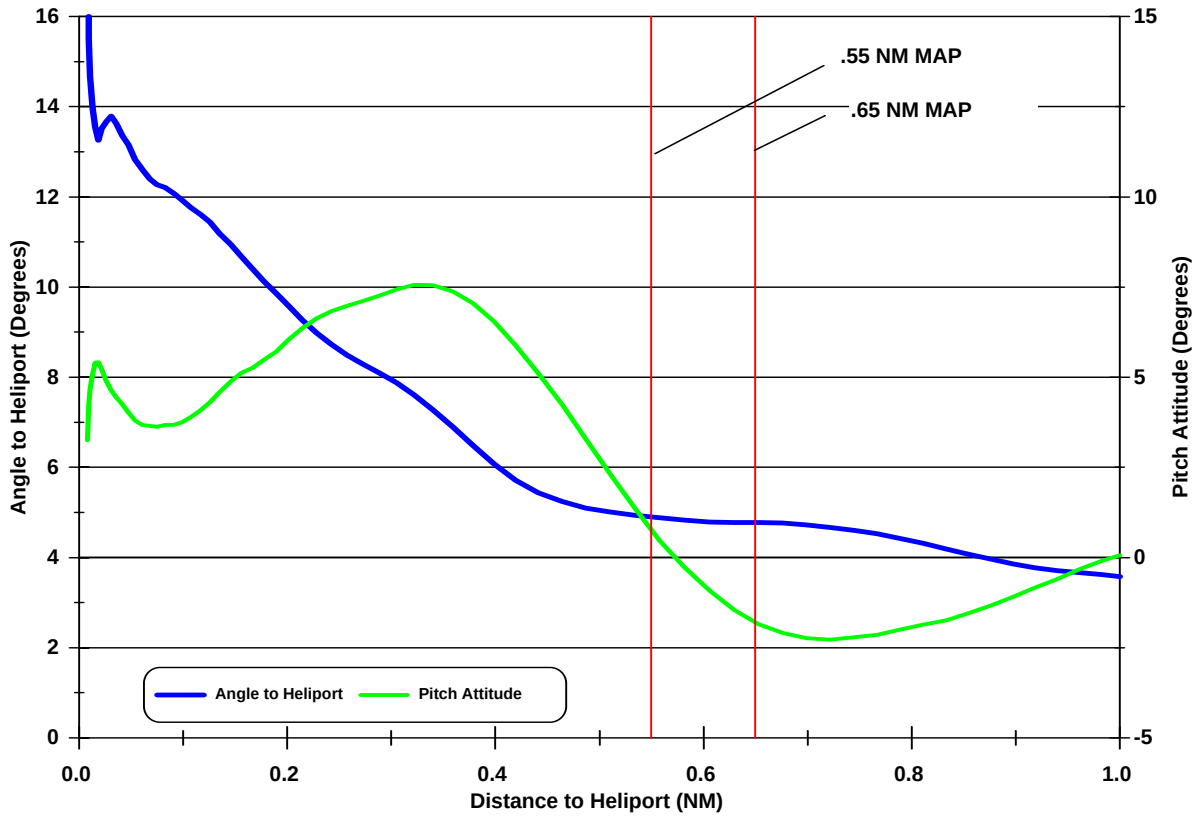
Profile View
Pilot P08 - 05/04/06a004 - Appr. #04Y



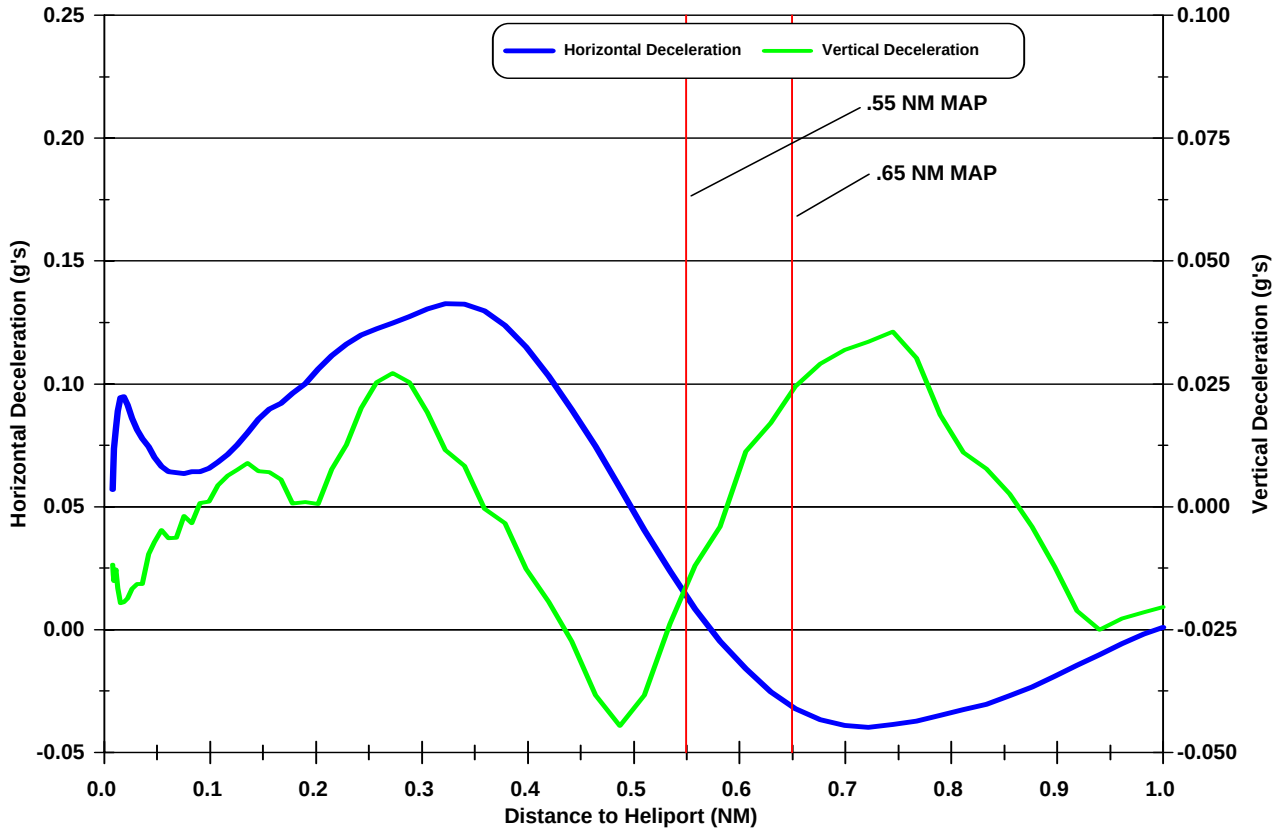
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06a004 - Appr. #04Y

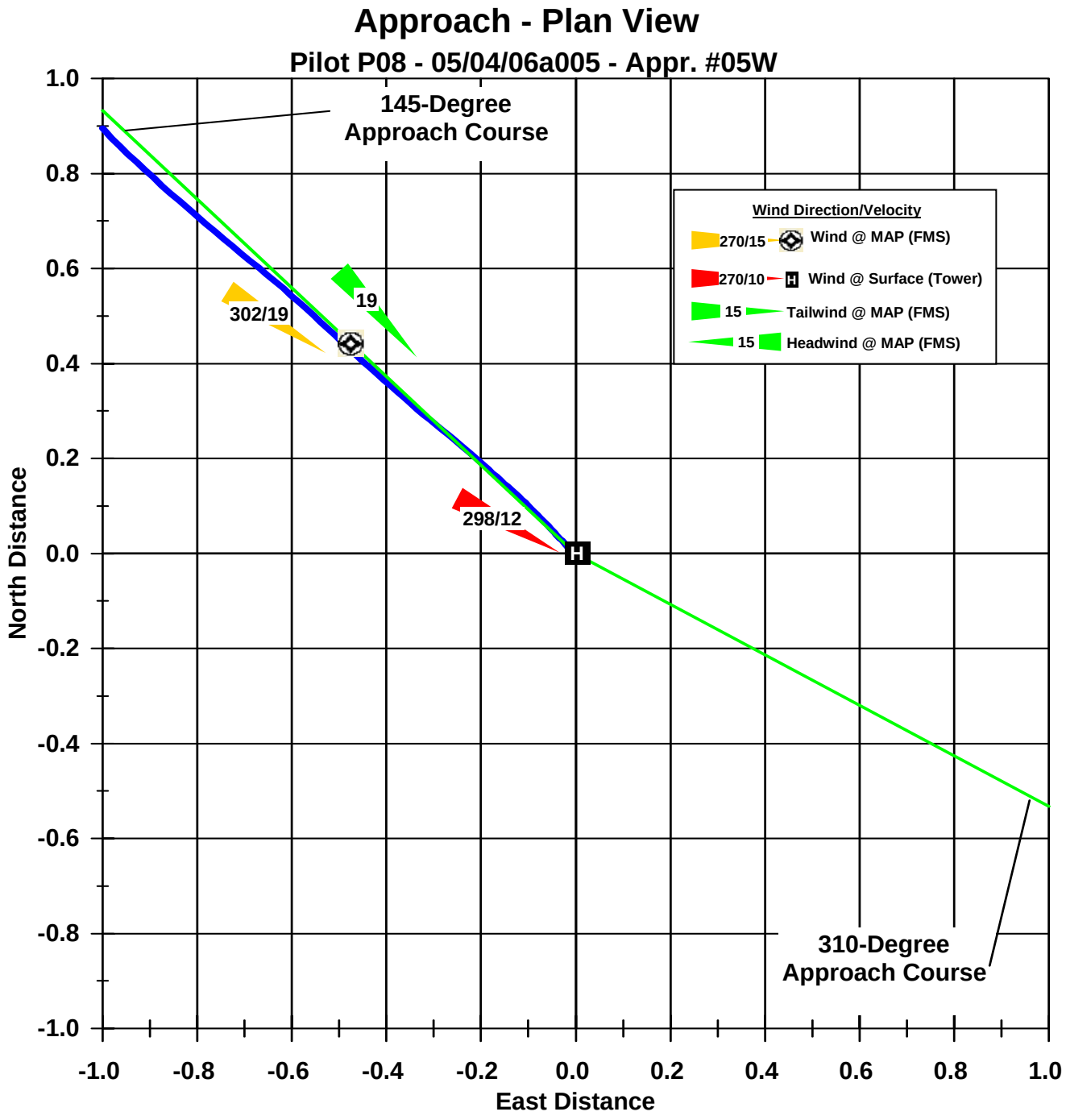


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06a004 - Appr. #04Y

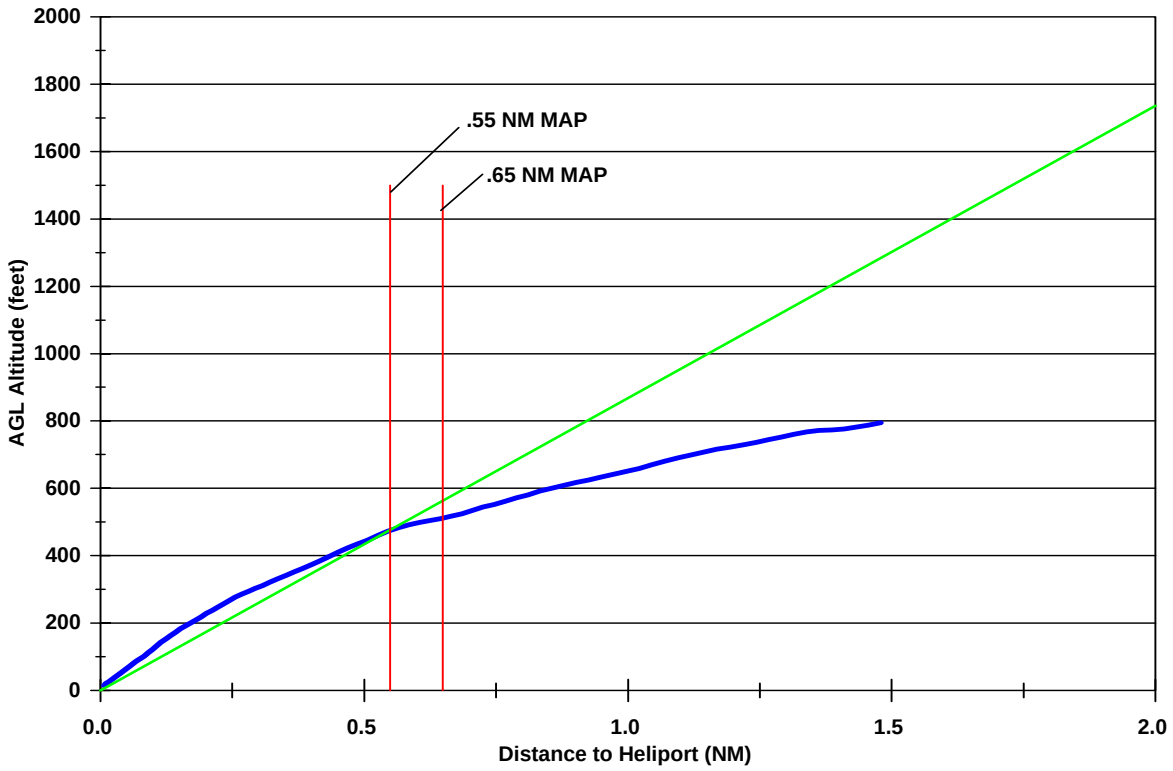


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06a004 - Appr. #04Y

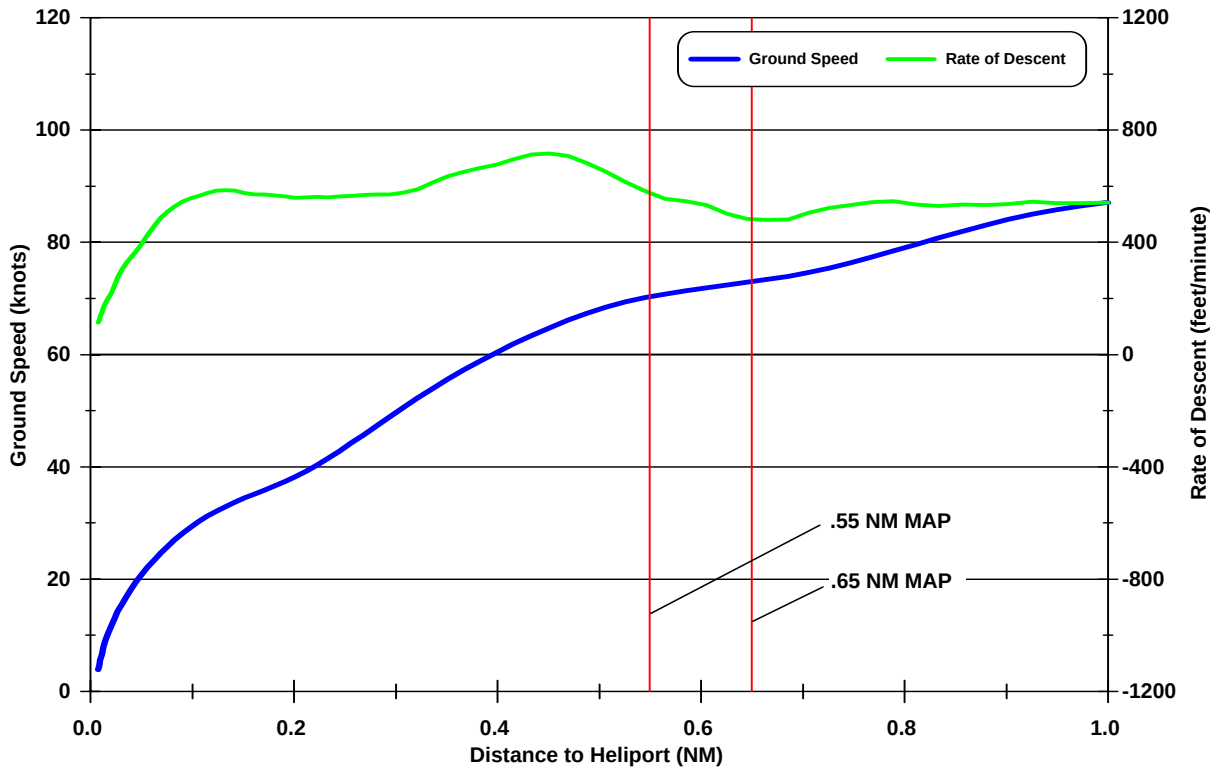



Approach - Plan View
Pilot P08 - 05/04/06a005 - Appr. #05W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
302/19
19
298/12
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

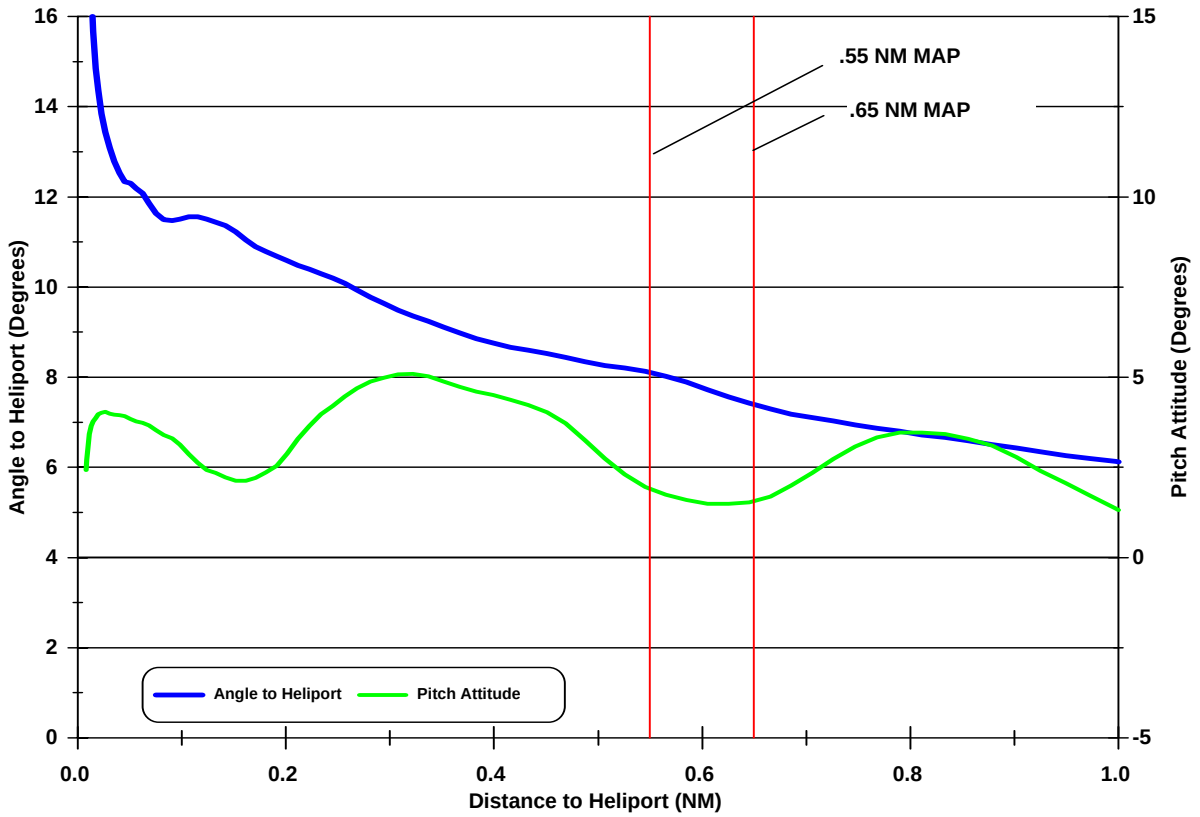
Profile View
Pilot P08 - 05/04/06a005 - Appr. #05W



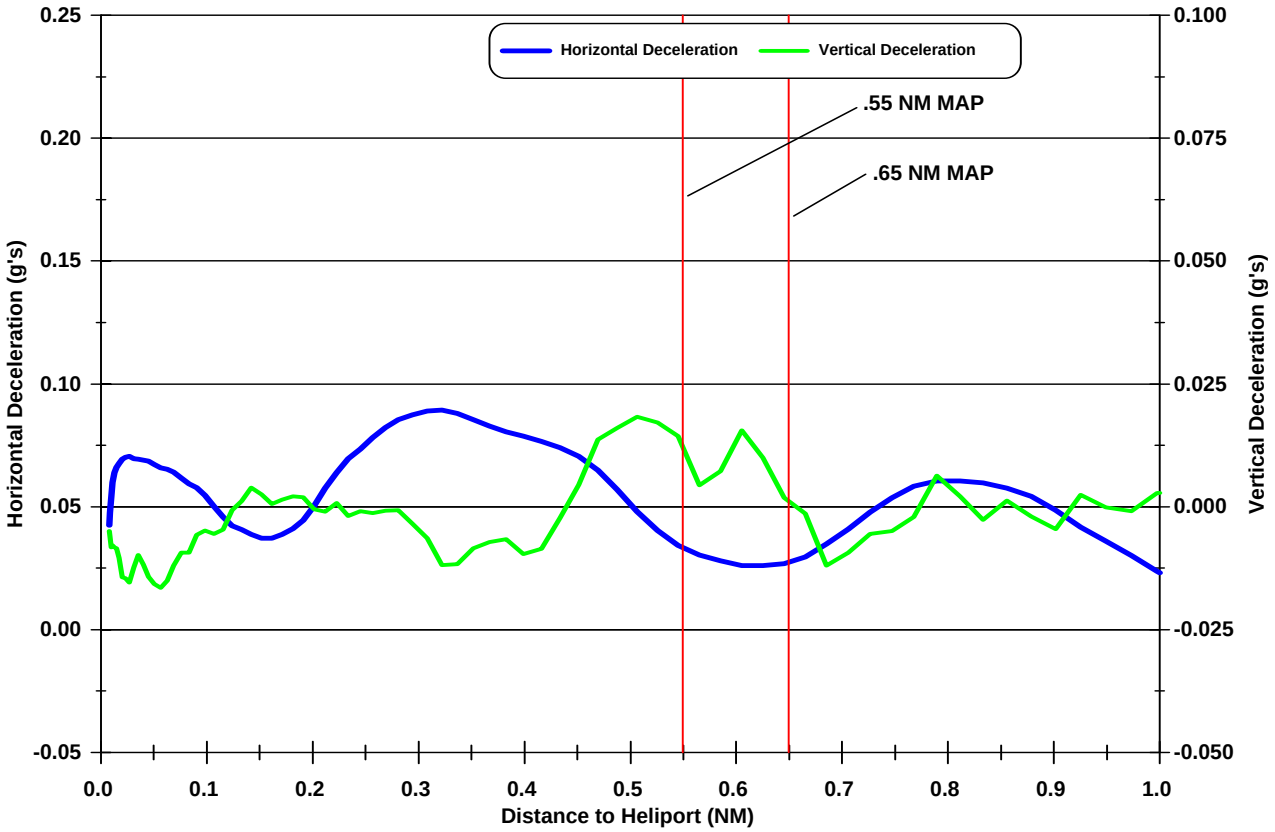
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06a005 - Appr. #05W

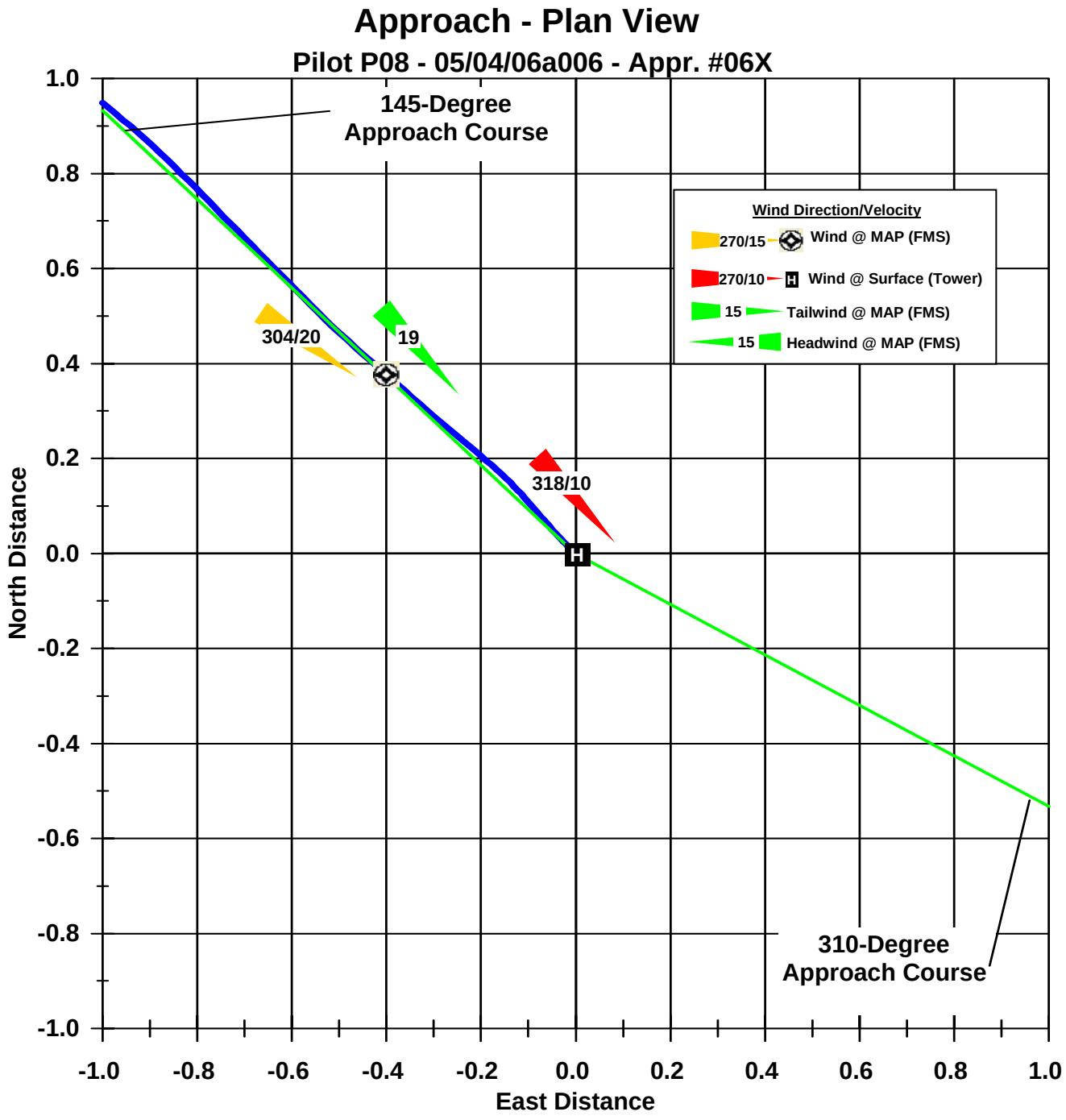


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06a005 - Appr. #05W

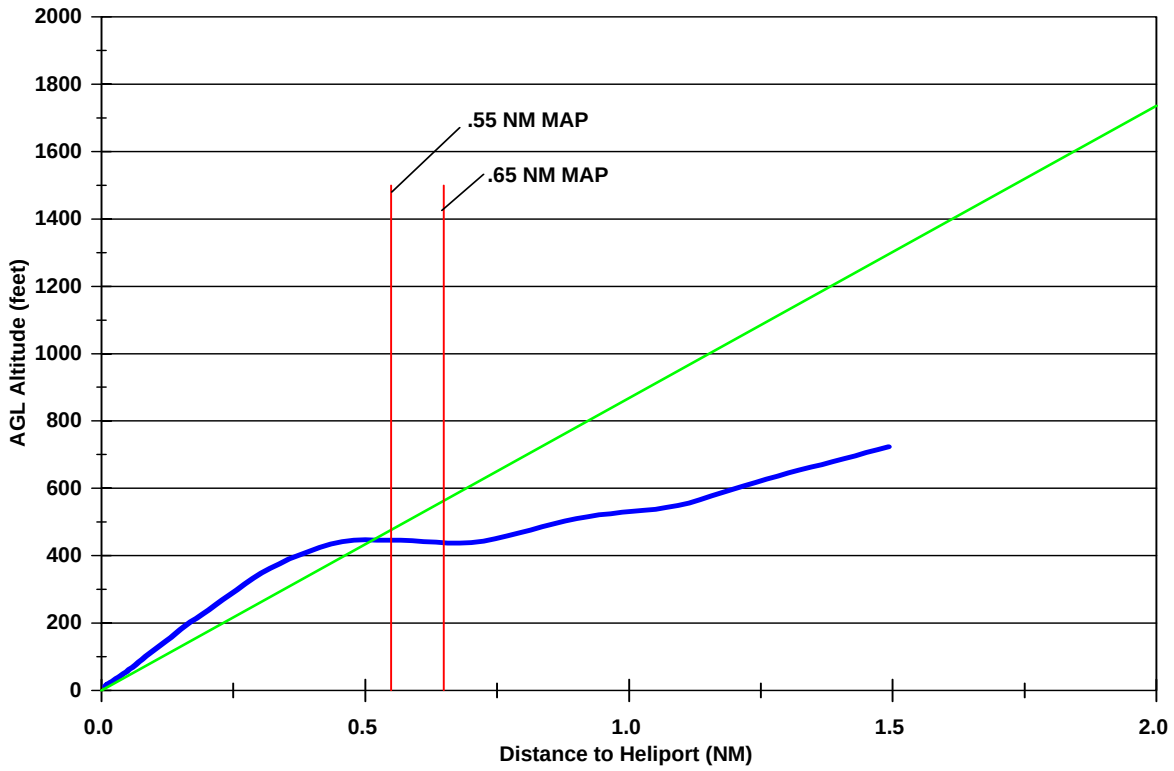


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06a005 - Appr. #05W

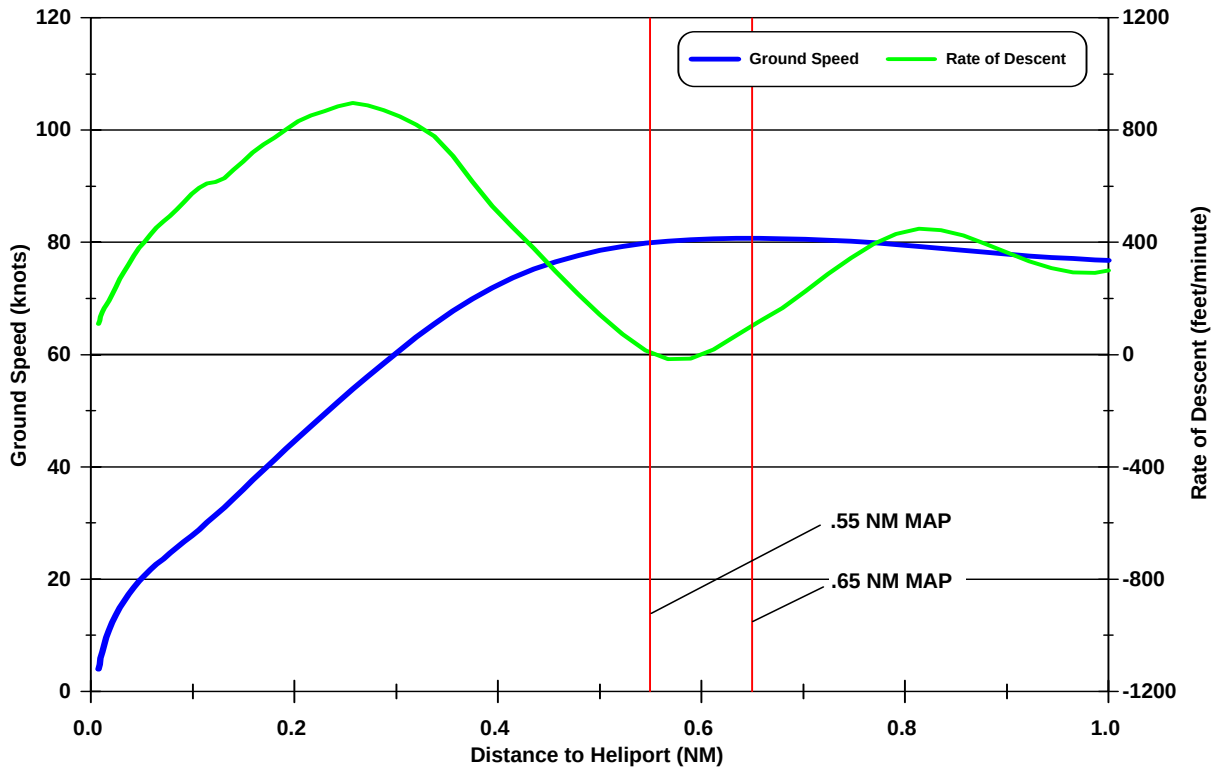



Approach - Plan View
Pilot P08 - 05/04/06a006 - Appr. #06X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
304/20
19
318/10
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

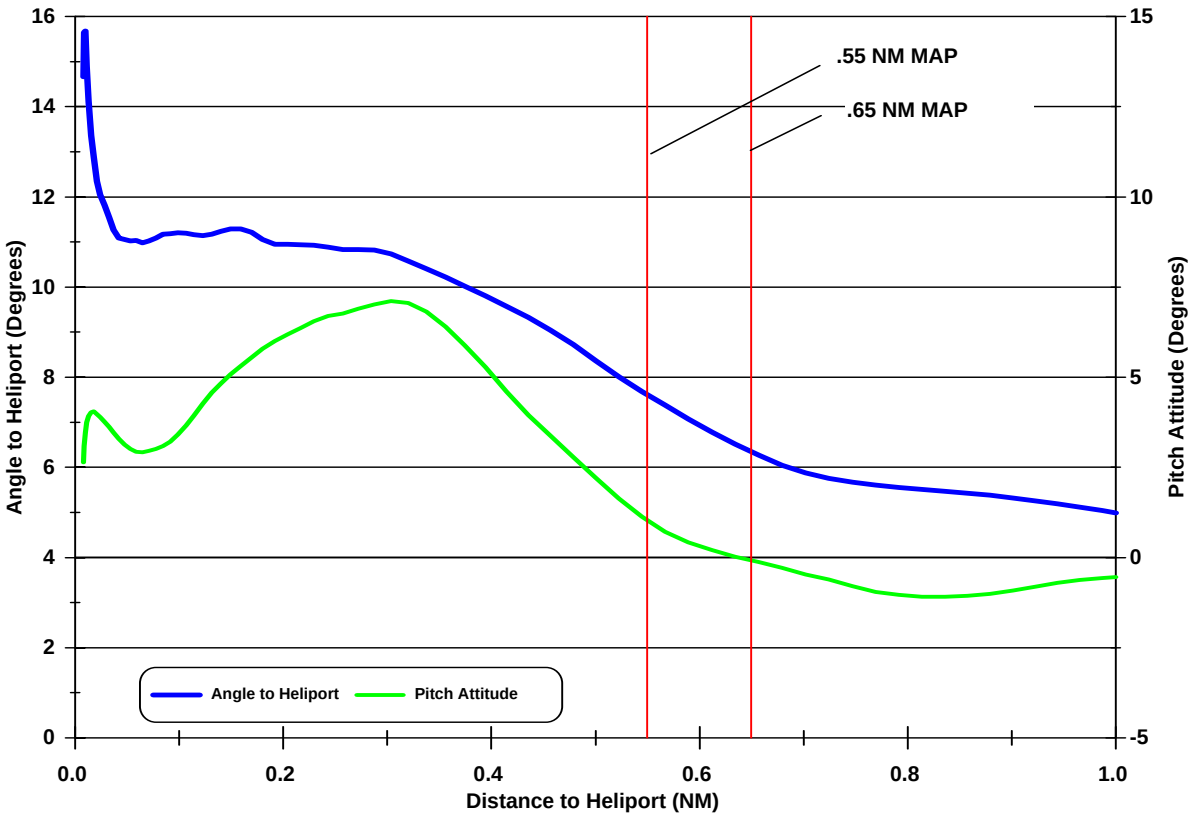
Profile View
Pilot P08 - 05/04/06a006 - Appr. #06X



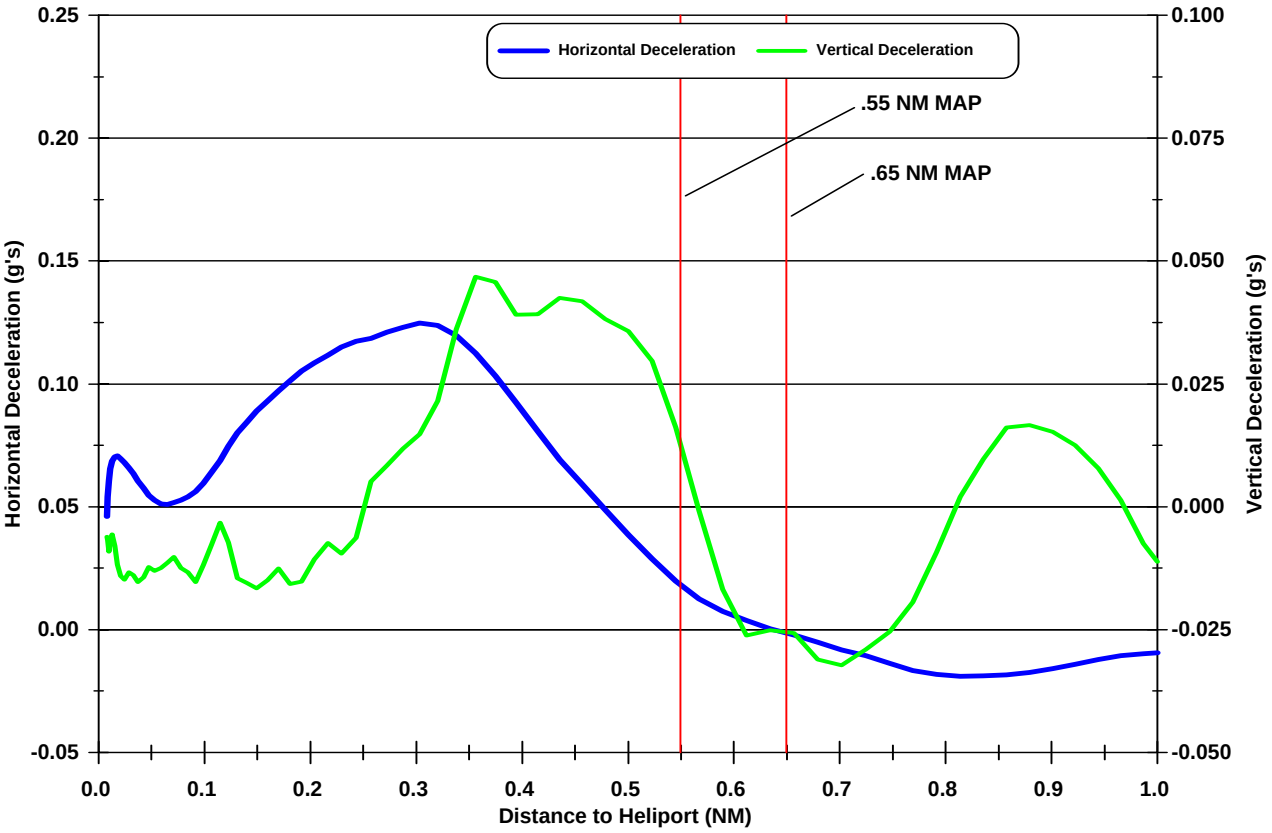
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06a006 - Appr. #06X

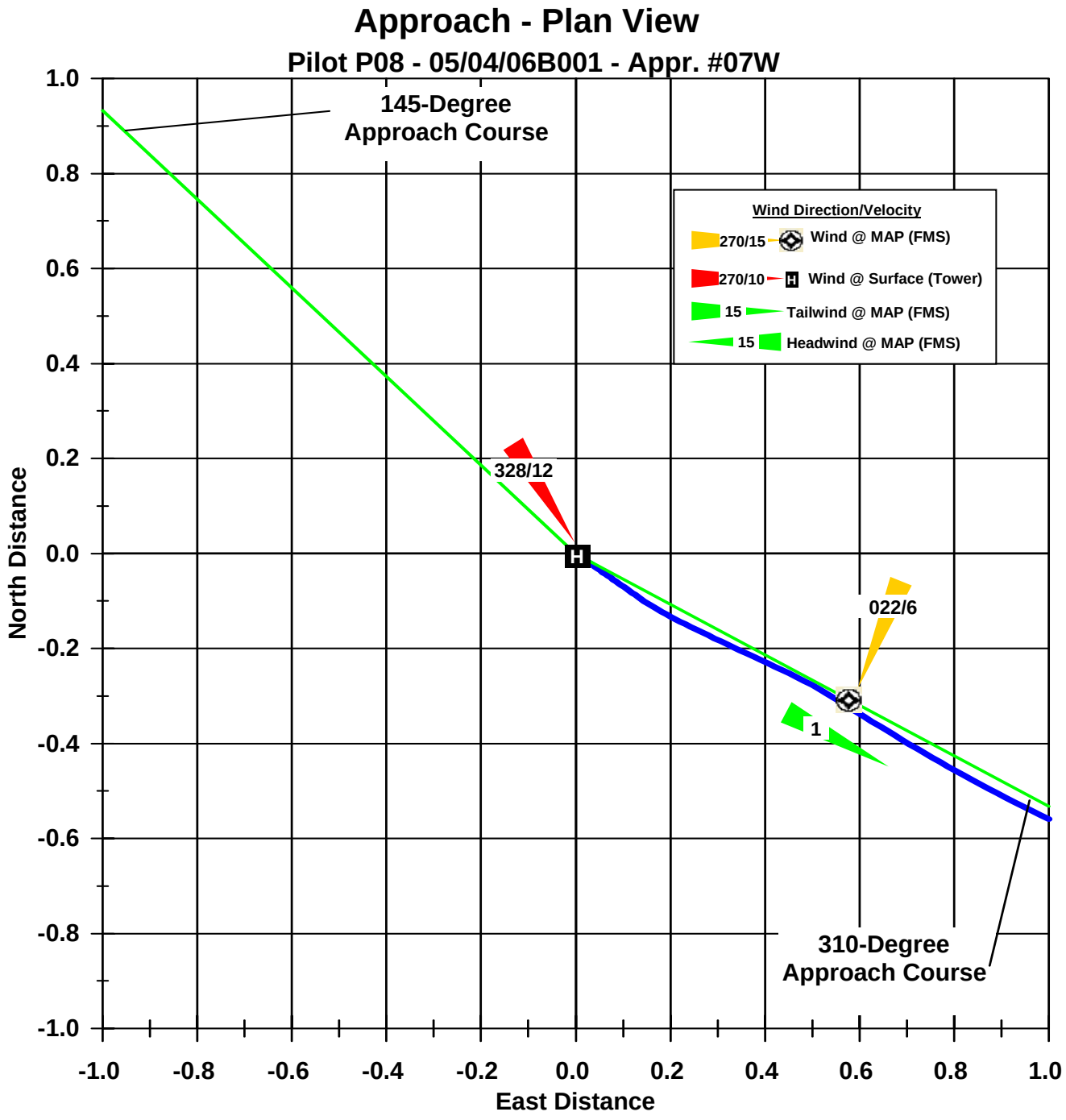


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06a006 - Appr. #06X

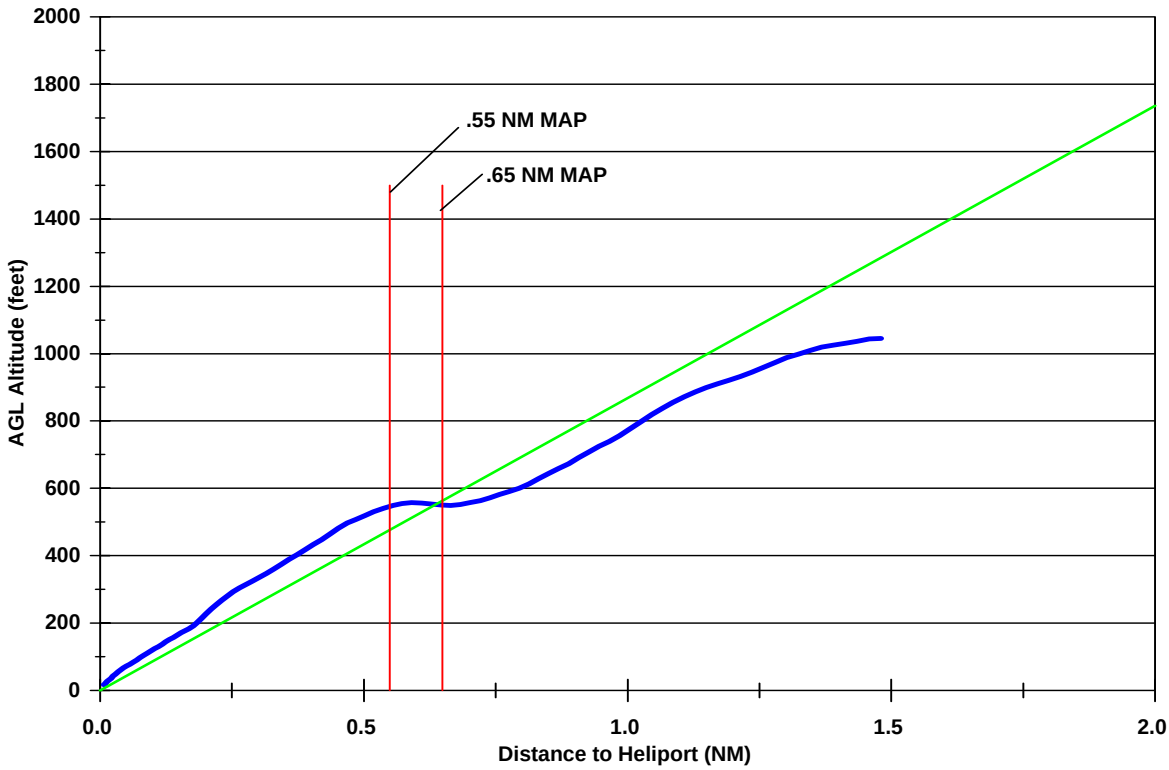


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06a006 - Appr. #06X

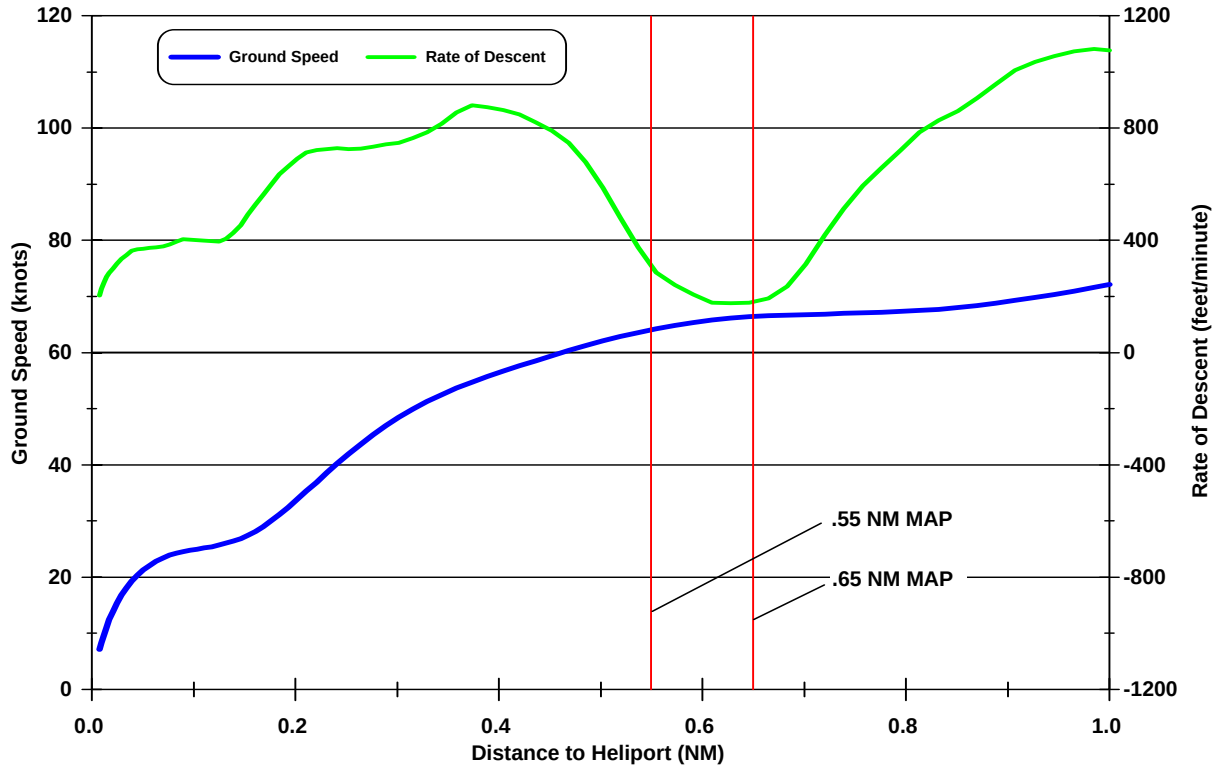



Approach - Plan View
Pilot P08 - 05/04/06B001 - Appr. #07W
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
328/12
022/6
1
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

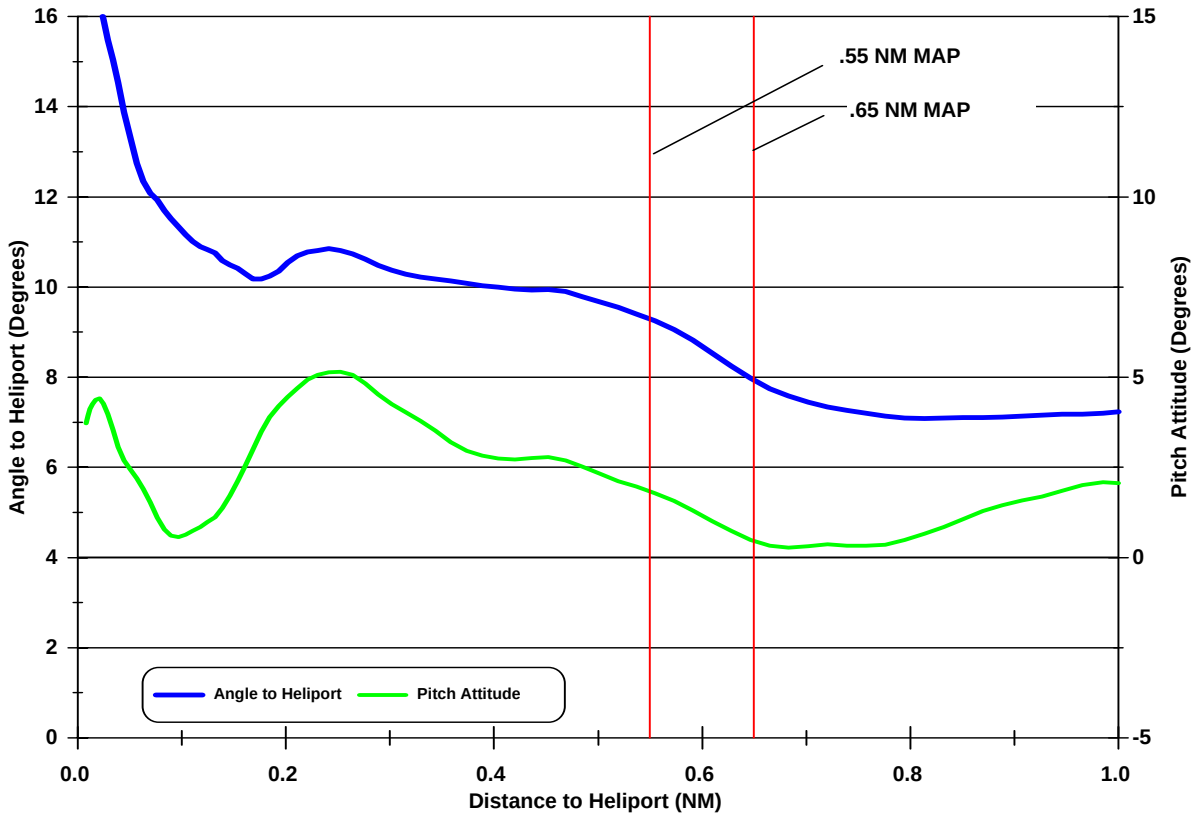
Profile View
Pilot P08 - 05/04/06B001 - Appr. #07W



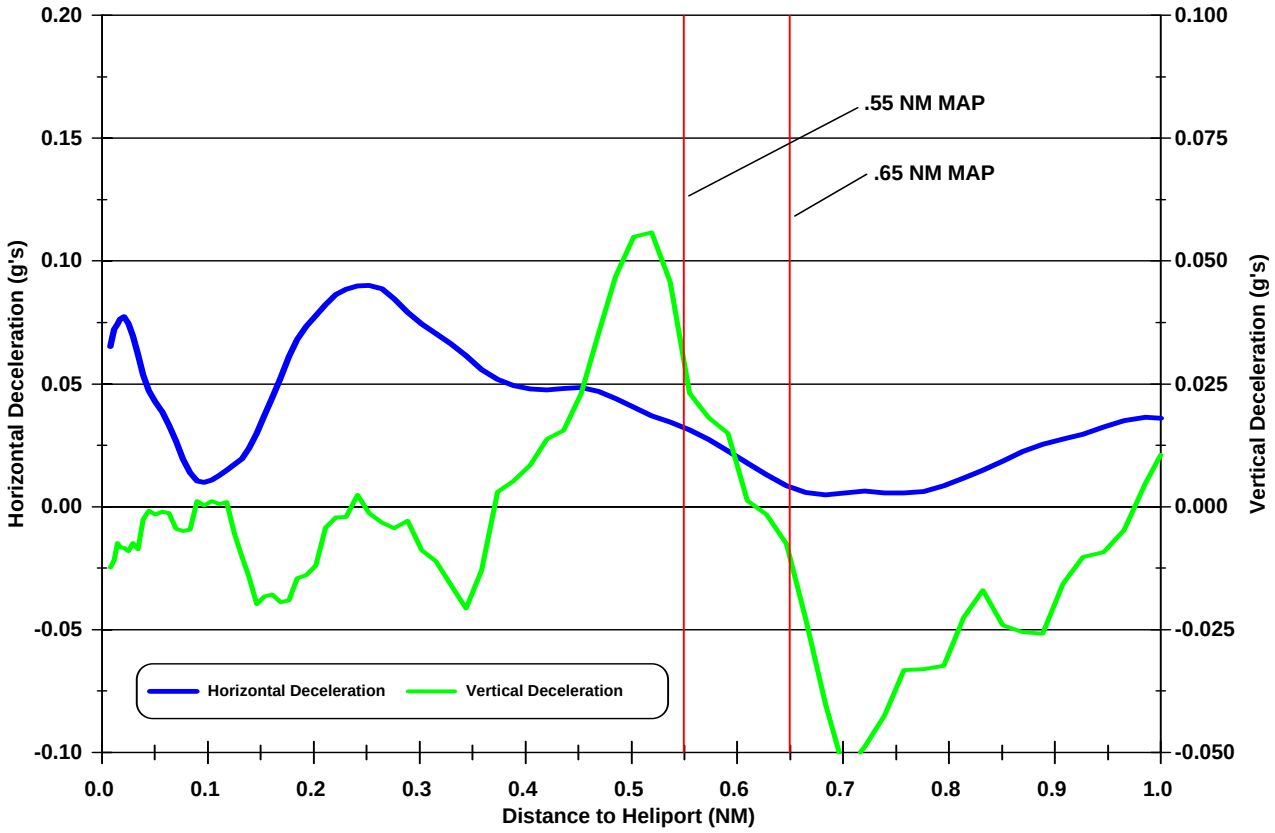
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06B001 - Appr. #07W

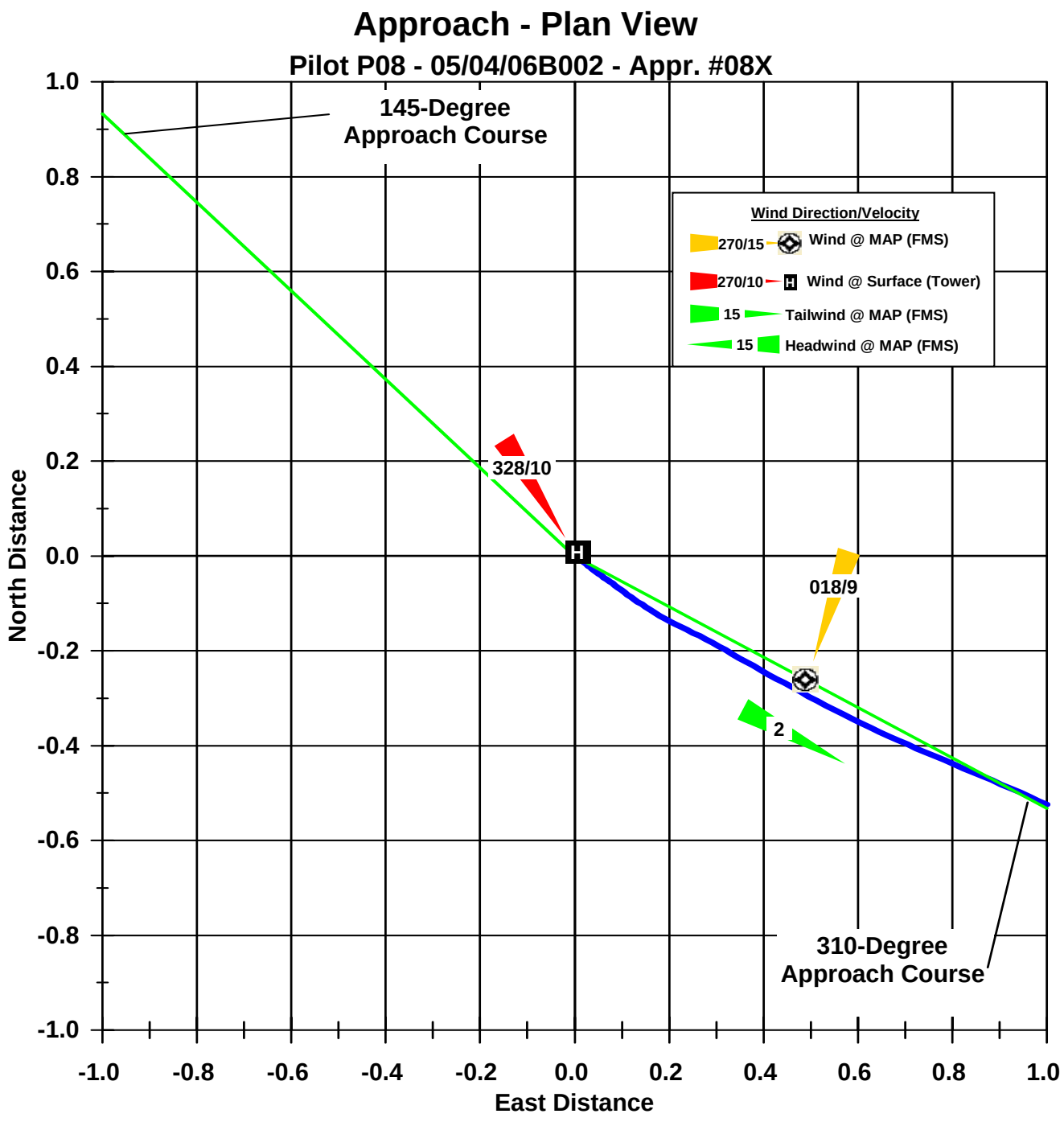


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06B001 - Appr. #07W

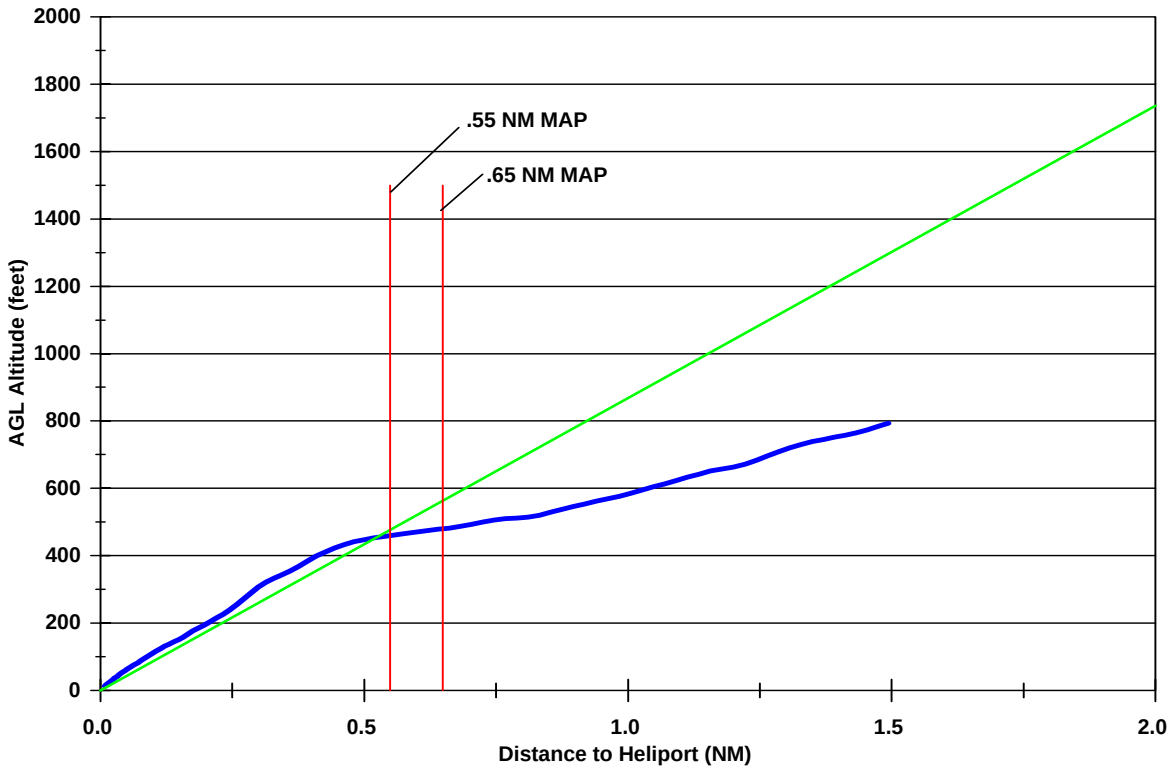


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06B001 - Appr. #07W

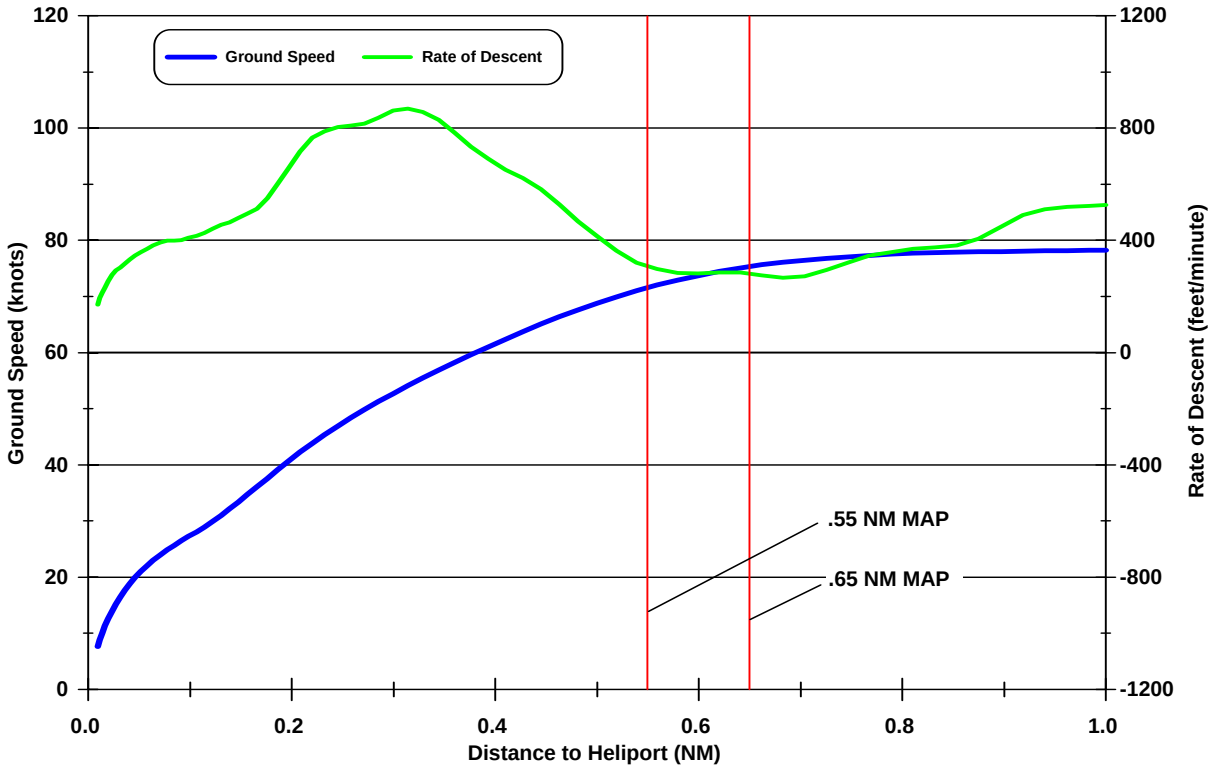



Approach - Plan View
Pilot P08 - 05/04/06B002 - Appr. #08X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
328/10
018/9
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

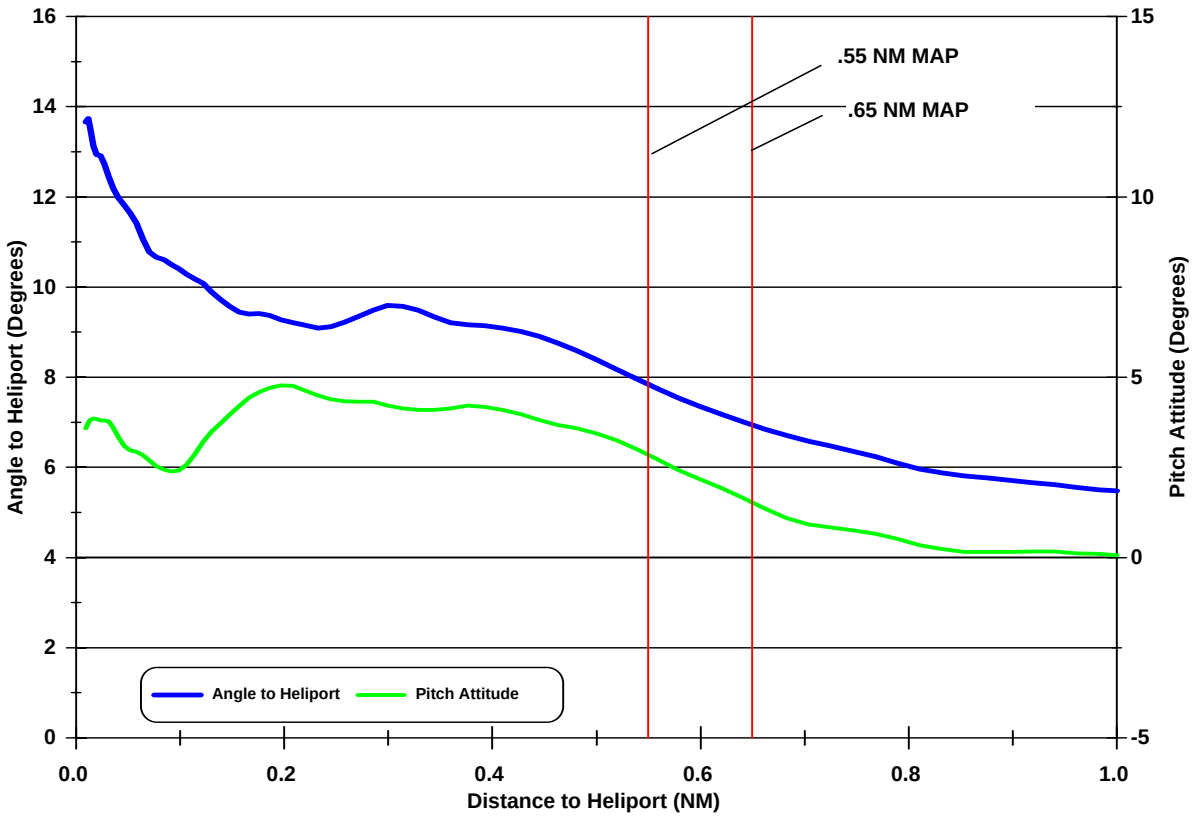
Profile View
Pilot P08 - 05/04/06B002 - Appr. #08X



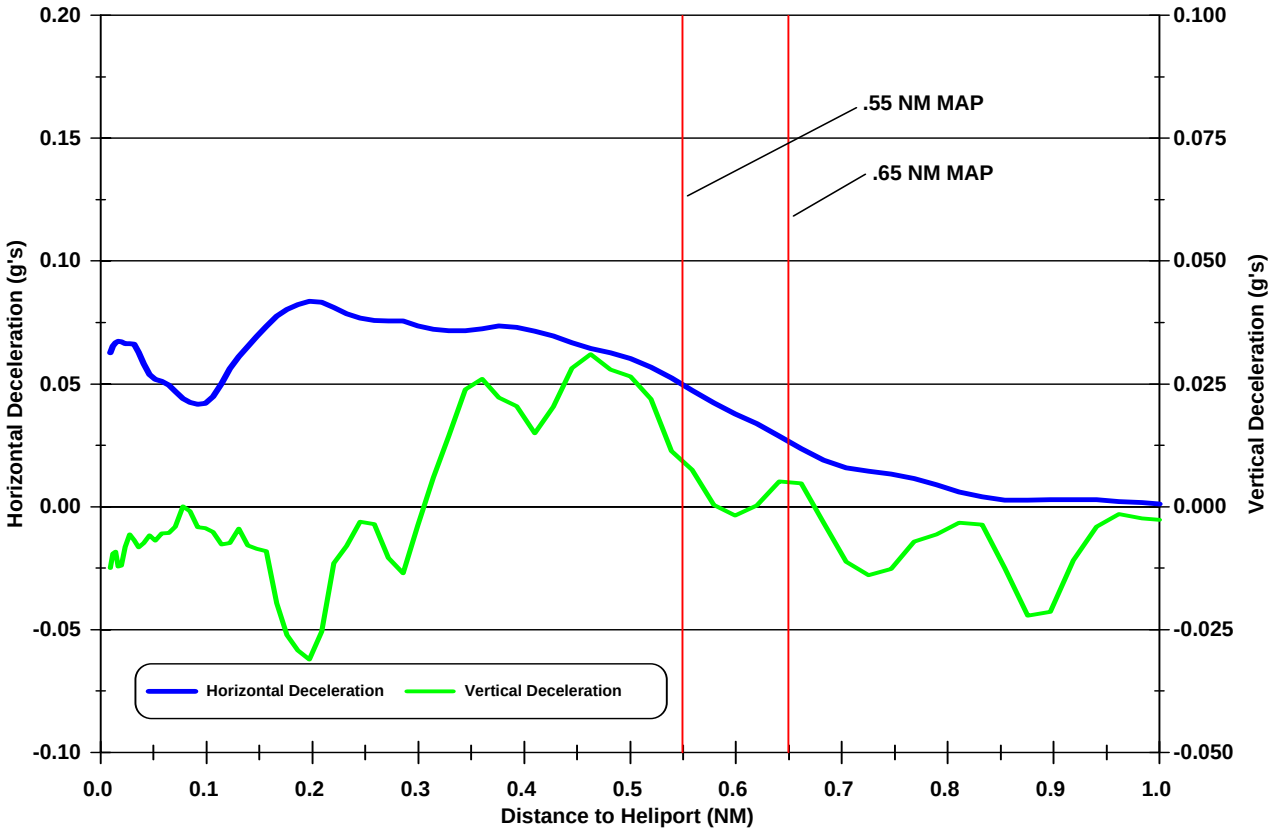
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06B002 - Appr. #08X

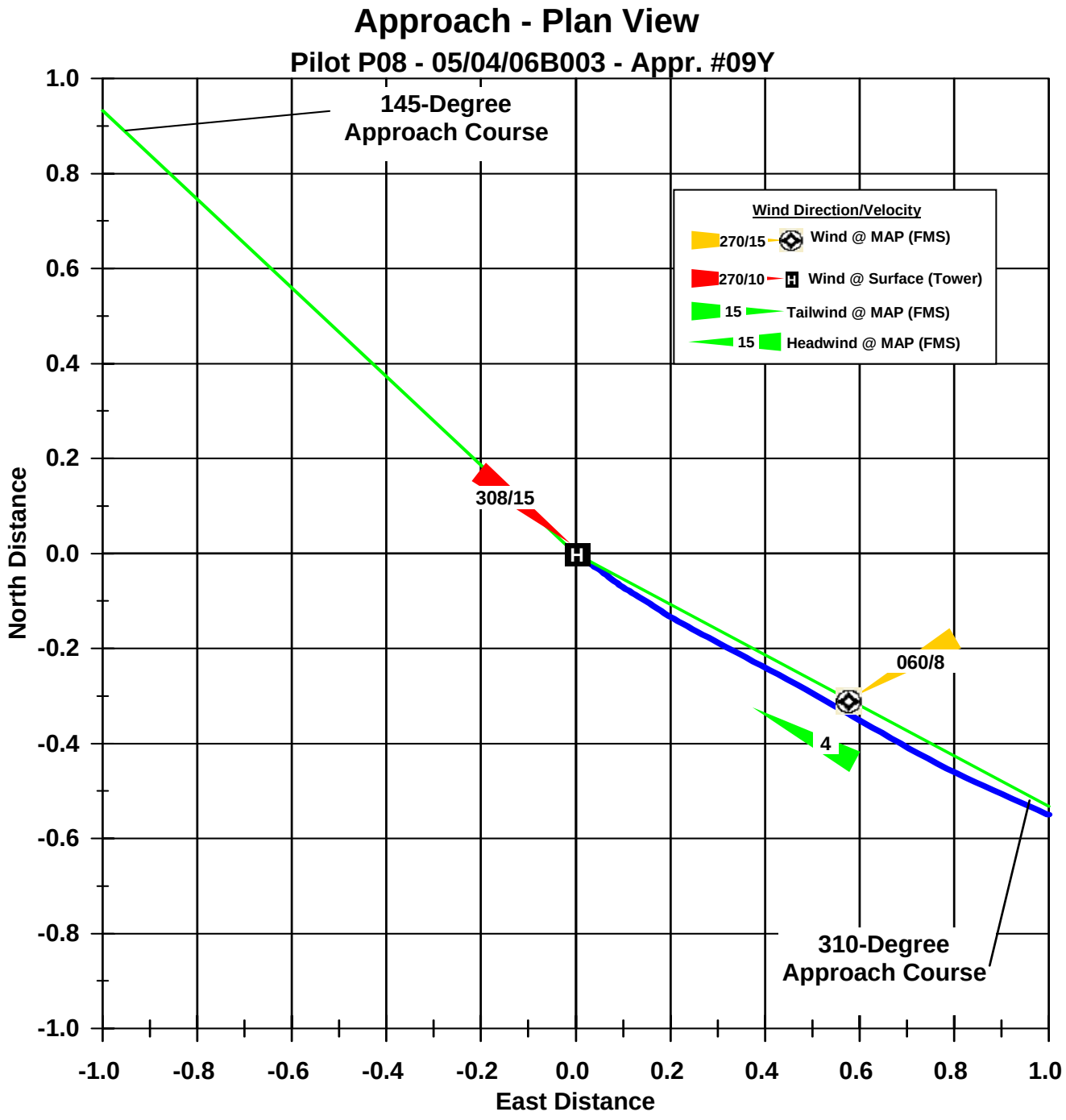


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06B002 - Appr. #08X

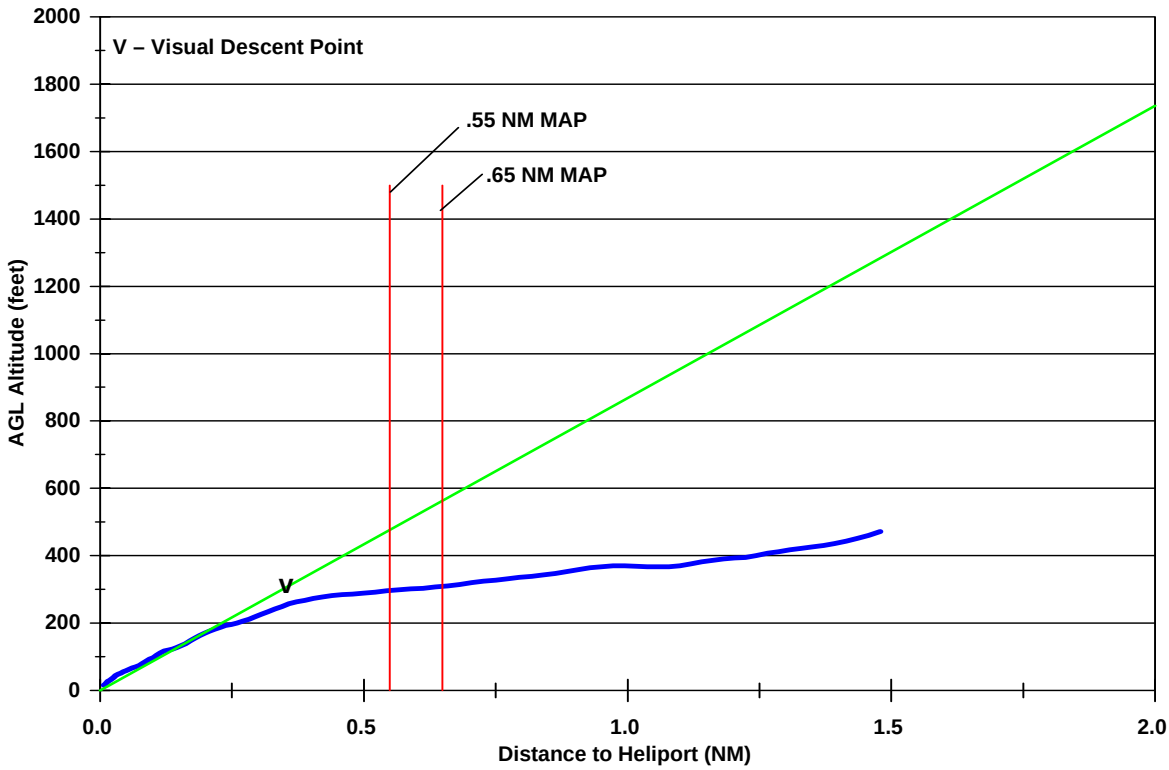


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06B002 - Appr. #08X

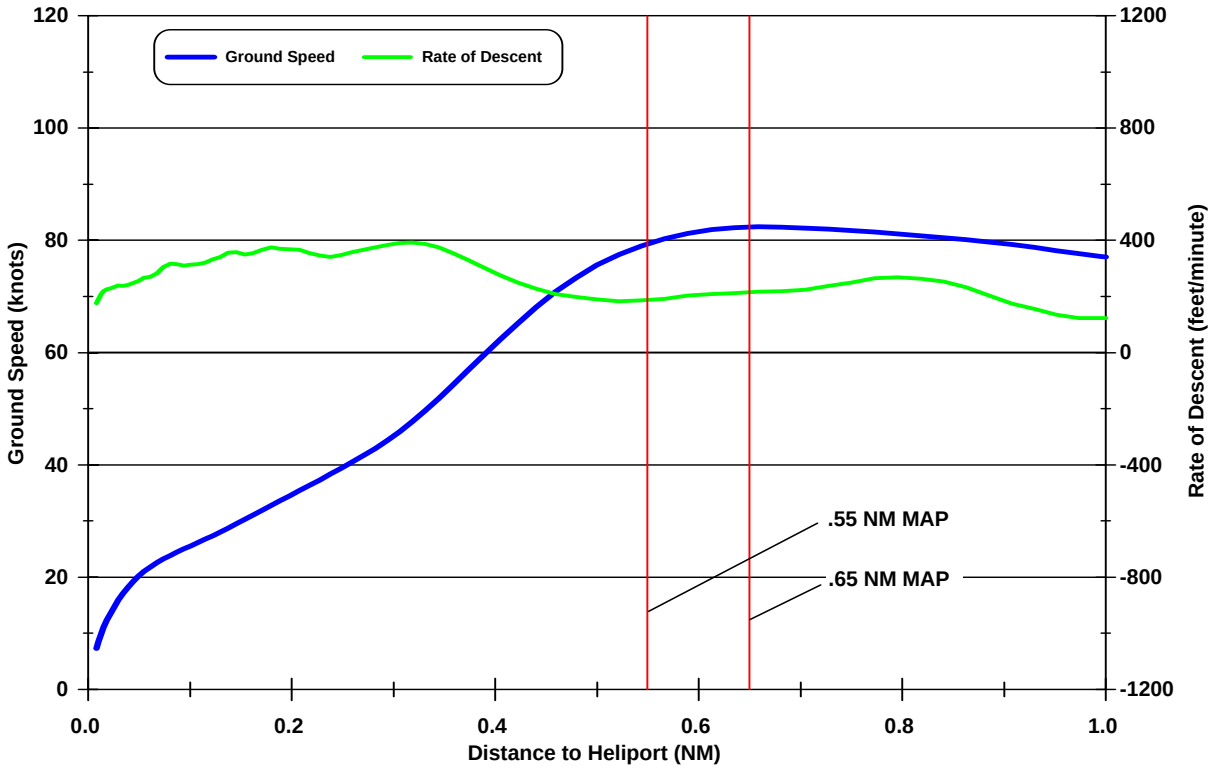



Approach - Plan View
Pilot P08 - 05/04/06B003 - Appr. #09Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
308/15
060/8
4
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

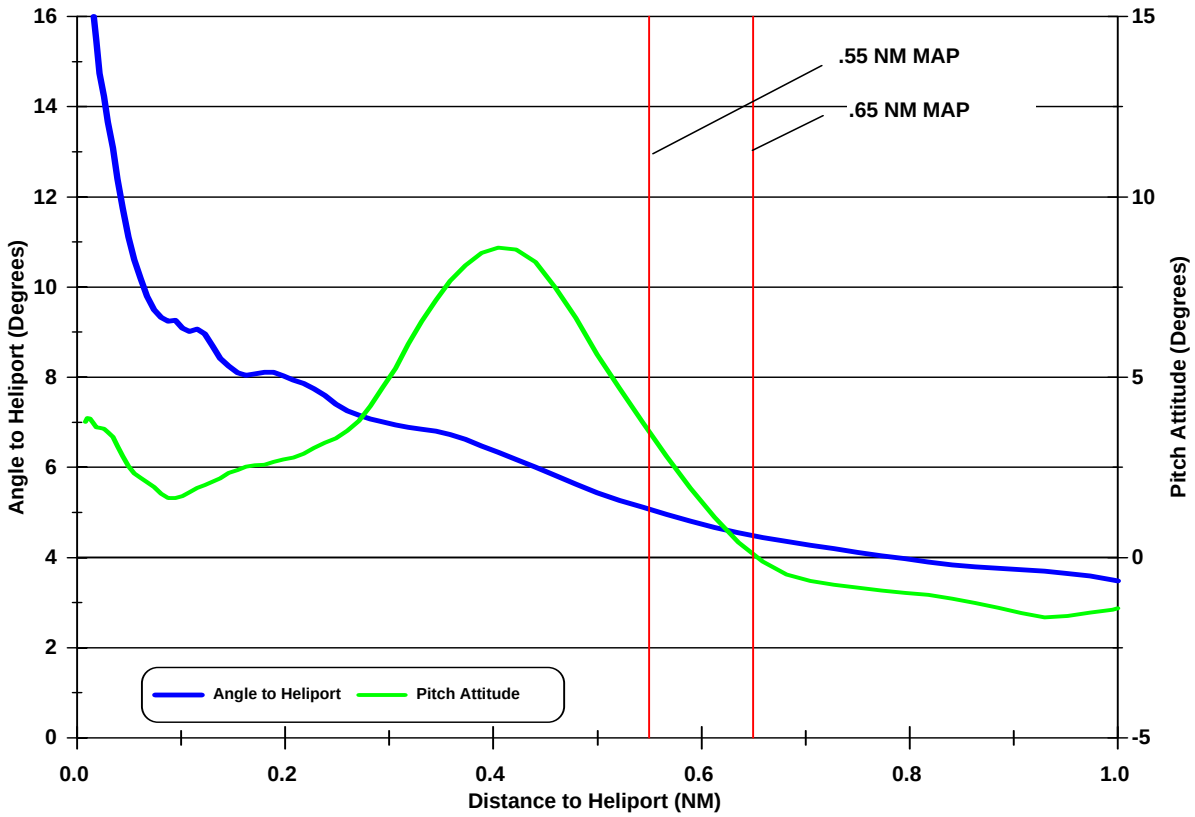
Profile View
Pilot P08 - 05/04/06B003 - Appr. #09Y



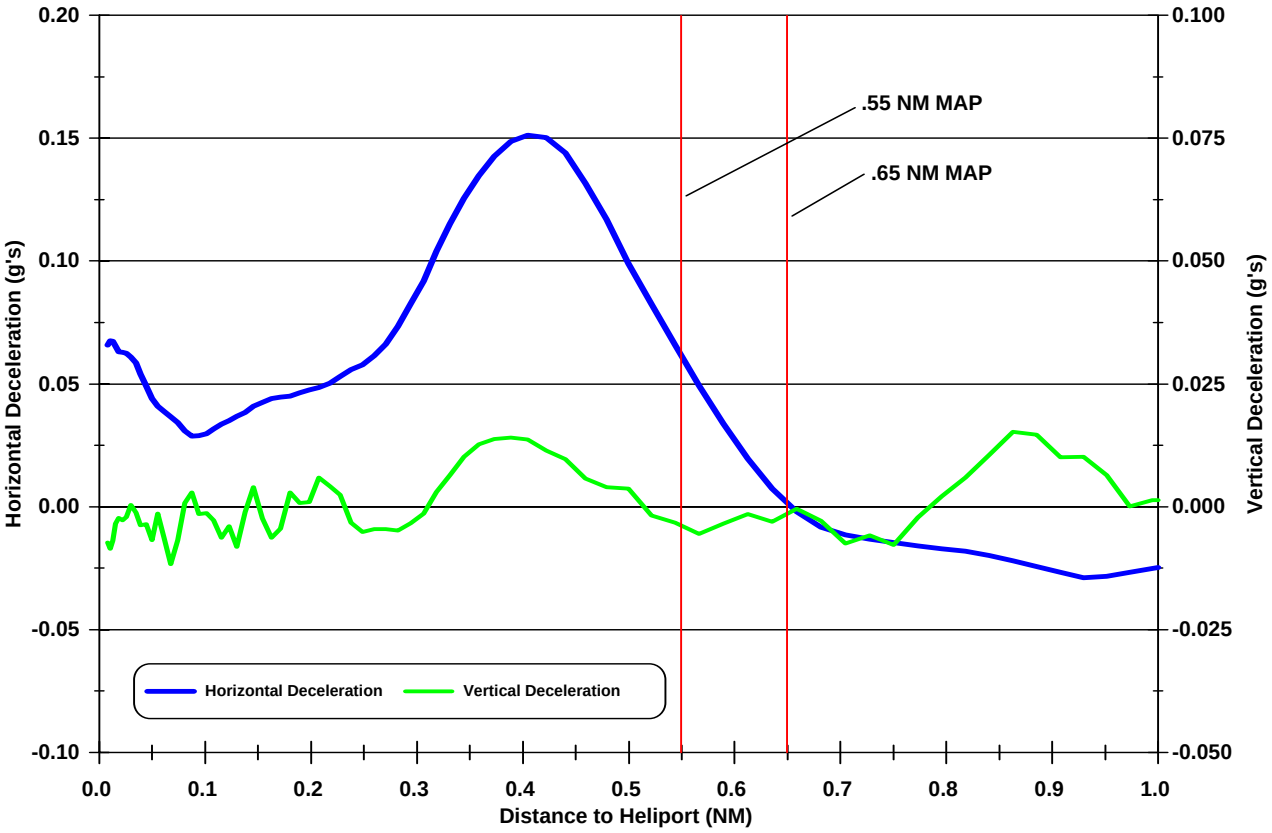
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06B003 - Appr. #09Y

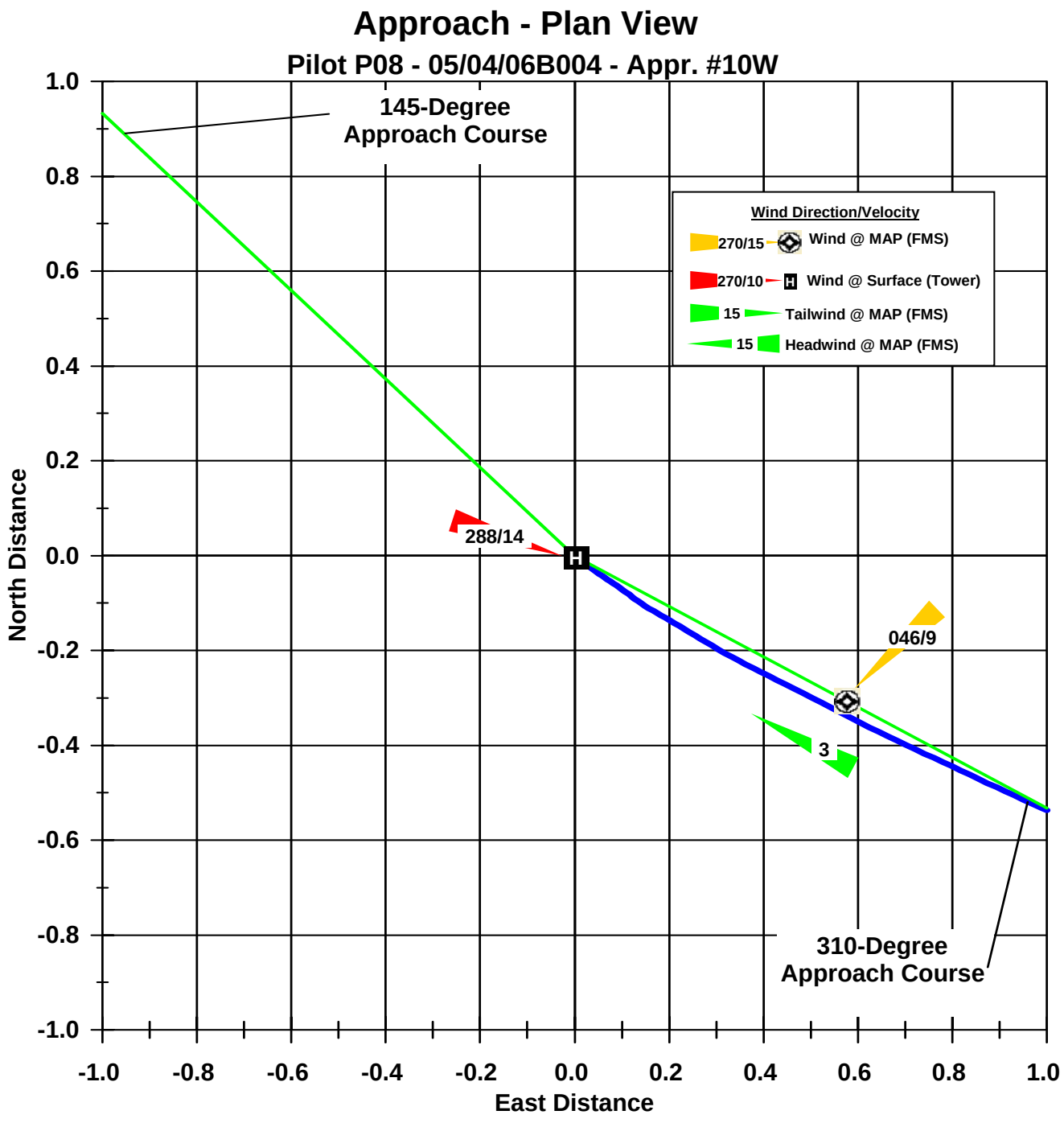


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06B003 - Appr. #09Y

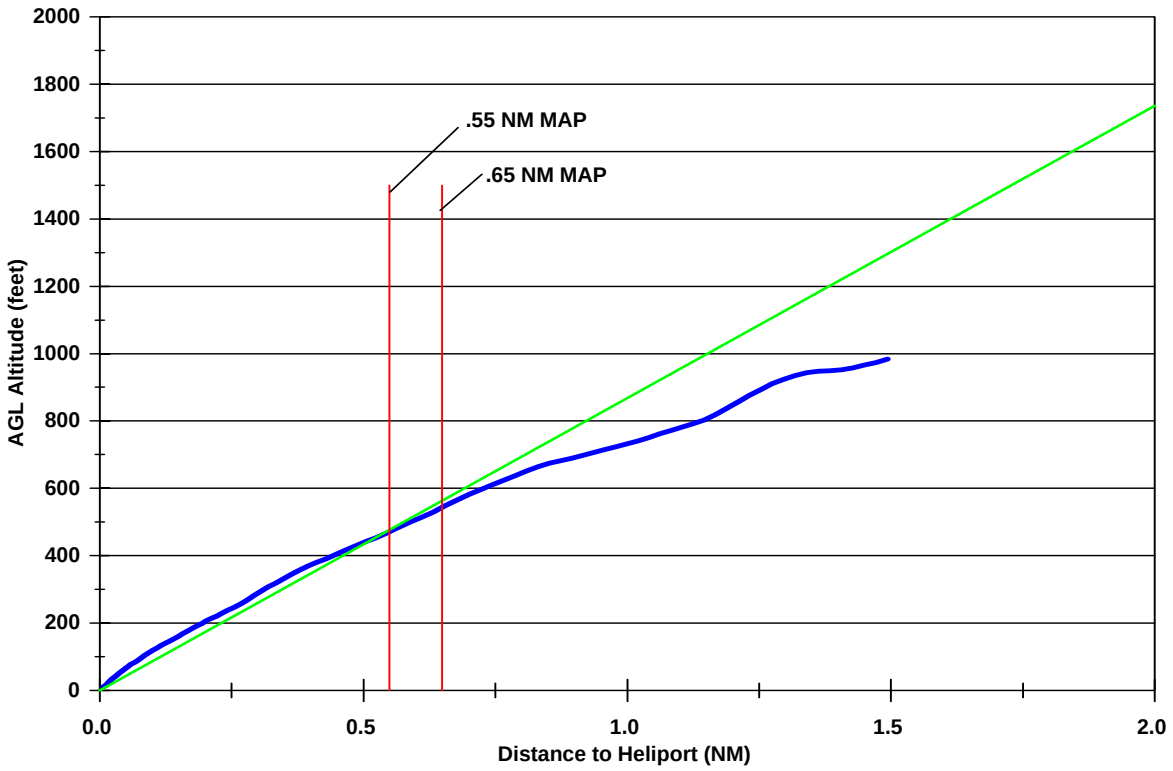


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06B003 - Appr. #09Y

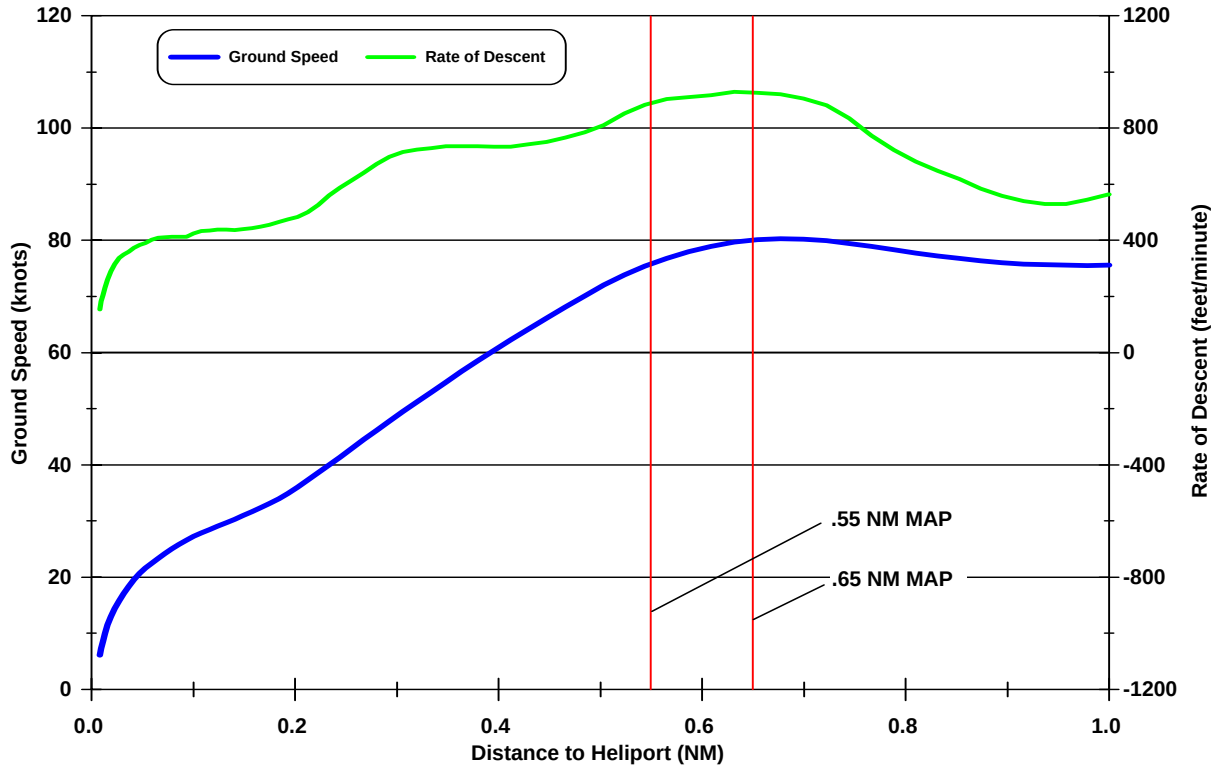



Approach - Plan View
Pilot P08 - 05/04/06B004 - Appr. #10W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
288/14
046/9
3
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

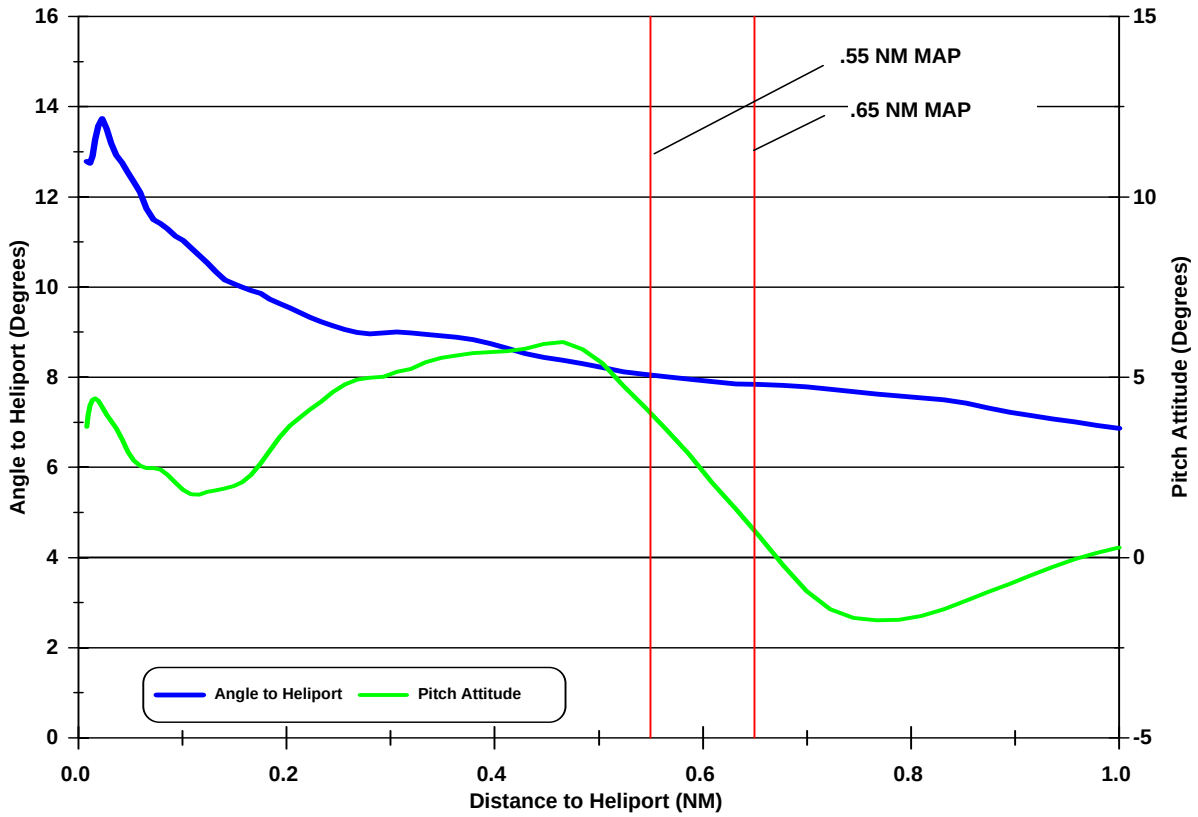
Profile View
Pilot P08 - 05/04/06B004 - Appr. #10W



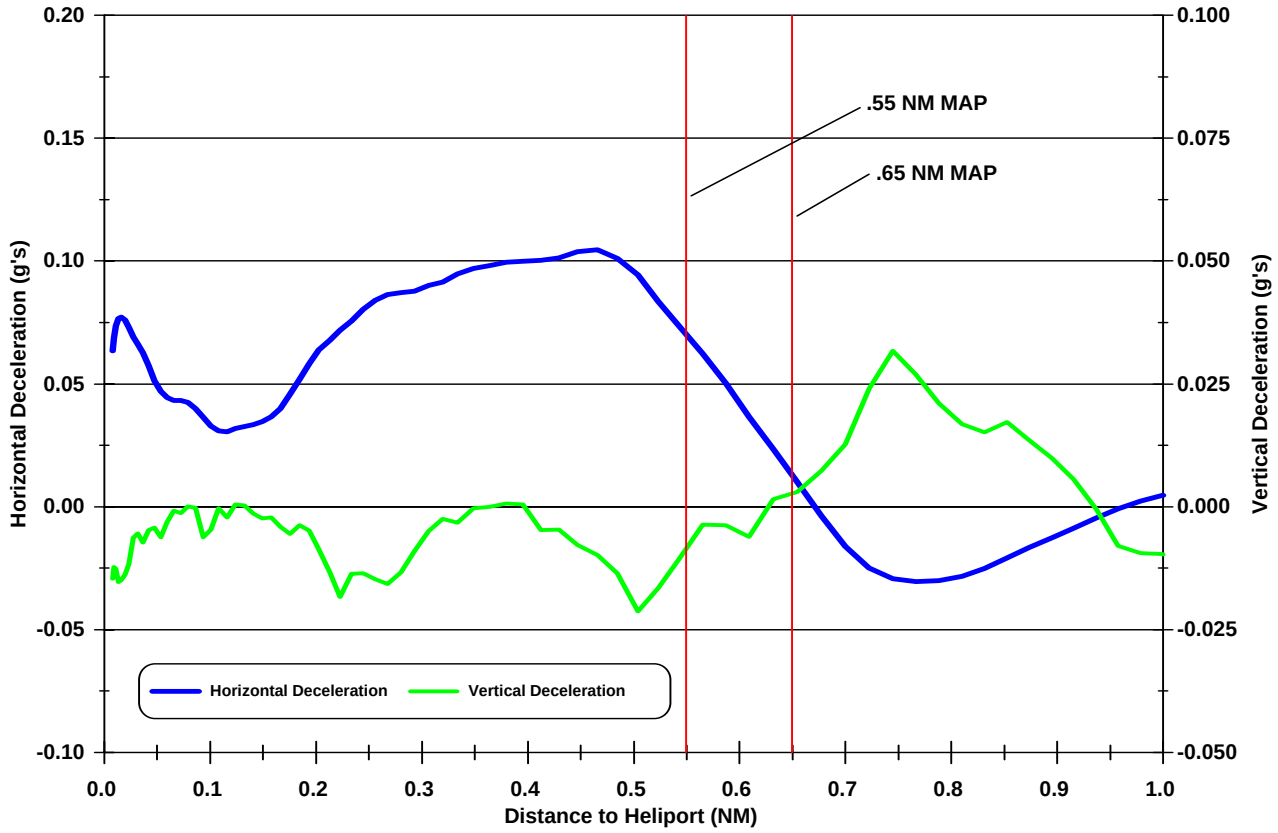
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06B004 - Appr. #10W

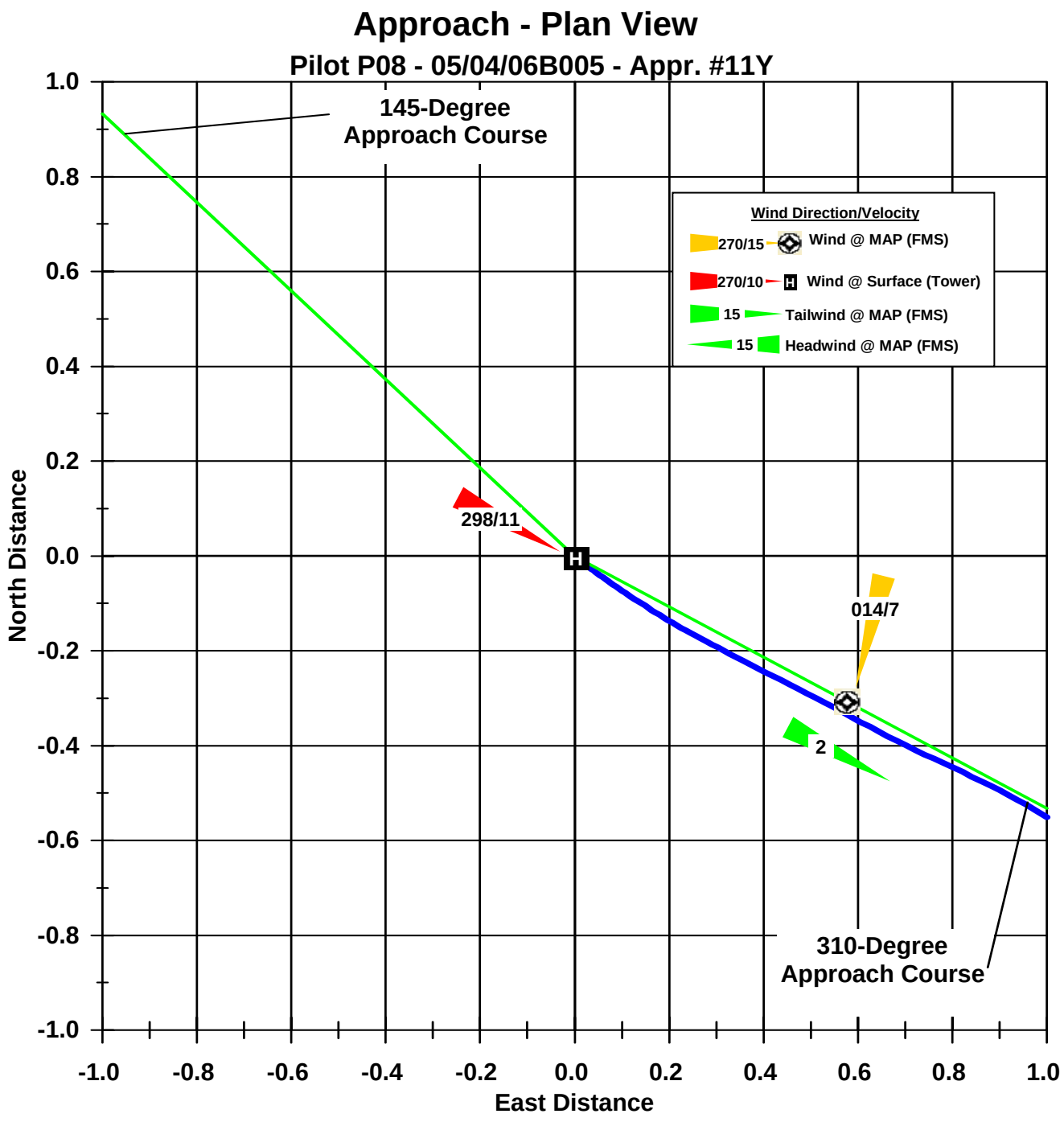


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06B004 - Appr. #10W

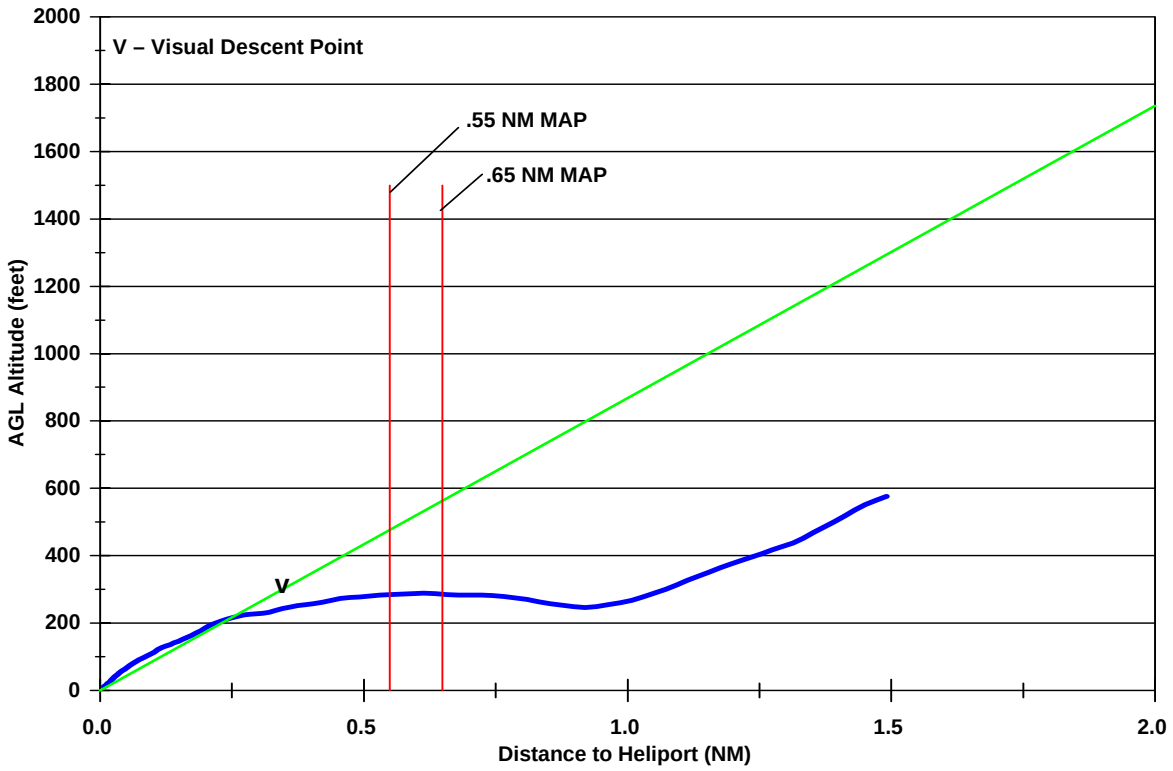


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06B004 - Appr. #10W

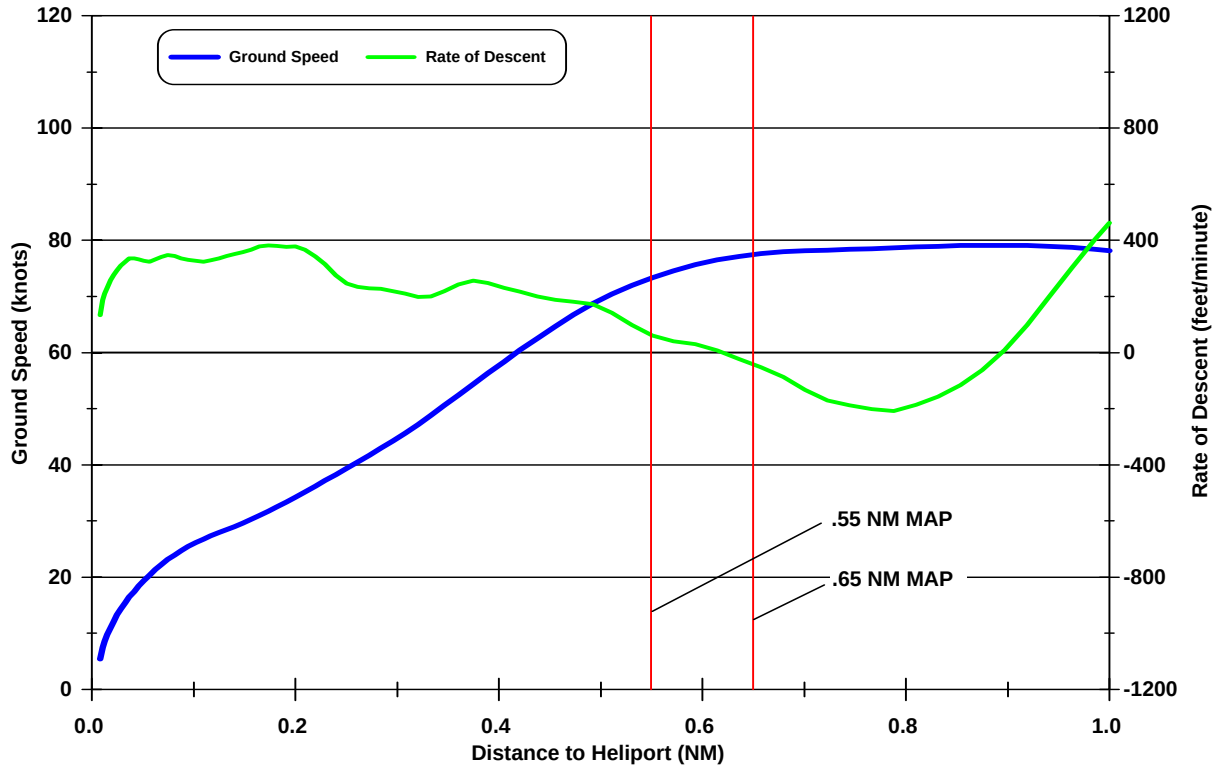



Approach - Plan View
Pilot P08 - 05/04/06B005 - Appr. #11Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
298/11
014/7
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

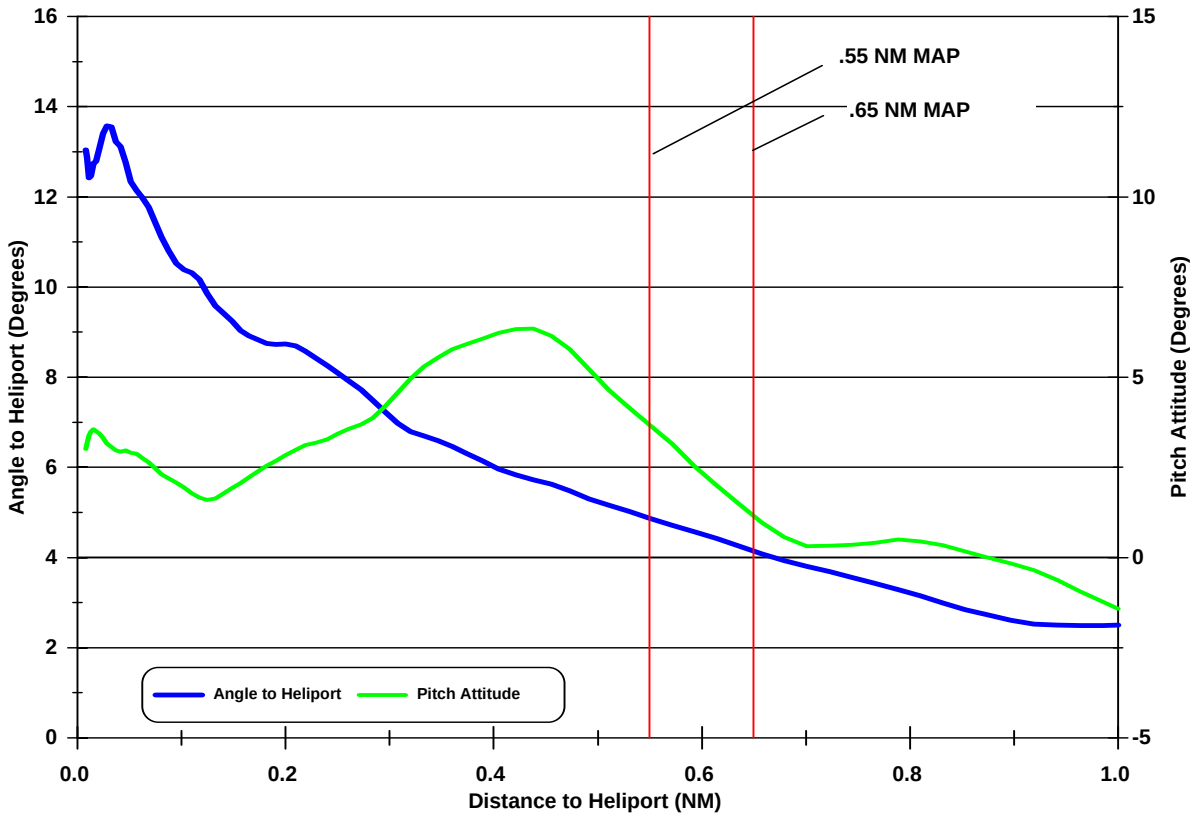
Profile View
Pilot P08 - 05/04/06B005 - Appr. #11Y



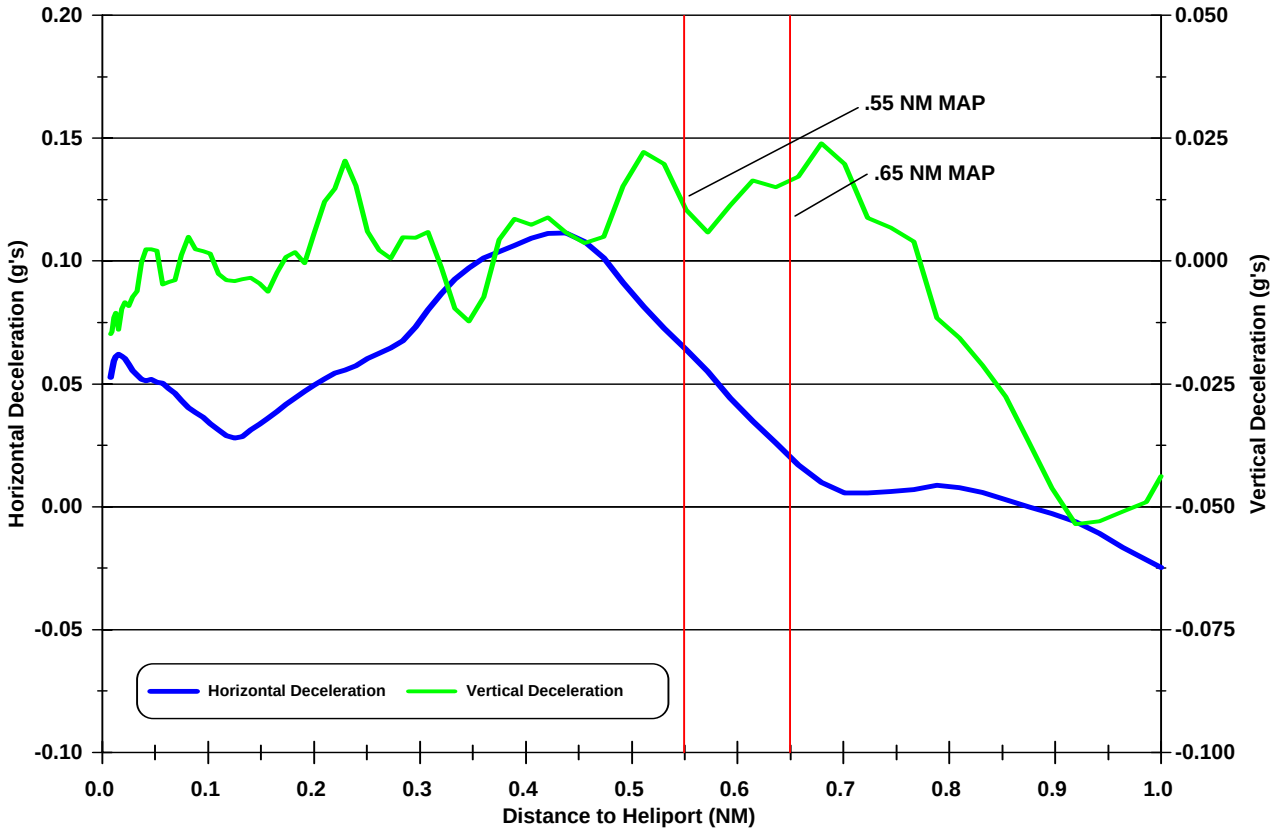
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06B005 - Appr. #11Y

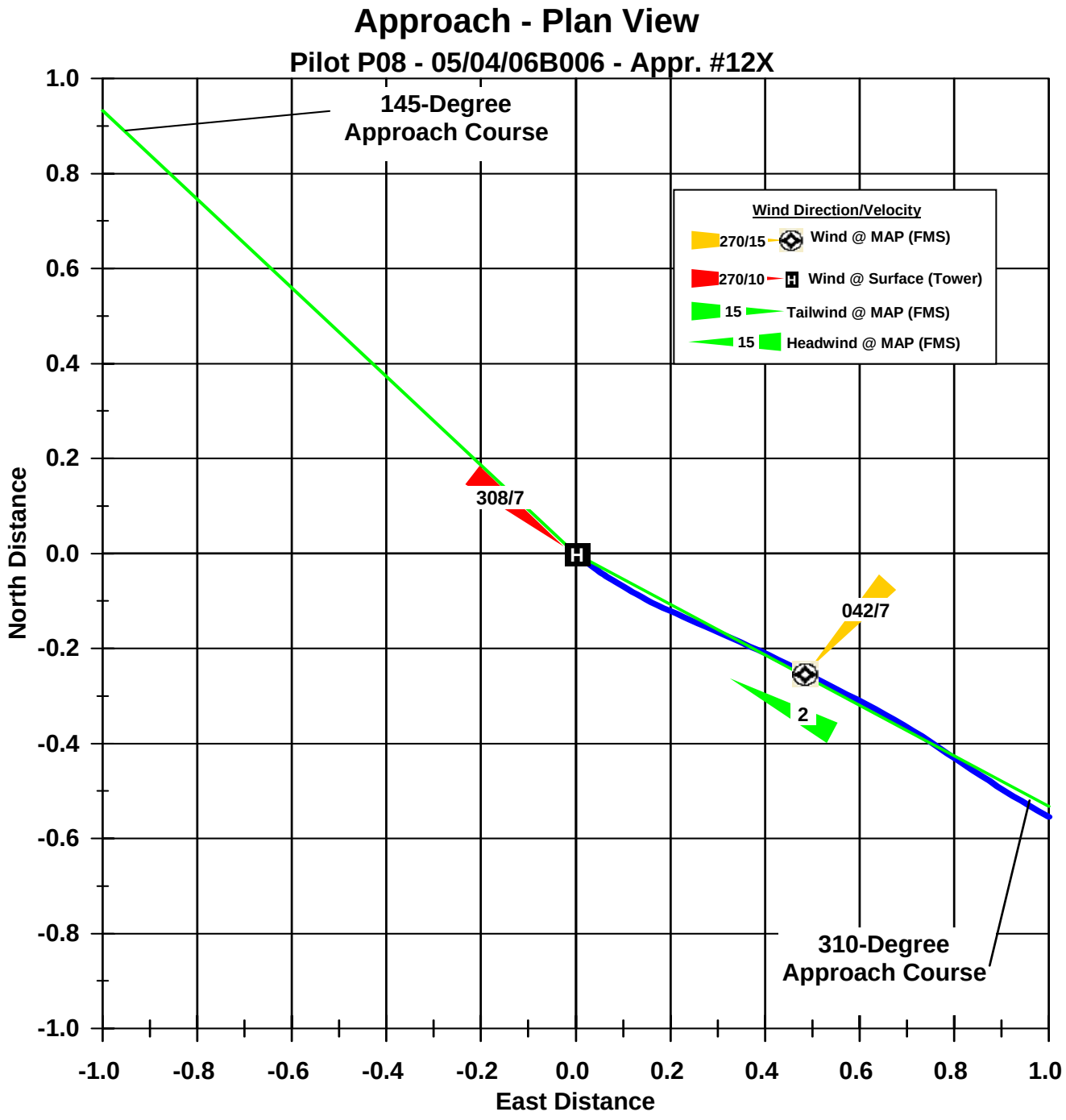


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06B005 - Appr. #11Y

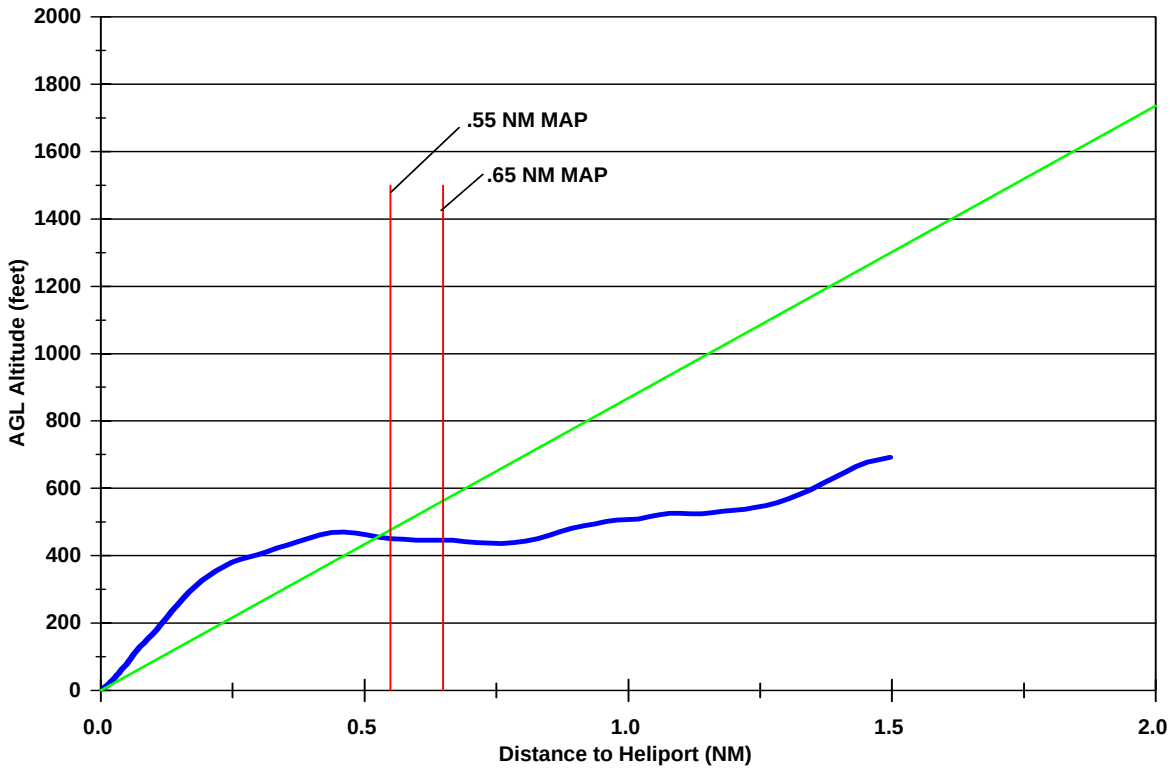


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06B005 - Appr. #11Y

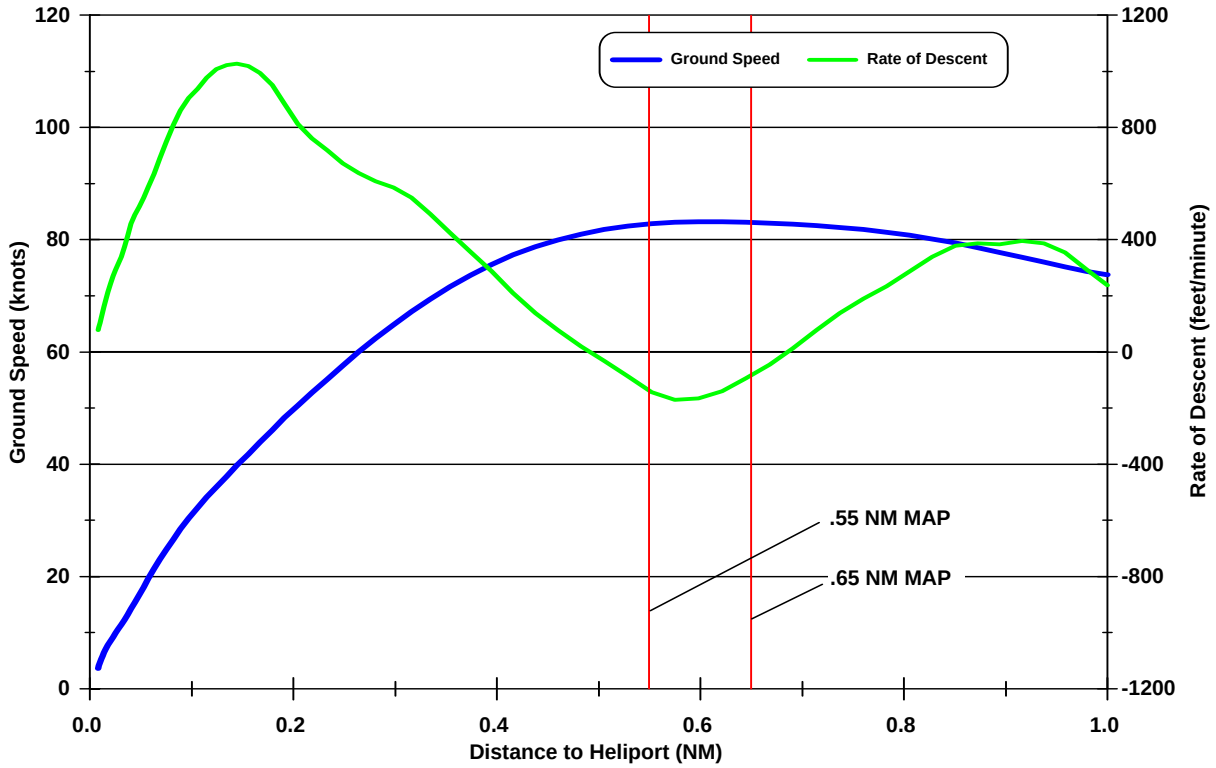



Approach - Plan View
Pilot P08 - 05/04/06B006 - Appr. #12X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
308/7
042/7
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

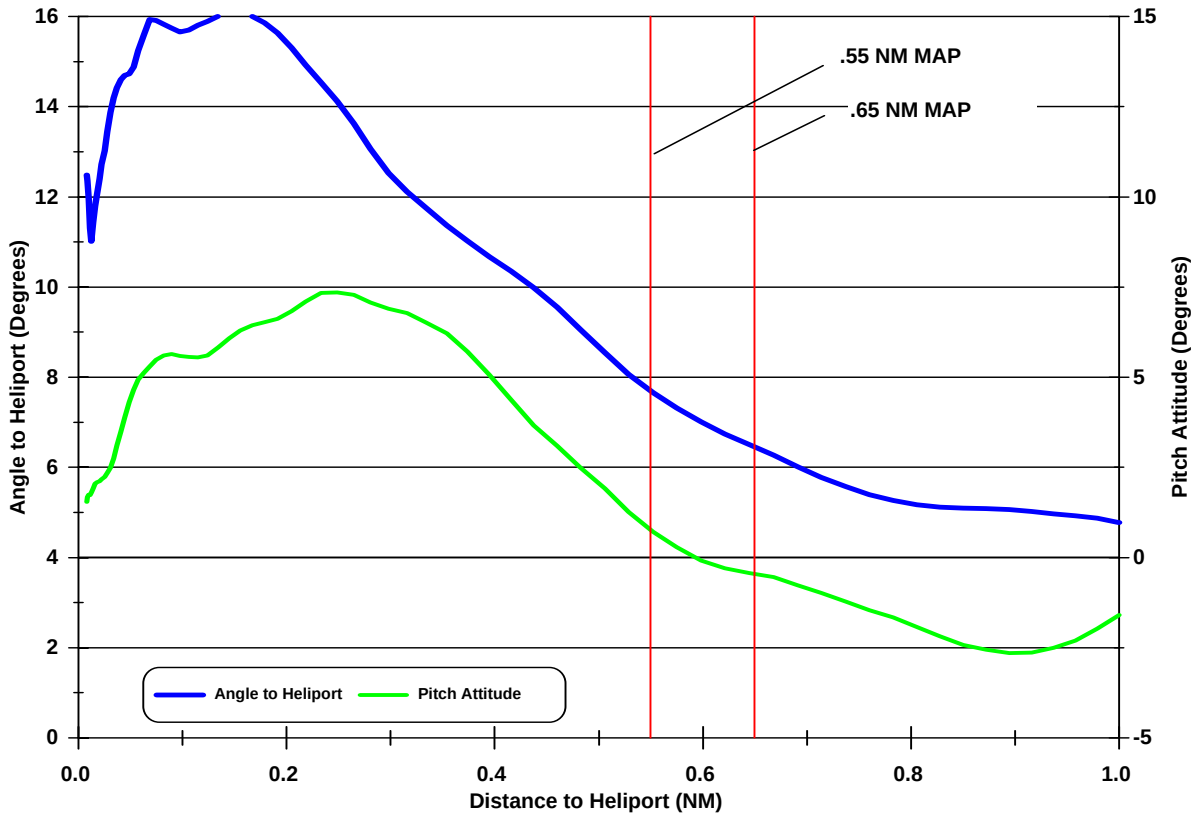
Profile View
Pilot P08 - 05/04/06B006 - Appr. #12X



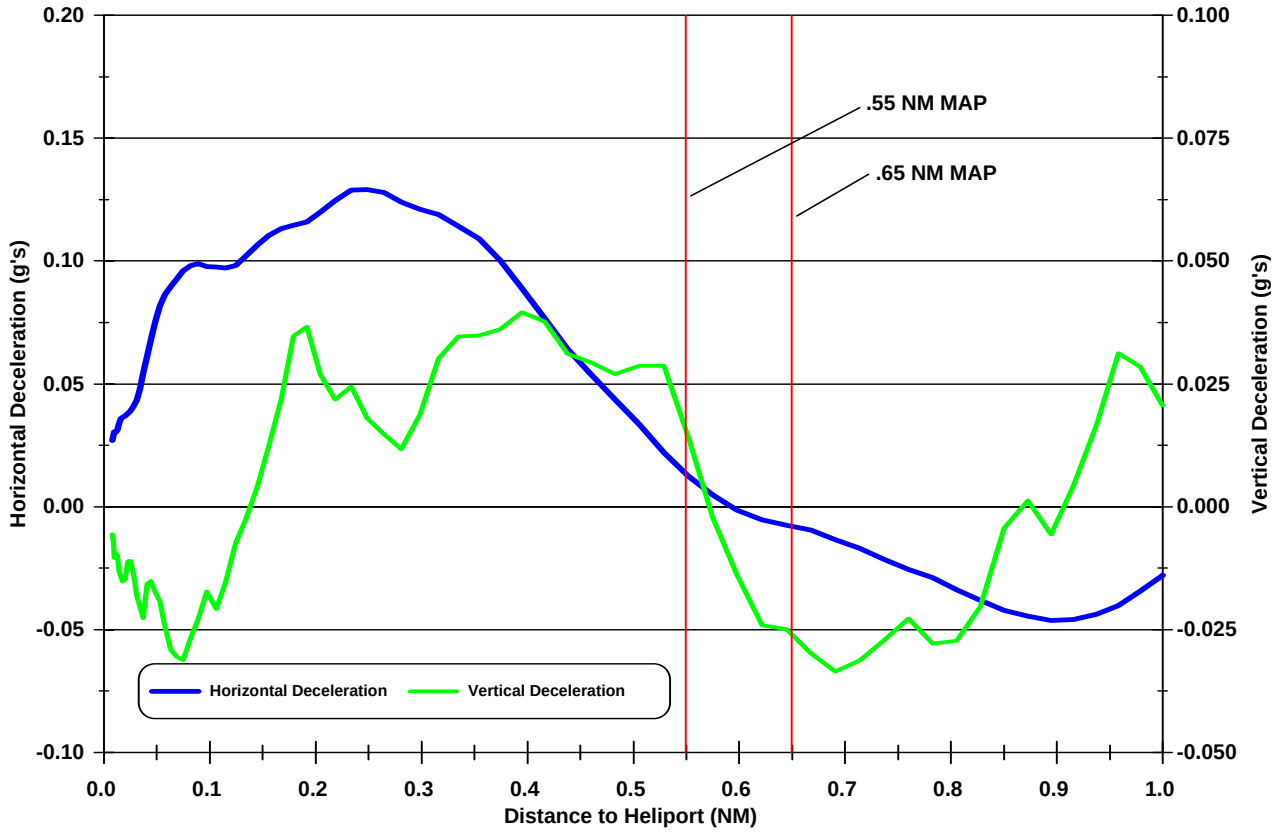
Ground Speed and Rate of Descent
Pilot P08 - 05/04/06B006 - Appr. #12X

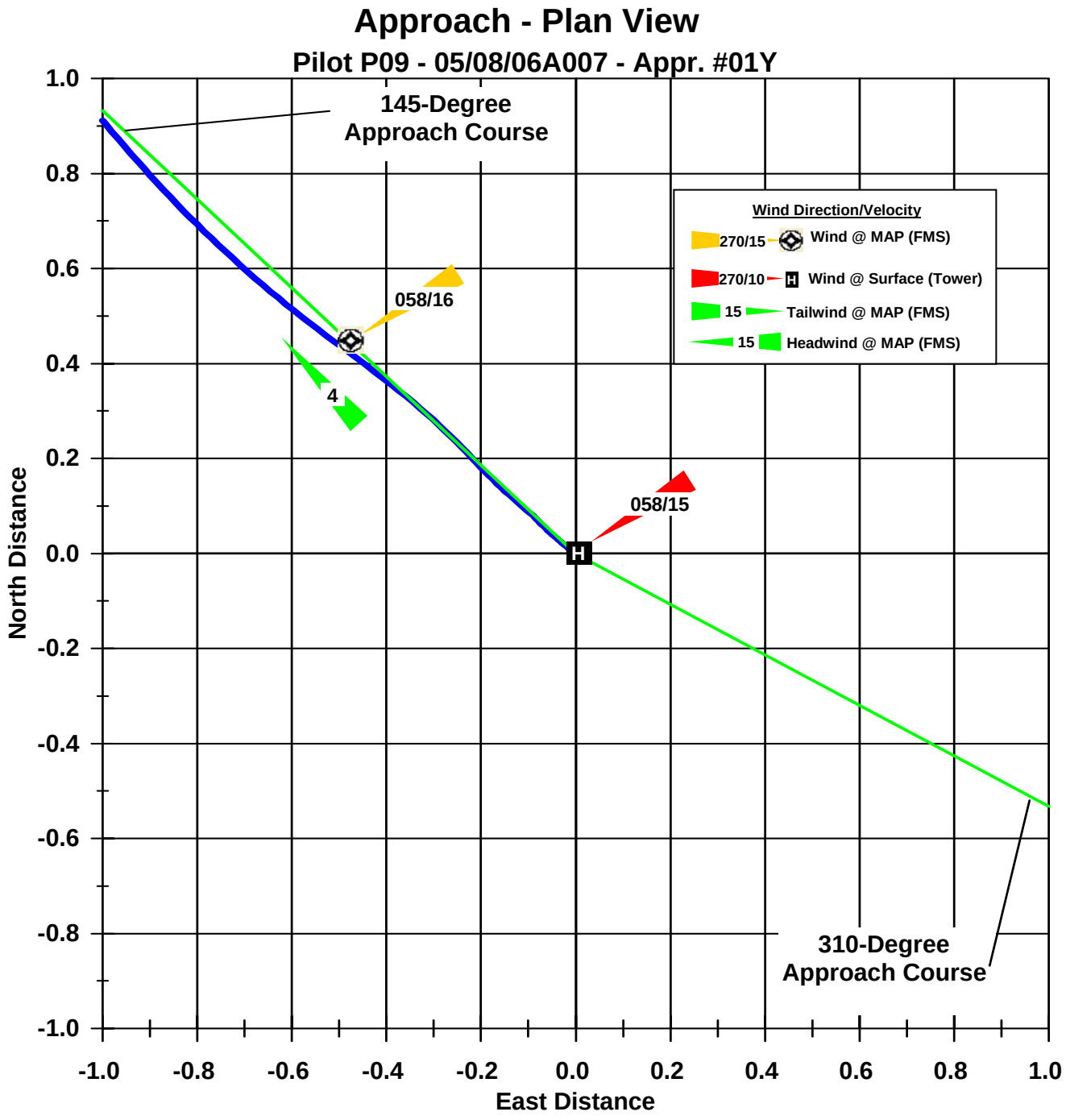


Angle to Heliport and Pitch Attitude
Pilot P08 - 05/04/06B006 - Appr. #12X

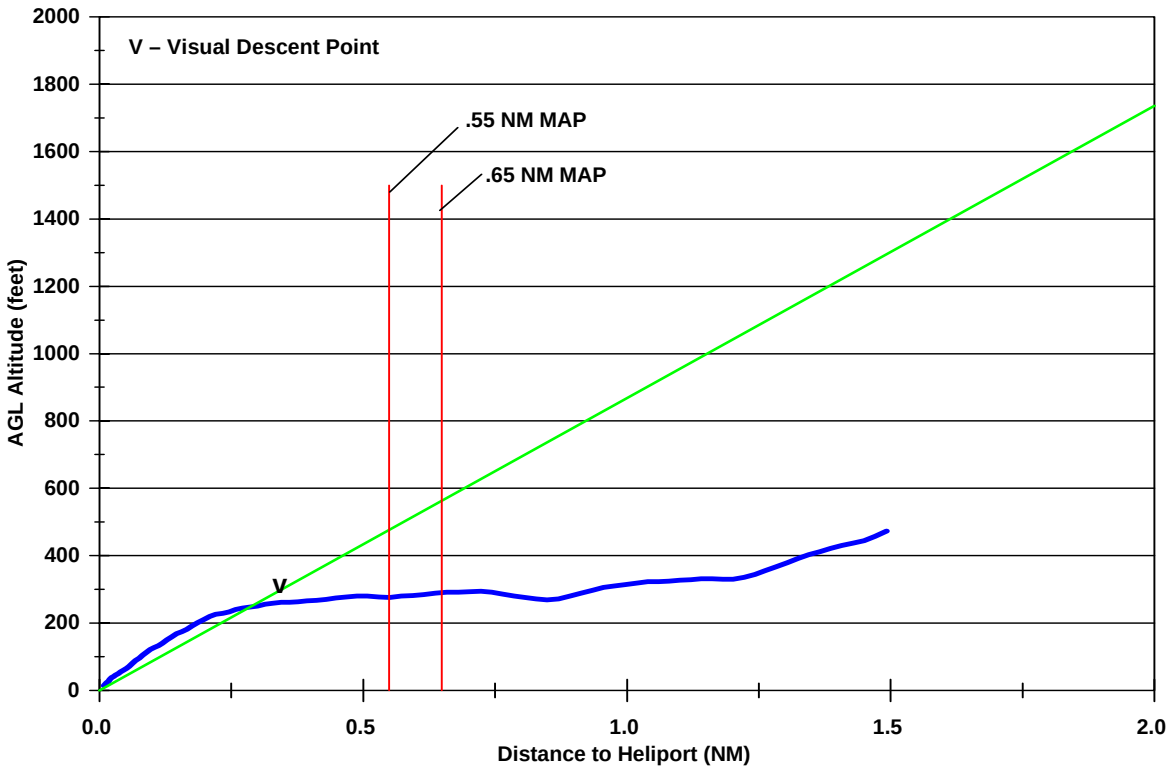


Horizontal and Vertical Deceleration
Pilot P08 - 05/04/06B006 - Appr. #12X

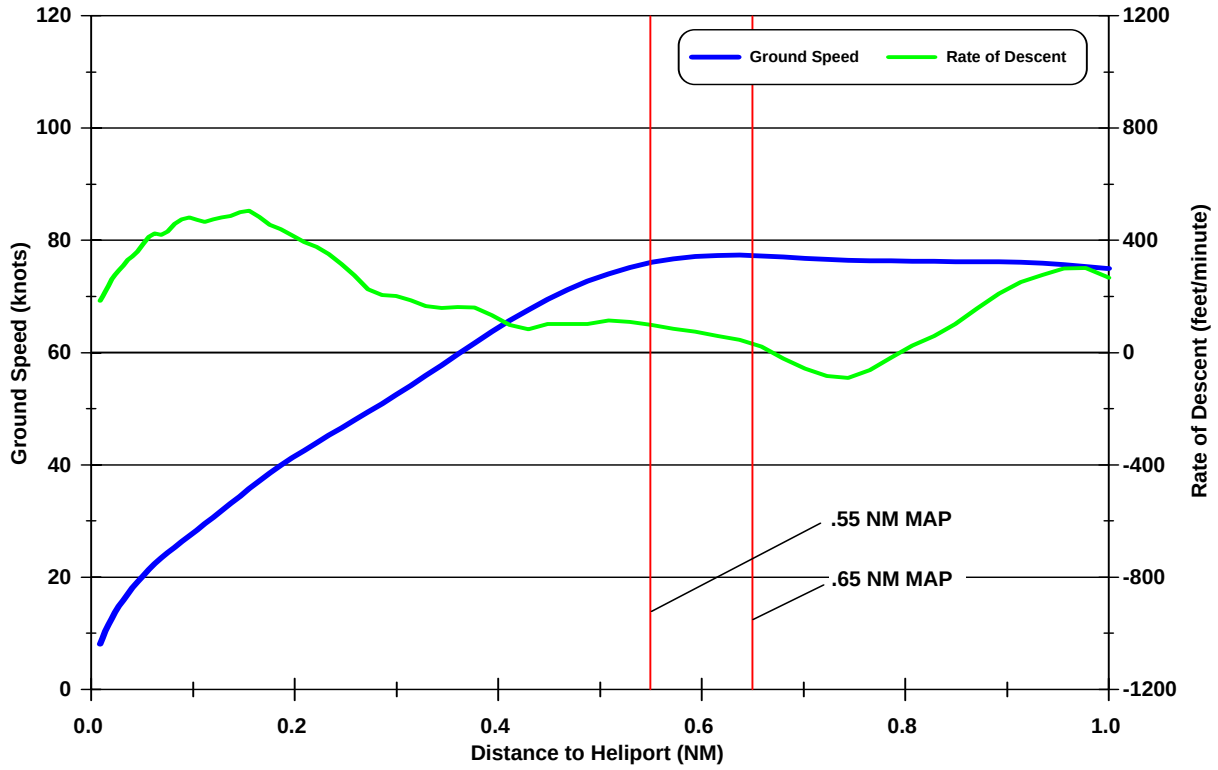



Approach - Plan View
Pilot P09 - 05/08/06A007 - Appr. #01Y
145-Degree
Approach Course
310-Degree
Approach Course
058/16
058/15
4
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

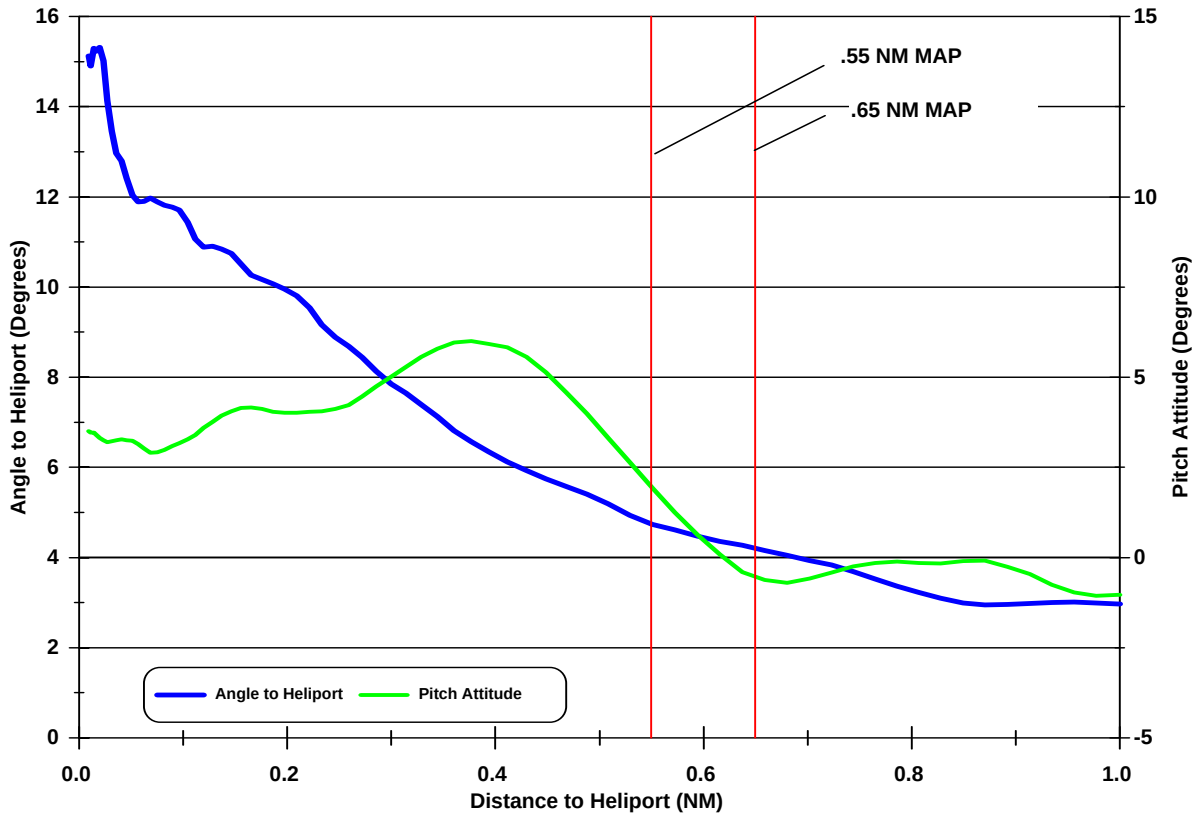
Profile View
Pilot P09 - 05/08/06A007 - Appr. #01Y



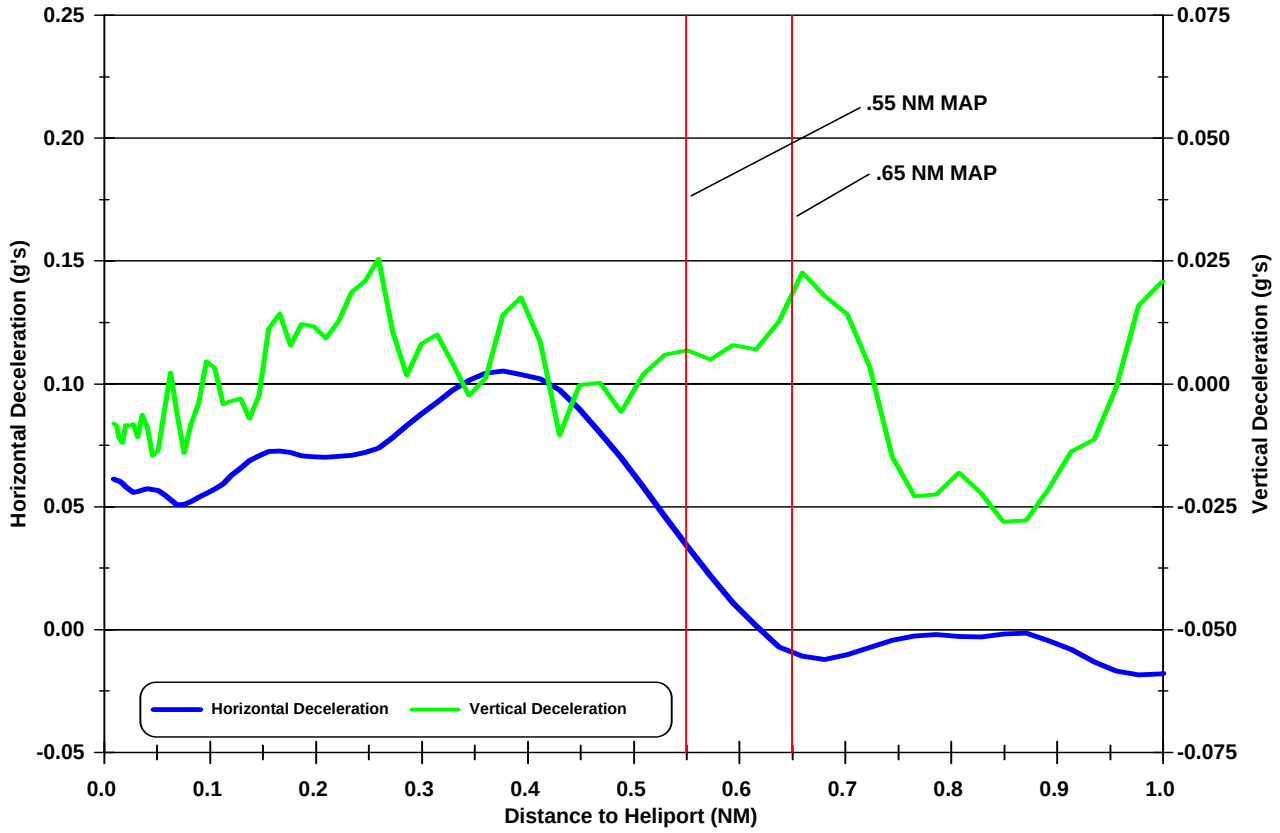
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06A007 - Appr. #01Y

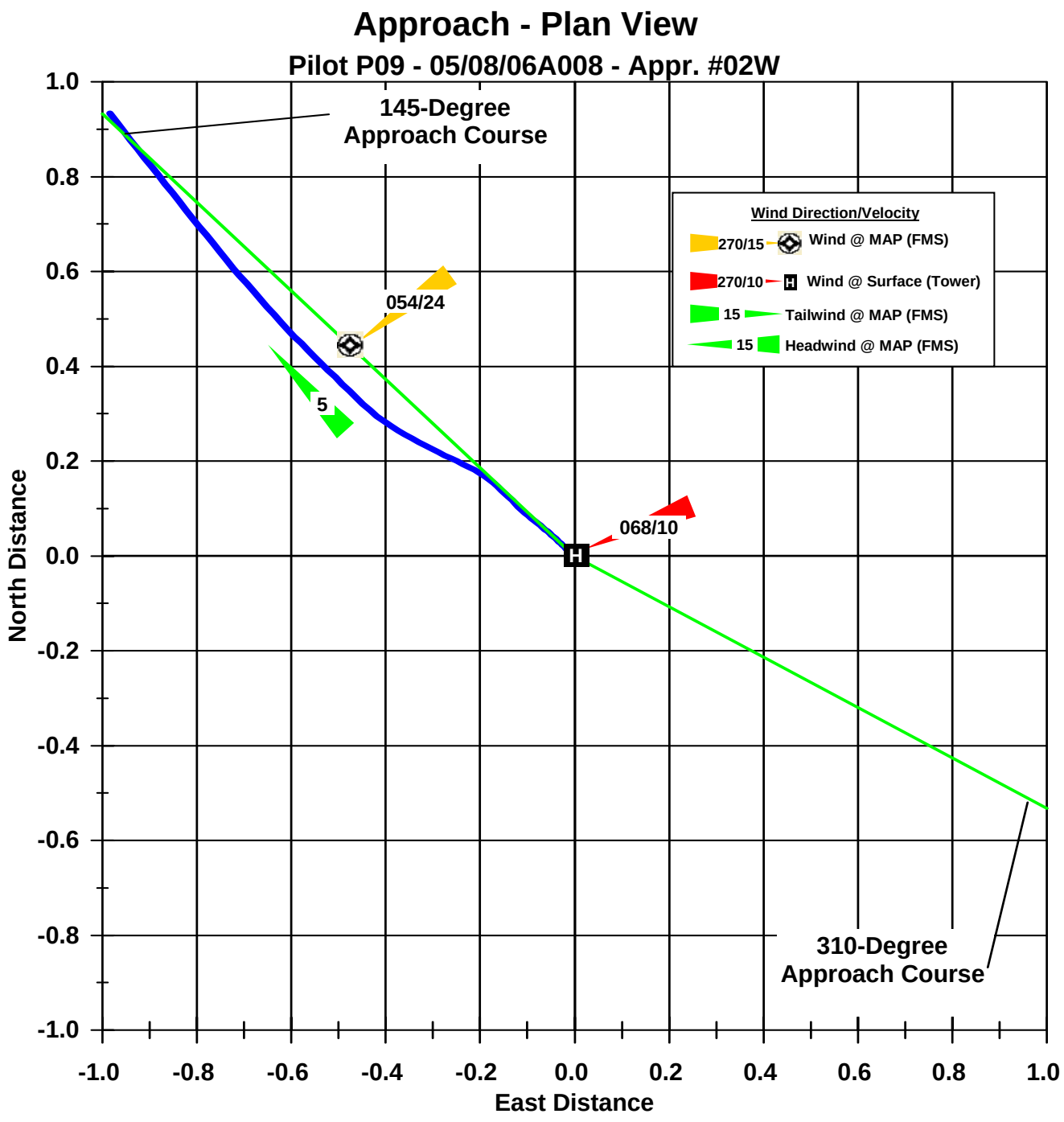


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06A007 - Appr. #01Y

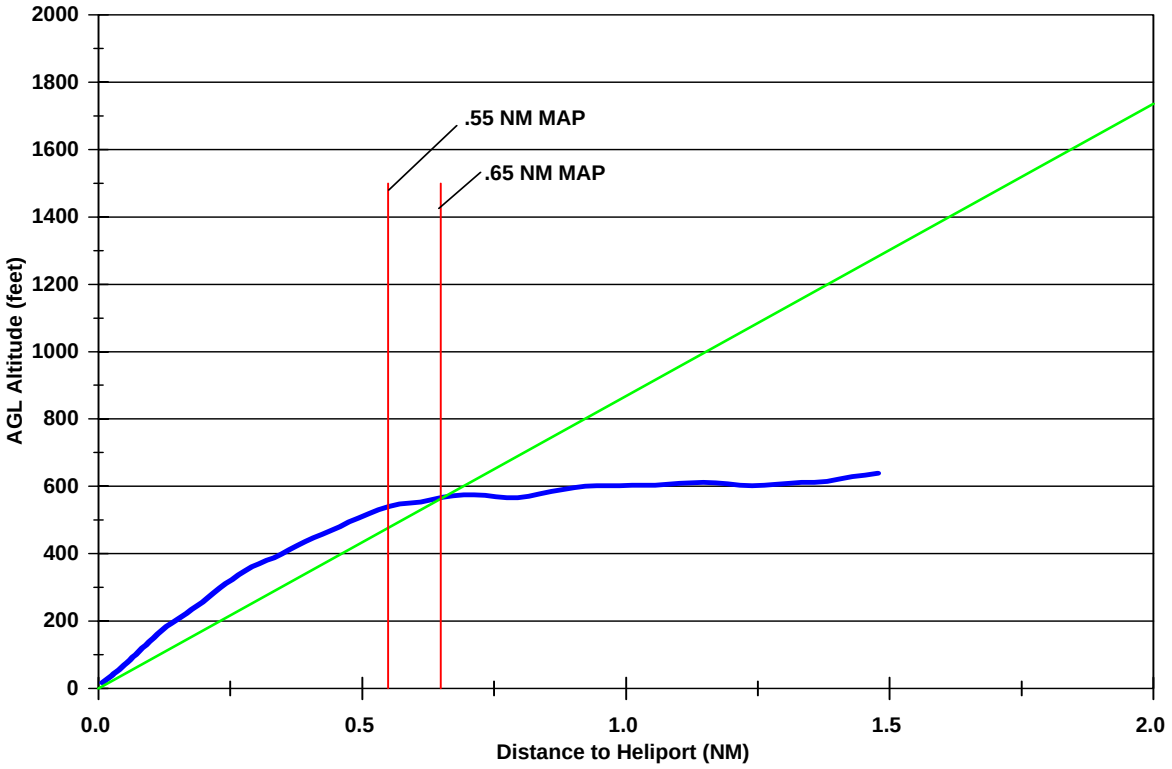


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06A007 - Appr. #01Y

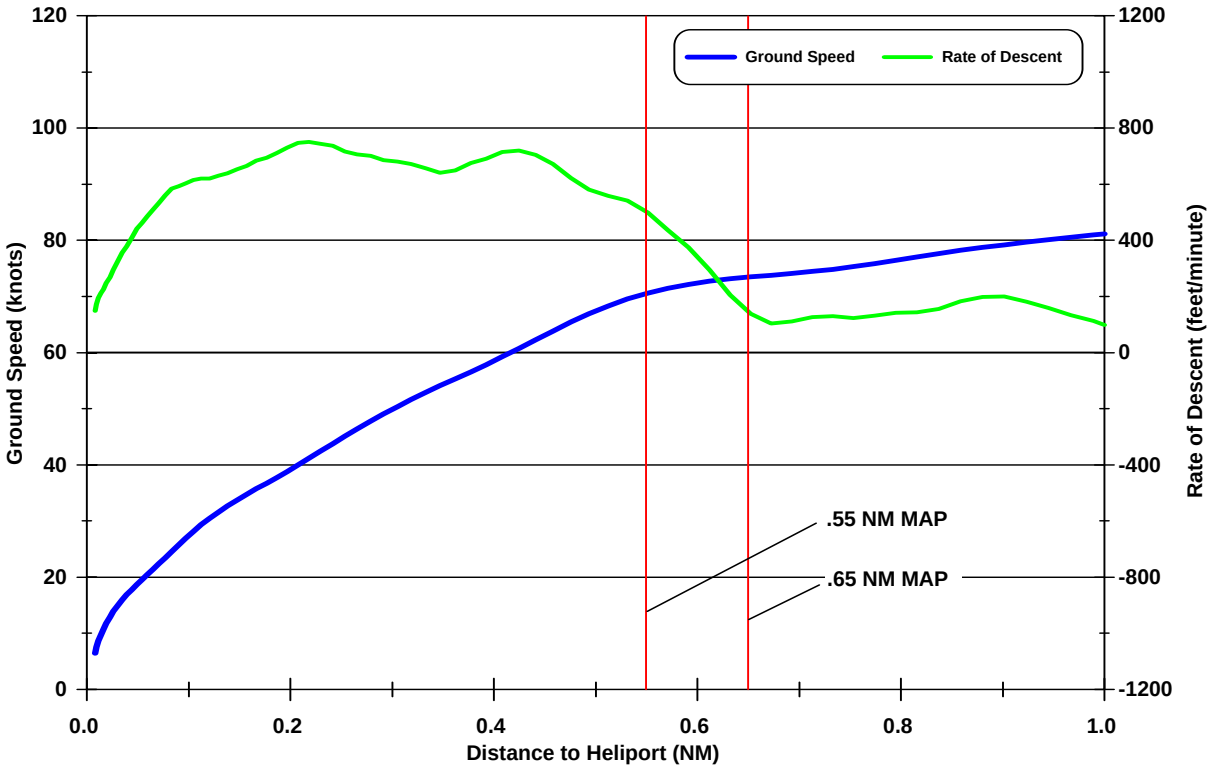



Approach - Plan View
Pilot P09 - 05/08/06A008 - Appr. #02W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
054/24
068/10
5
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

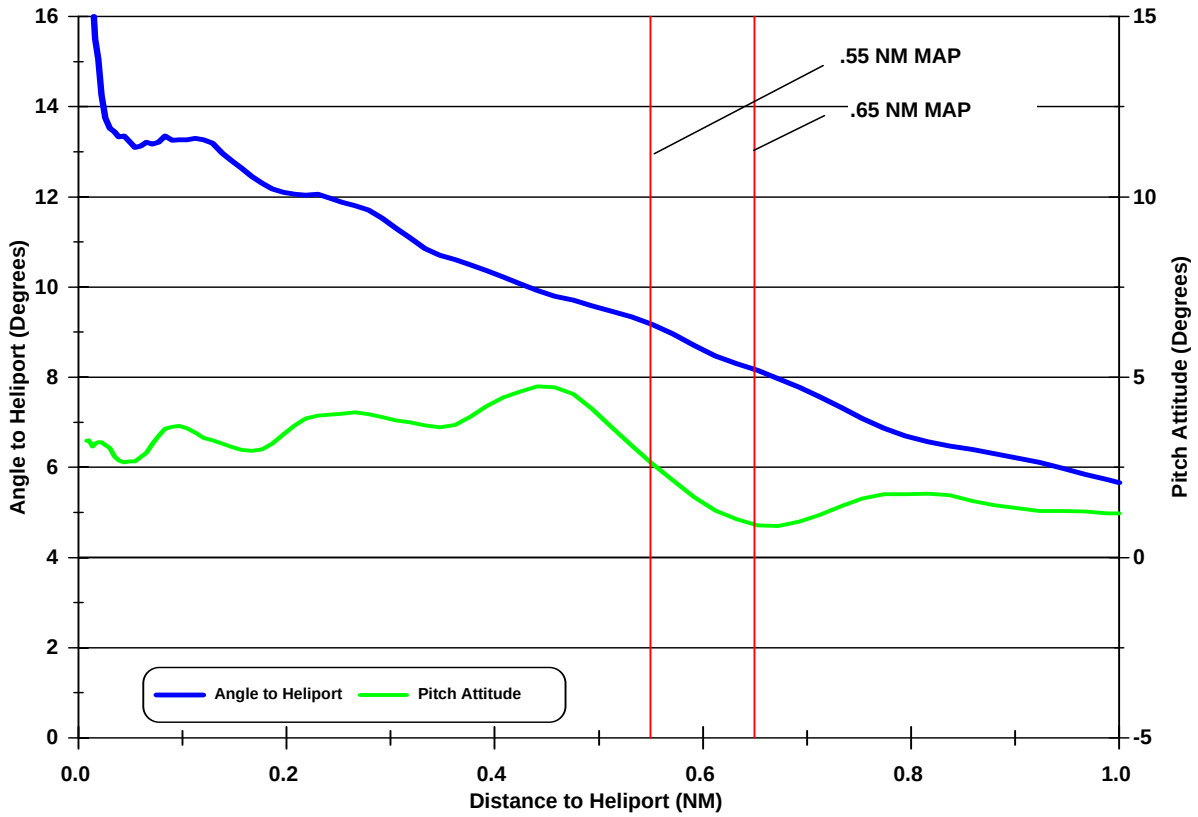
Profile View
Pilot P09 - 05/08/06A008 - Appr. #02W



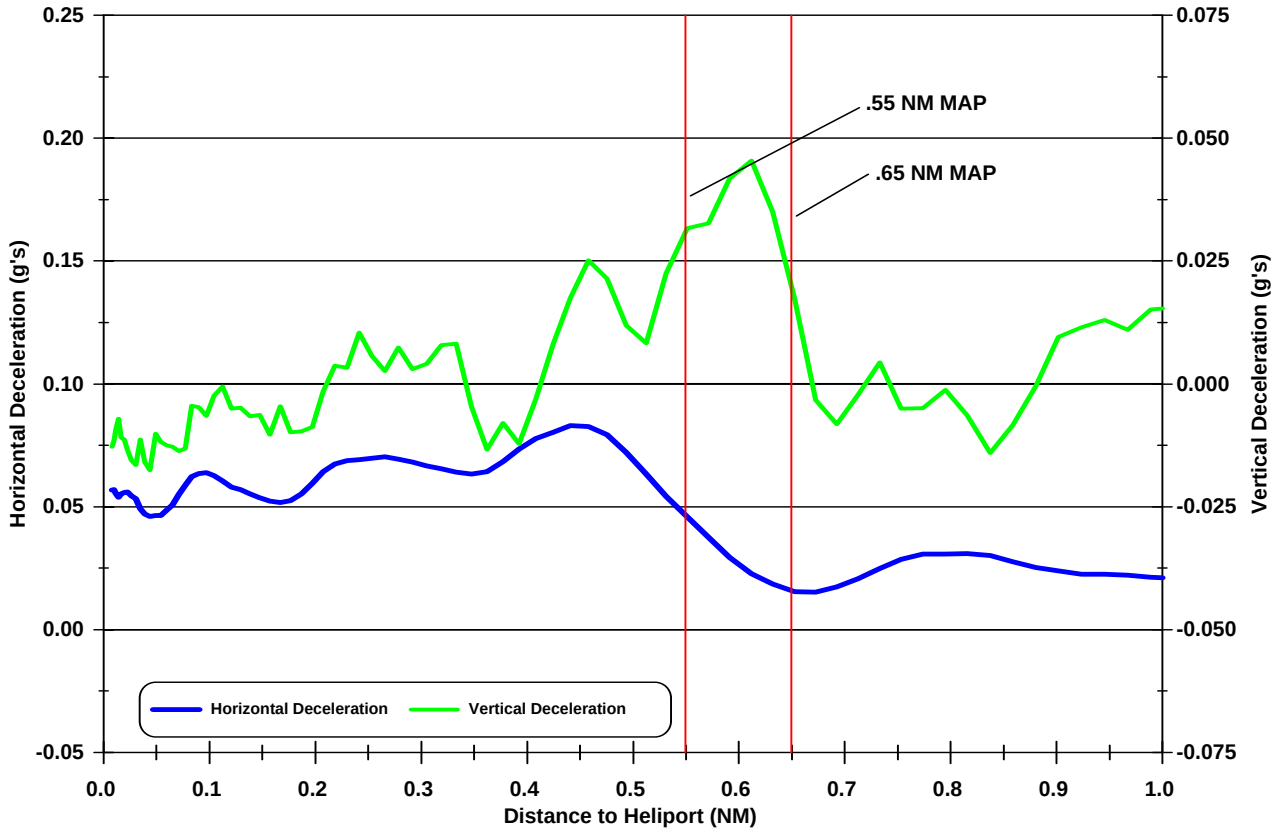
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06A008 - Appr. #02W

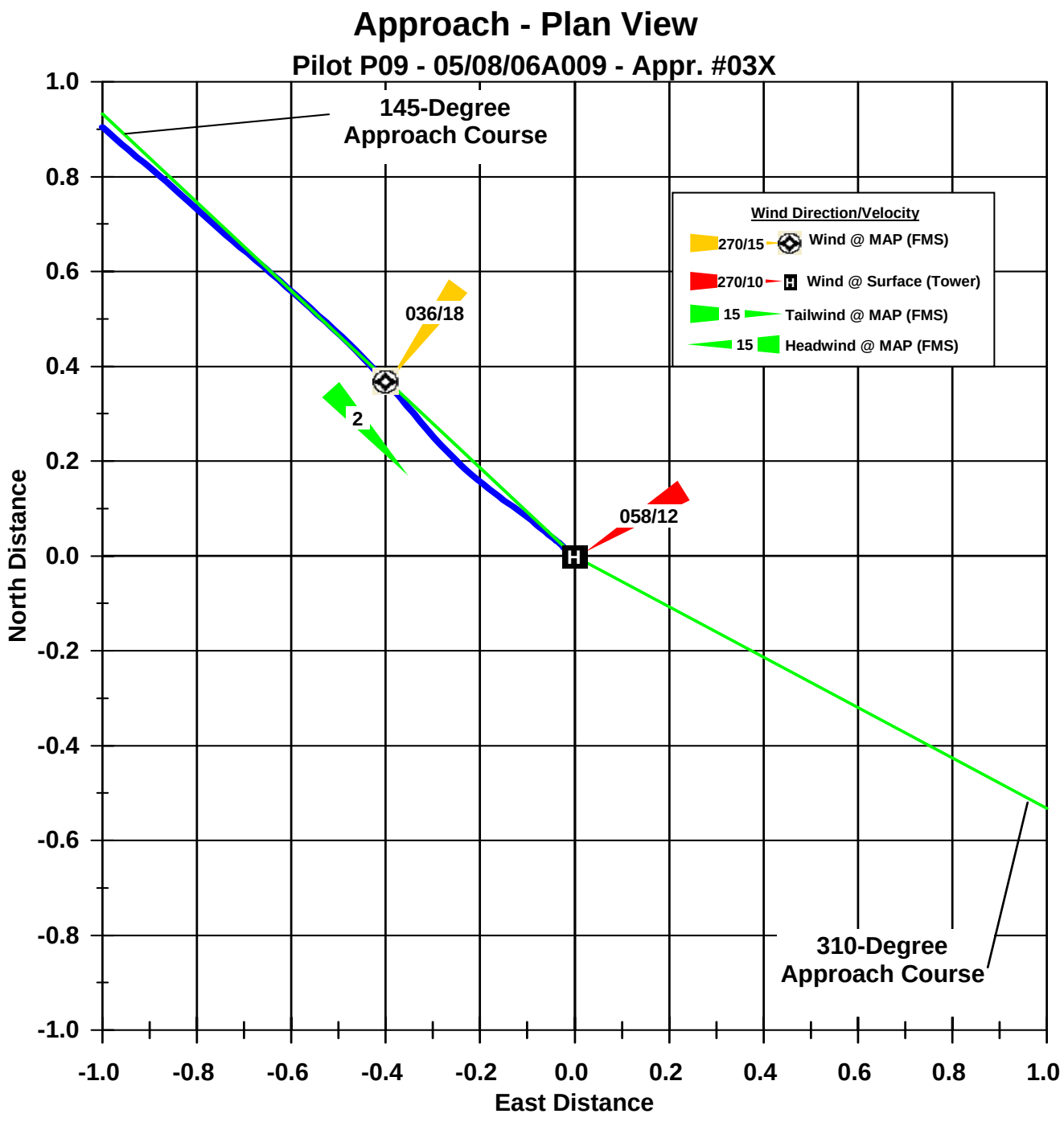


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06A008 - Appr. #02W

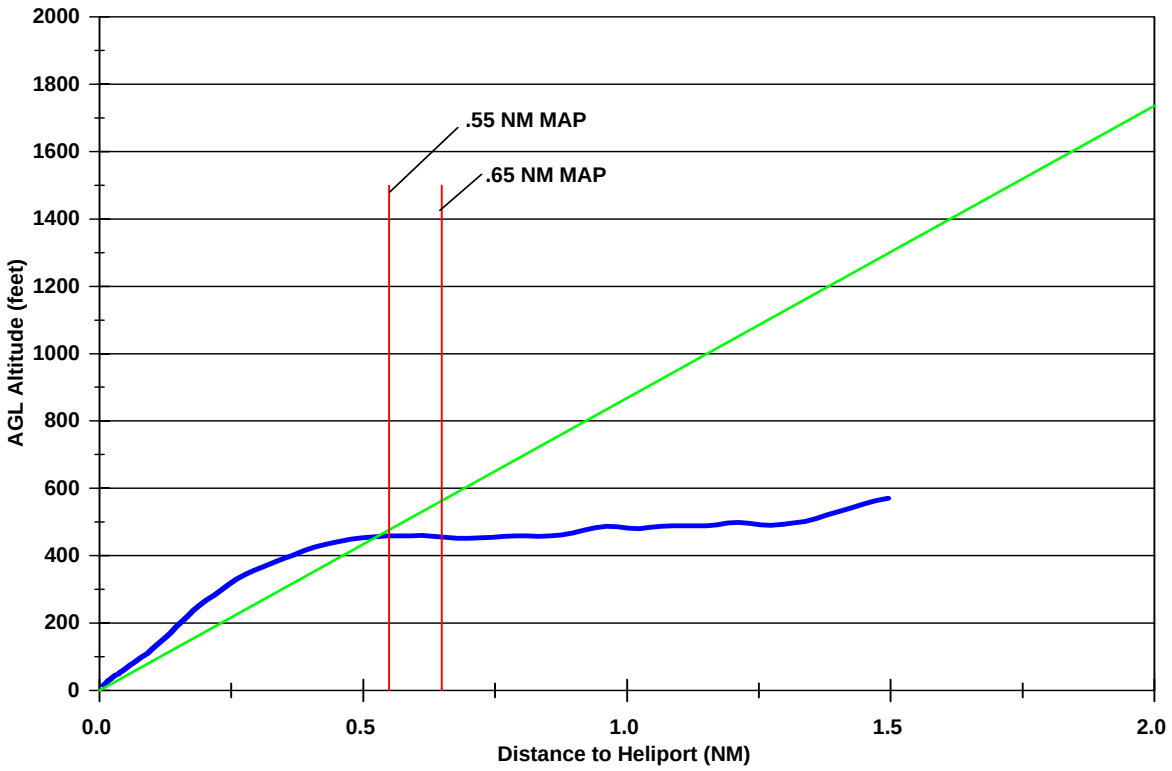


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06A008 - Appr. #02W

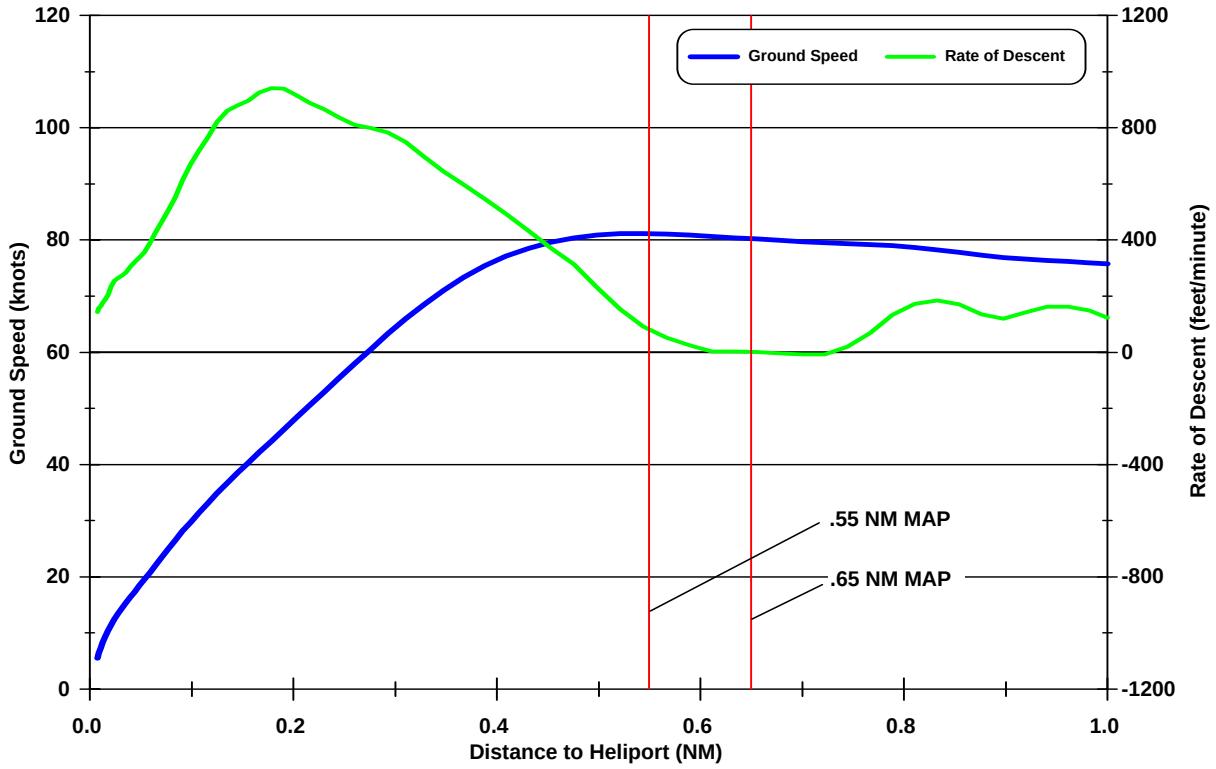



Approach - Plan View
Pilot P09 - 05/08/06A009 - Appr. #03X
145-Degree
Approach Course
310-Degree
Approach Course
036/18
2
058/12
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

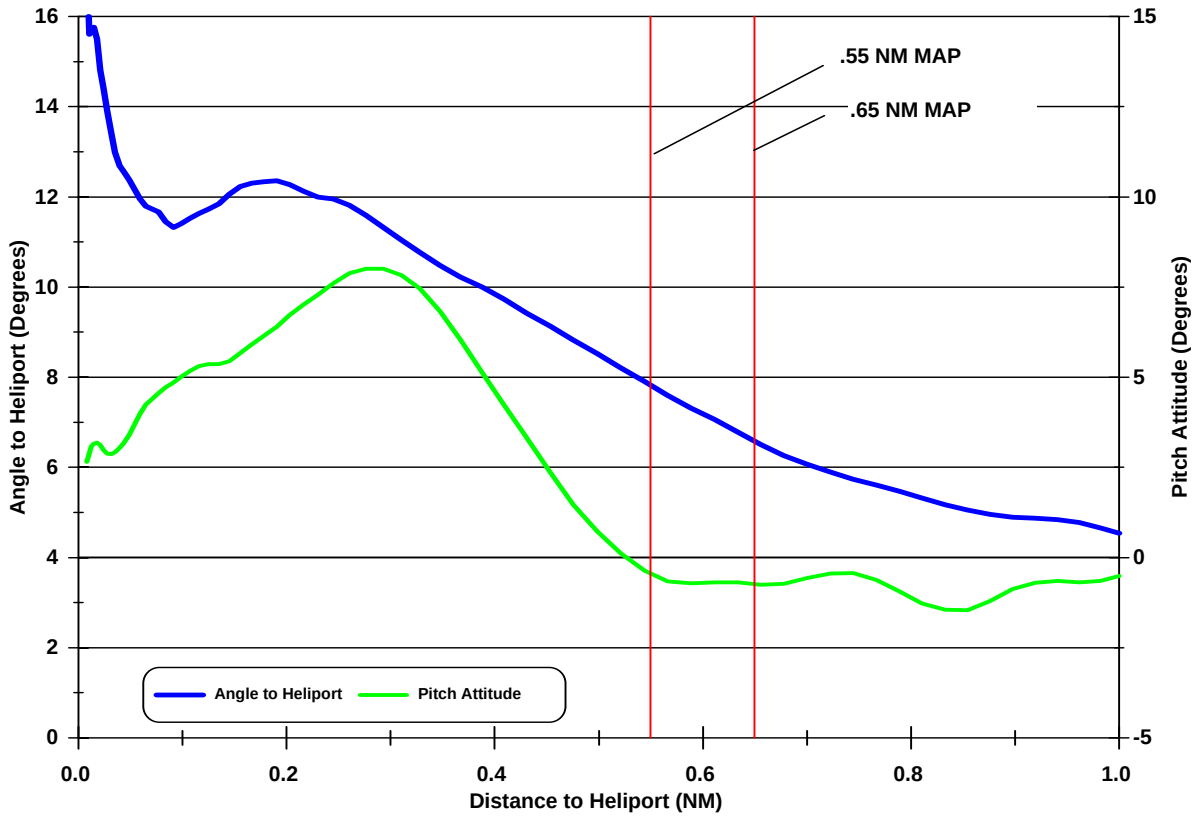
Profile View
Pilot P09 - 05/08/06A009 - Appr. #03X



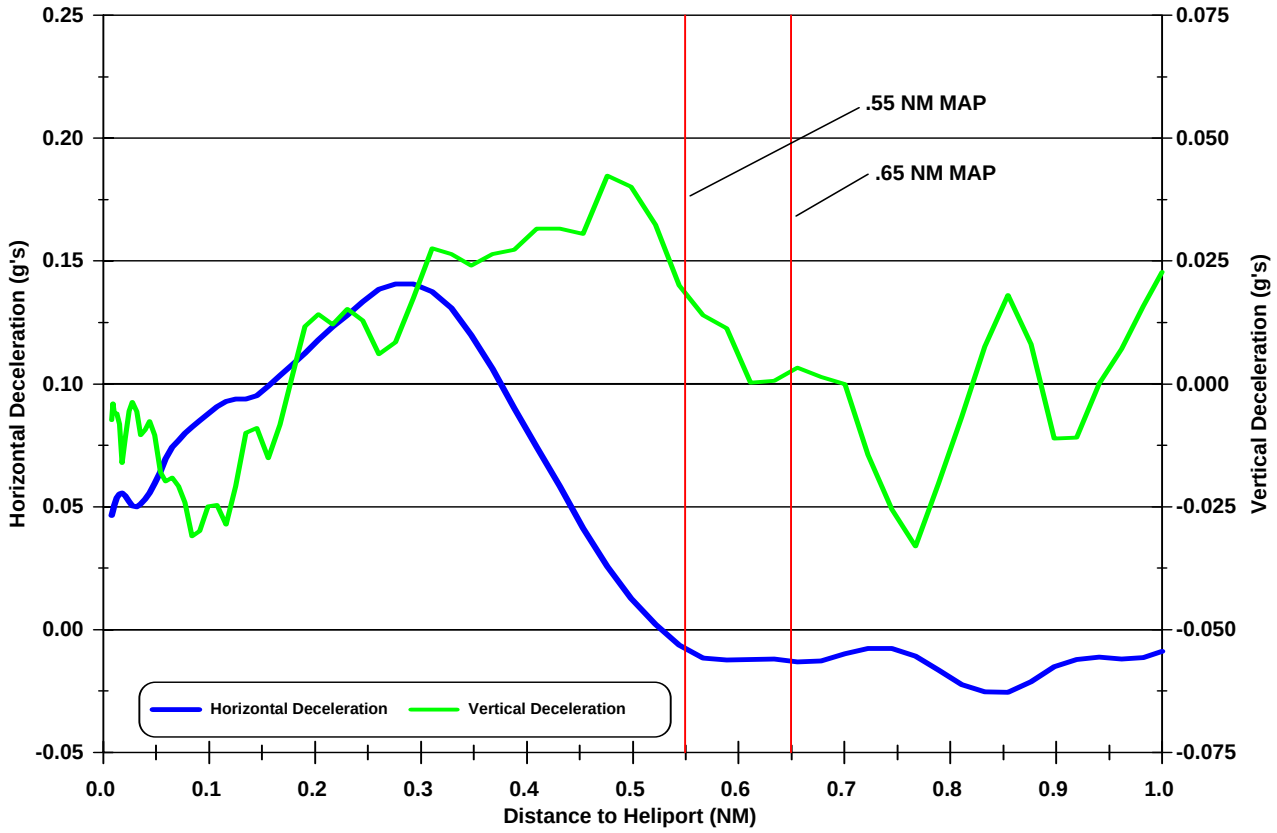
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06A009 - Appr. #03X

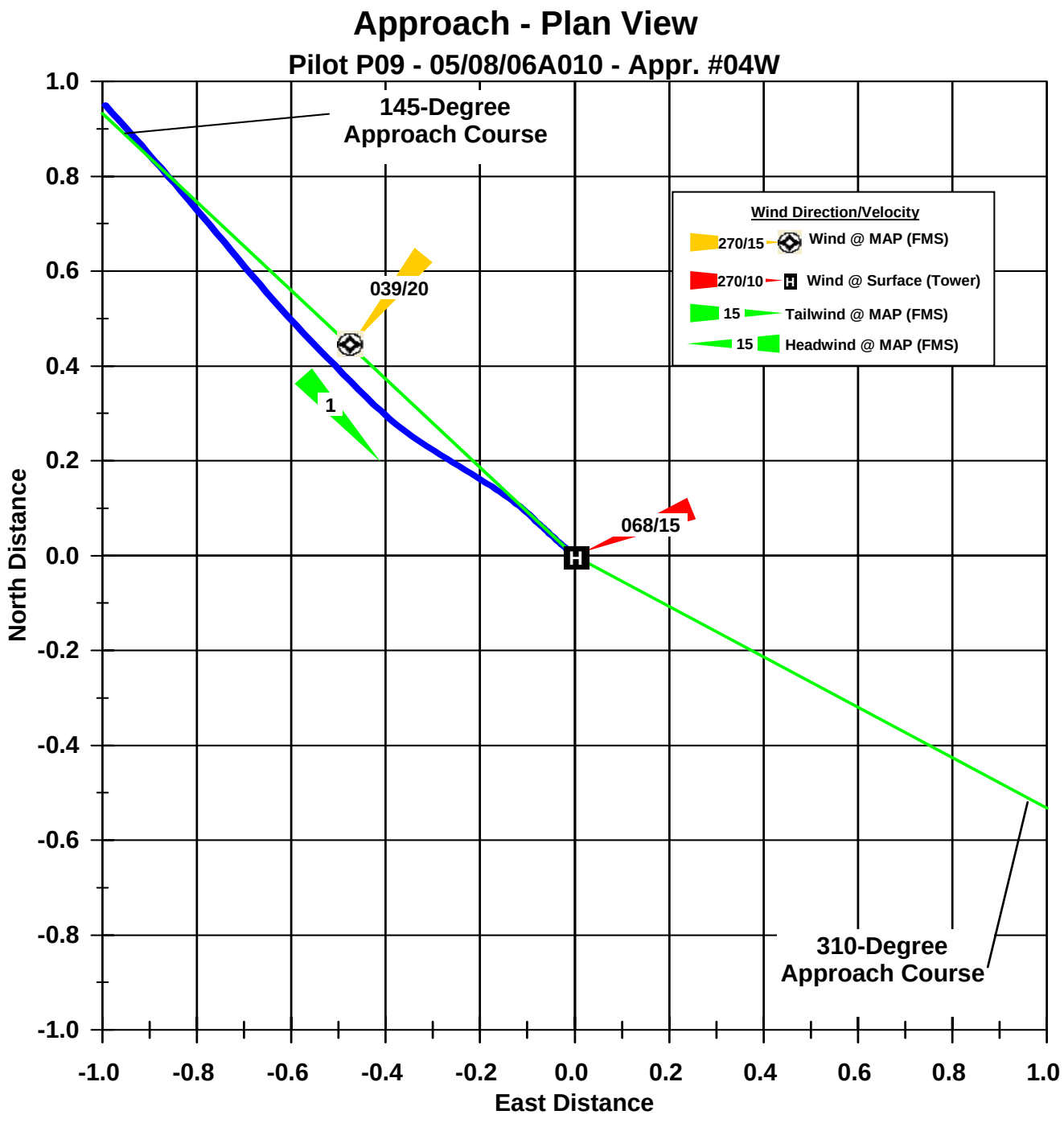


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06A009 - Appr. #03X

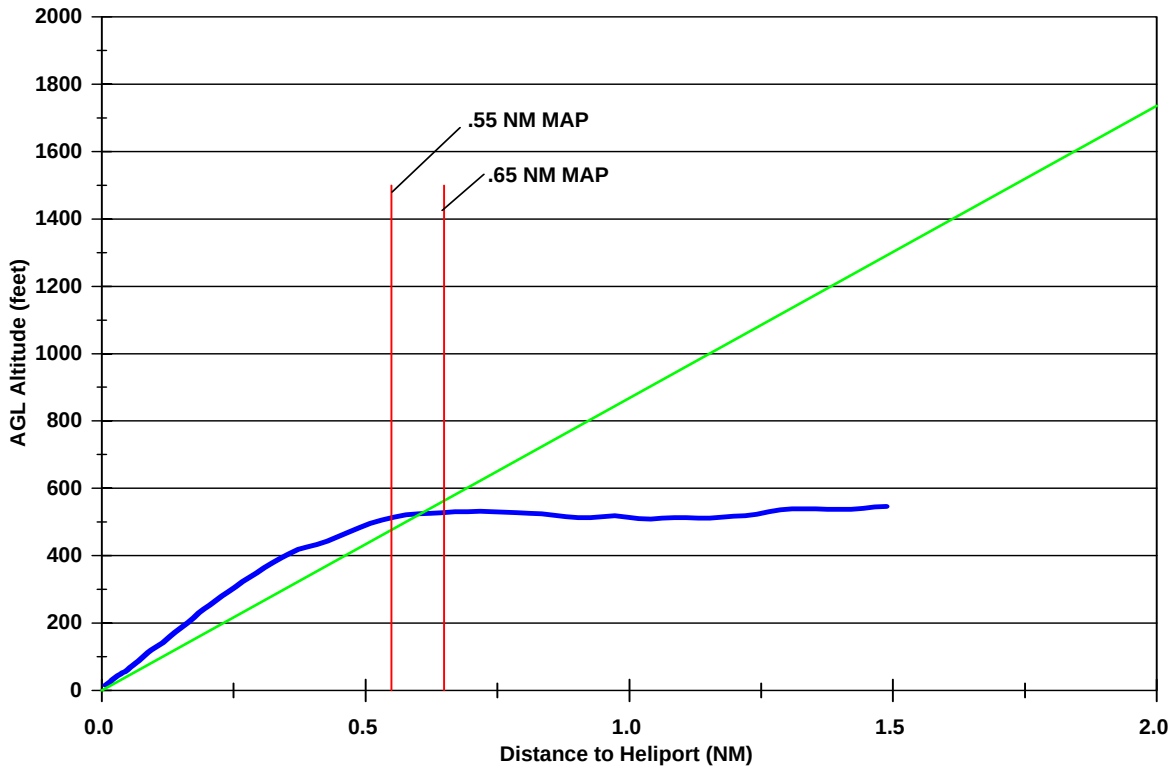


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06A009 - Appr. #03X

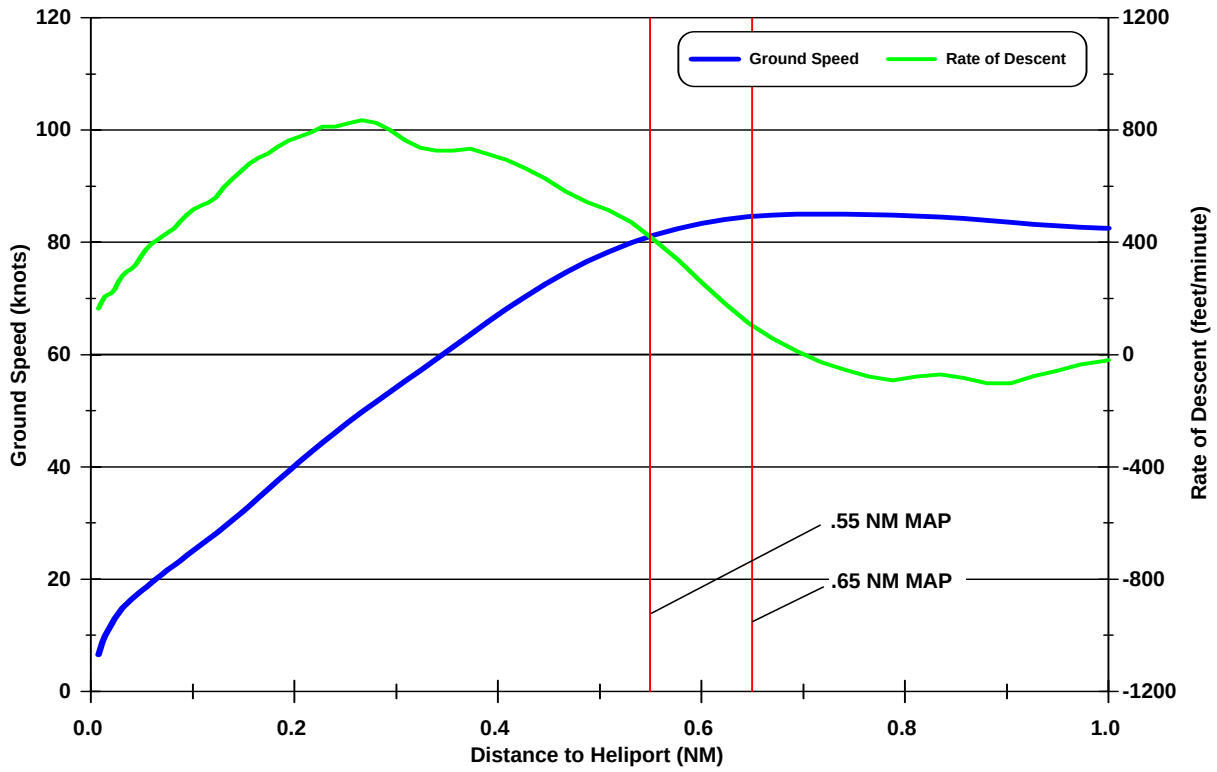



Approach - Plan View
Pilot P09 - 05/08/06A010 - Appr. #04W
145-Degree
Approach Course
310-Degree
Approach Course
039/20
068/15
1
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

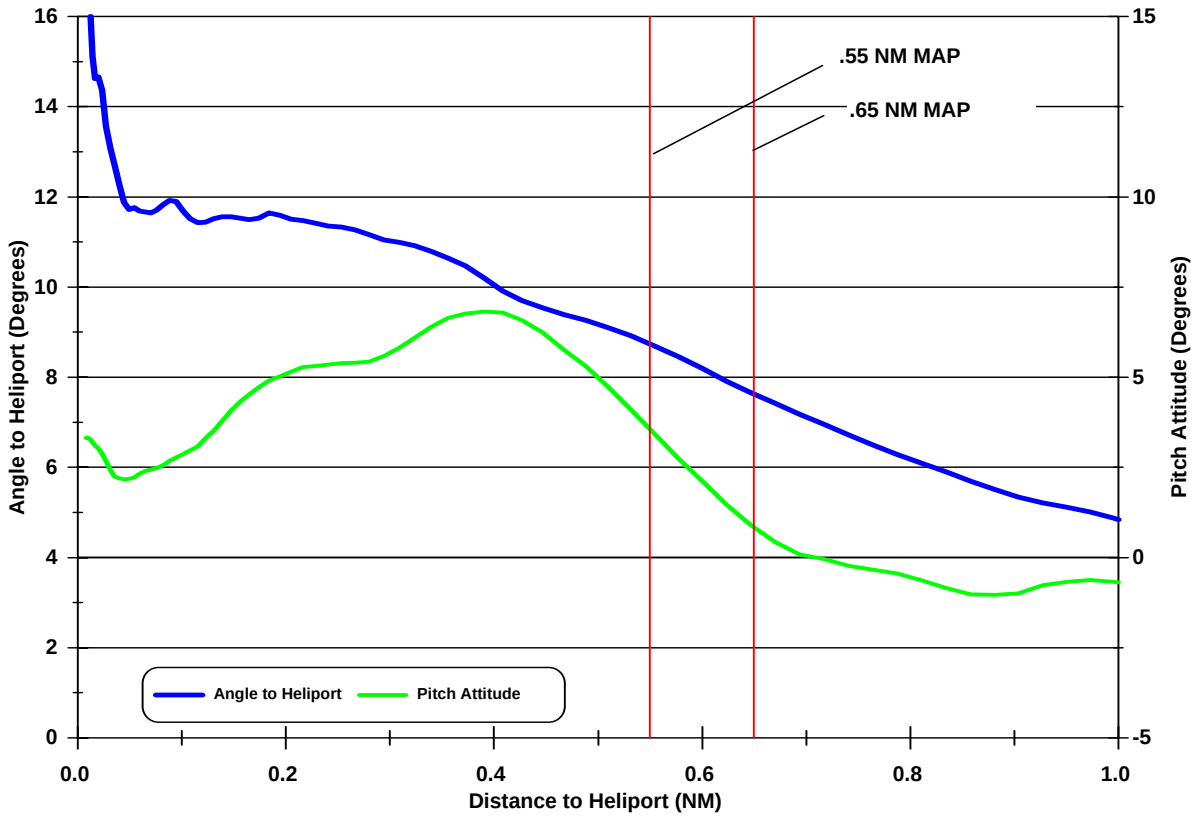
Profile View
Pilot P09 - 05/08/06A010 - Appr. #04W



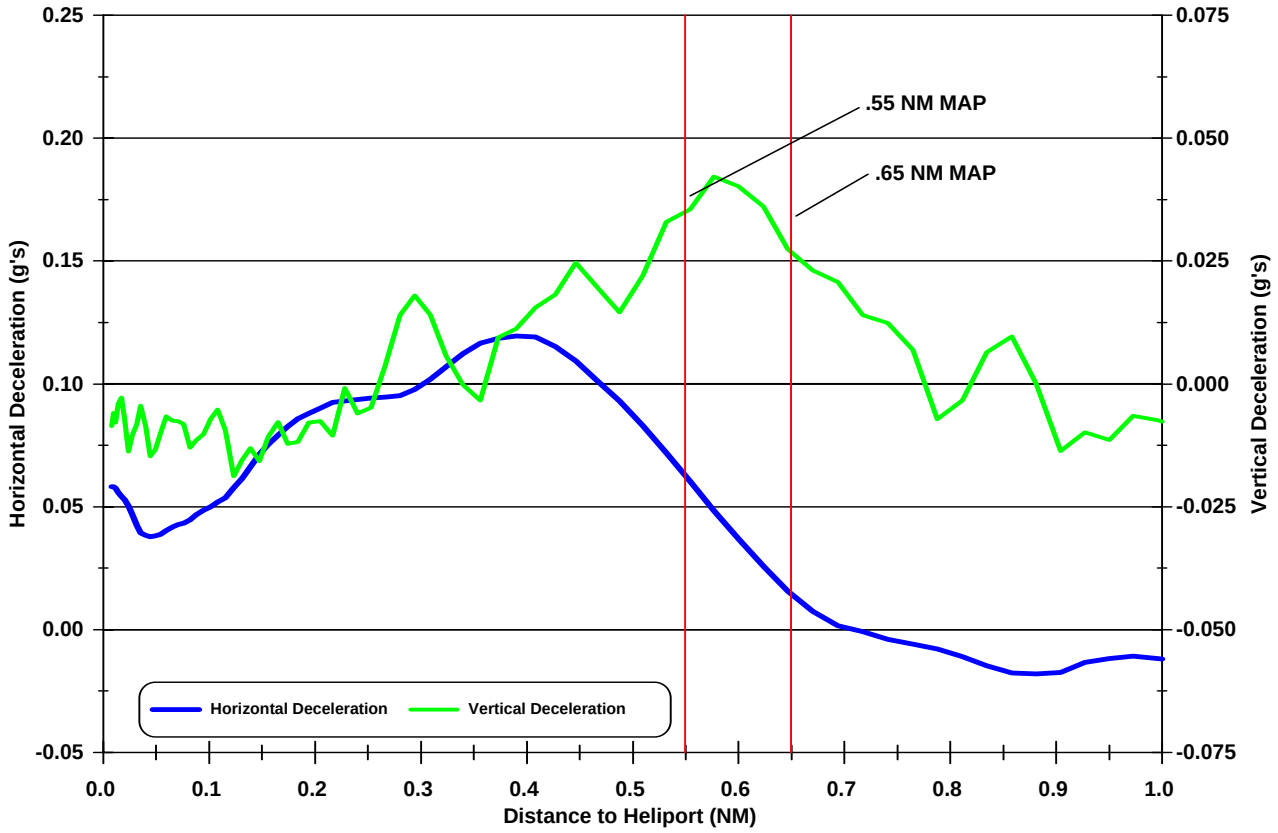
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06A010 - Appr. #04W

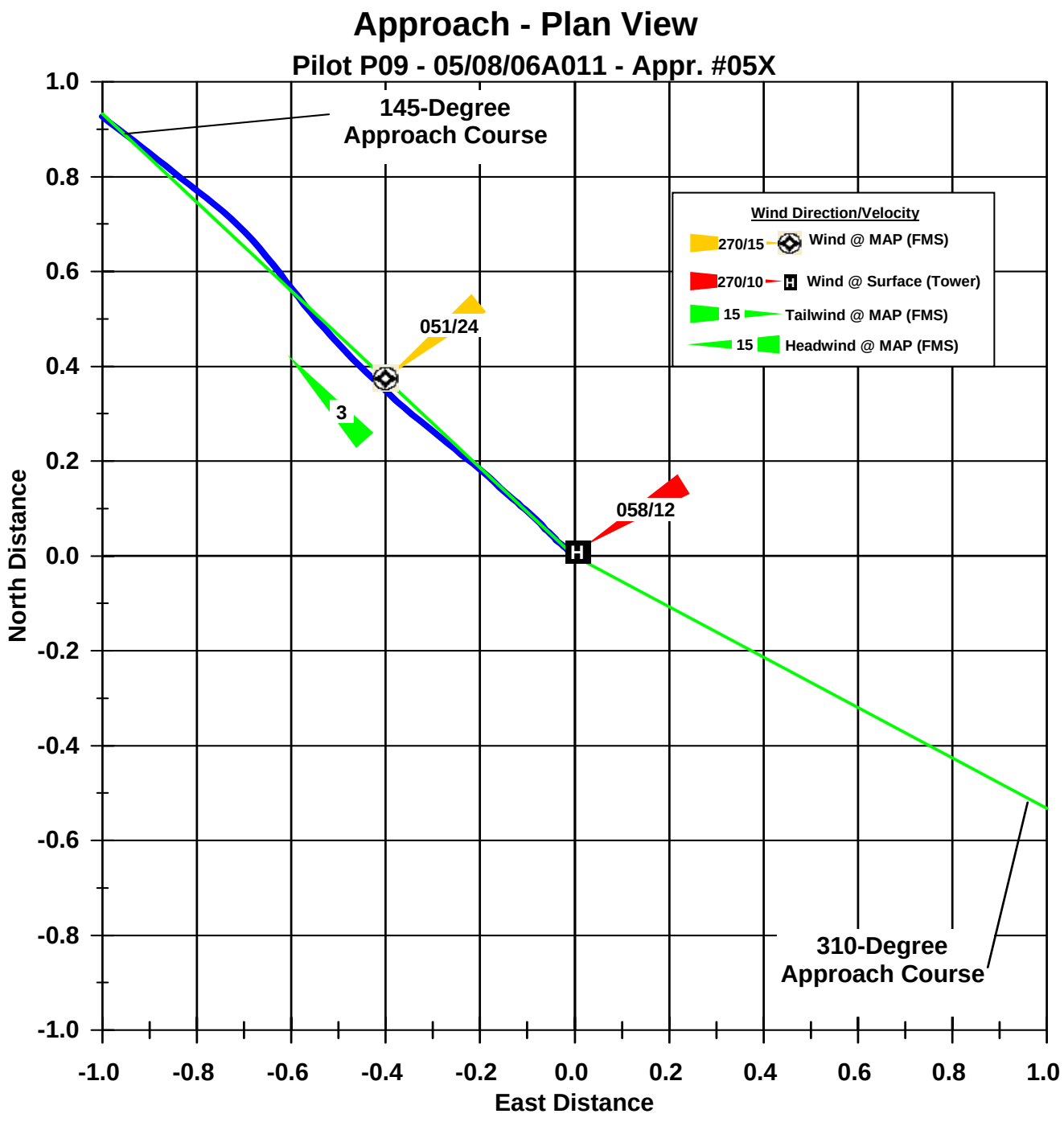


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06A010 - Appr. #04W

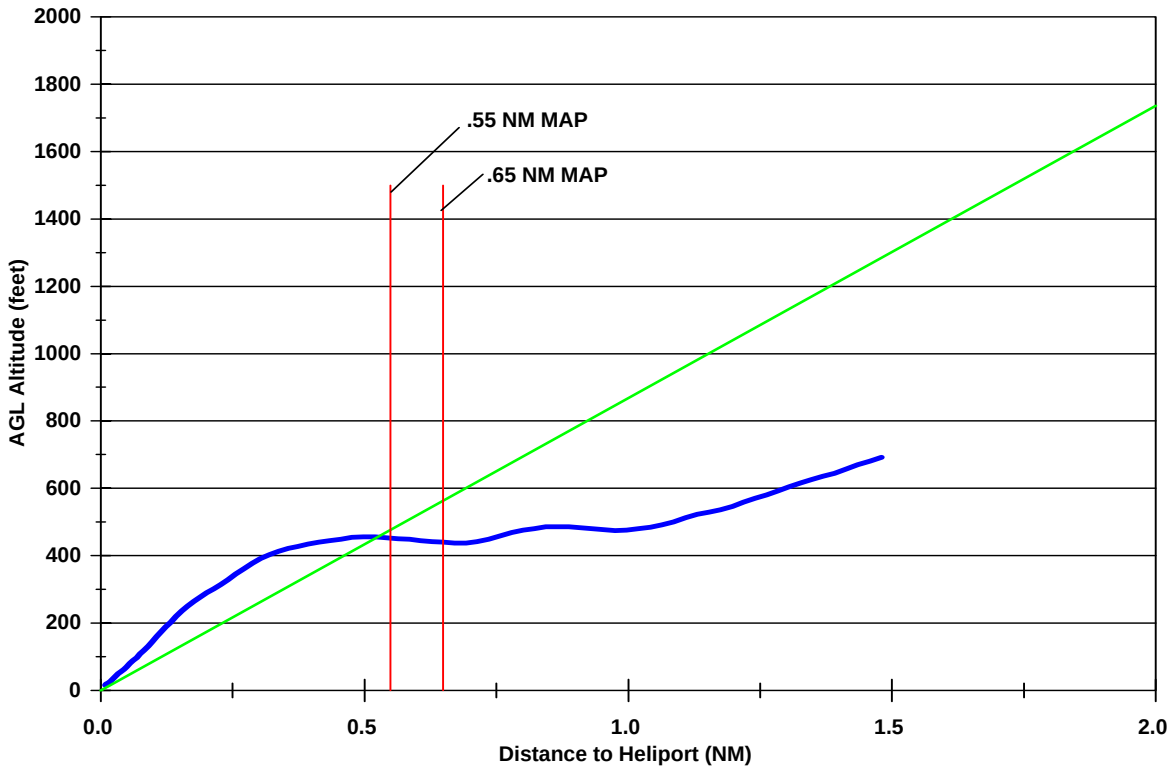


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06A010 - Appr. #04W

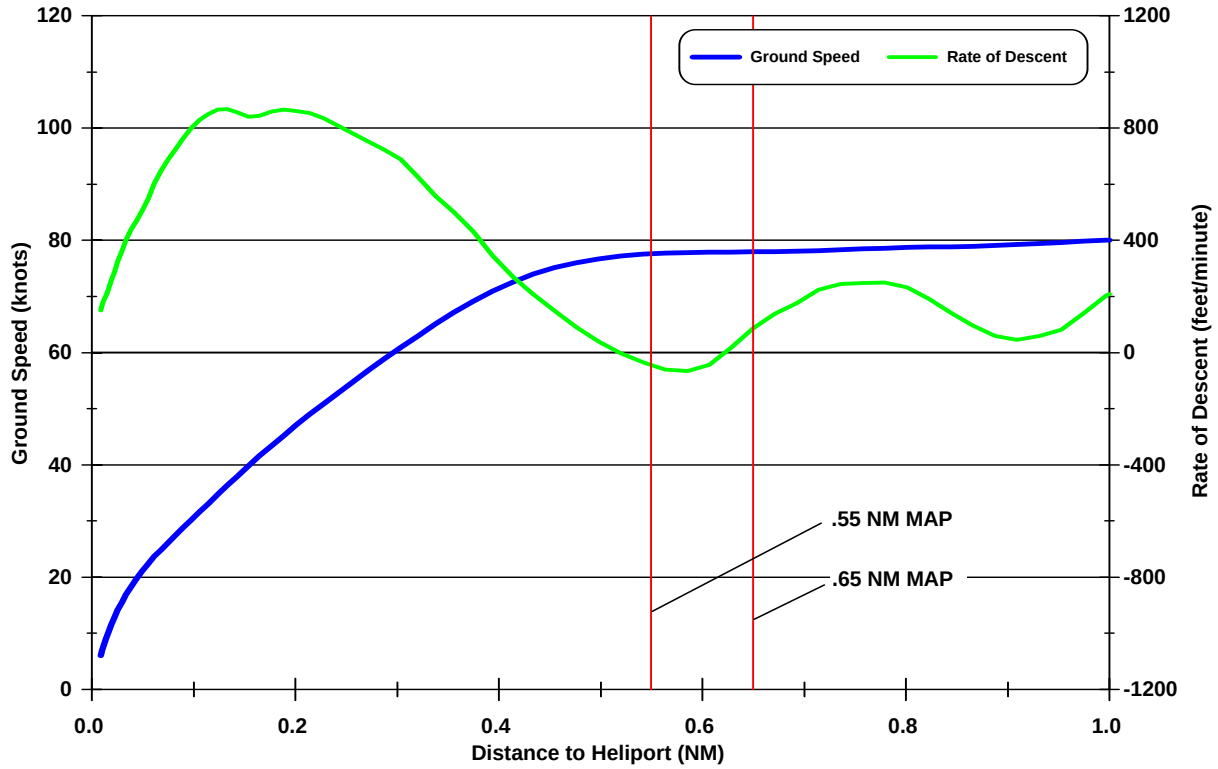



Approach - Plan View
Pilot P09 - 05/08/06A011 - Appr. #05X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
051/24
058/12
3
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

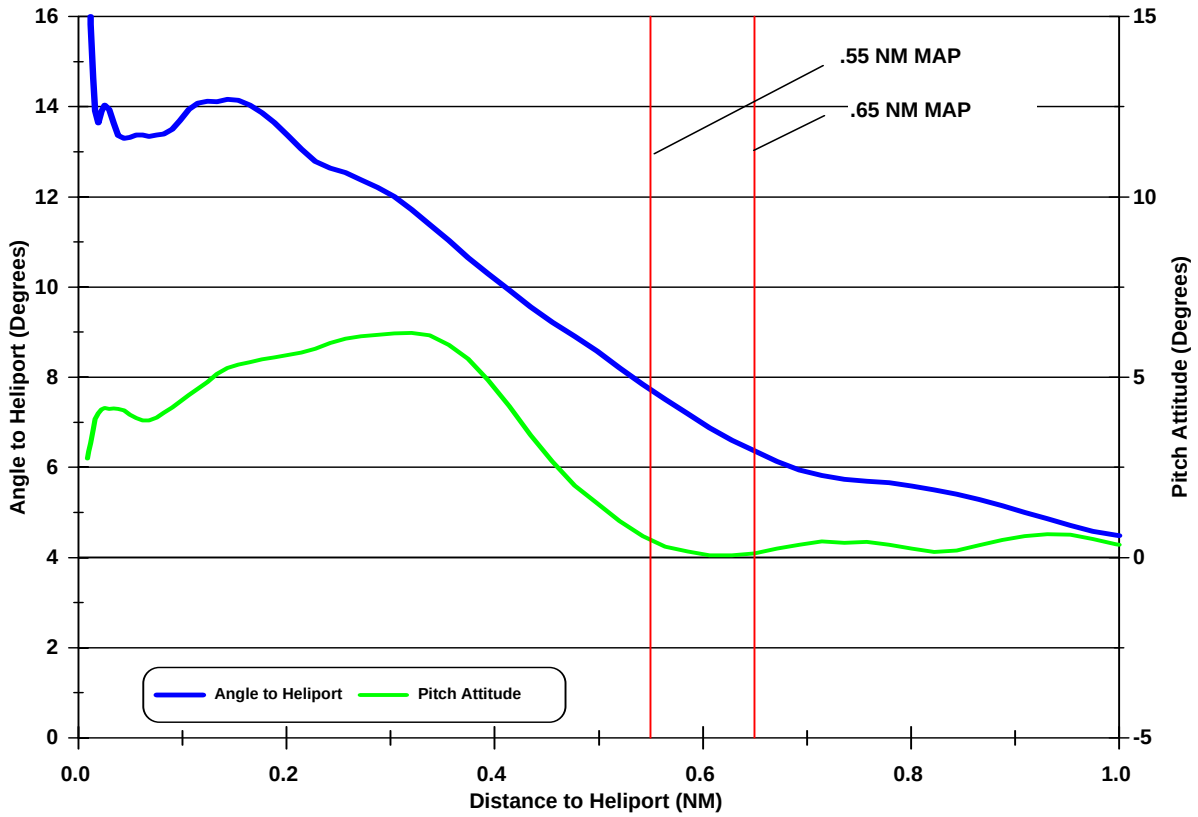
Profile View
Pilot P09 - 05/08/06A011 - Appr. #05X



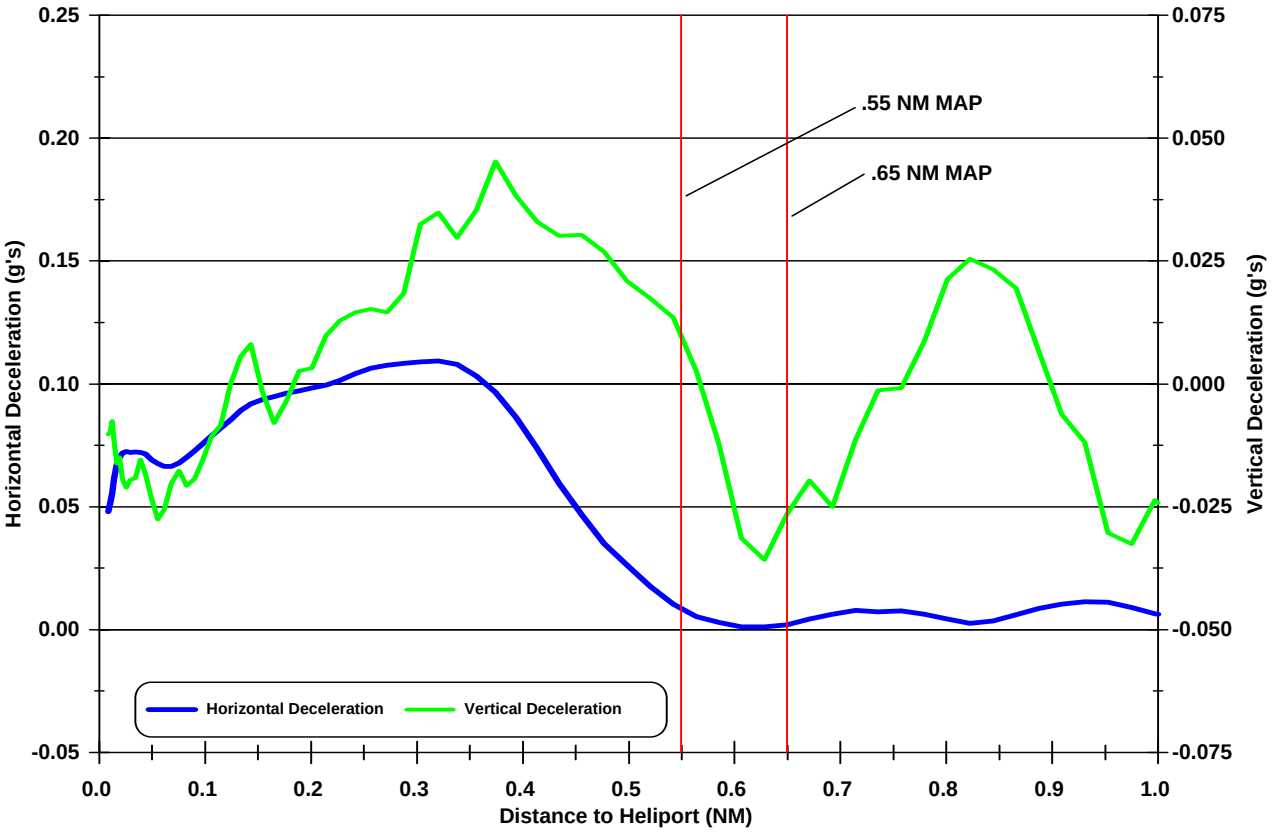
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06A011 - Appr. #05X

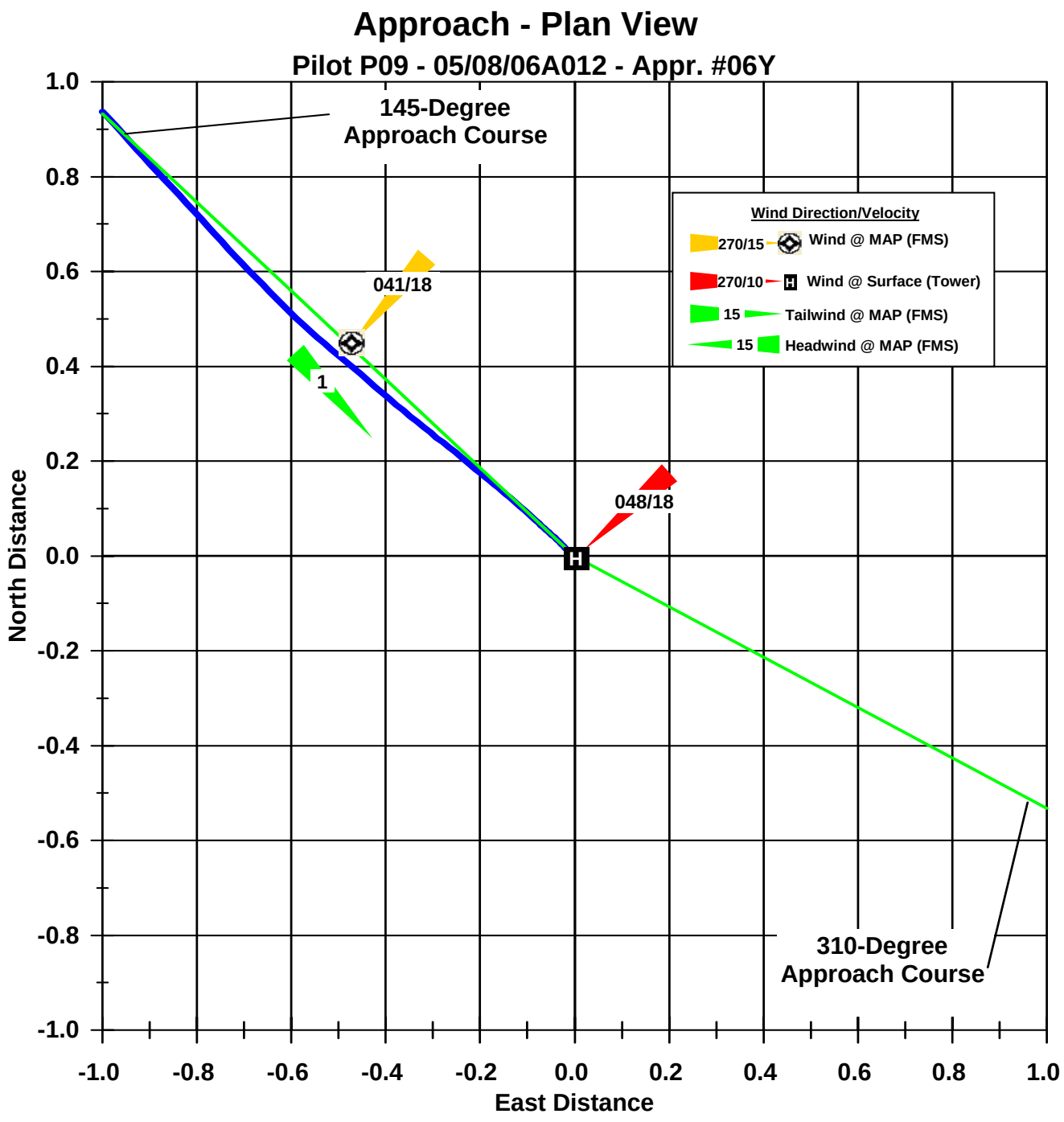


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06A011 - Appr. #05X

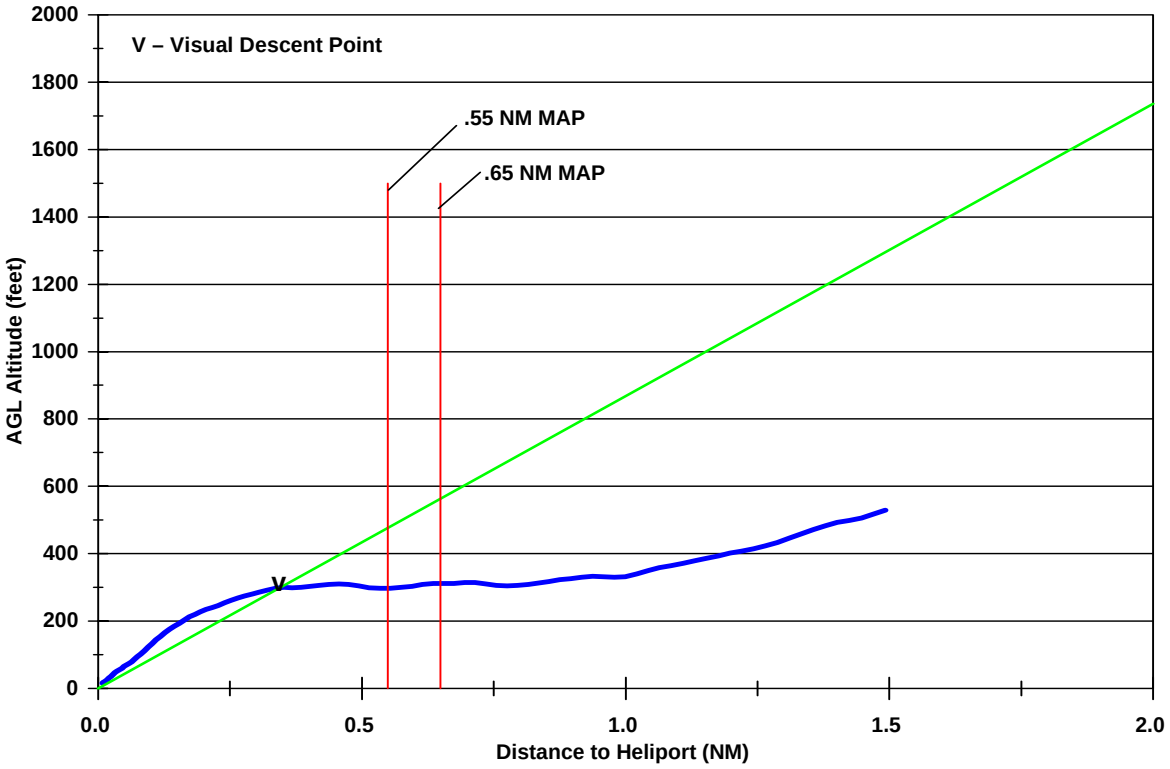


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06A011 - Appr. #05X

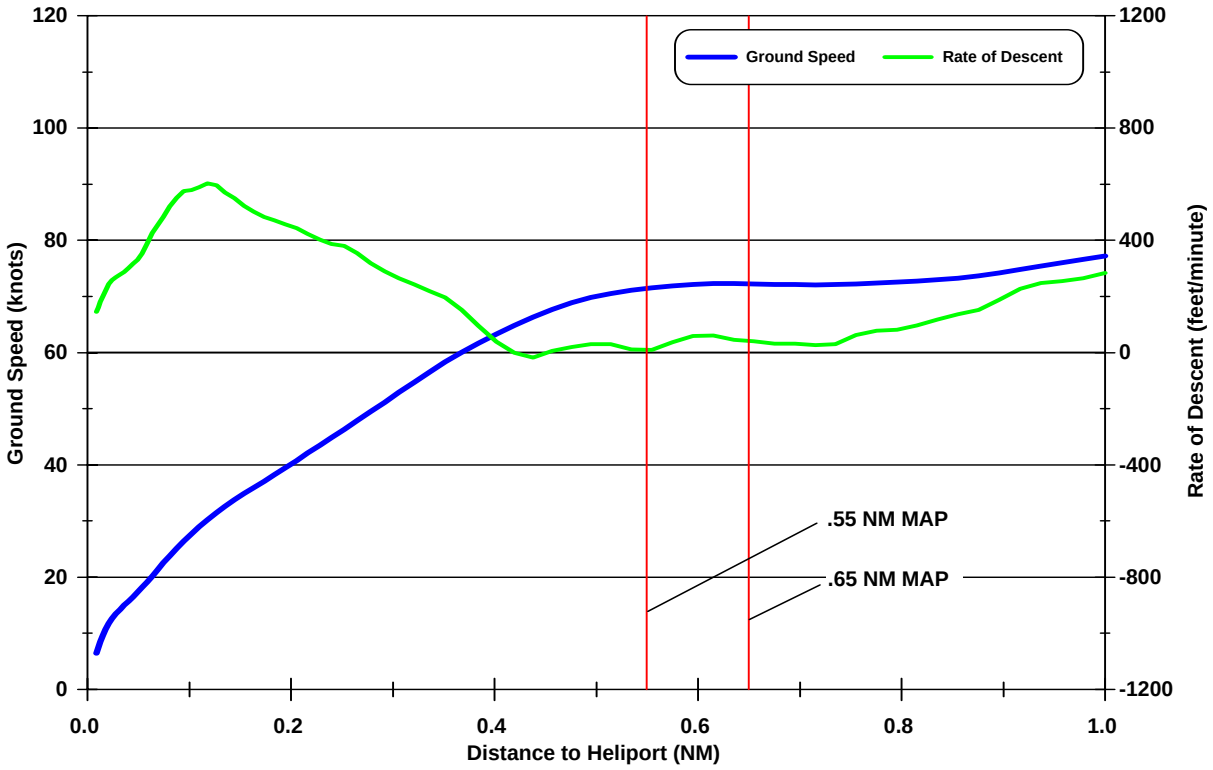



Approach - Plan View
Pilot P09 - 05/08/06A012 - Appr. #06Y
145-Degree
Approach Course
310-Degree
Approach Course
041/18
048/18
1
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

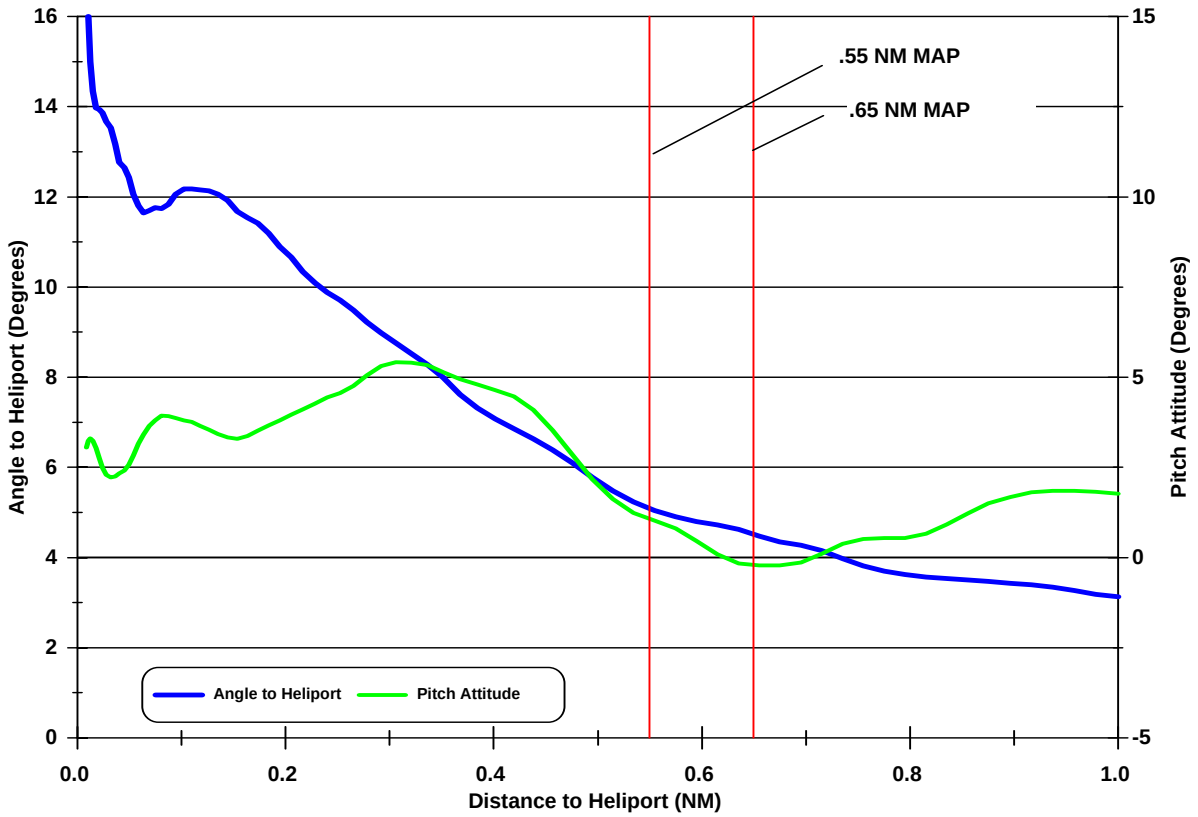
Profile View
Pilot P09 - 05/08/06A012 - Appr. #06Y



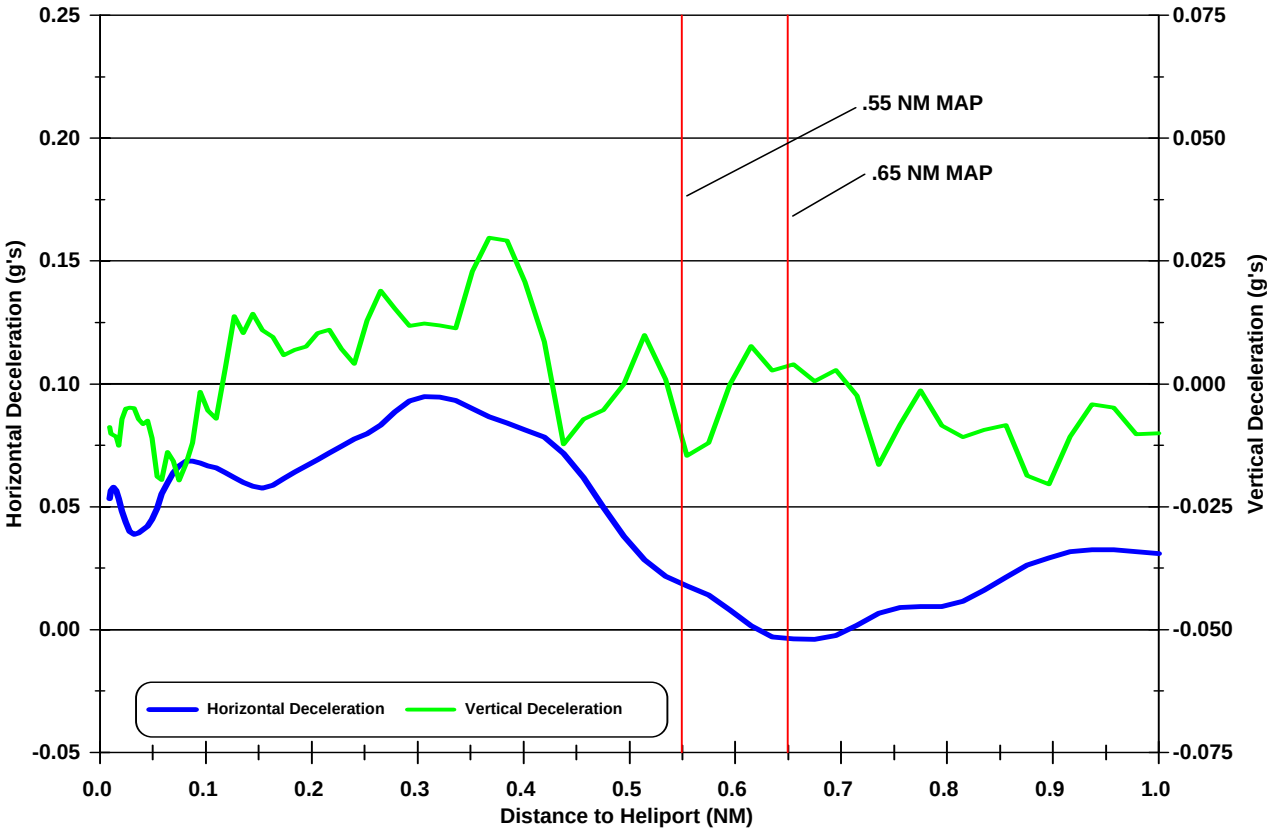
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06A012 - Appr. #06Y

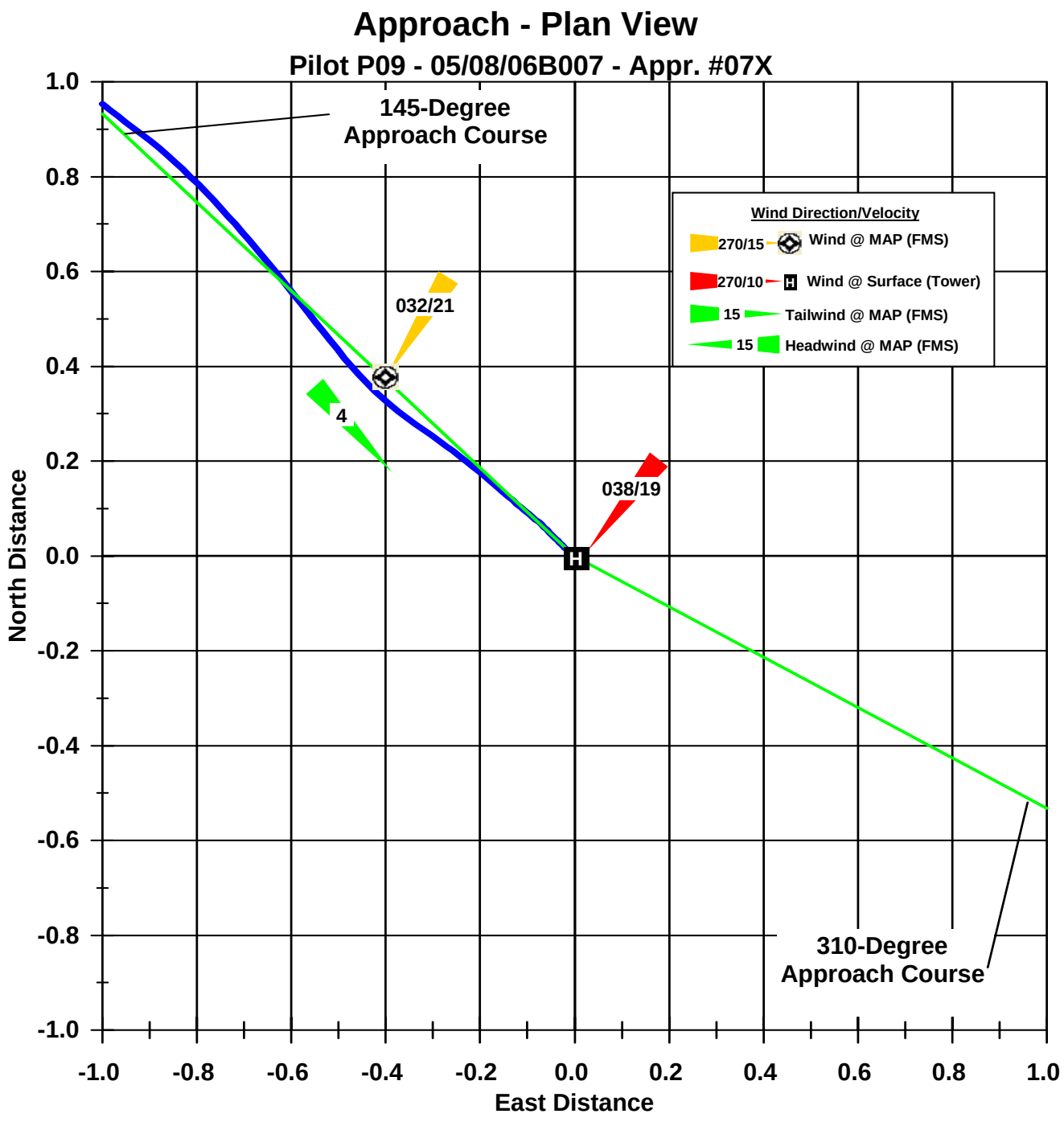


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06A012 - Appr. #06Y

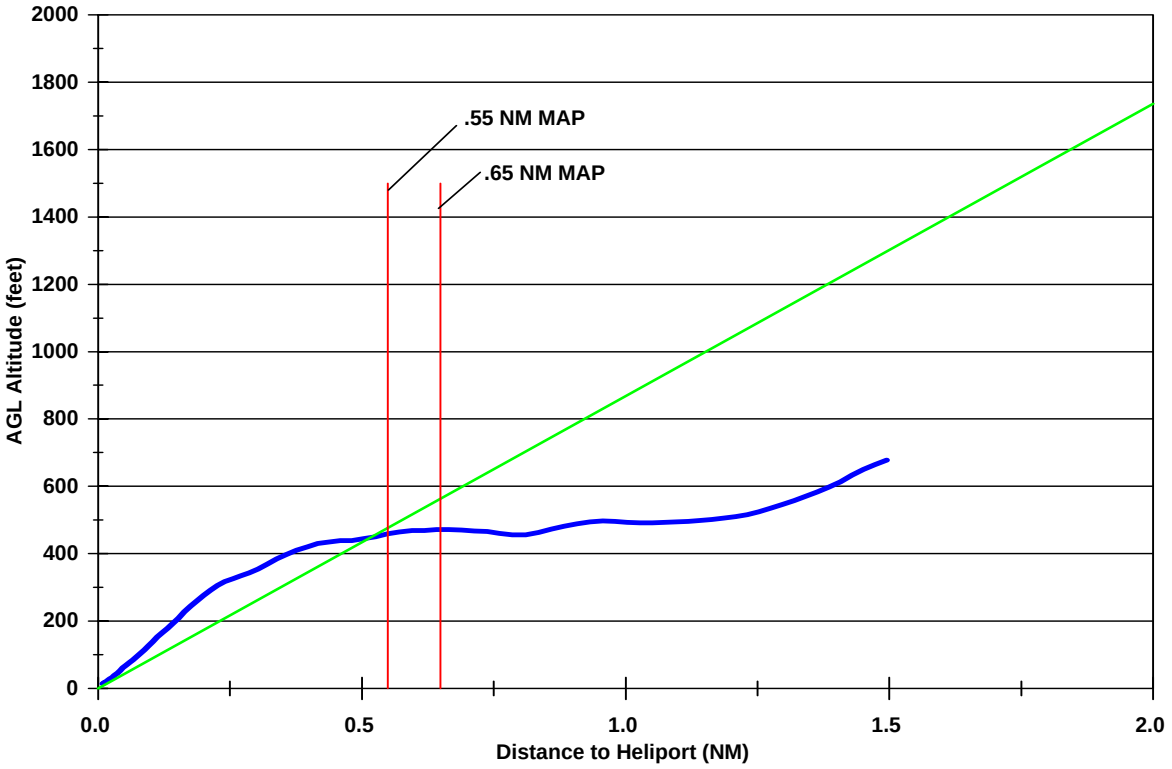


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06A012 - Appr. #06Y

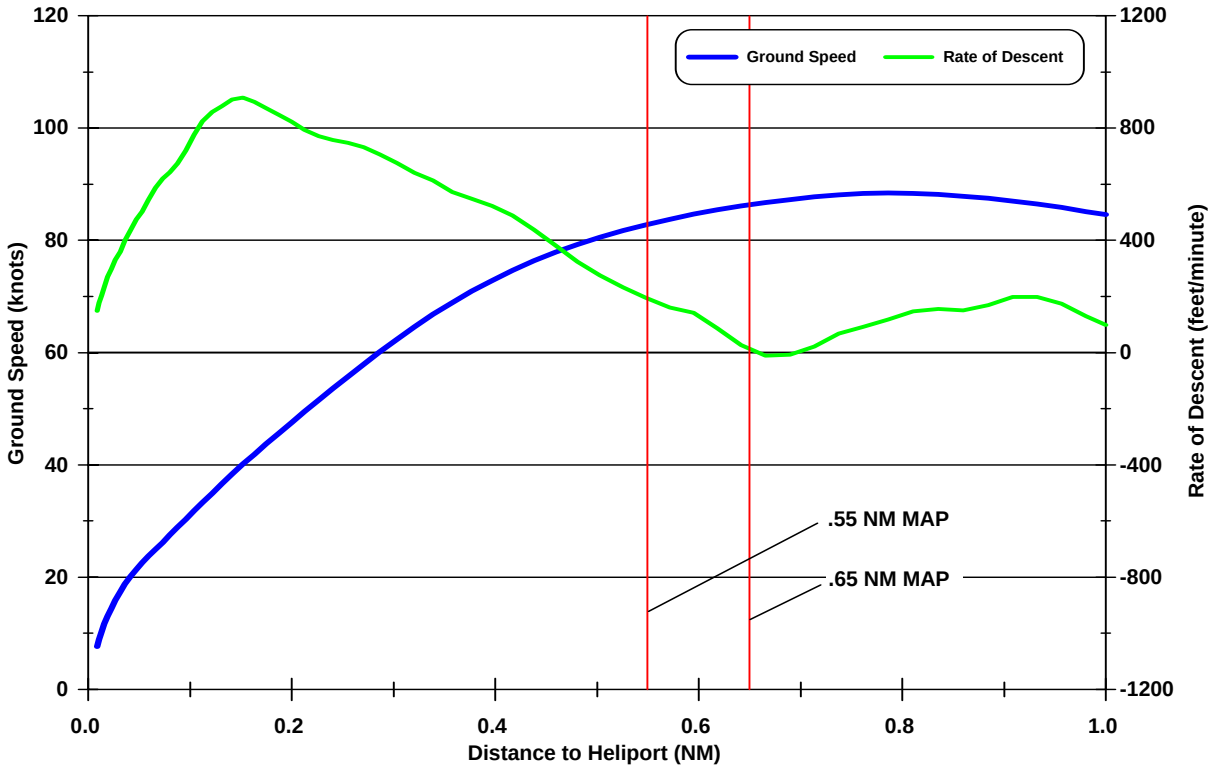



Approach - Plan View
Pilot P09 - 05/08/06B007 - Appr. #07X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
032/21
4
038/19
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

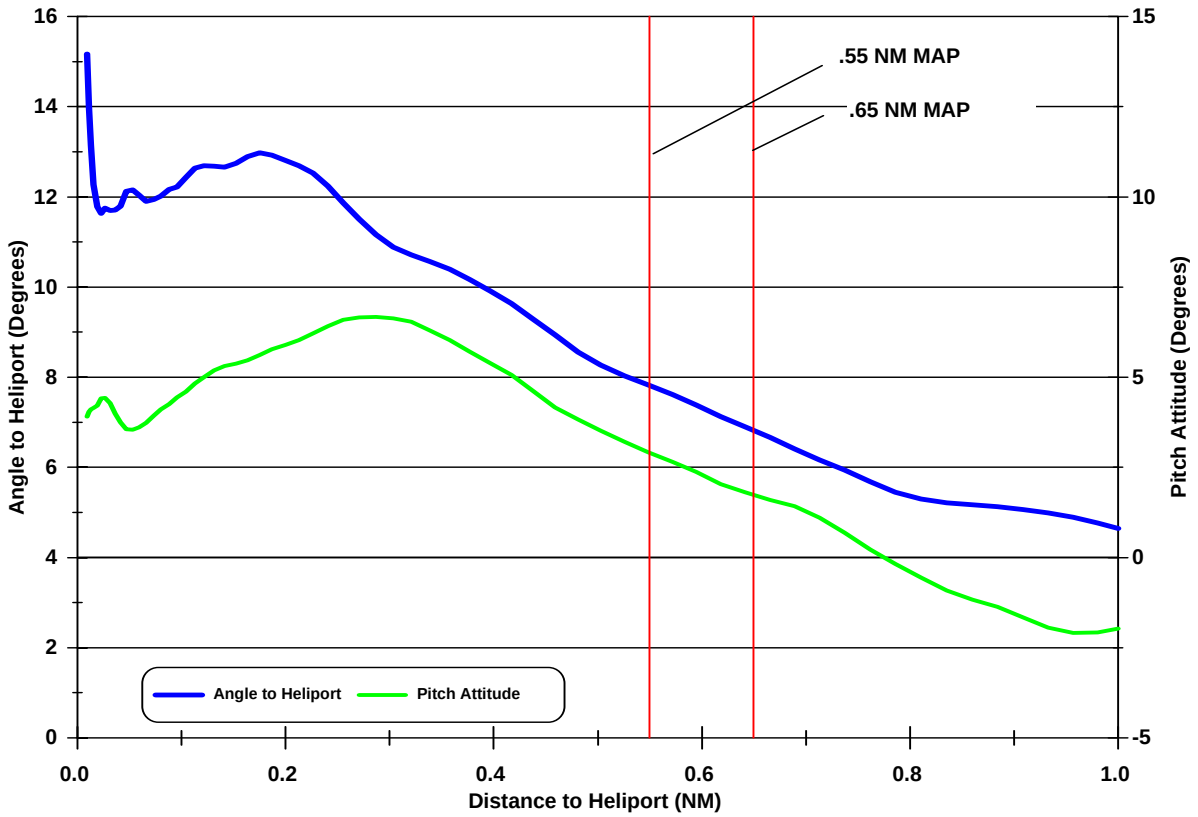
Profile View
Pilot P09 - 05/08/06B007 - Appr. #07X



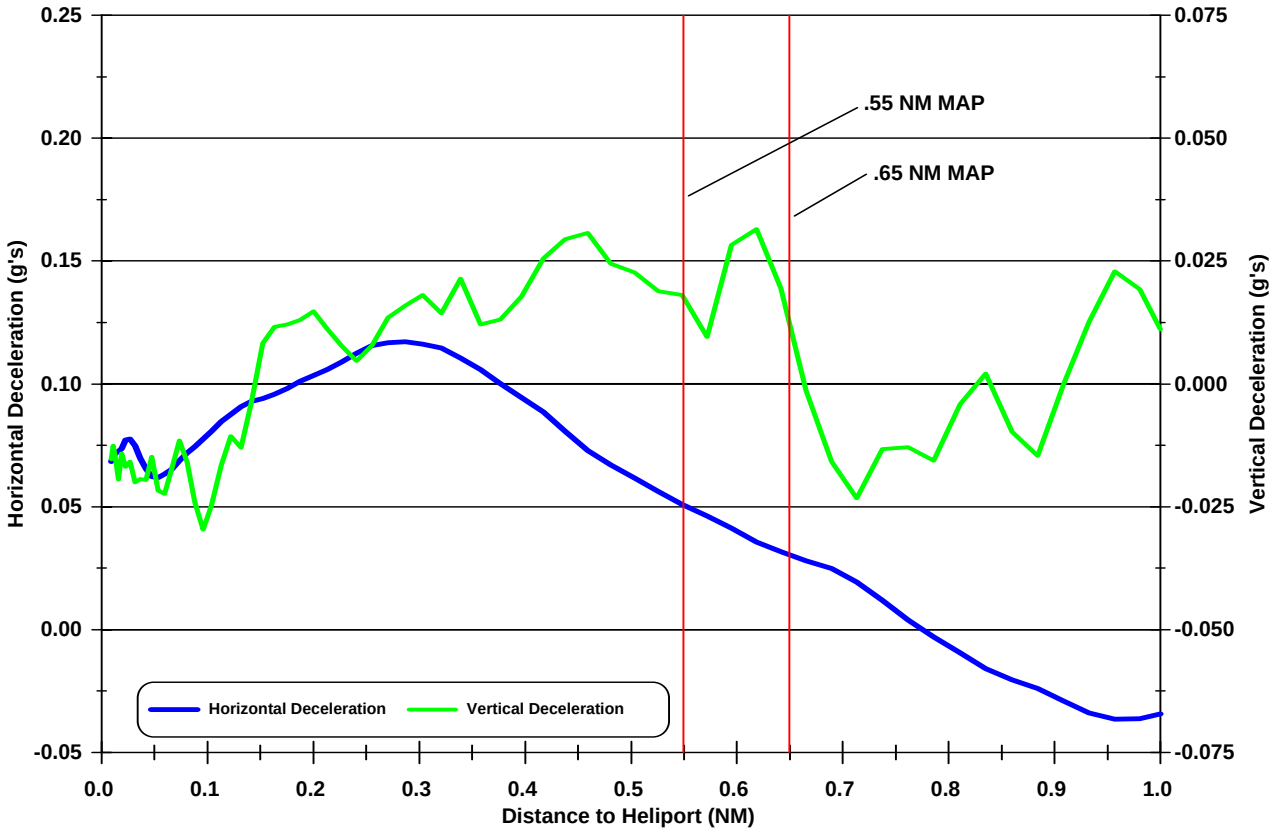
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06B007 - Appr. #07X

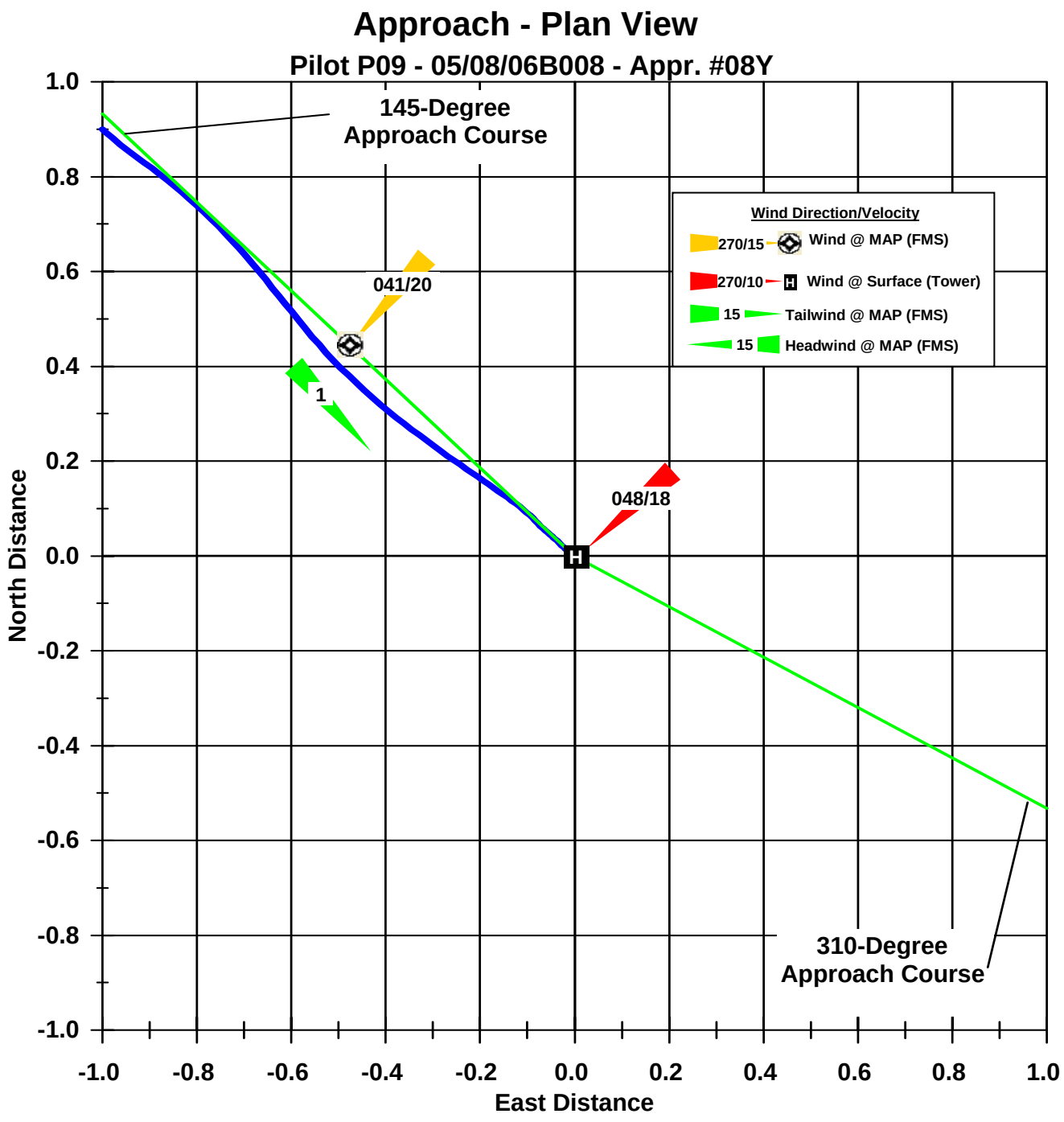


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06B007 - Appr. #07X

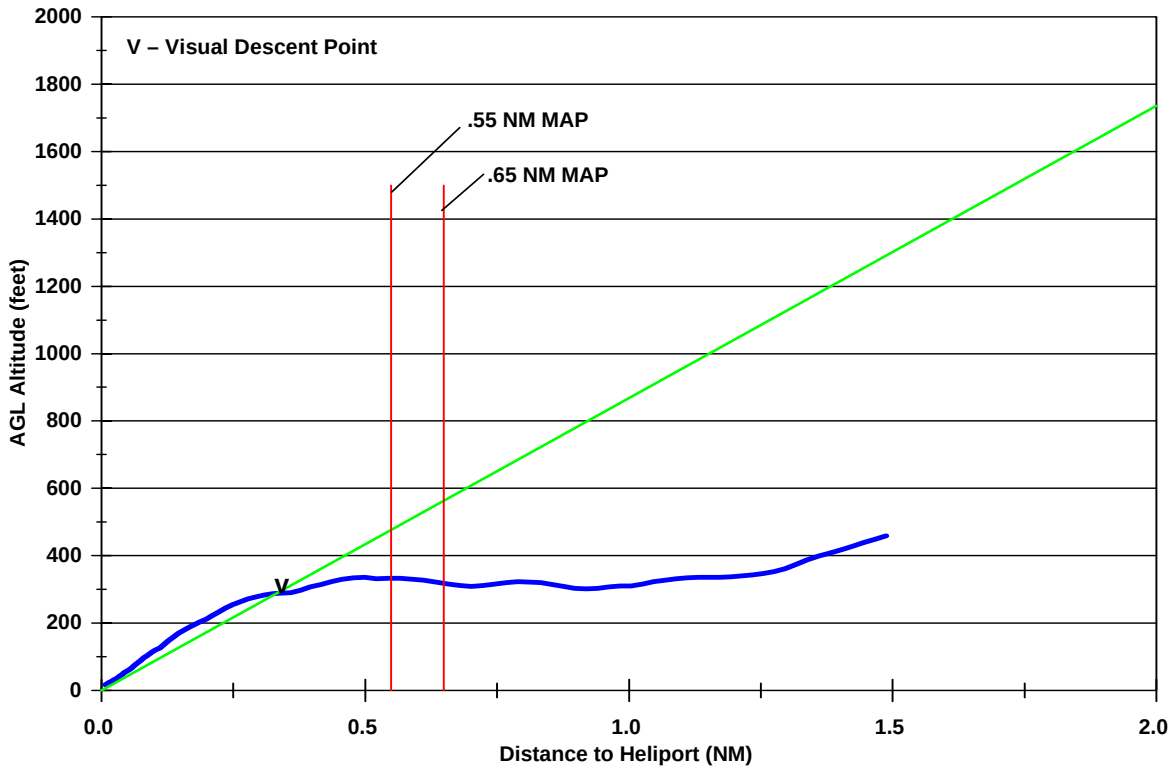


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06B007 - Appr. #07X

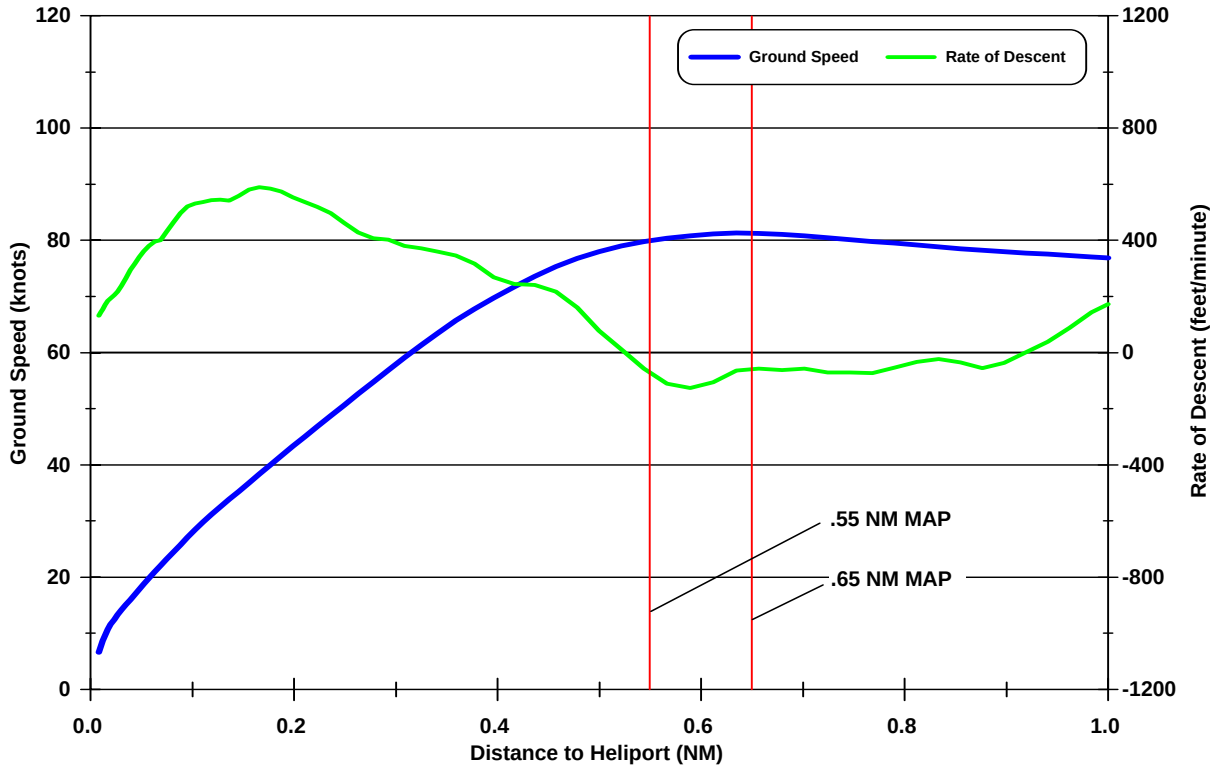



Approach - Plan View
Pilot P09 - 05/08/06B008 - Appr. #08Y
145-Degree
Approach Course
310-Degree
Approach Course
041/20
048/18
1
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

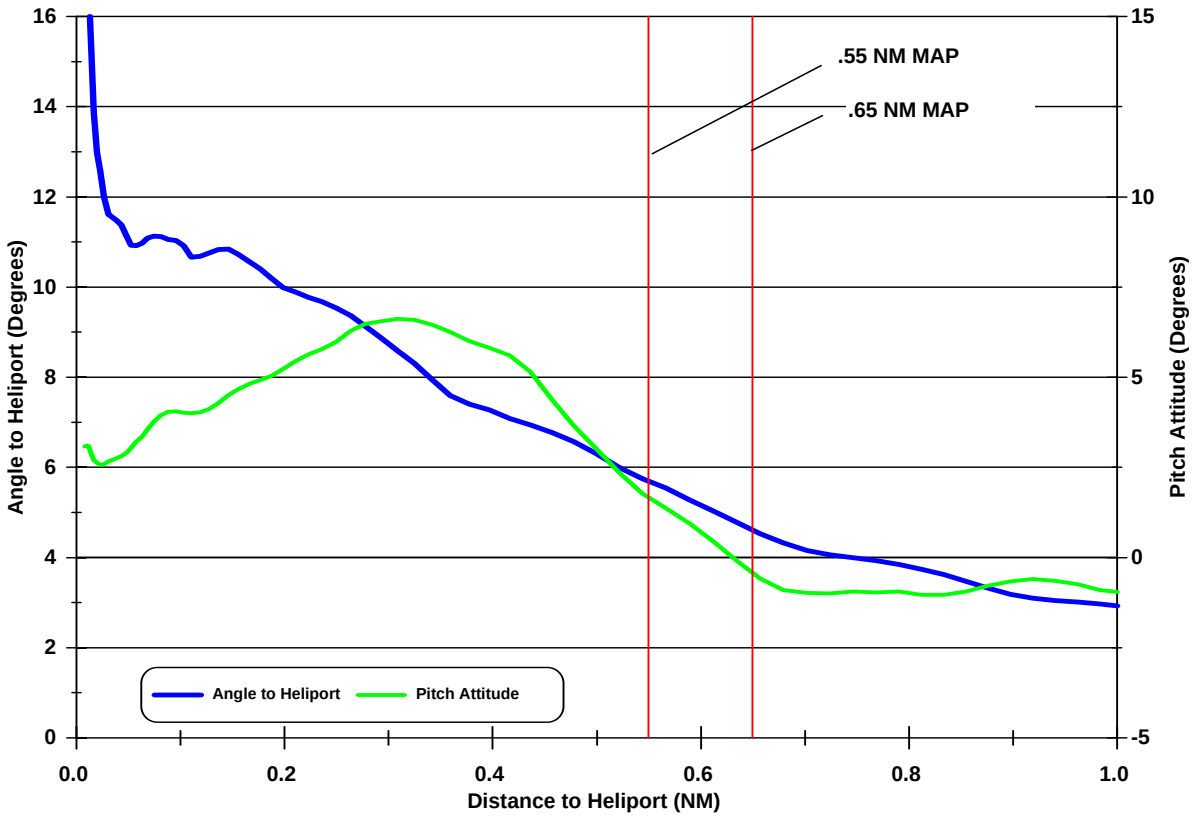
Profile View
Pilot P09 - 05/08/06B008 - Appr. #08Y



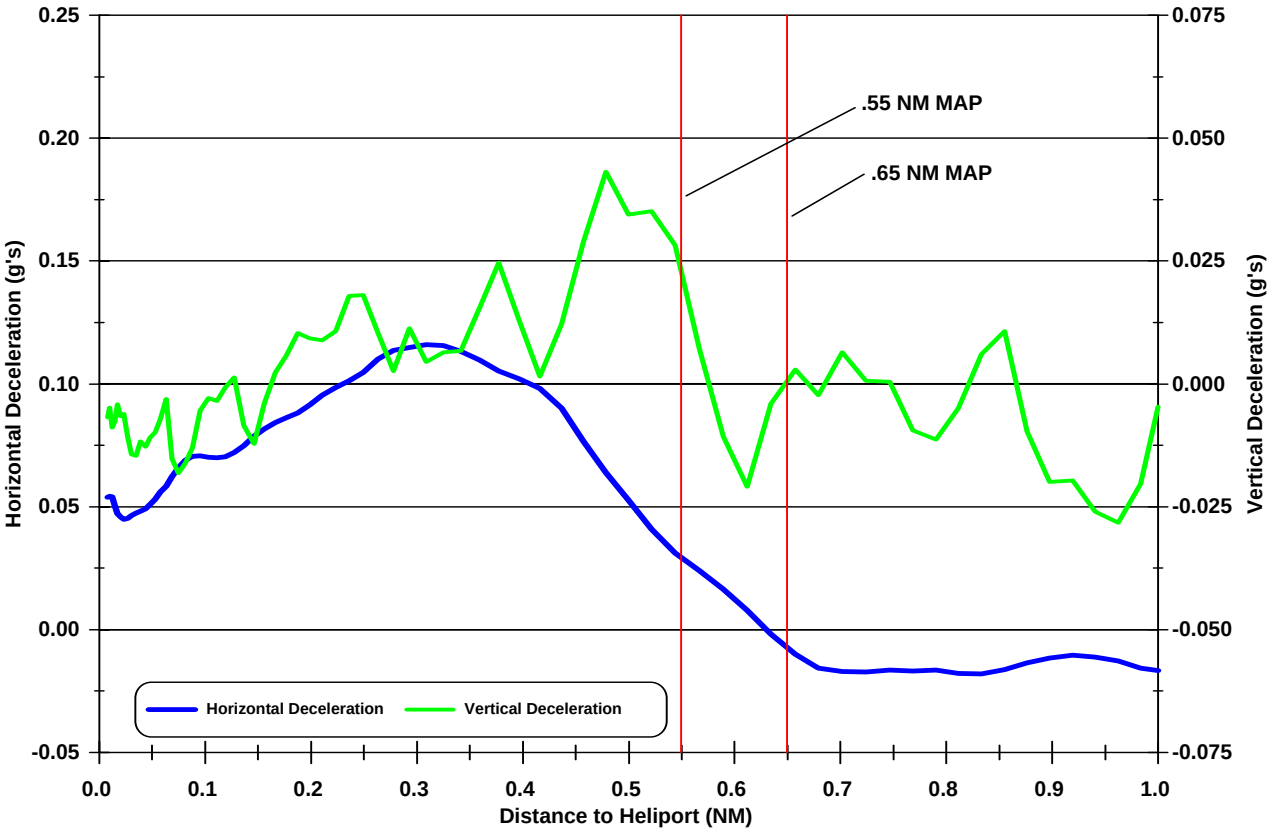
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06B008 - Appr. #08Y

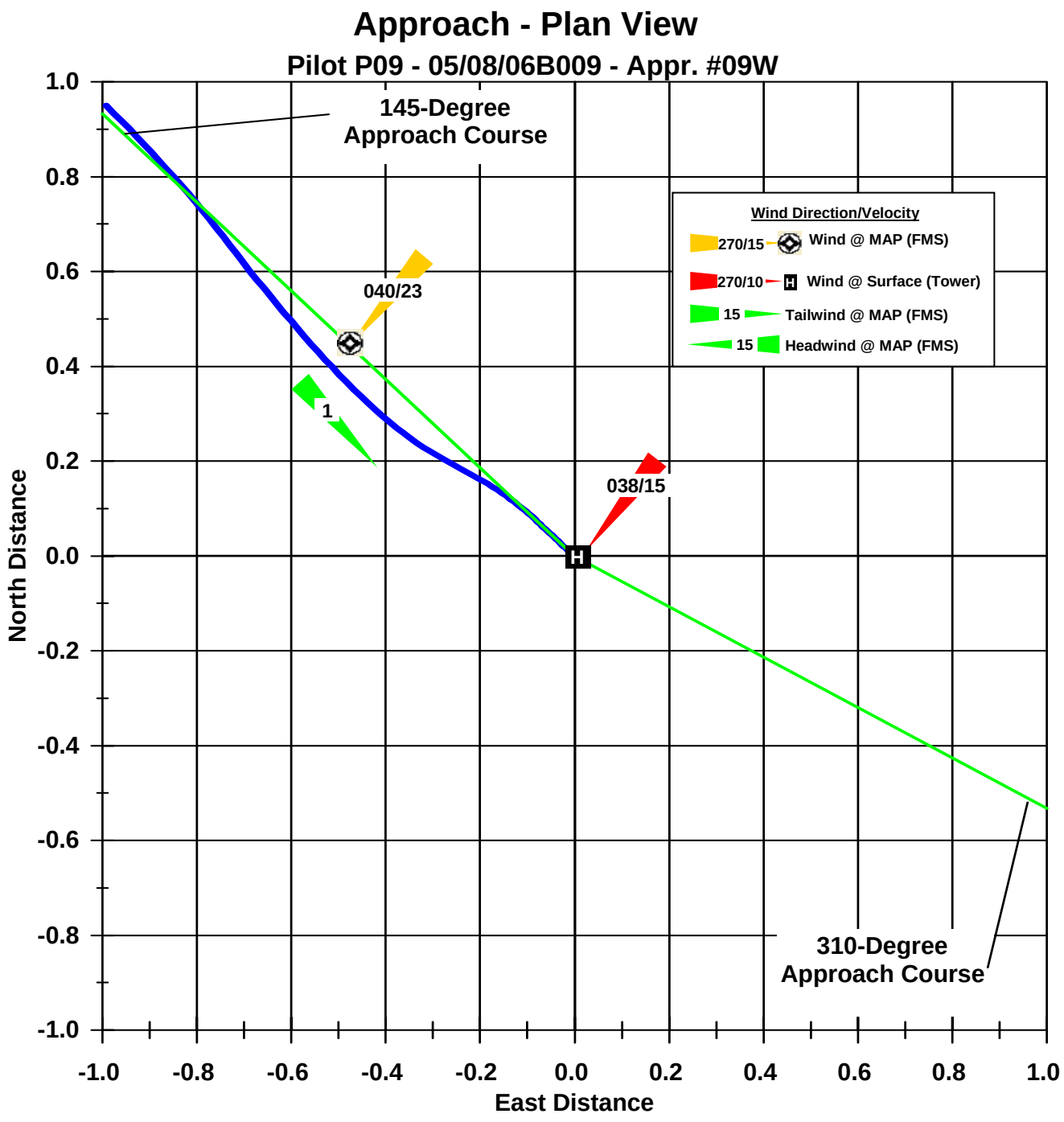


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06B008 - Appr. #08Y

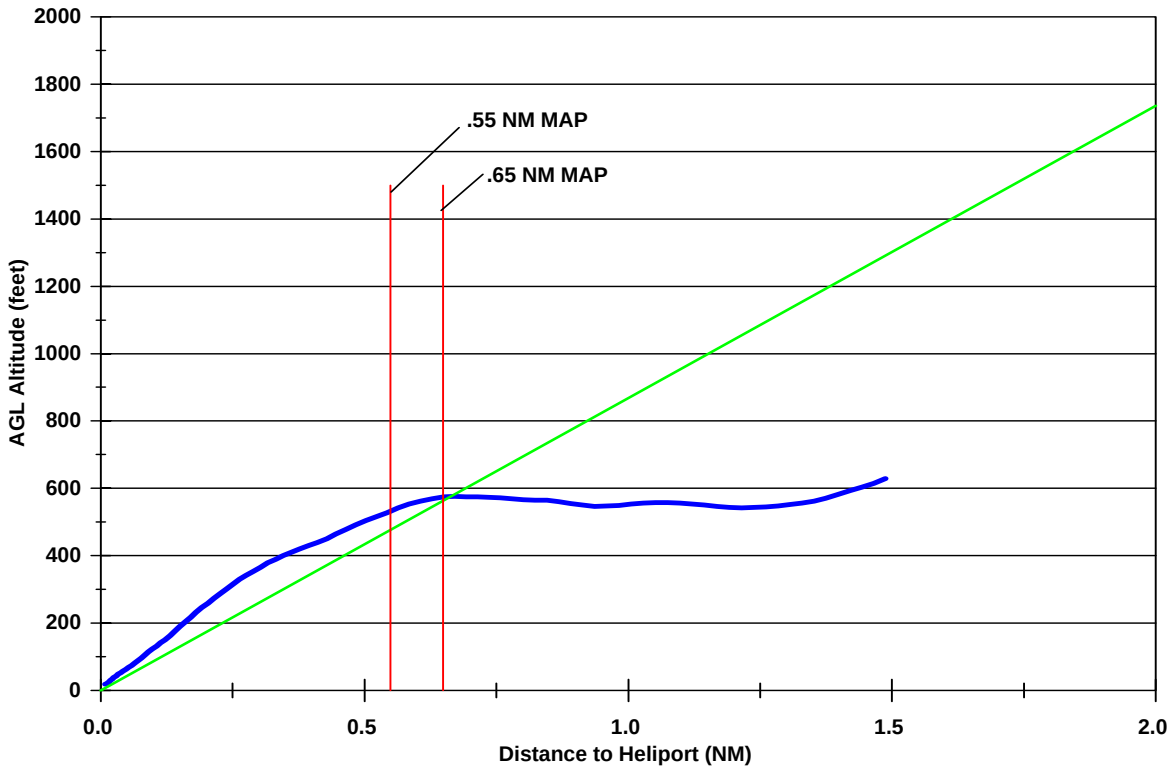


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06B008 - Appr. #08Y

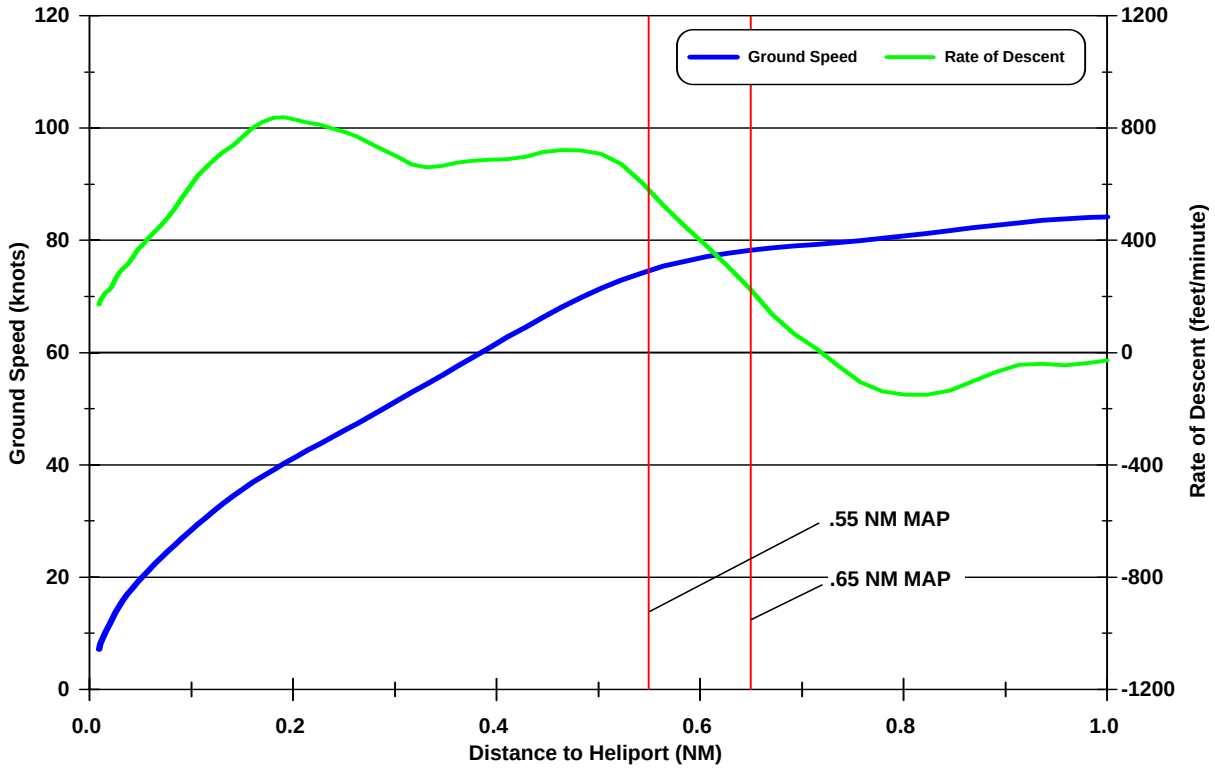



Approach - Plan View
Pilot P09 - 05/08/06B009 - Appr. #09W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
040/23
038/15
1
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

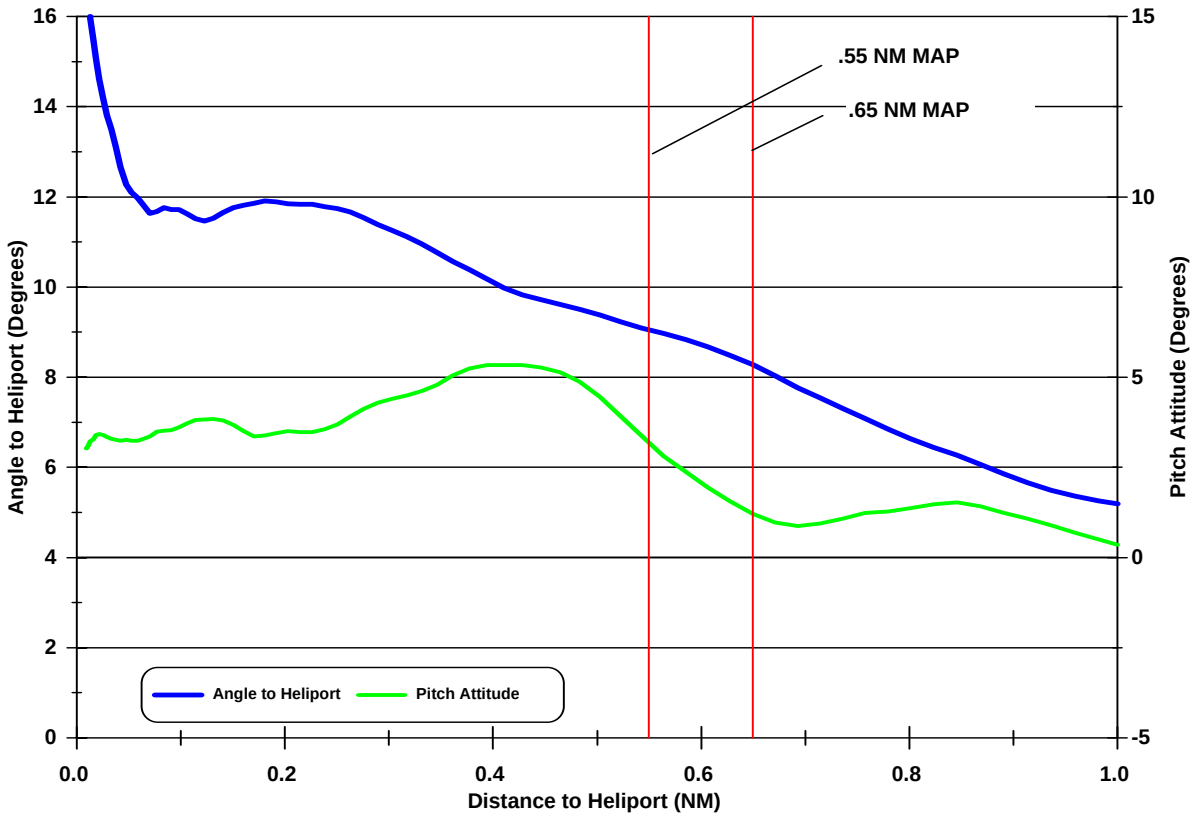
Profile View
Pilot P09 - 05/08/06B009 - Appr. #09W



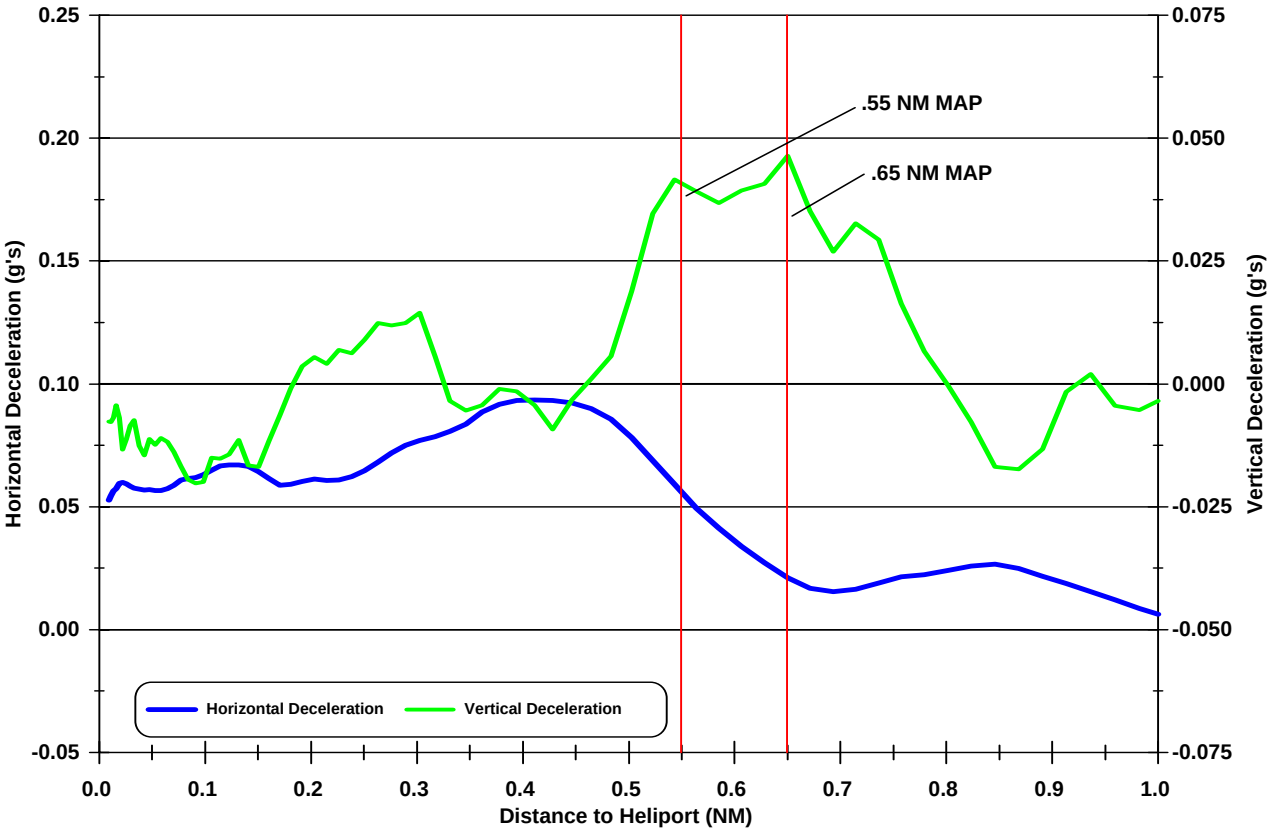
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06B009 - Appr. #09W

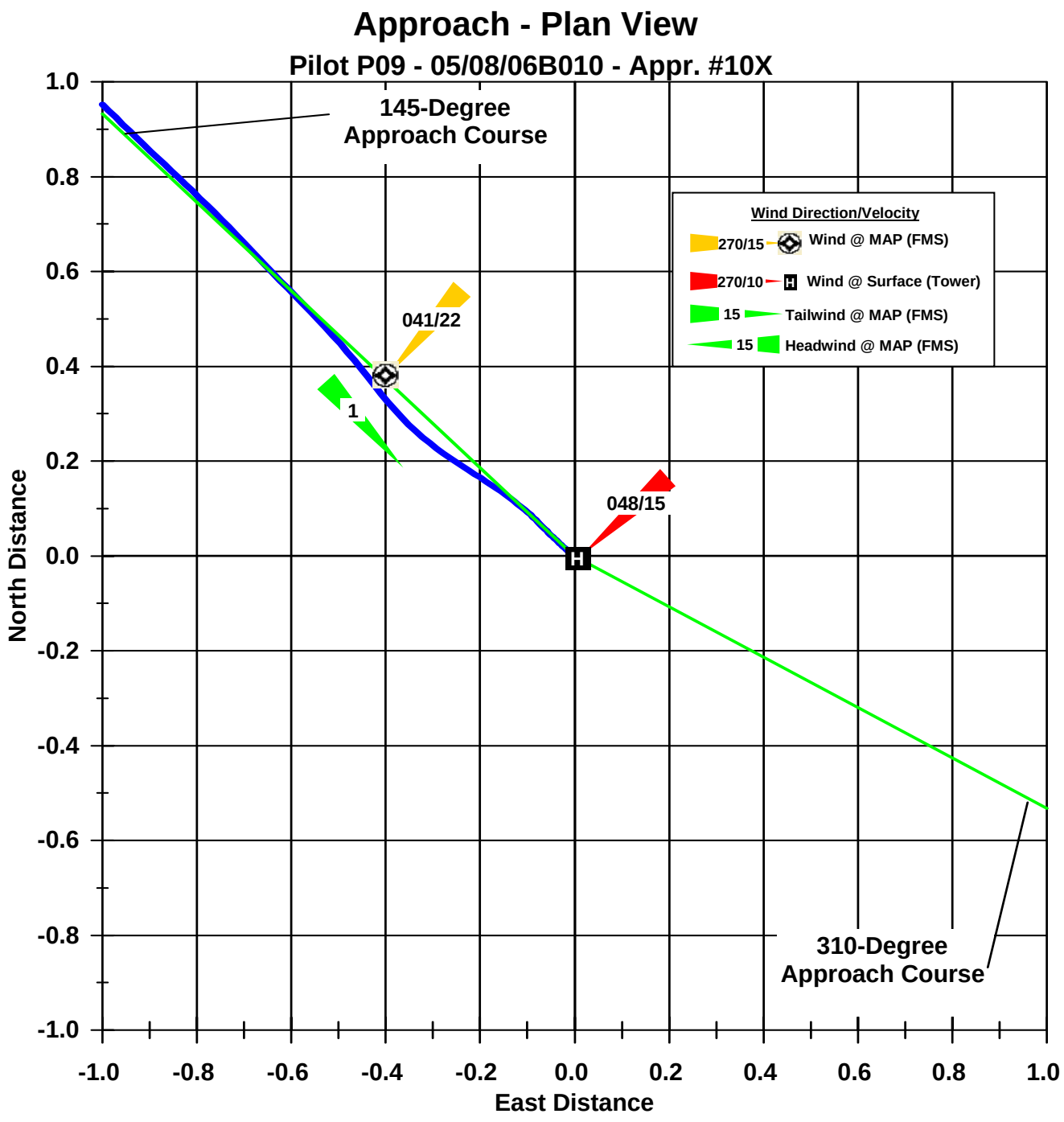


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06B009 - Appr. #09W

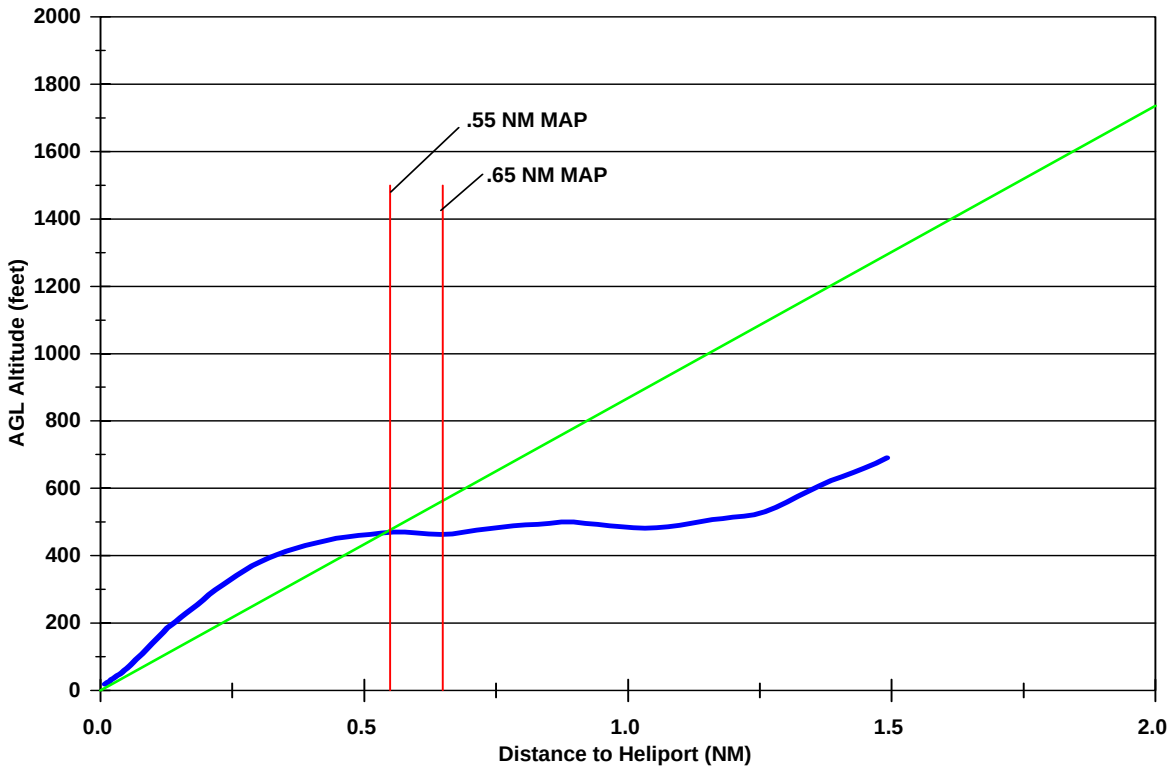


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06B009 - Appr. #09W

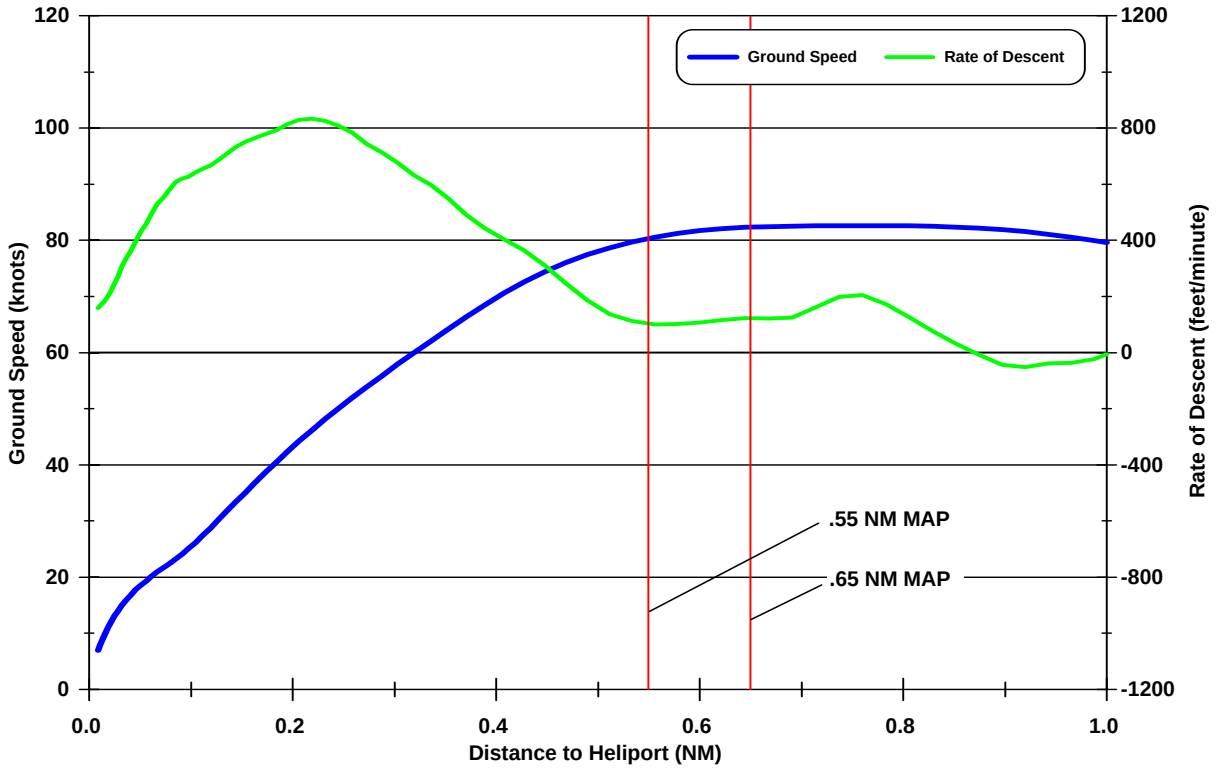



Approach - Plan View
Pilot P09 - 05/08/06B010 - Appr. #10X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
041/22
1
048/15
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

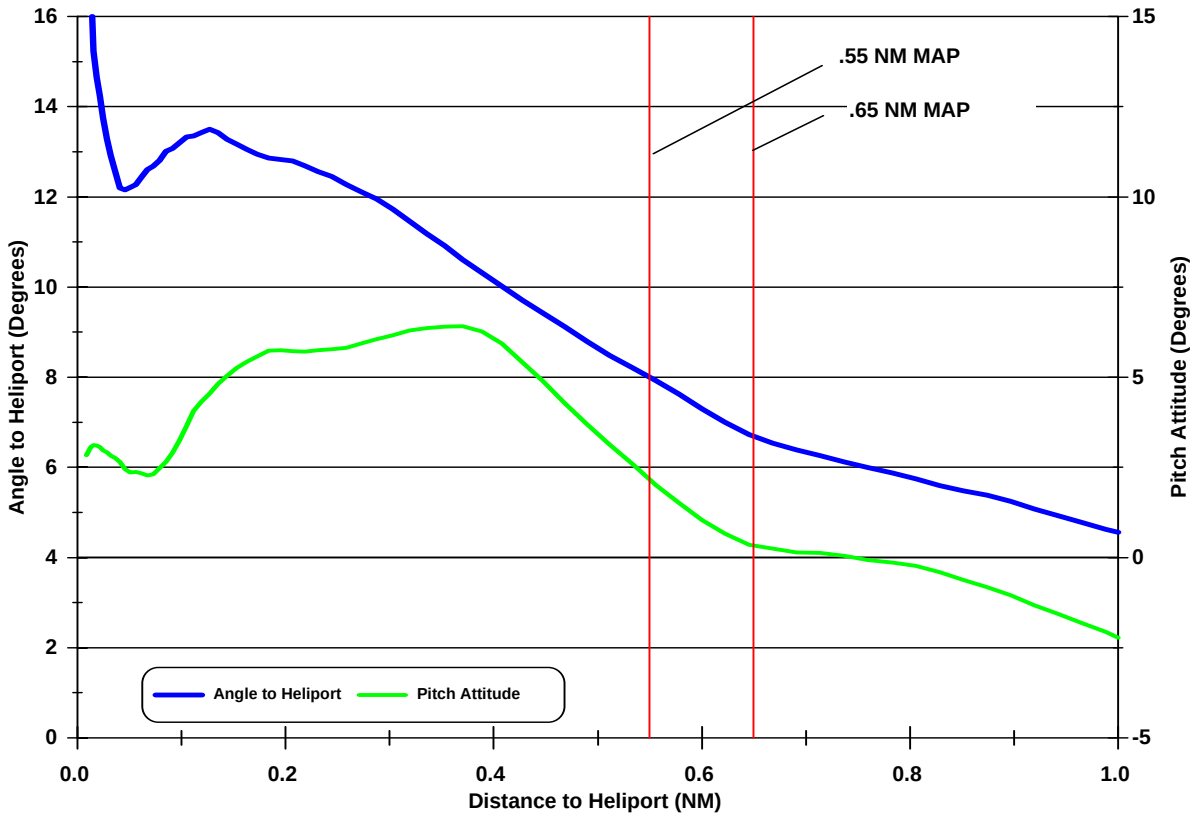
Profile View
Pilot P09 - 05/08/06B010 - Appr. #10X



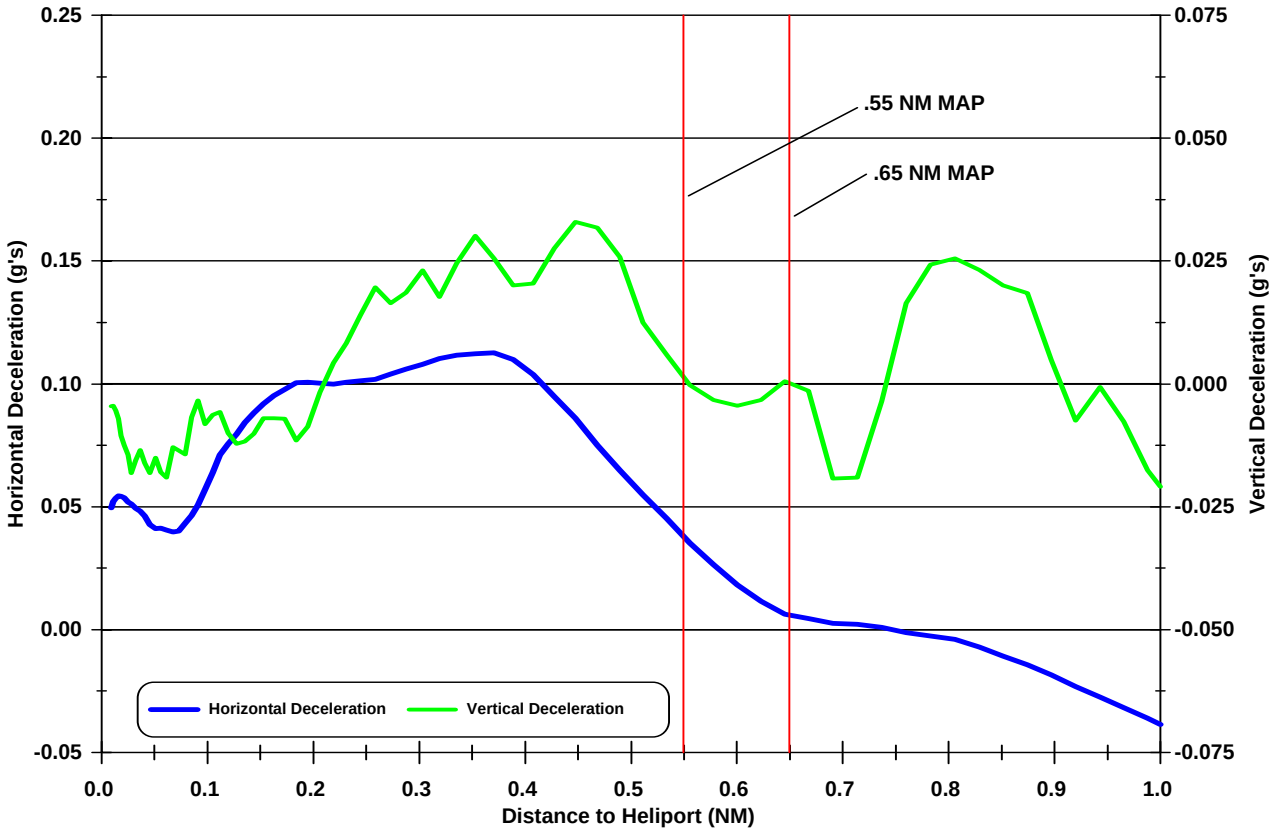
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06B010 - Appr. #10X

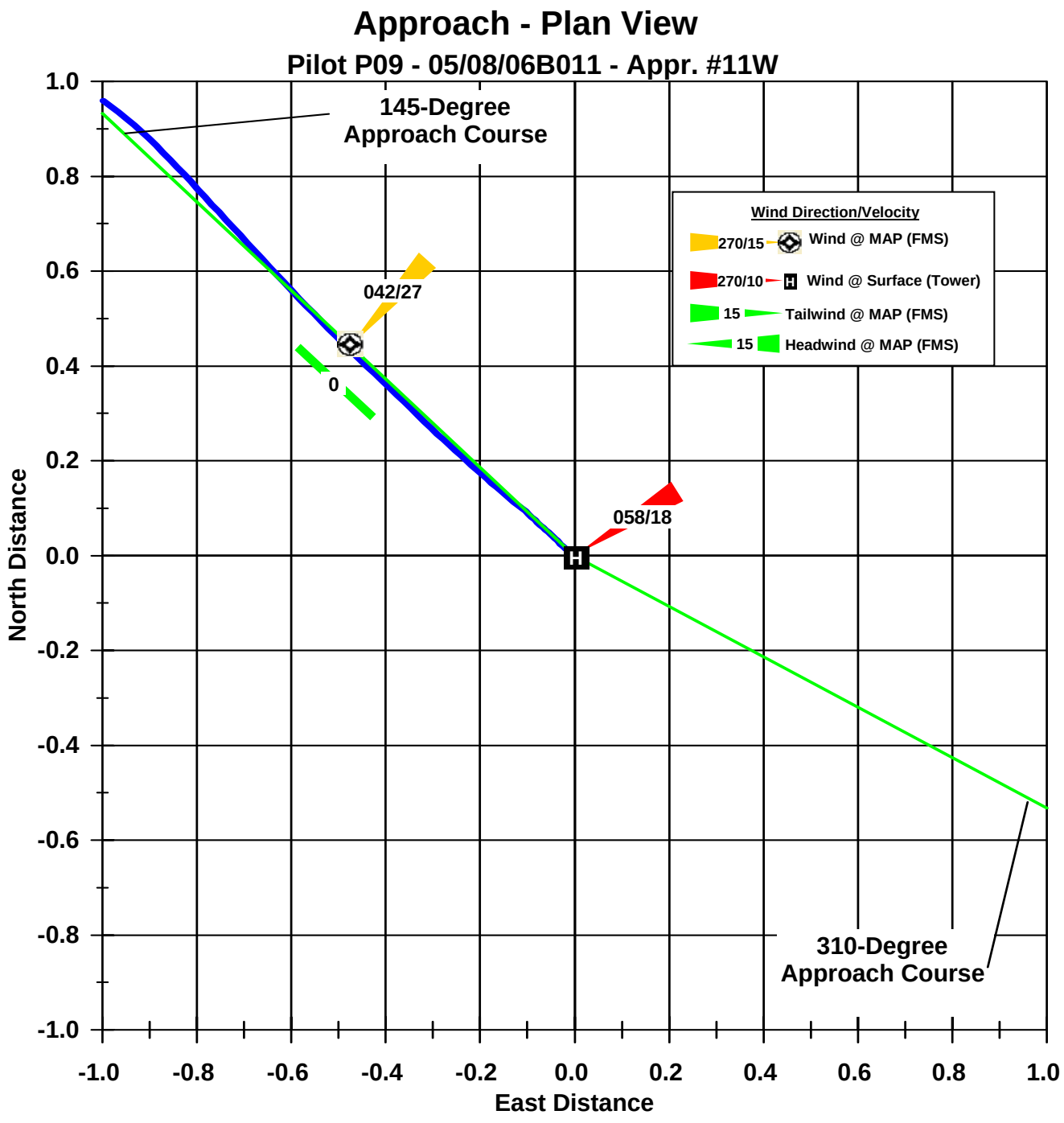


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06B010 - Appr. #10X

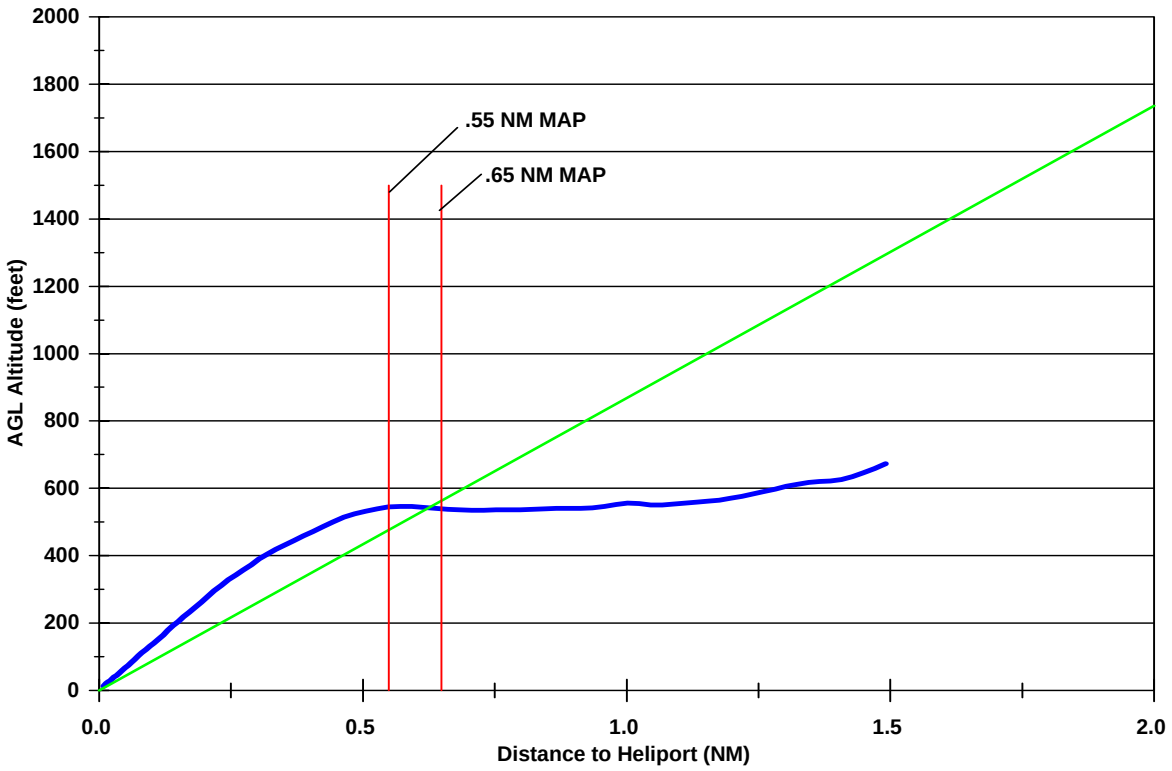


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06B010 - Appr. #10X

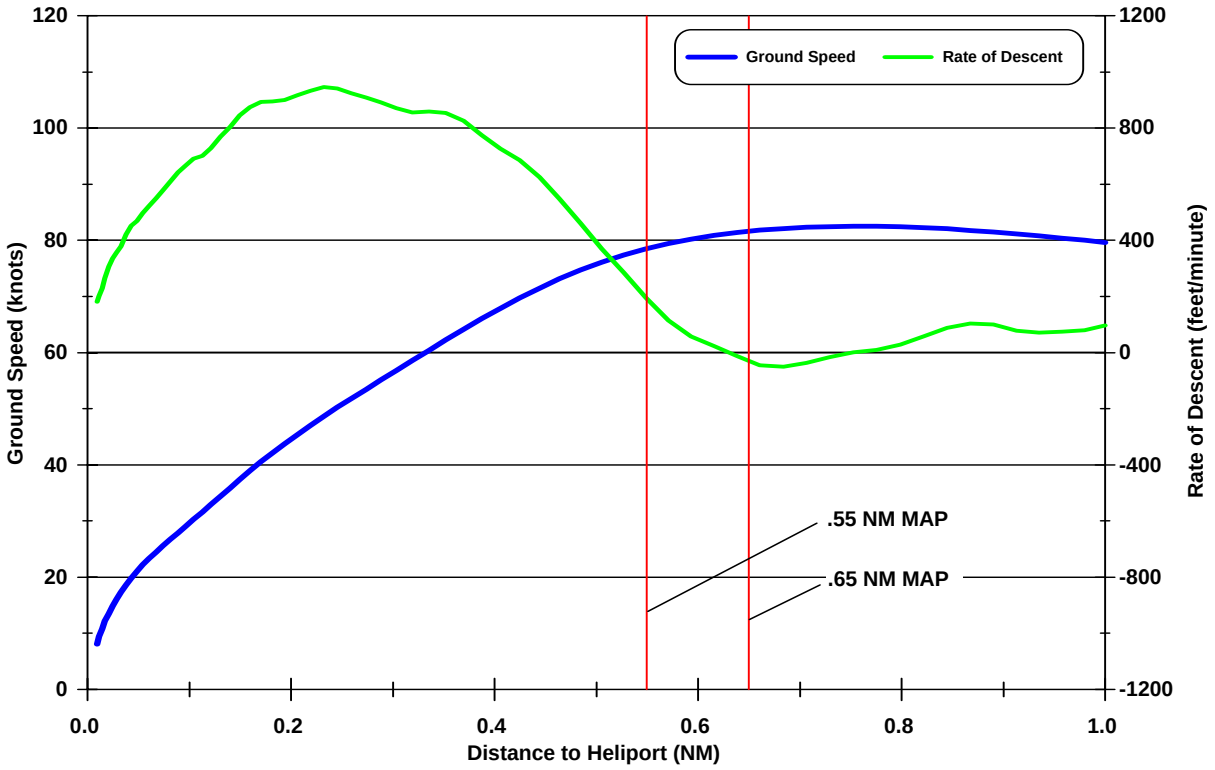



Approach - Plan View
Pilot P09 - 05/08/06B011 - Appr. #11W
145-Degree
Approach Course
310-Degree
Approach Course
042/27
0
058/18
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

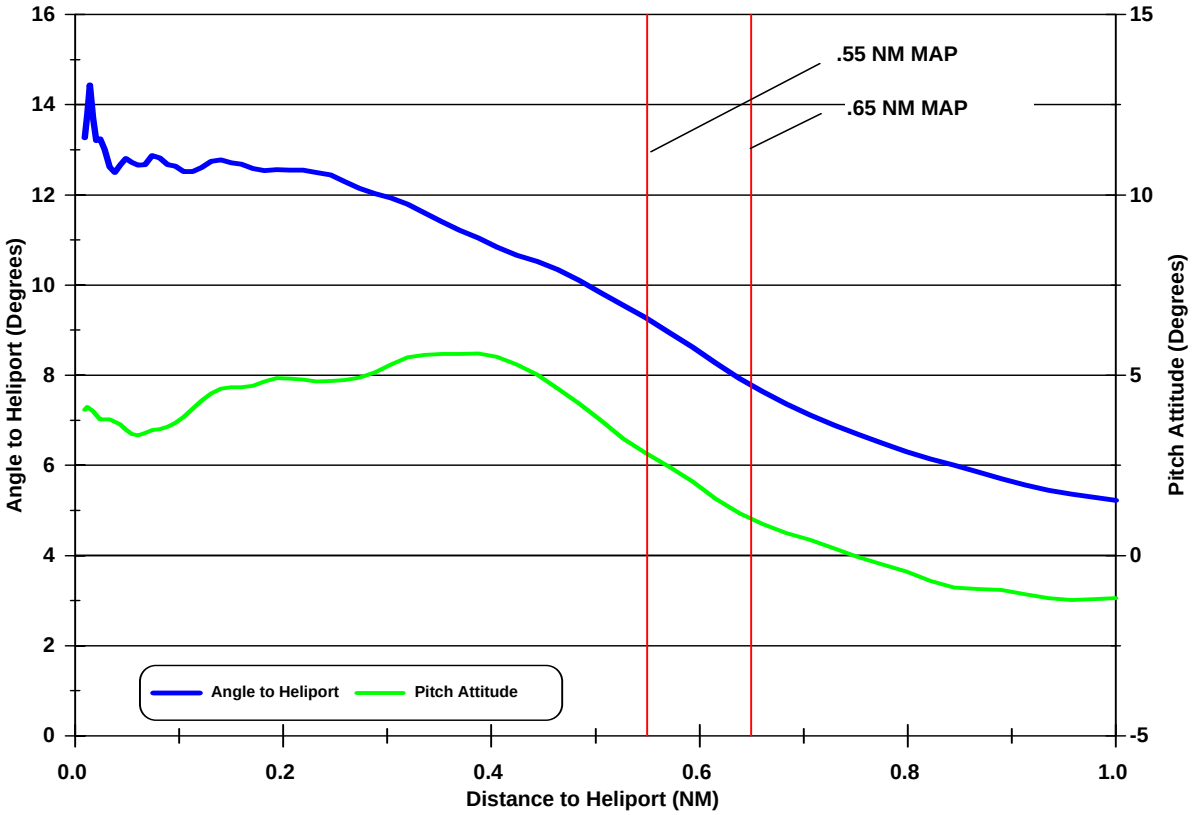
Profile View
Pilot P09 - 05/08/06B011 - Appr. #11W



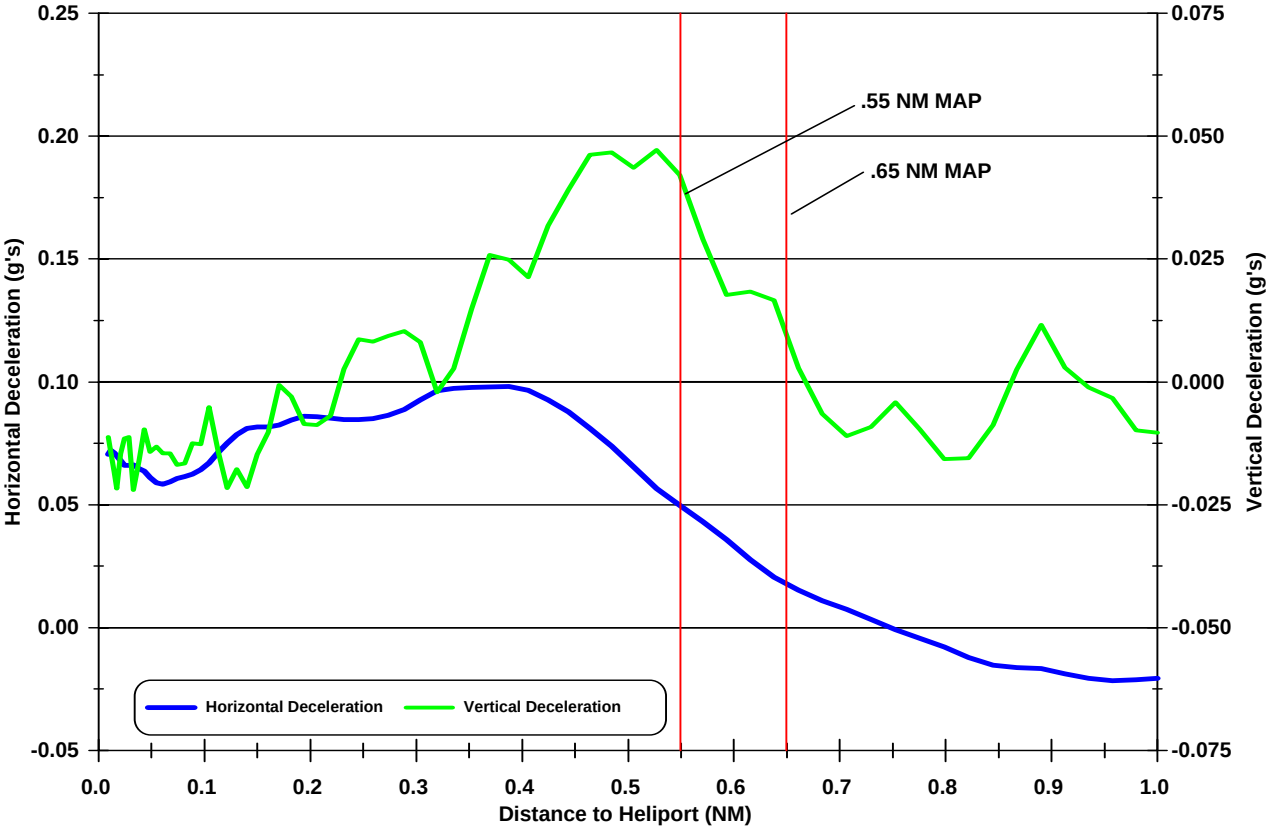
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06B011 - Appr. #11W

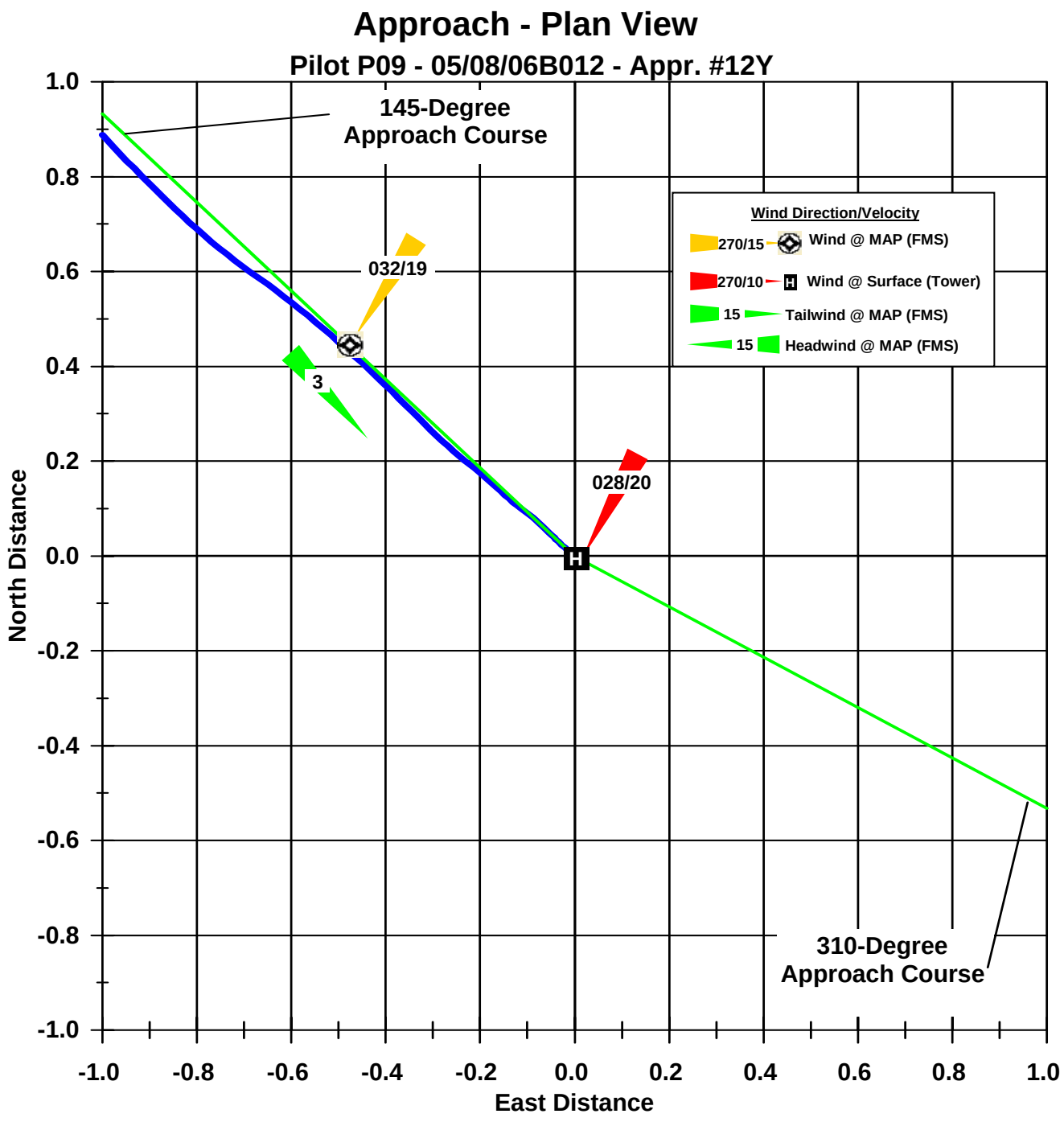


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06B011 - Appr. #11W

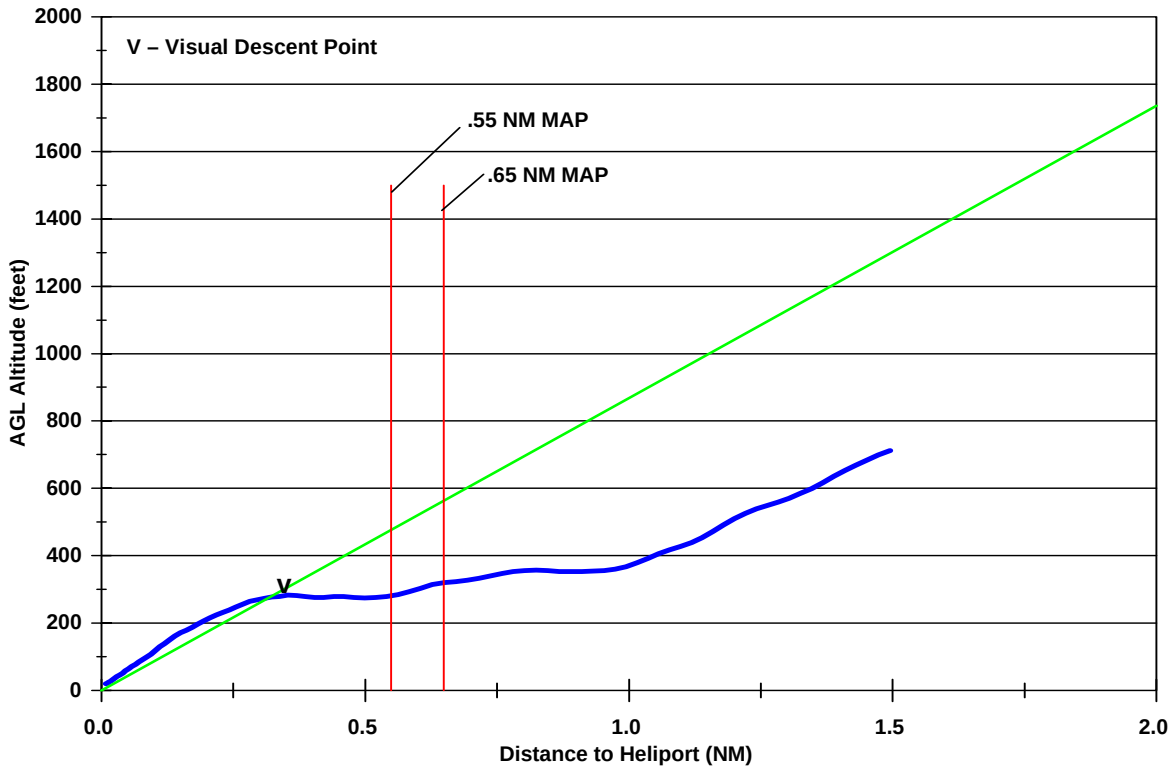


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06B011 - Appr. #11W

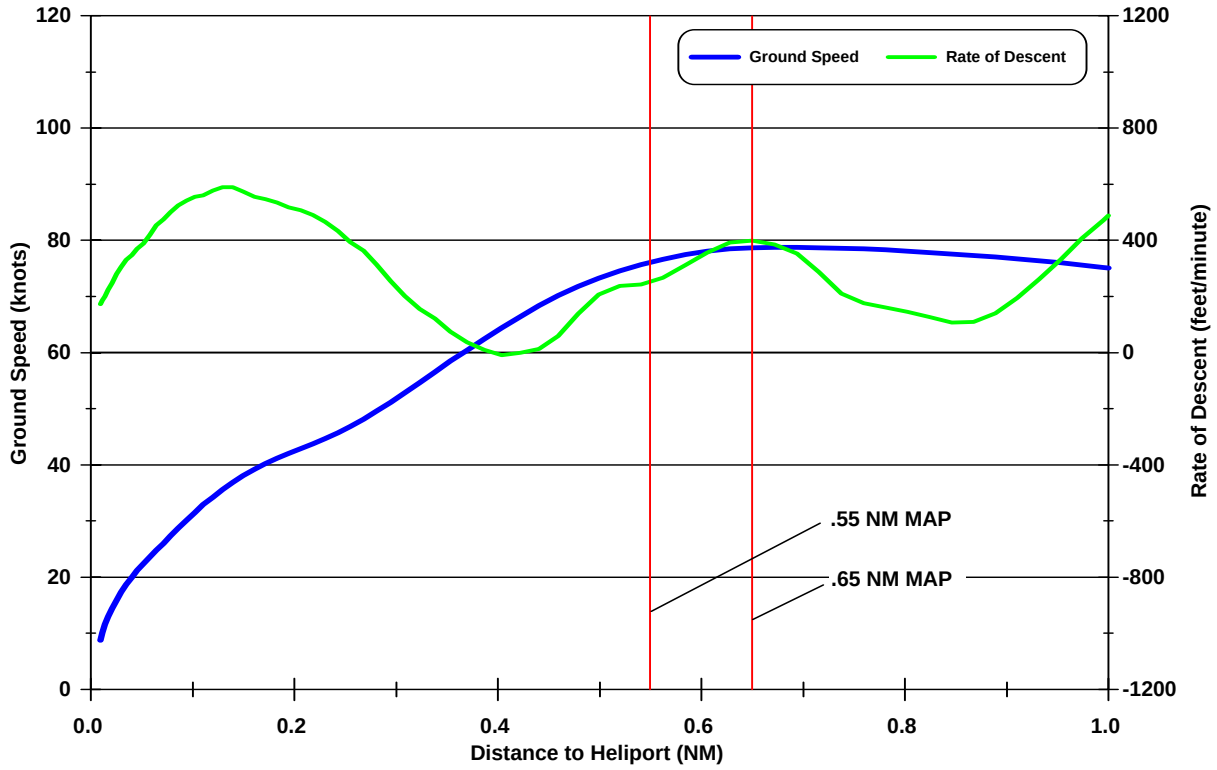



Approach - Plan View
Pilot P09 - 05/08/06B012 - Appr. #12Y
145-Degree
Approach Course
310-Degree
Approach Course
032/19
3
028/20
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

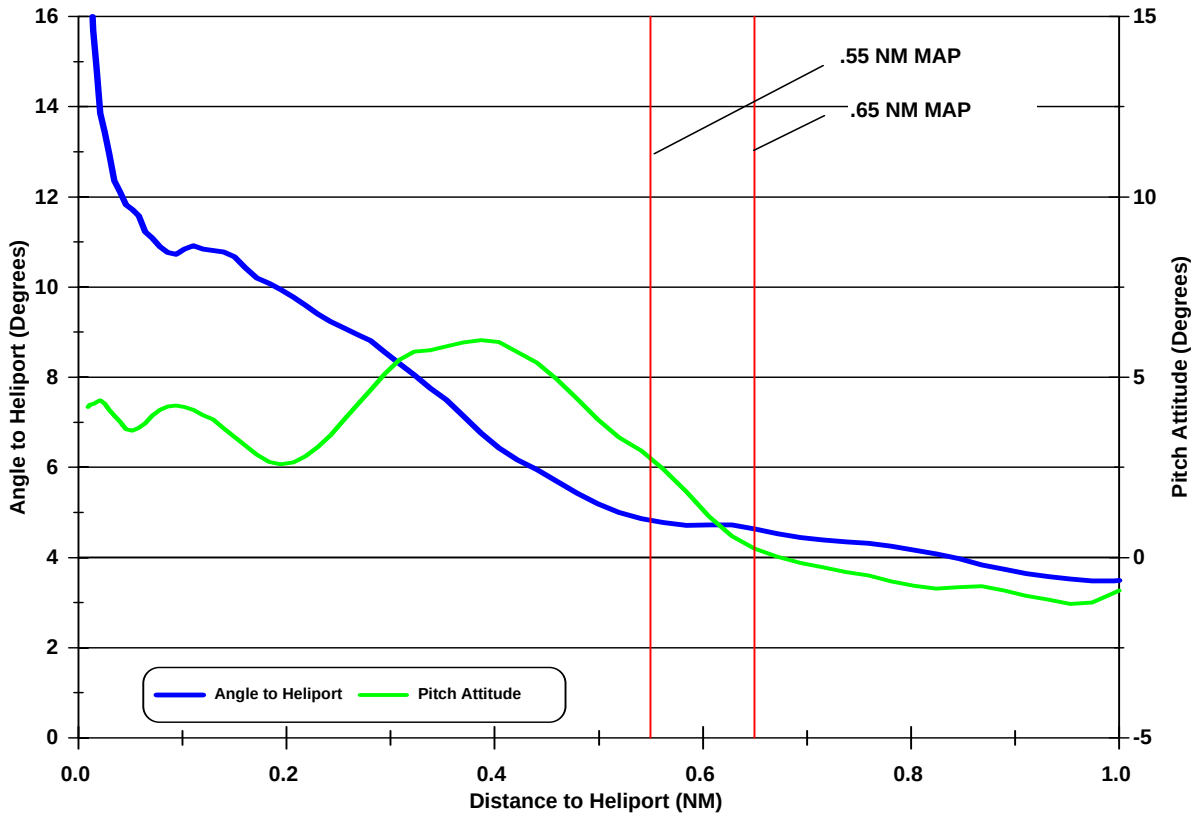
Profile View
Pilot P09 - 05/08/06B012 - Appr. #12Y



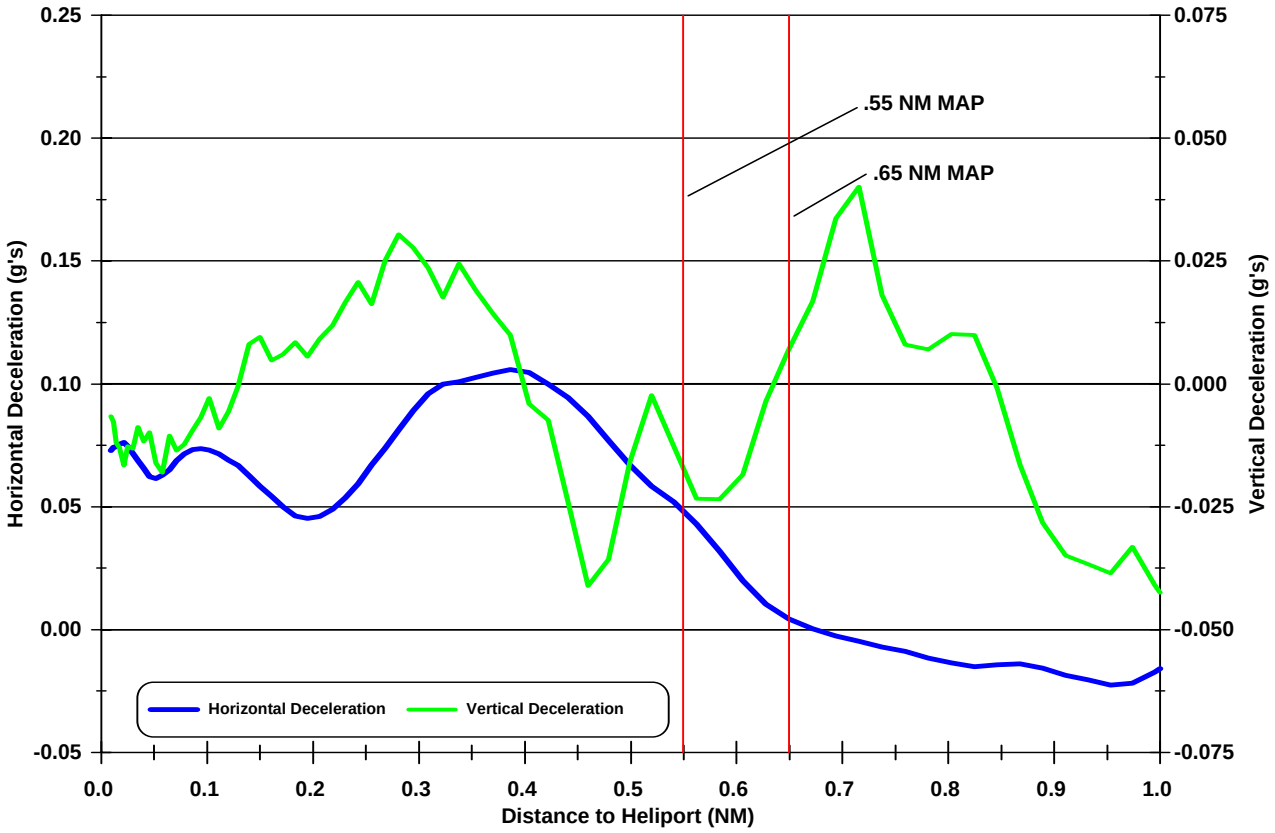
Ground Speed and Rate of Descent
Pilot P09 - 05/08/06B012 - Appr. #12Y

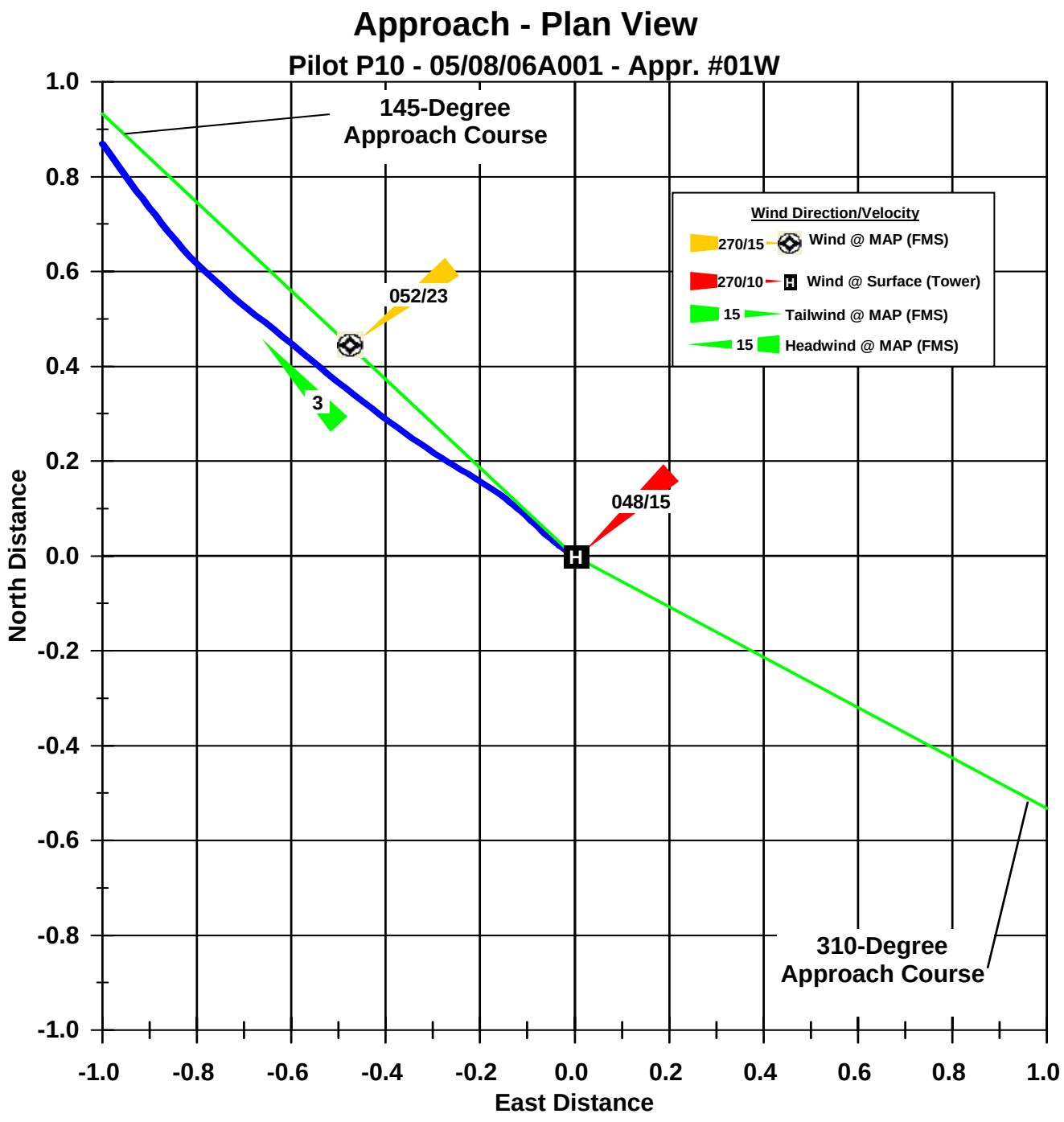


Angle to Heliport and Pitch Attitude
Pilot P09 - 05/08/06B012 - Appr. #12Y

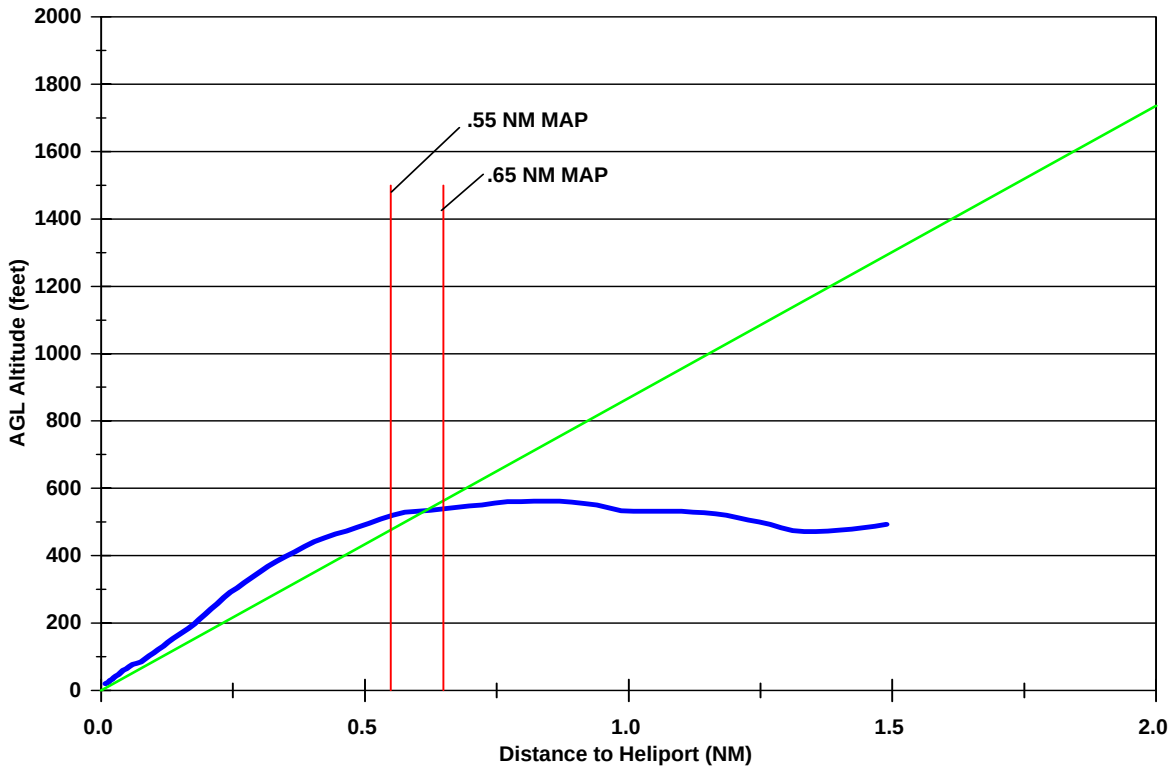


Horizontal and Vertical Deceleration
Pilot P09 - 05/08/06B012 - Appr. #12Y

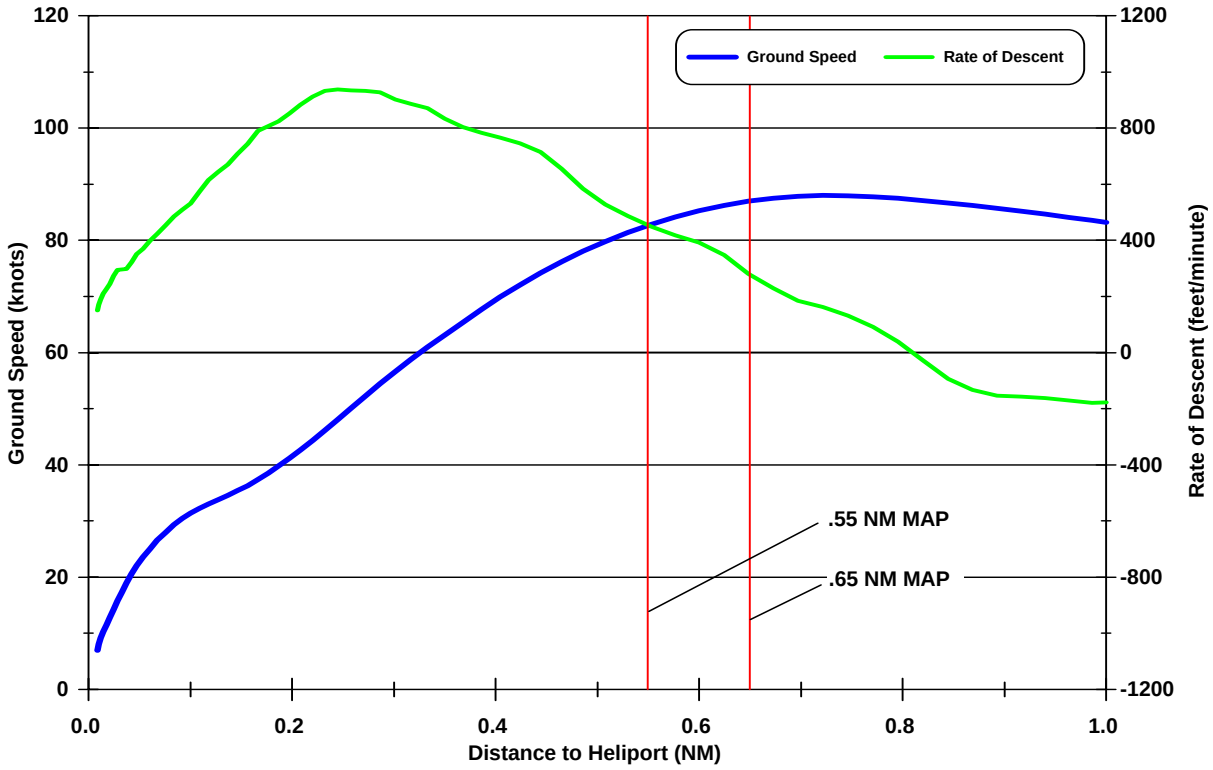



Approach - Plan View
Pilot P10 - 05/08/06A001 - Appr. #01W
145-Degree
Approach Course
310-Degree
Approach Course
052/23
3
048/15
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

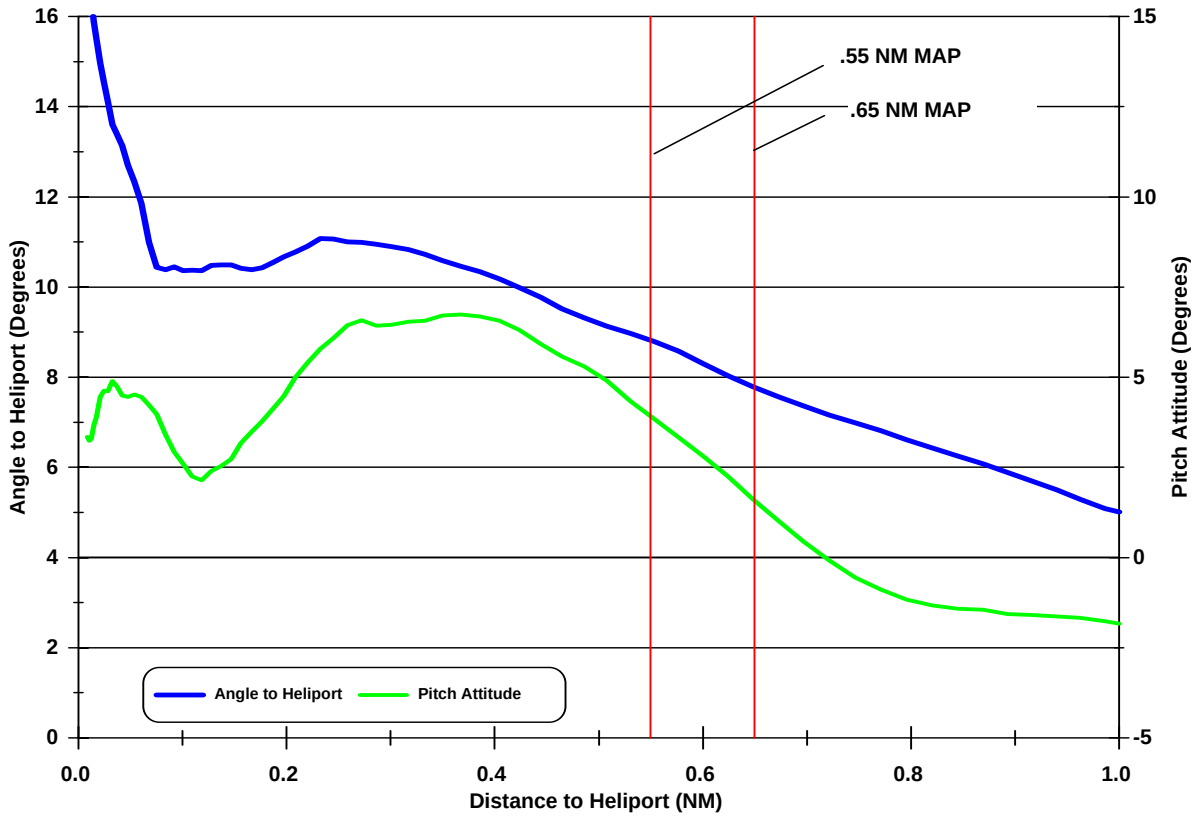
Profile View
Pilot P10 - 05/08/06A001 - Appr. #01W



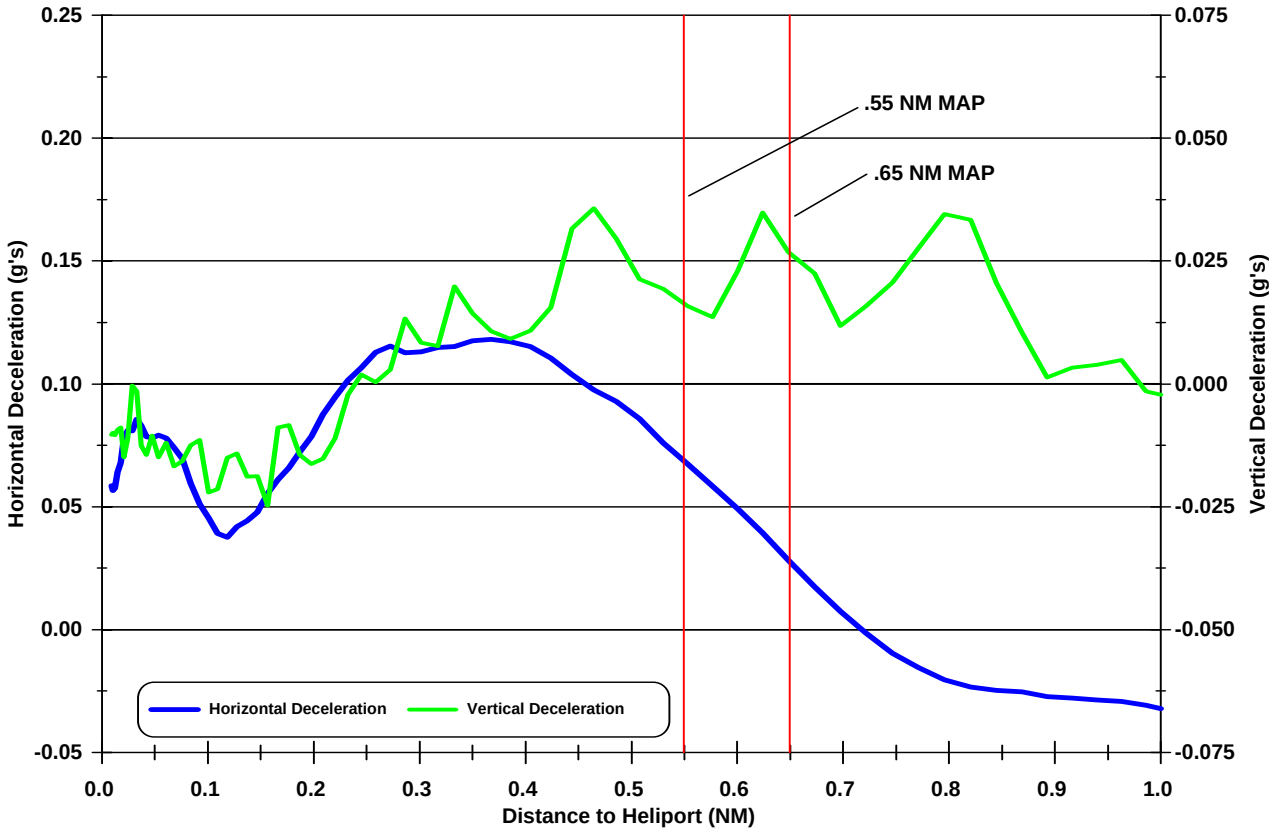
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06A001 - Appr. #01W

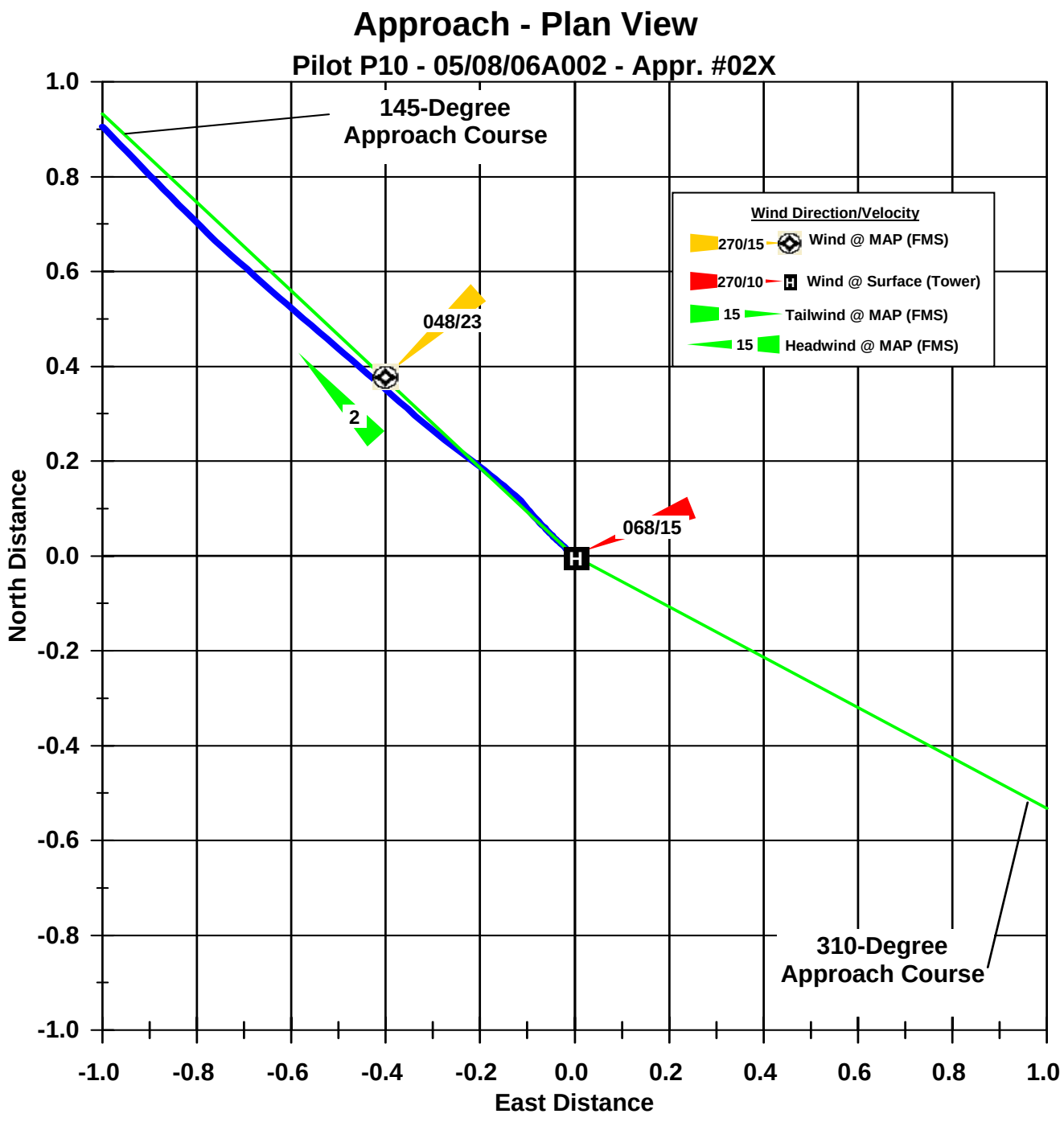


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06A001 - Appr. #01W

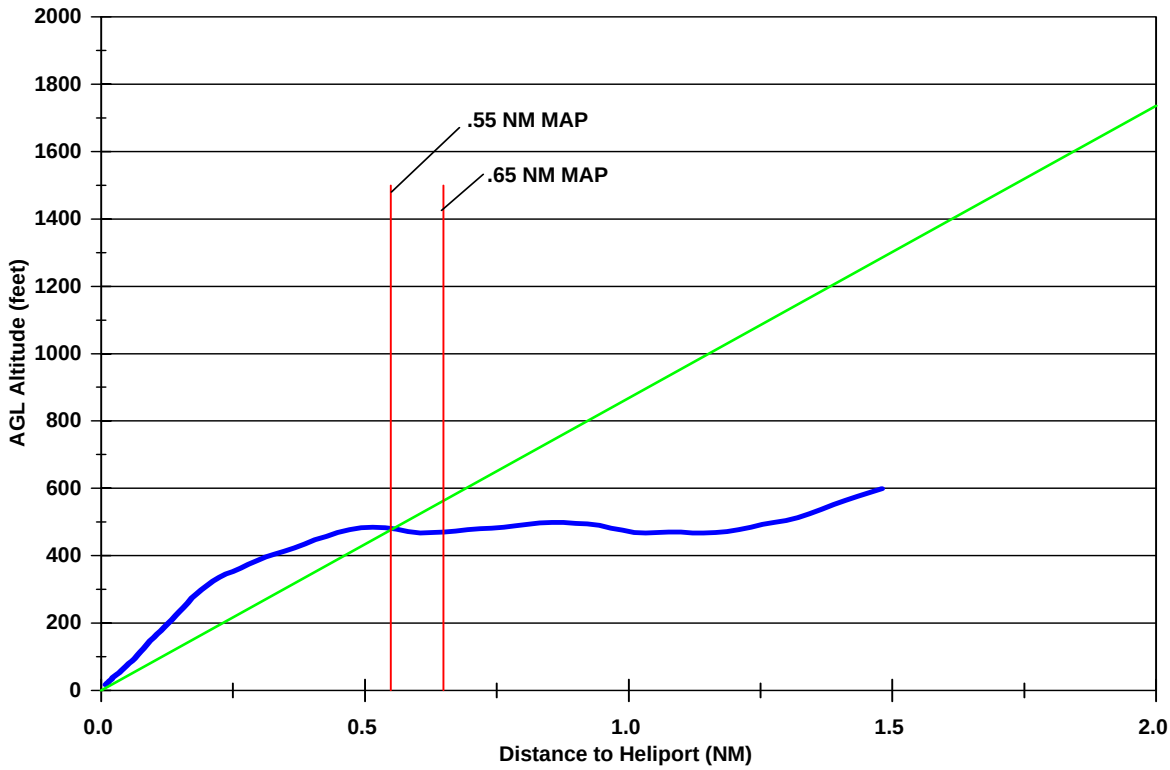


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06A001 - Appr. #01W

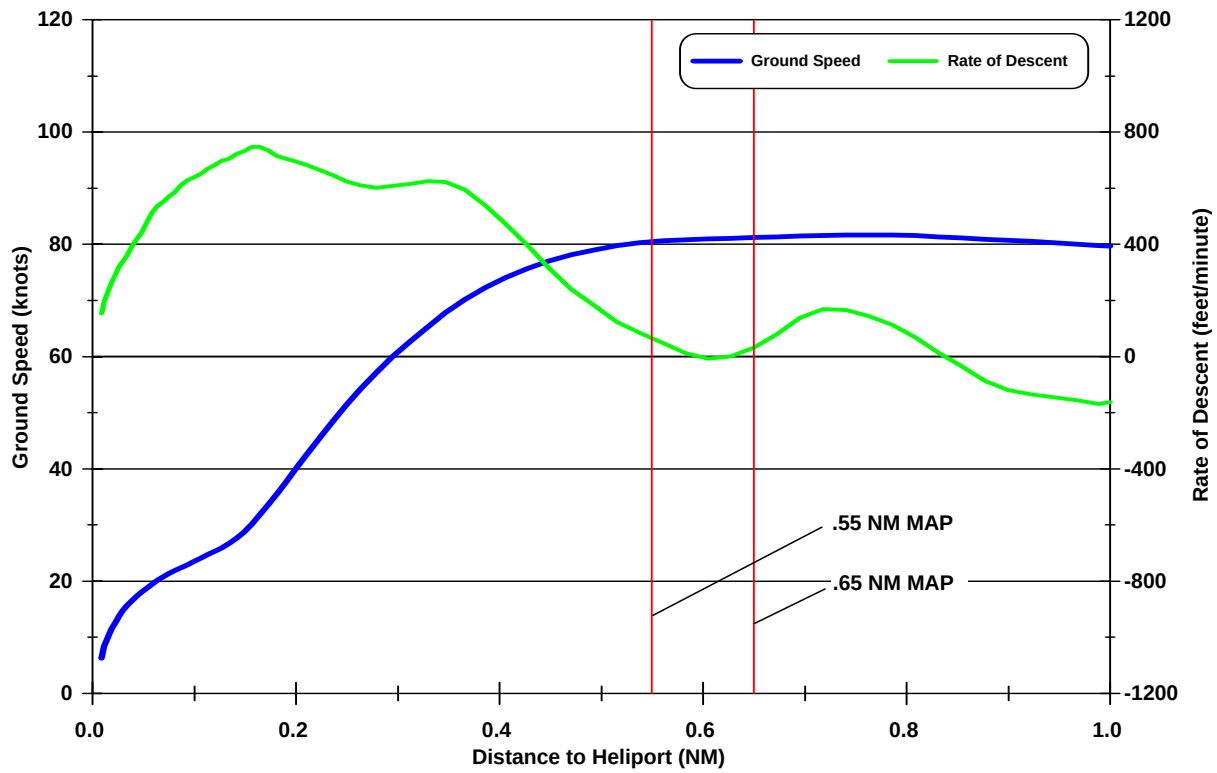



Approach - Plan View
Pilot P10 - 05/08/06A002 - Appr. #02X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
048/23
2
068/15
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

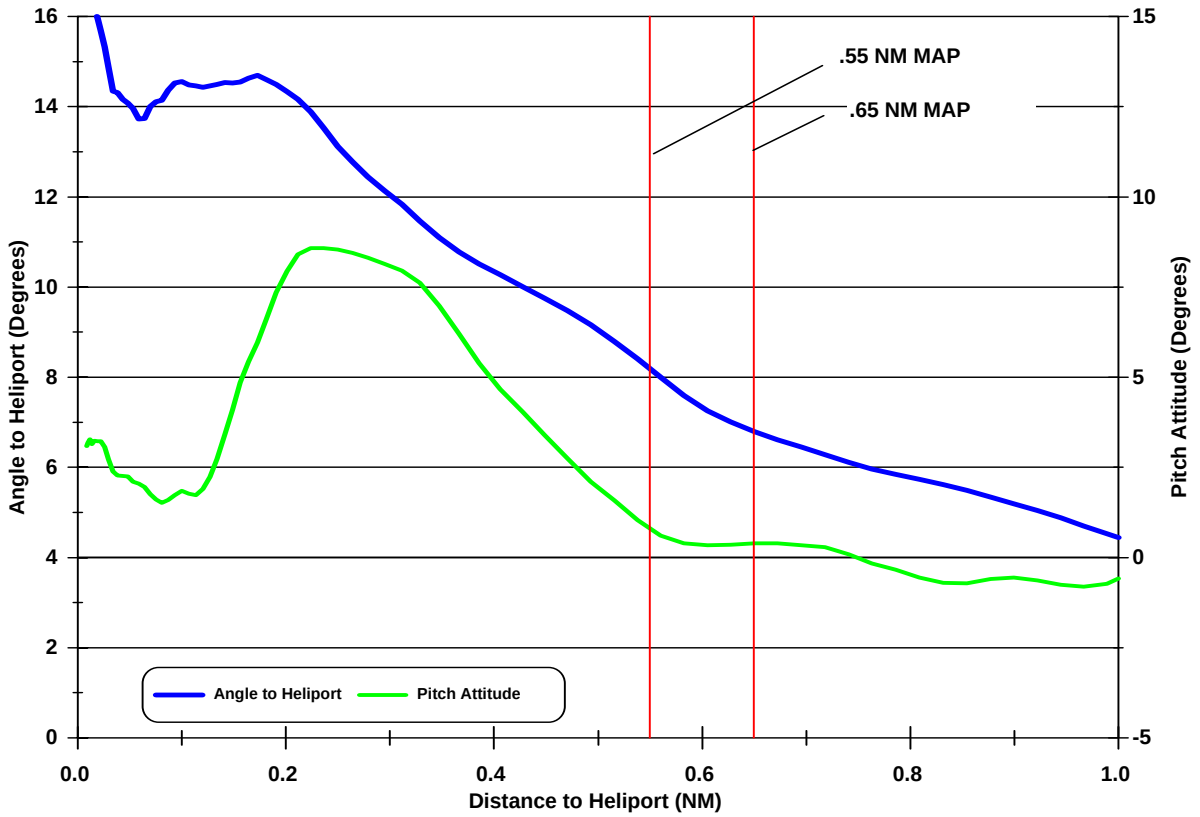
Profile View
Pilot P10 - 05/08/06A002 - Appr. #02X



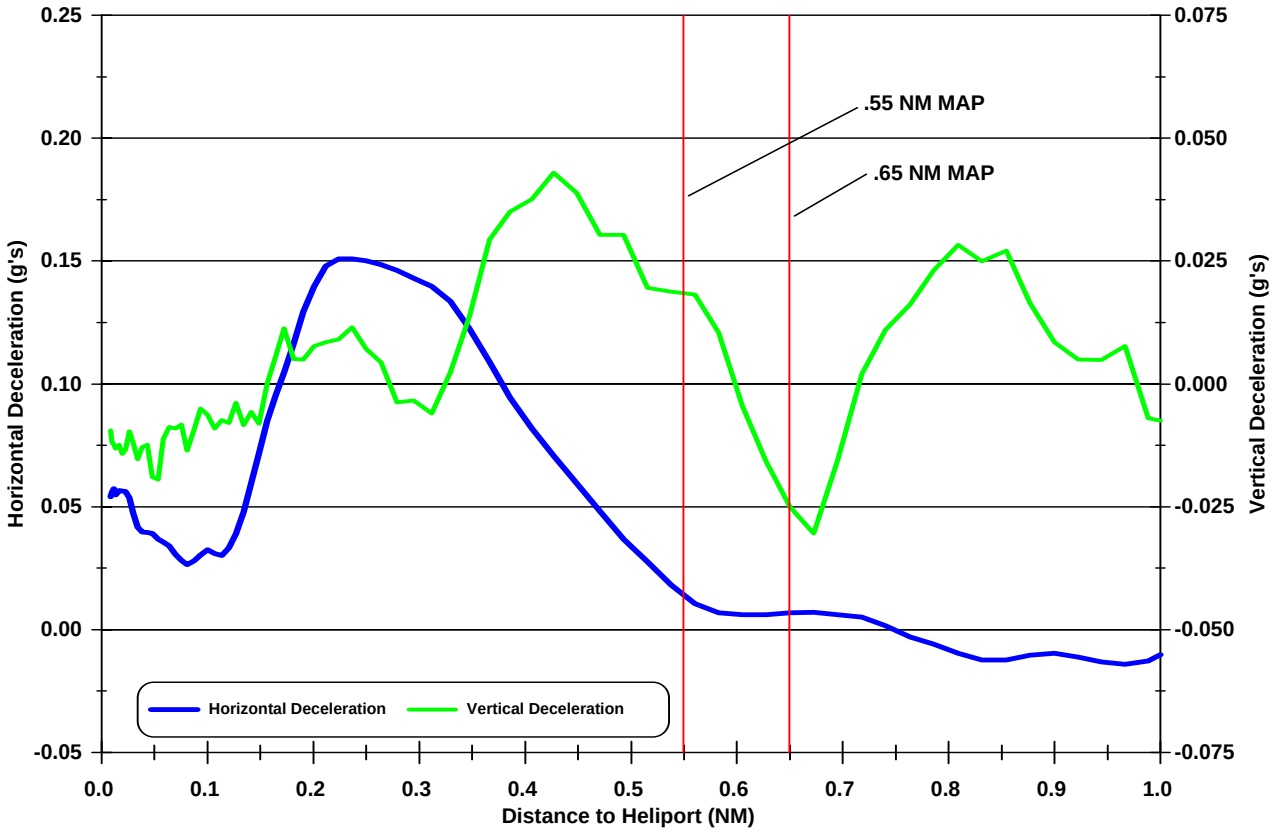
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06A002 - Appr. #02X

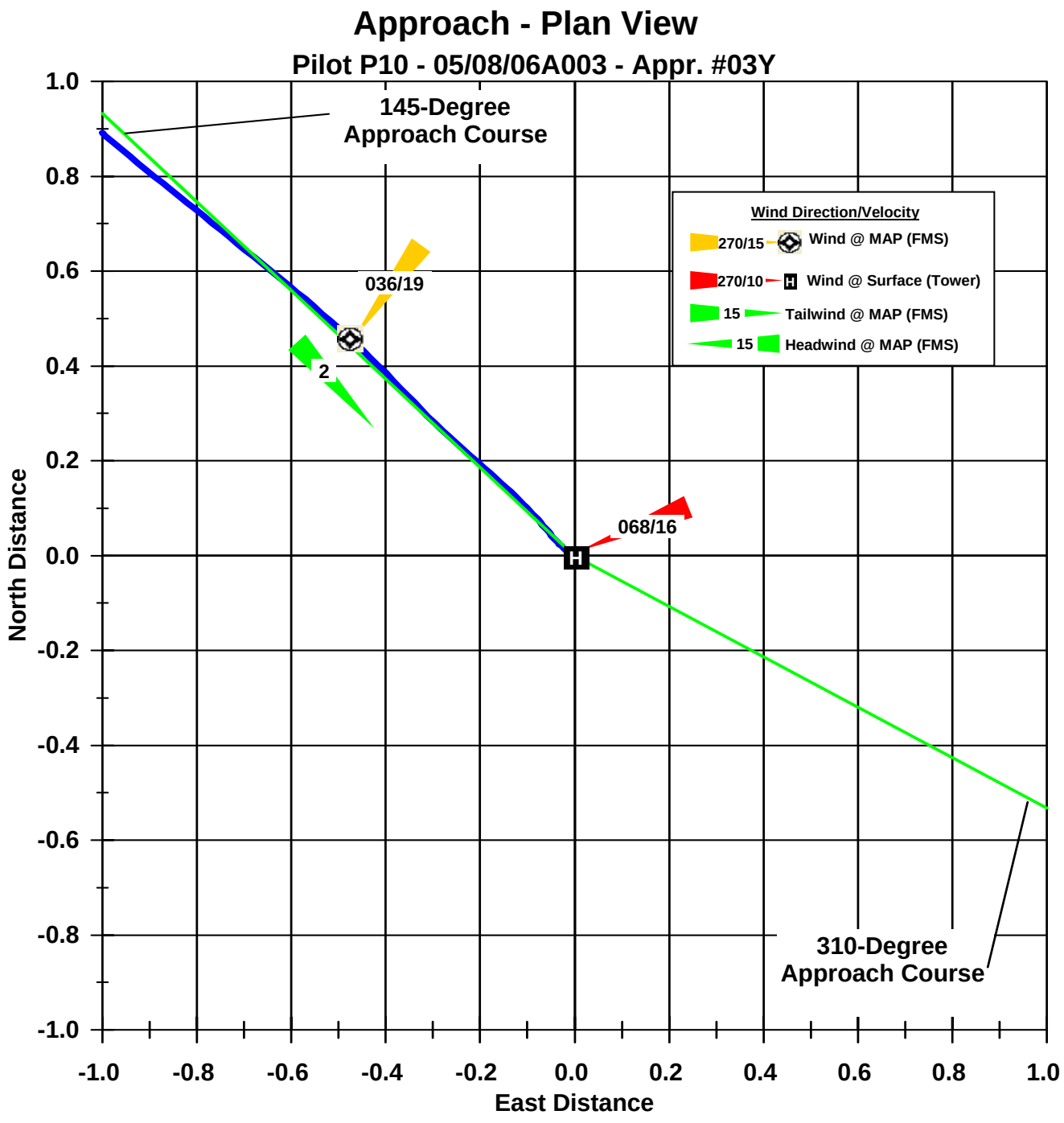


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06A002 - Appr. #02X

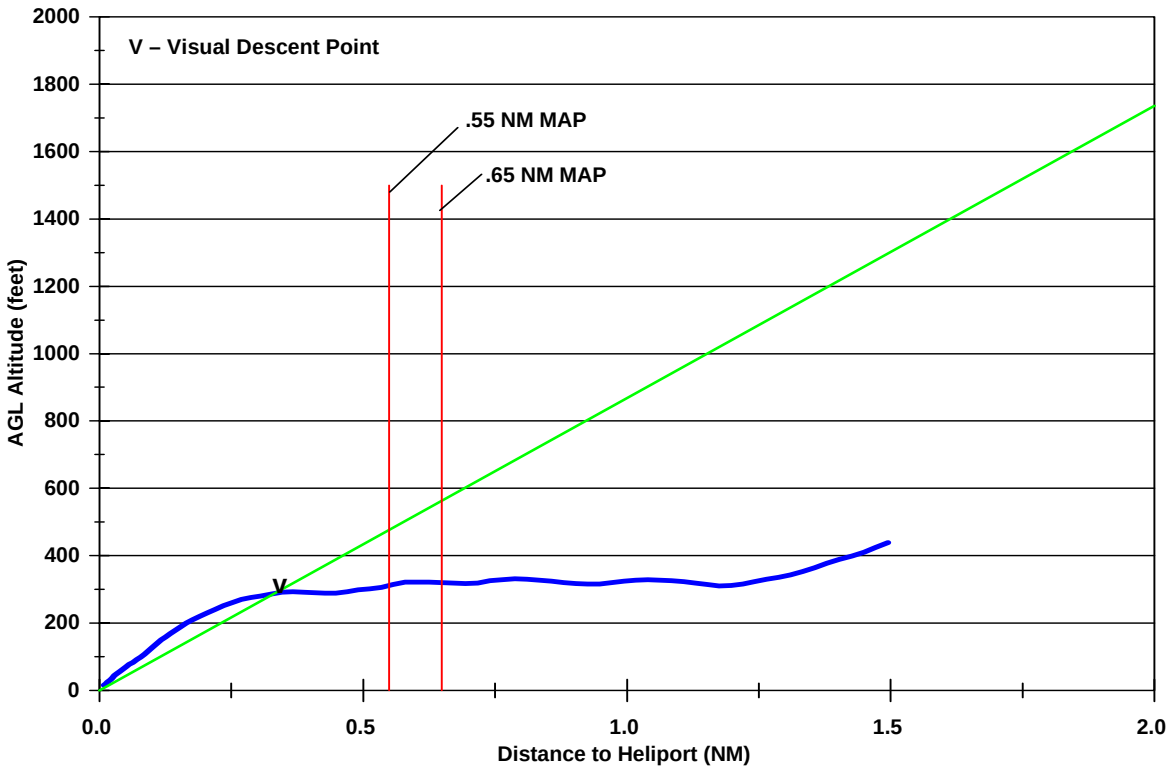


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06A002 - Appr. #02X

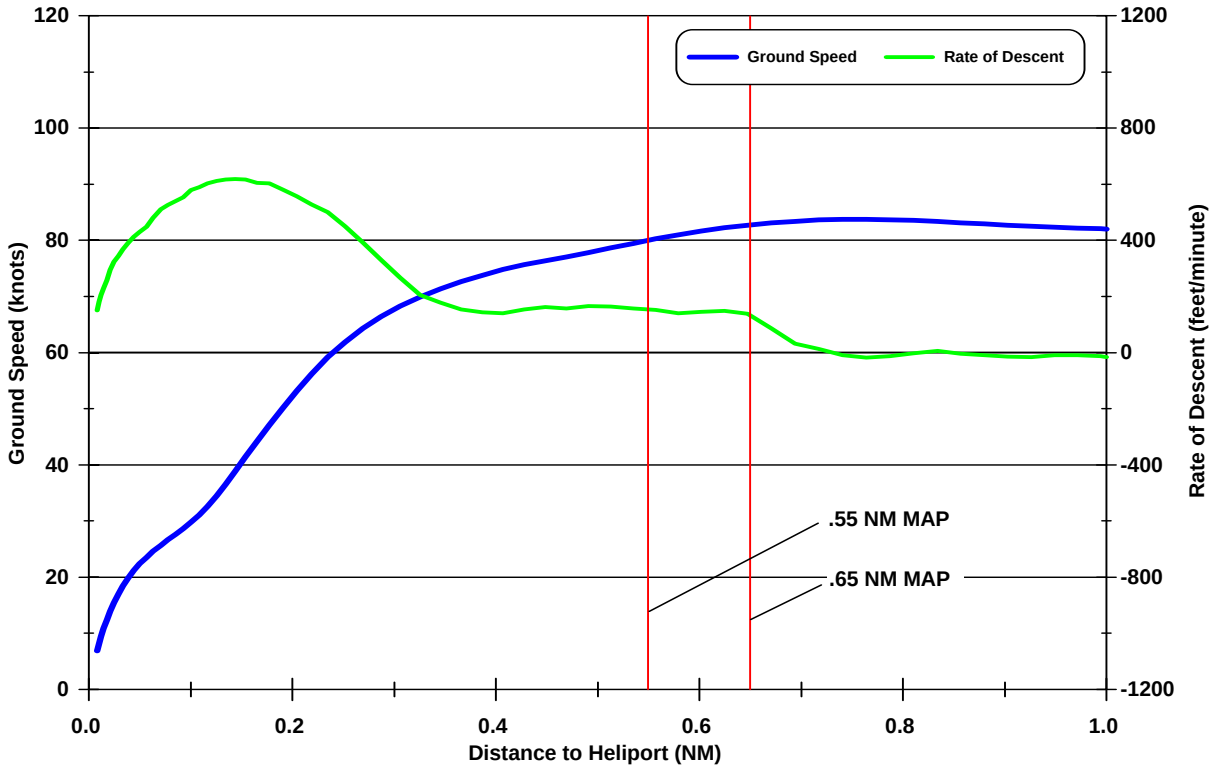



Approach - Plan View
Pilot P10 - 05/08/06A003 - Appr. #03Y
145-Degree
Approach Course
310-Degree
Approach Course
036/19
2
068/16
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

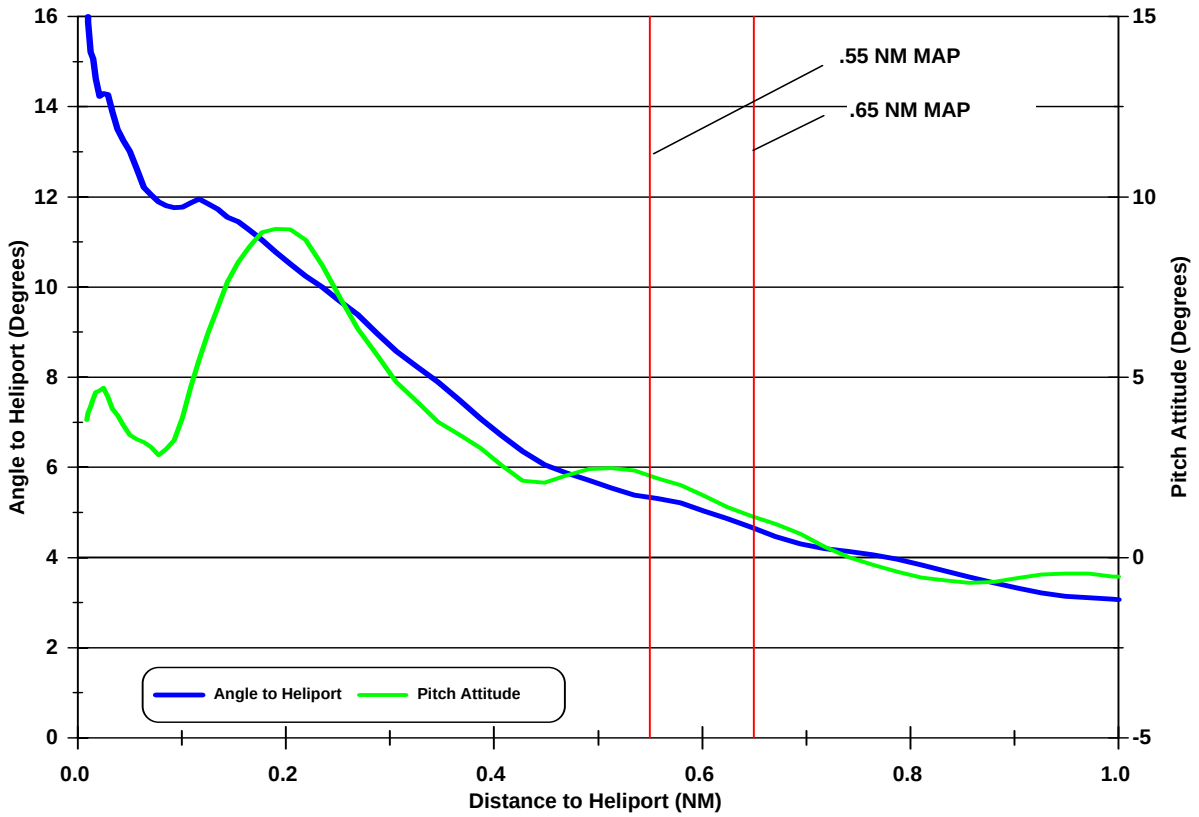
Profile View
Pilot P10 - 05/08/06A003 - Appr. #03Y



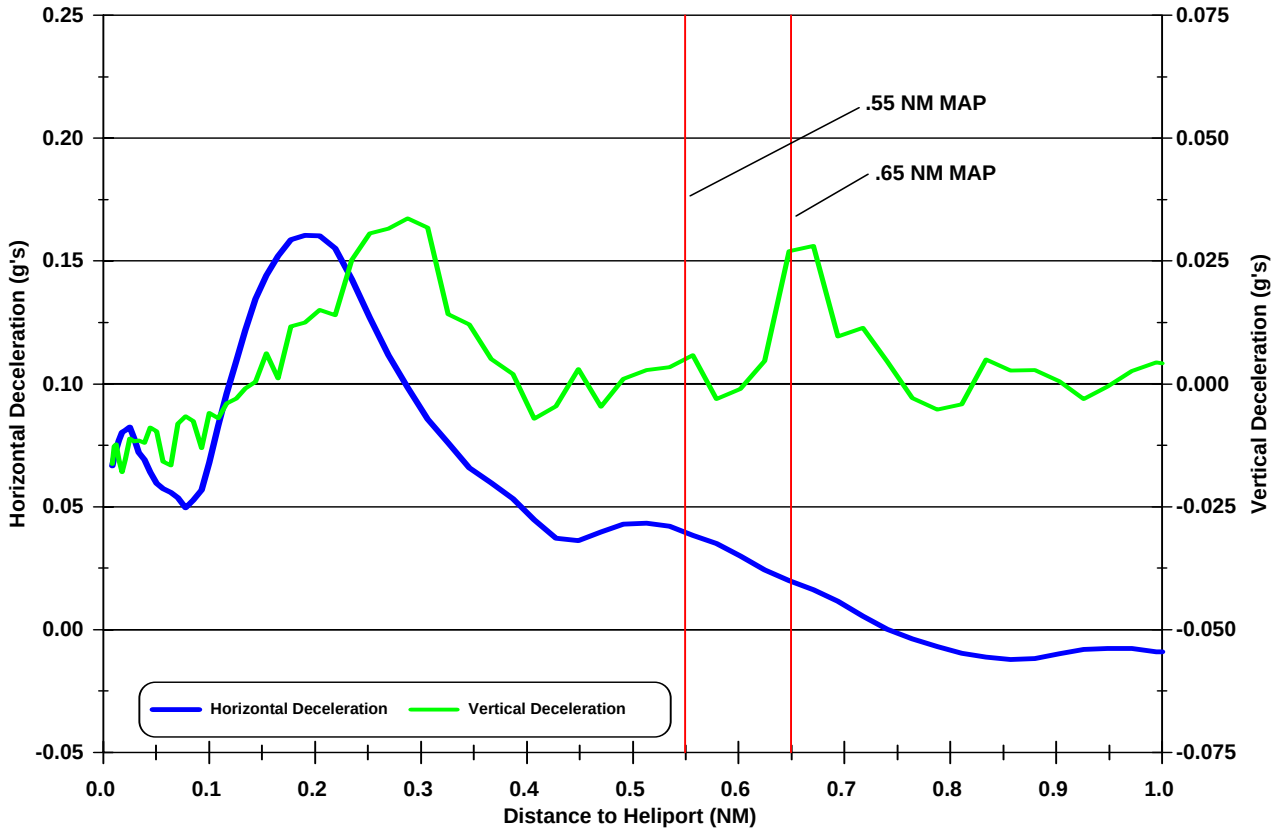
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06A003 - Appr. #03Y

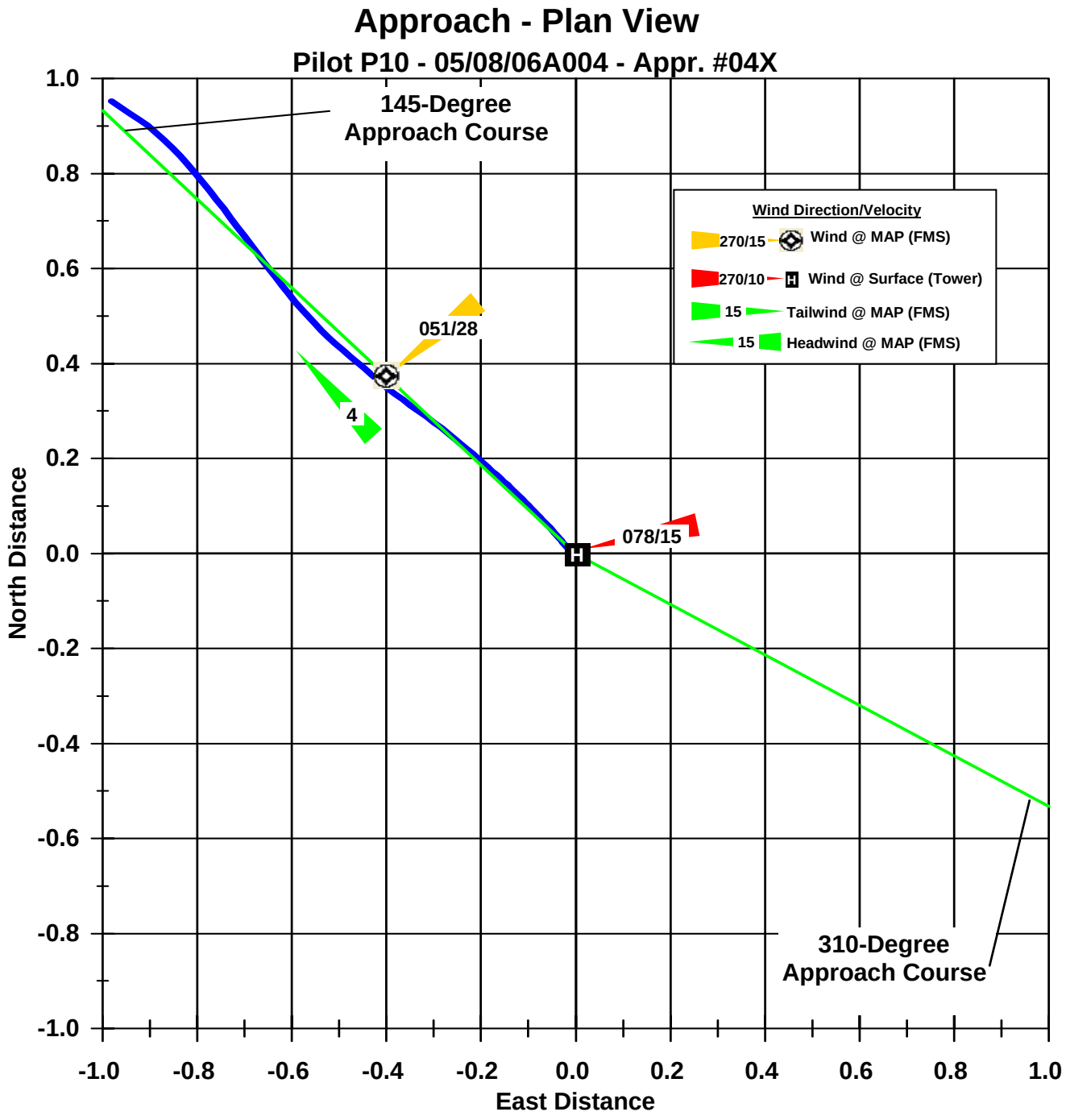


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06A003 - Appr. #03Y

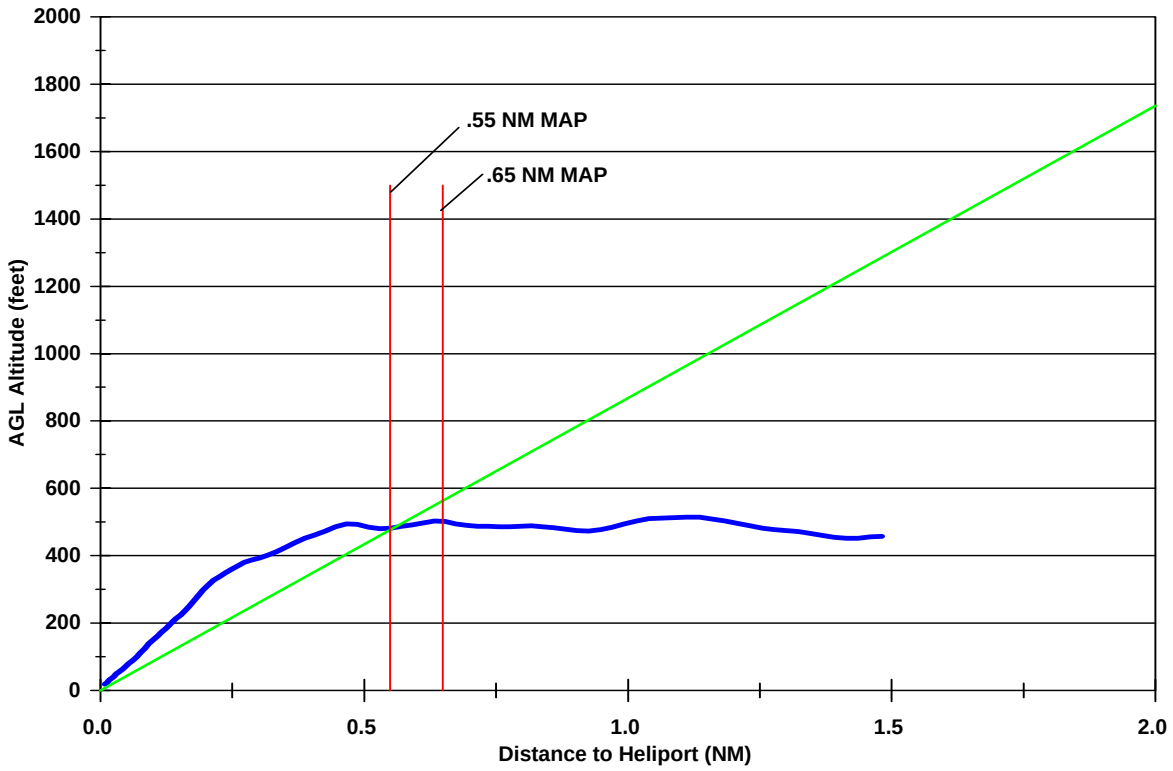


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06A003 - Appr. #03Y

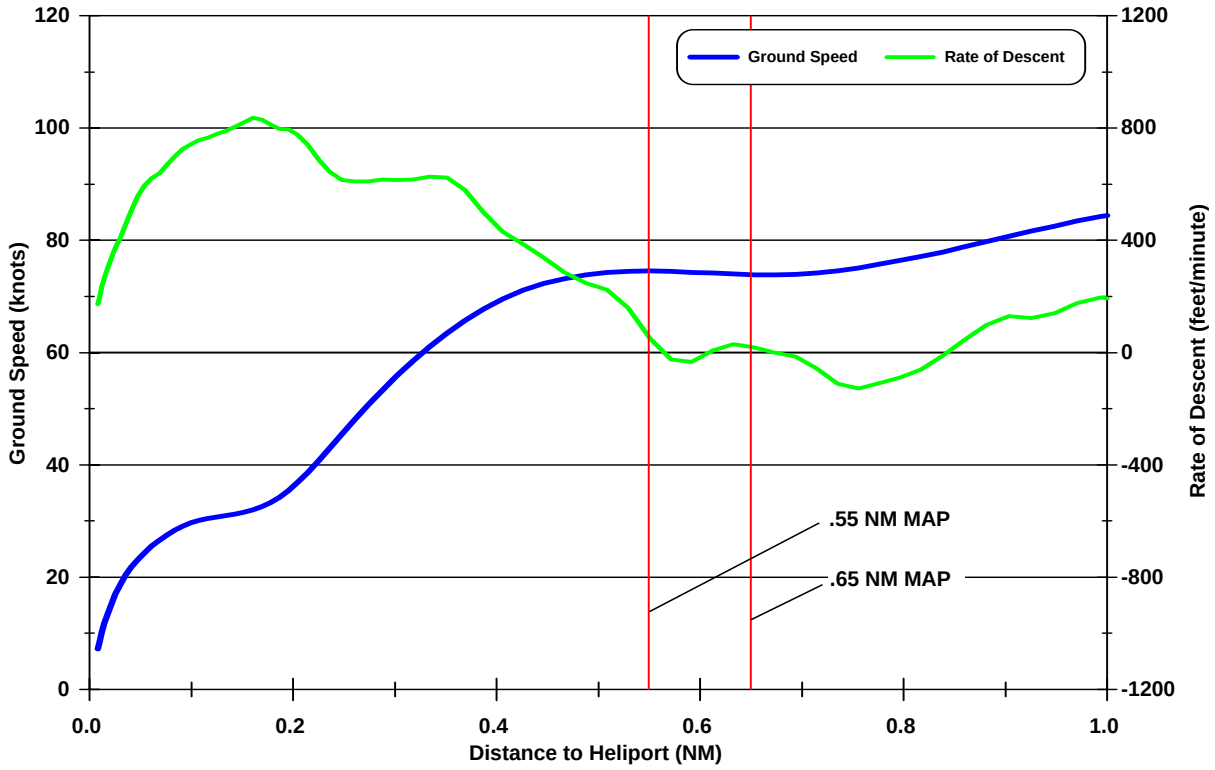



Approach - Plan View
Pilot P10 - 05/08/06A004 - Appr. #04X
145-Degree
Approach Course
310-Degree
Approach Course
051/28
078/15
4
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

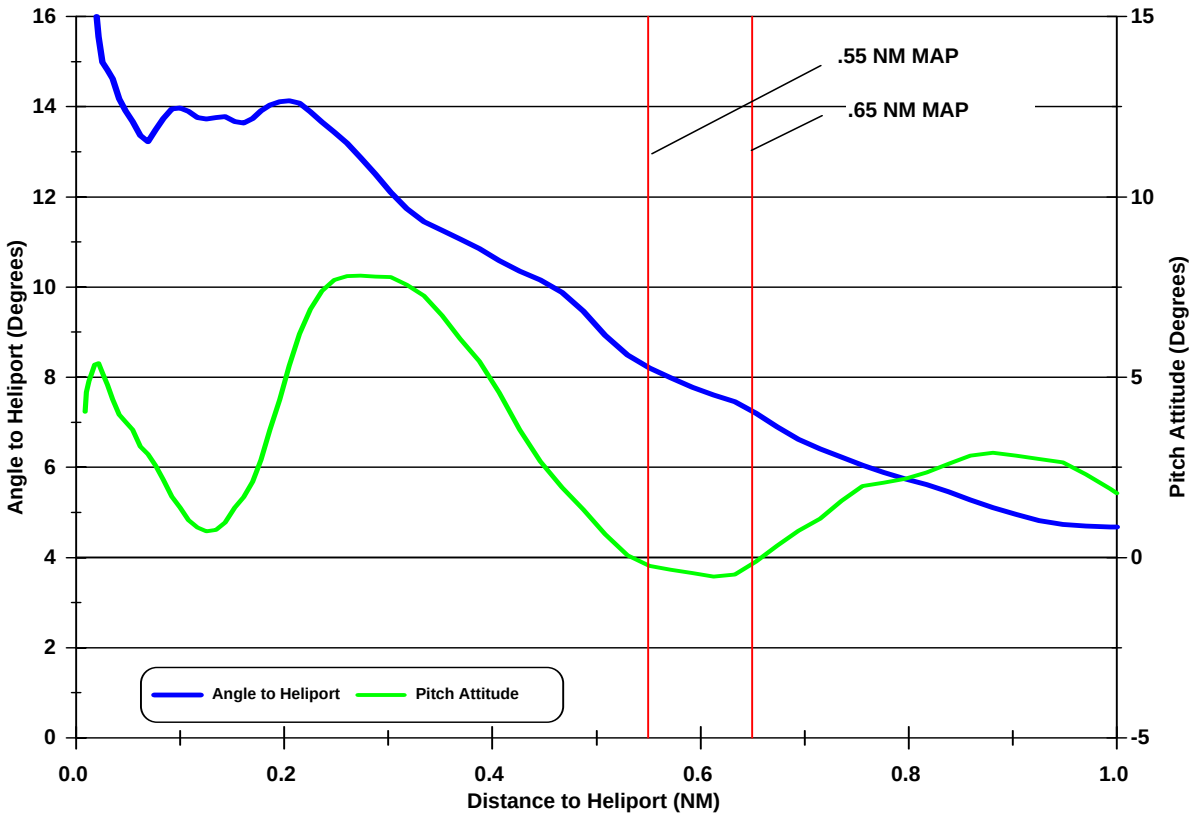
Profile View
Pilot P10 - 05/08/06A004 - Appr. #04X



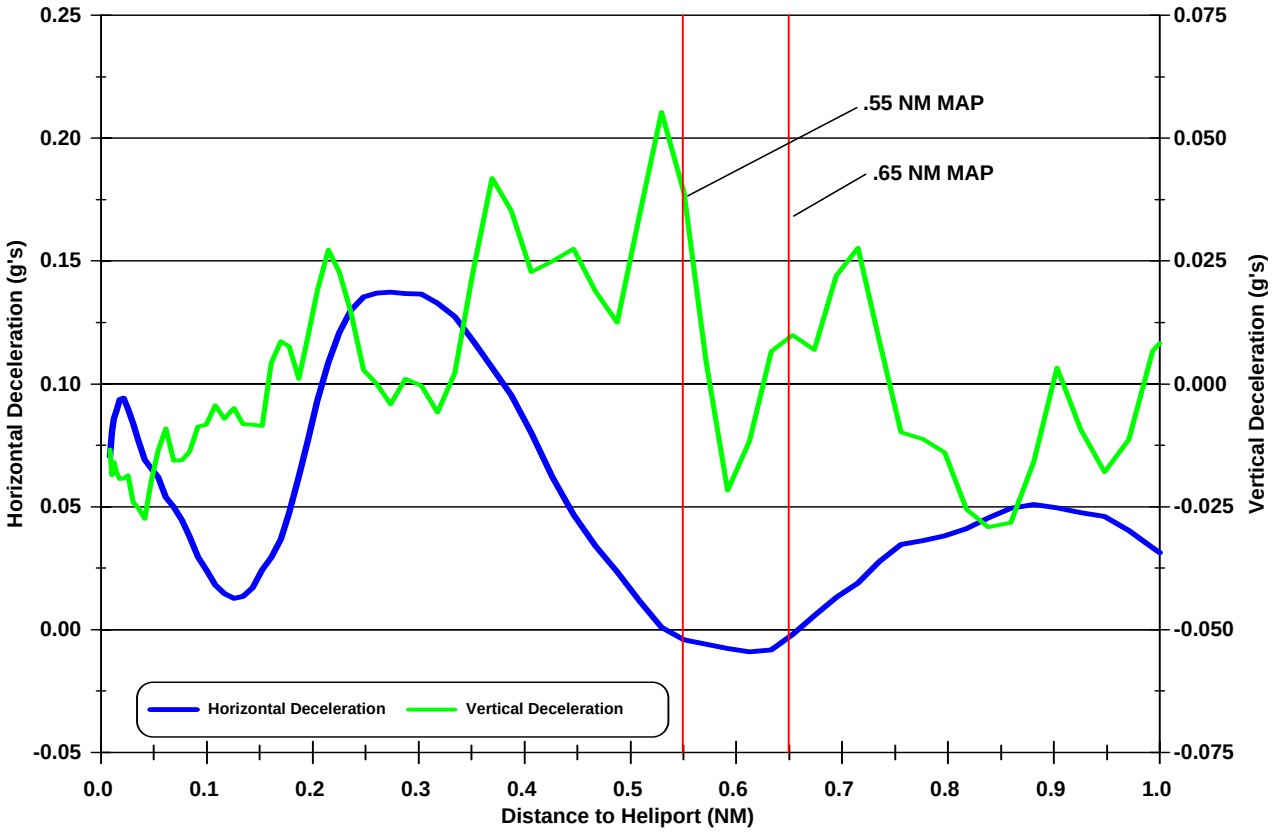
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06A004 - Appr. #04X

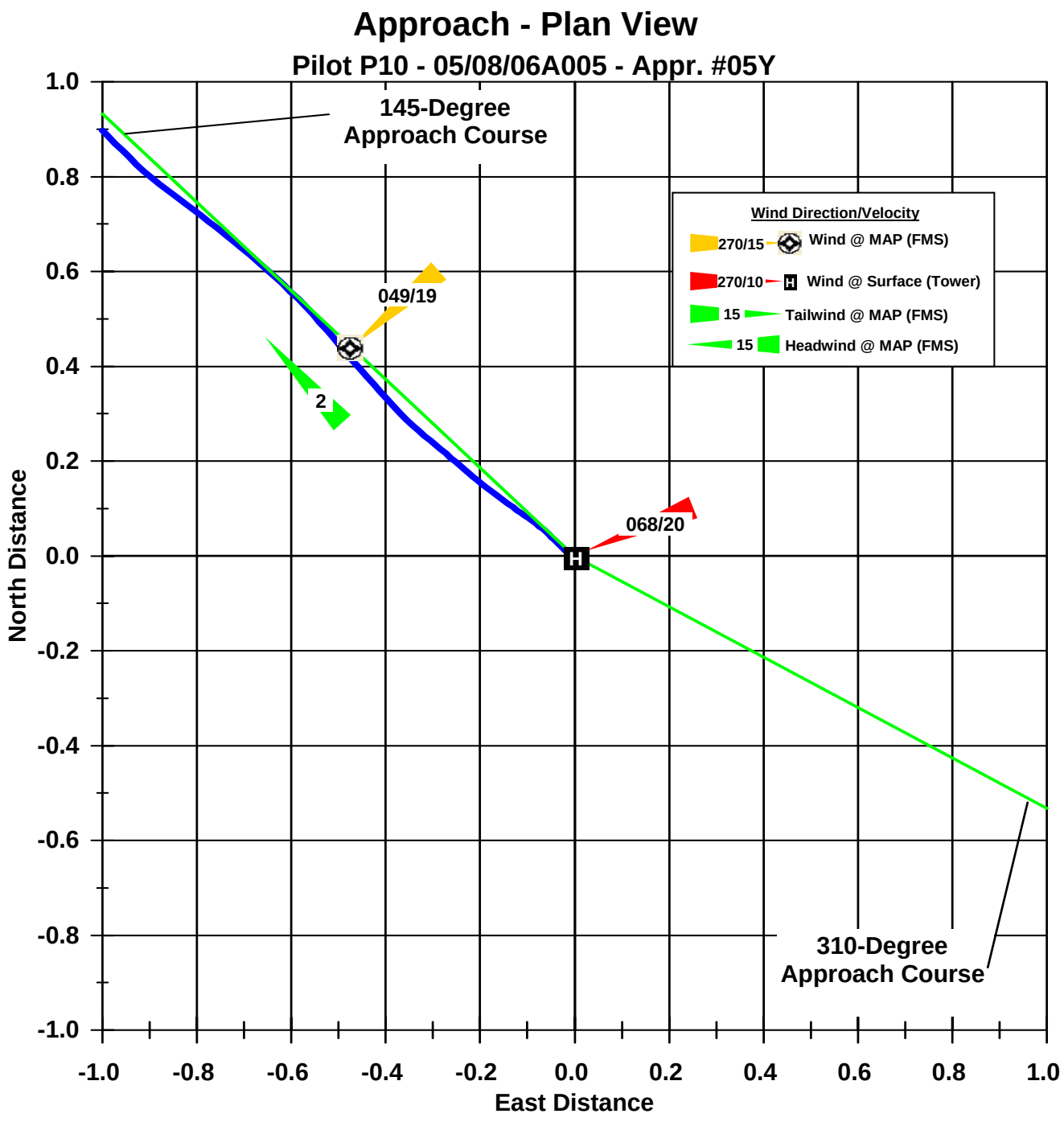


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06A004 - Appr. #04X

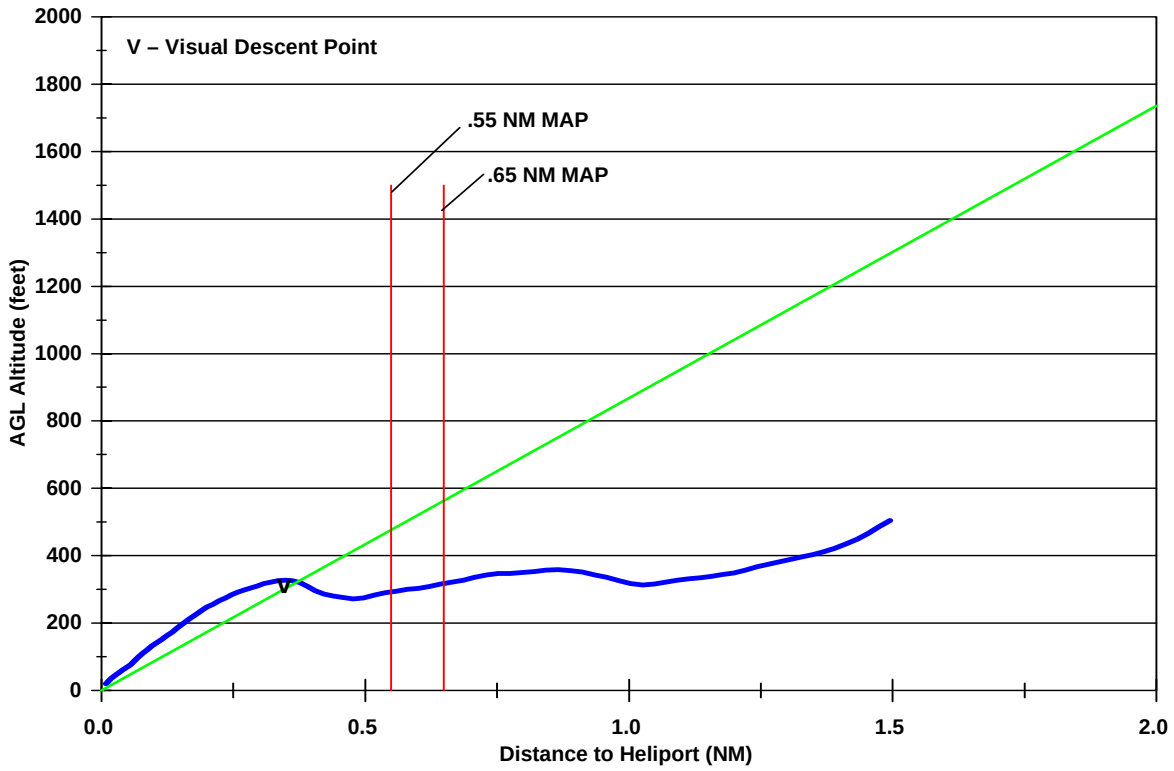


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06A004 - Appr. #04X

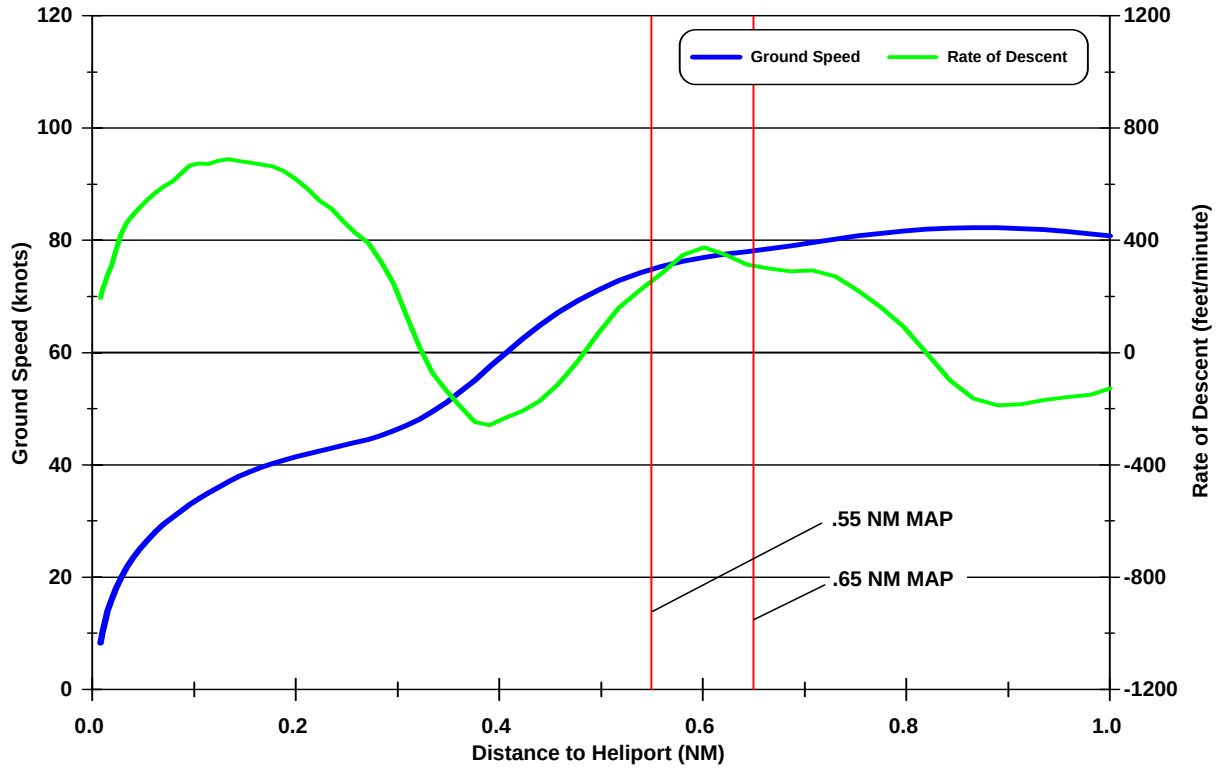



Approach - Plan View
Pilot P10 - 05/08/06A005 - Appr. #05Y
145-Degree
Approach Course
310-Degree
Approach Course
049/19
068/20
2
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

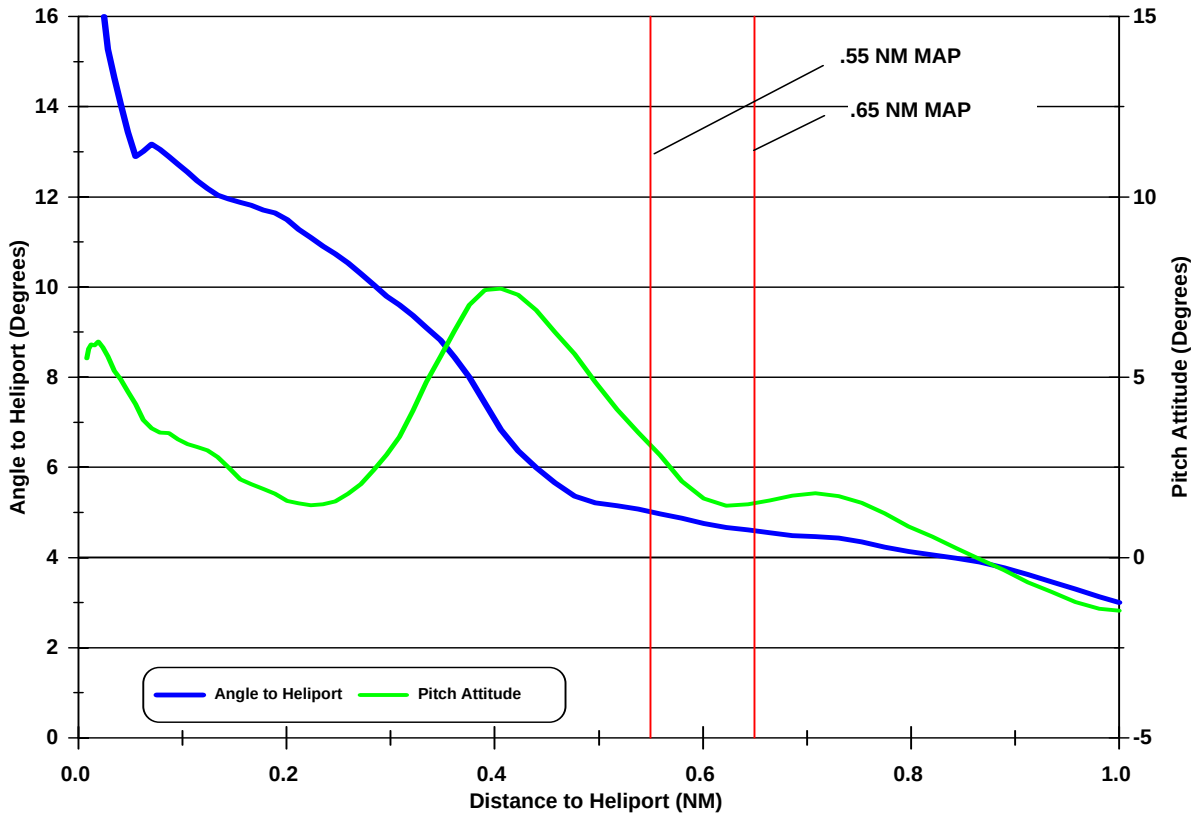
Profile View
Pilot P10 - 05/08/06A005 - Appr. #05Y



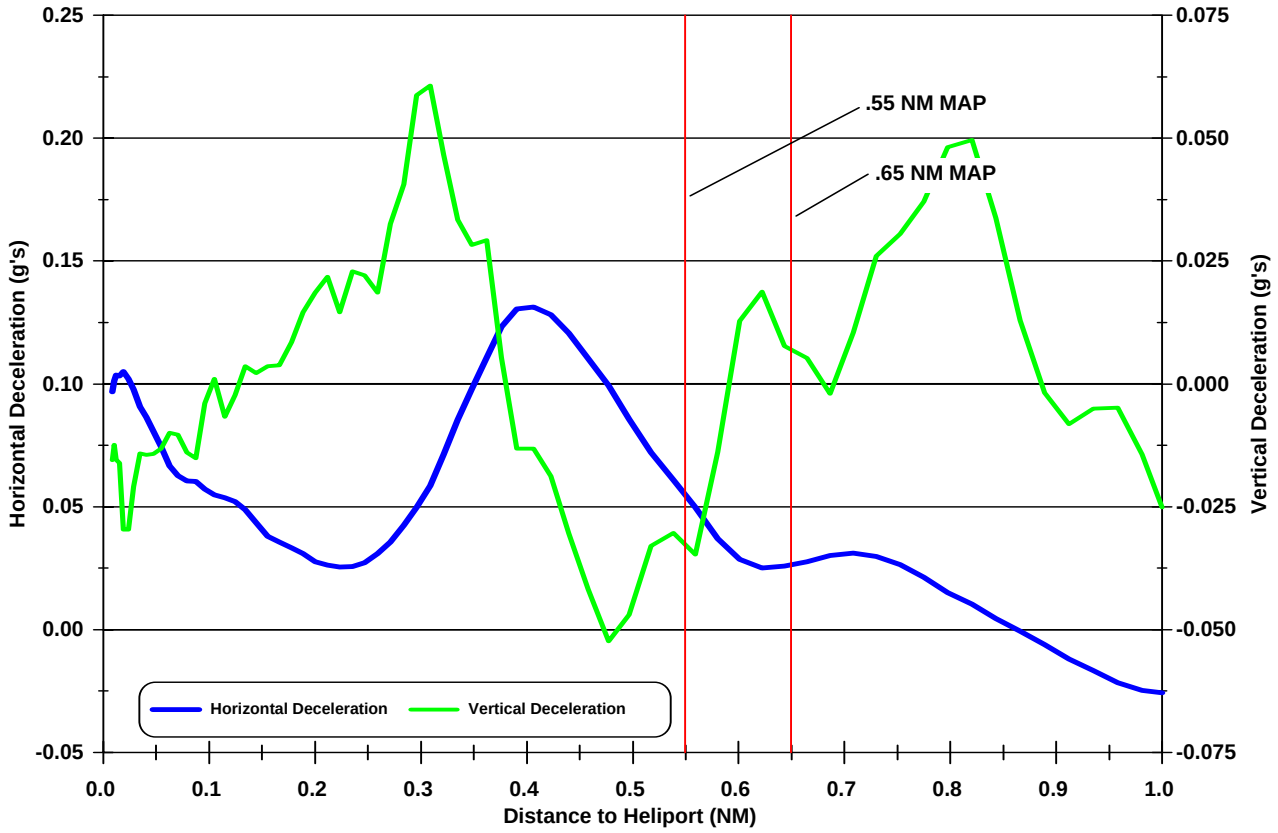
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06A005 - Appr. #05Y

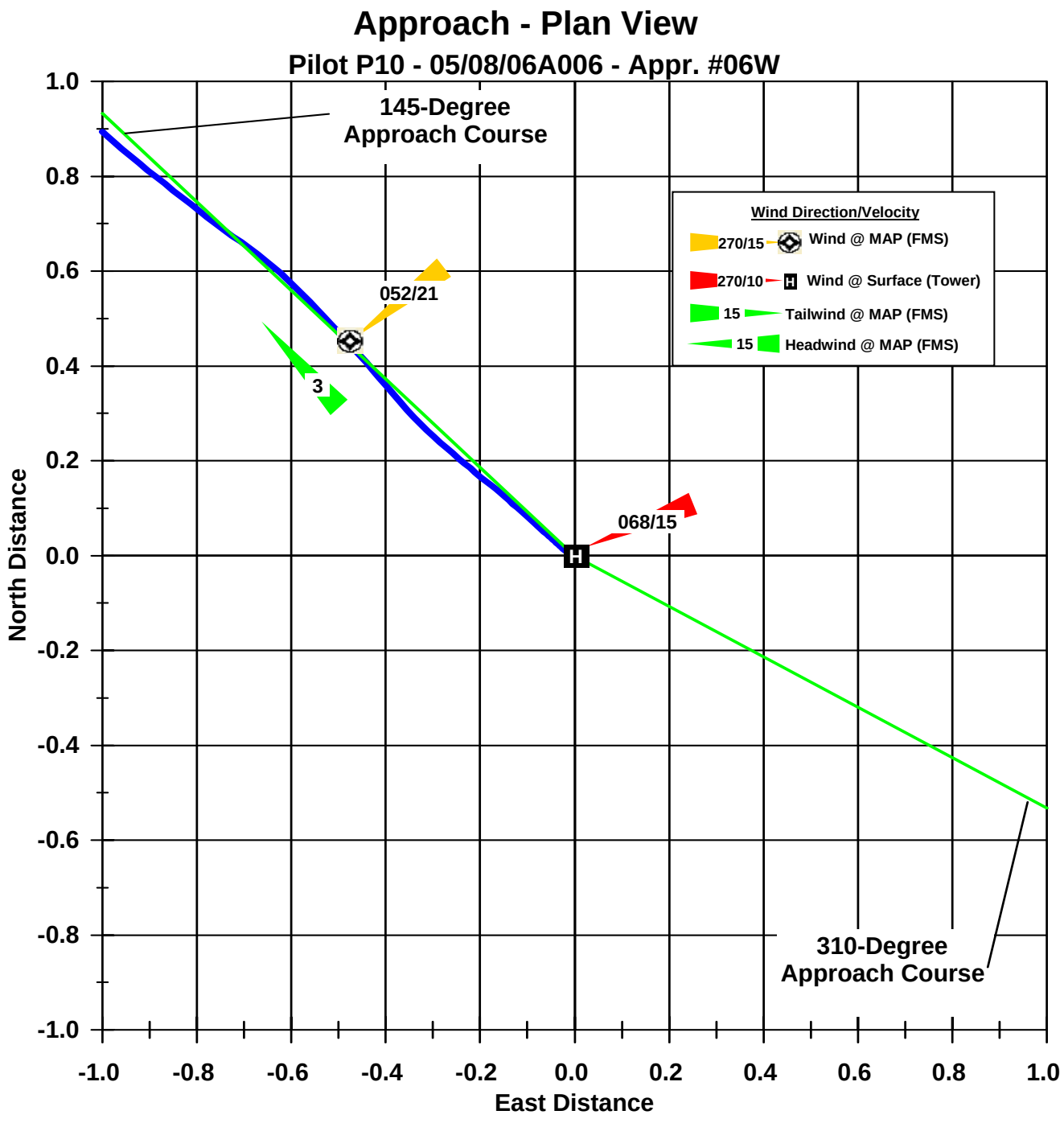


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06A005 - Appr. #05Y

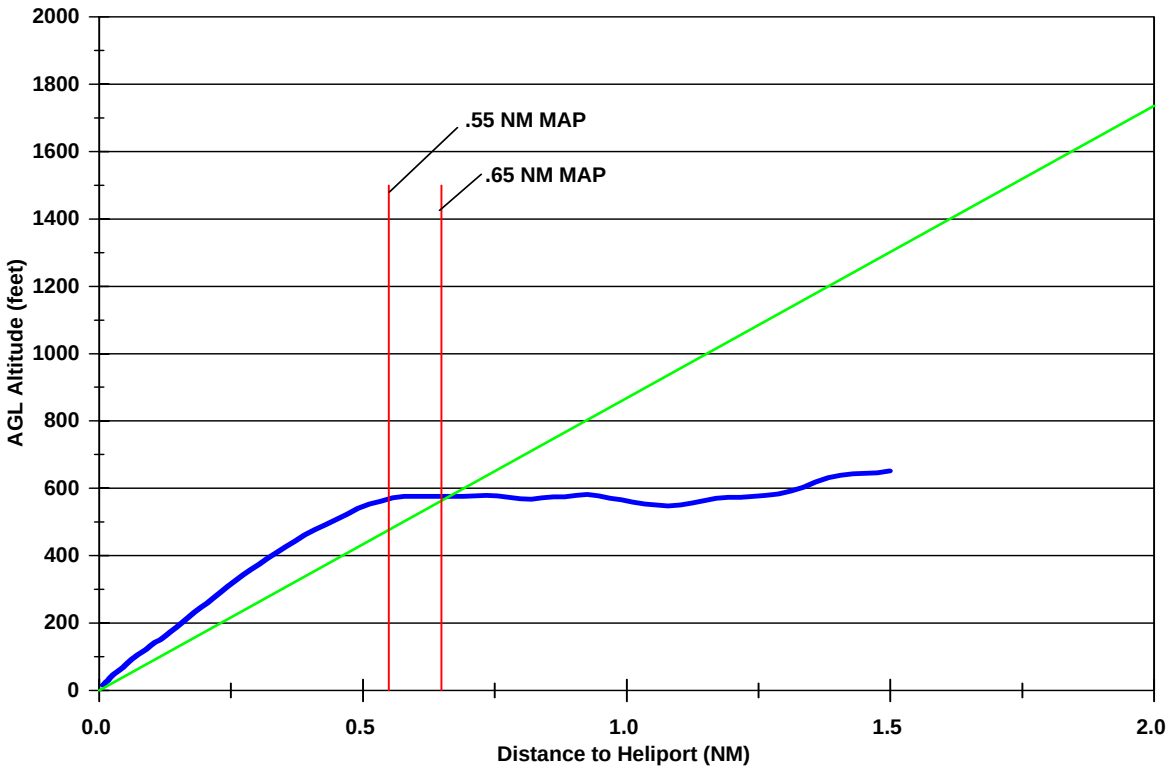


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06A005 - Appr. #05Y

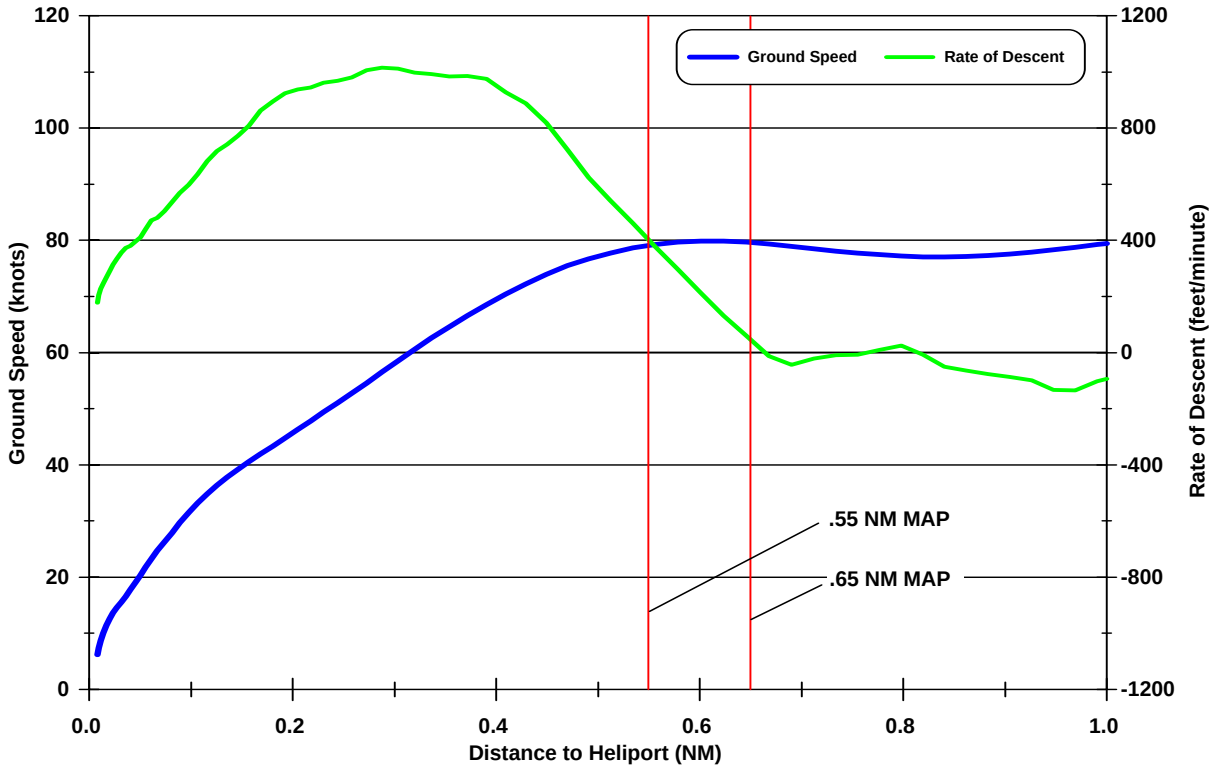



Approach - Plan View
Pilot P10 - 05/08/06A006 - Appr. #06W
145-Degree
Approach Course
310-Degree
Approach Course
052/21
068/15
3
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

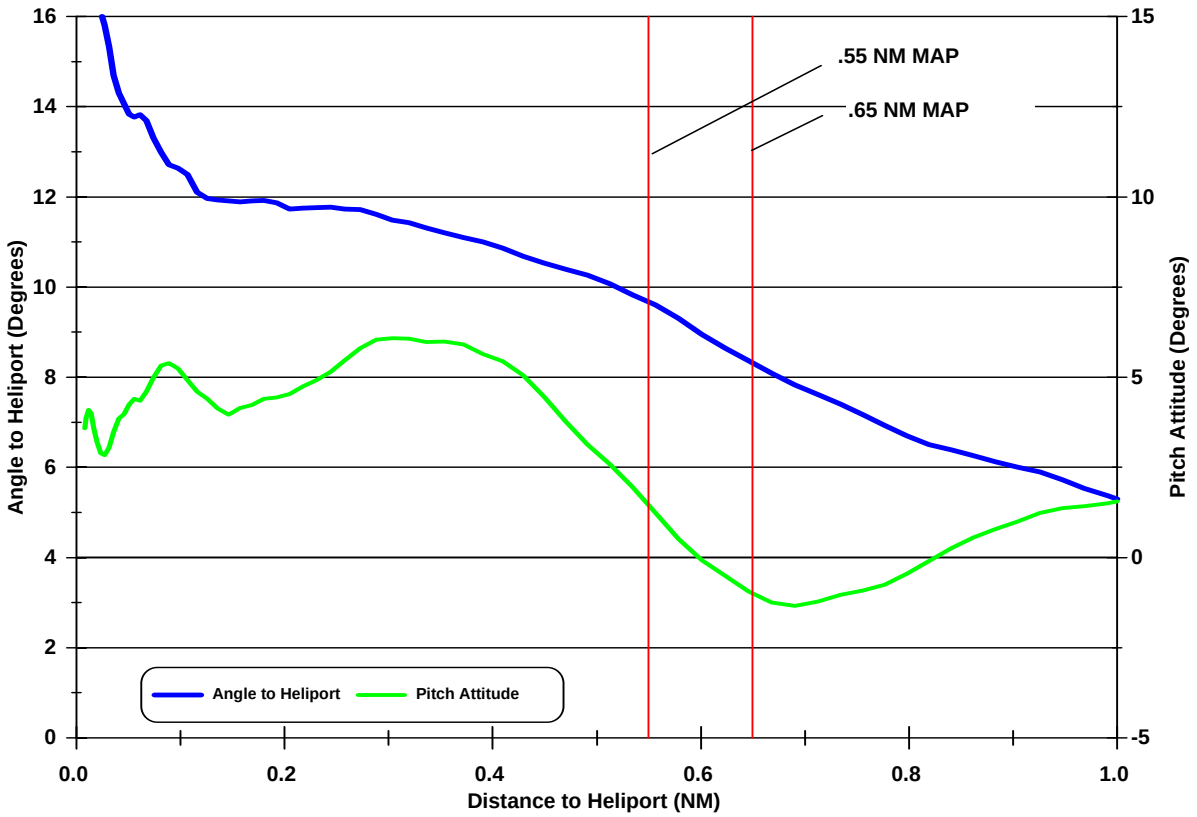
Profile View
Pilot P10 - 05/08/06A006 - Appr. #06W



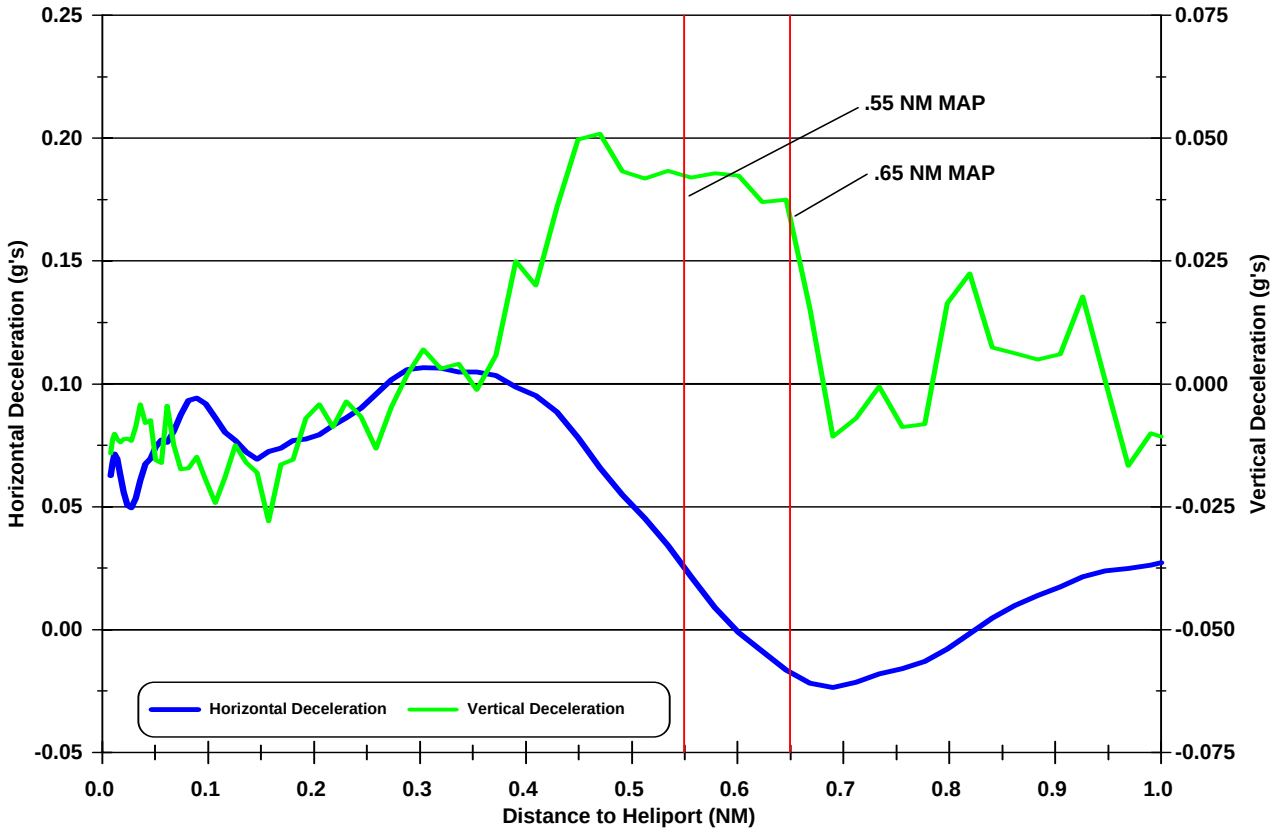
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06A006 - Appr. #06W

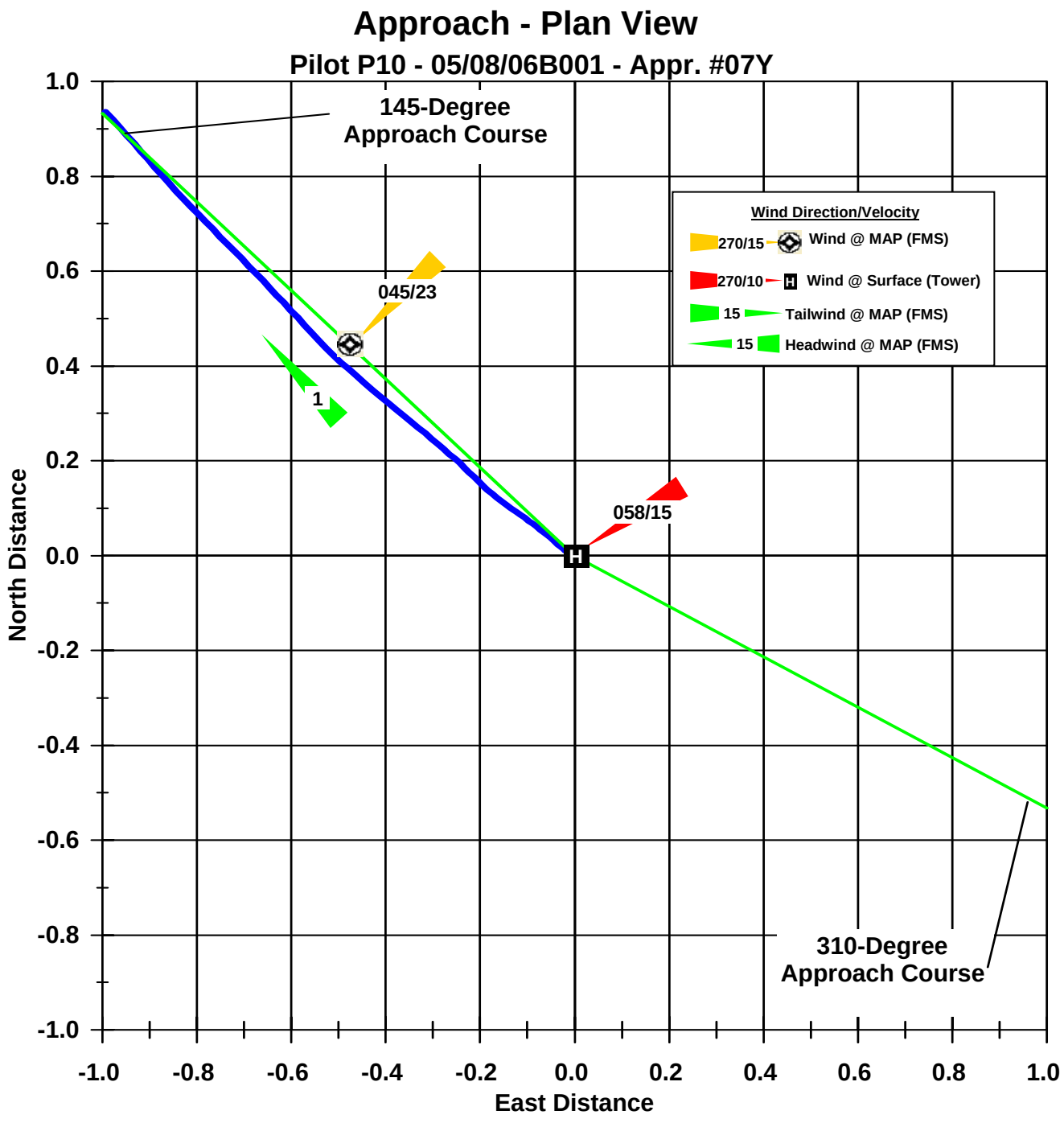


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06A006 - Appr. #06W

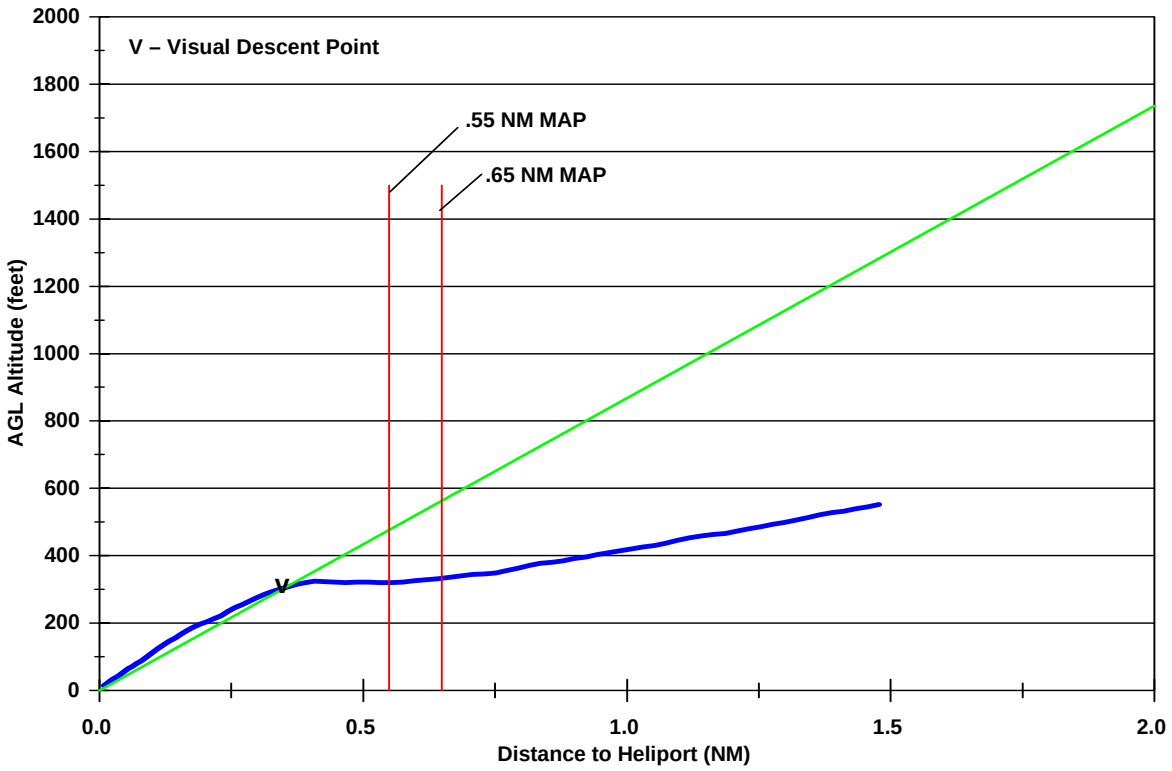


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06A006 - Appr. #06W

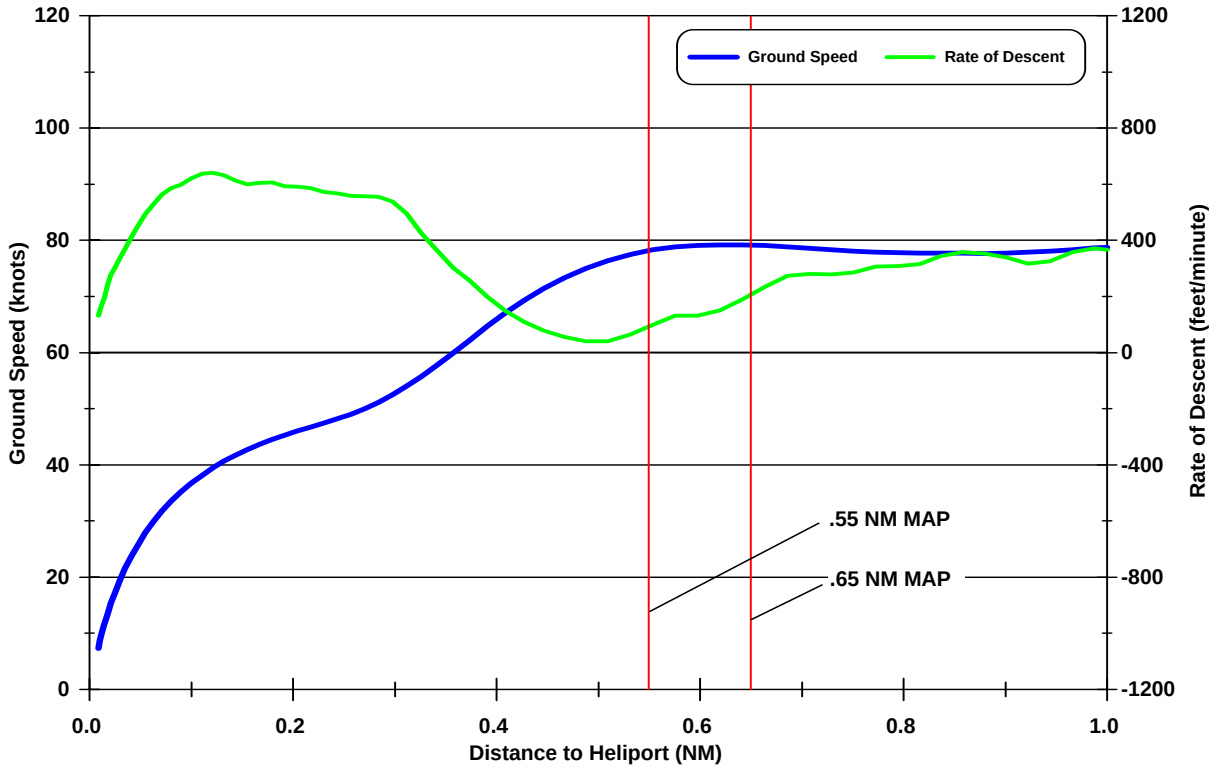



Approach - Plan View
Pilot P10 - 05/08/06B001 - Appr. #07Y
145-Degree
Approach Course
045/23
1
058/15
H
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

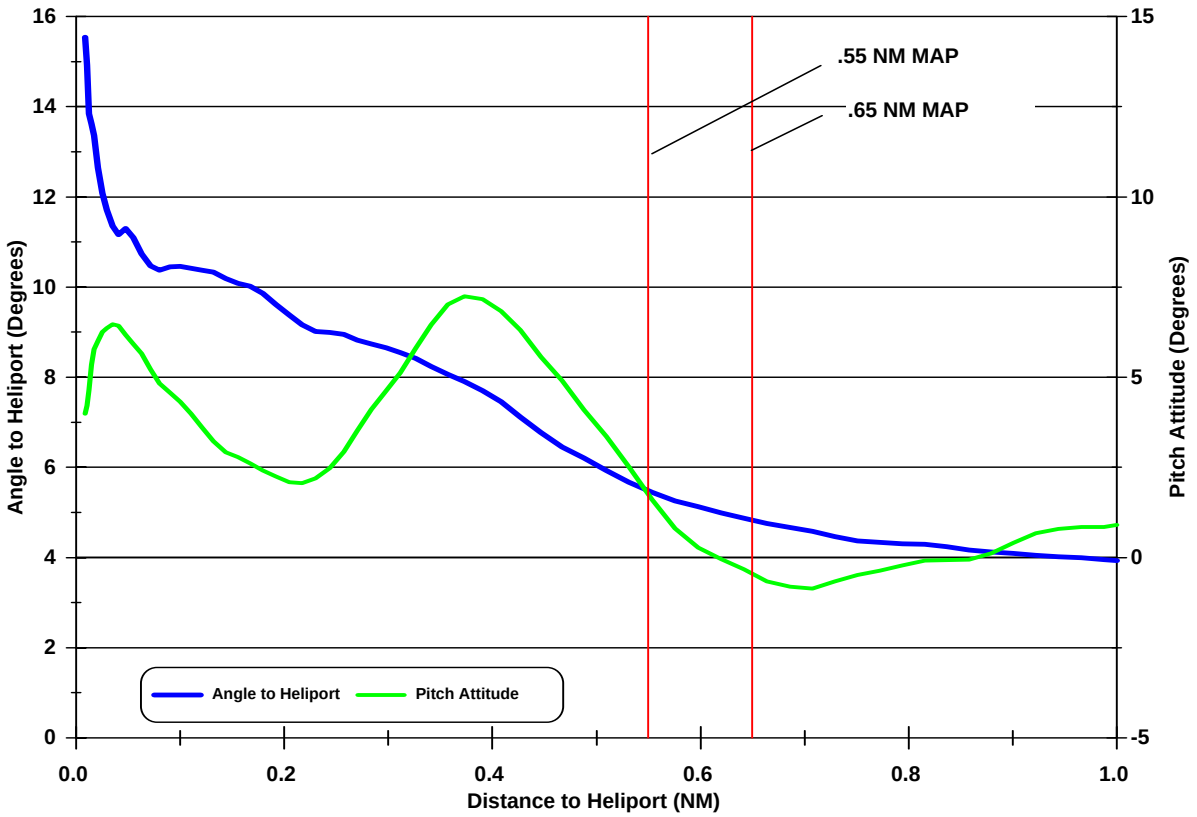
Profile View
Pilot P10 - 05/08/06B001 - Appr. #07Y



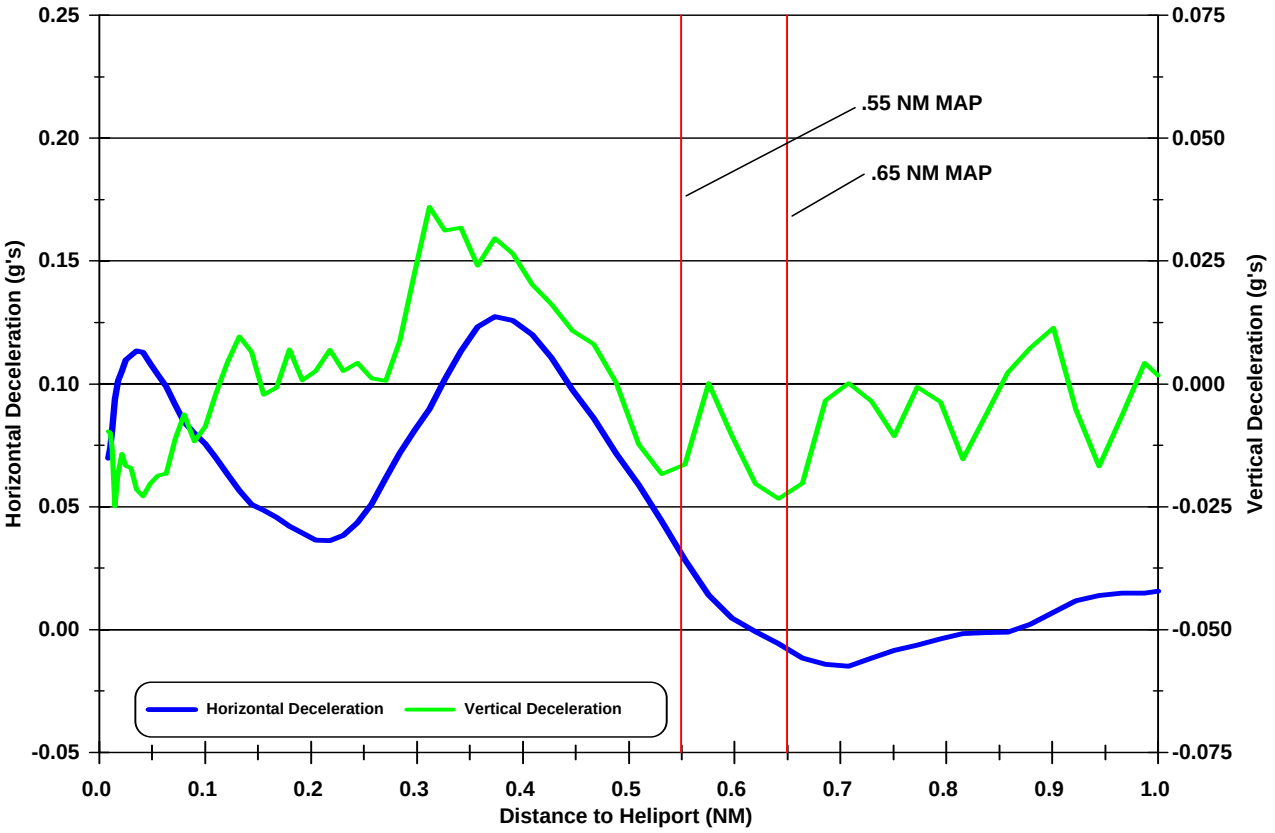
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06B001 - Appr. #07Y

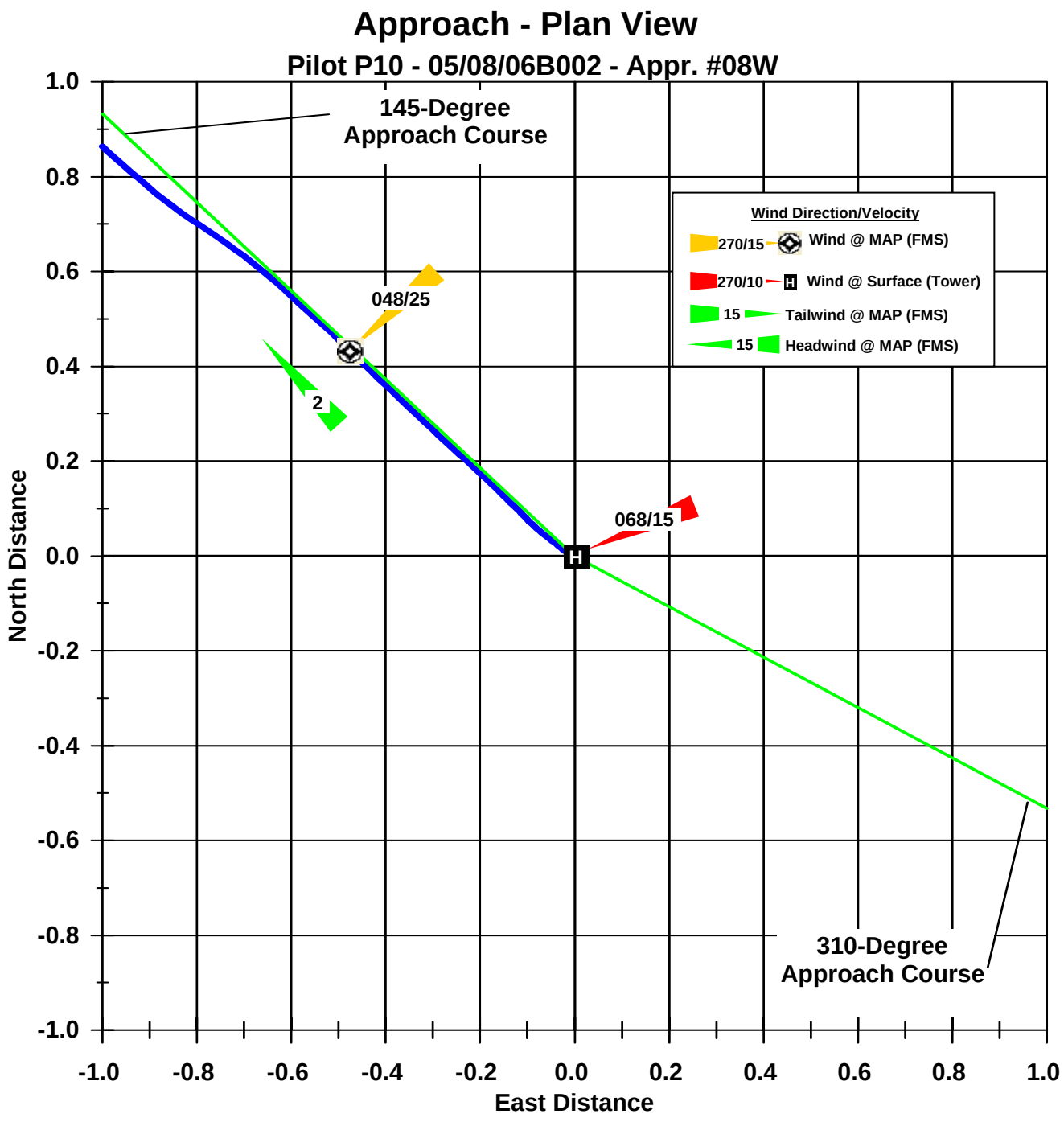


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06B001 - Appr. #07Y

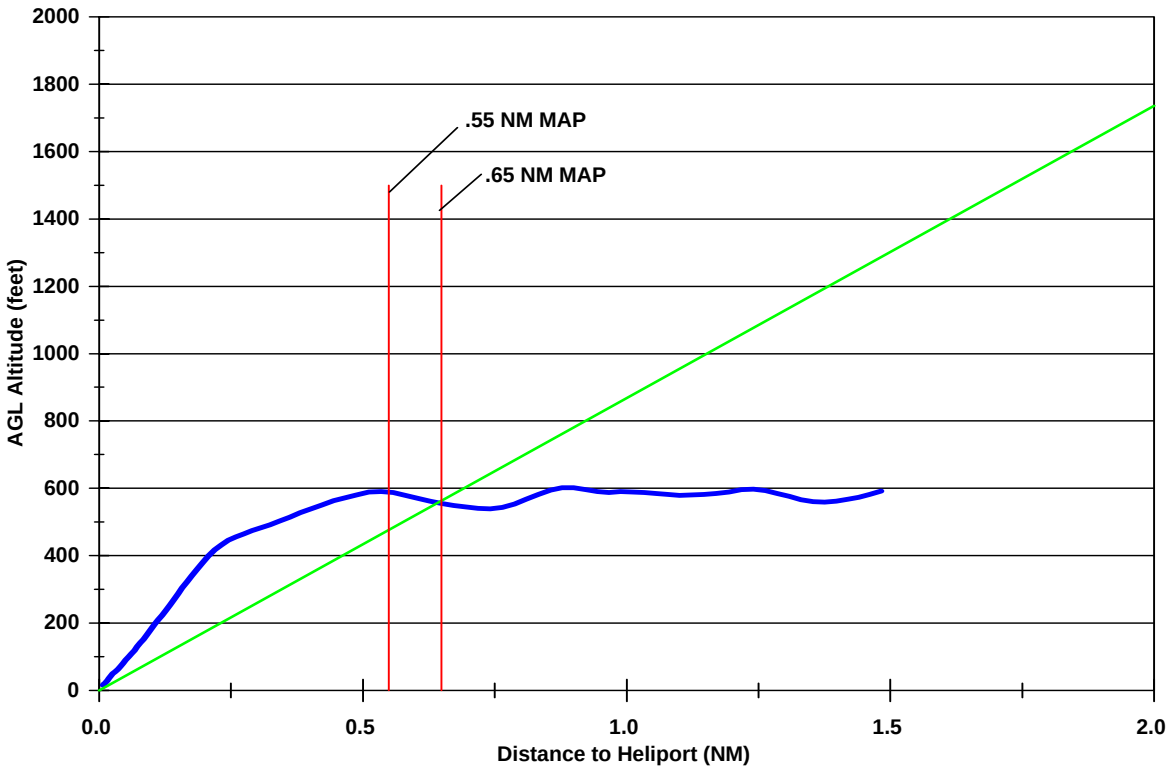


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06B001 - Appr. #07Y

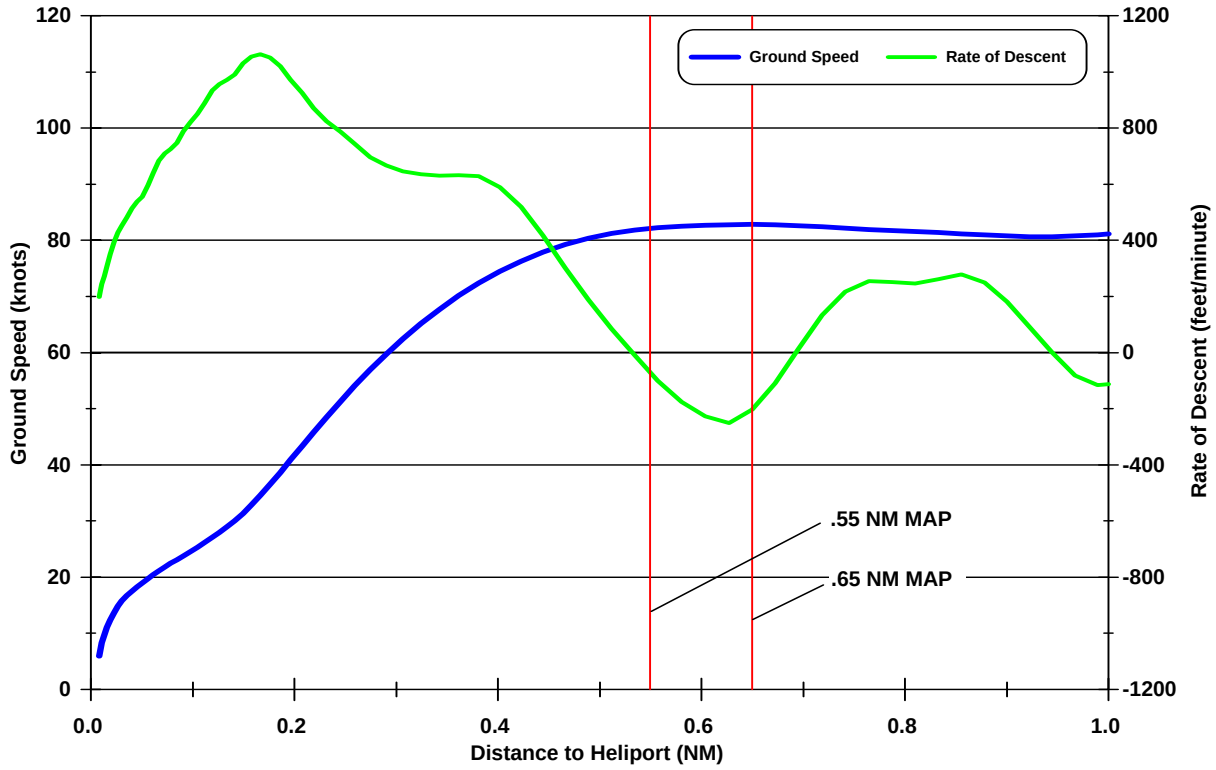



Approach - Plan View
Pilot P10 - 05/08/06B002 - Appr. #08W
145-Degree
Approach Course
310-Degree
Approach Course
048/25
2
068/15
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

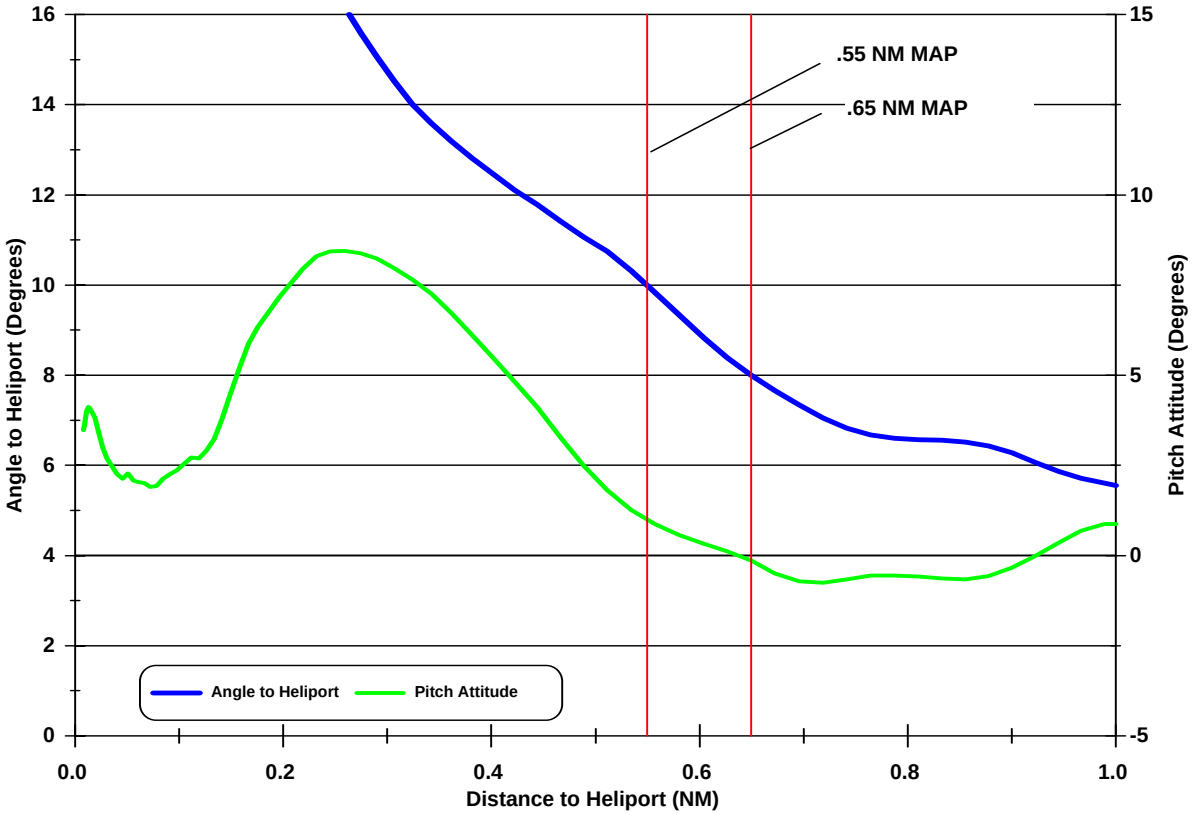
Profile View
Pilot P10 - 05/08/06B002 - Appr. #08W



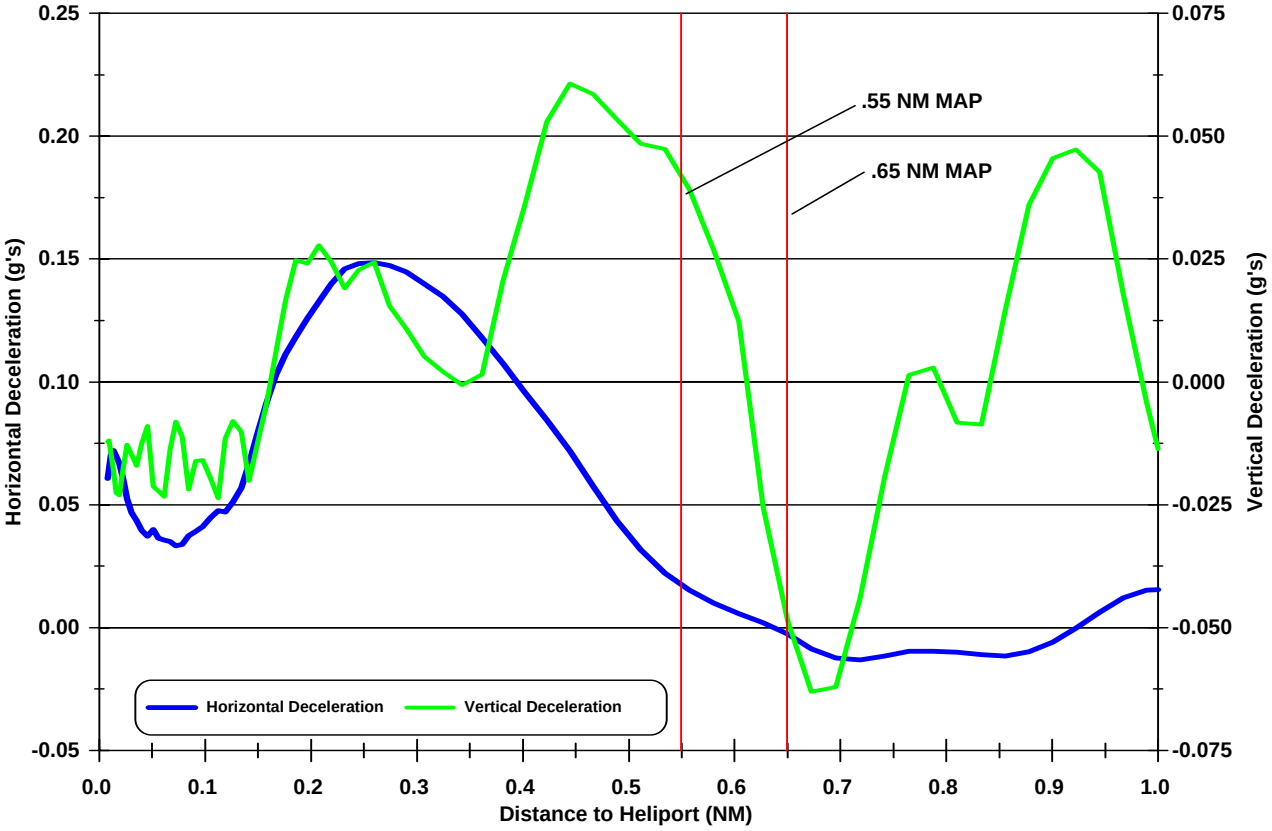
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06B002 - Appr. #08W

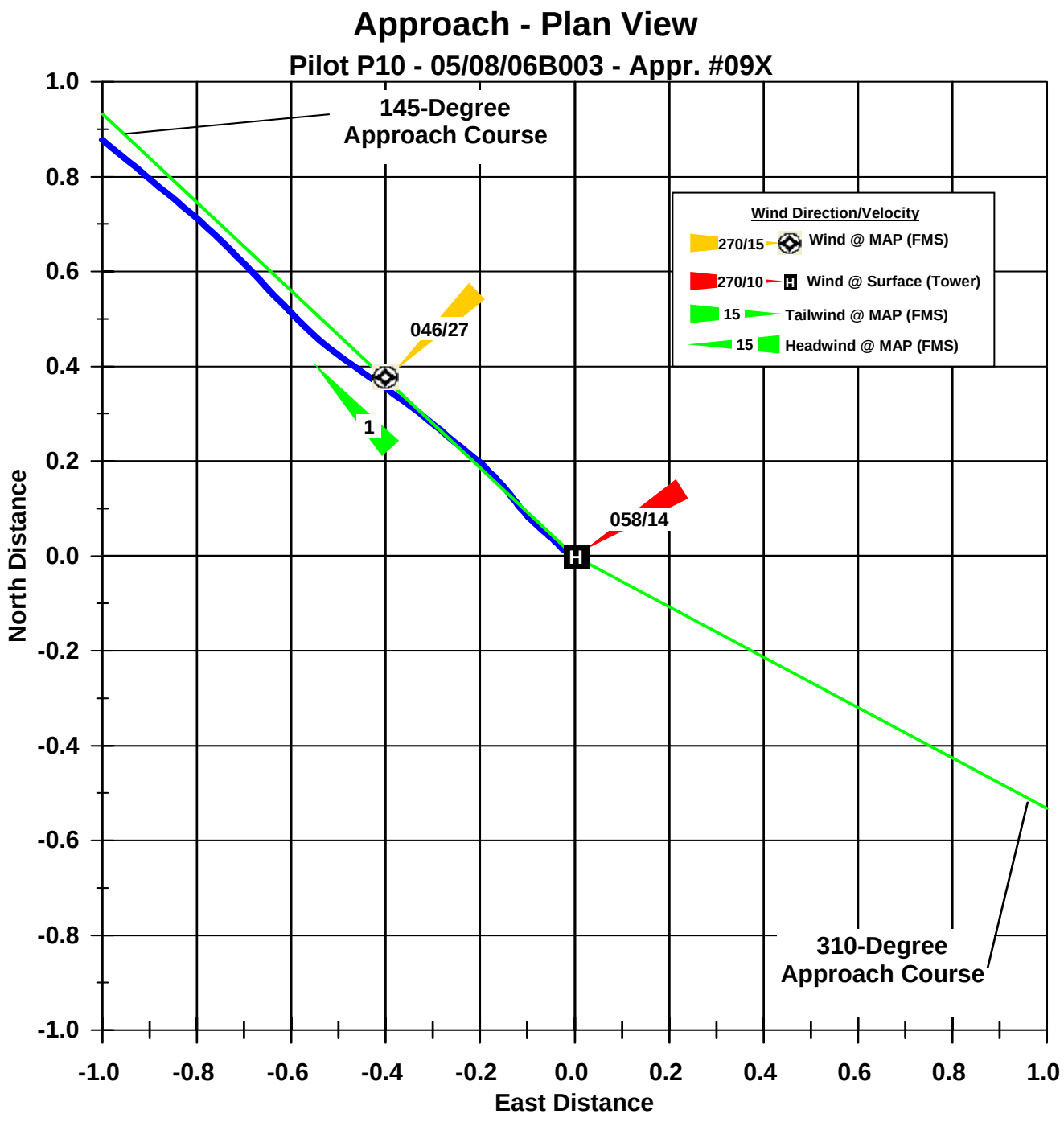


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06B002 - Appr. #08W

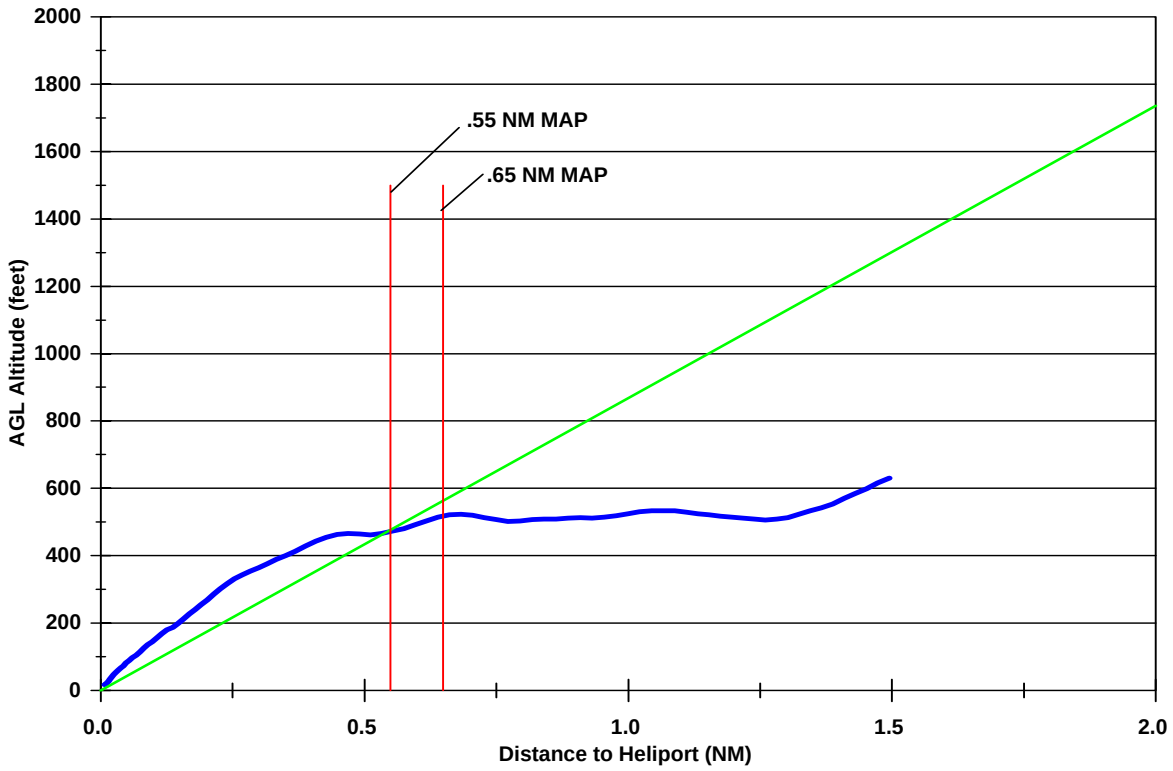


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06B002 - Appr. #08W

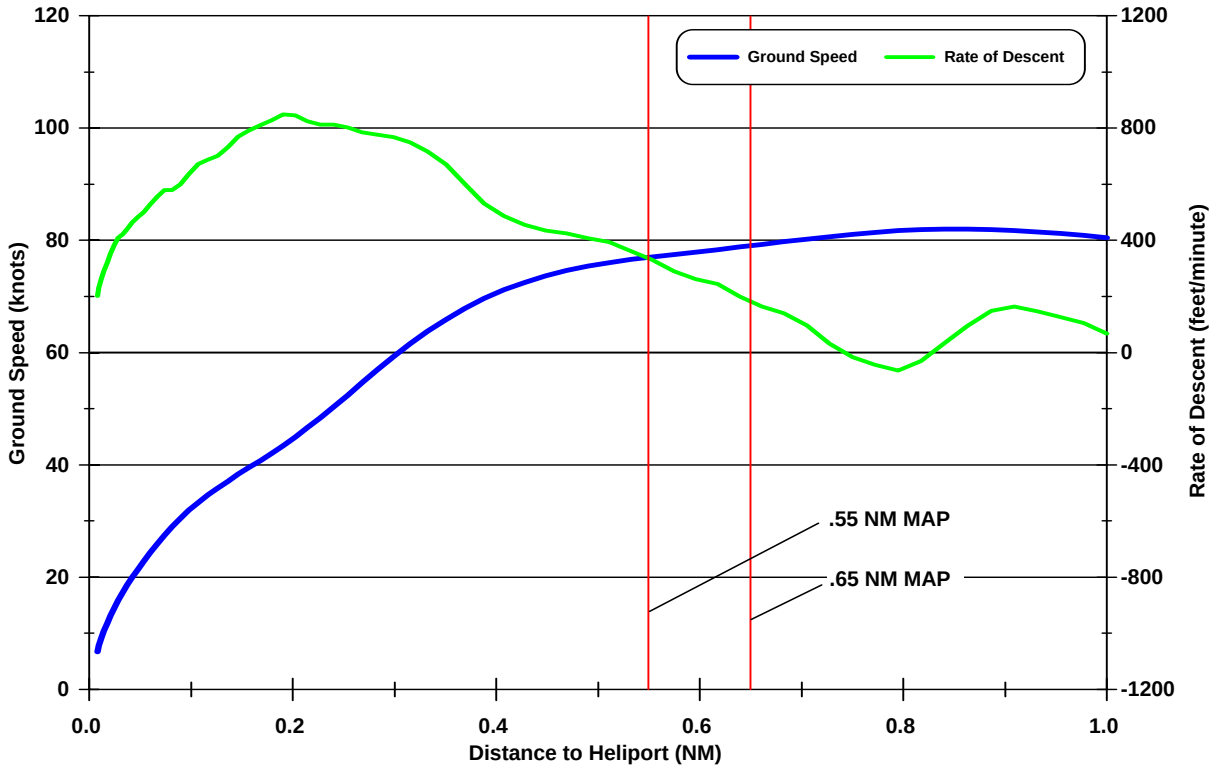



Approach - Plan View
Pilot P10 - 05/08/06B003 - Appr. #09X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
046/27
1
058/14
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

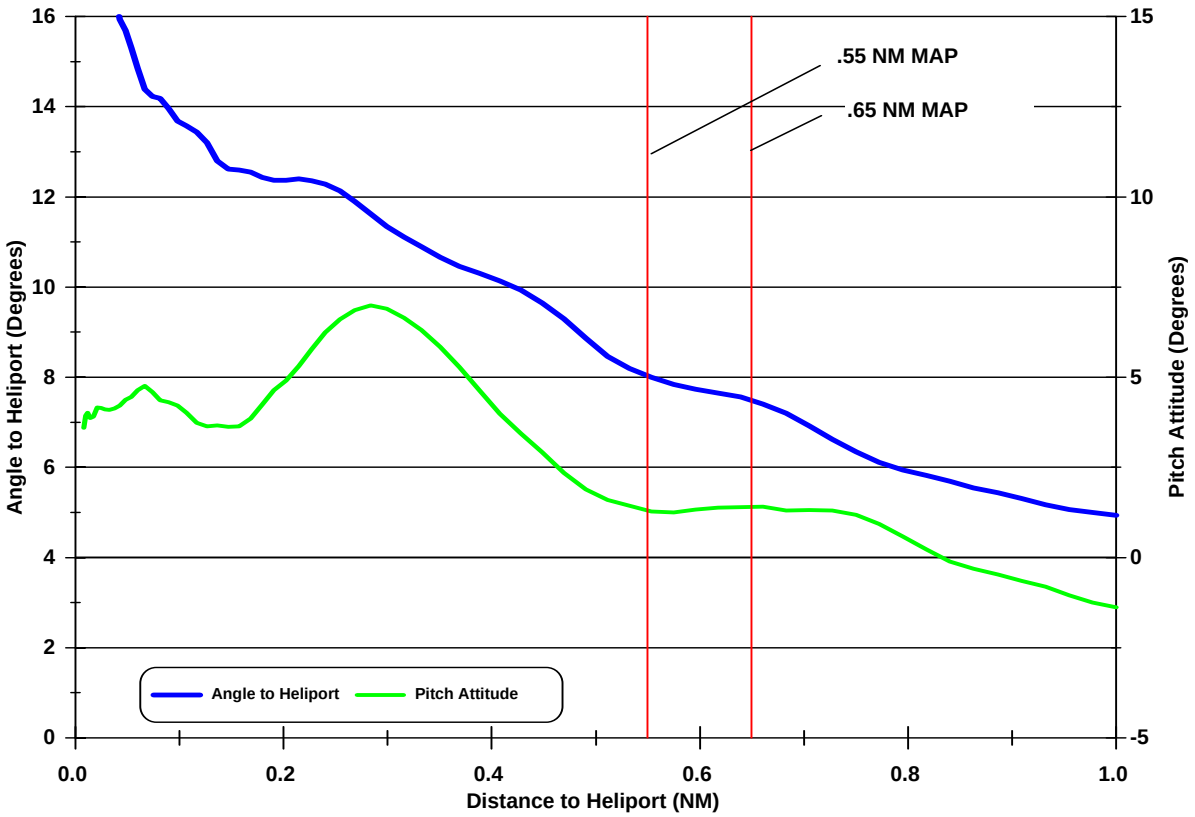
Profile View
Pilot P10 - 05/08/06B003 - Appr. #09X



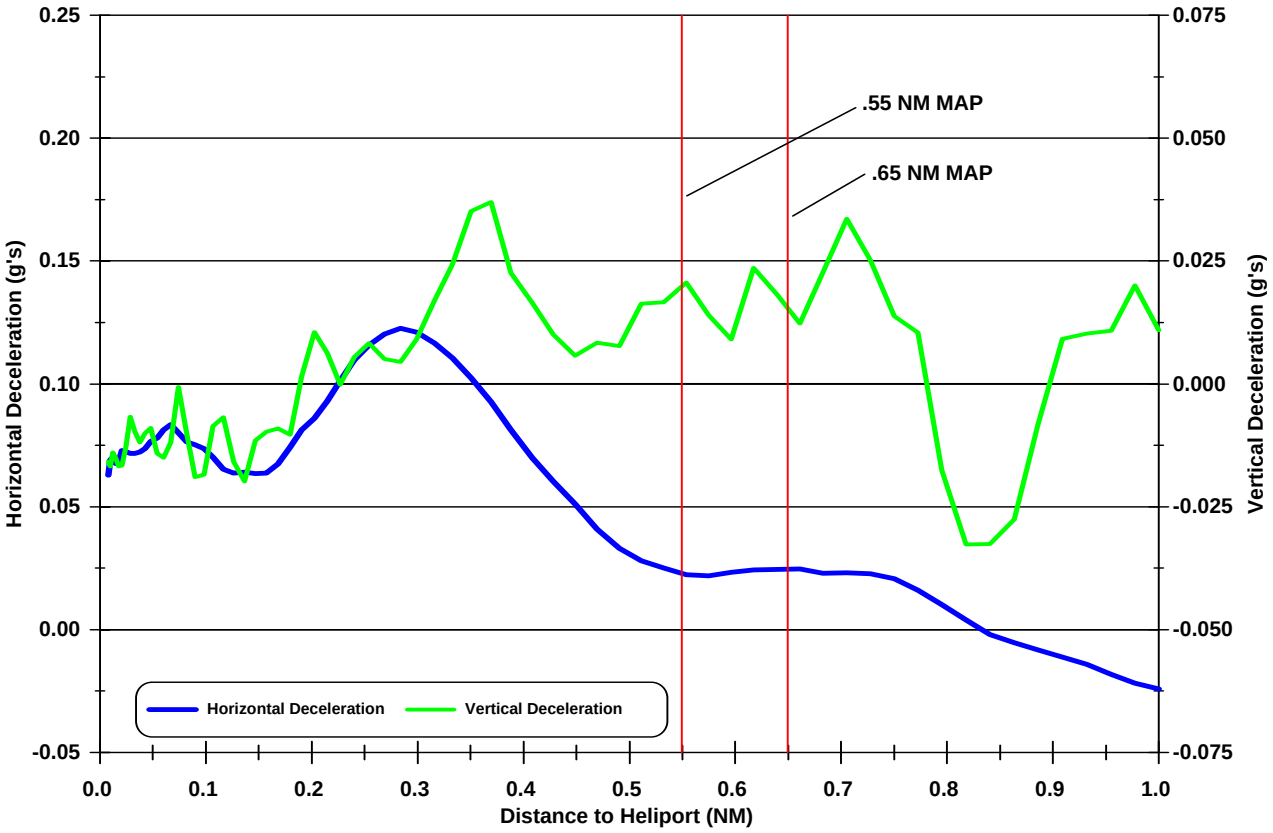
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06B003 - Appr. #09X

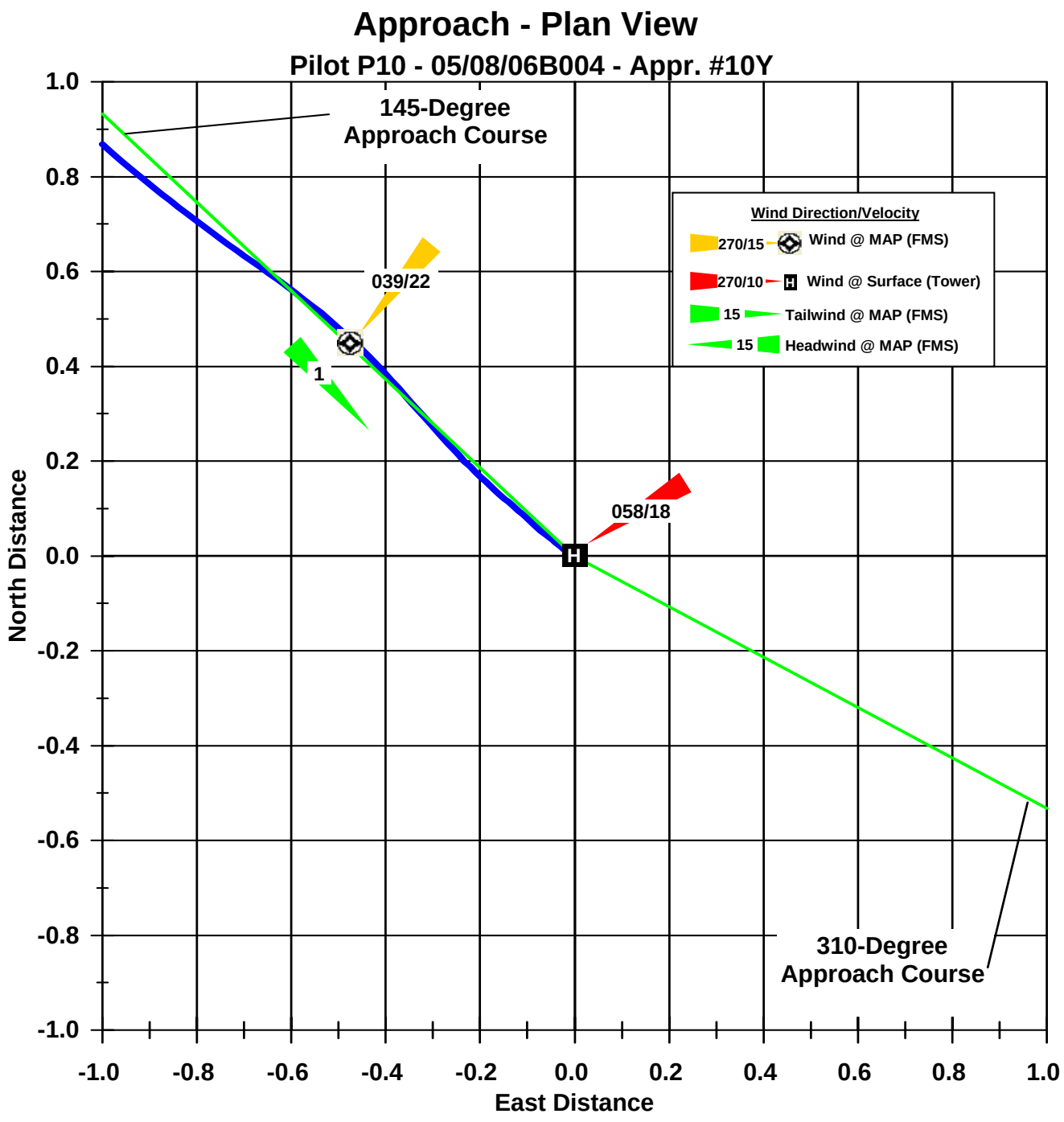


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06B003 - Appr. #09X

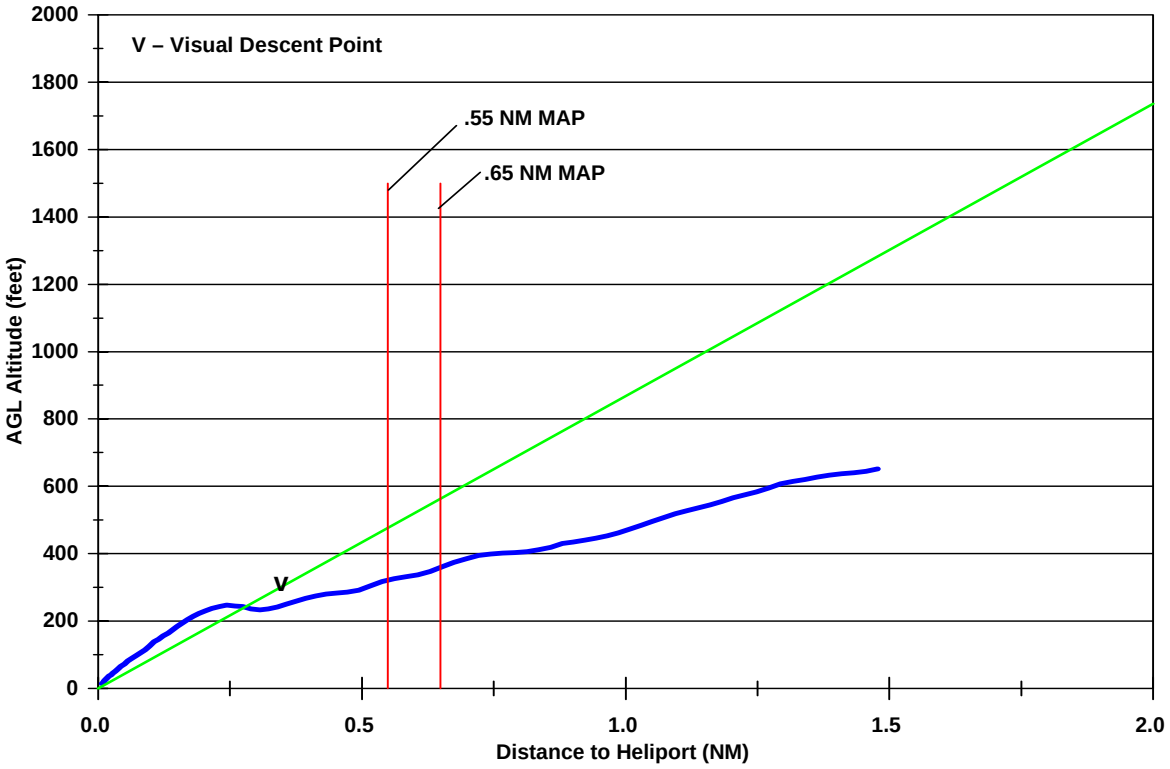


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06B003 - Appr. #09X

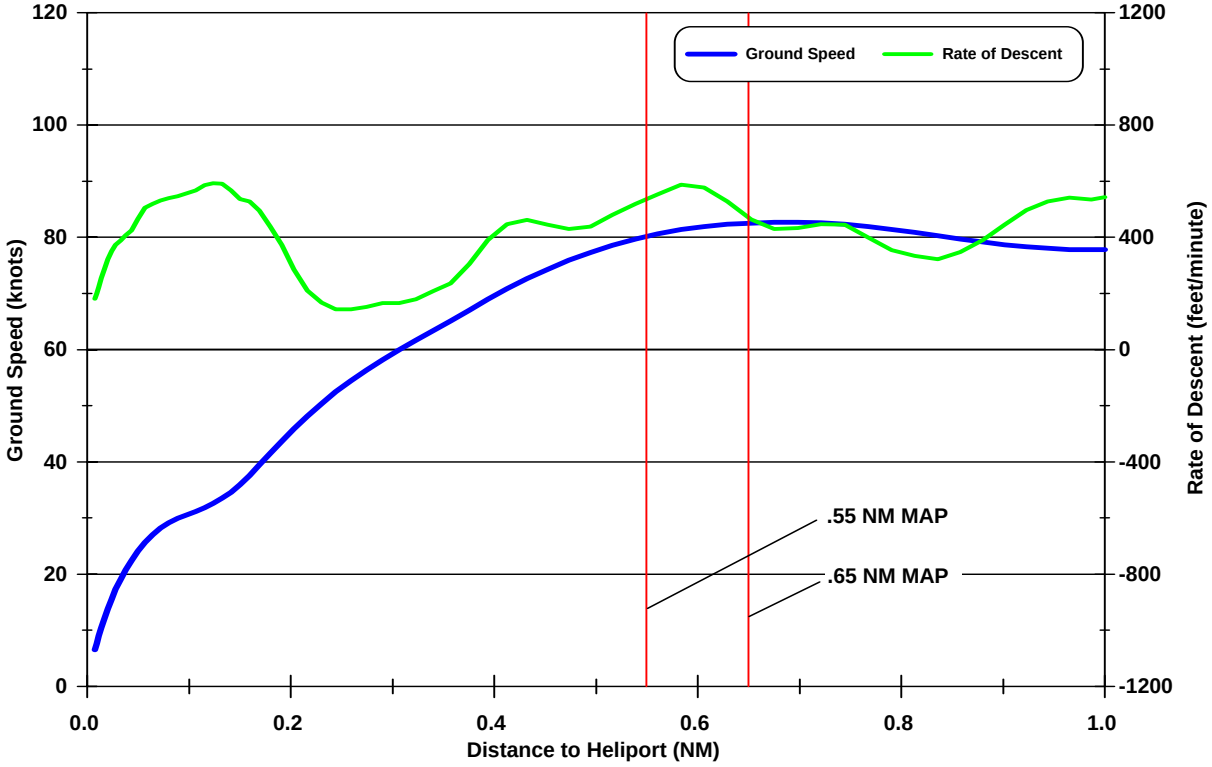



Approach - Plan View
Pilot P10 - 05/08/06B004 - Appr. #10Y
145-Degree
Approach Course
310-Degree
Approach Course
039/22
058/18
1
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

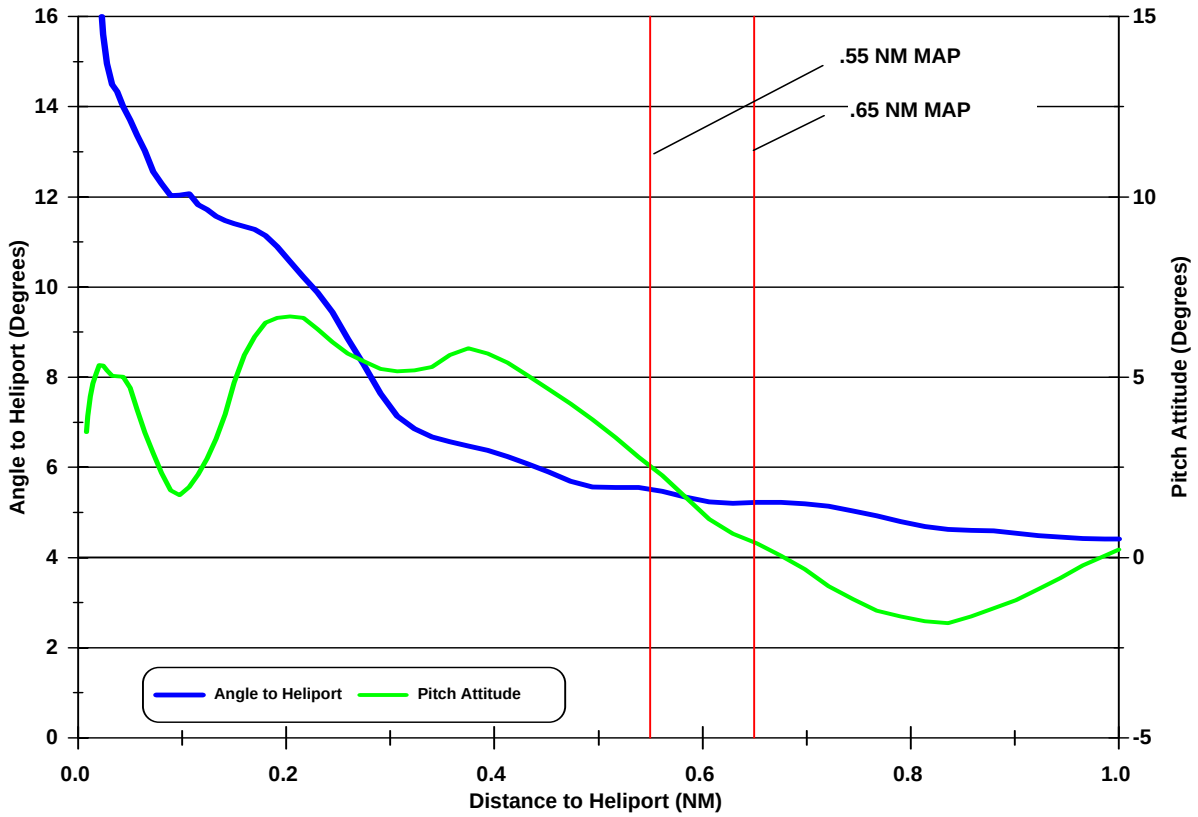
Profile View
Pilot P10 - 05/08/06B004 - Appr. #10Y



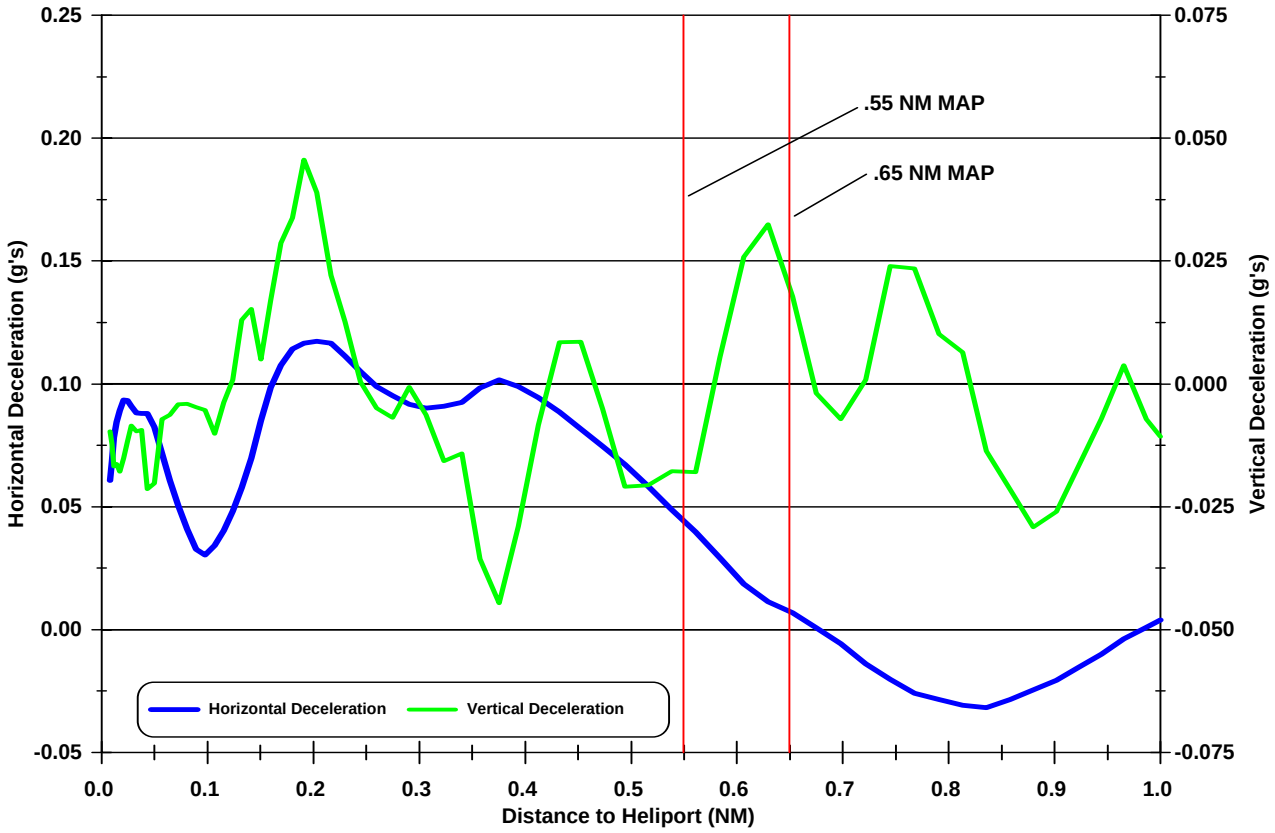
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06B004 - Appr. #10Y

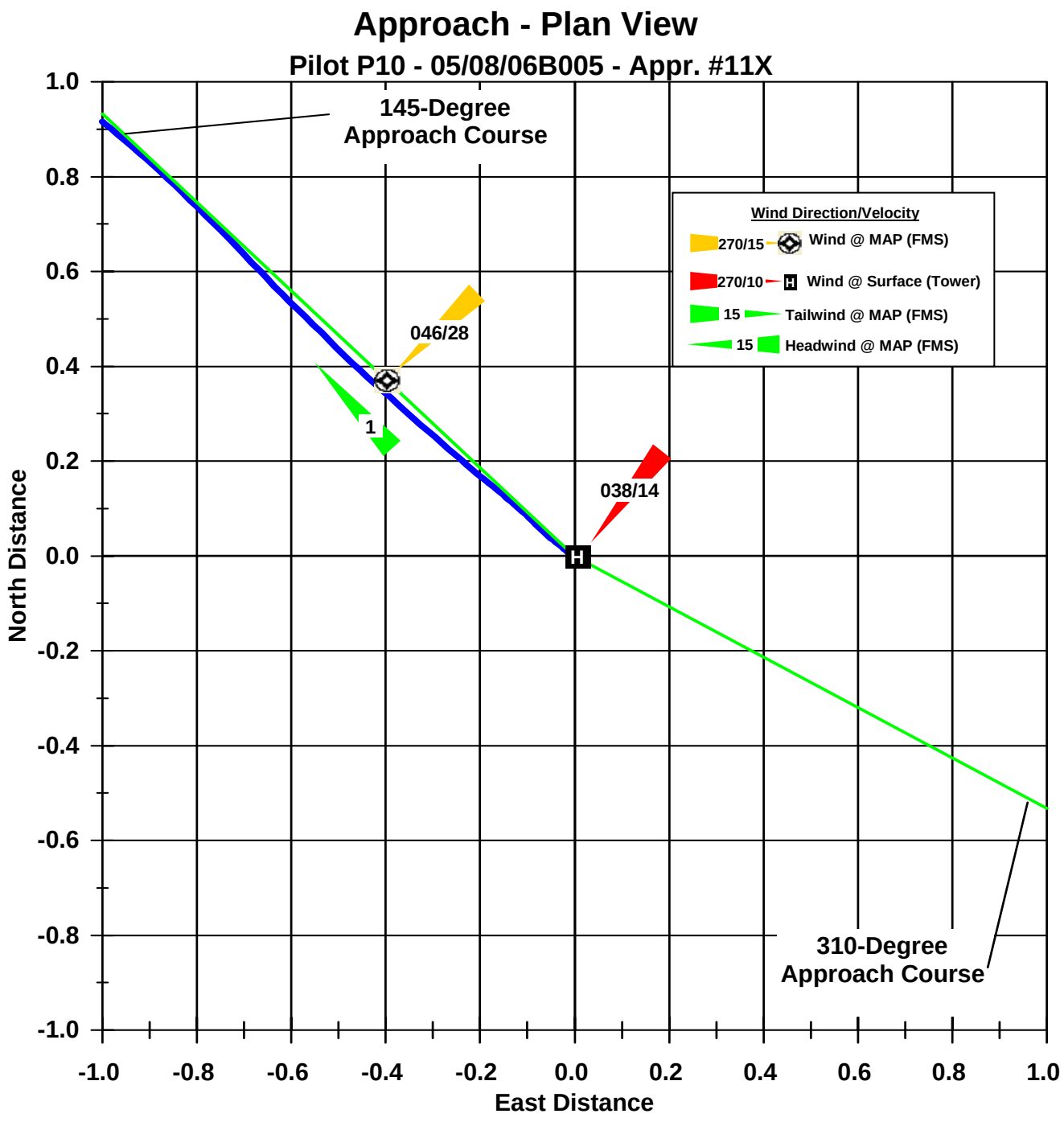


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06B004 - Appr. #10Y

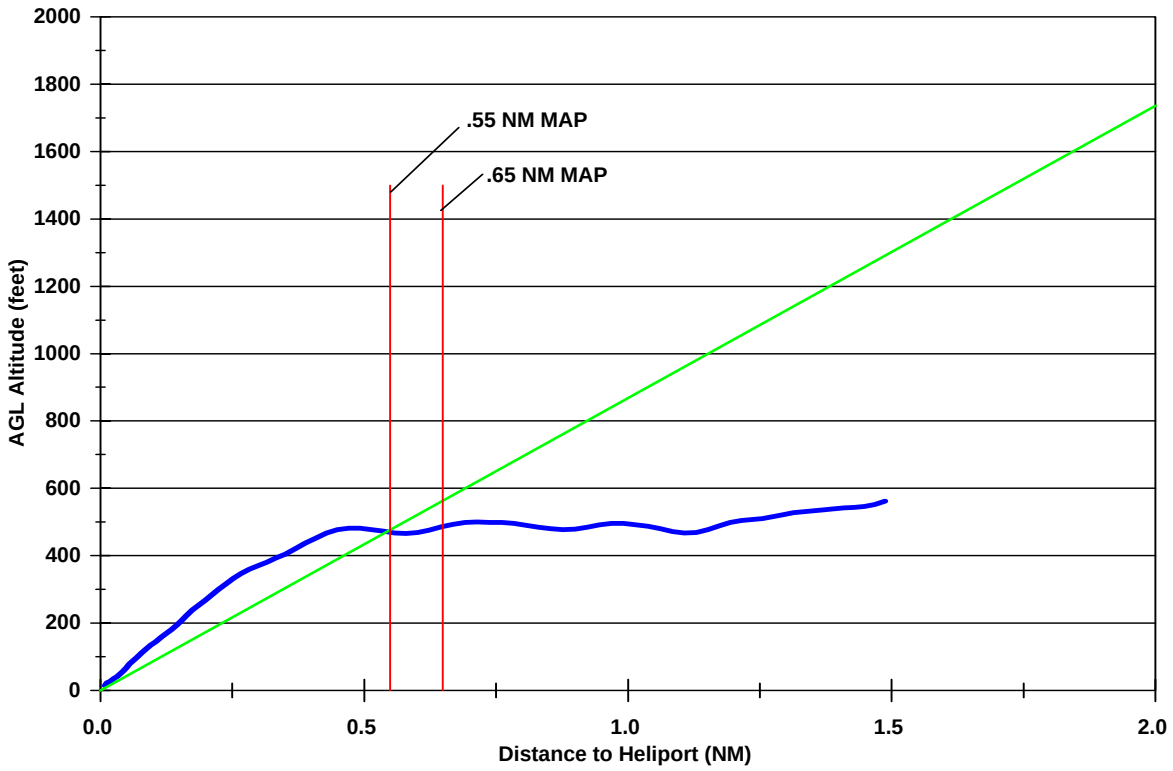


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06B004 - Appr. #10Y

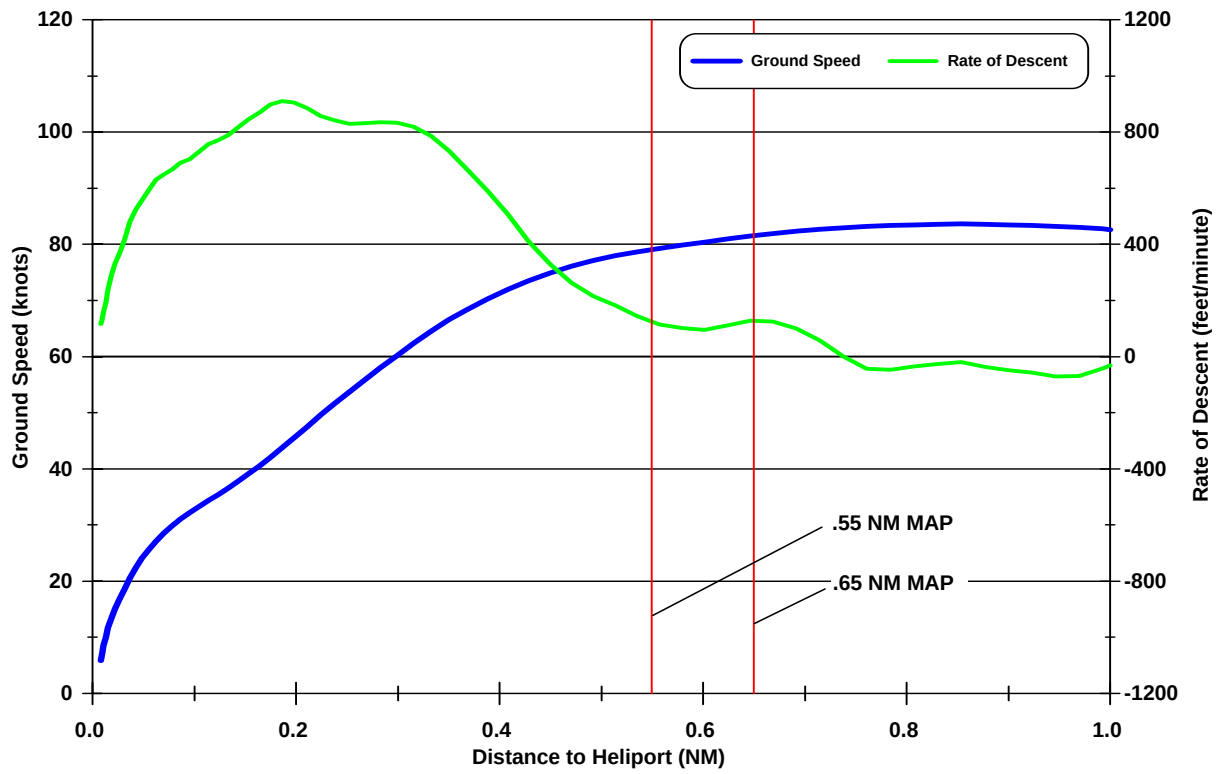



Approach - Plan View
Pilot P10 - 05/08/06B005 - Appr. #11X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
046/28
1
038/14
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

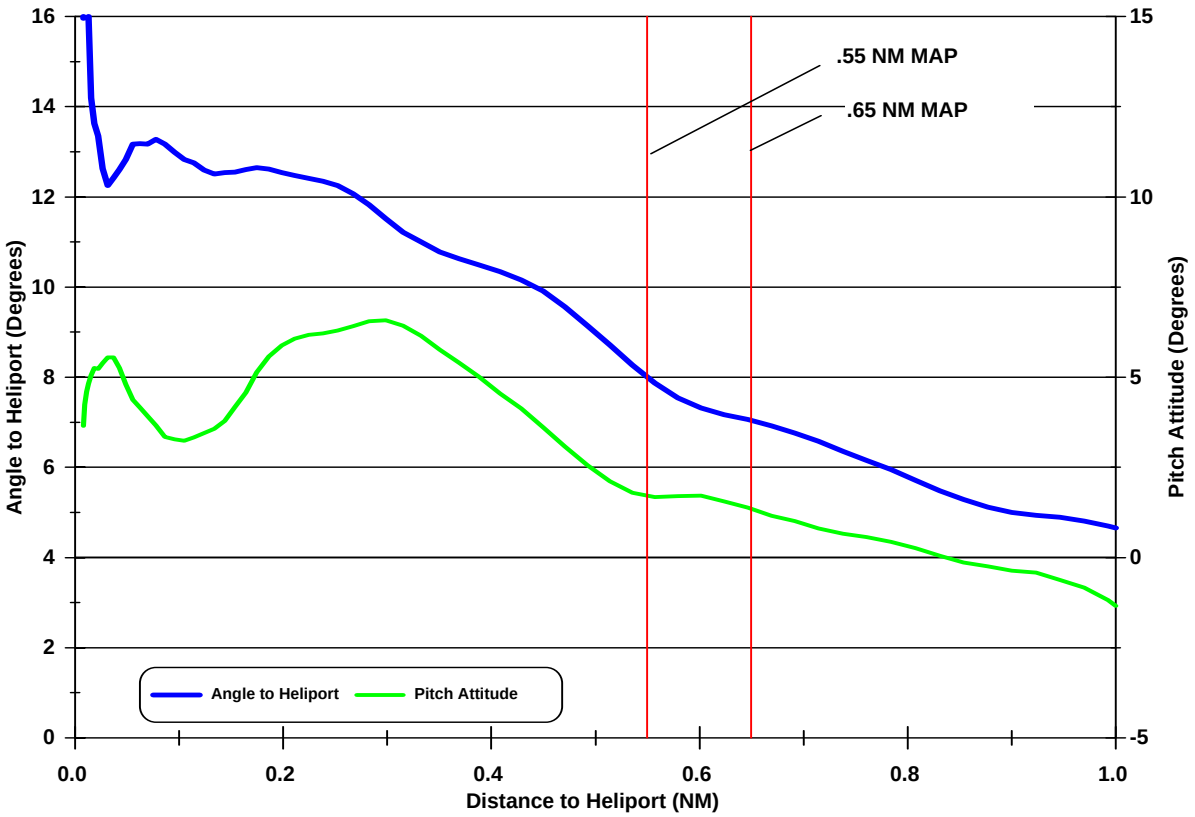
Profile View
Pilot P10 - 05/08/06B005 - Appr. #11X



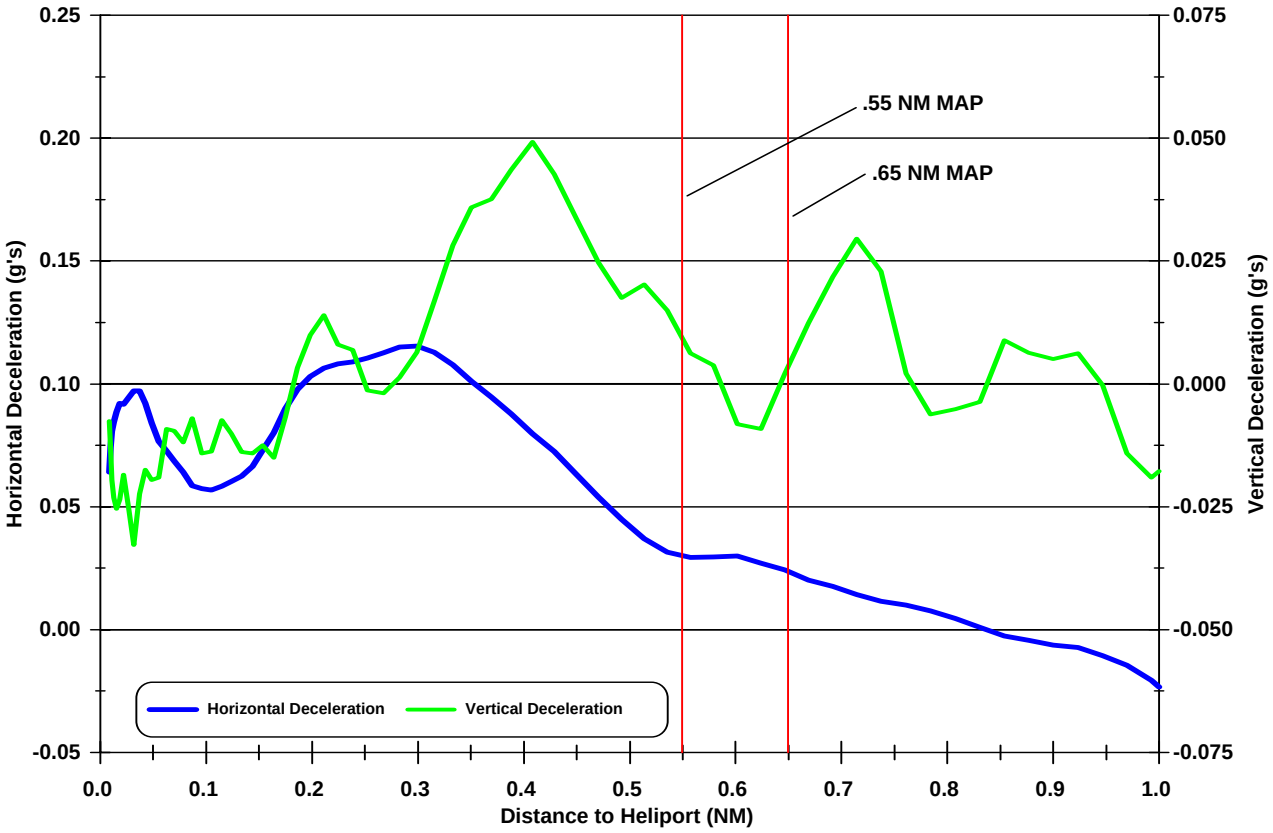
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06B005 - Appr. #11X

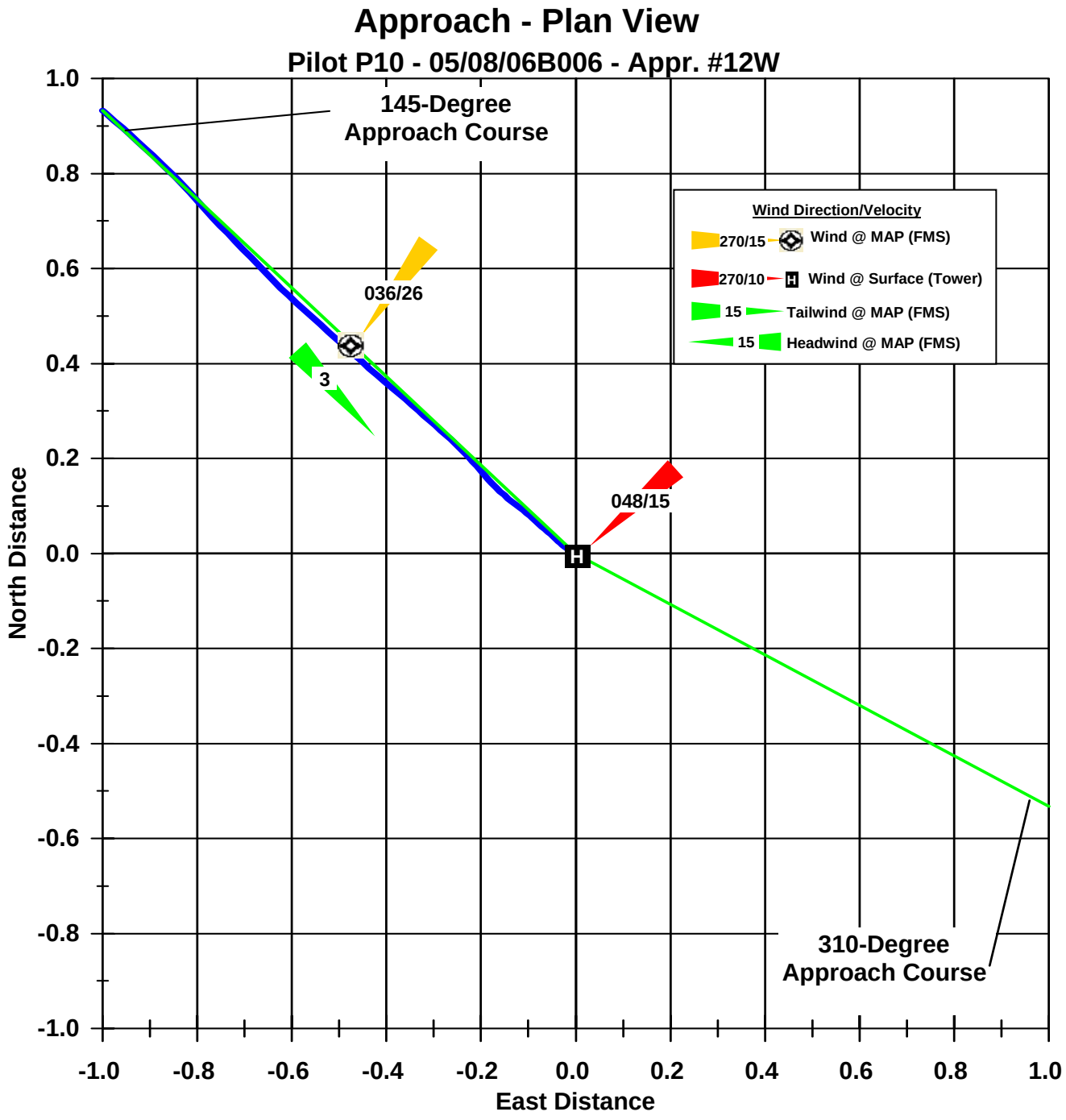


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06B005 - Appr. #11X

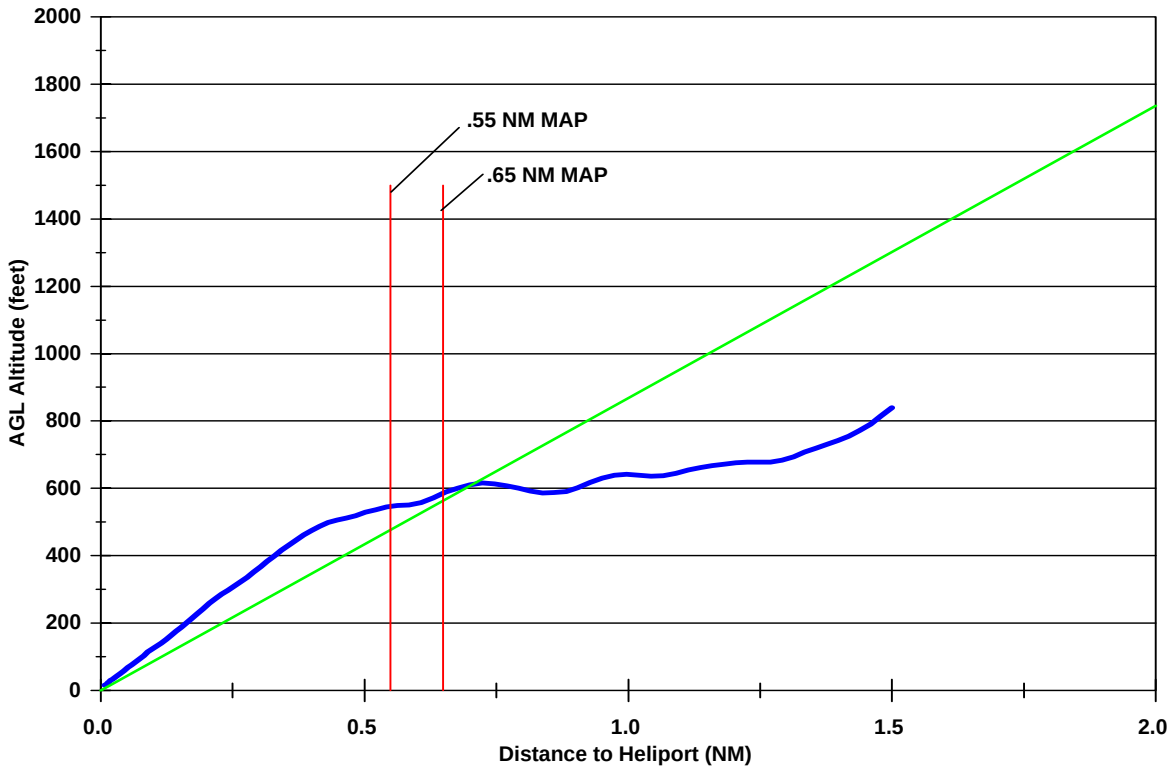


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06B005 - Appr. #11X

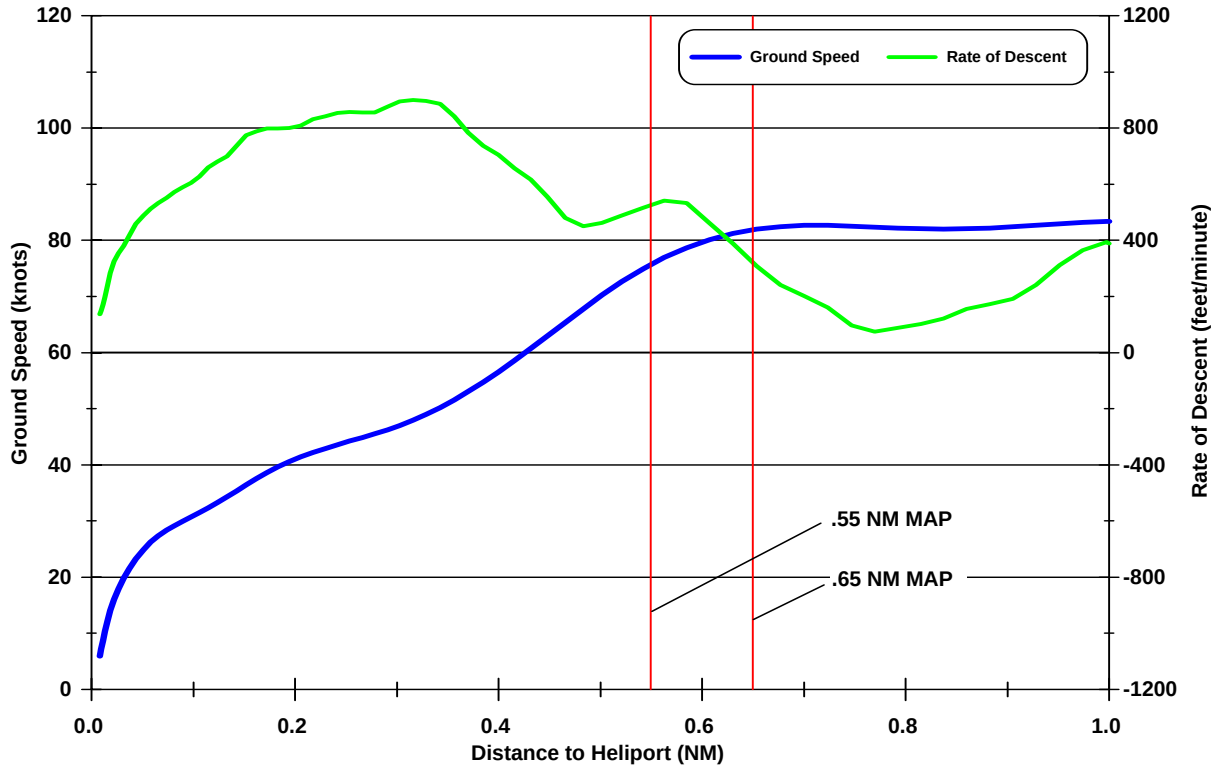



Approach - Plan View
Pilot P10 - 05/08/06B006 - Appr. #12W
145-Degree
Approach Course
310-Degree
Approach Course
036/26
3
048/15
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

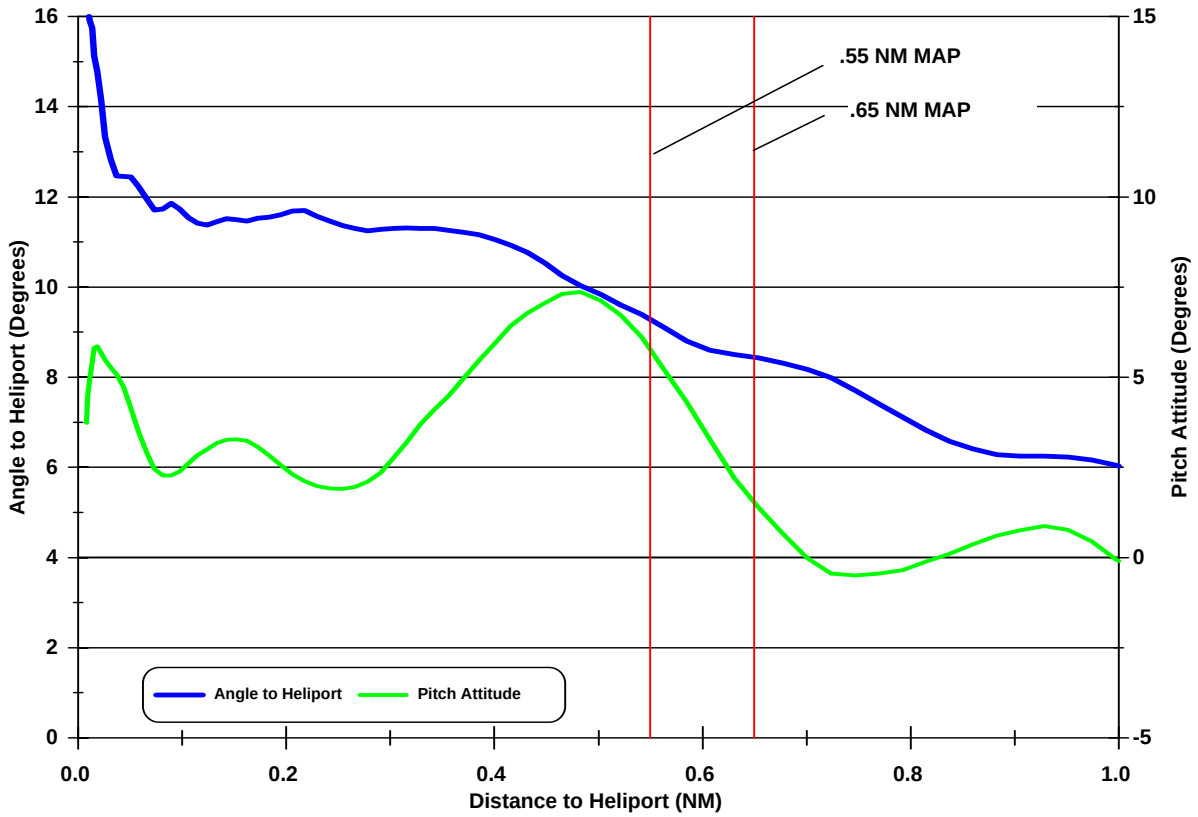
Profile View
Pilot P10 - 05/08/06B006 - Appr. #12W



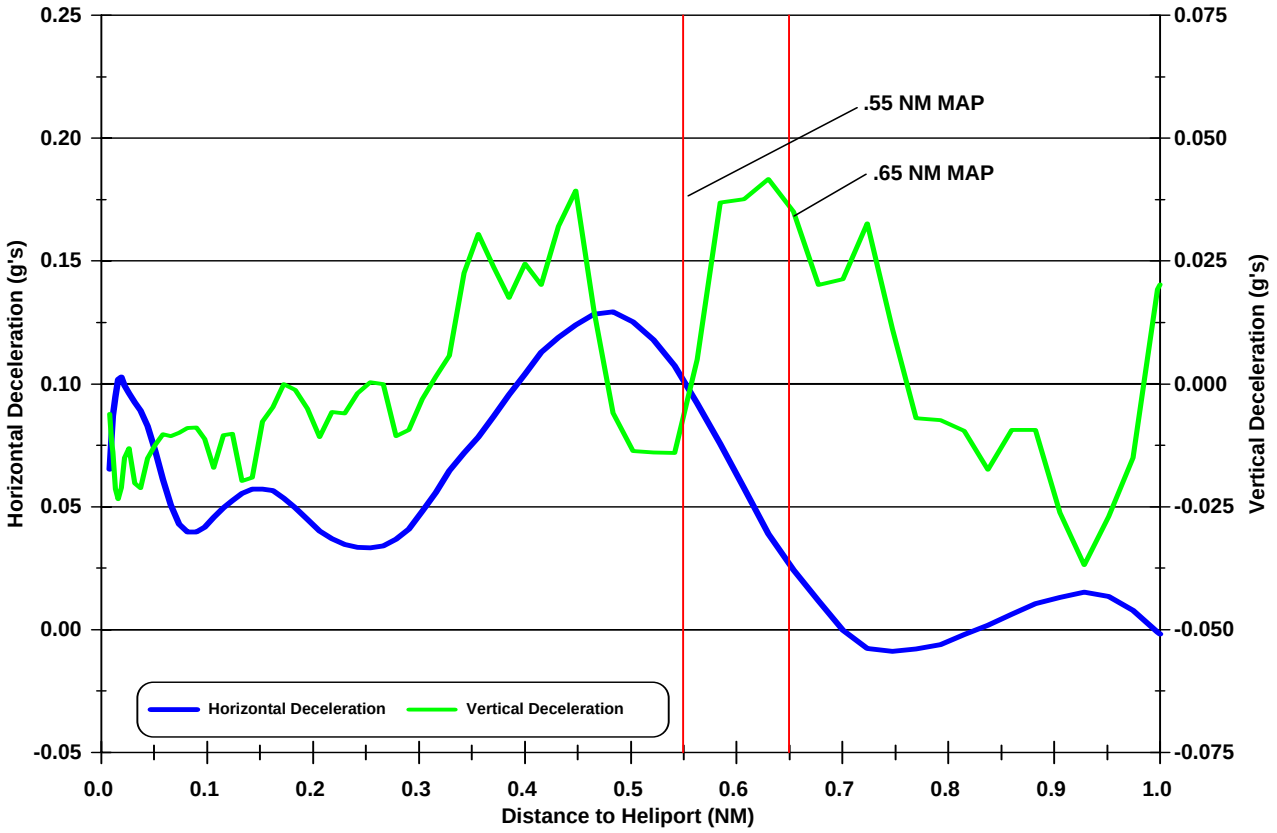
Ground Speed and Rate of Descent
Pilot P10 - 05/08/06B006 - Appr. #12W

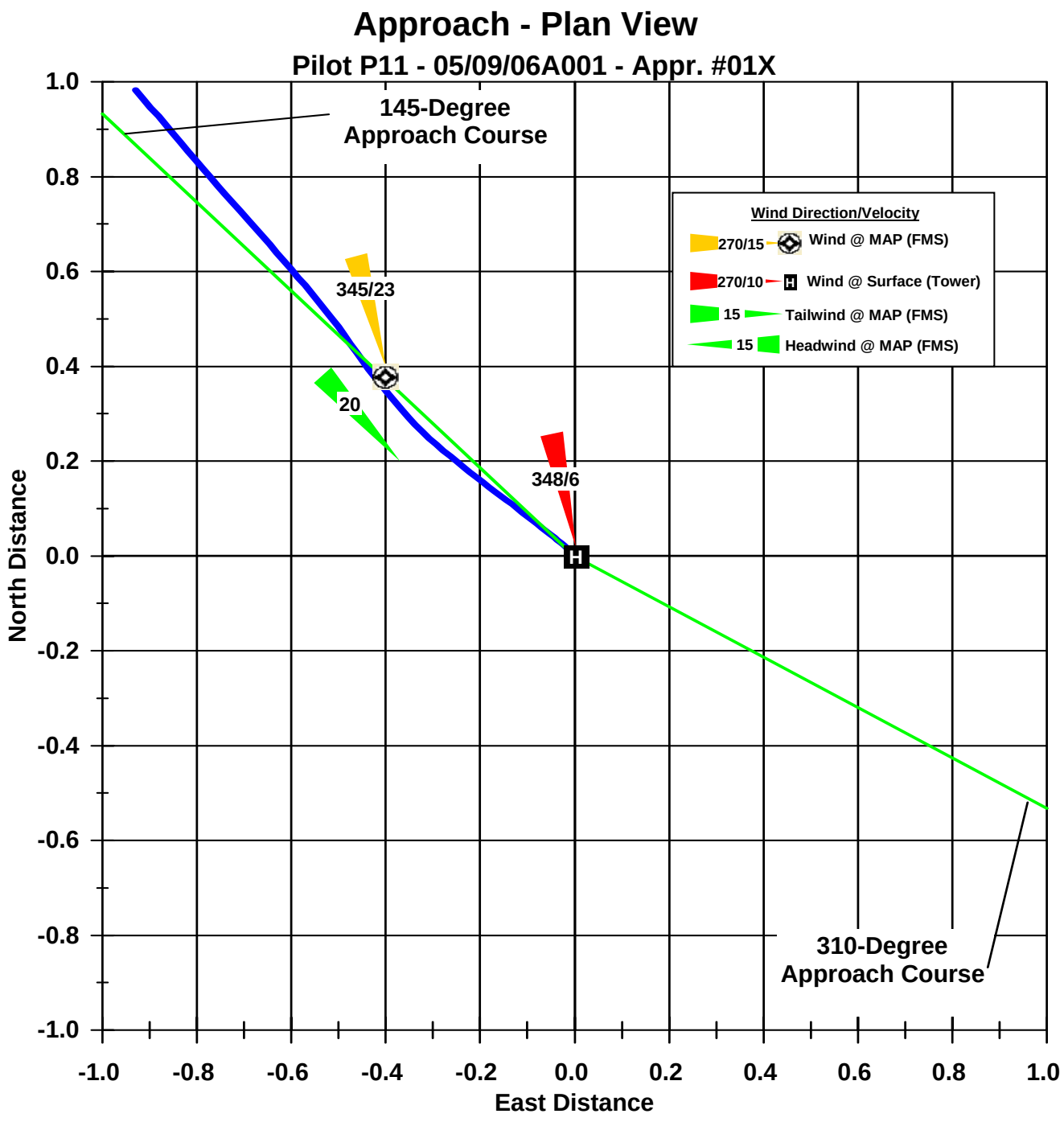


Angle to Heliport and Pitch Attitude
Pilot P10 - 05/08/06B006 - Appr. #12W

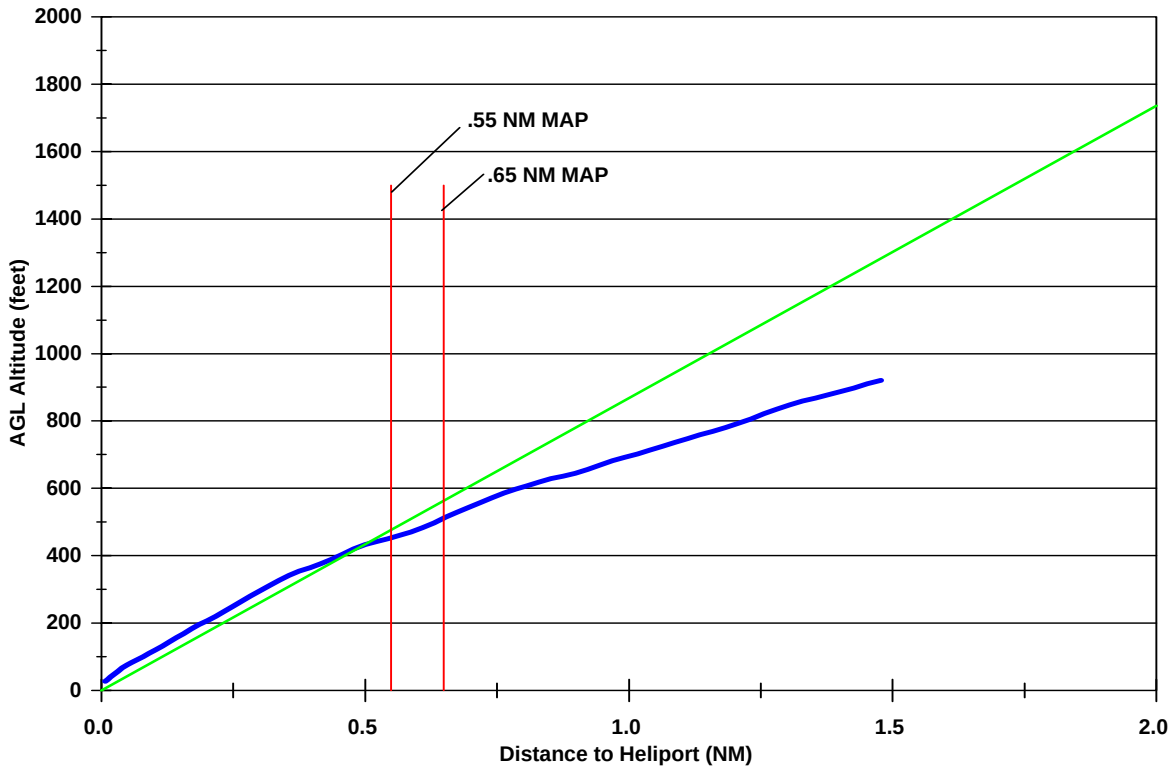


Horizontal and Vertical Deceleration
Pilot P10 - 05/08/06B006 - Appr. #12W

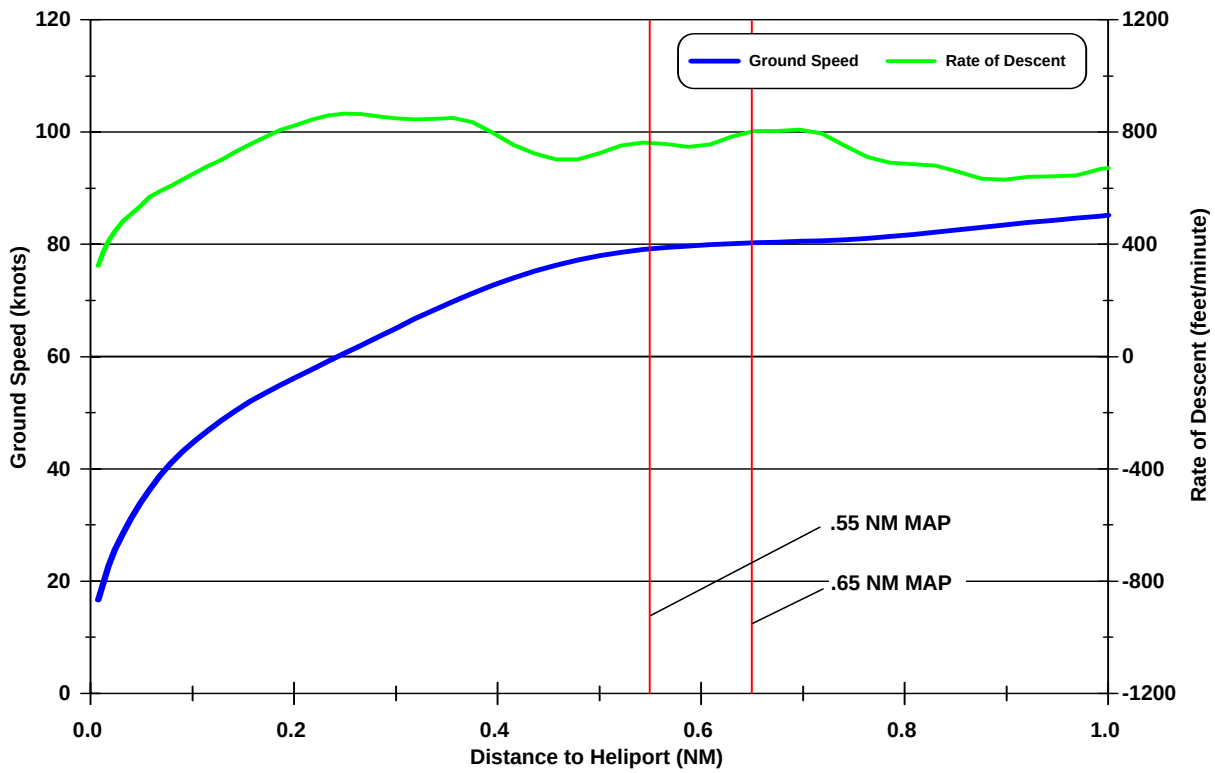



Approach - Plan View
Pilot P11 - 05/09/06A001 - Appr. #01X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
345/23
20
348/6
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

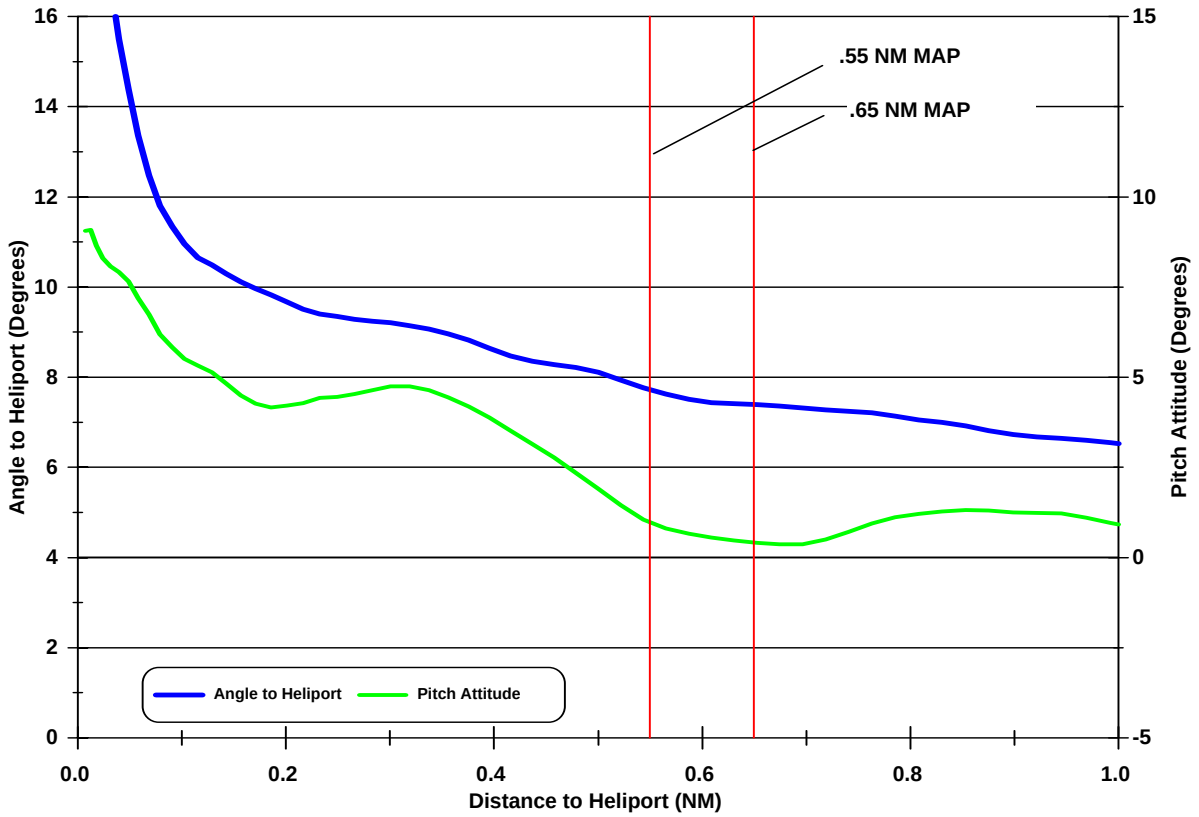
Profile View
Pilot P11 - 05/09/06A001 - Appr. #01X



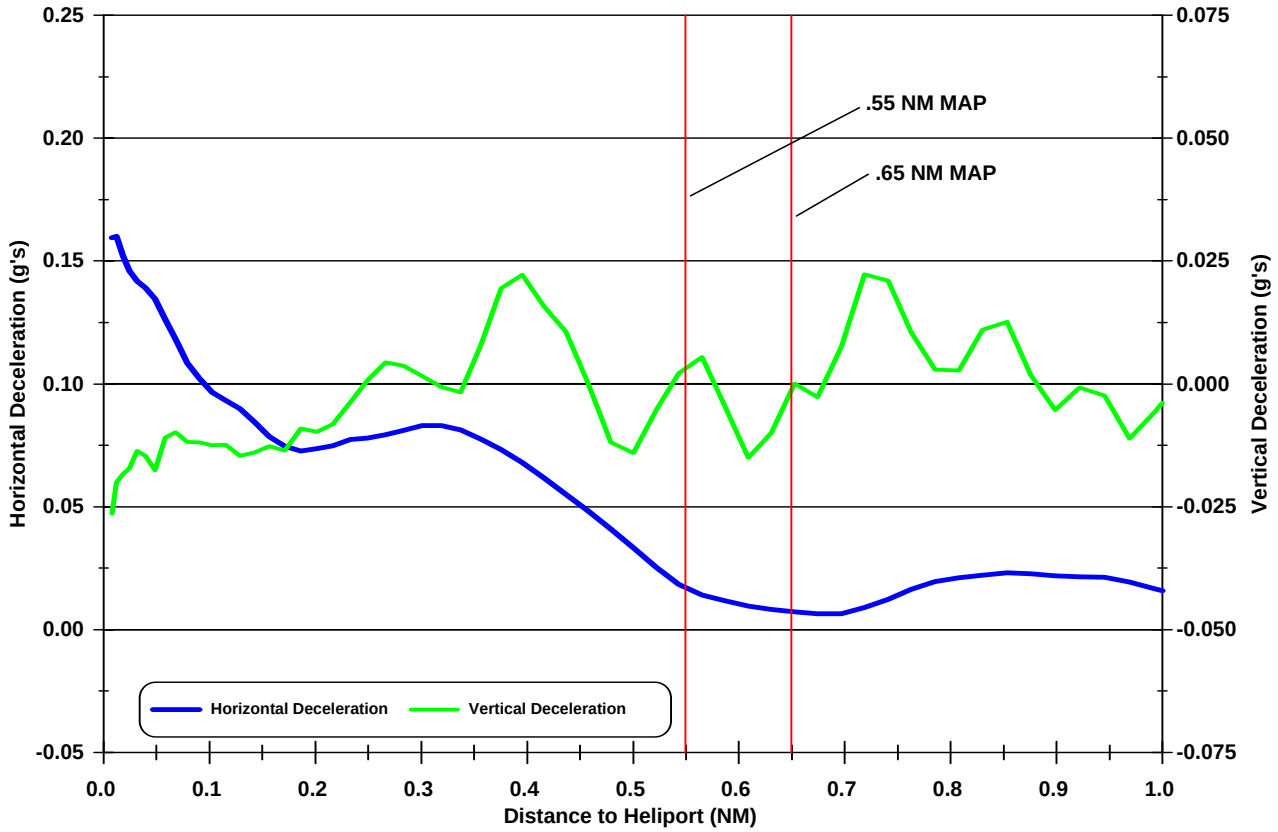
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06A001 - Appr. #01X

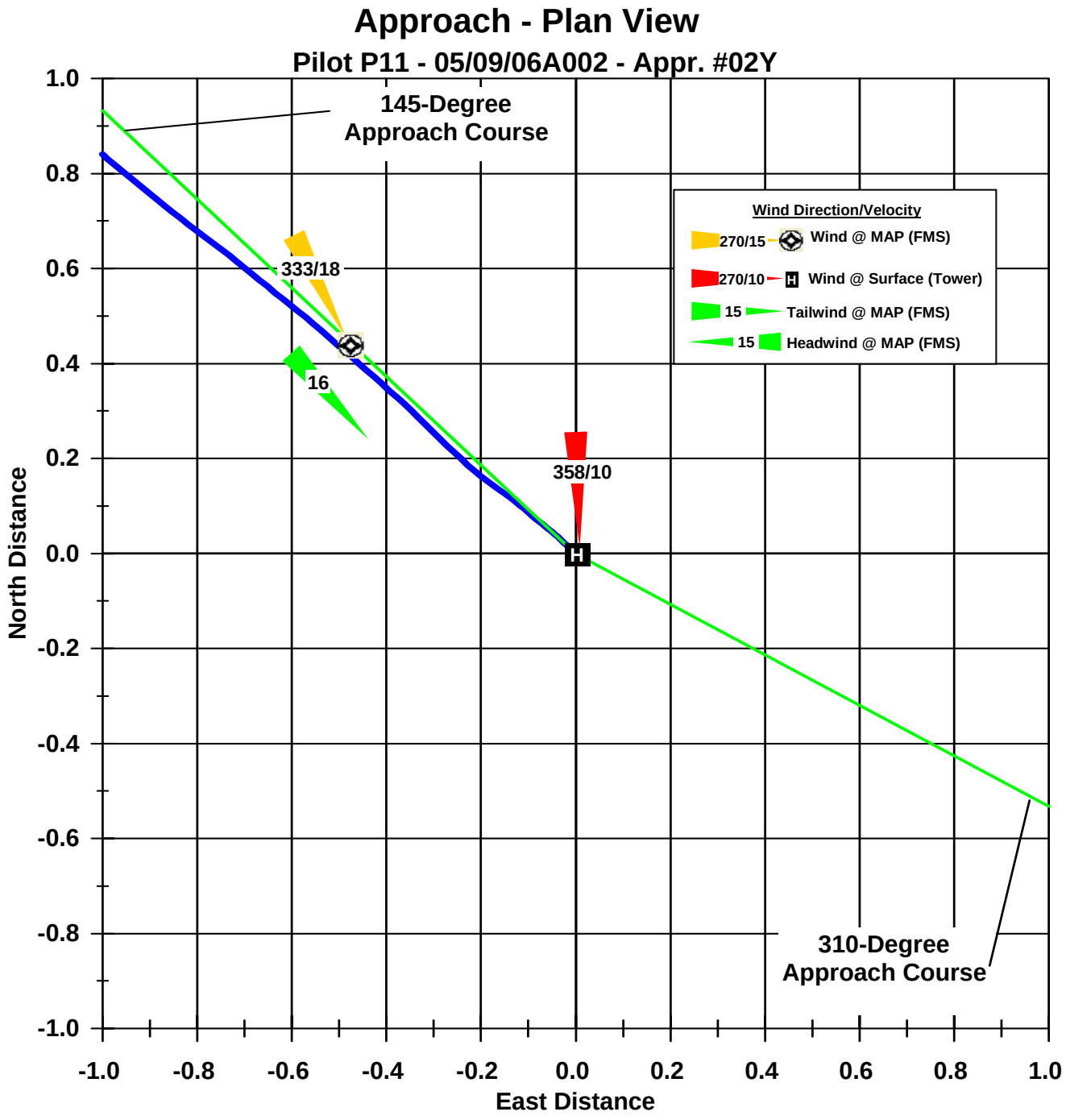


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06A001 - Appr. #01X

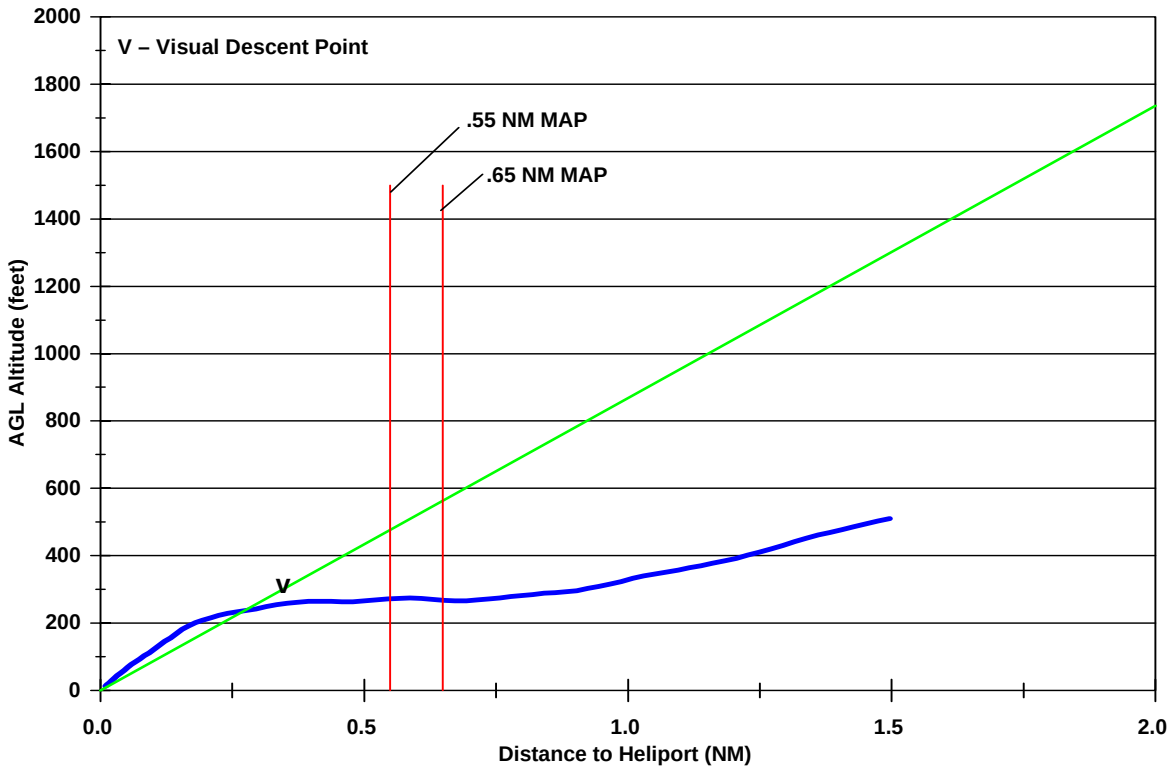


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06A001 - Appr. #01X

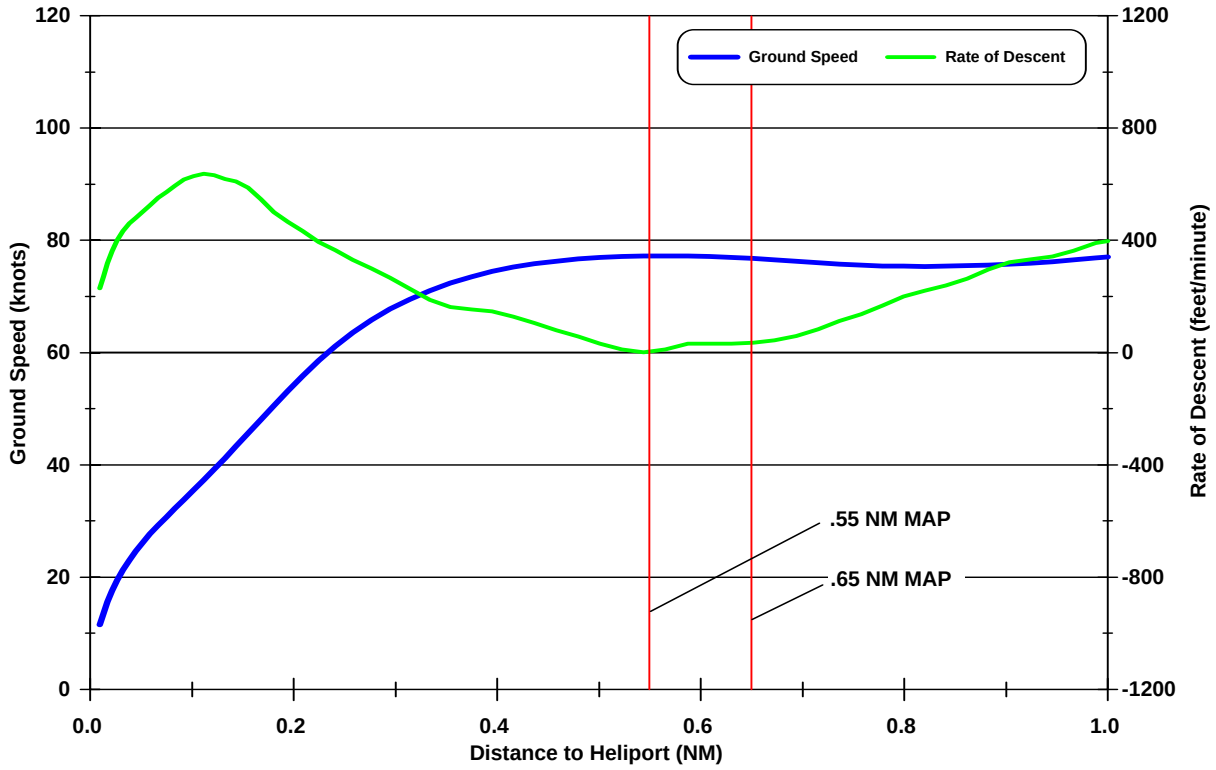



Approach - Plan View
Pilot P11 - 05/09/06A002 - Appr. #02Y
145-Degree
Approach Course
310-Degree
Approach Course
333/18
16
358/10
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

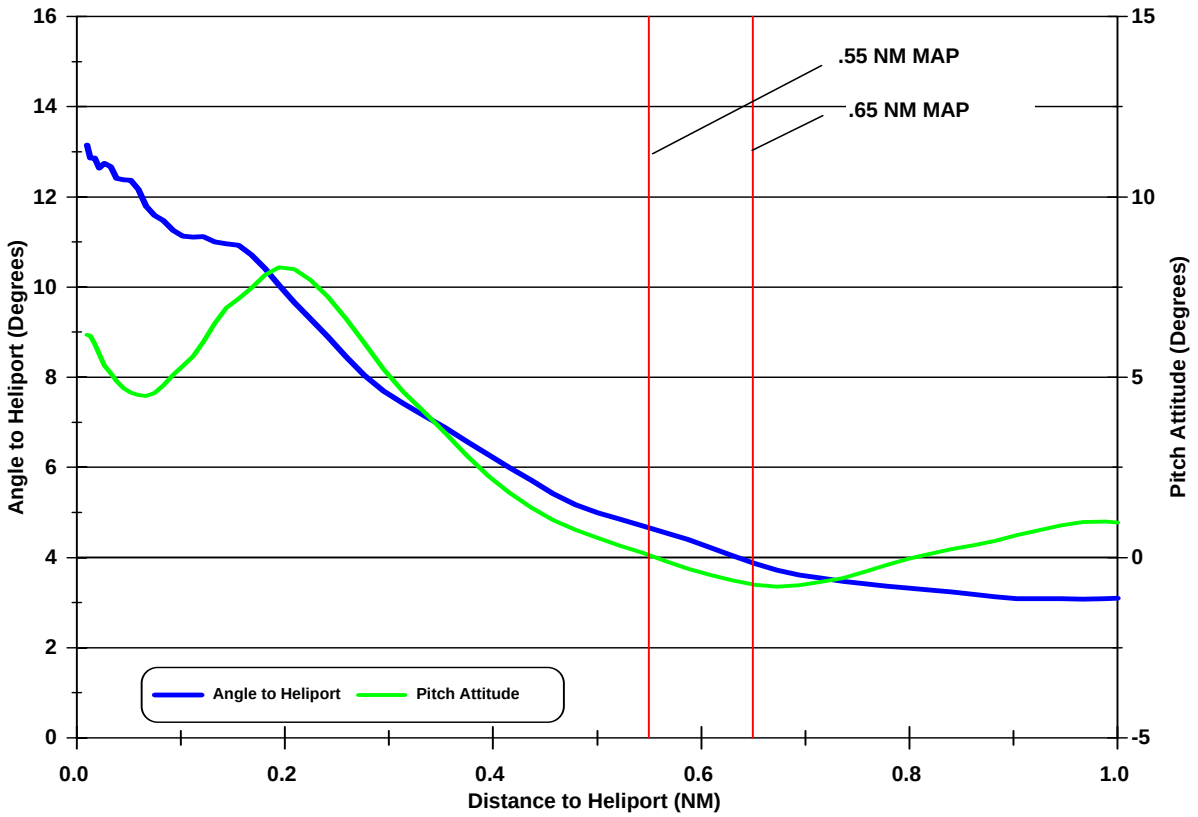
Profile View
Pilot P11 - 05/09/06A002 - Appr. #02Y



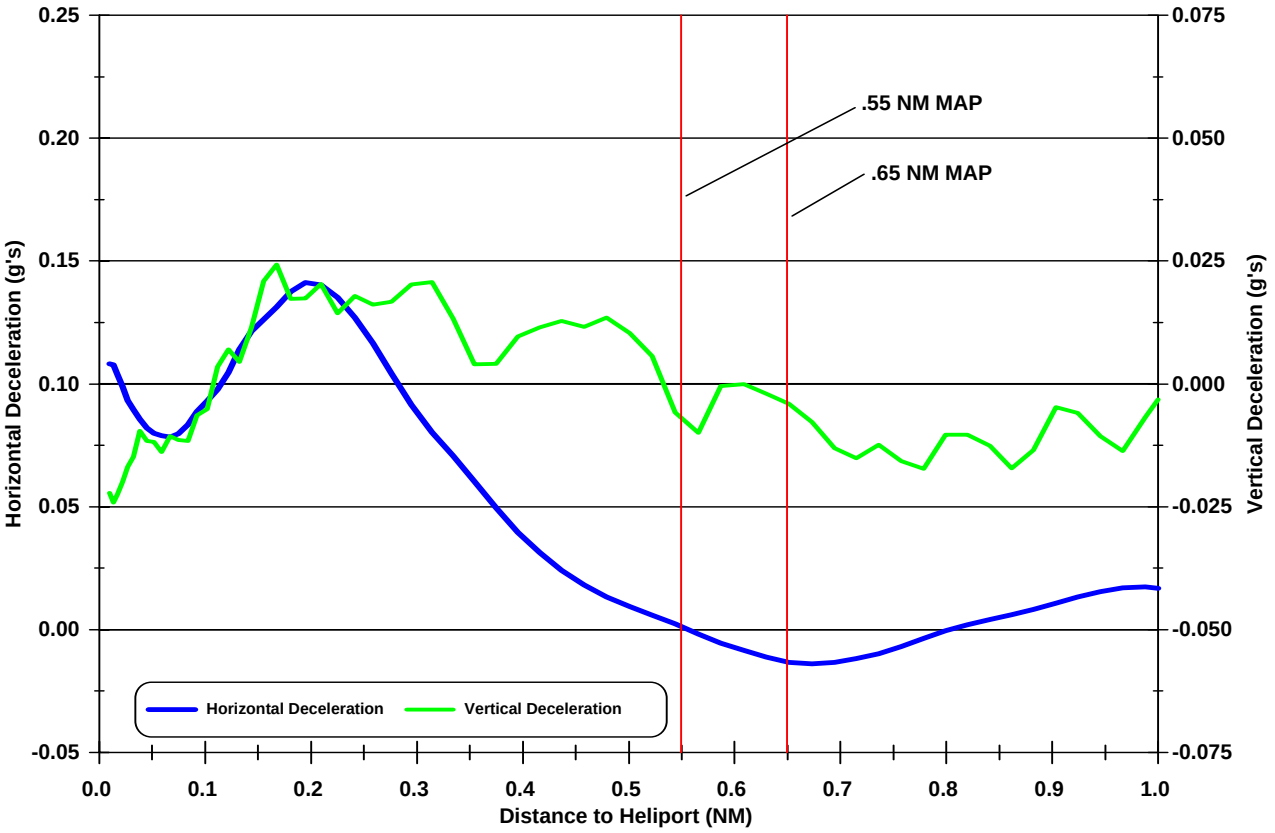
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06A002 - Appr. #02Y

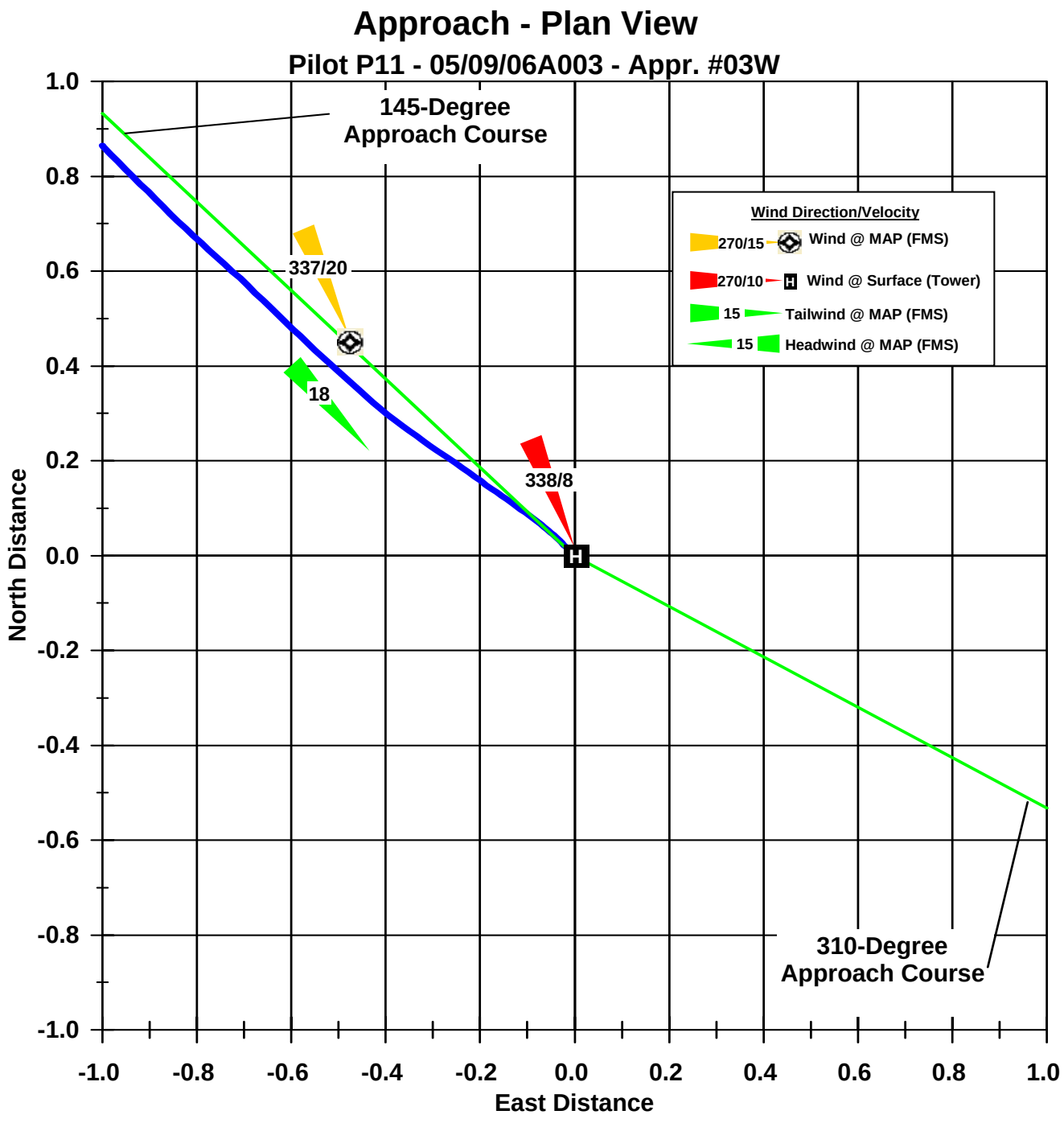


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06A002 - Appr. #02Y

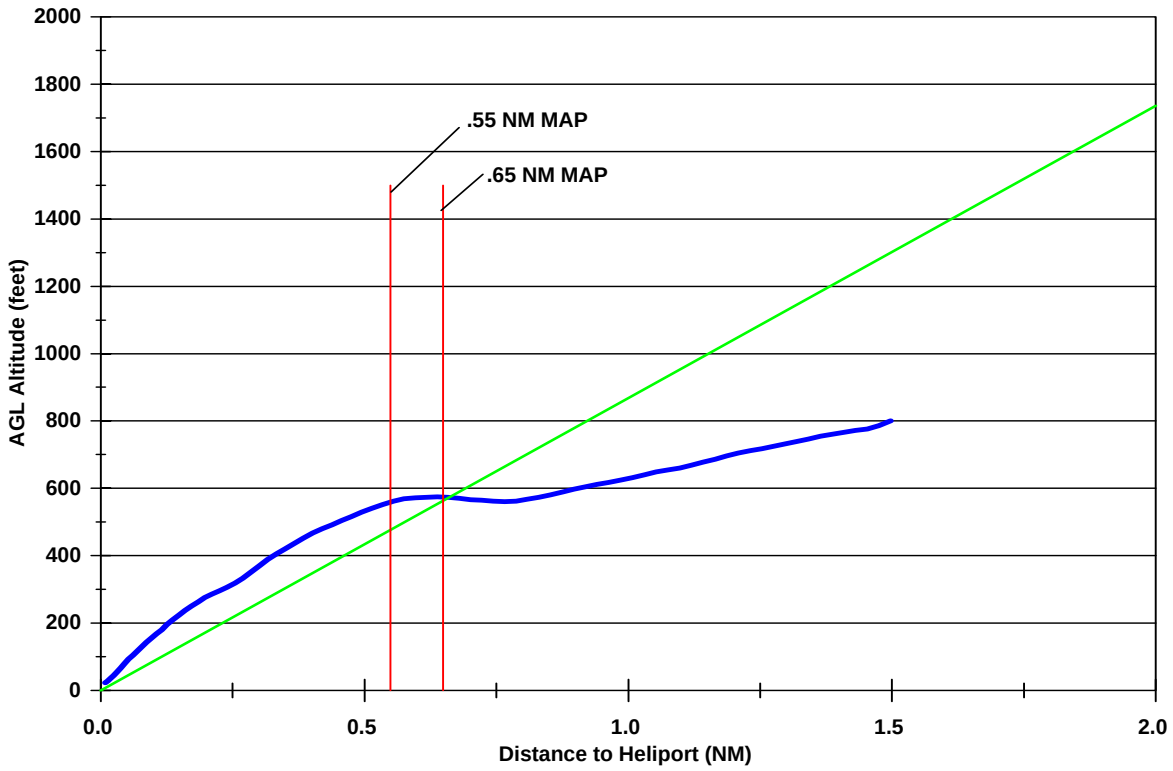


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06A002 - Appr. #02Y

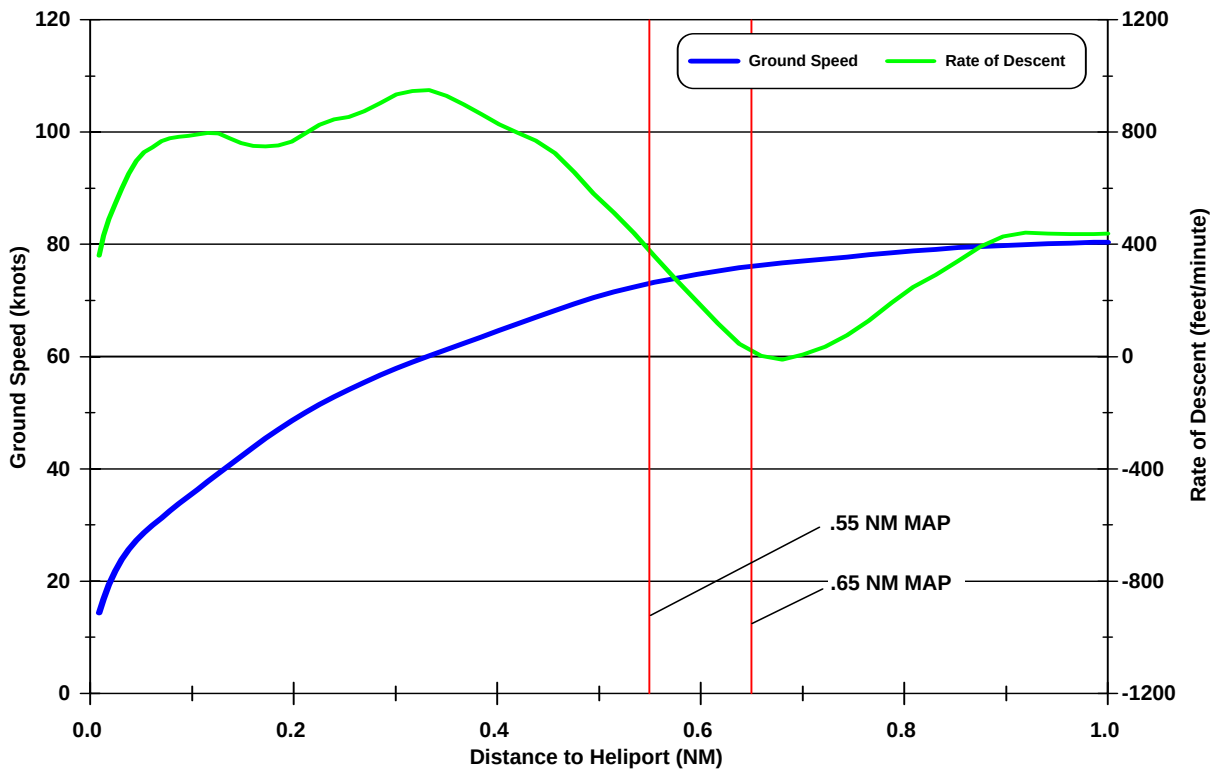



Approach - Plan View
Pilot P11 - 05/09/06A003 - Appr. #03W
145-Degree
Approach Course
310-Degree
Approach Course
337/20
18
338/8
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

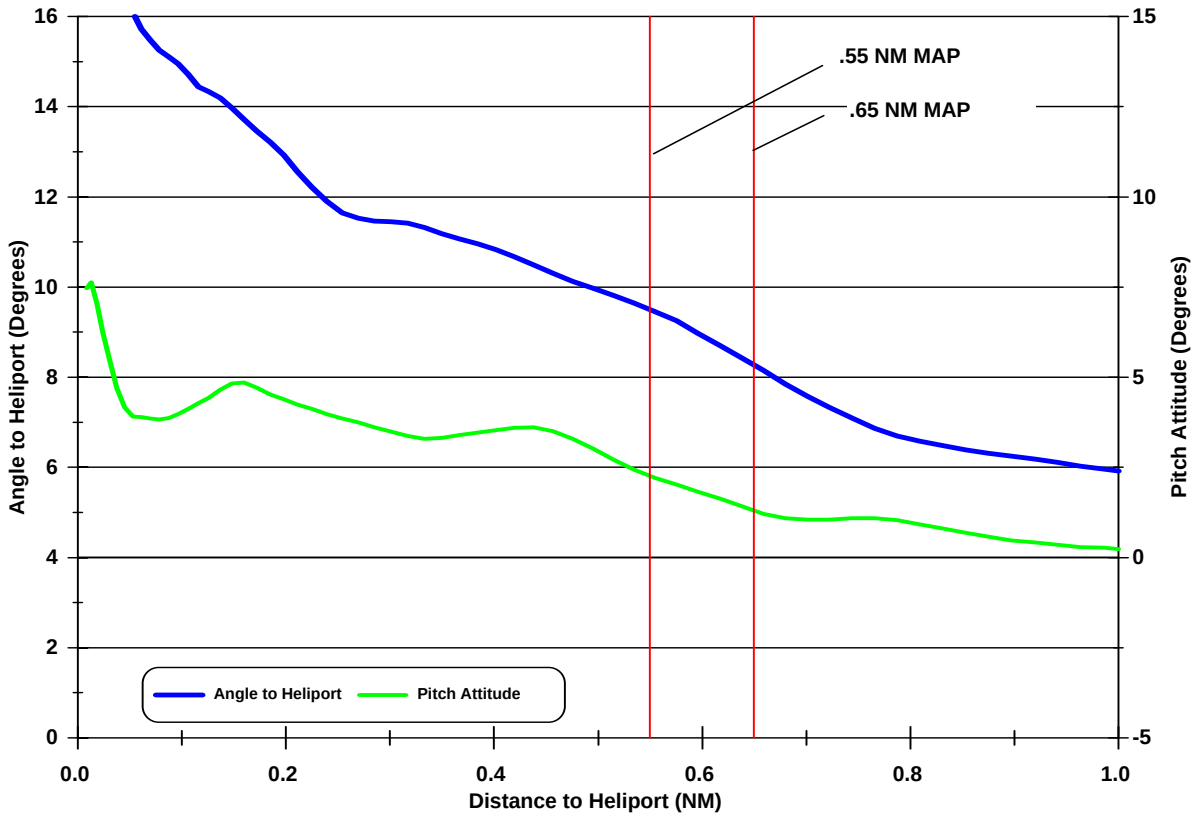
Profile View
Pilot P11 - 05/09/06A003 - Appr. #03W



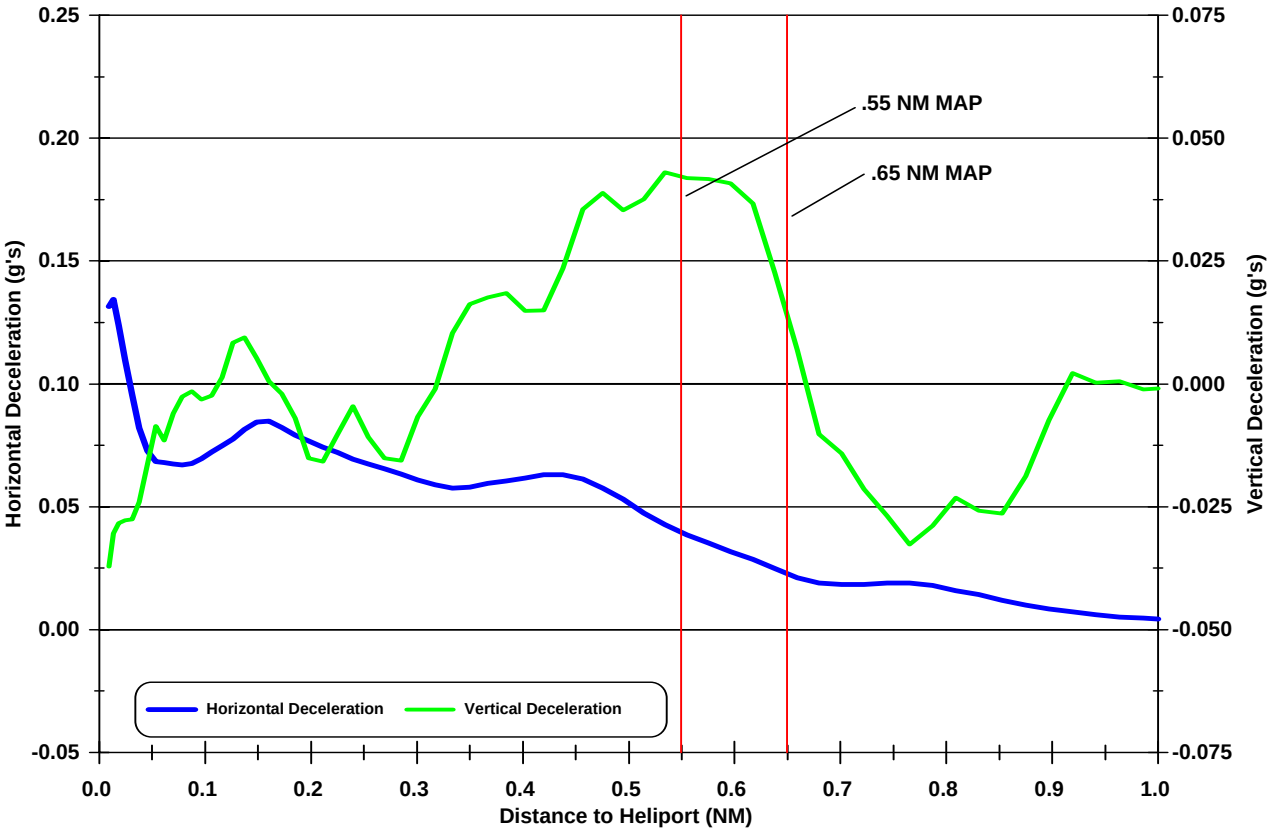
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06A003 - Appr. #03W

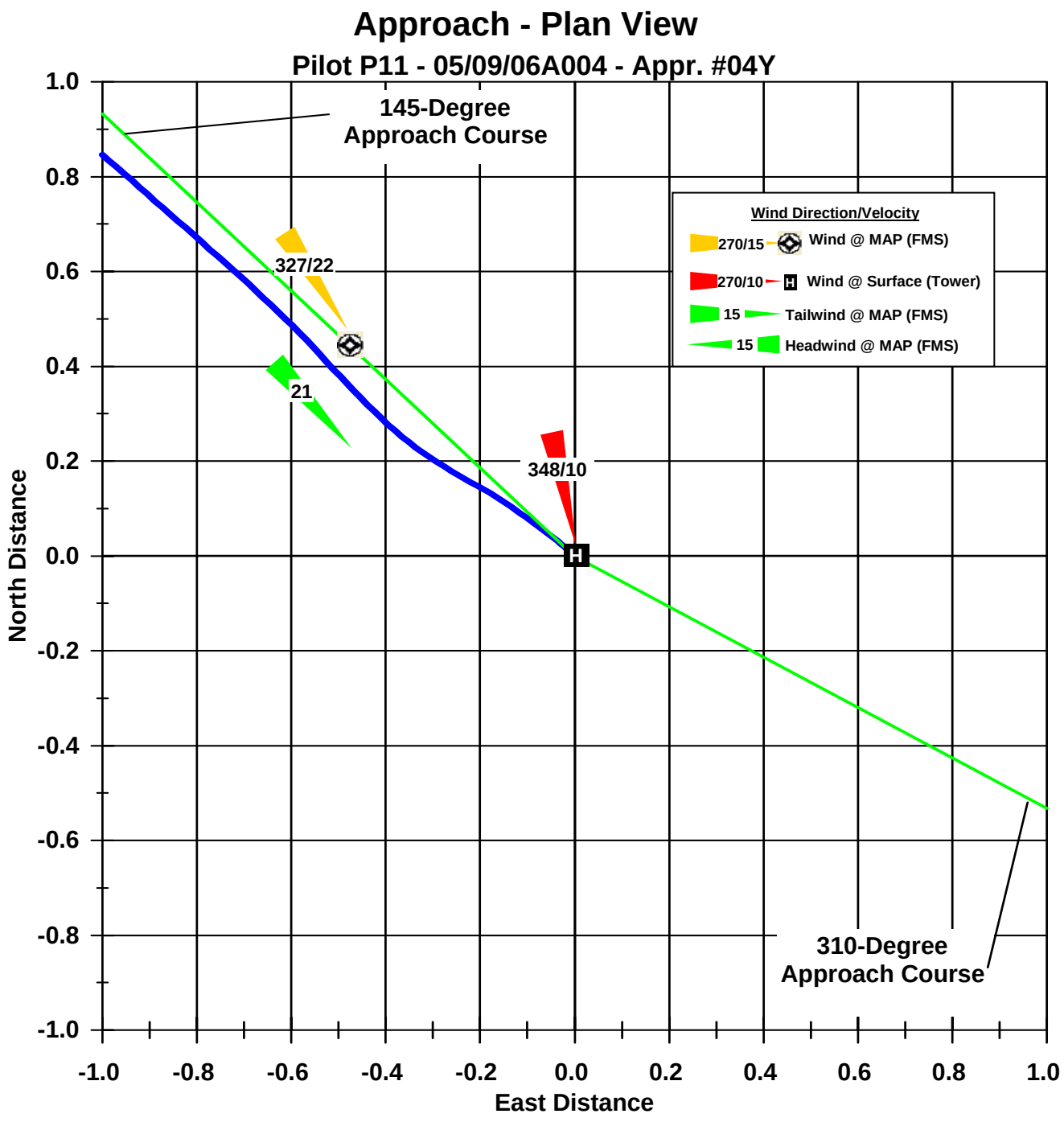


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06A003 - Appr. #03W

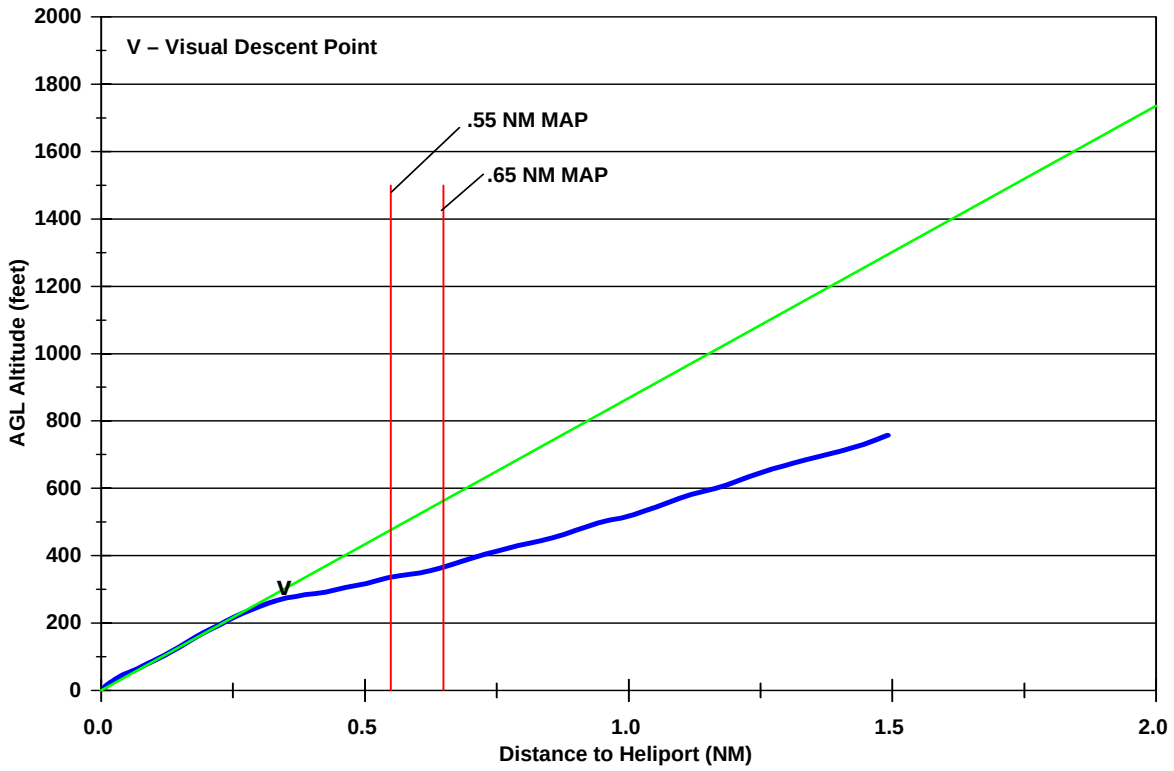


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06A003 - Appr. #03W

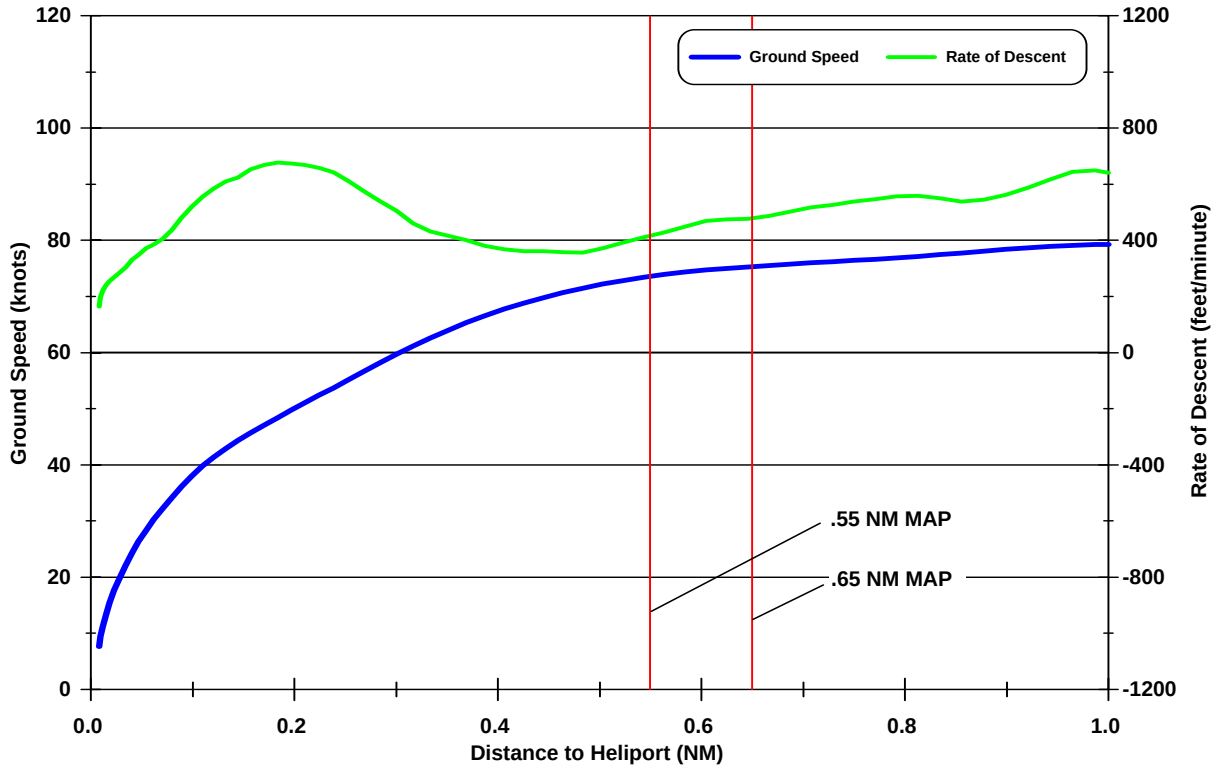



Approach - Plan View
Pilot P11 - 05/09/06A004 - Appr. #04Y
145-Degree
Approach Course
310-Degree
Approach Course
327/22
21
348/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

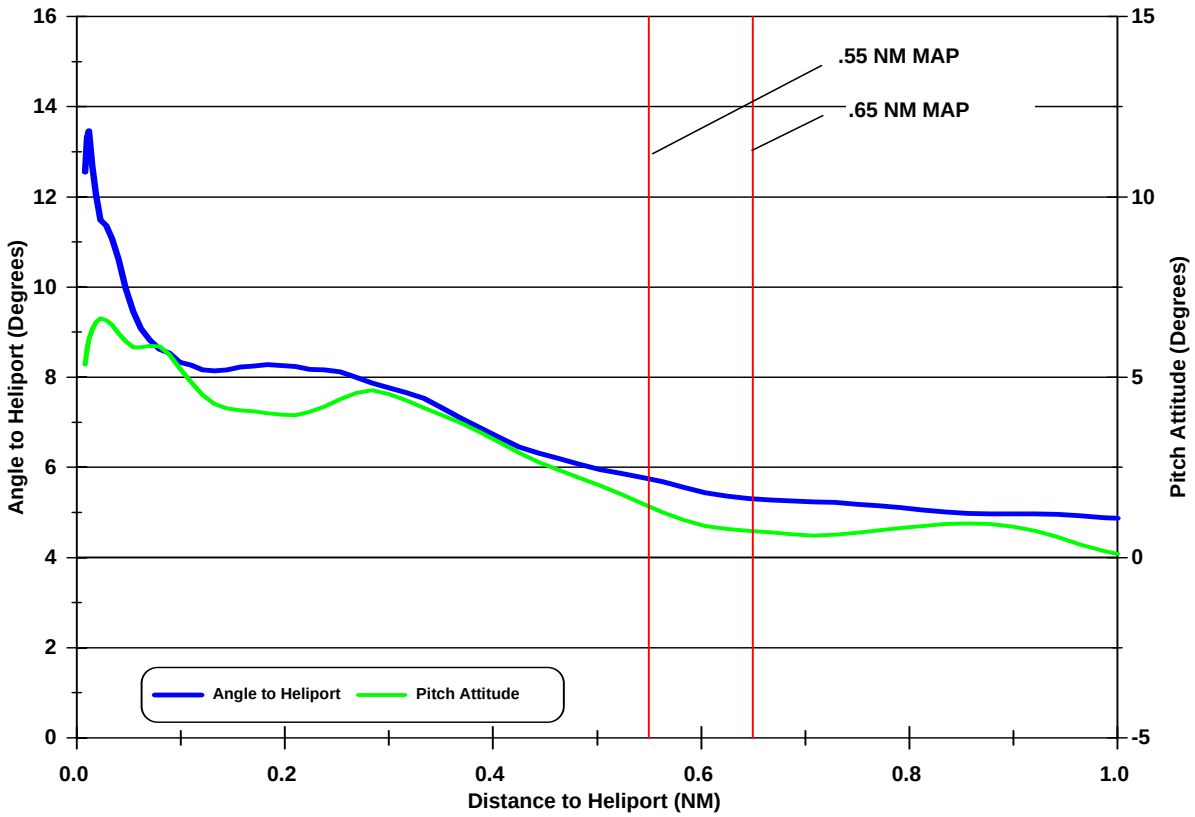
Profile View
Pilot P11 - 05/09/06A004 - Appr. #04Y



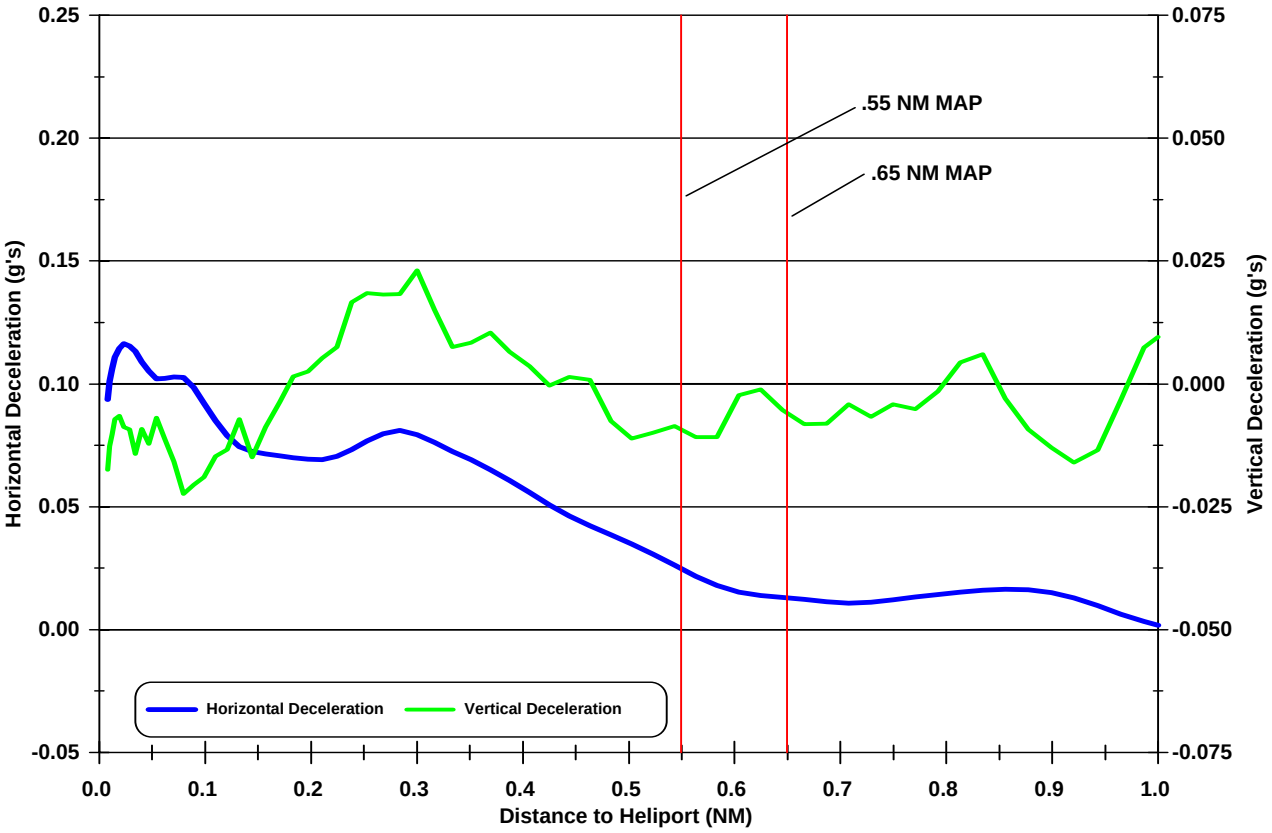
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06A004 - Appr. #04Y

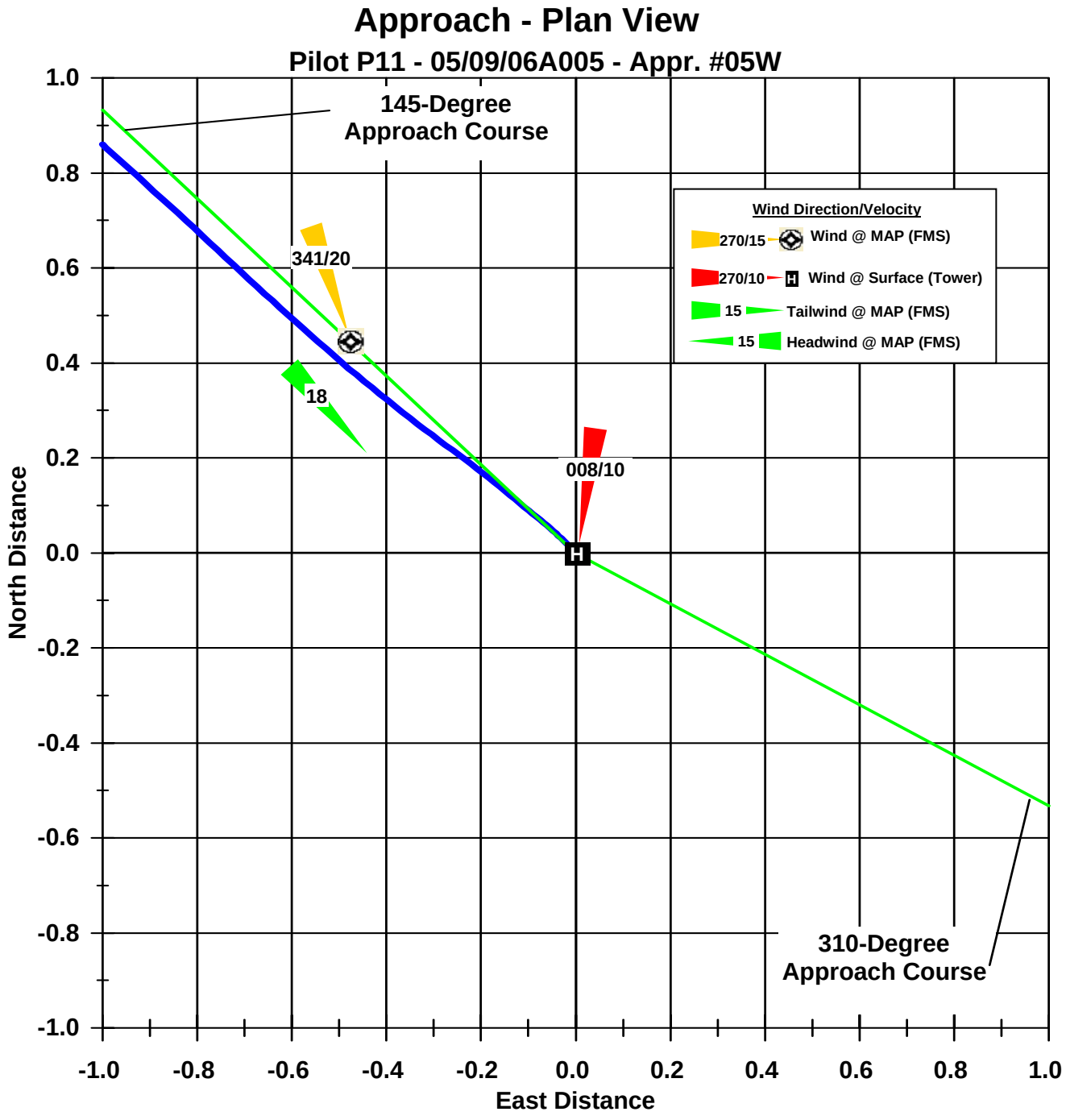


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06A004 - Appr. #04Y

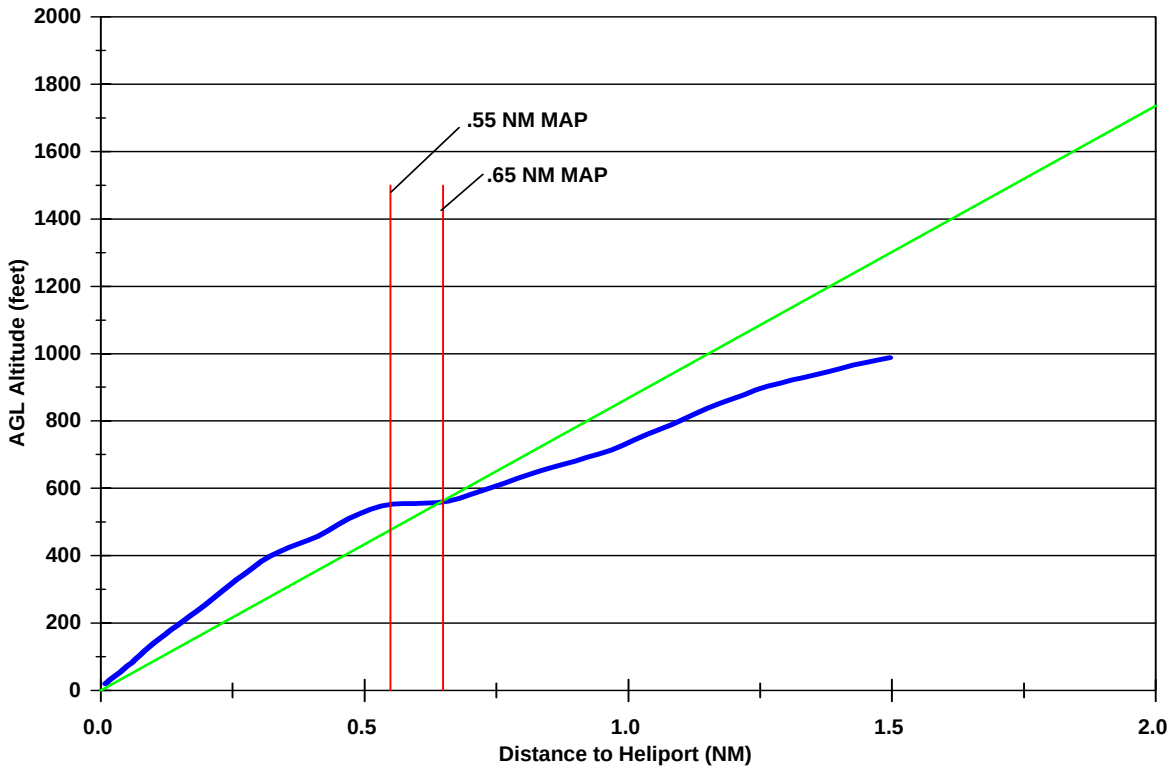


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06A004 - Appr. #04Y

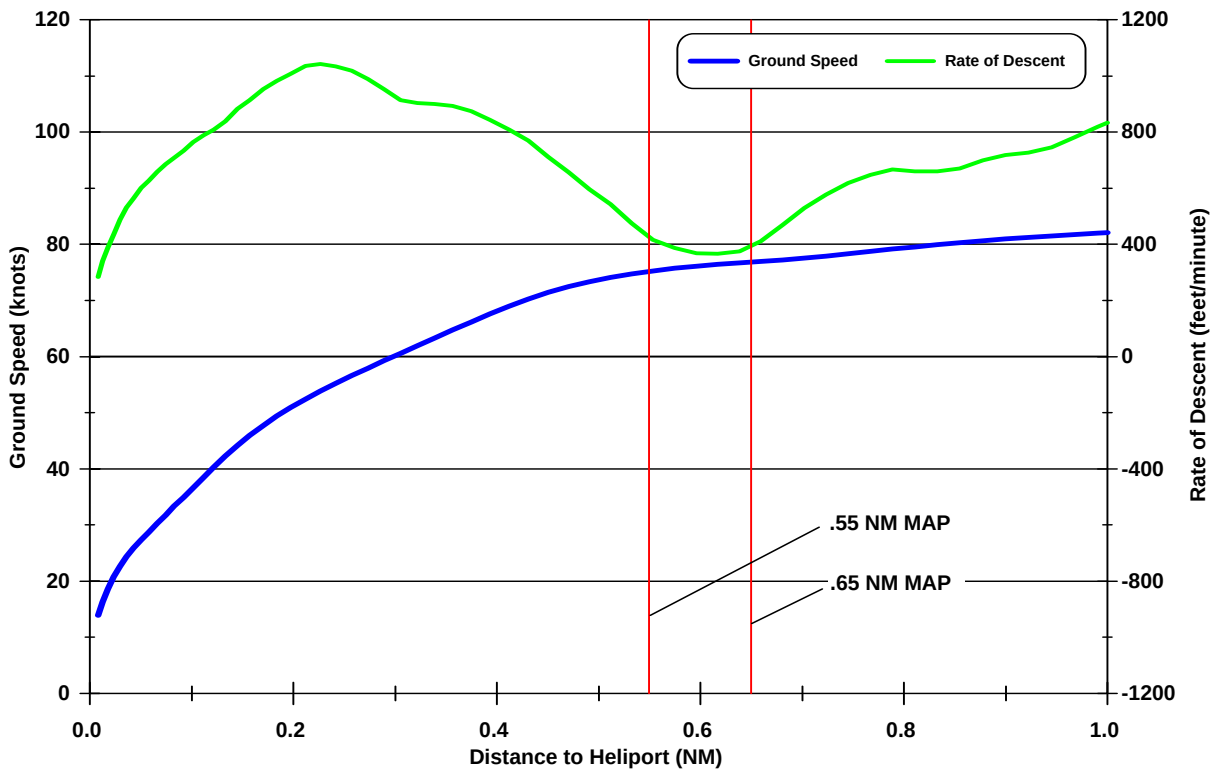



Approach - Plan View
Pilot P11 - 05/09/06A005 - Appr. #05W
145-Degree
Approach Course
310-Degree
Approach Course
341/20
18
008/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

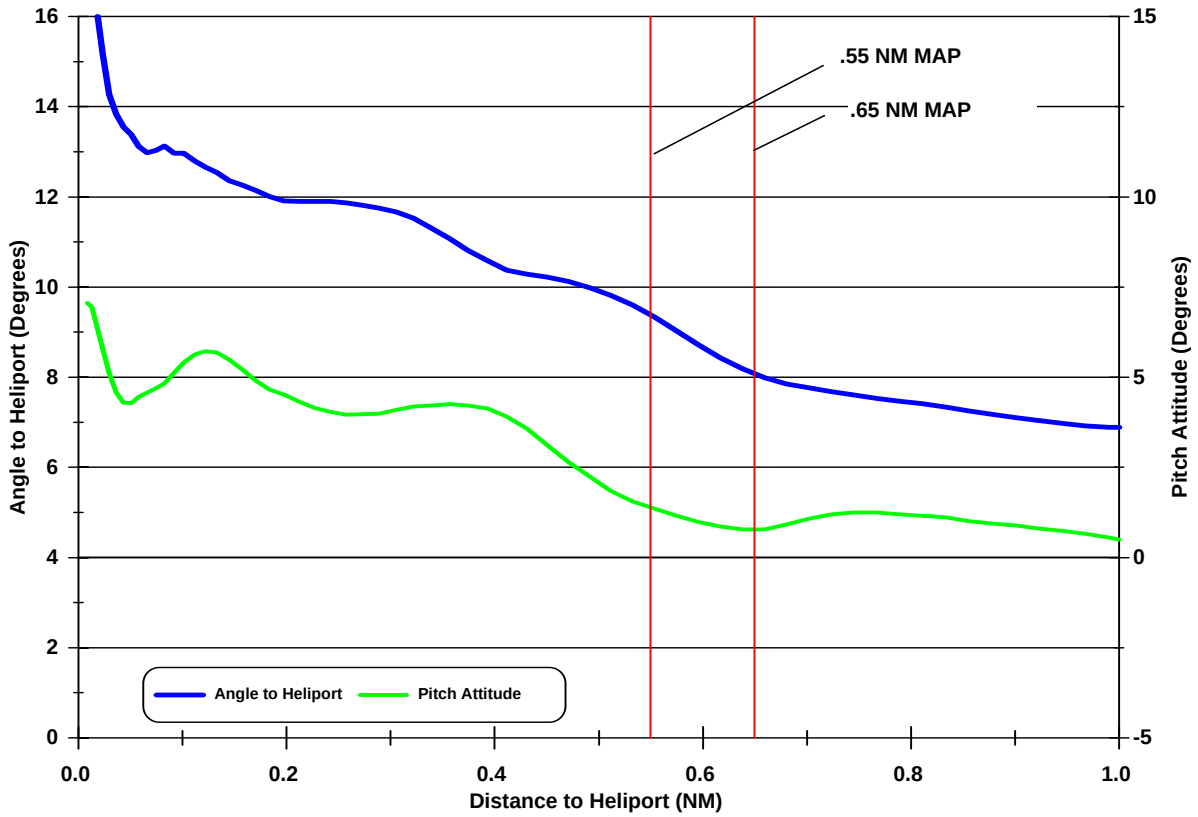
Profile View
Pilot P11 - 05/09/06A005 - Appr. #05W



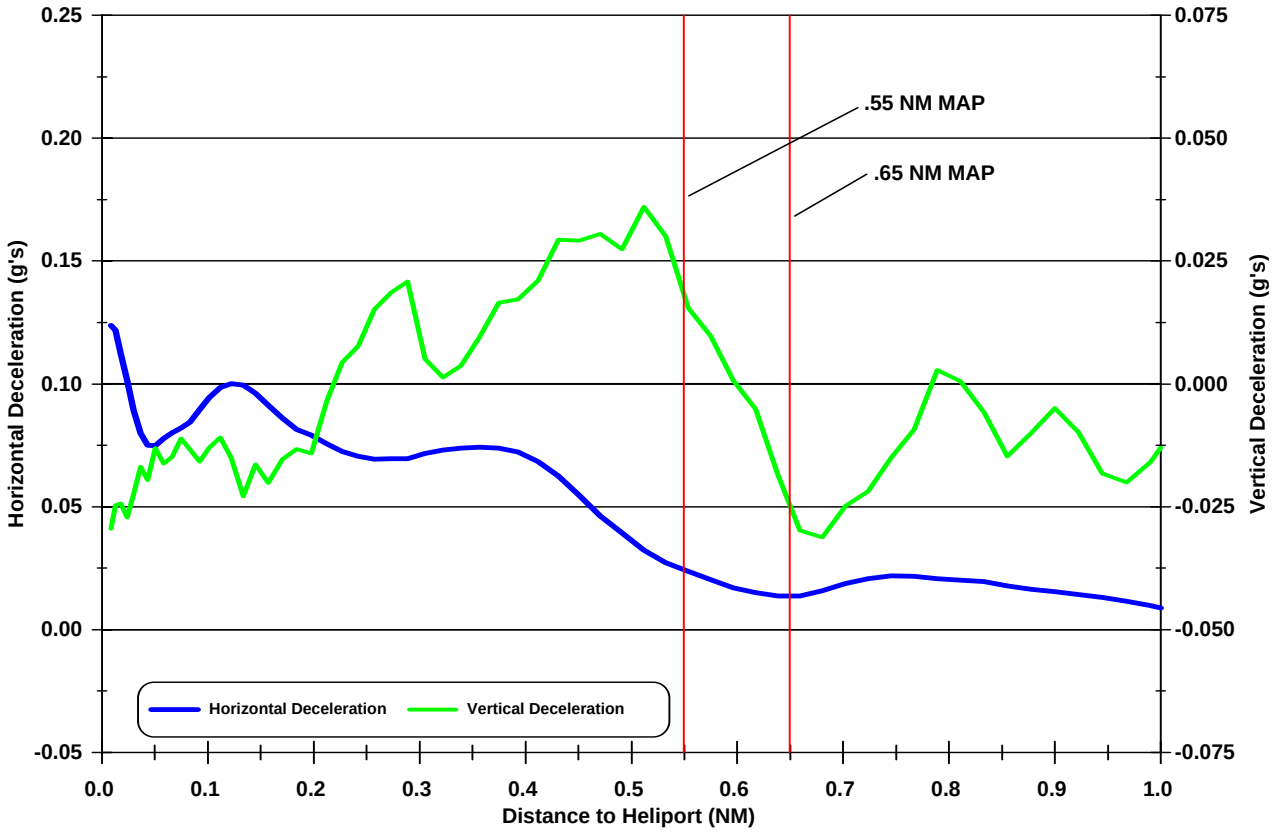
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06A005 - Appr. #05W

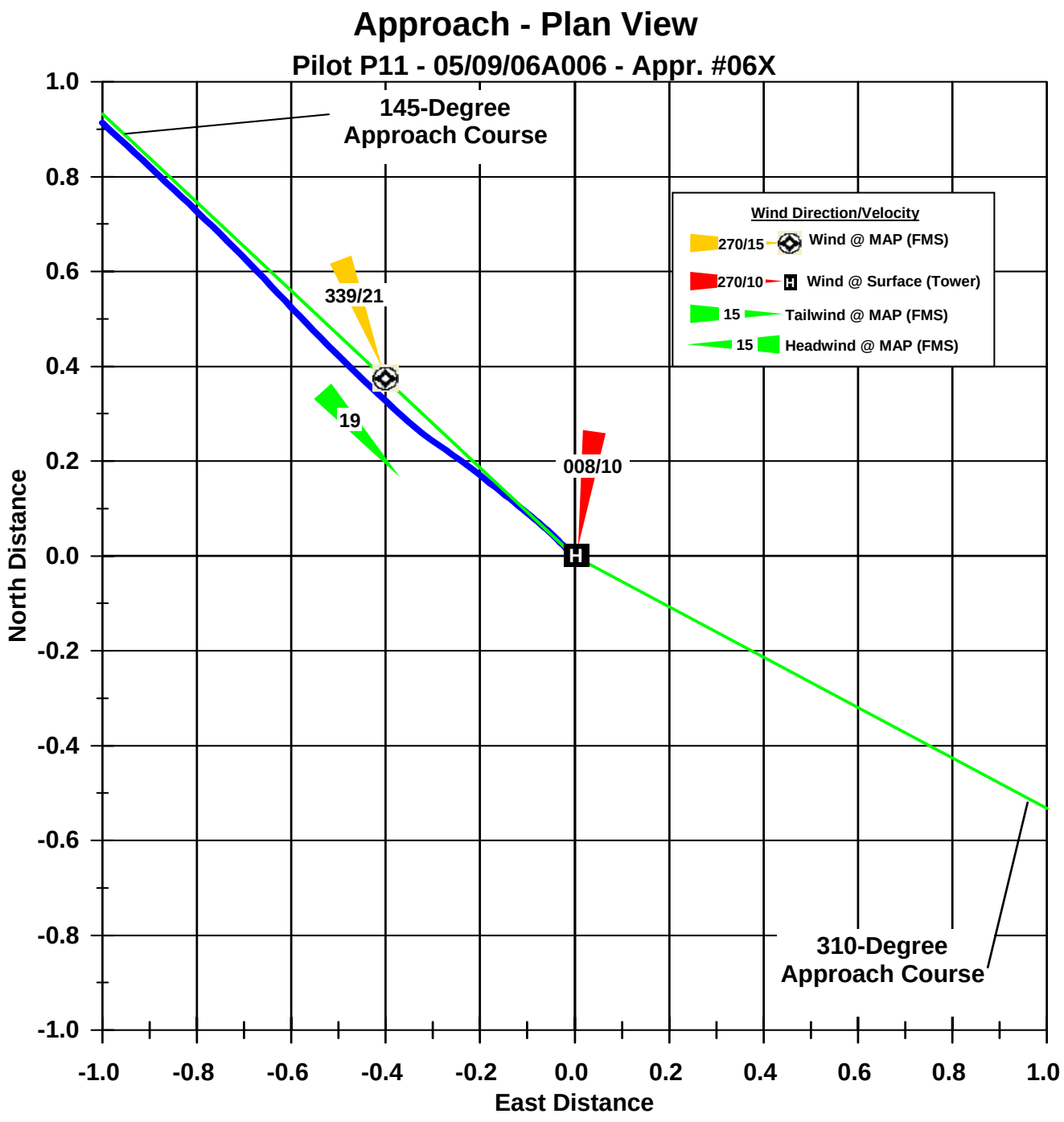


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06A005 - Appr. #05W

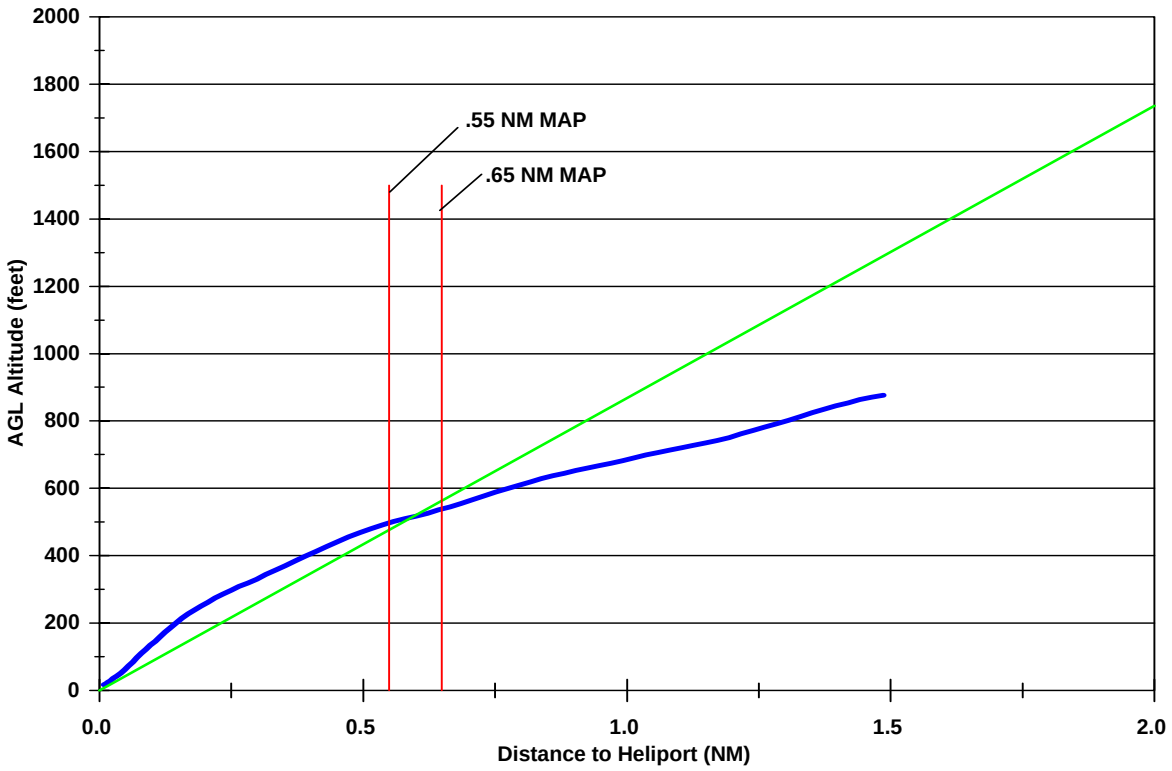


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06A005 - Appr. #05W

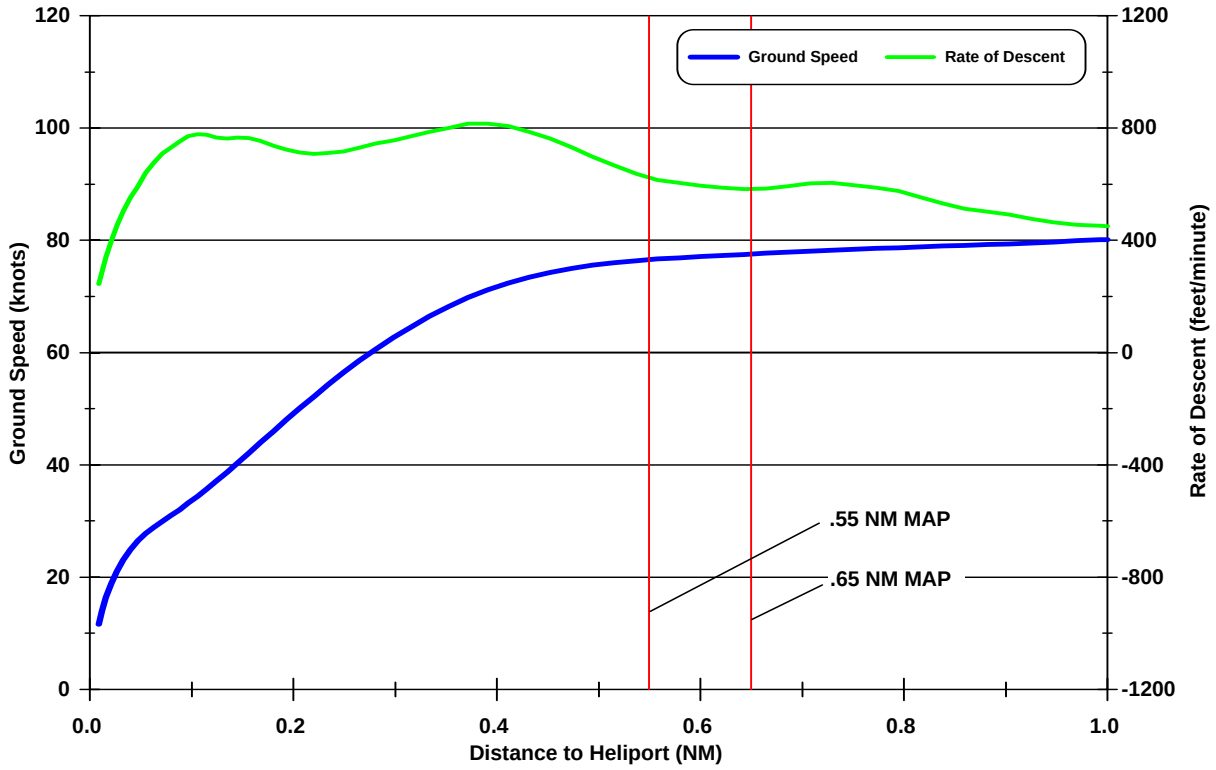



Approach - Plan View
Pilot P11 - 05/09/06A006 - Appr. #06X
145-Degree
Approach Course
310-Degree
Approach Course
339/21
19
008/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

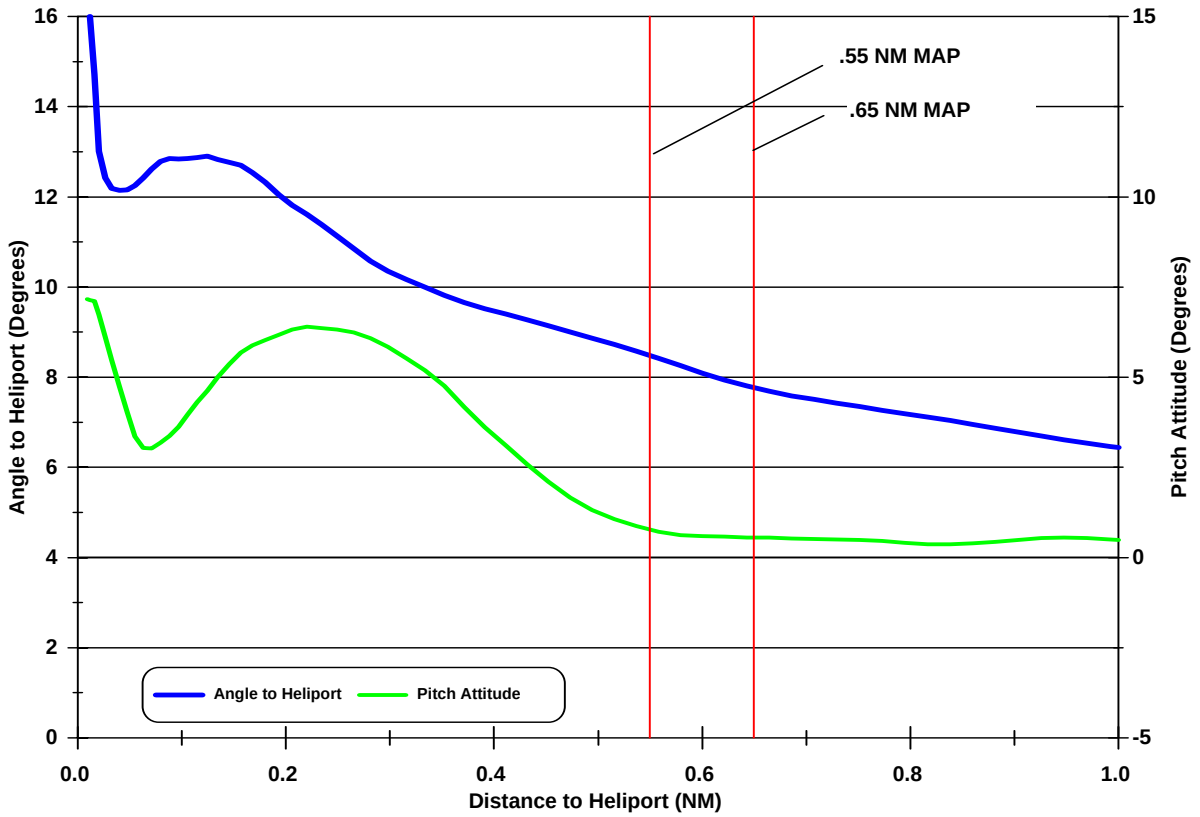
Profile View
Pilot P11 - 05/09/06A006 - Appr. #06X



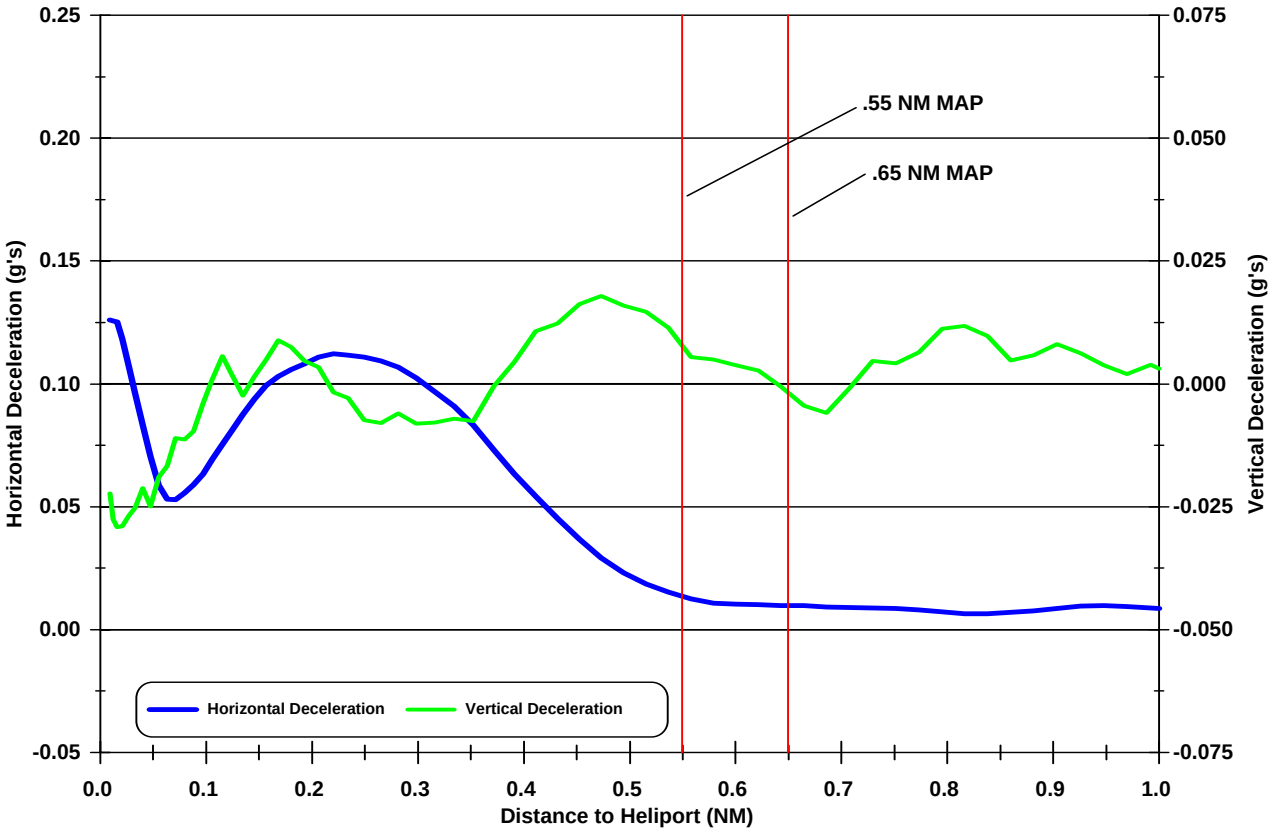
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06A006 - Appr. #06X

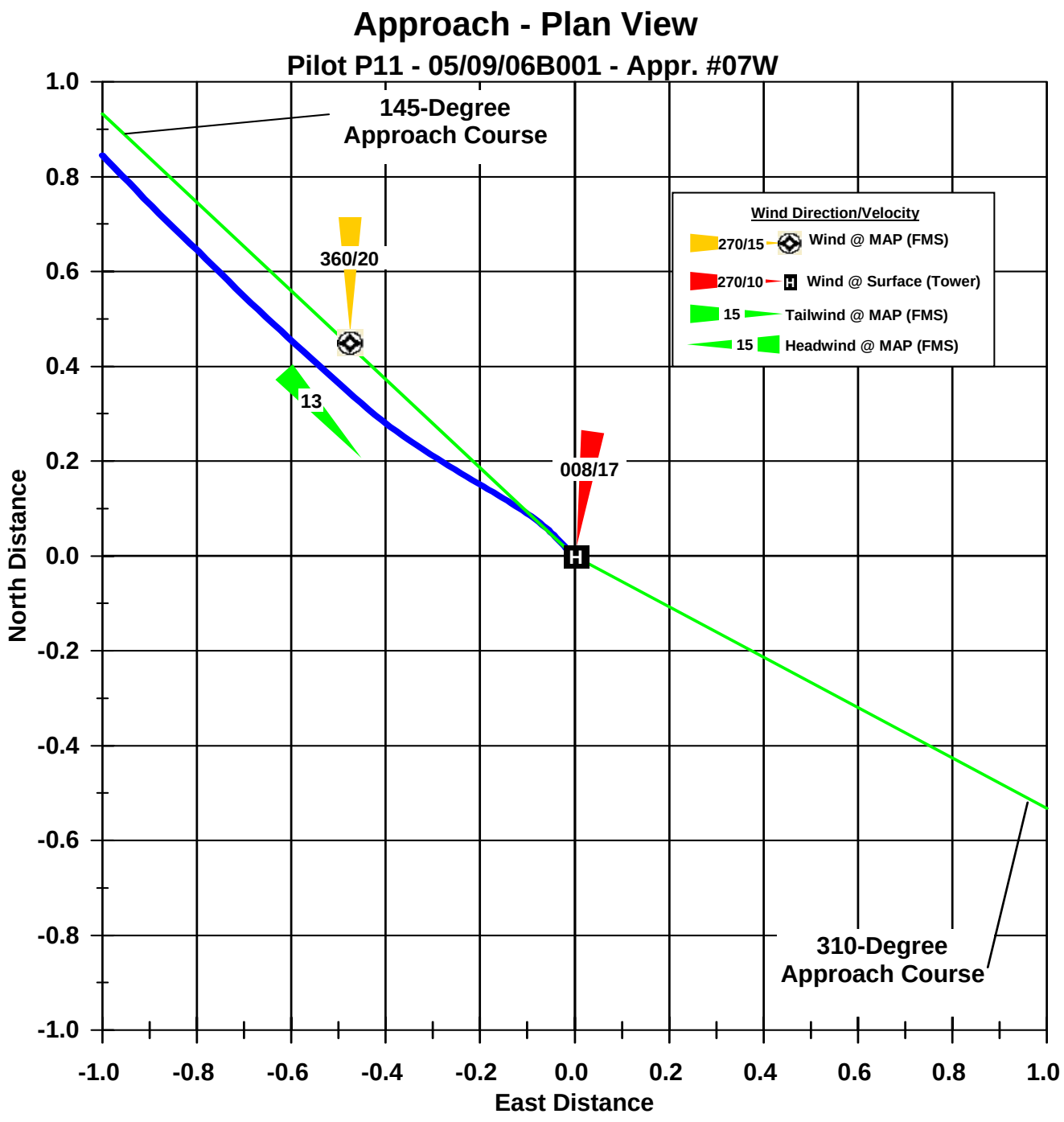


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06A006 - Appr. #06X

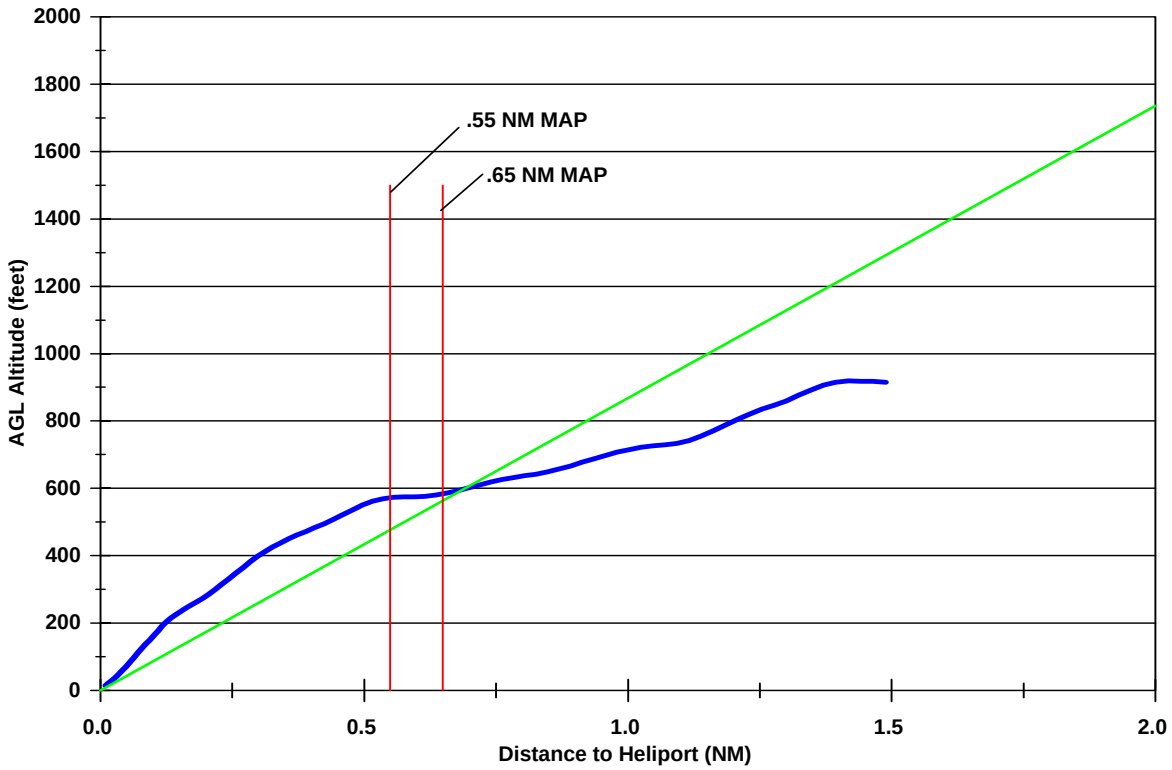


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06A006 - Appr. #06X

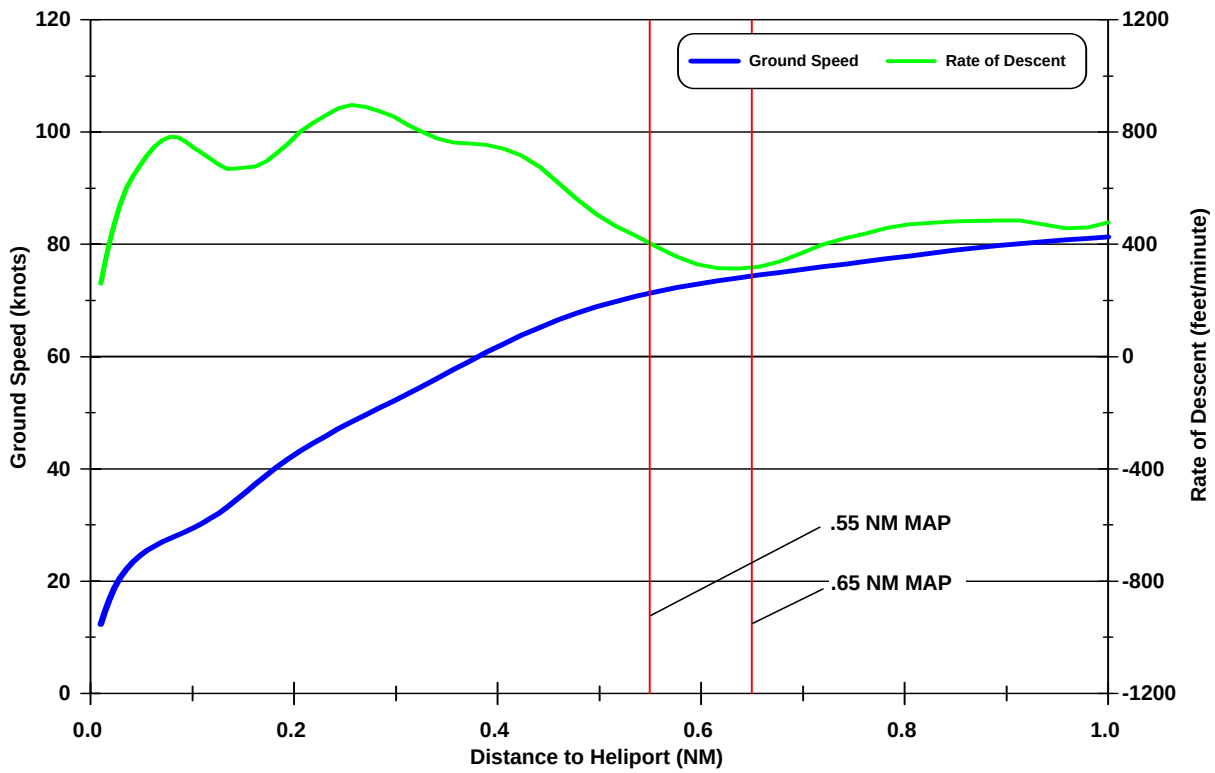



Approach - Plan View
Pilot P11 - 05/09/06B001 - Appr. #07W
145-Degree
Approach Course
310-Degree
Approach Course
360/20
13
008/17
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

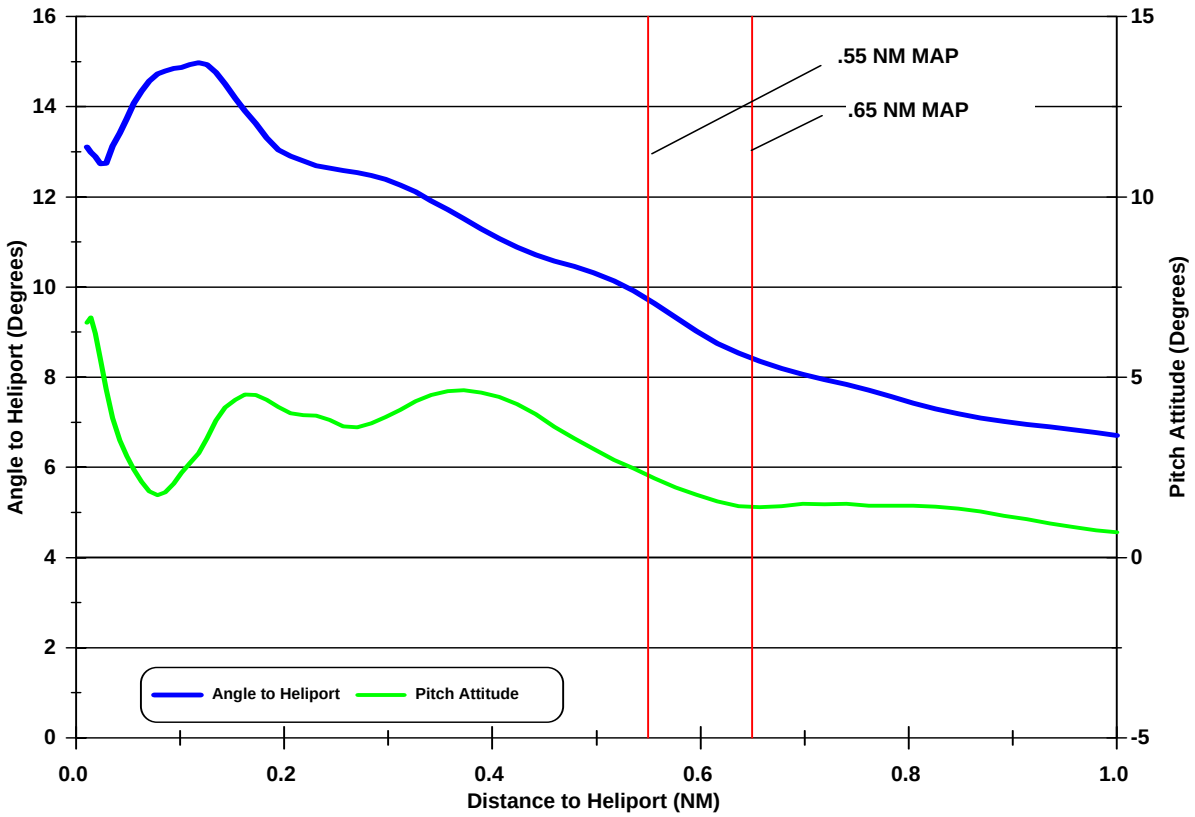
Profile View
Pilot P11 - 05/09/06B001 - Appr. #07W



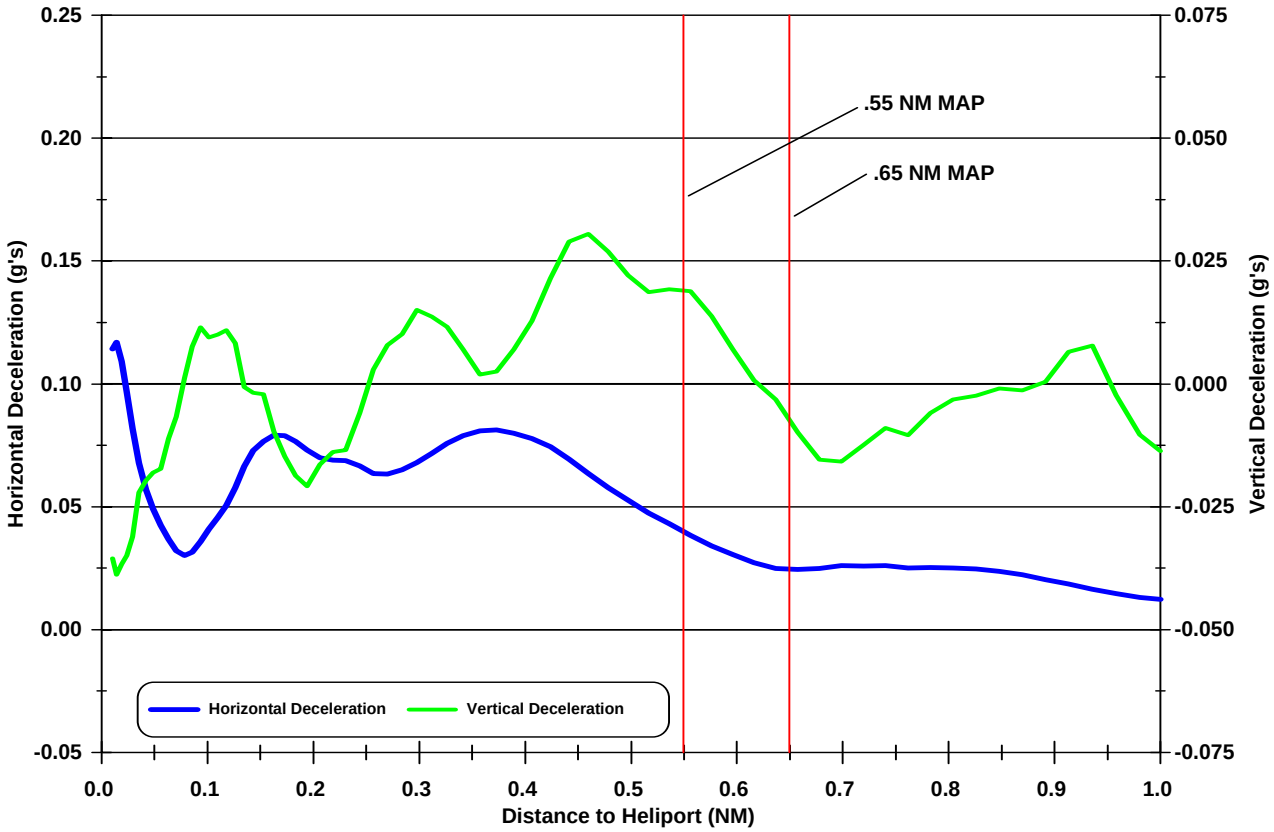
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06B001 - Appr. #07W

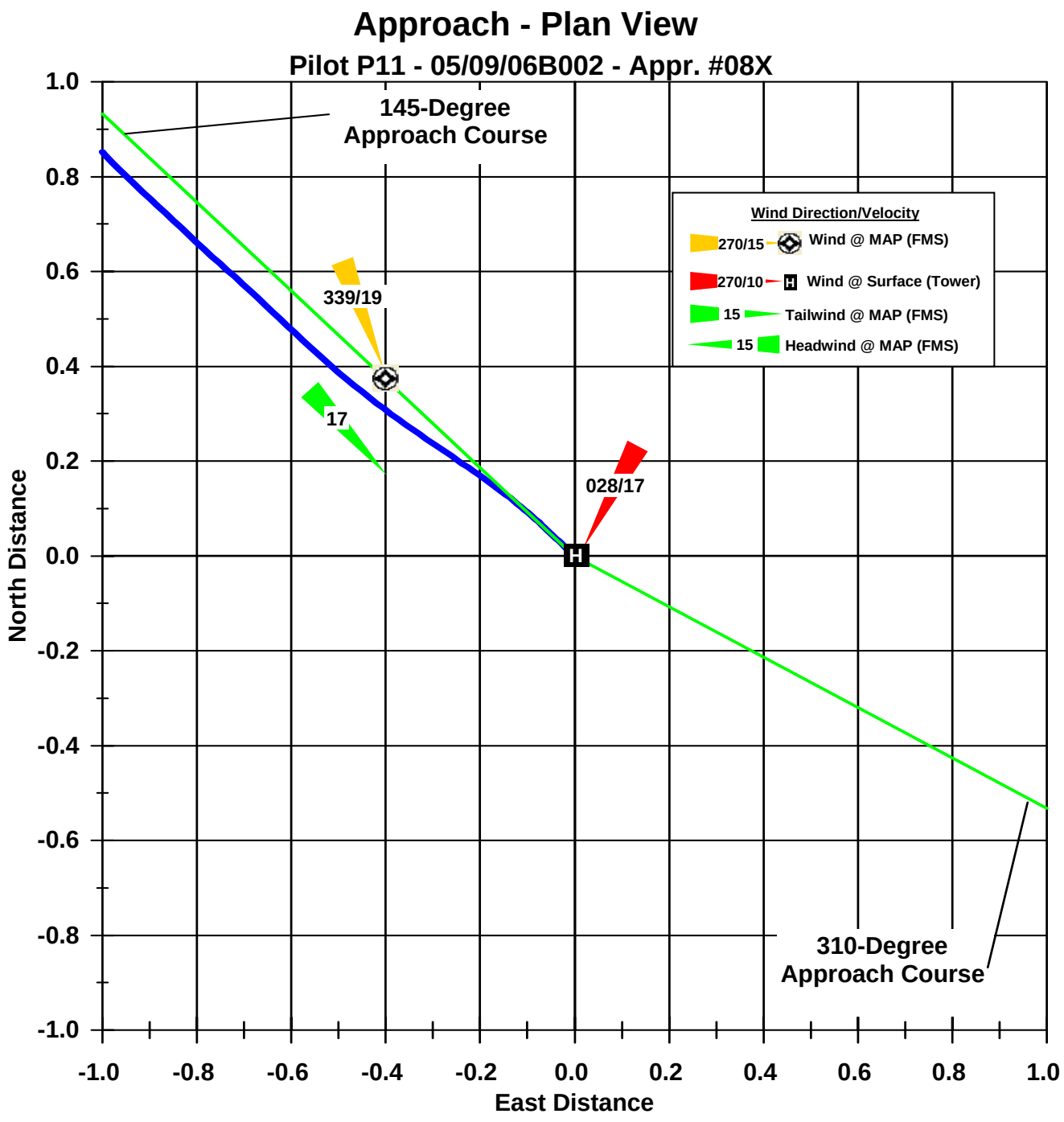


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06B001 - Appr. #07W

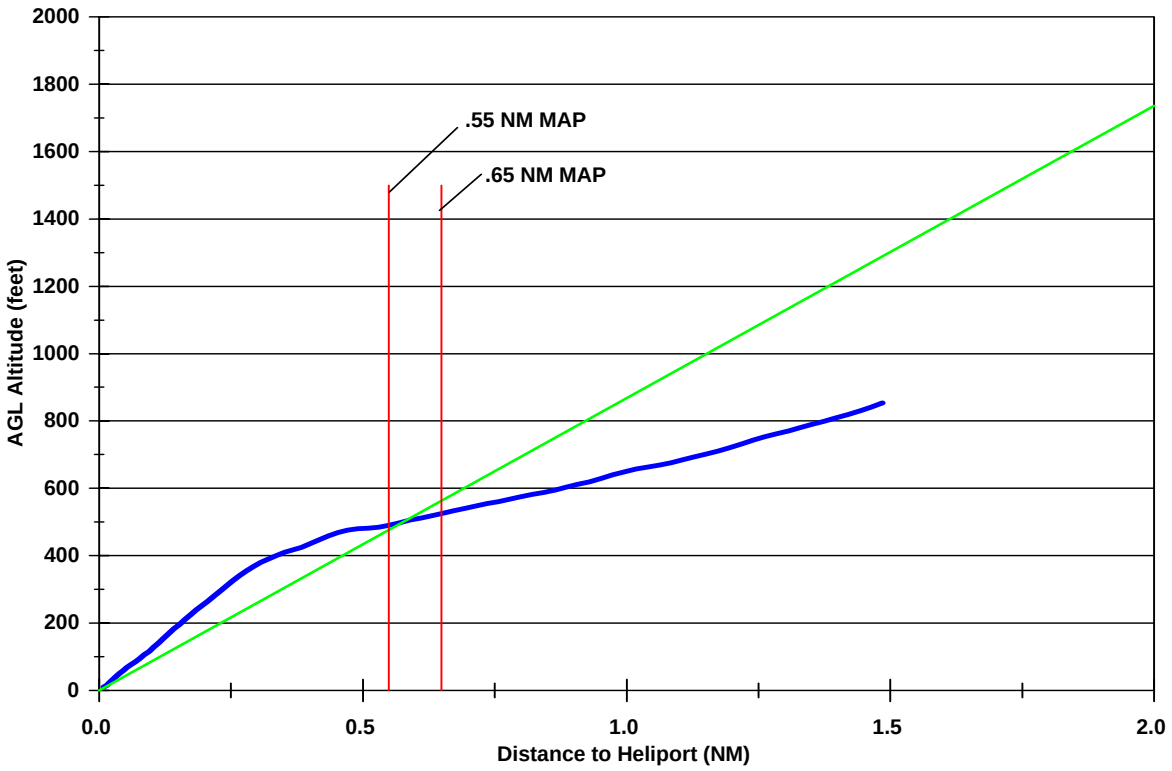


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06B001 - Appr. #07W

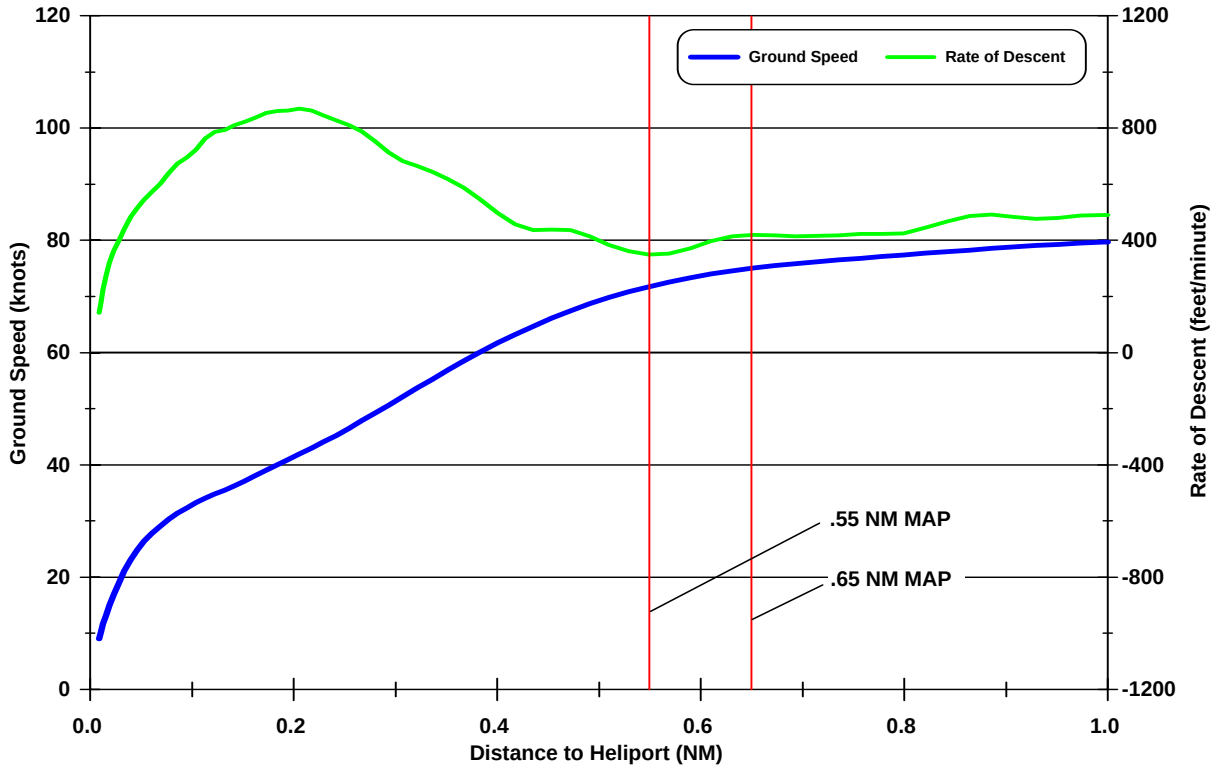



Approach - Plan View
Pilot P11 - 05/09/06B002 - Appr. #08X
145-Degree
Approach Course
310-Degree
Approach Course
339/19
17
028/17
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

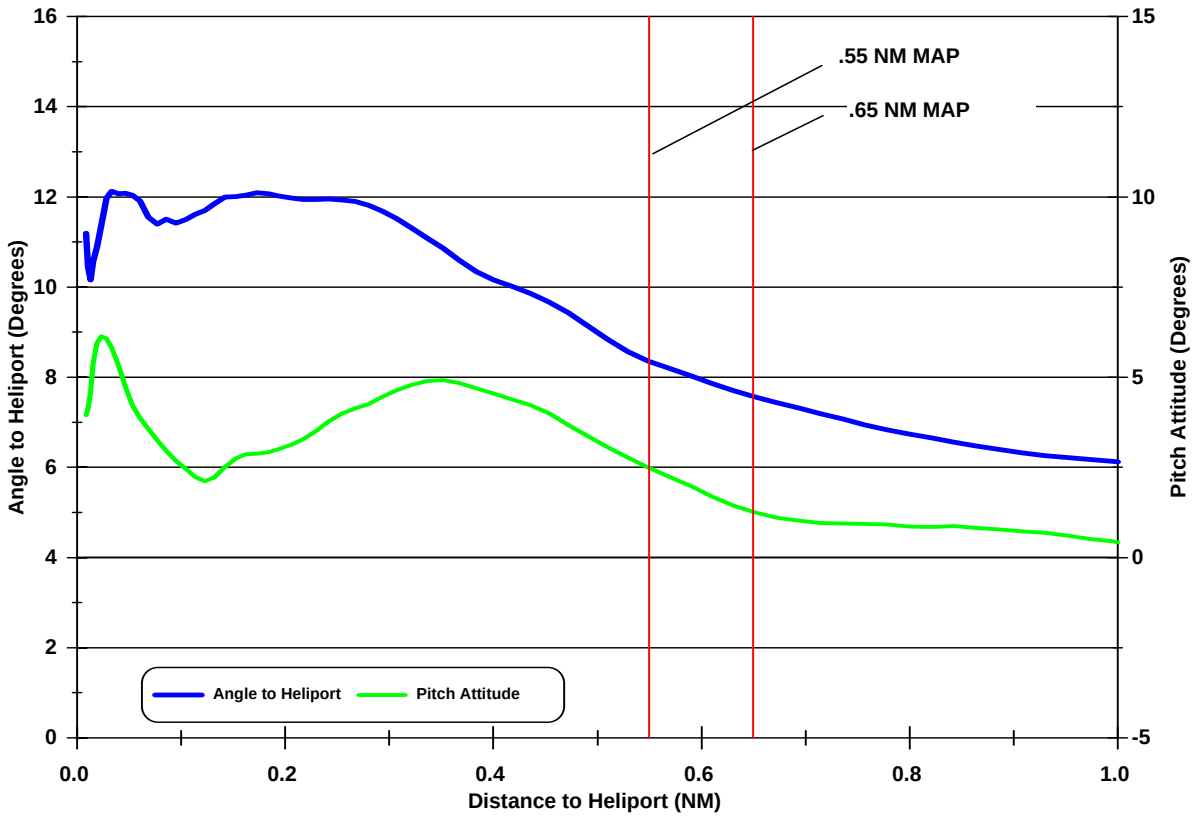
Profile View
Pilot P11 - 05/09/06B002 - Appr. #08X



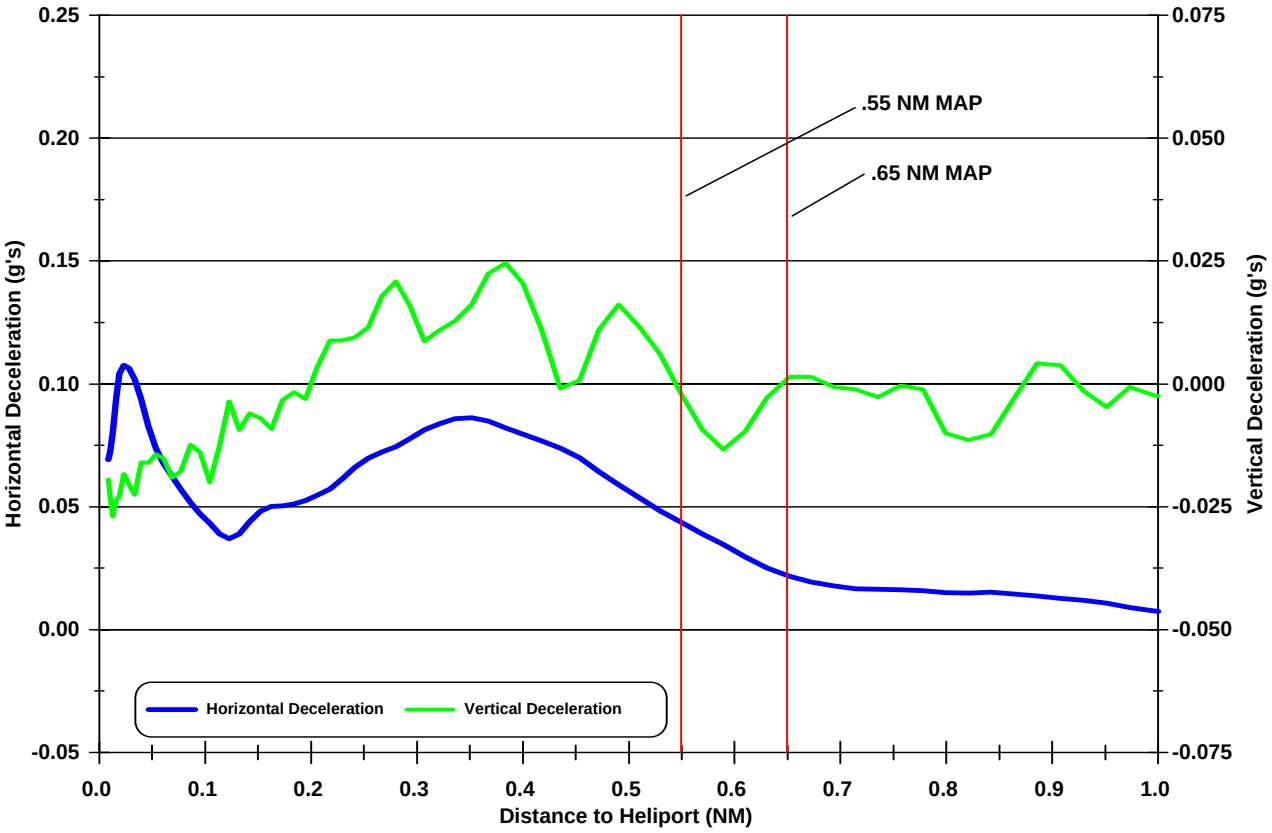
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06B002 - Appr. #08X

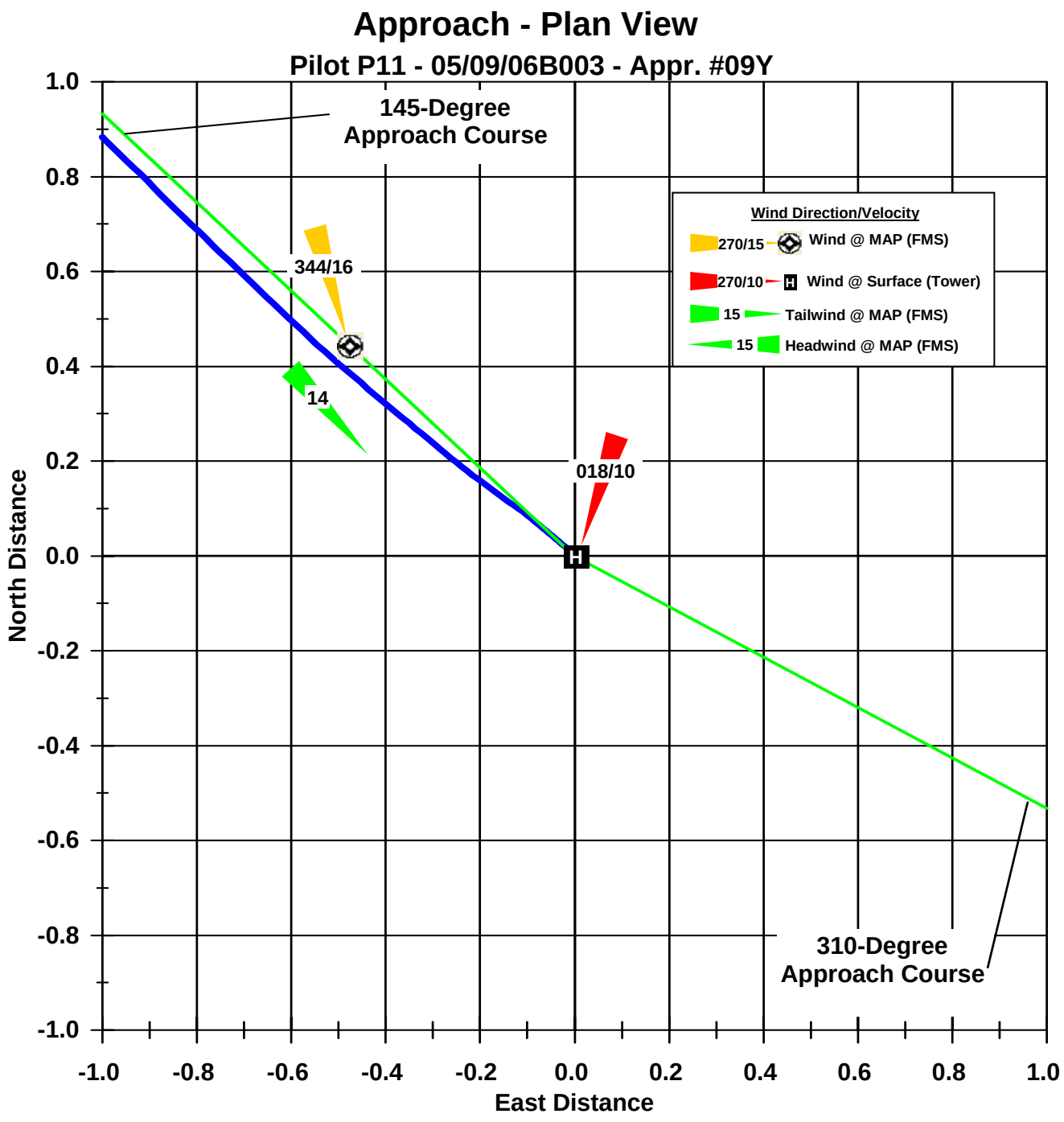


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06B002 - Appr. #08X

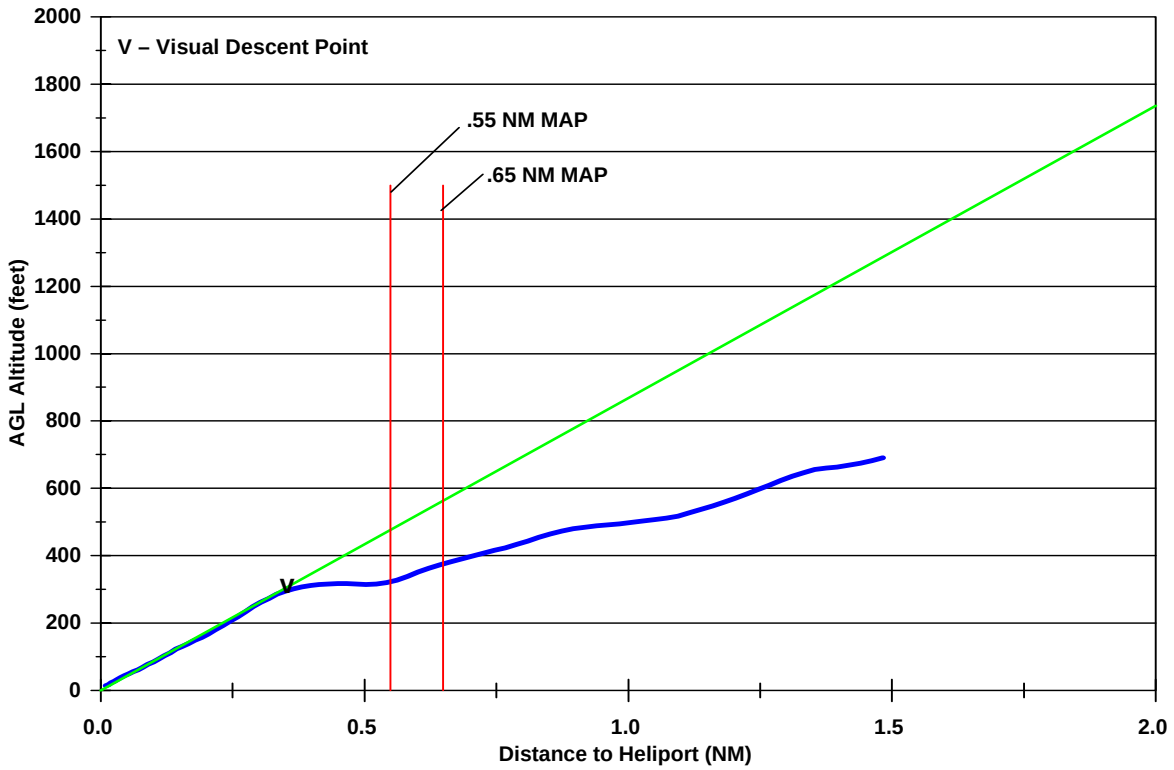


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06B002 - Appr. #08X

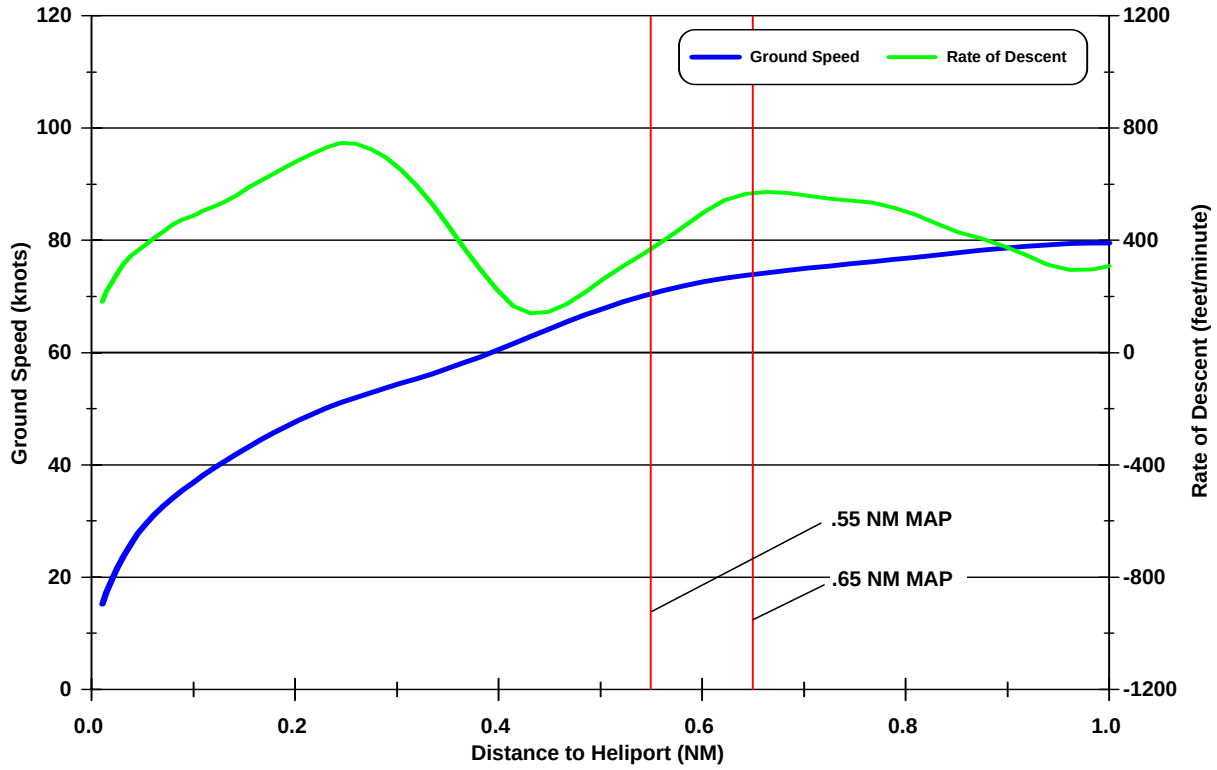



Approach - Plan View
Pilot P11 - 05/09/06B003 - Appr. #09Y
145-Degree
Approach Course
310-Degree
Approach Course
344/16
14
018/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

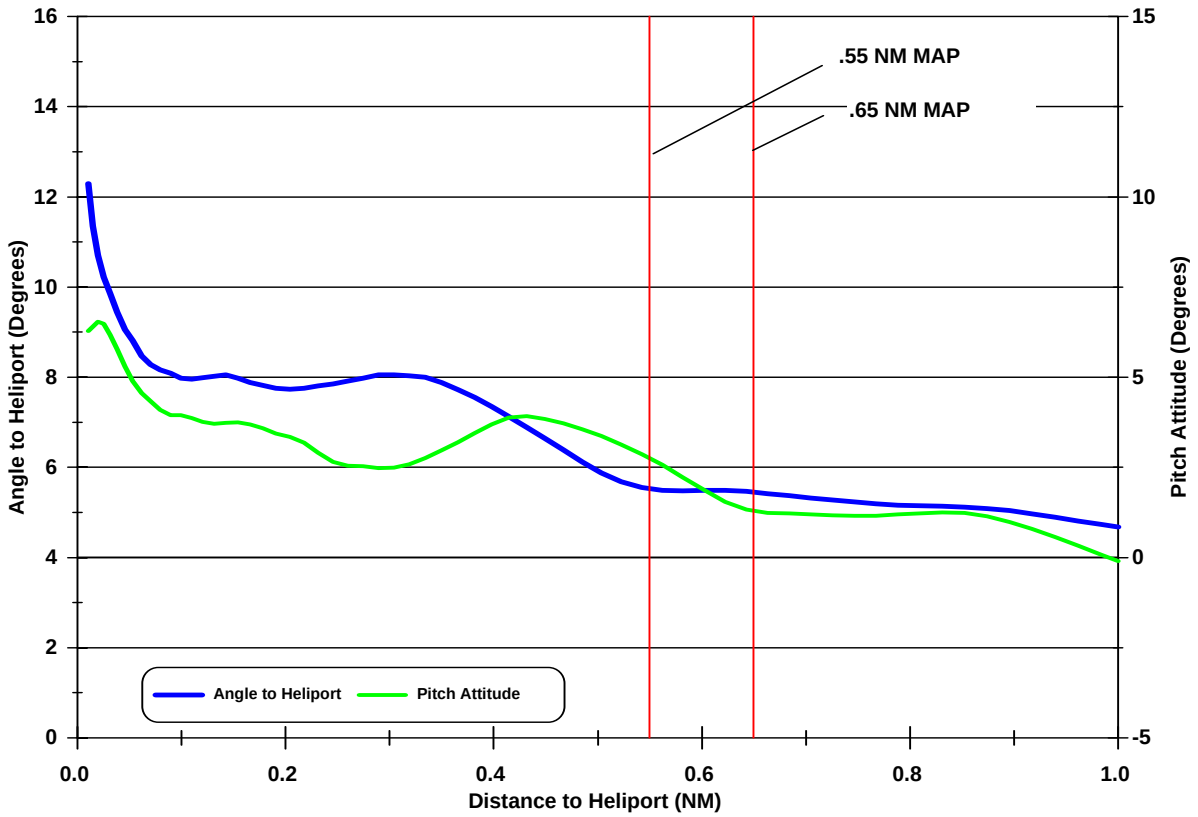
Profile View
Pilot P11 - 05/09/06B003 - Appr. #09Y



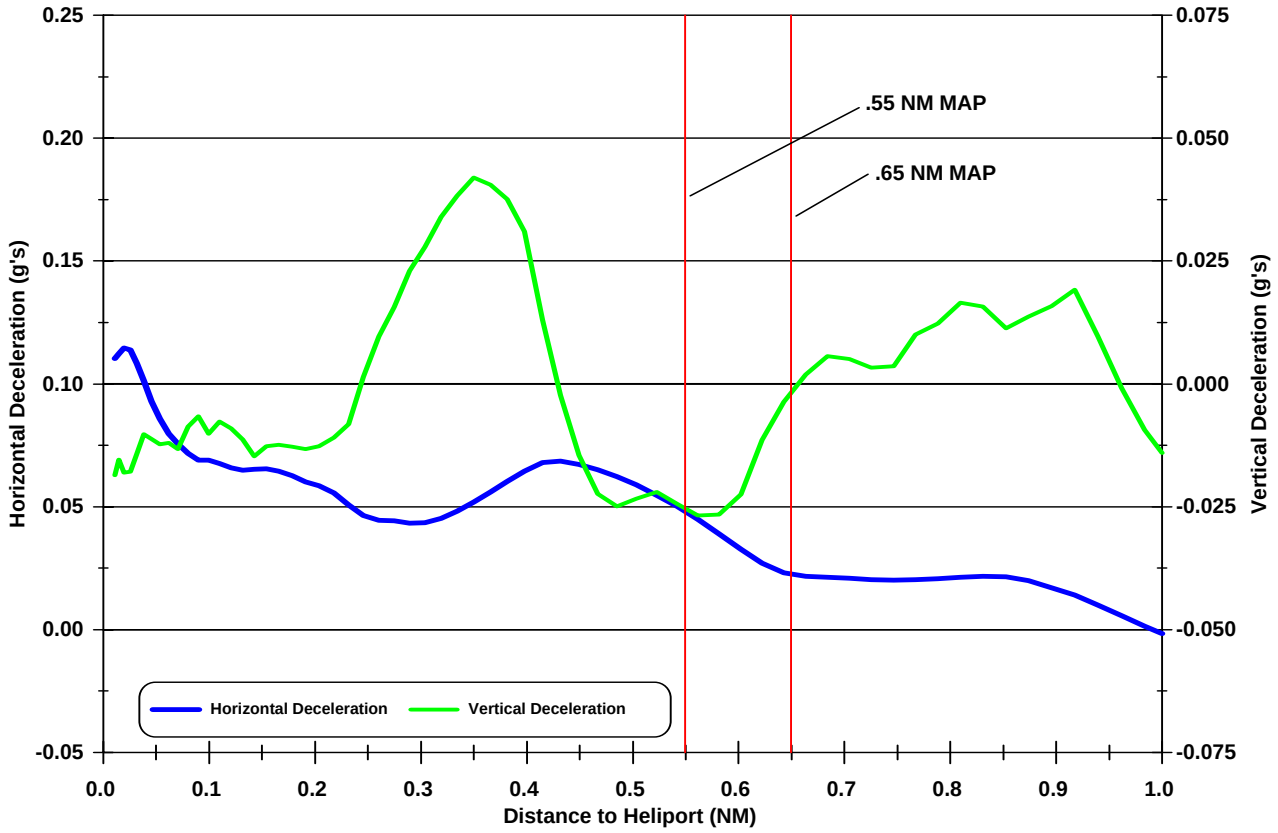
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06B003 - Appr. #09Y

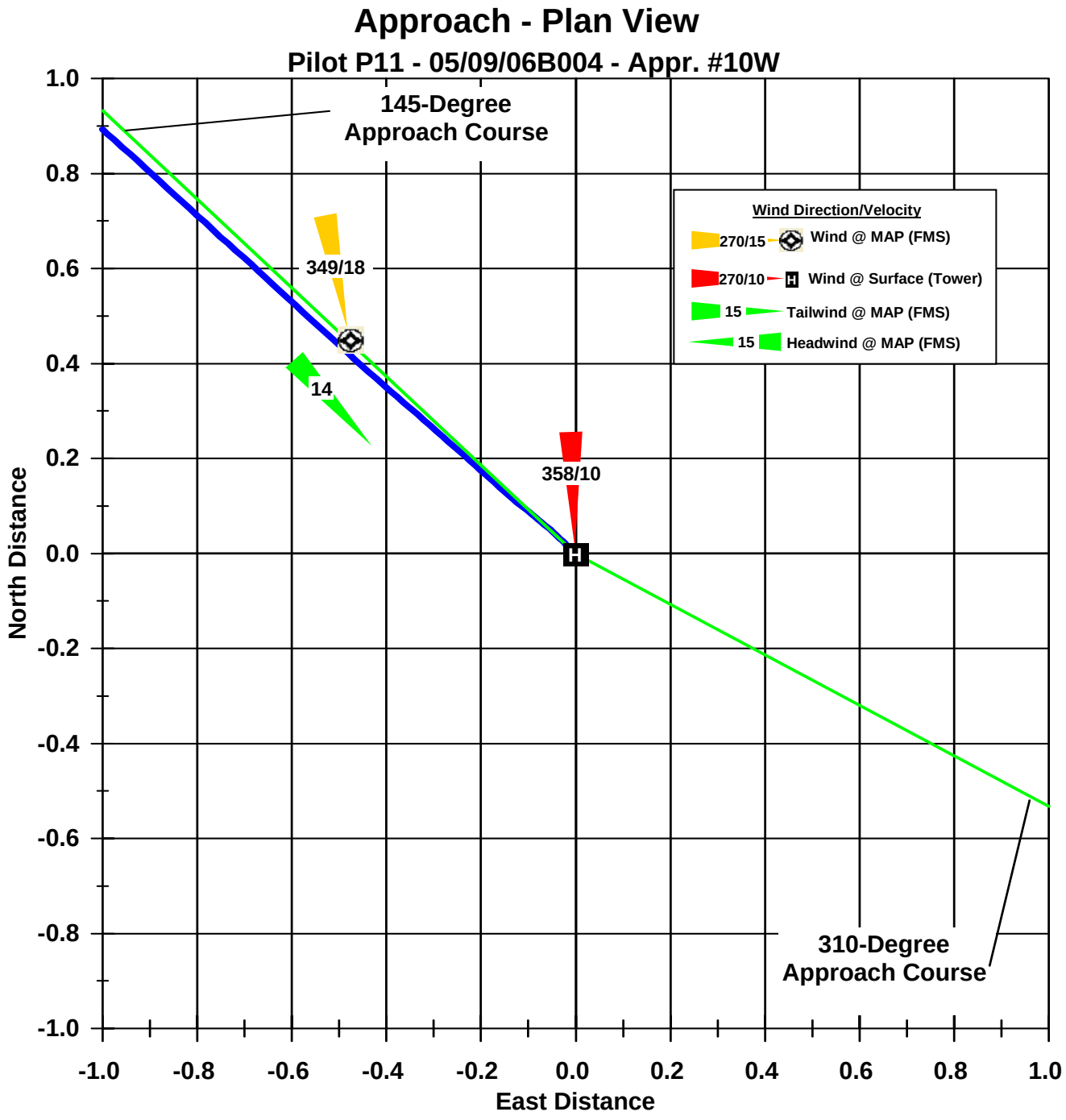


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06B003 - Appr. #09Y

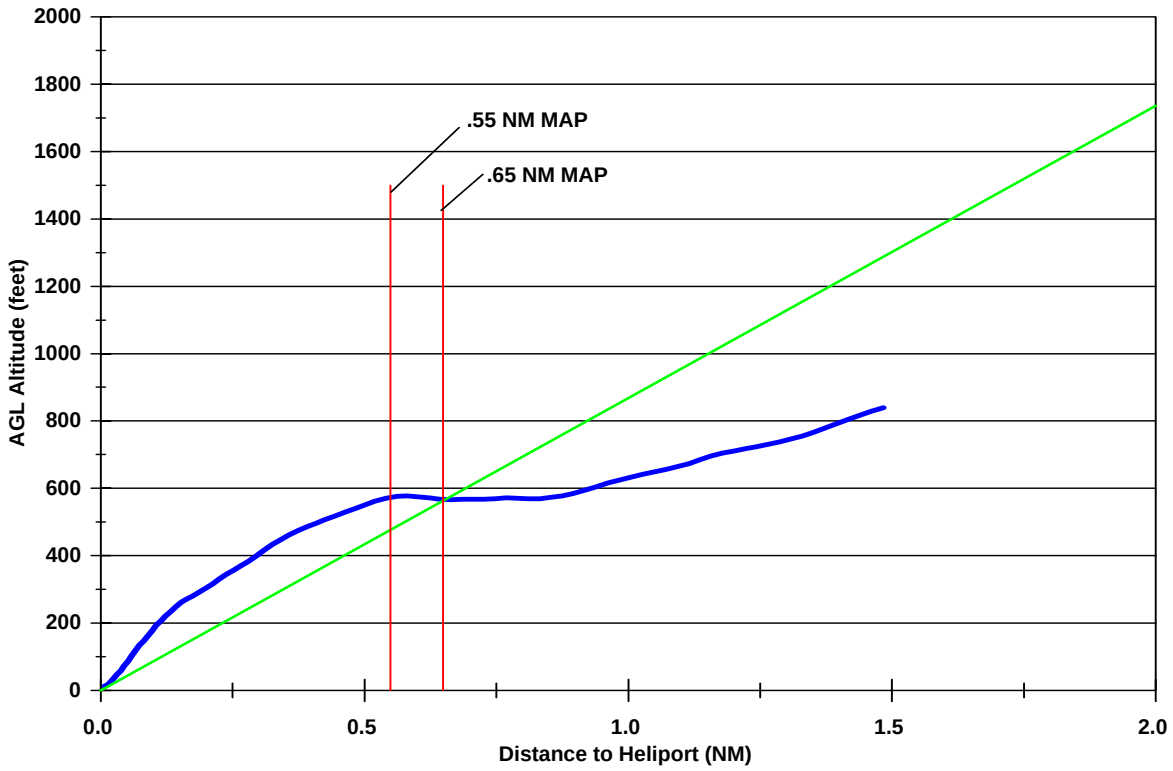


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06B003 - Appr. #09Y

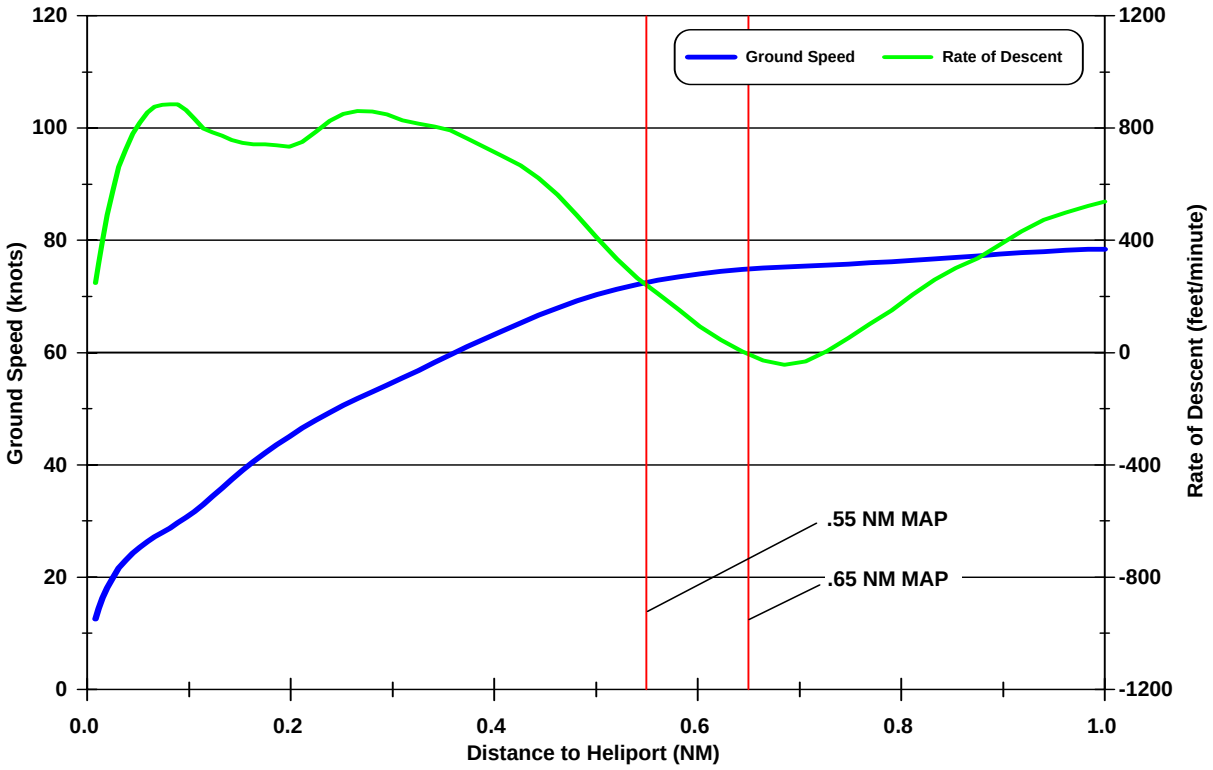



Approach - Plan View
Pilot P11 - 05/09/06B004 - Appr. #10W
145-Degree
Approach Course
310-Degree
Approach Course
349/18
14
358/10
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

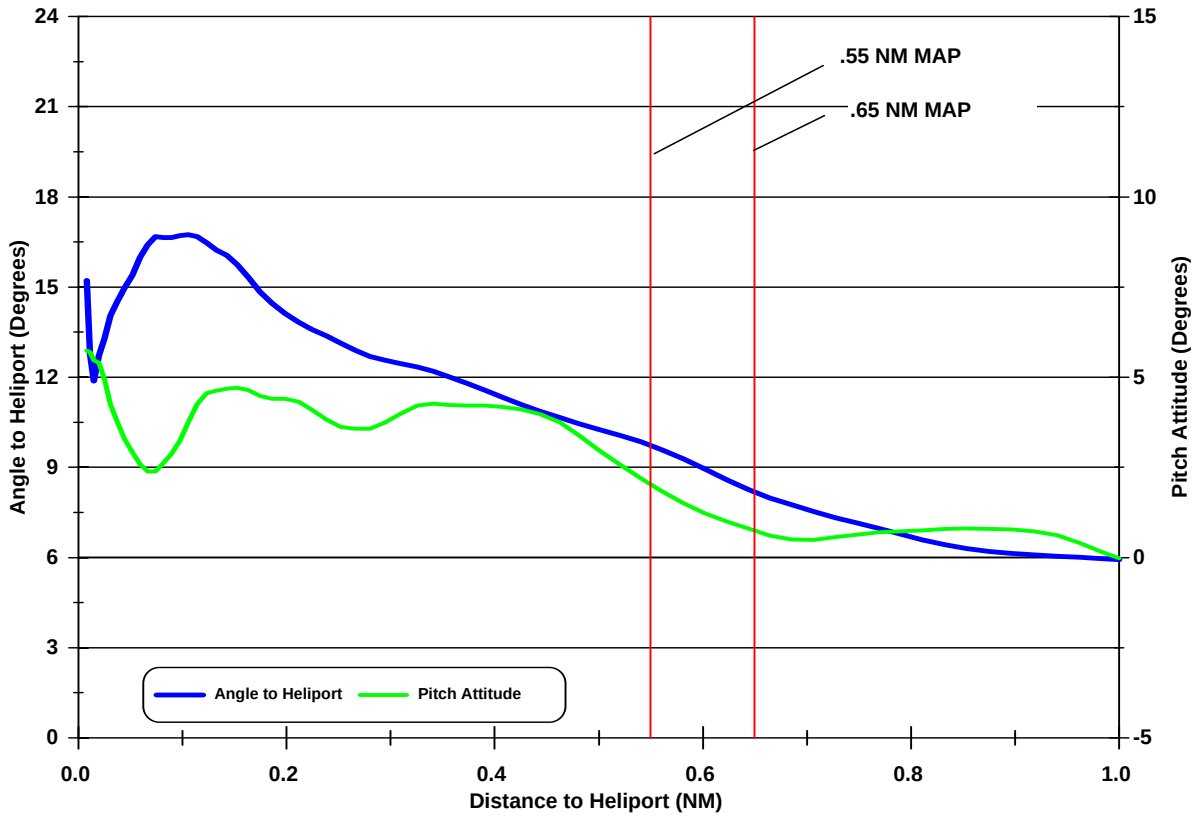
Profile View
Pilot P11 - 05/09/06B004 - Appr. #10W



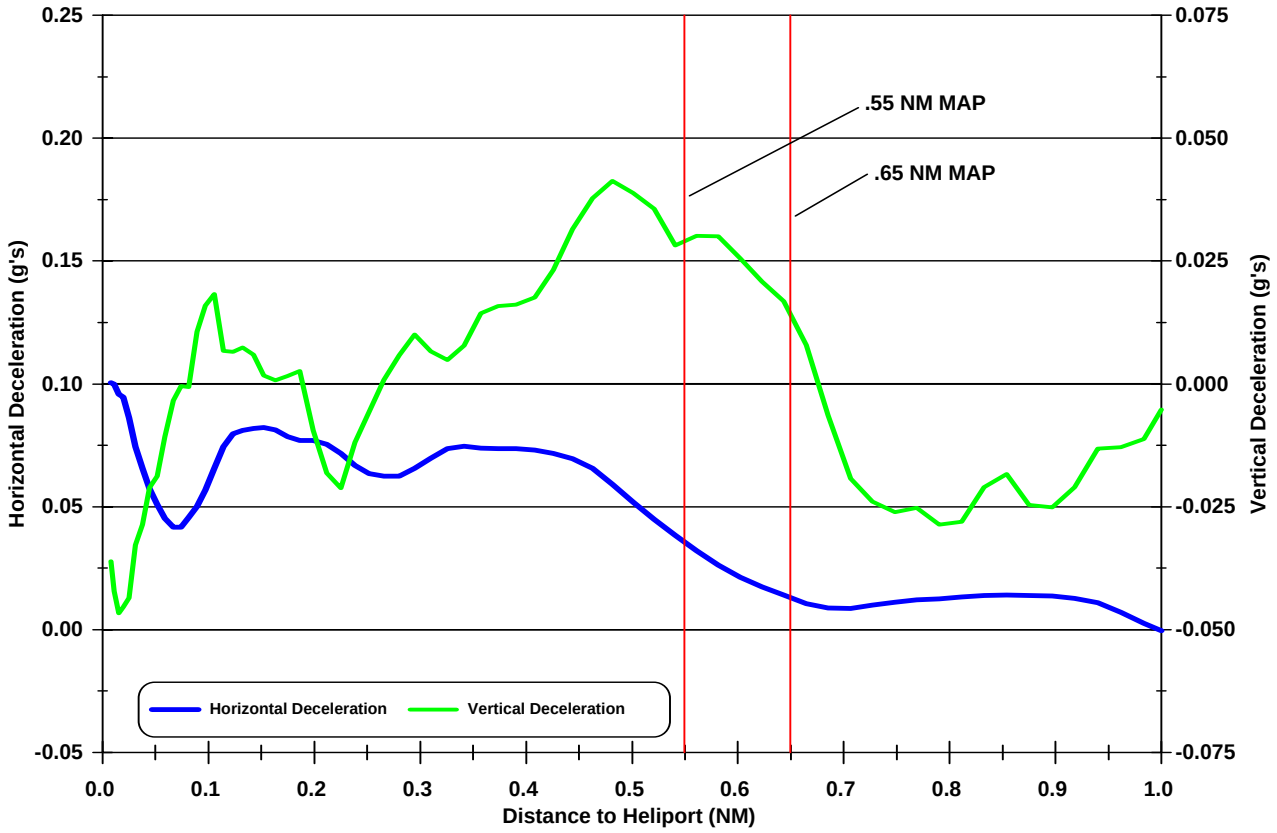
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06B004 - Appr. #10W

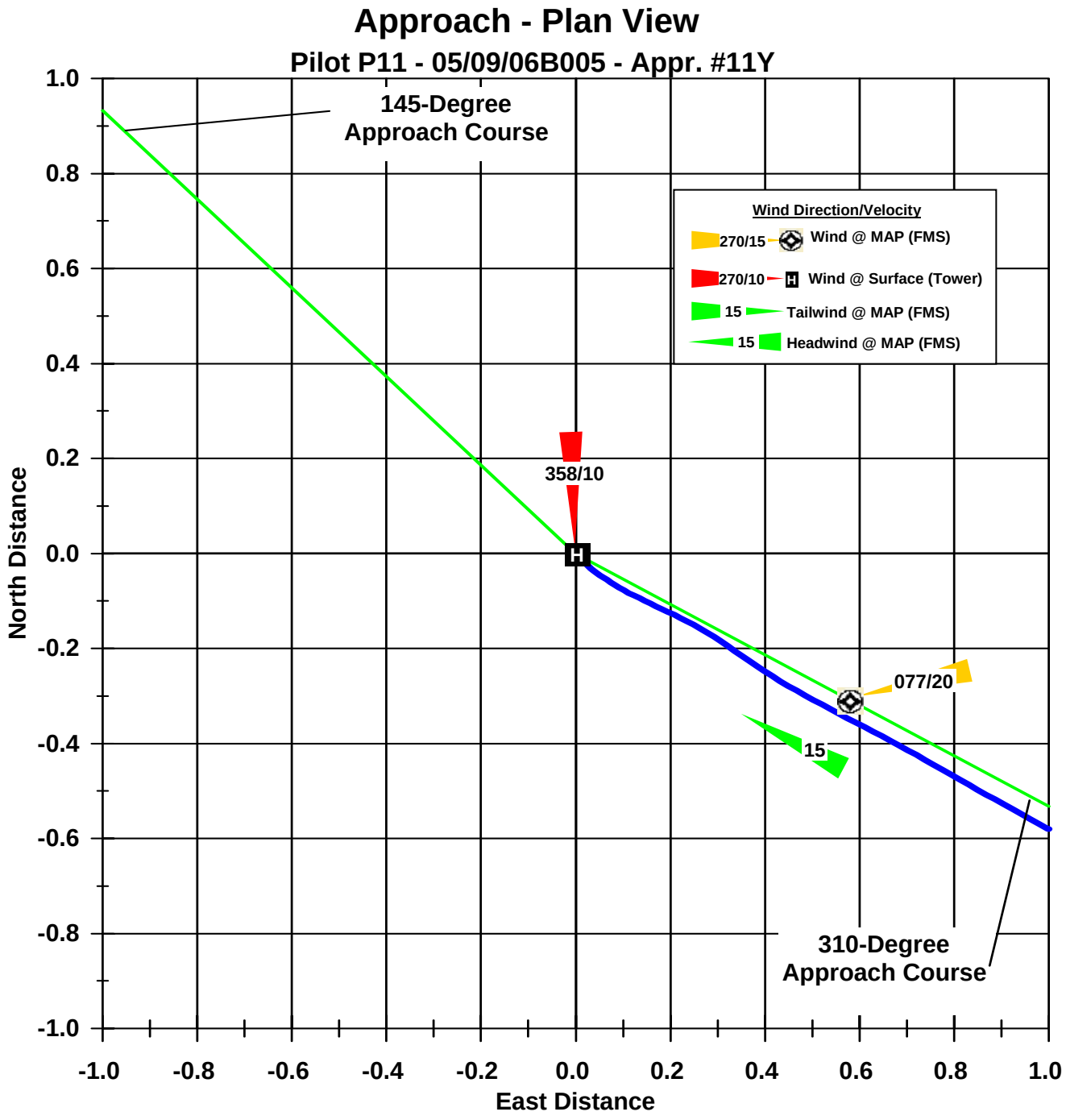


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06B004 - Appr. #10W

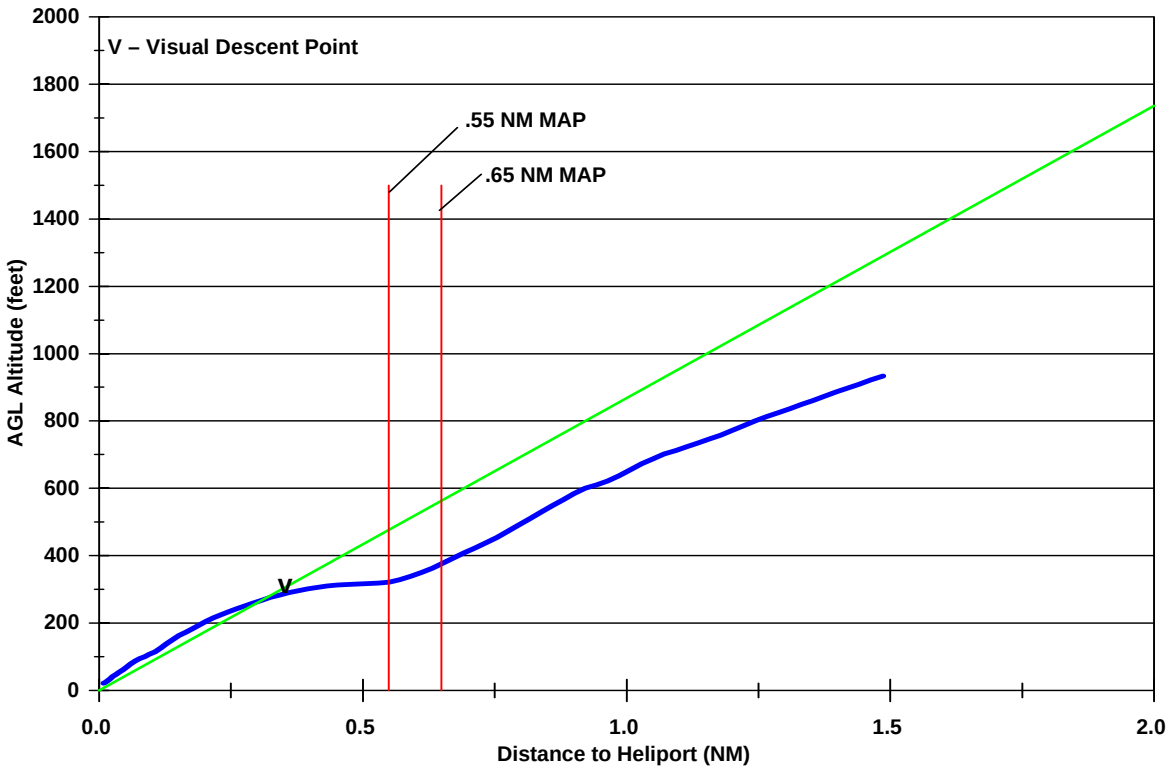


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06B004 - Appr. #10W

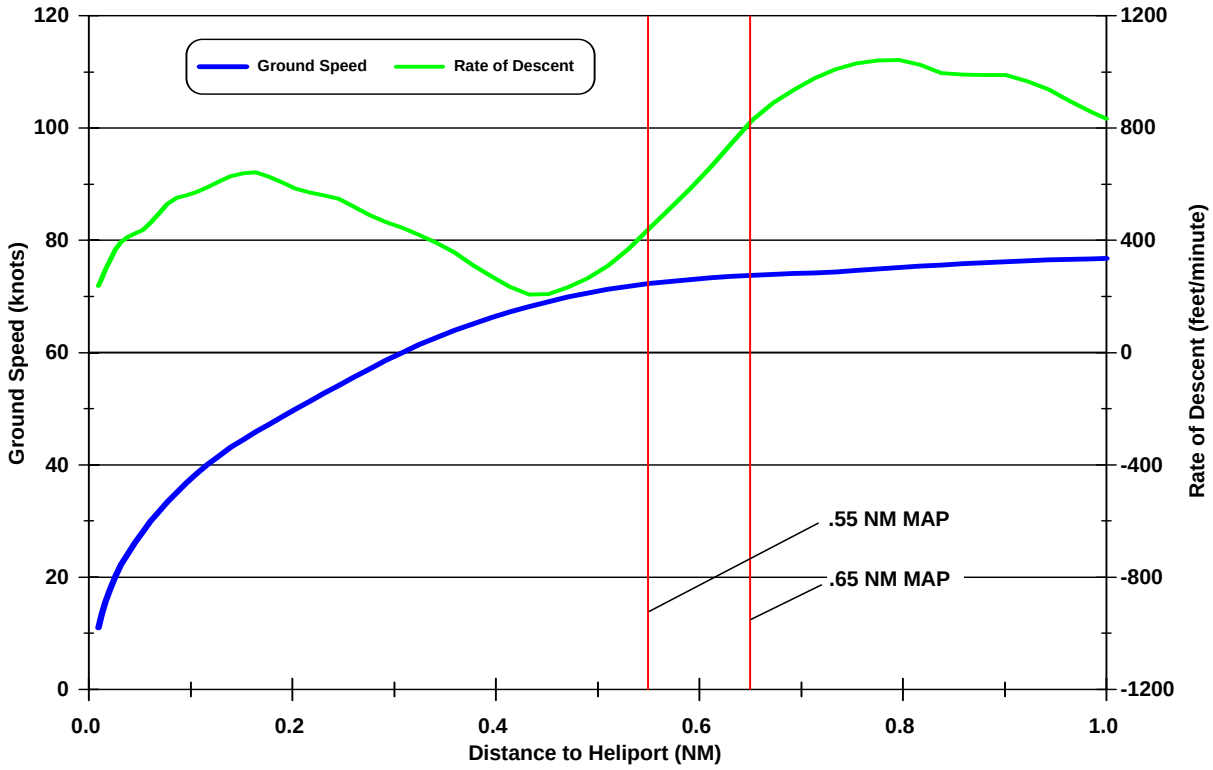



Approach - Plan View
Pilot P11 - 05/09/06B005 - Appr. #11Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
358/10
077/20
15
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

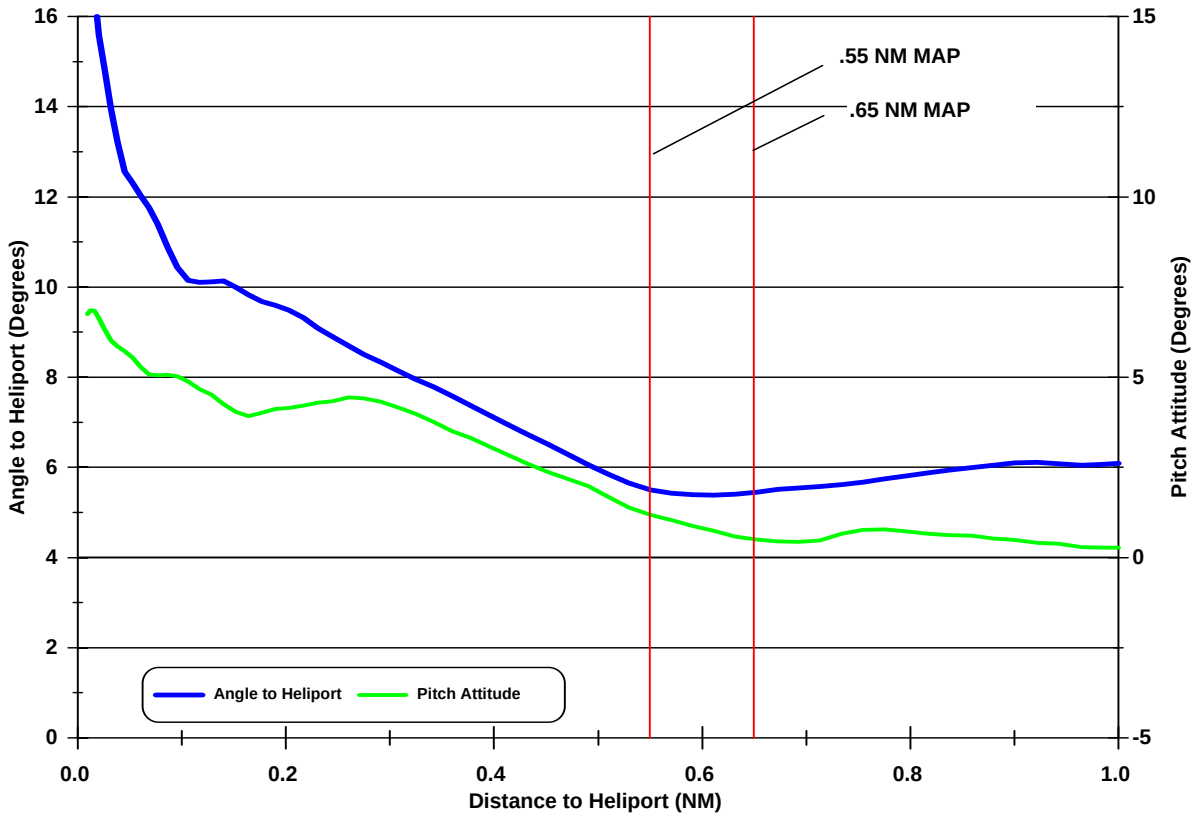
Profile View
Pilot P11 - 05/09/06B005 - Appr. #11Y



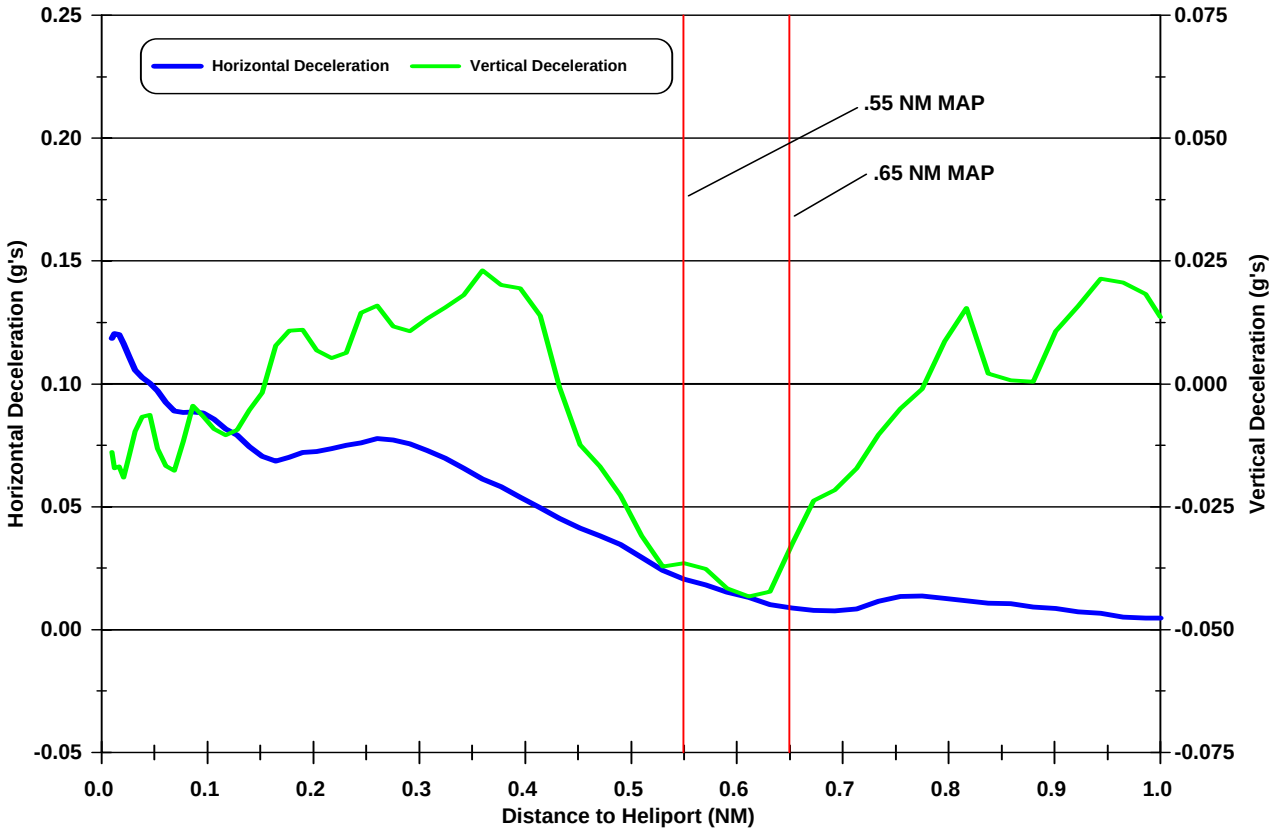
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06B005 - Appr. #11Y

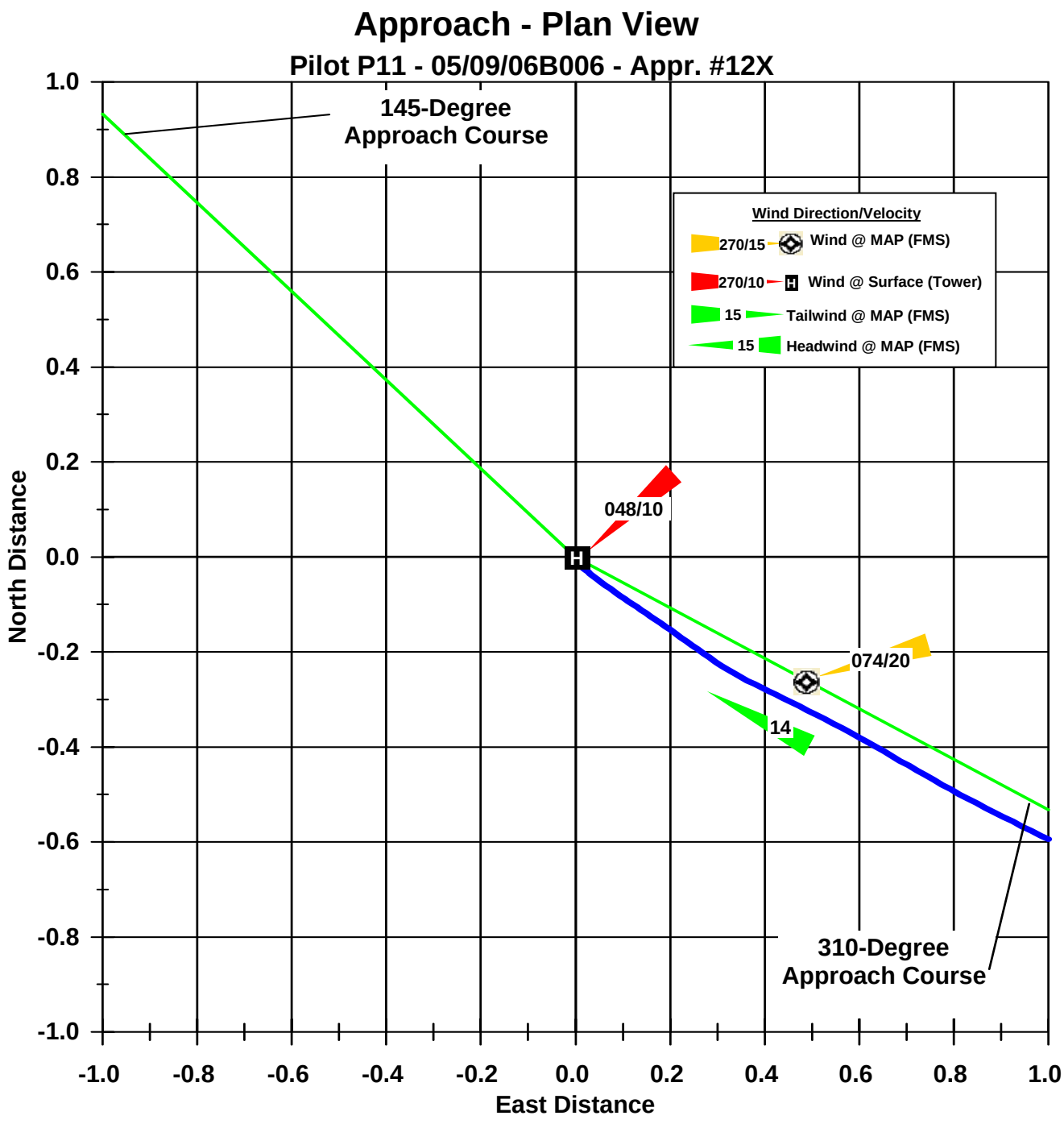


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06B005 - Appr. #11Y

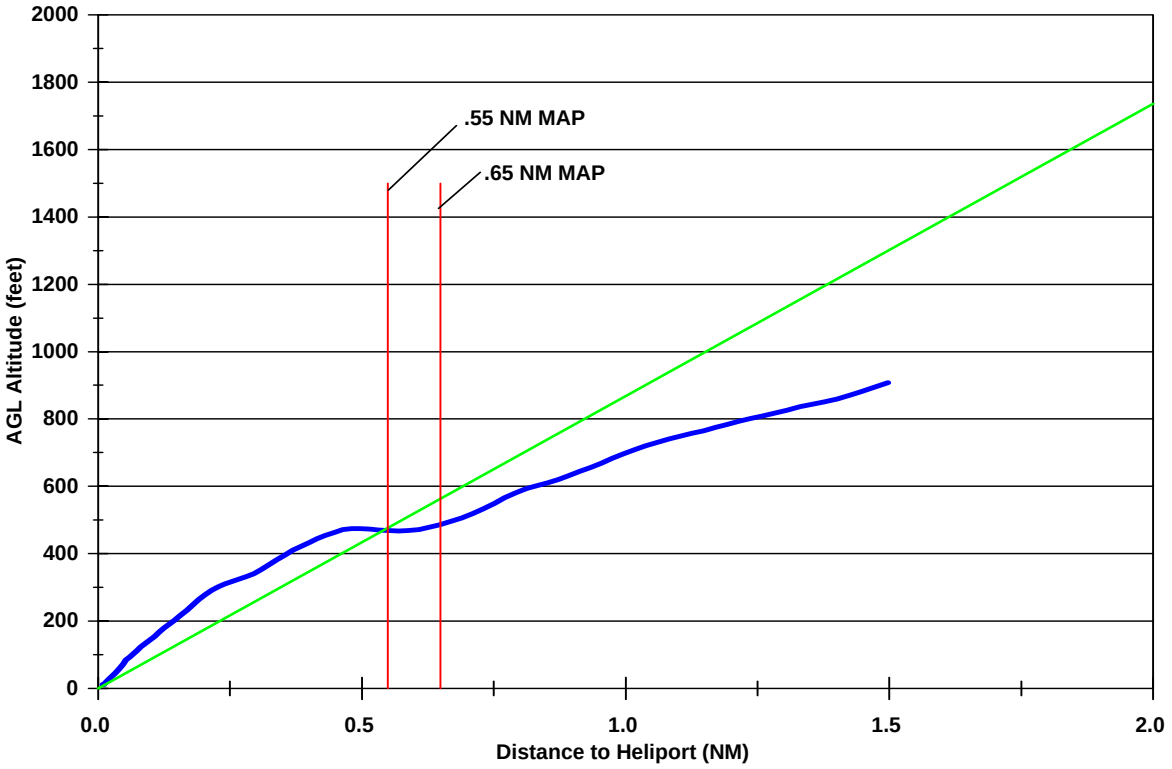


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06B005 - Appr. #11Y

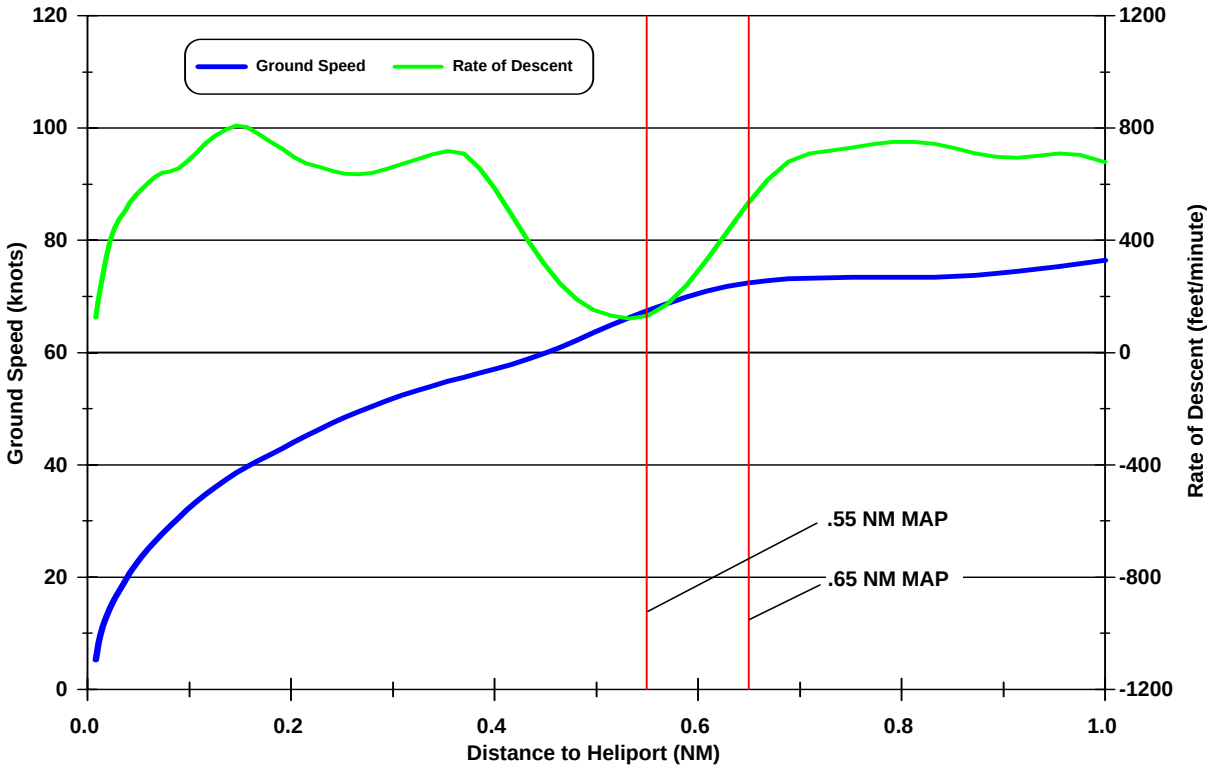



Approach - Plan View
Pilot P11 - 05/09/06B006 - Appr. #12X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
048/10
074/20
14
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

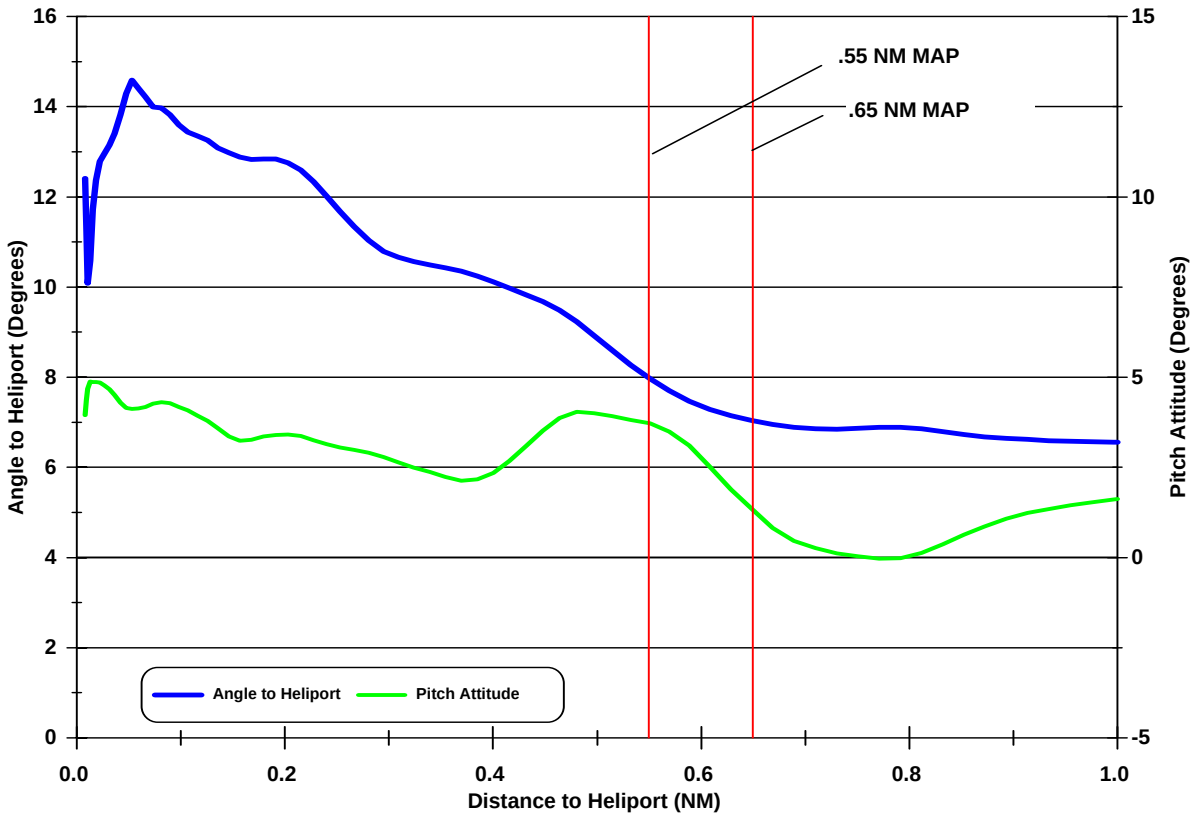
Profile View
Pilot P11 - 05/09/06B006 - Appr. #12X



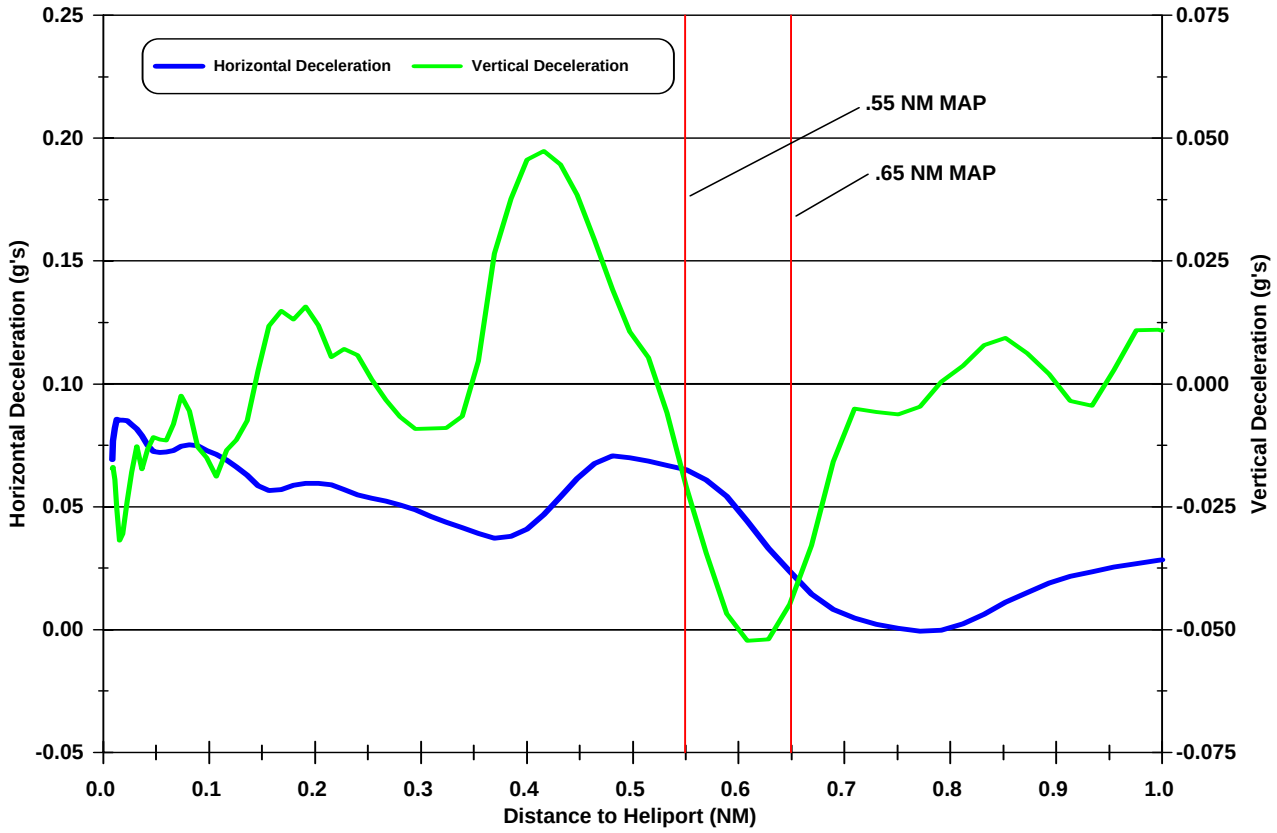
Ground Speed and Rate of Descent
Pilot P11 - 05/09/06B006 - Appr. #12X

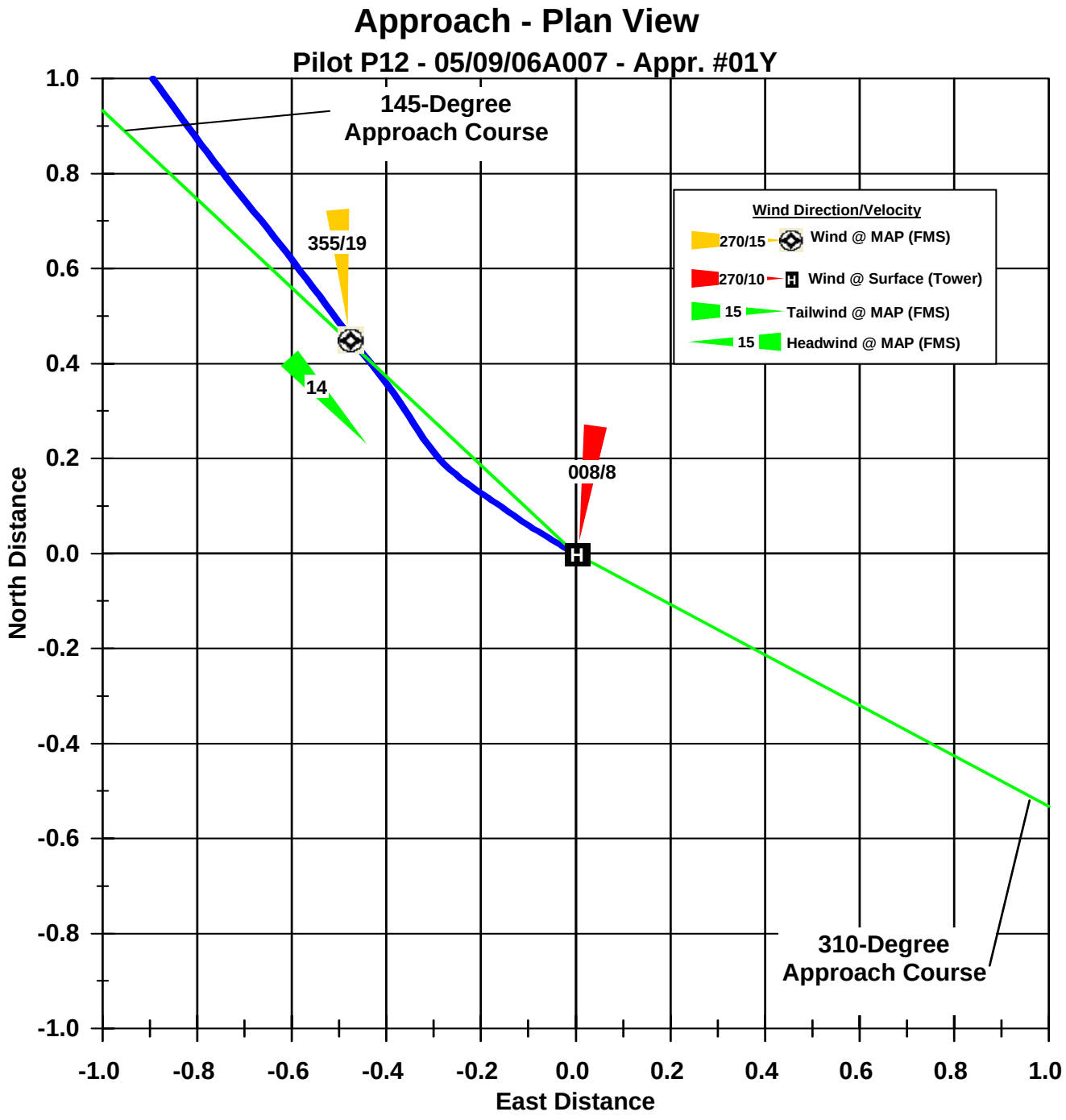


Angle to Heliport and Pitch Attitude
Pilot P11 - 05/09/06B006 - Appr. #12X

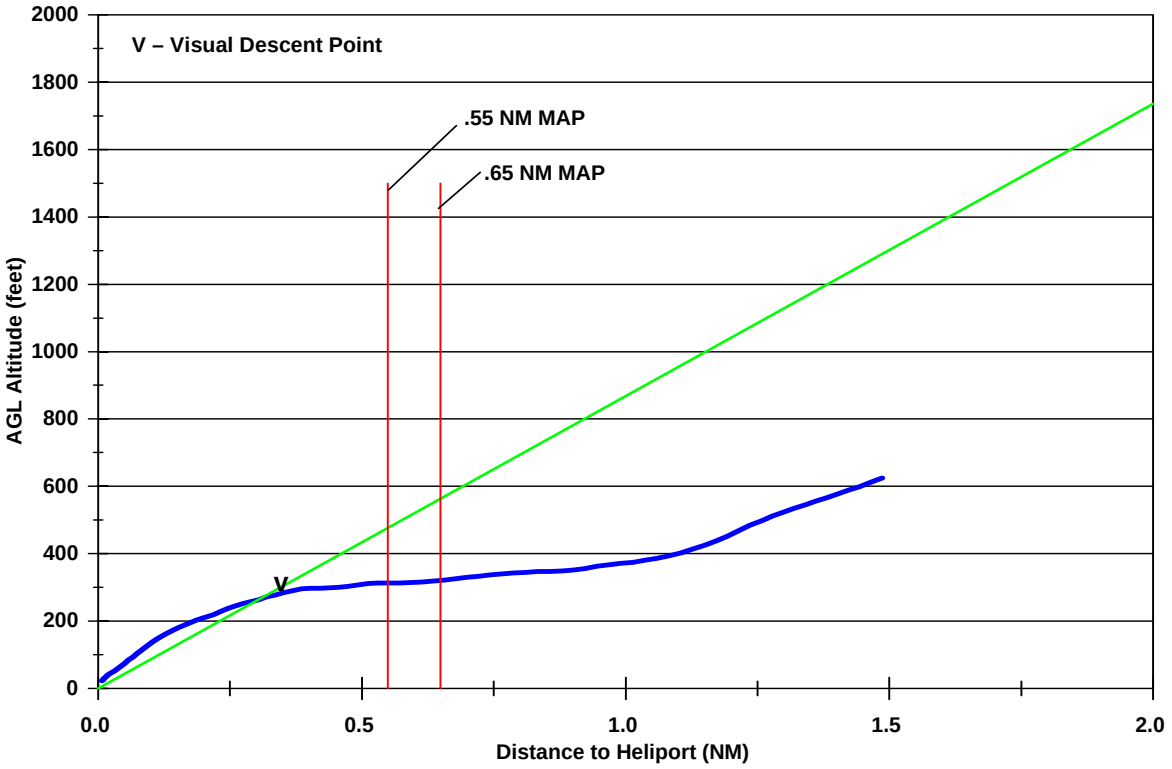


Horizontal and Vertical Deceleration
Pilot P11 - 05/09/06B006 - Appr. #12X

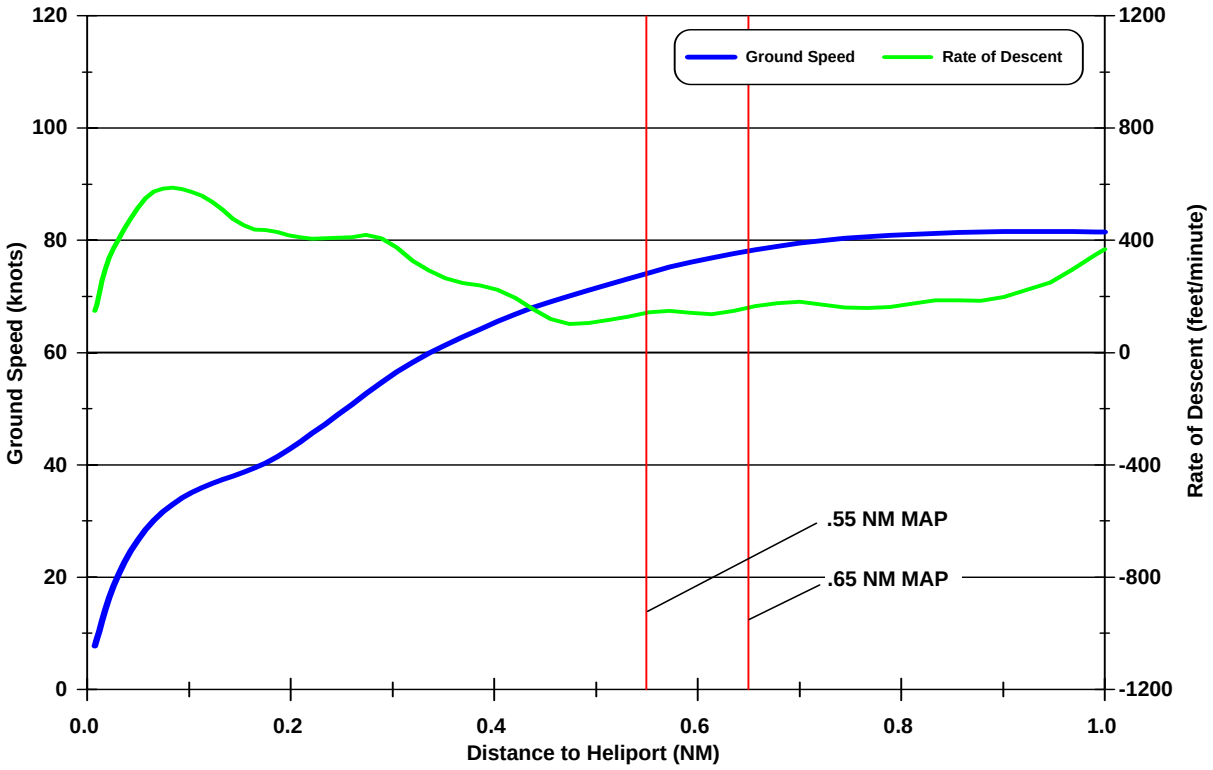



Approach - Plan View
Pilot P12 - 05/09/06A007 - Appr. #01Y
145-Degree
Approach Course
310-Degree
Approach Course
355/19
14
008/8
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

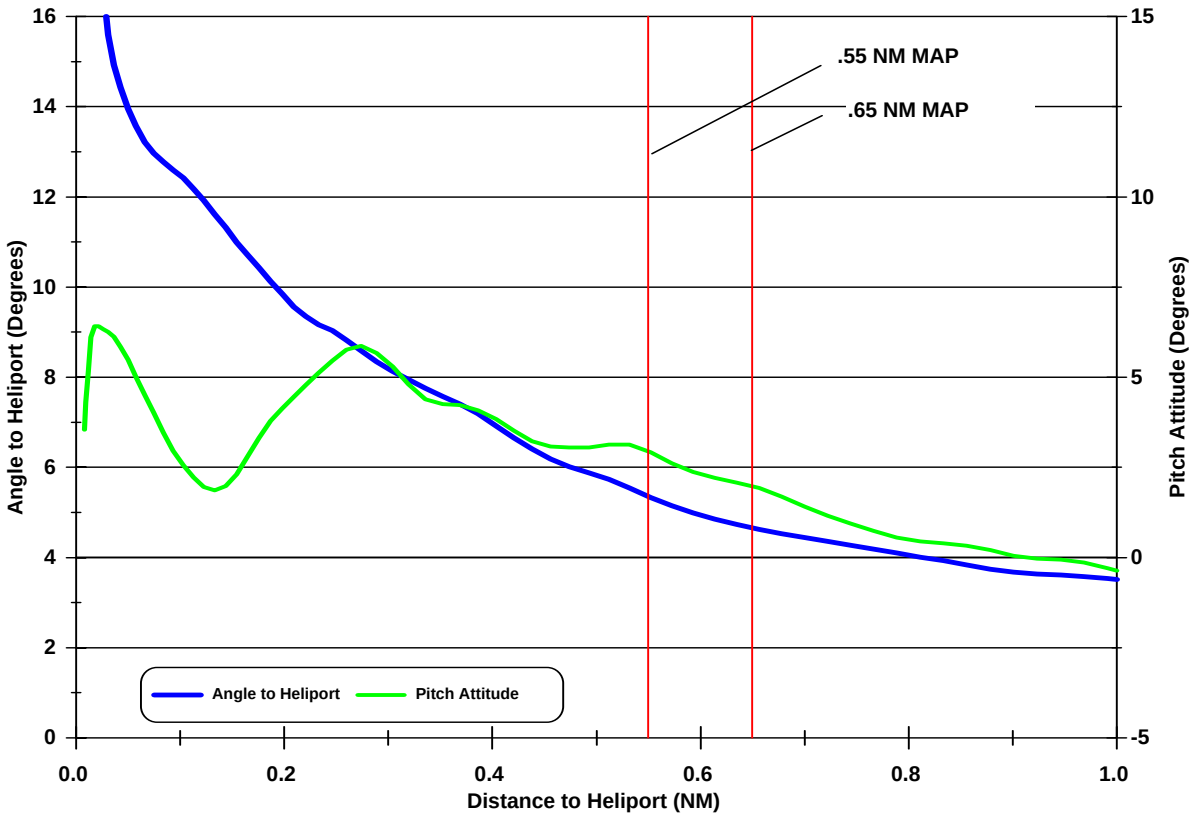
Profile View
Pilot P12 - 05/09/06A007 - Appr. #01Y



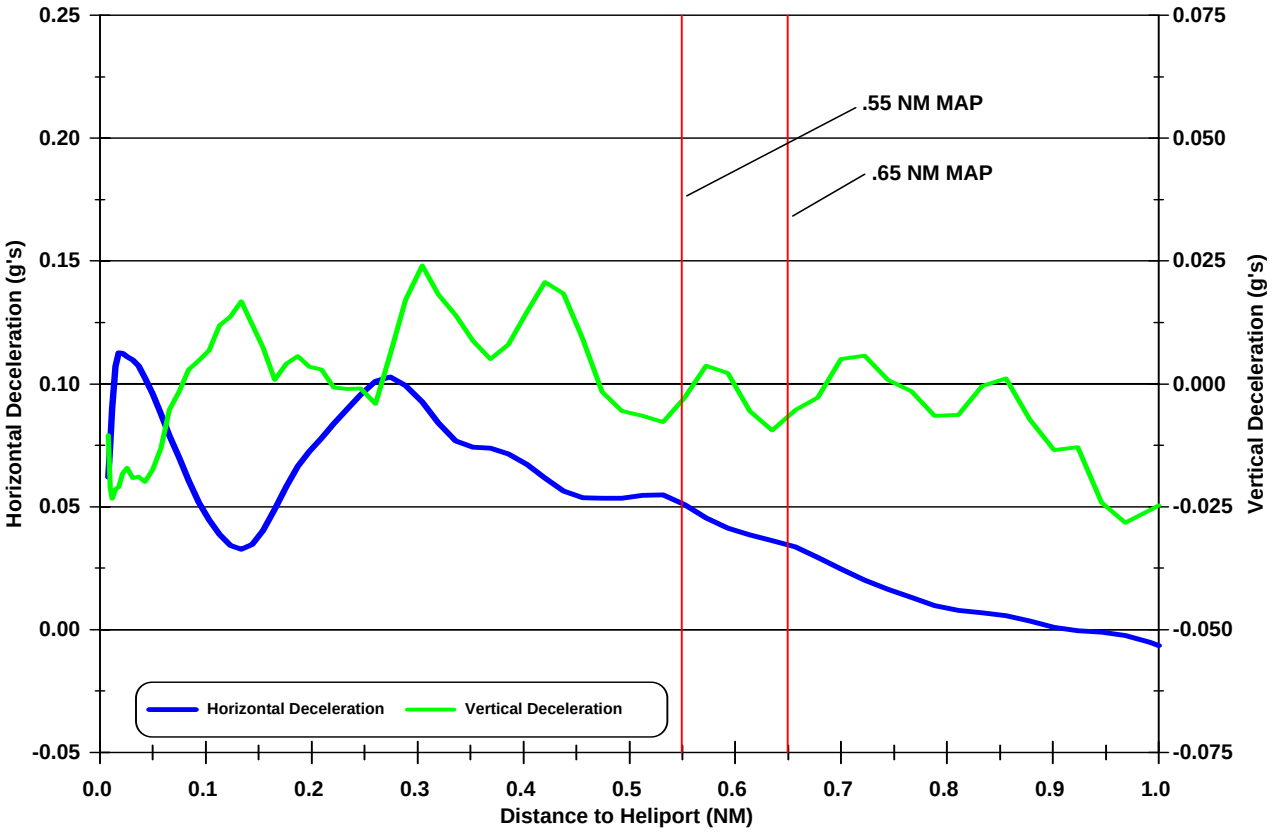
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06A007 - Appr. #01Y

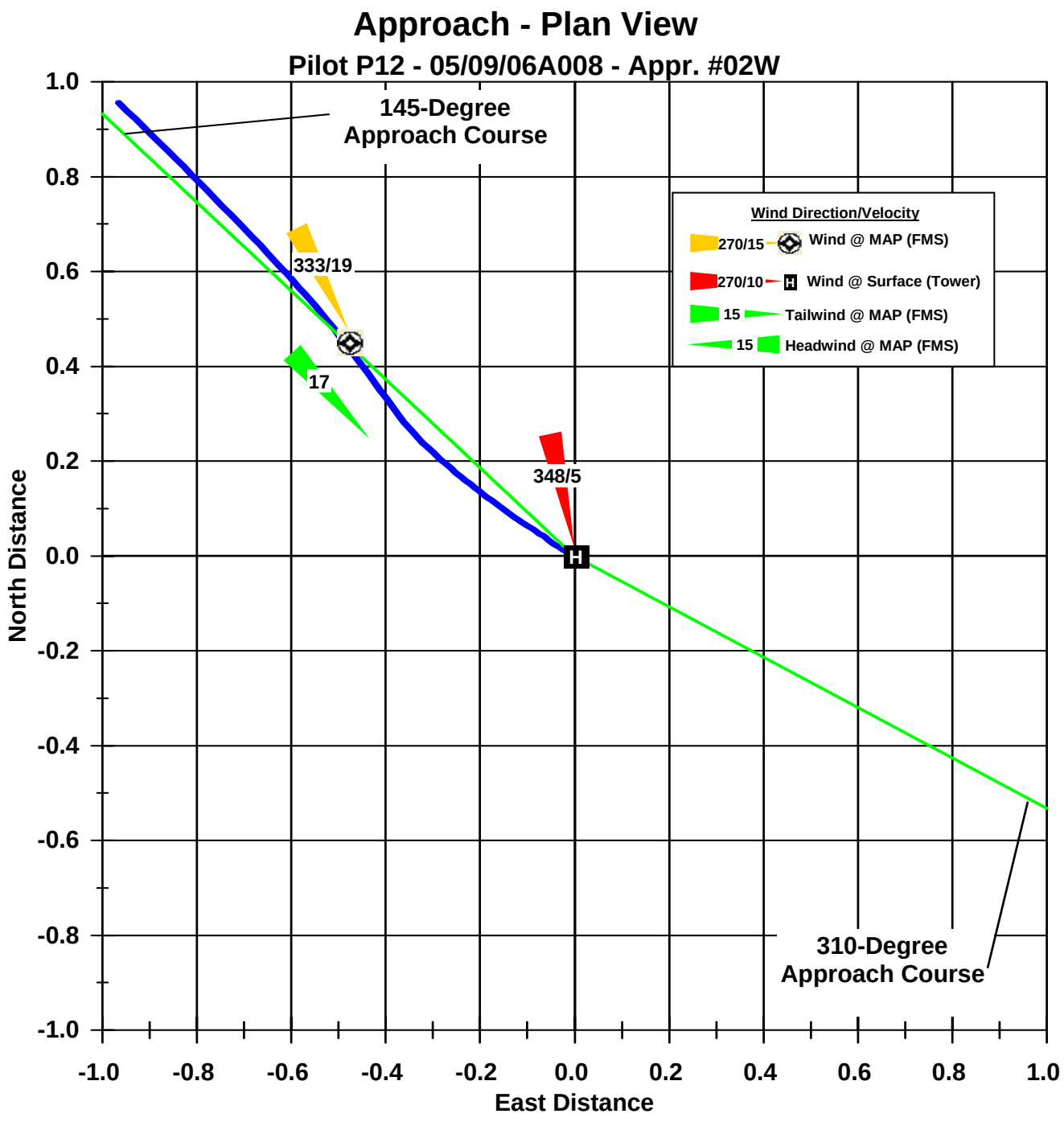


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06A007 - Appr. #01Y

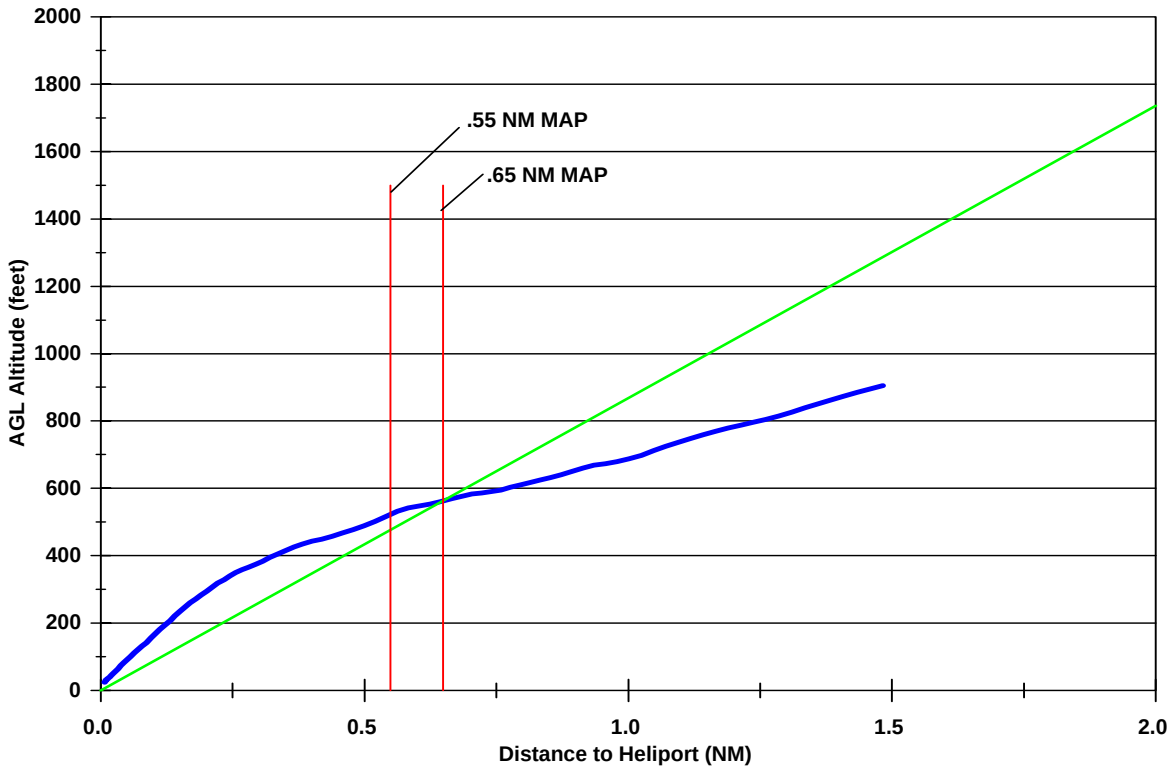


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06A007 - Appr. #01Y

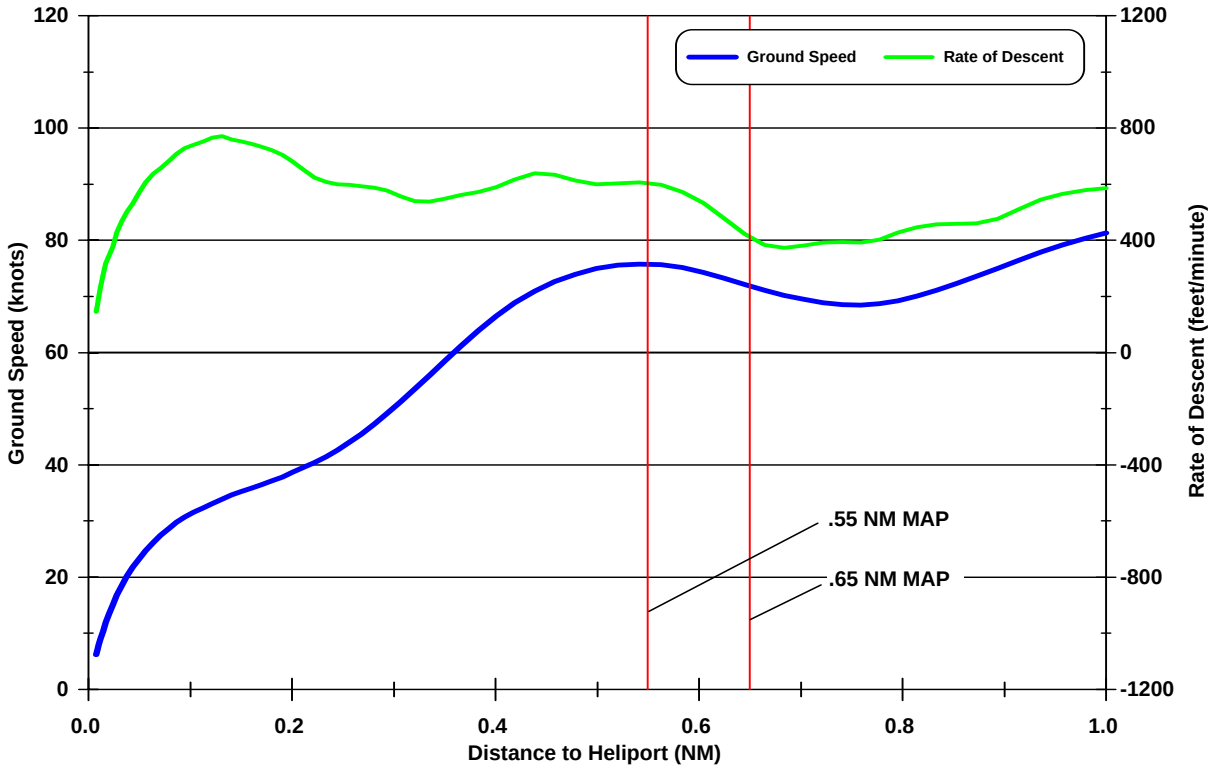



Approach - Plan View
Pilot P12 - 05/09/06A008 - Appr. #02W
145-Degree
Approach Course
310-Degree
Approach Course
333/19
17
348/5
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

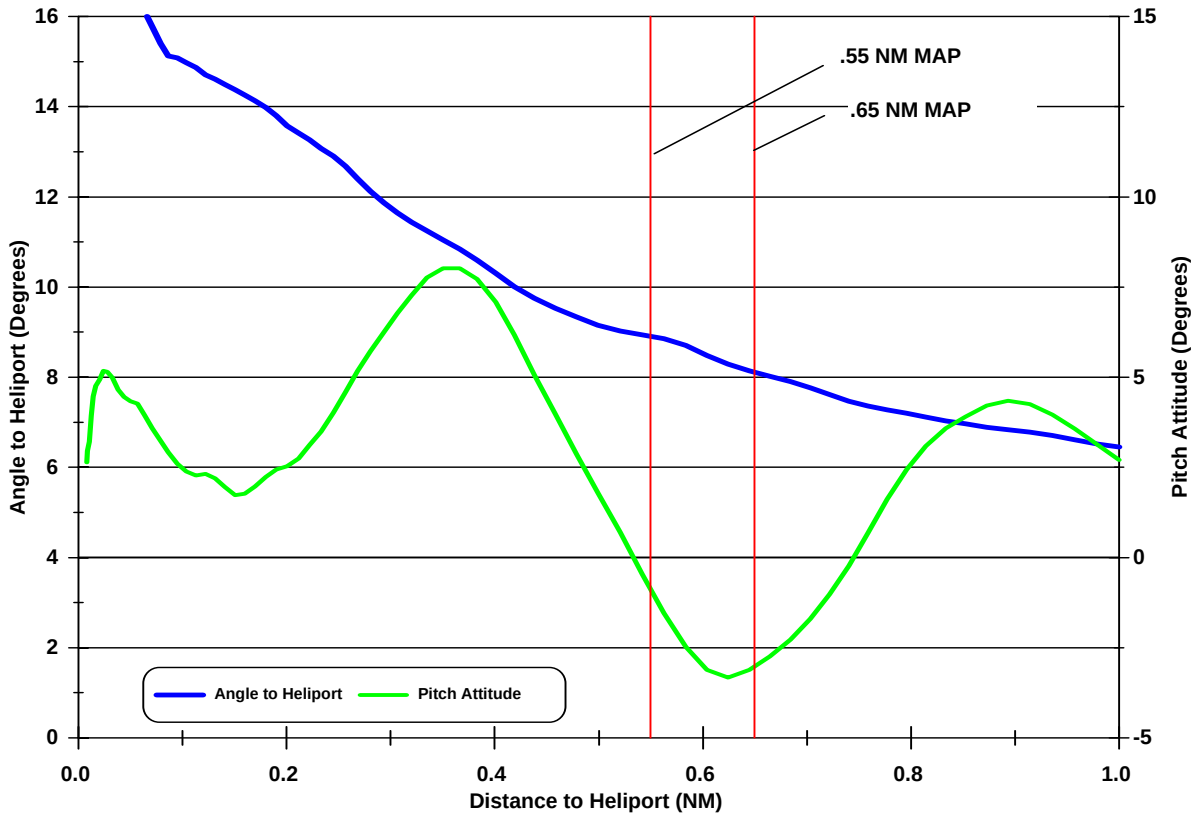
Profile View
Pilot P12 - 05/09/06A008 - Appr. #02W



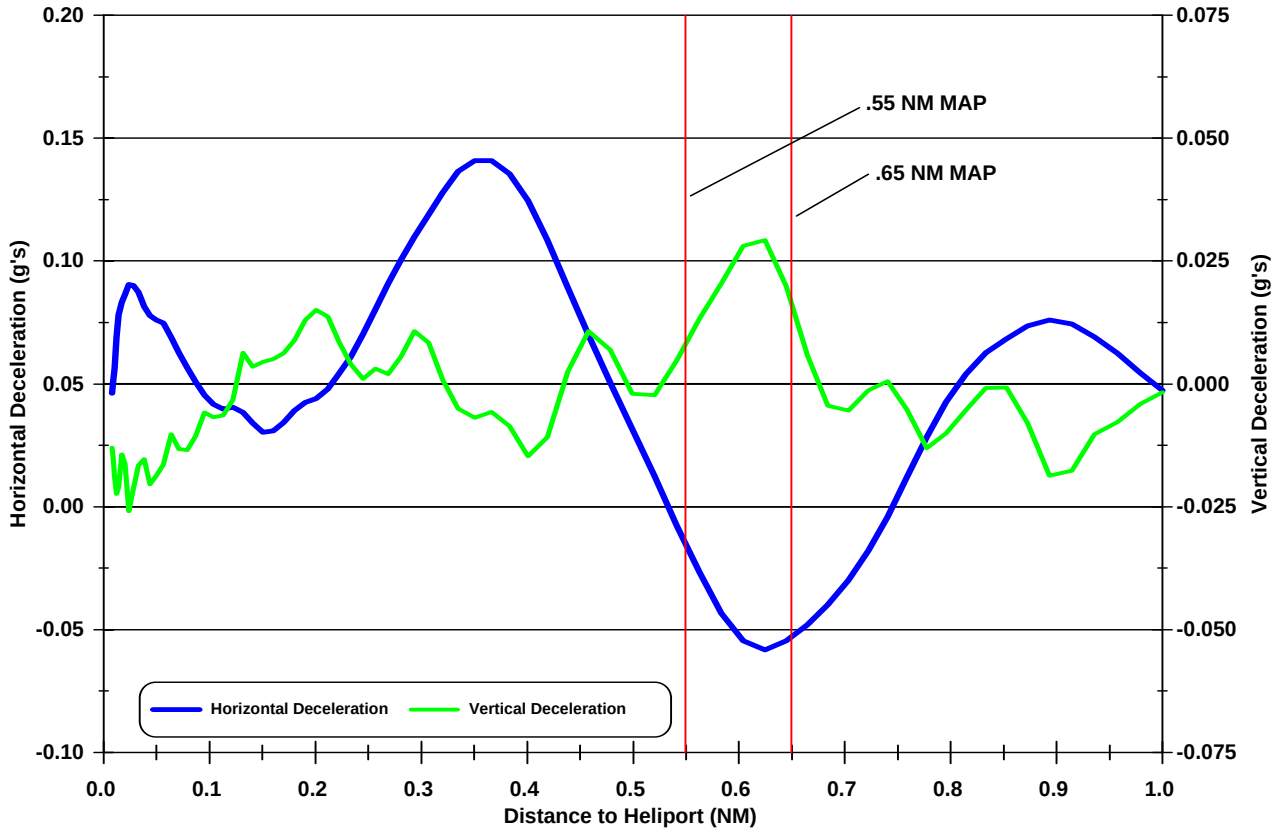
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06A008 - Appr. #02W

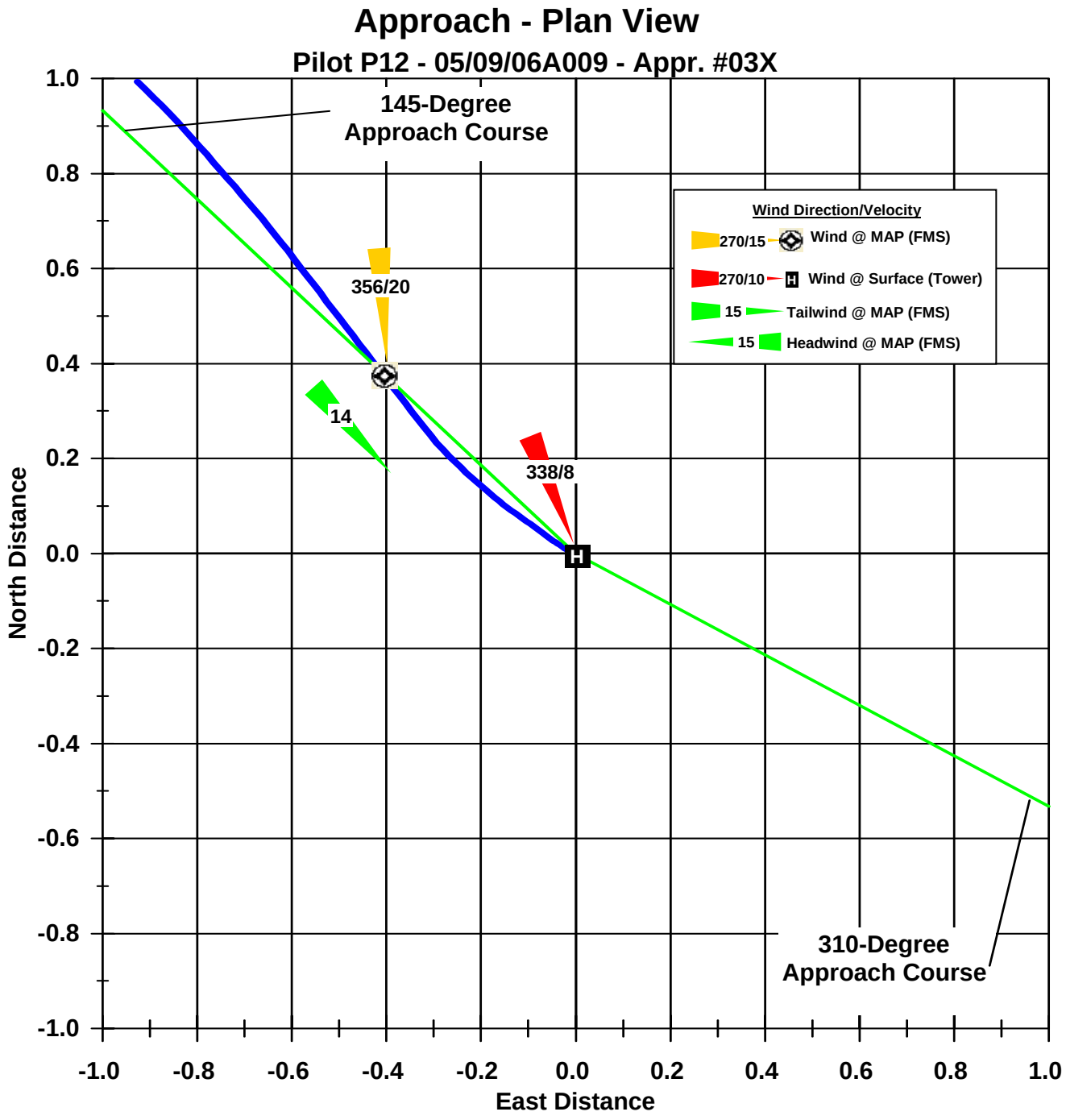


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06A008 - Appr. #02W

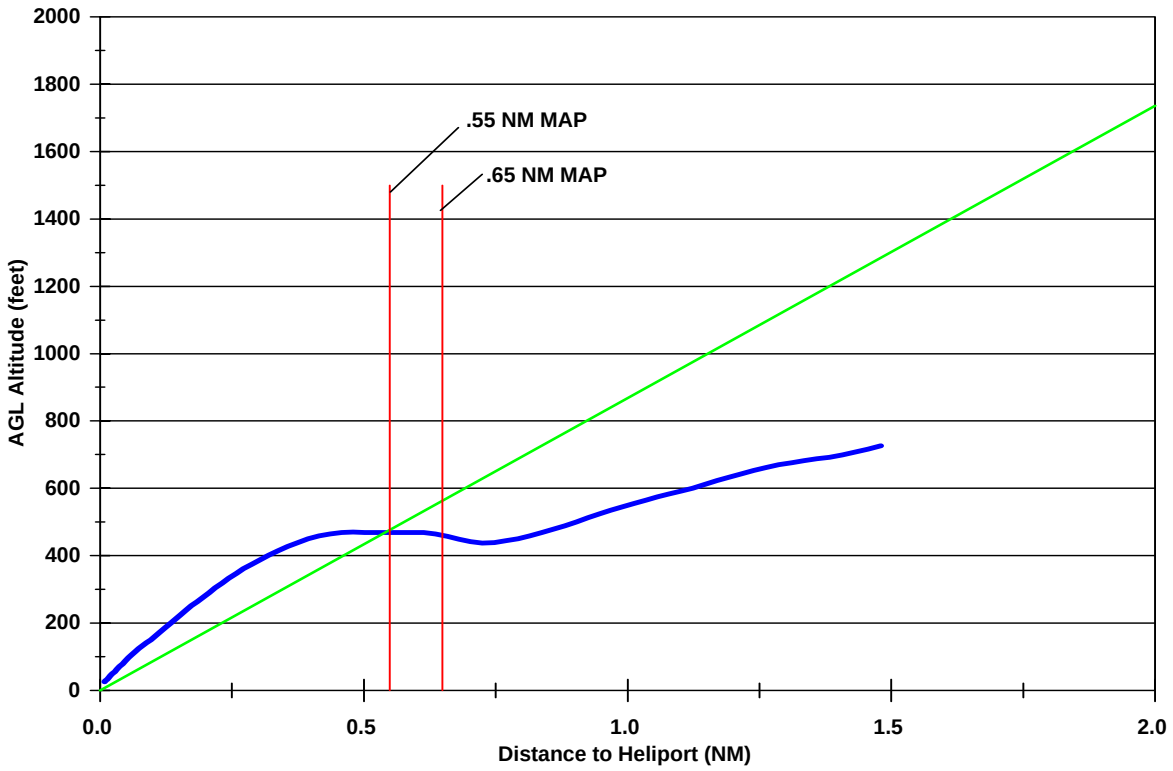


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06A008 - Appr. #02W

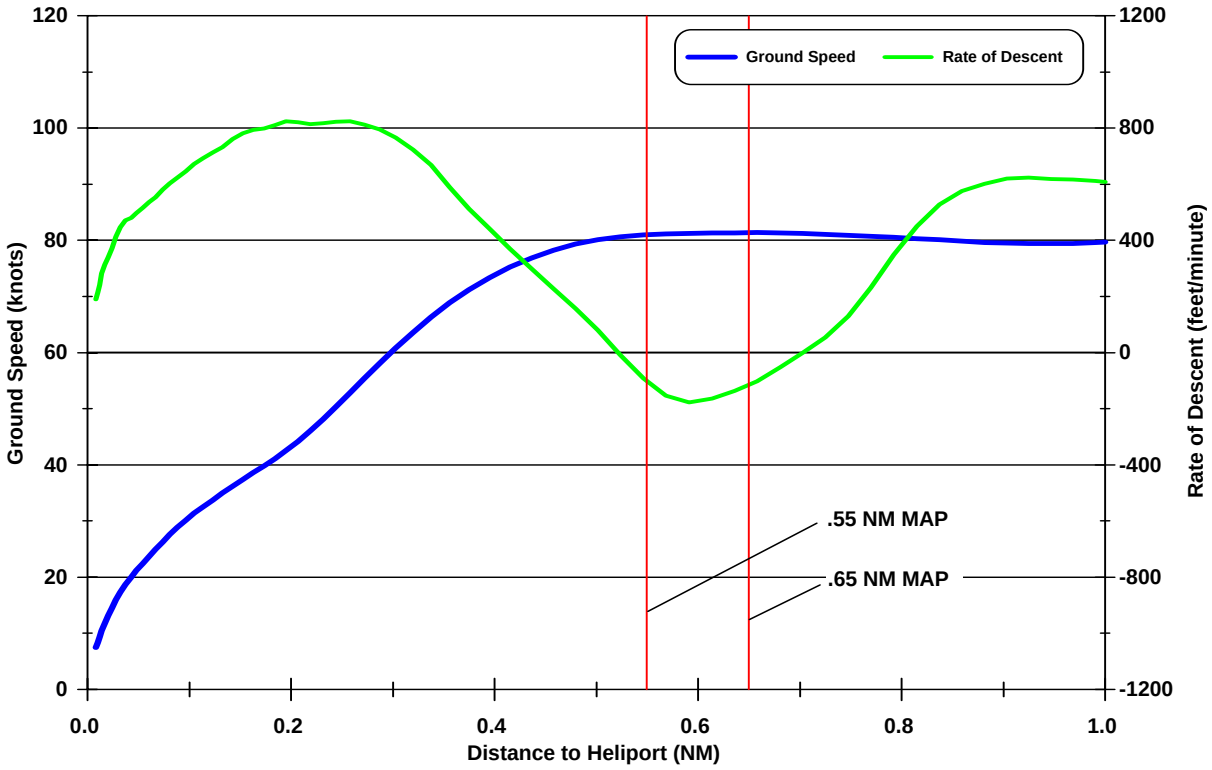



Approach - Plan View
Pilot P12 - 05/09/06A009 - Appr. #03X
145-Degree
Approach Course
310-Degree
Approach Course
356/20
14
338/8
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

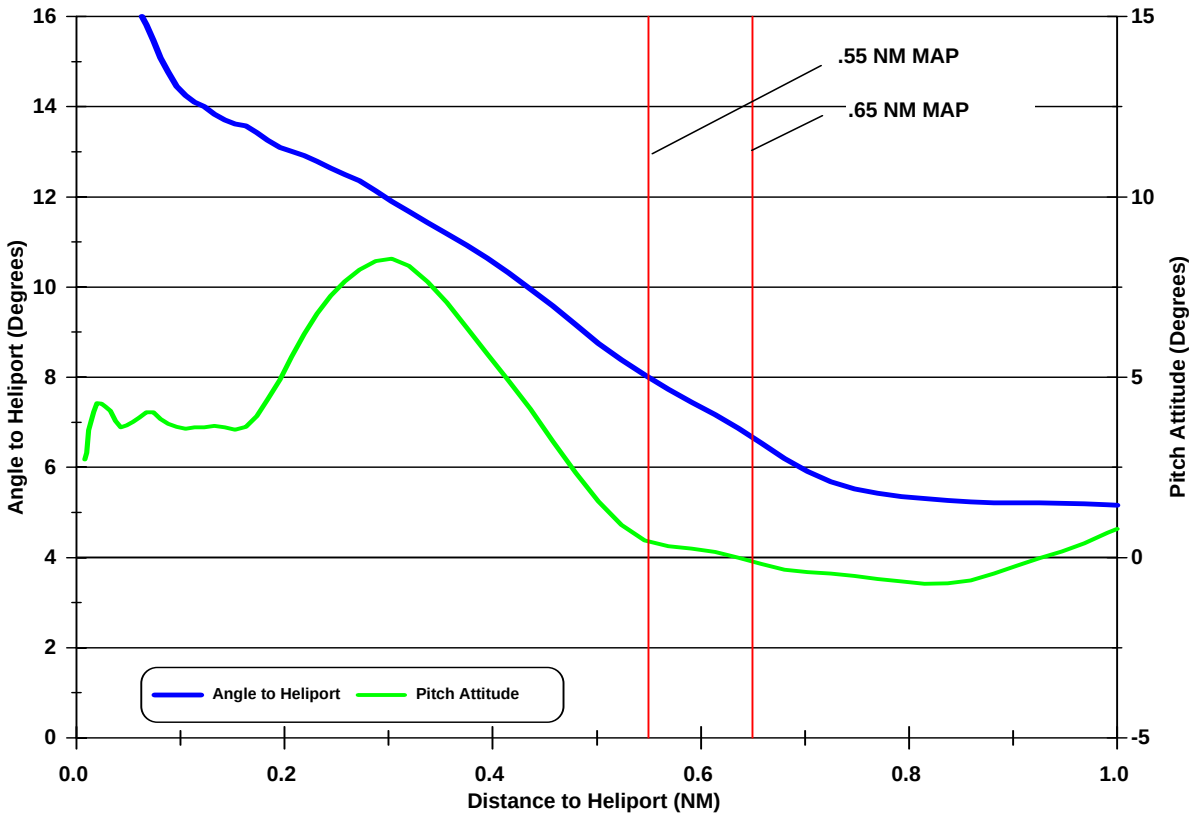
Profile View
Pilot P12 - 05/09/06A009 - Appr. #03X



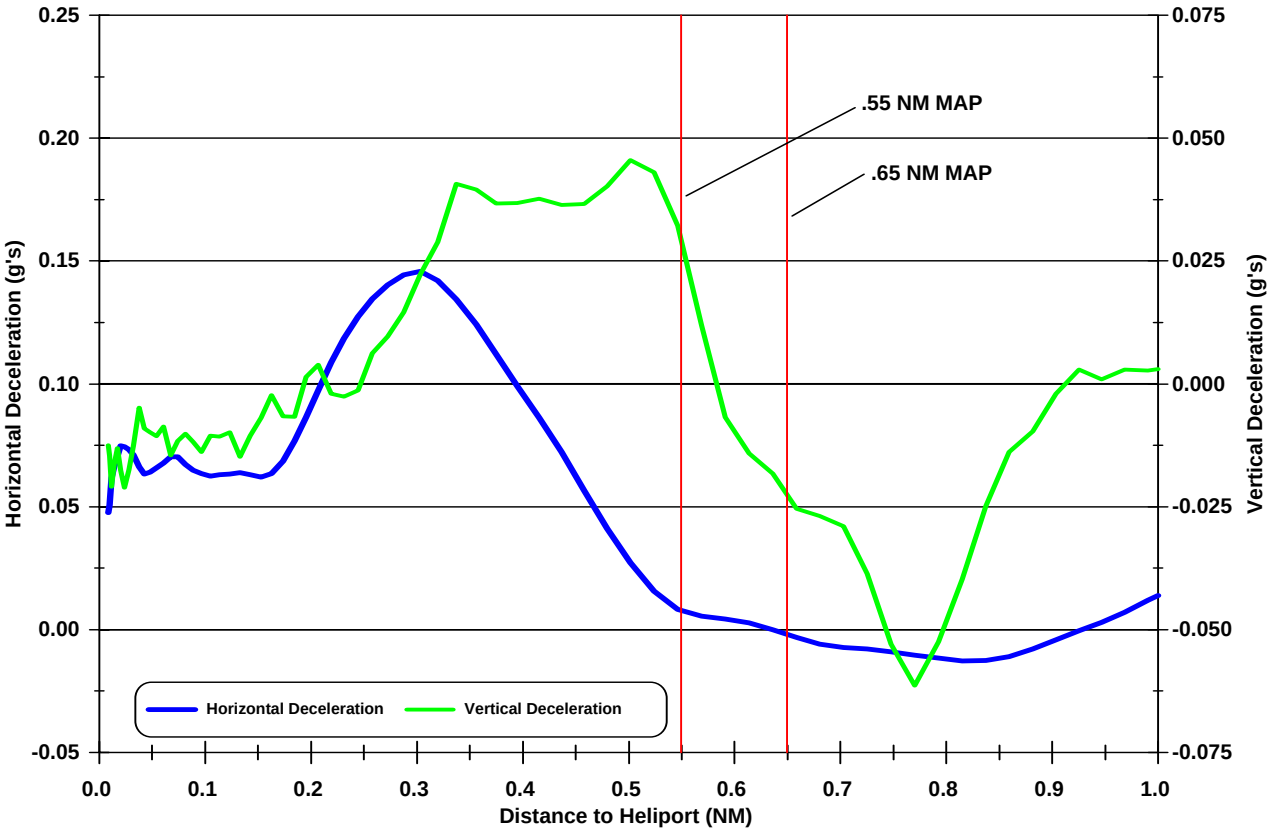
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06A009 - Appr. #03X

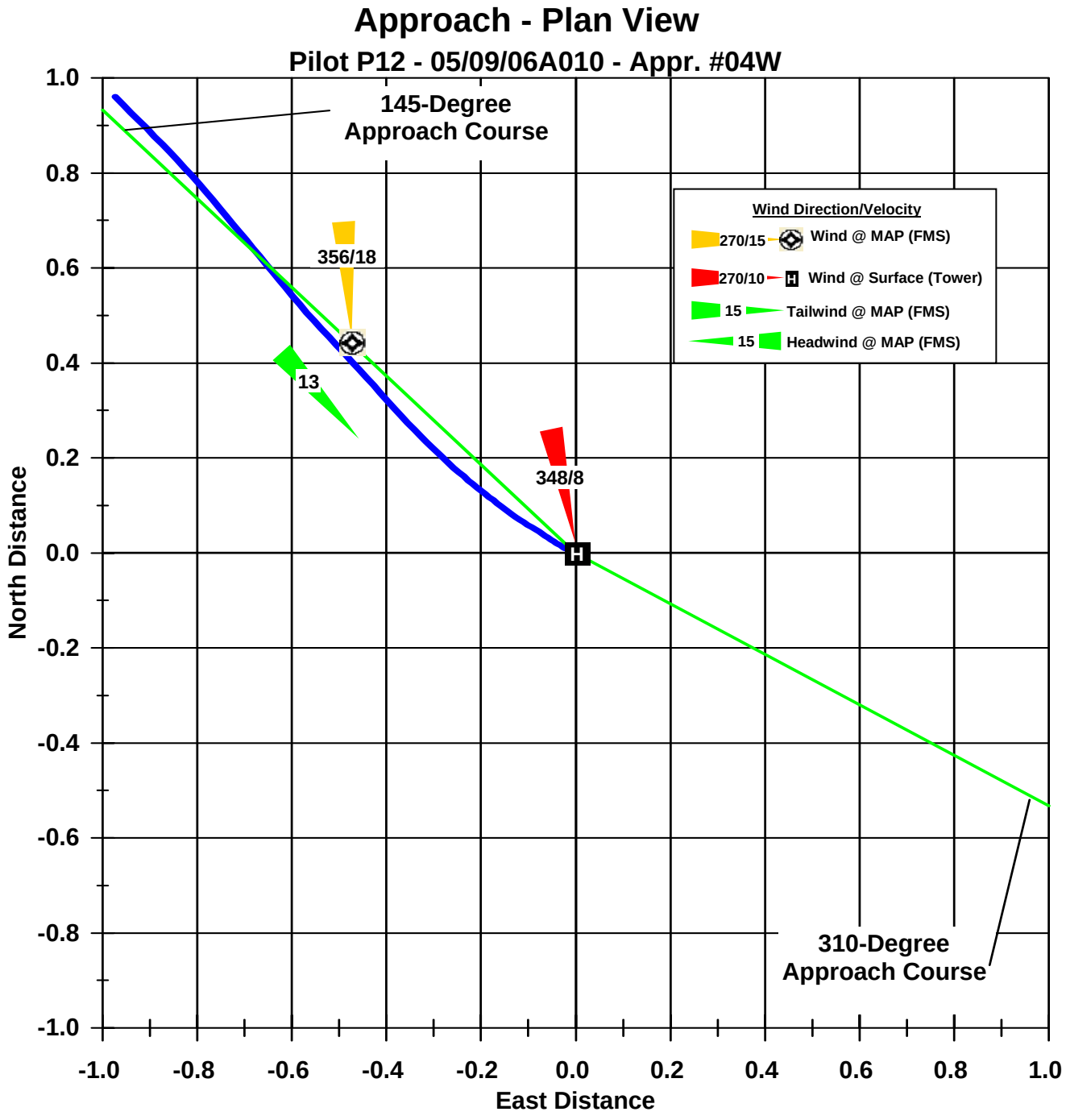


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06A009 - Appr. #03X

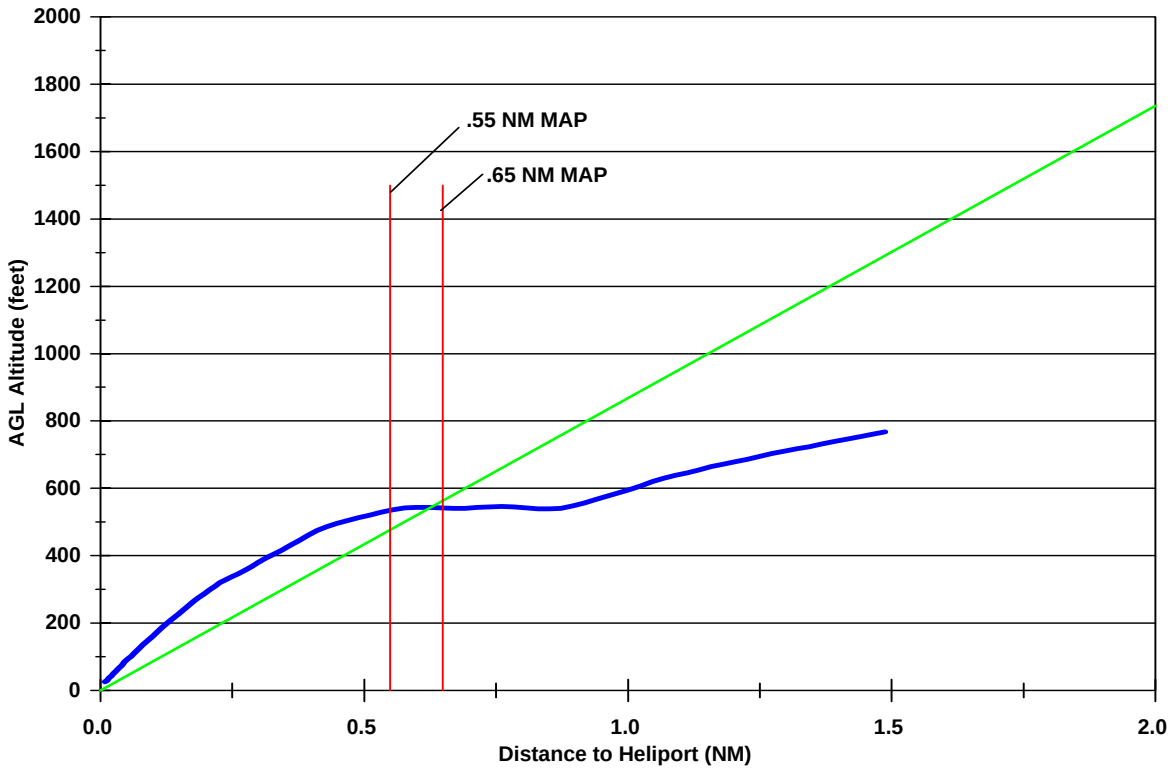


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06A009 - Appr. #03X

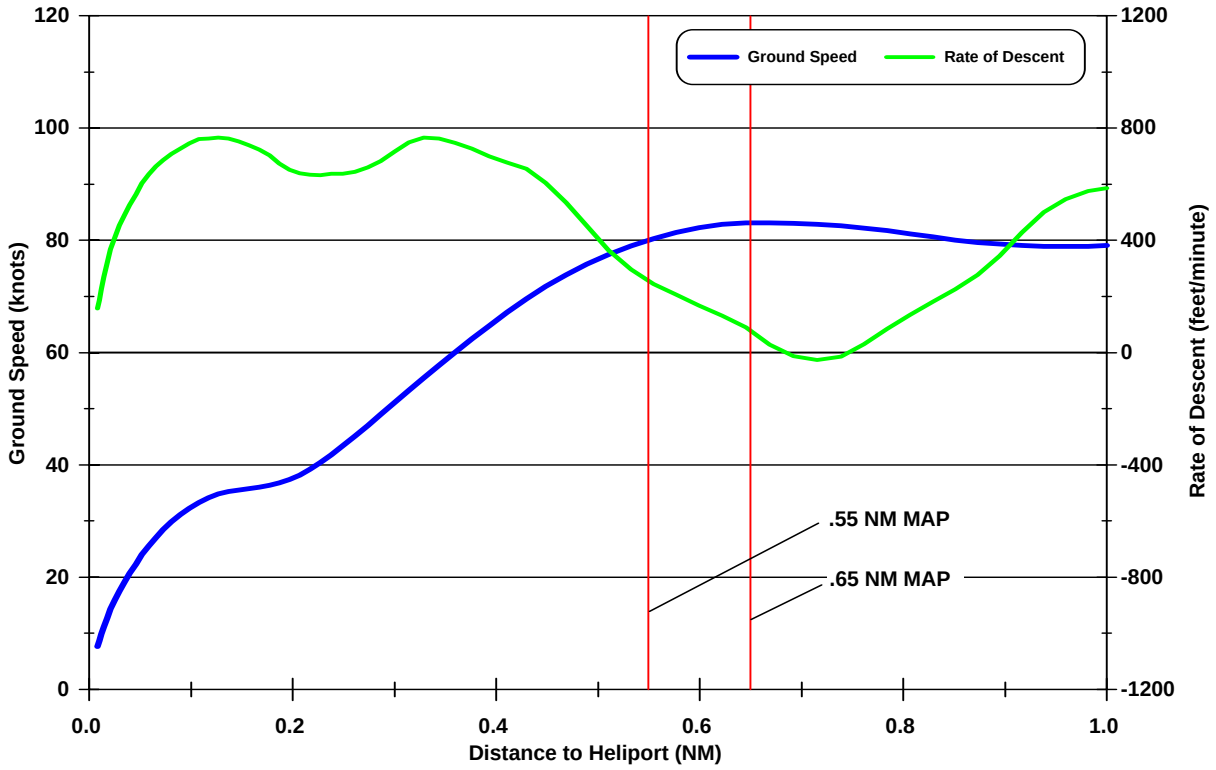



Approach - Plan View
Pilot P12 - 05/09/06A010 - Appr. #04W
145-Degree
Approach Course
310-Degree
Approach Course
356/18
13
348/8
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

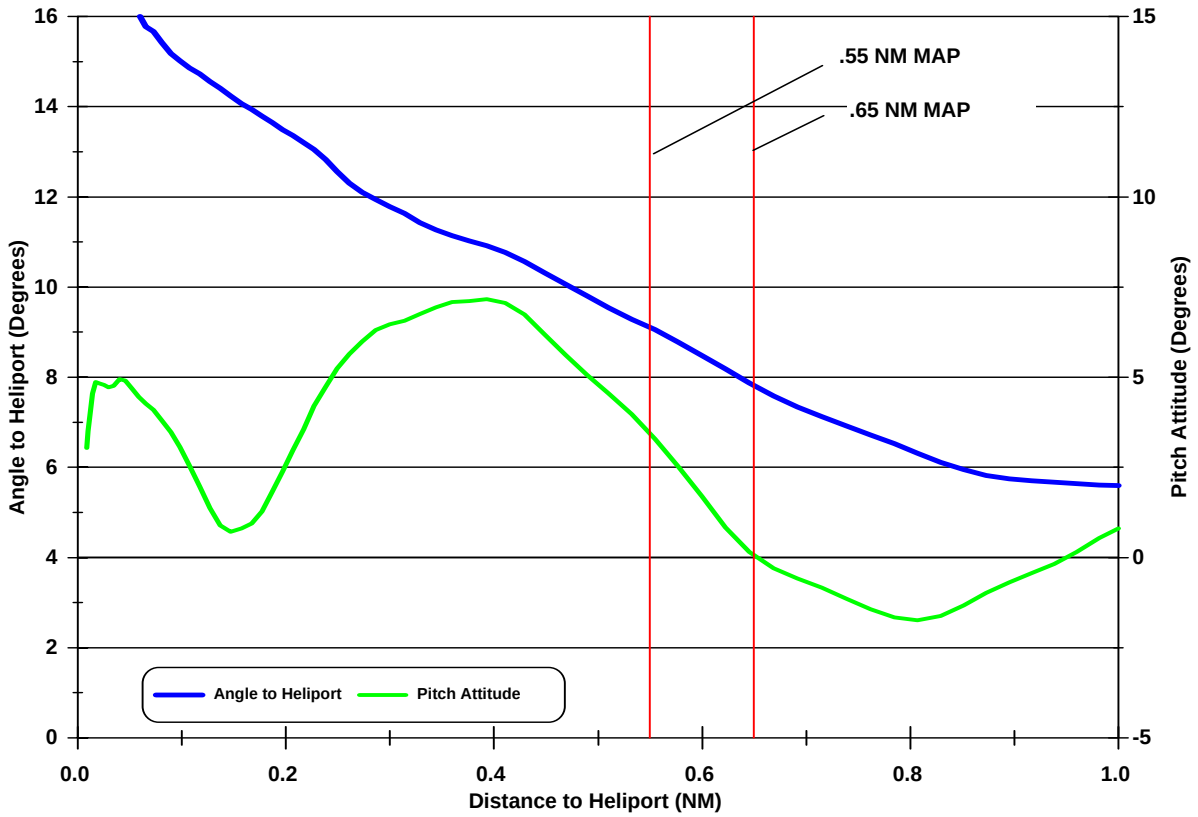
Profile View
Pilot P12 - 05/09/06A010 - Appr. #04W



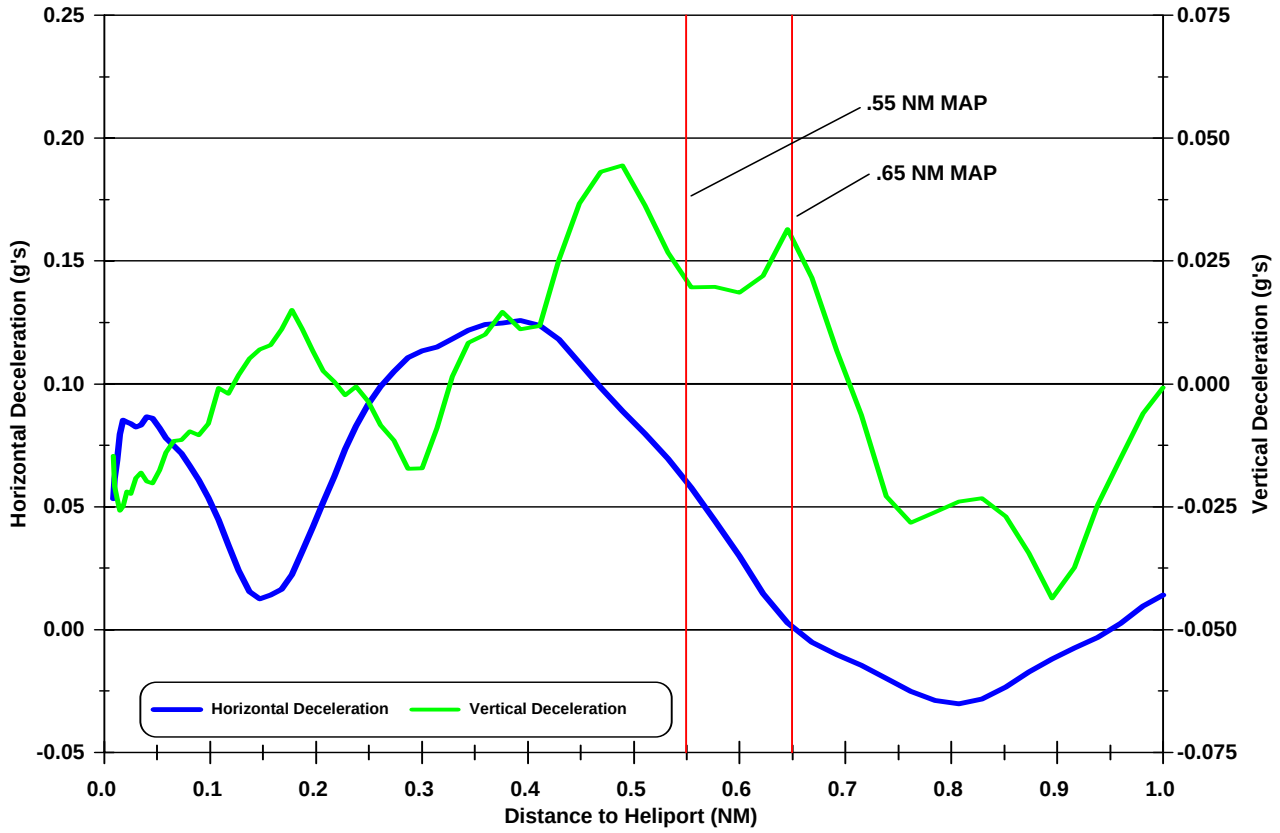
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06A010 - Appr. #04W

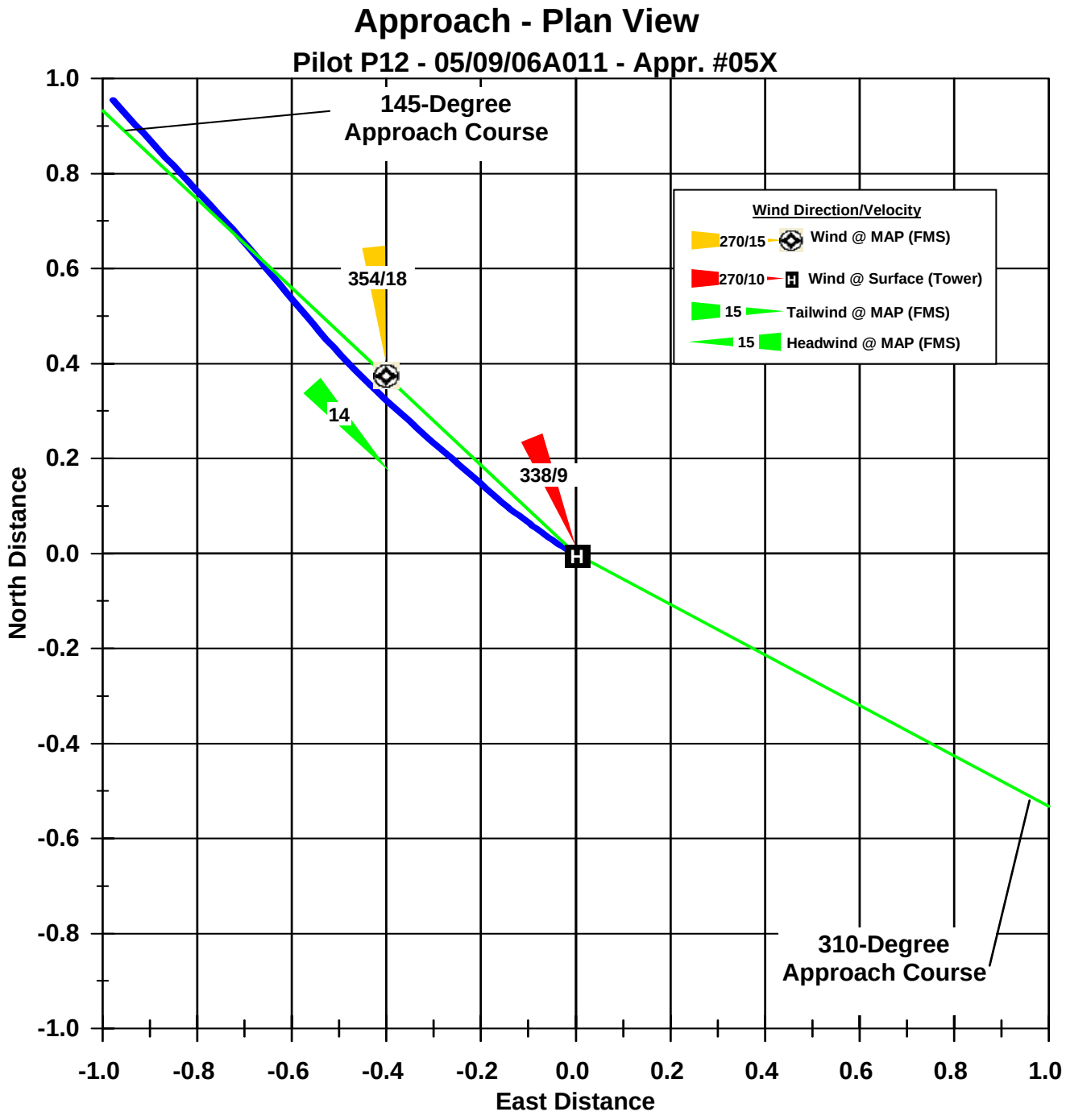


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06A010 - Appr. #04W

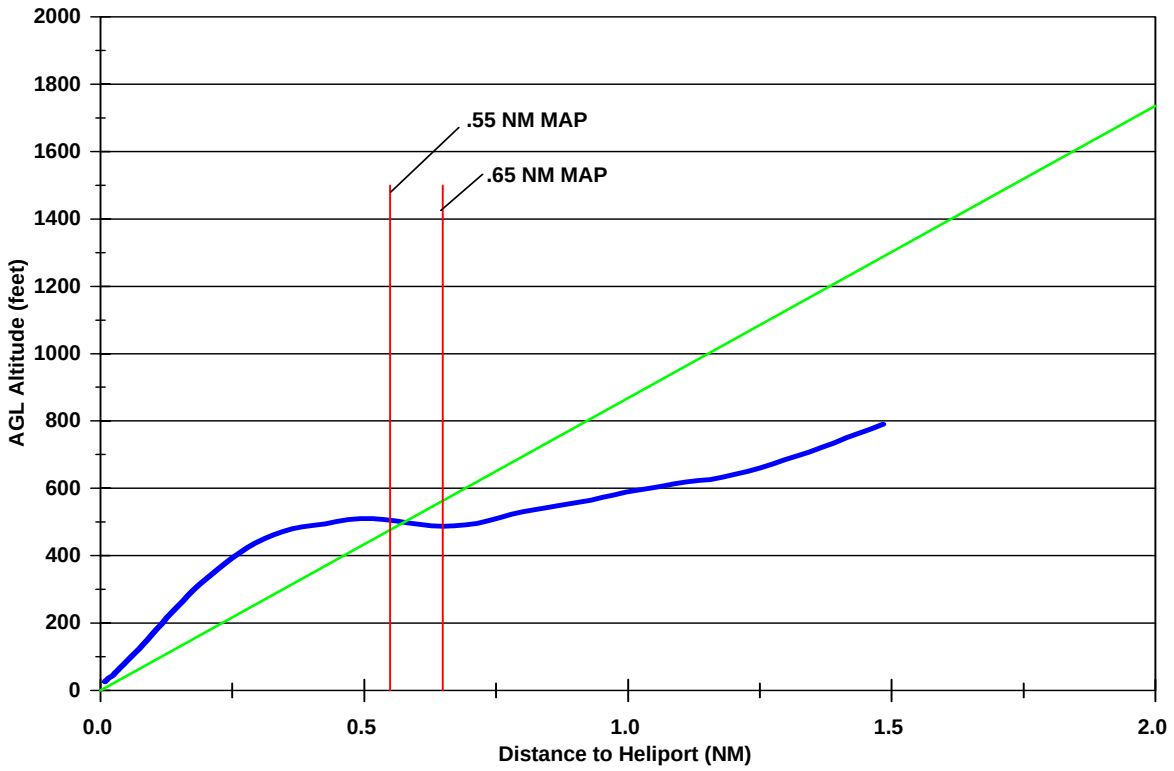


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06A010 - Appr. #04W

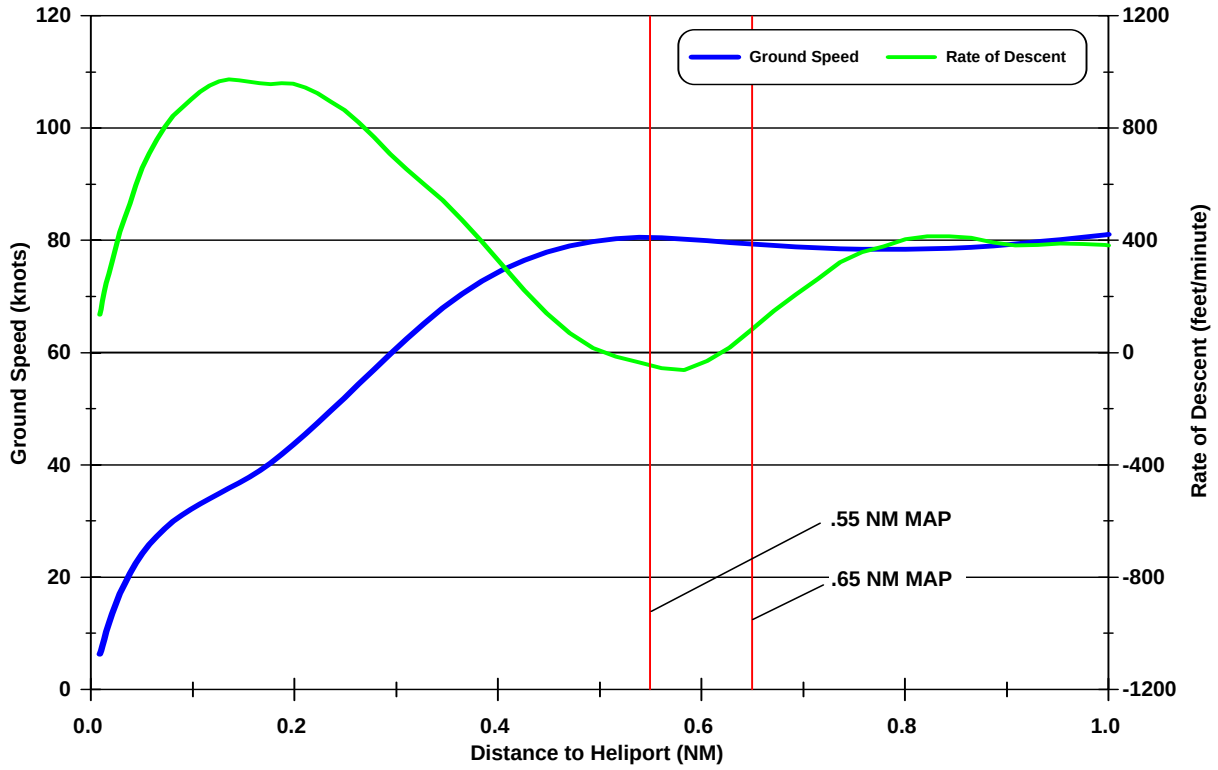



Approach - Plan View
Pilot P12 - 05/09/06A011 - Appr. #05X
145-Degree
Approach Course
310-Degree
Approach Course
354/18
14
338/9
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

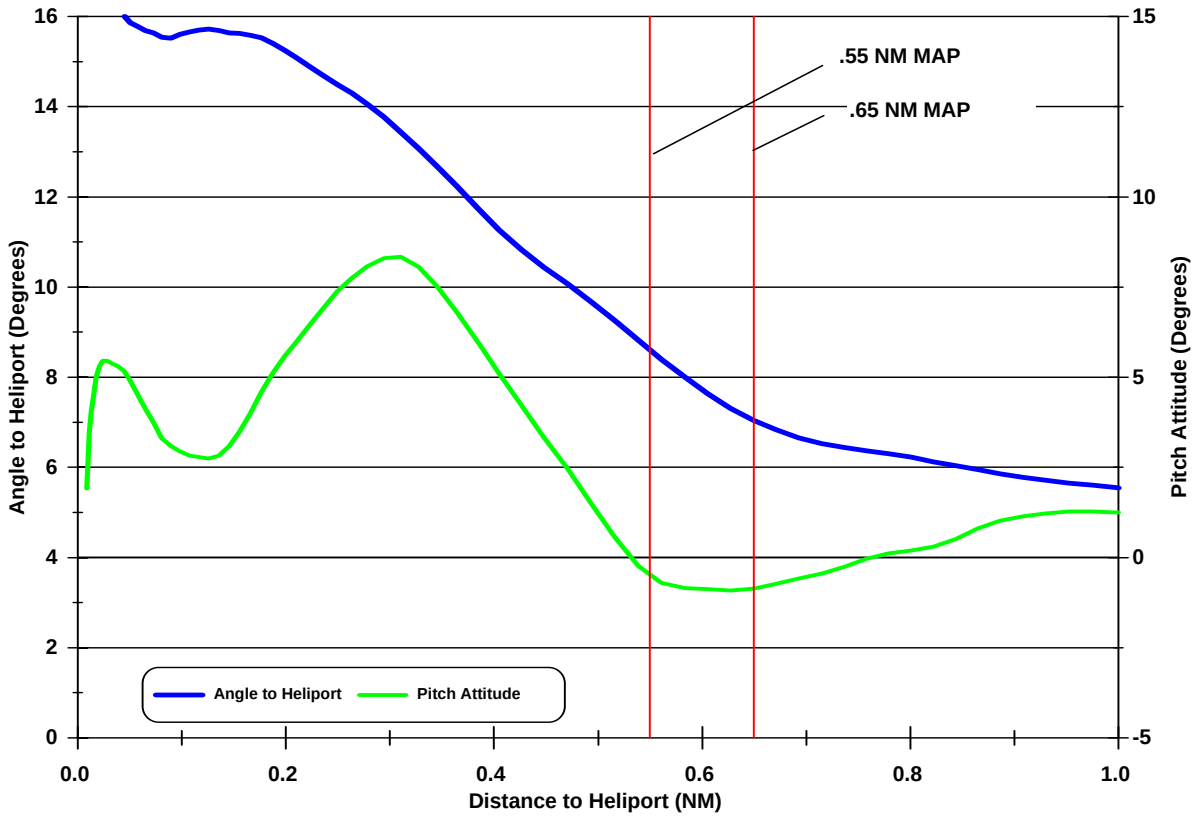
Profile View
Pilot P12 - 05/09/06A011 - Appr. #05X



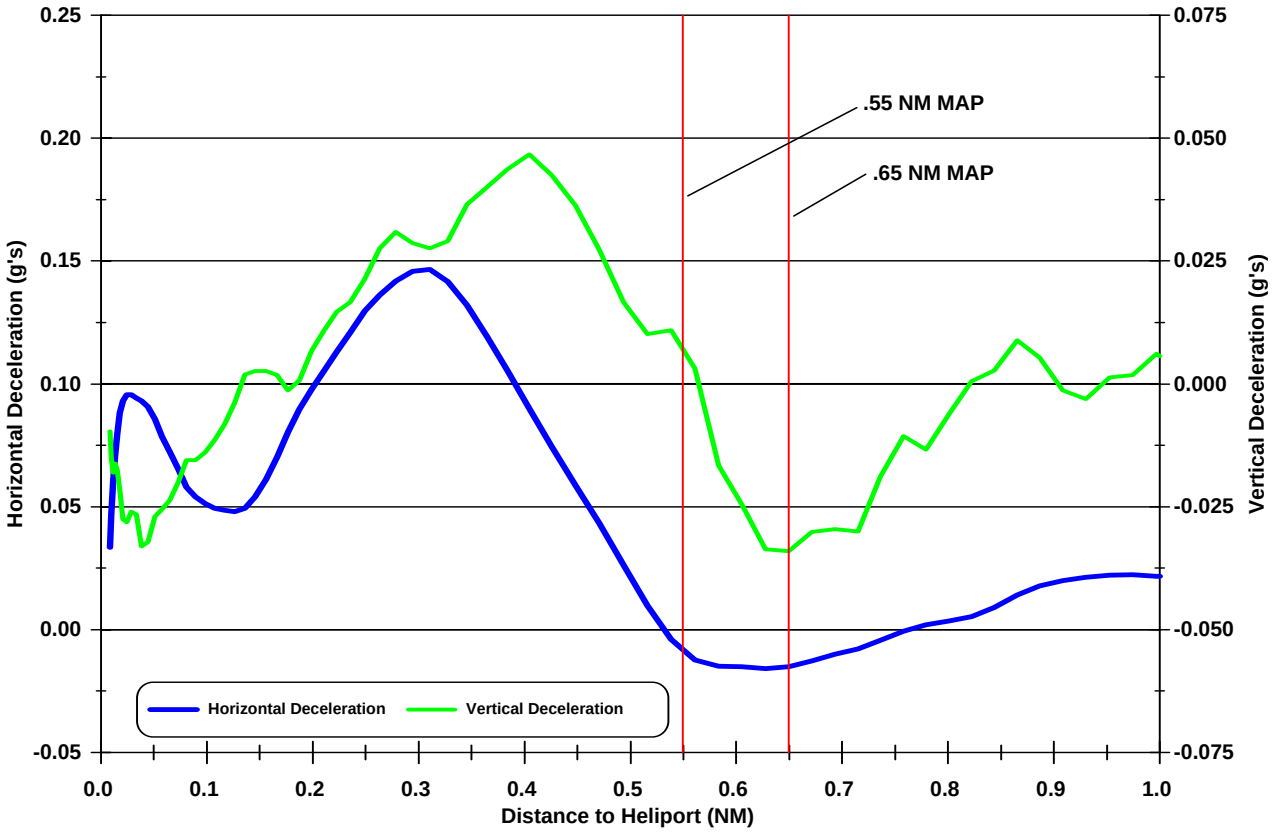
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06A011 - Appr. #05X

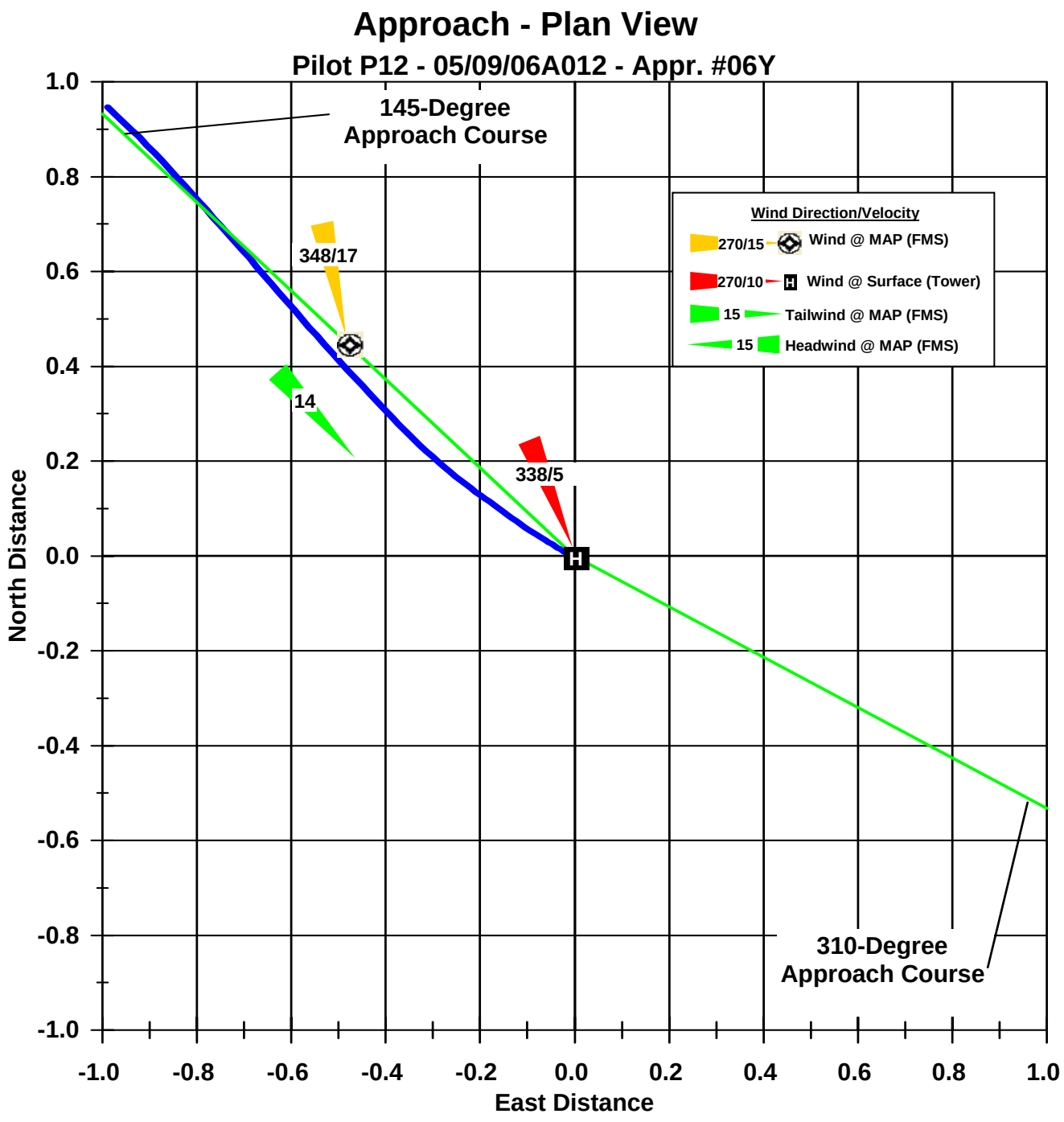


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06A011 - Appr. #05X

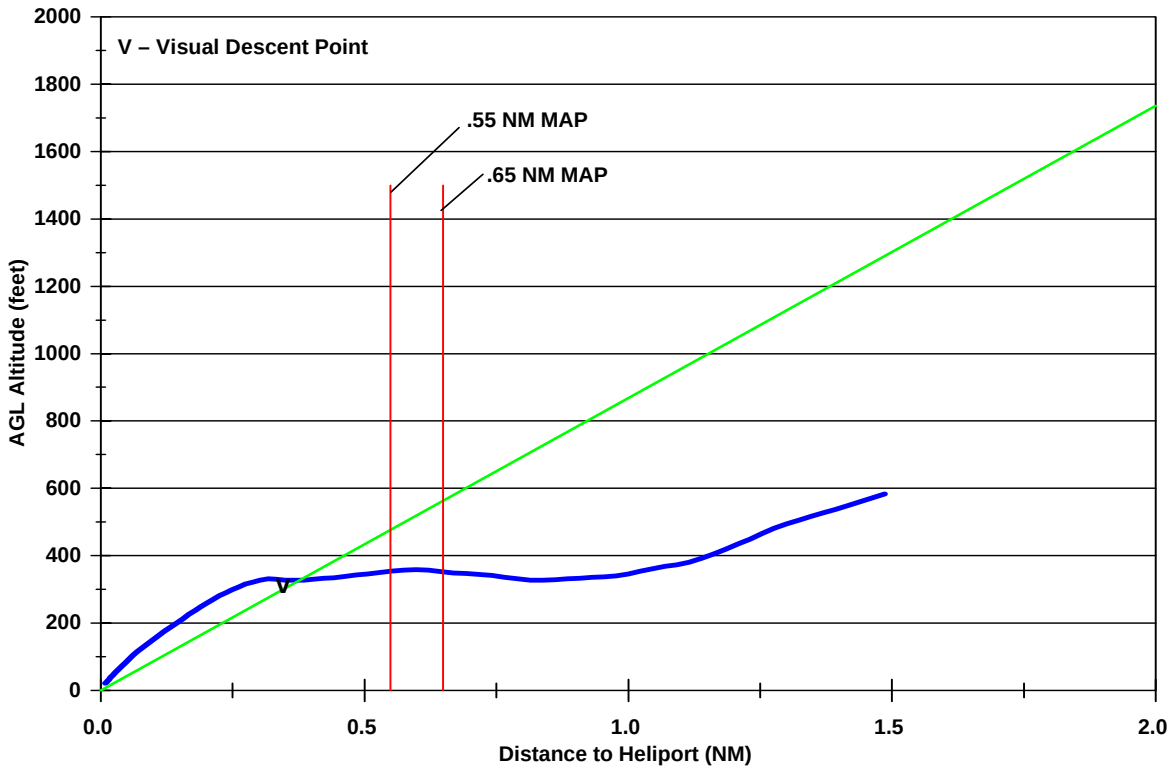


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06A011 - Appr. #05X

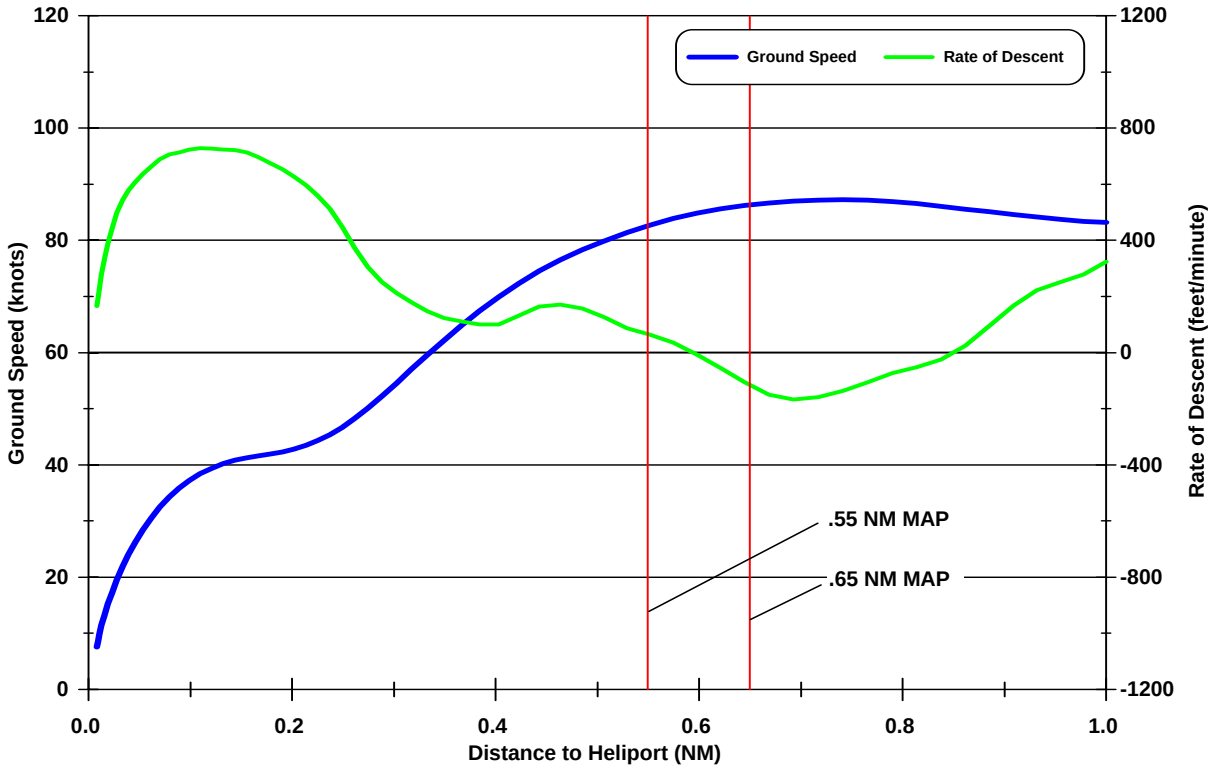



Approach - Plan View
Pilot P12 - 05/09/06A012 - Appr. #06Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
348/17
14
338/5
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

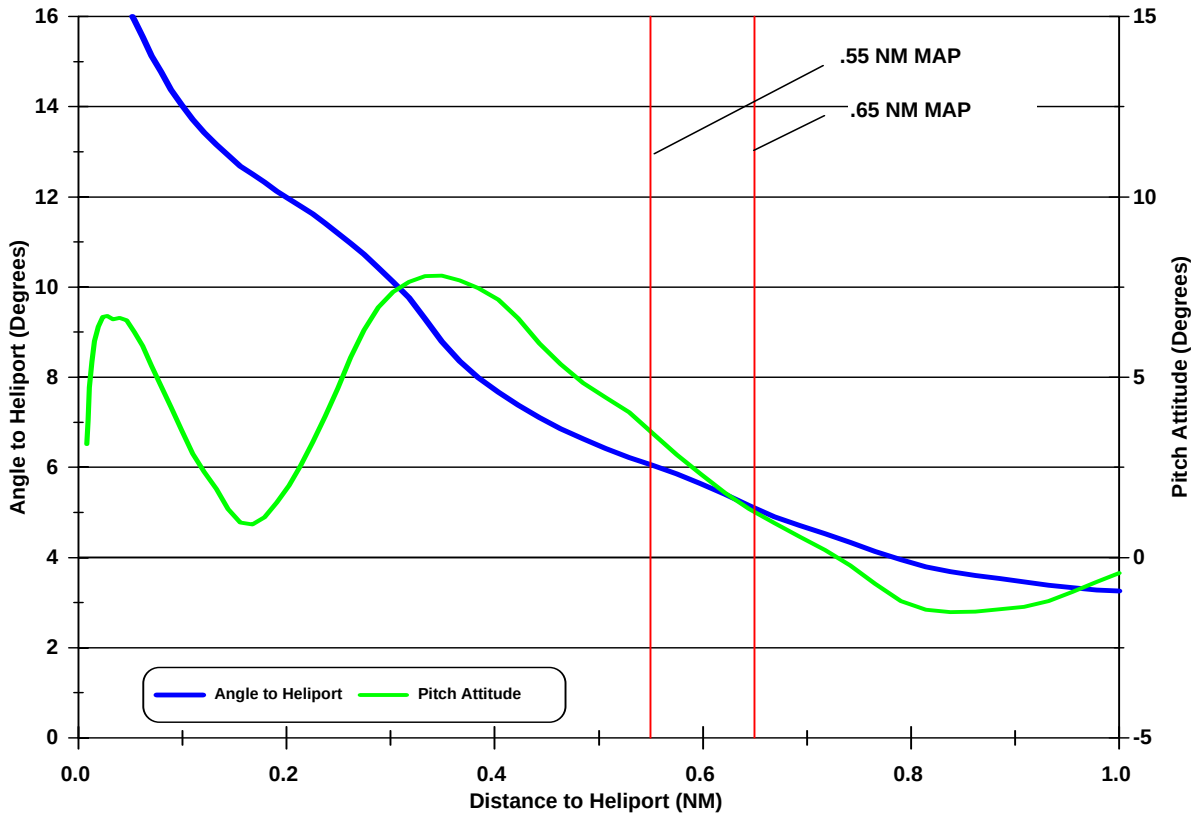
Profile View
Pilot P12 - 05/09/06A012 - Appr. #06Y



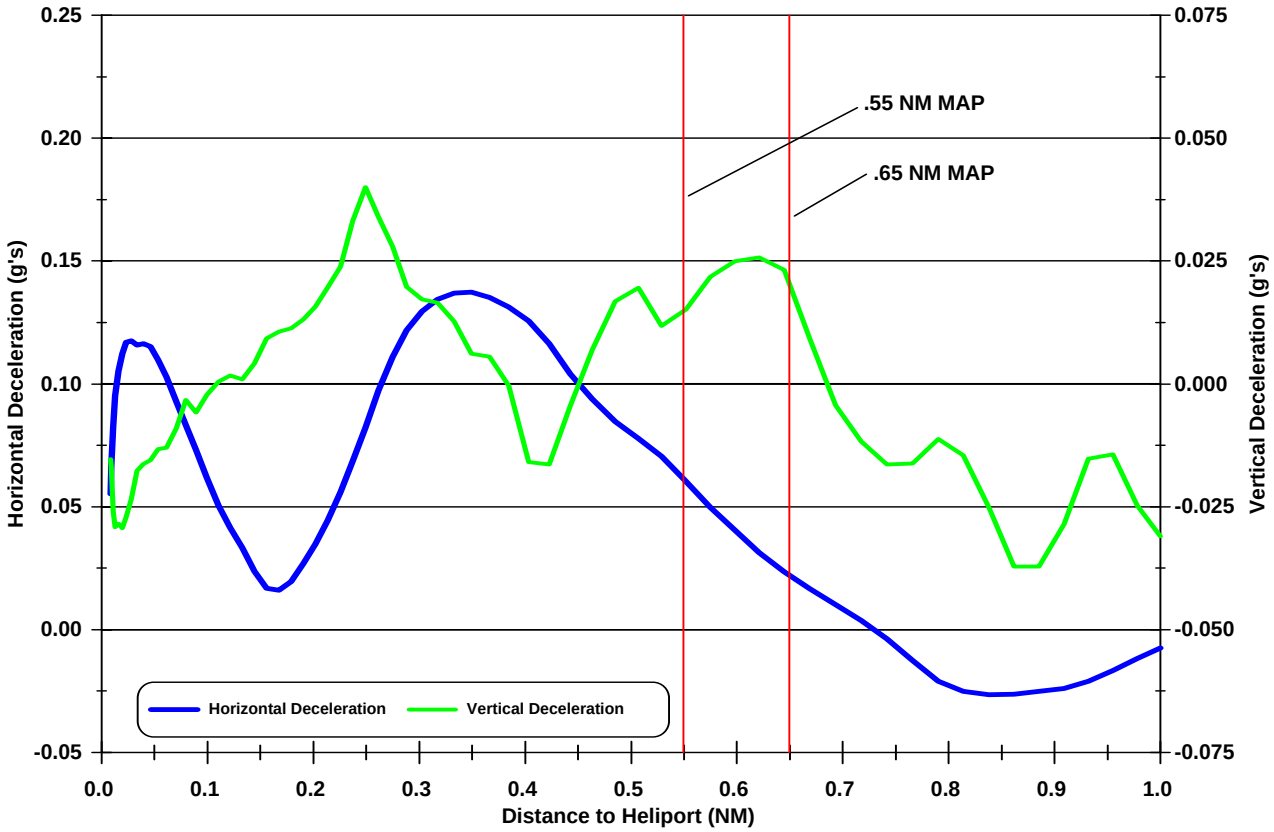
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06A012 - Appr. #06Y

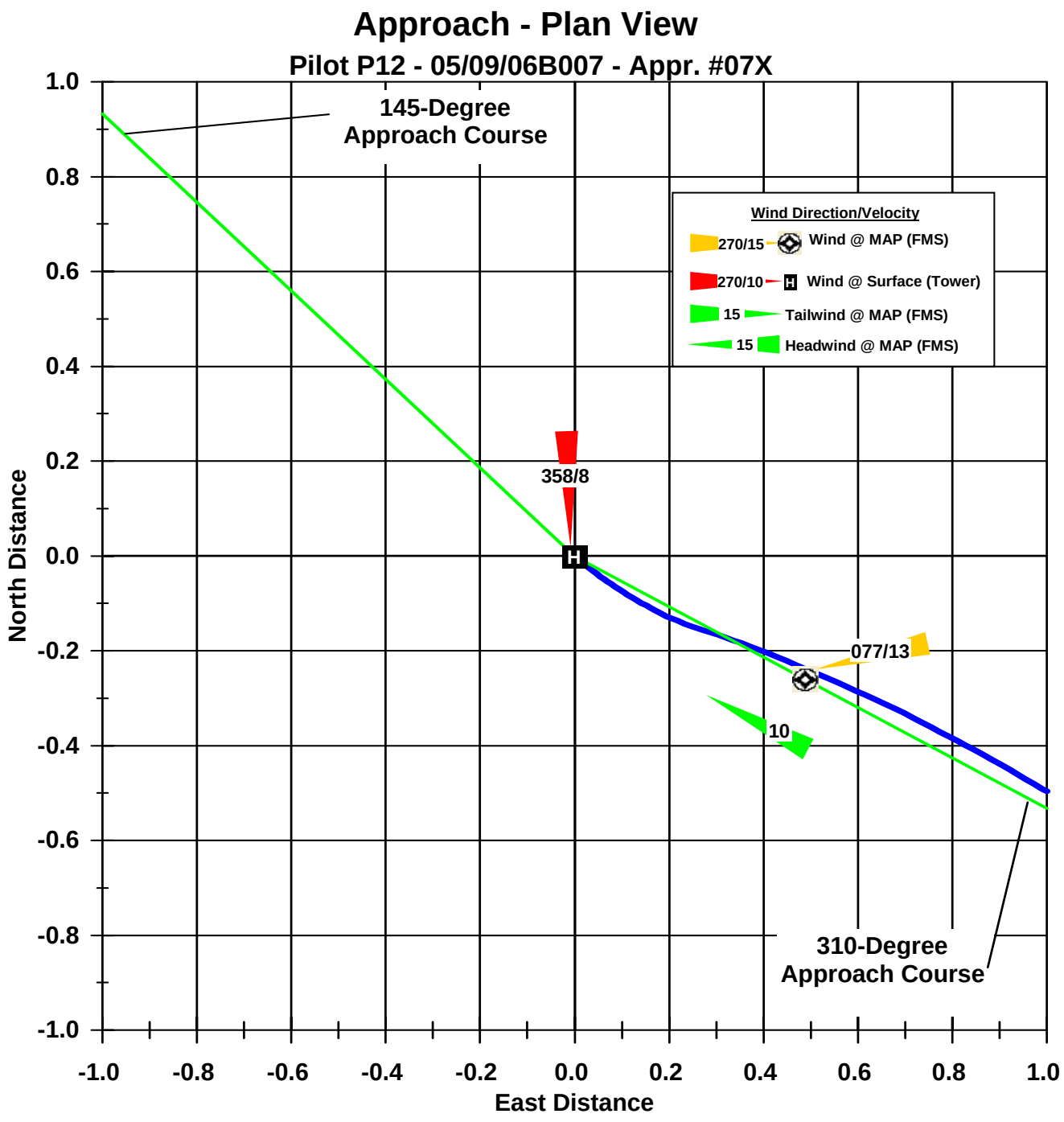


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06A012 - Appr. #06Y

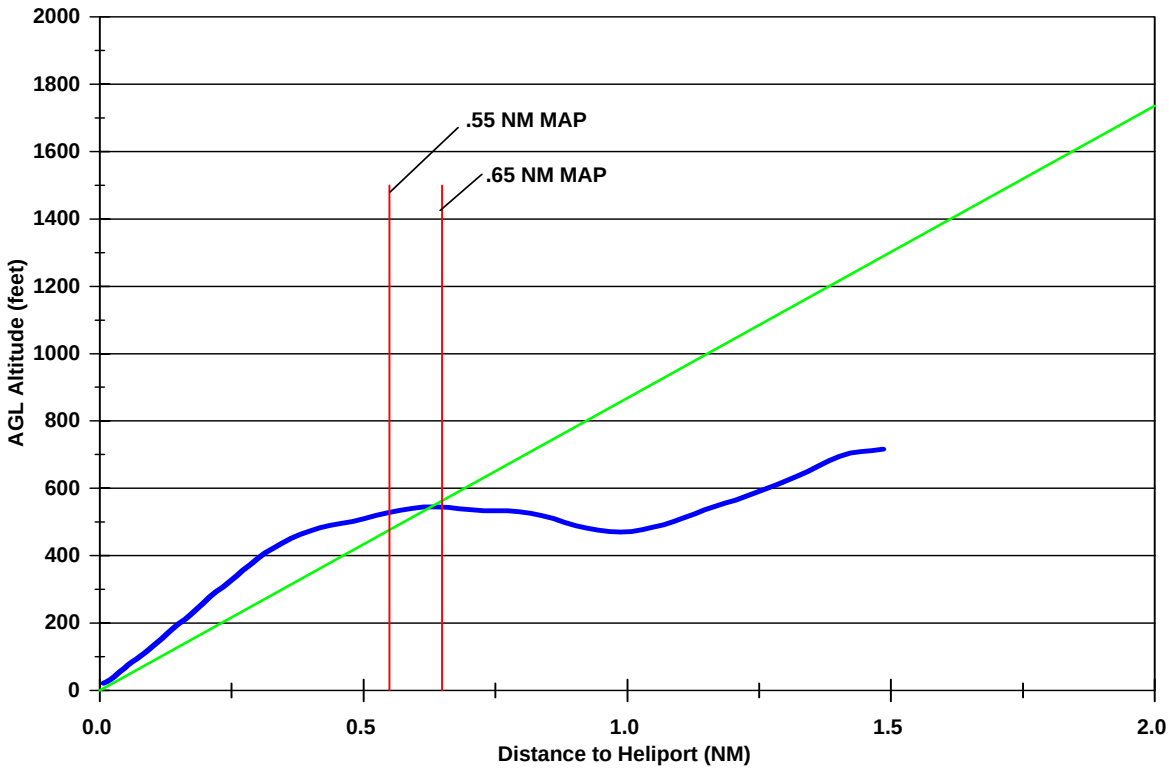


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06A012 - Appr. #06Y

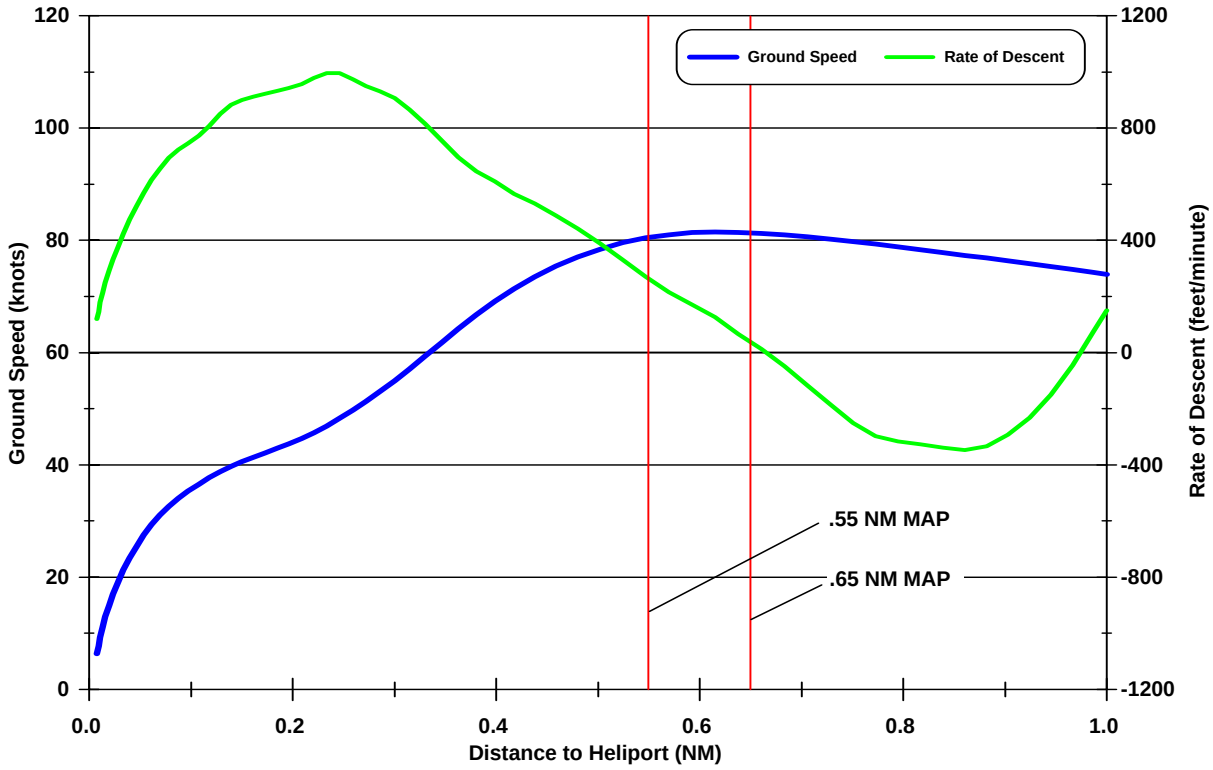



Approach - Plan View
Pilot P12 - 05/09/06B007 - Appr. #07X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
358/8
077/13
10
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

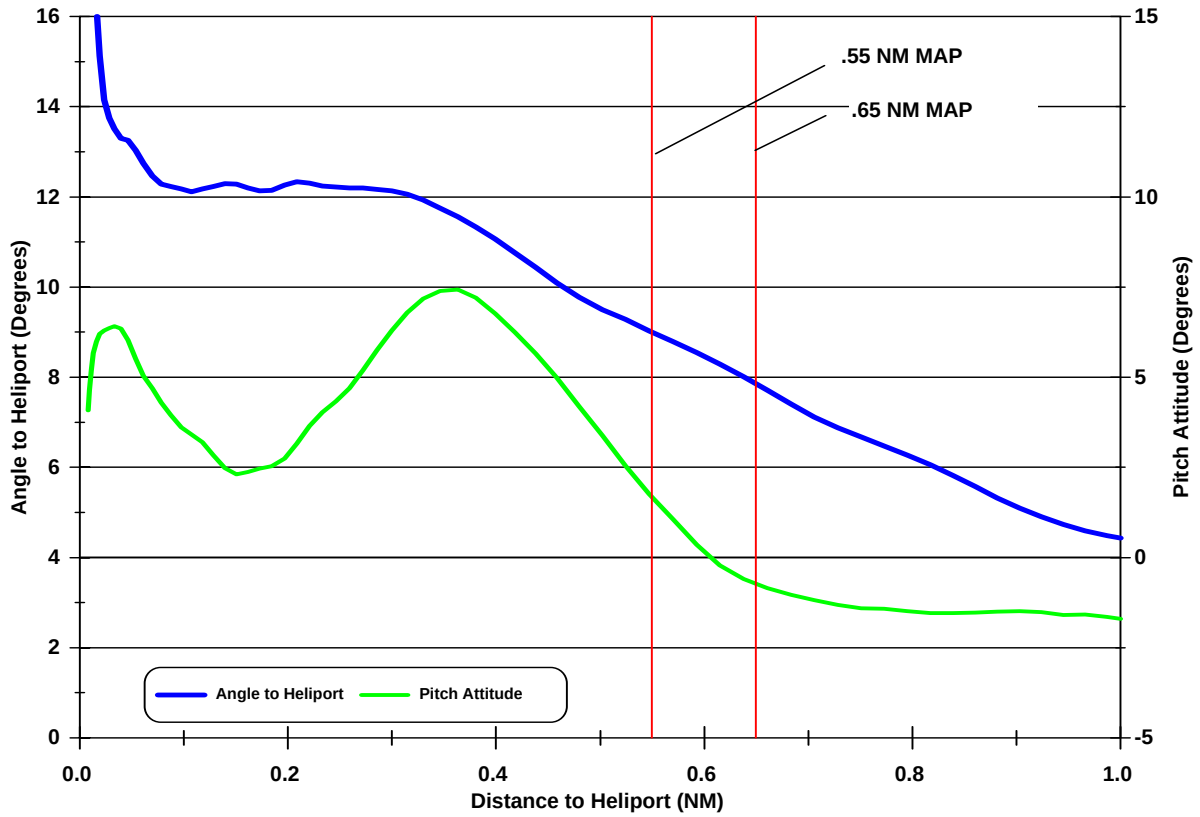
Profile View
Pilot P12 - 05/09/06B007 - Appr. #07X



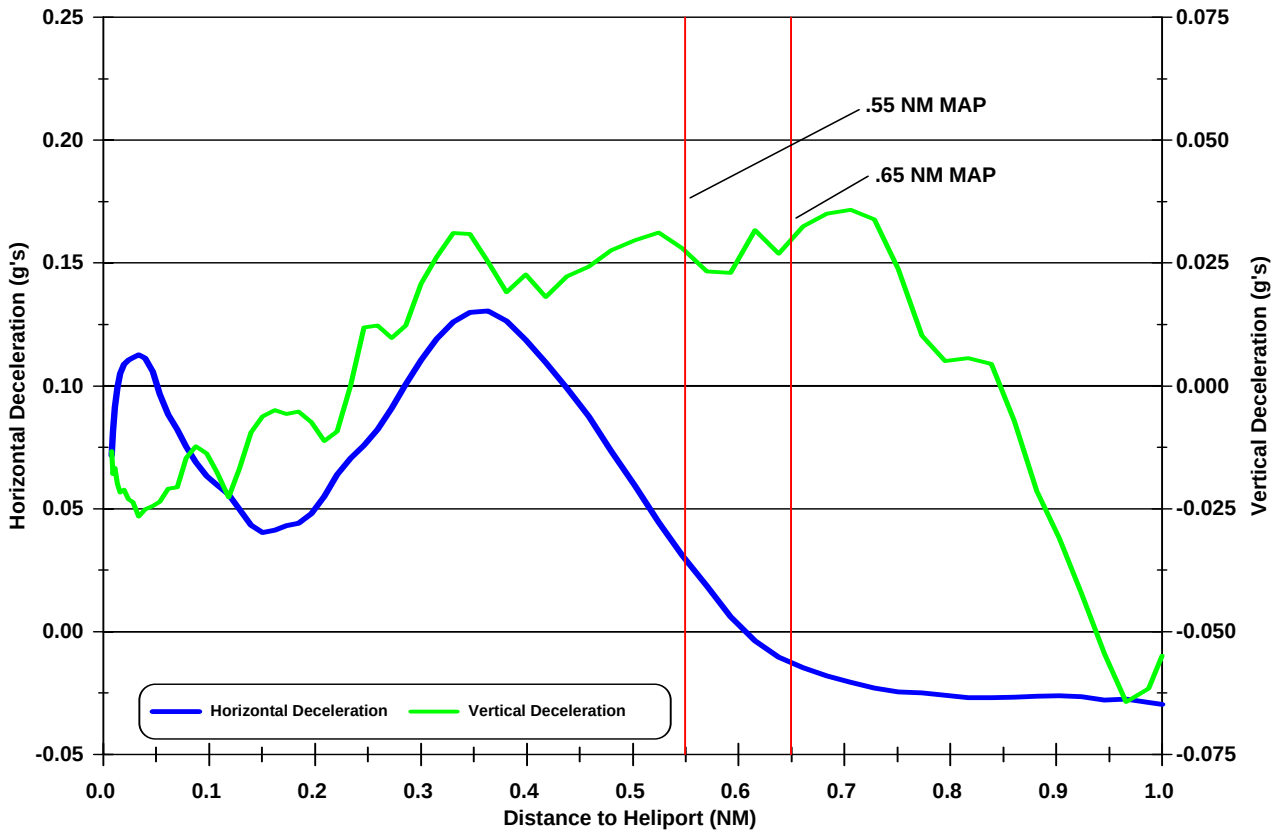
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06B007 - Appr. #07X

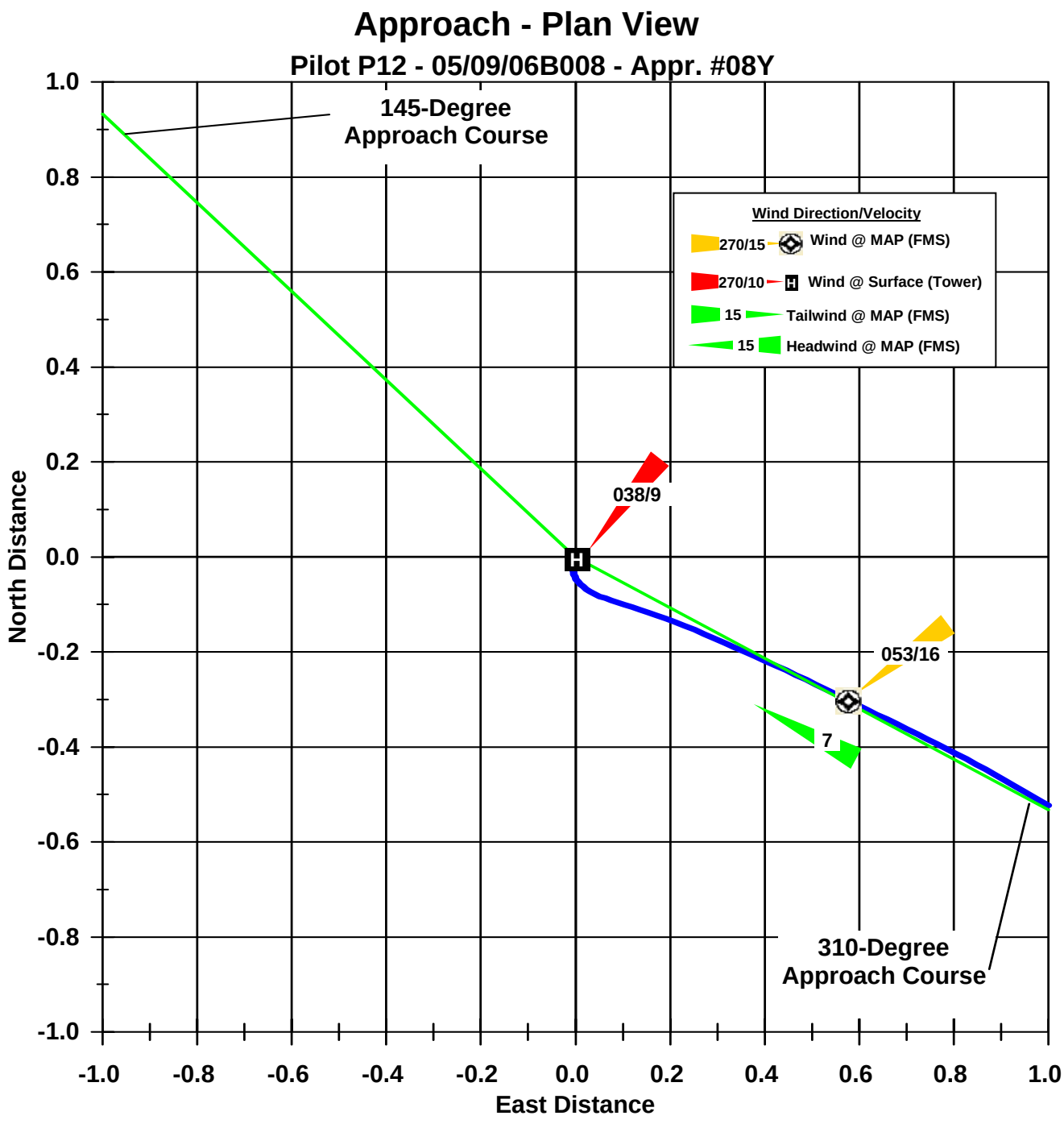


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06B007 - Appr. #07X

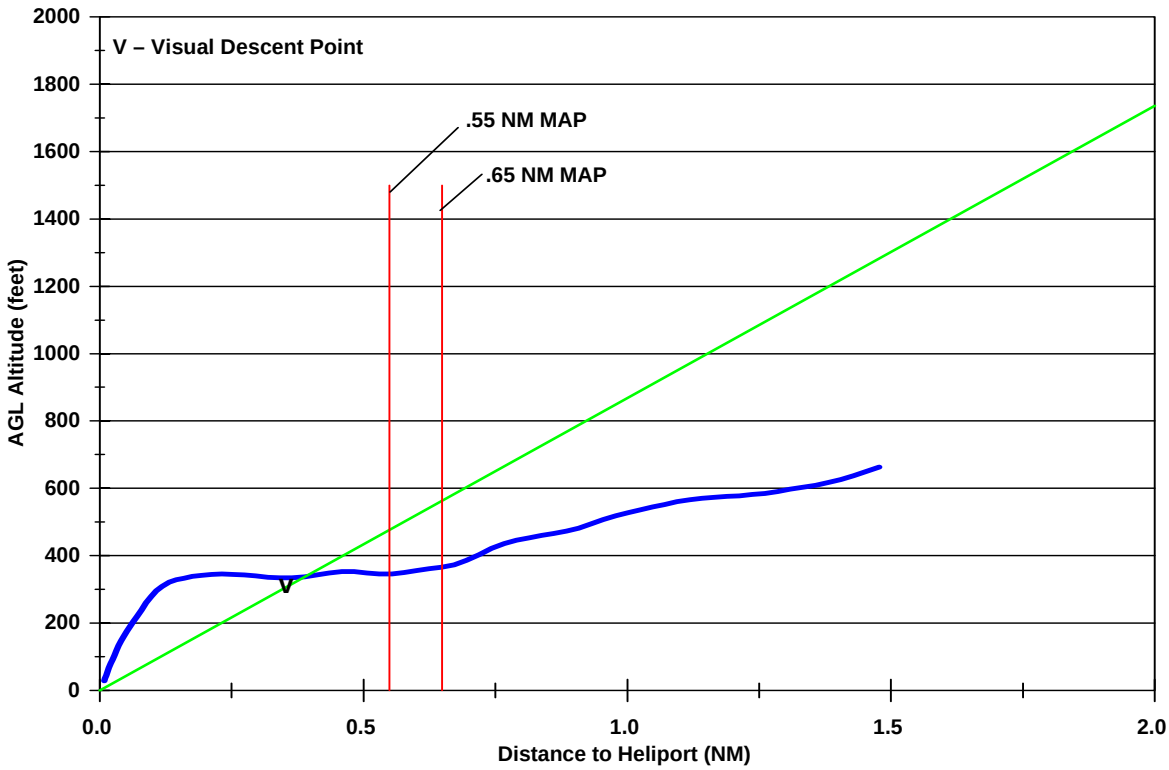


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06B007 - Appr. #07X

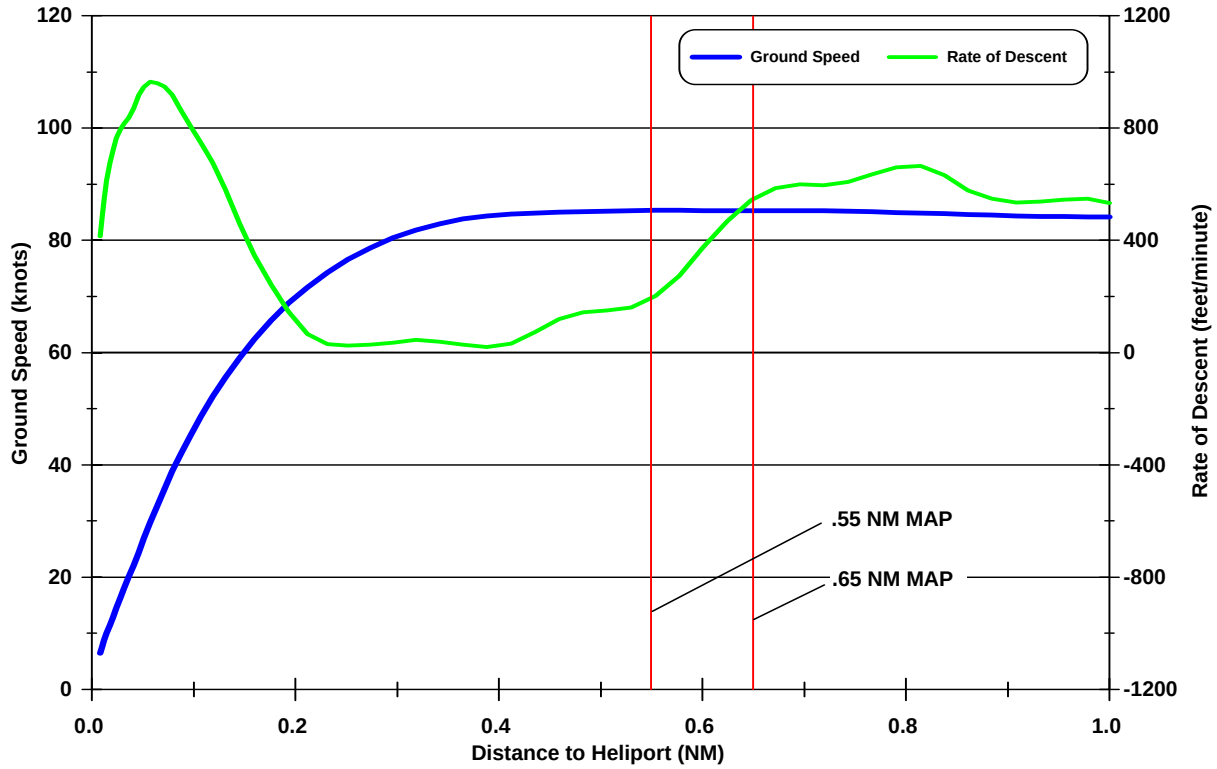



Approach - Plan View
Pilot P12 - 05/09/06B008 - Appr. #08Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
038/9
053/16
7
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

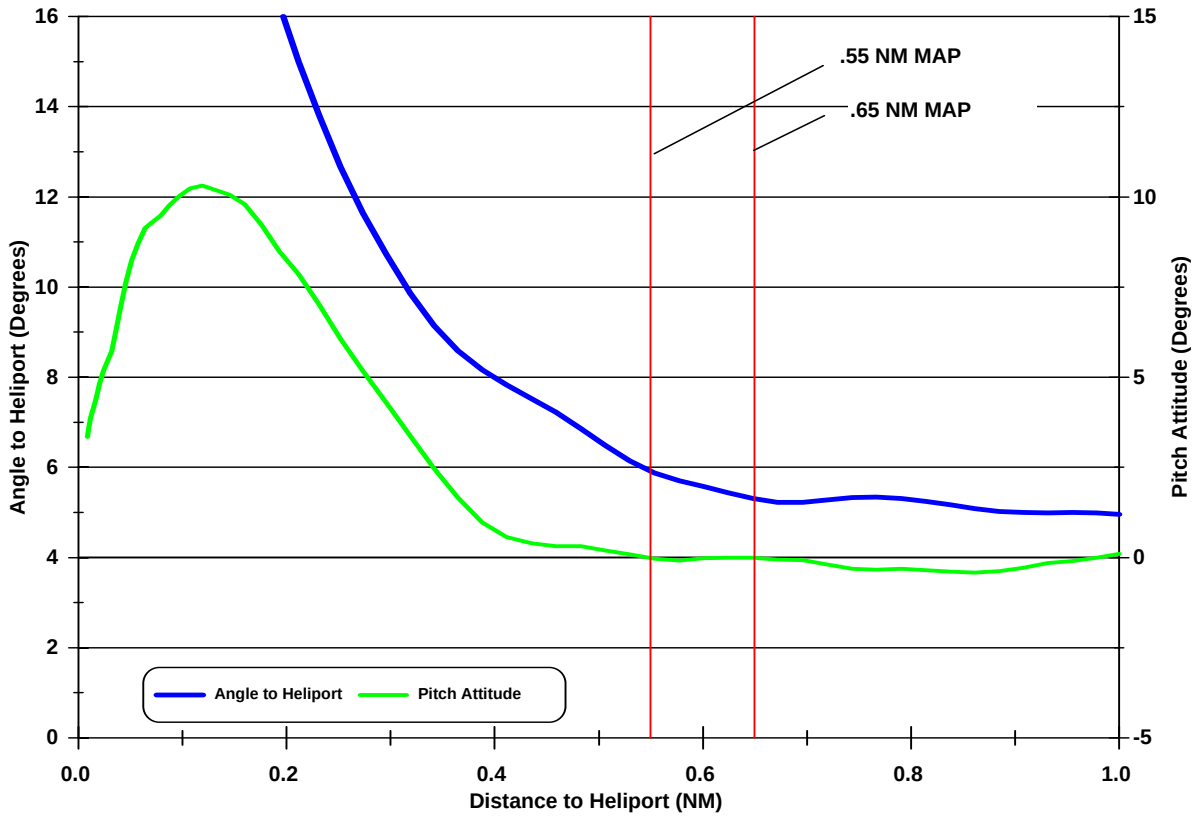
Profile View
Pilot P12 - 05/09/06B008 - Appr. #08Y



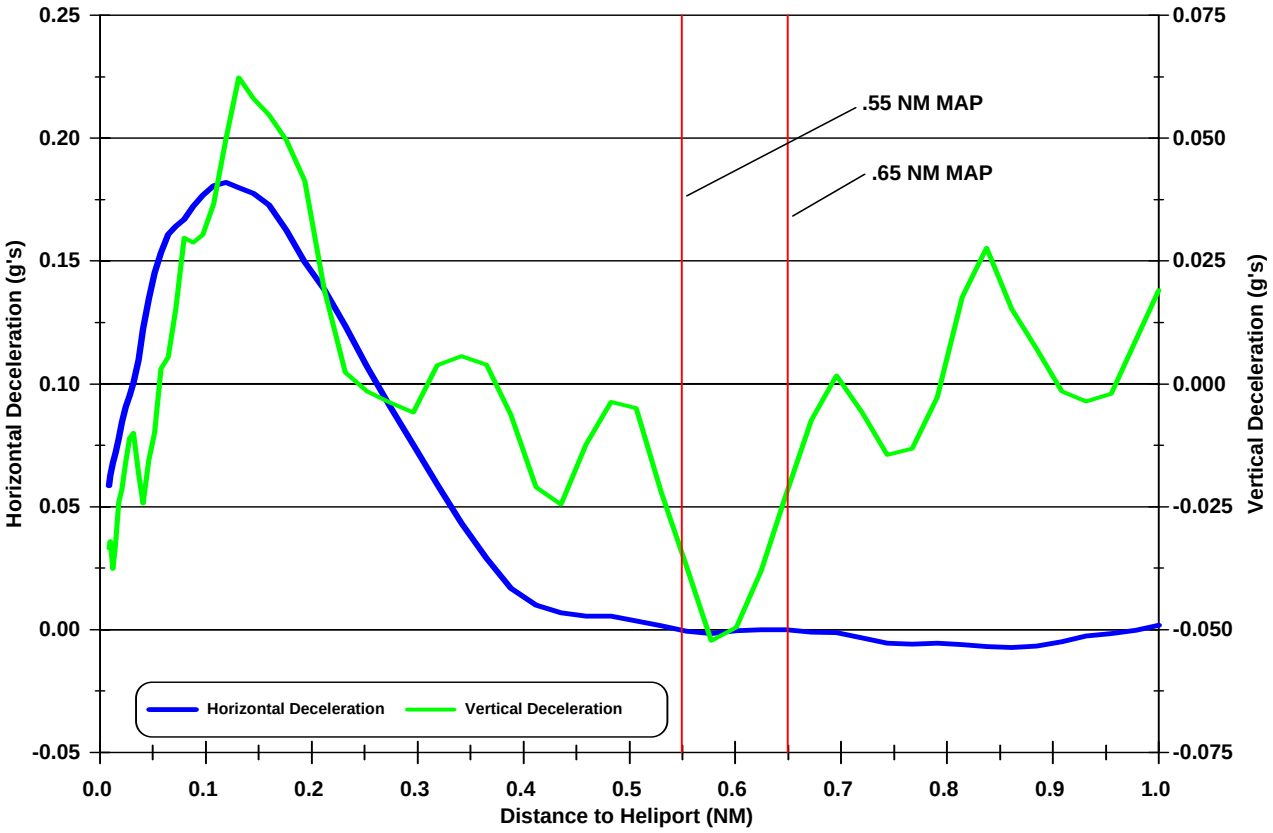
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06B008 - Appr. #08Y

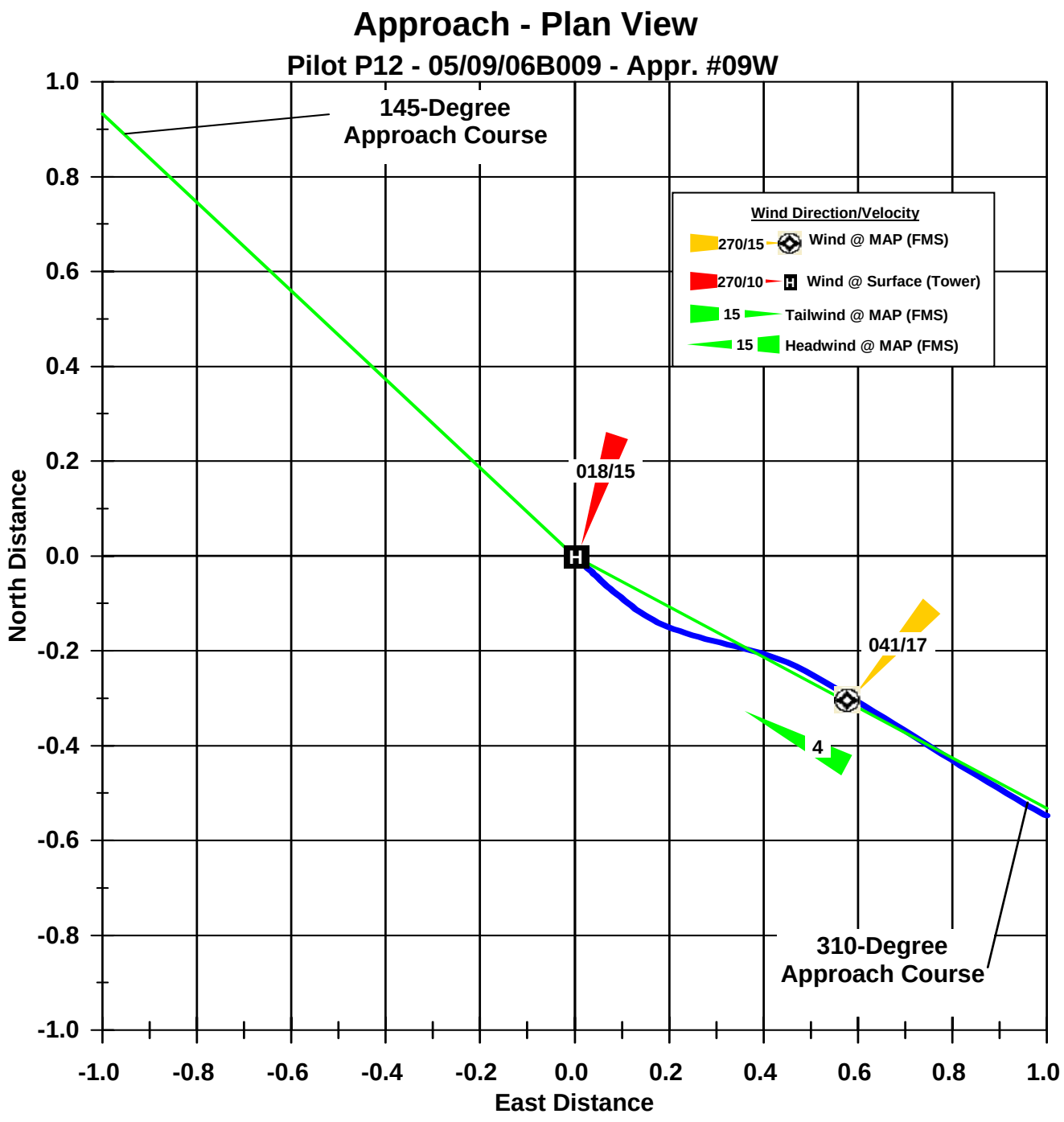


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06B008 - Appr. #08Y

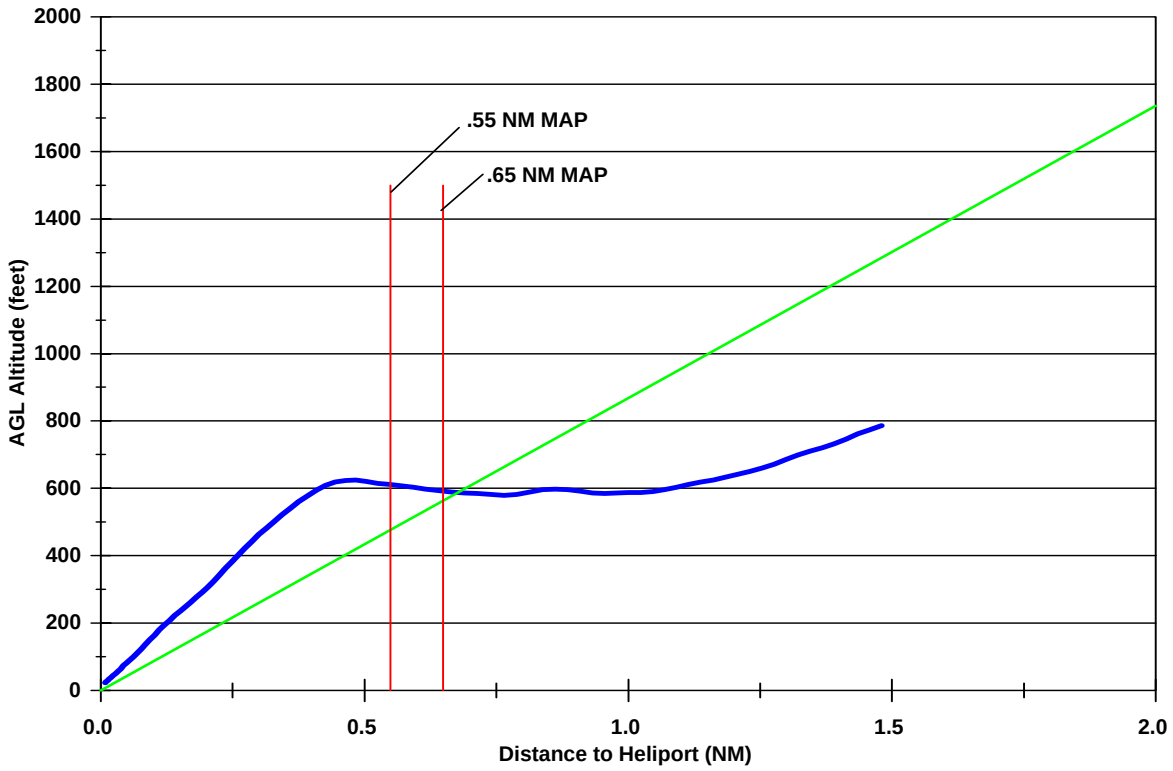


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06B008 - Appr. #08Y

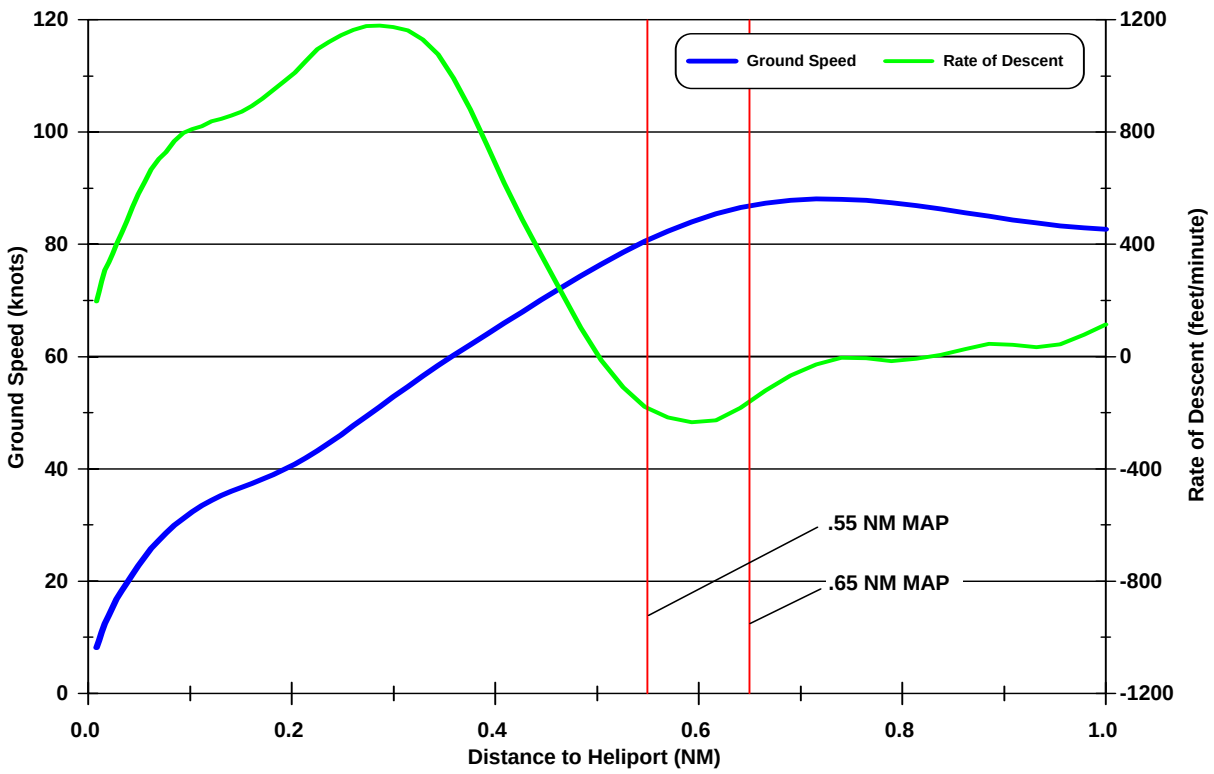



Approach - Plan View
Pilot P12 - 05/09/06B009 - Appr. #09W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
018/15
041/17
4
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

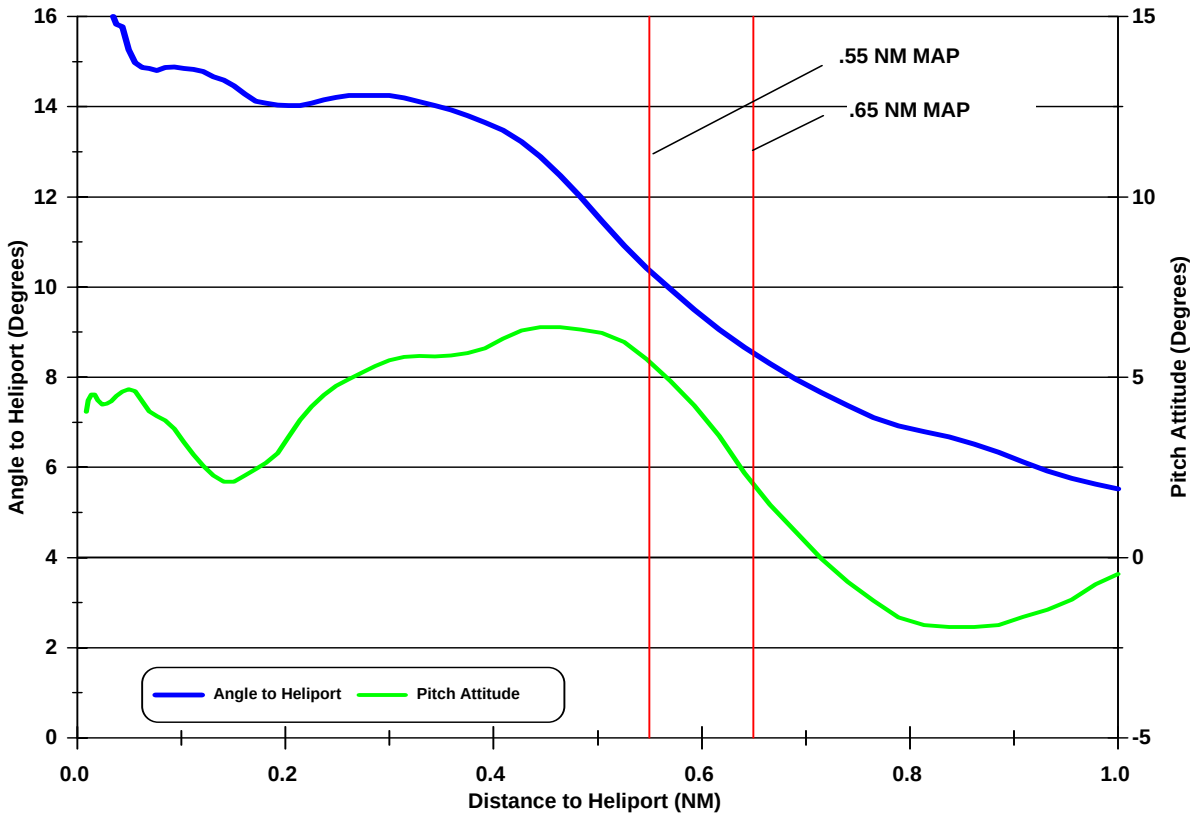
Profile View
Pilot P12 - 05/09/06B009 - Appr. #09W



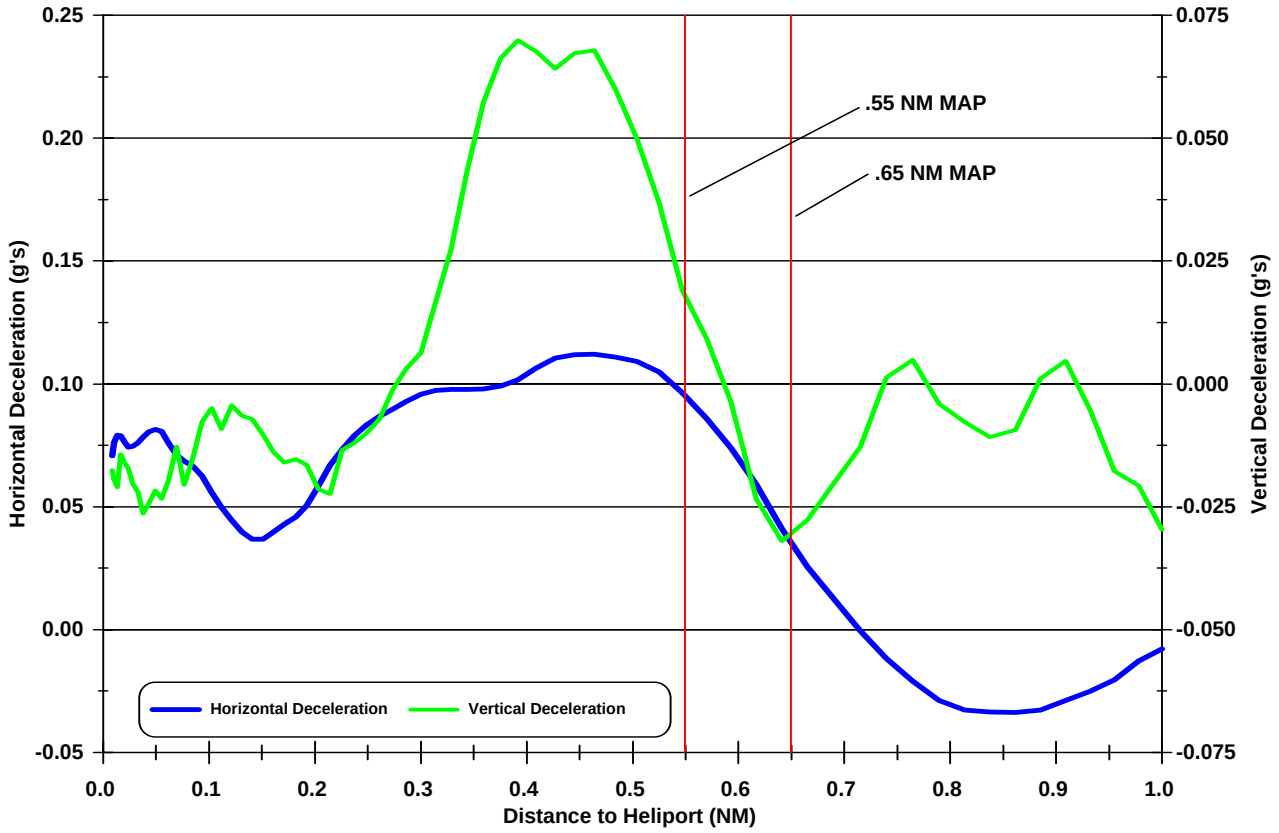
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06B009 - Appr. #09W

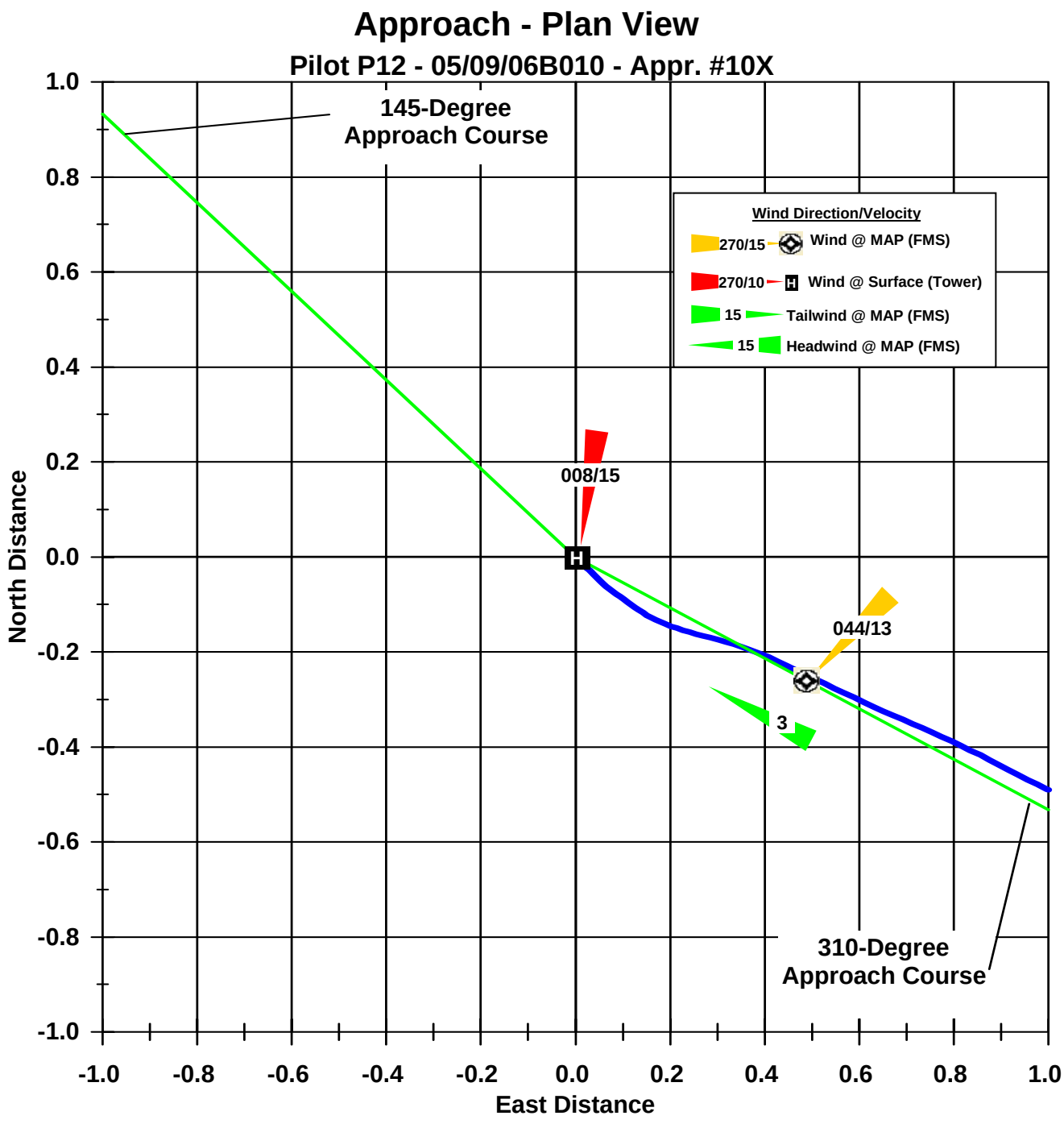


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06B009 - Appr. #09W

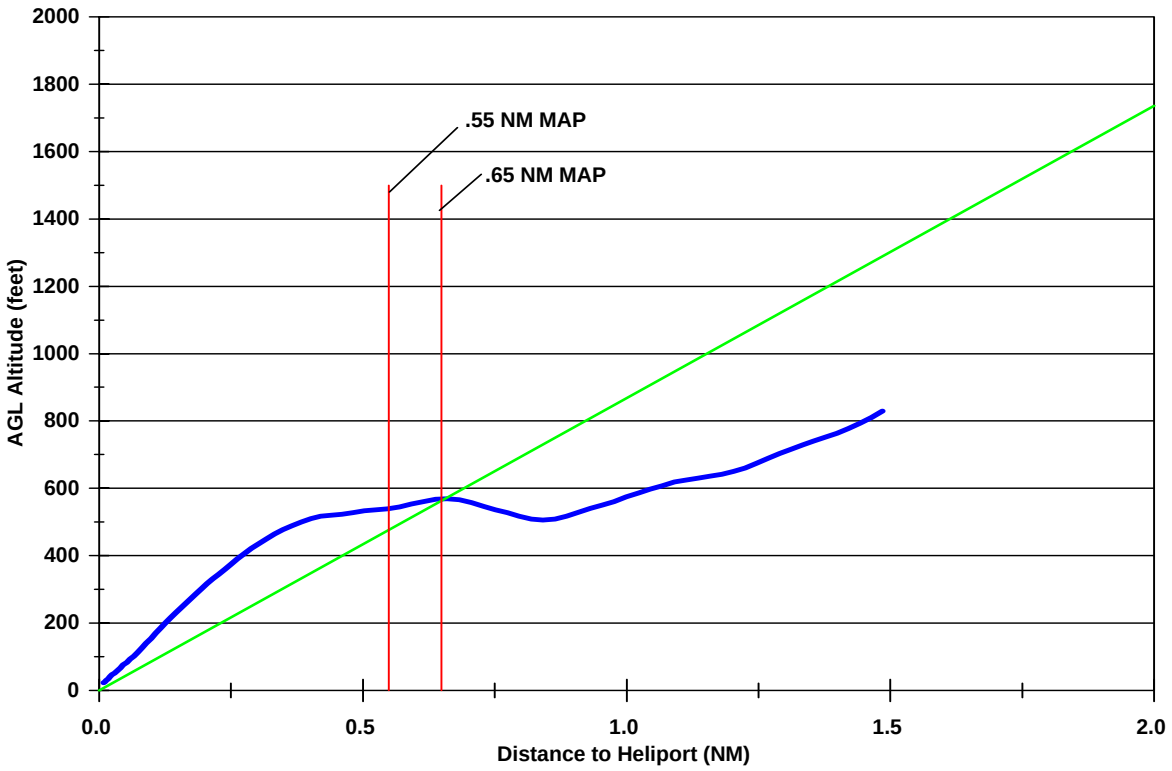


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06B009 - Appr. #09W

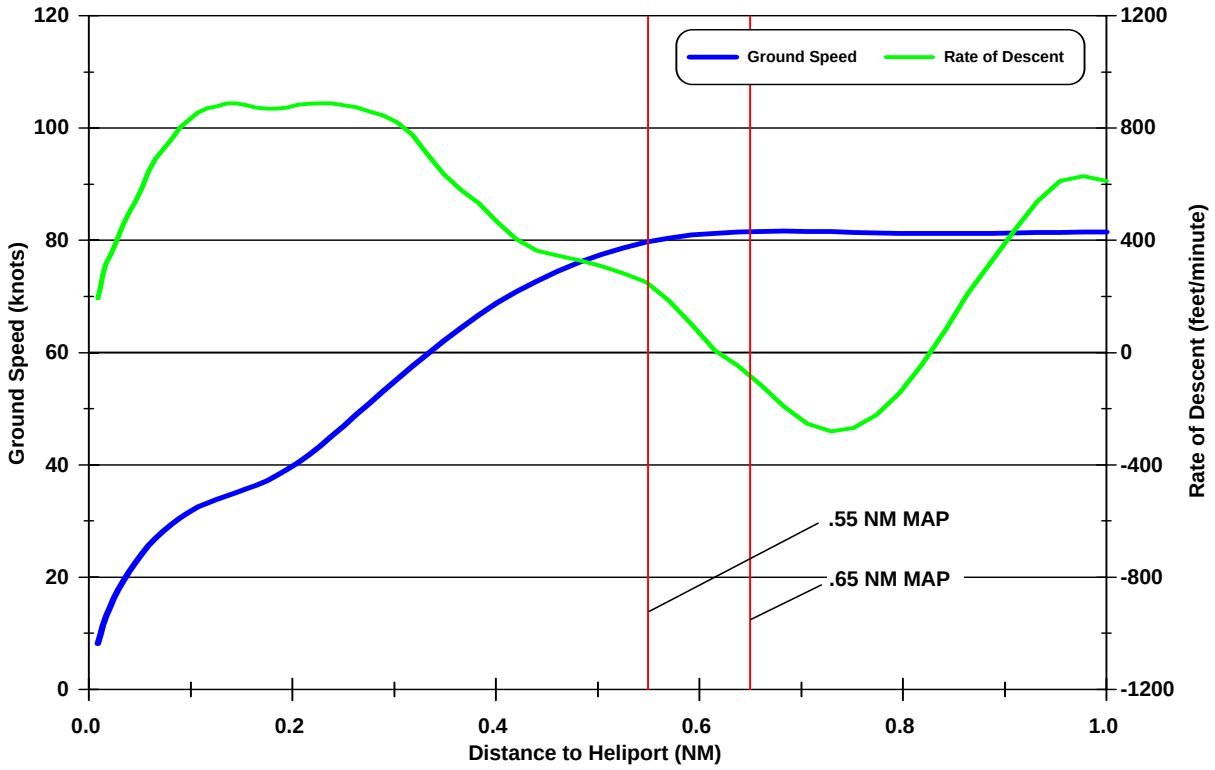



Approach - Plan View
Pilot P12 - 05/09/06B010 - Appr. #10X
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
008/15
044/13
3
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

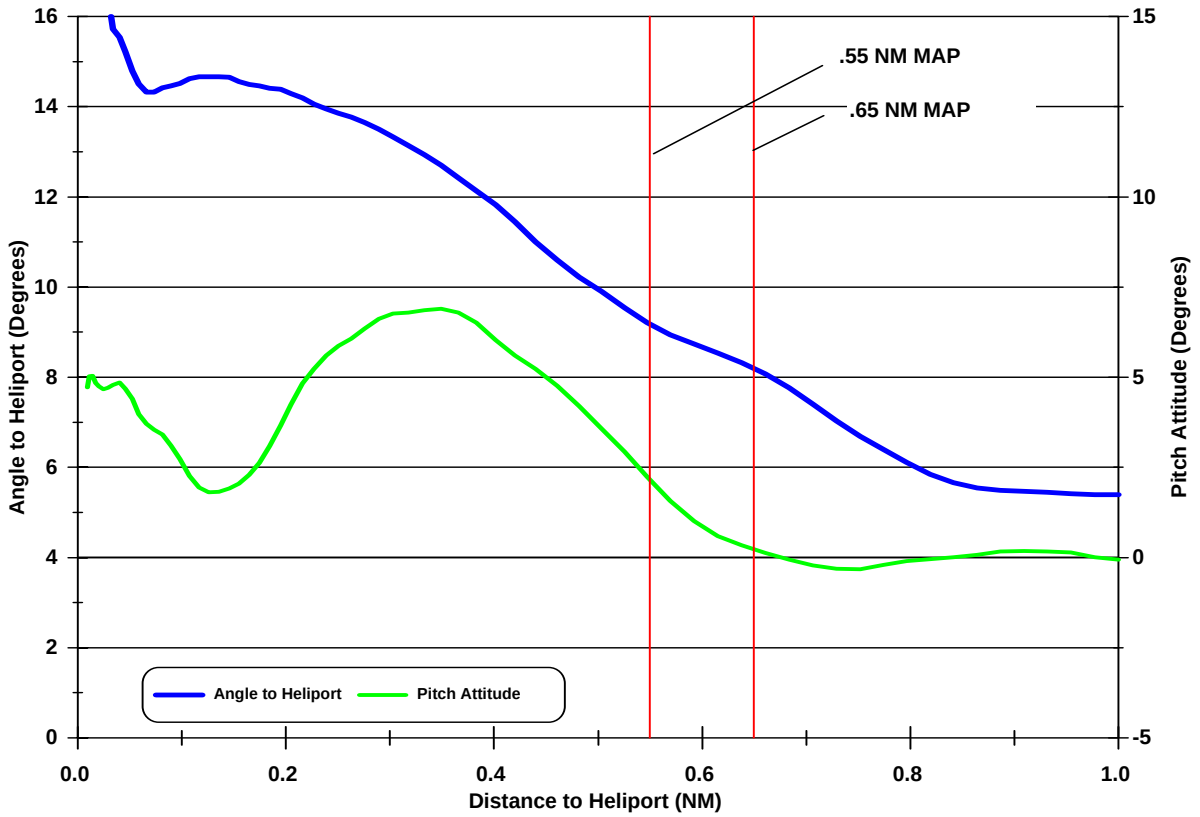
Profile View
Pilot P12 - 05/09/06B010 - Appr. #10X



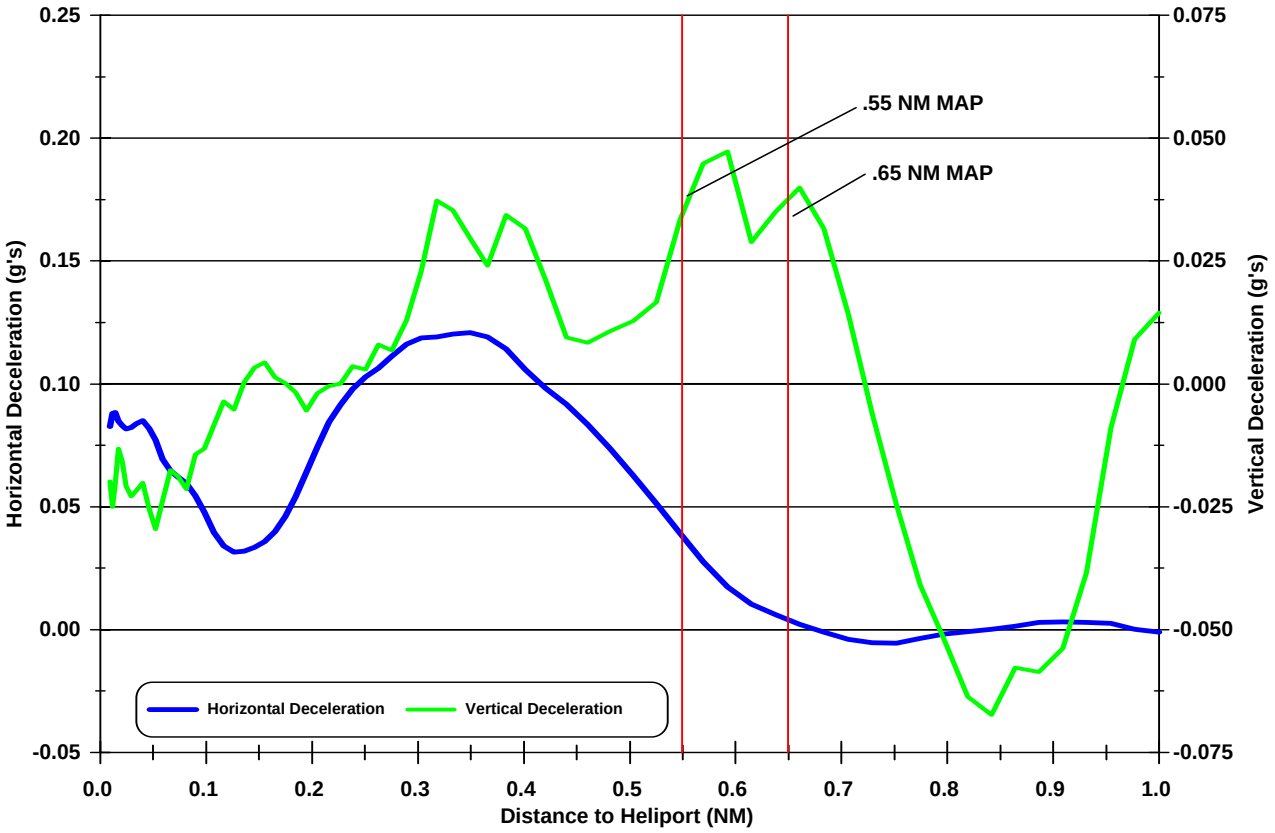
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06B010 - Appr. #10X

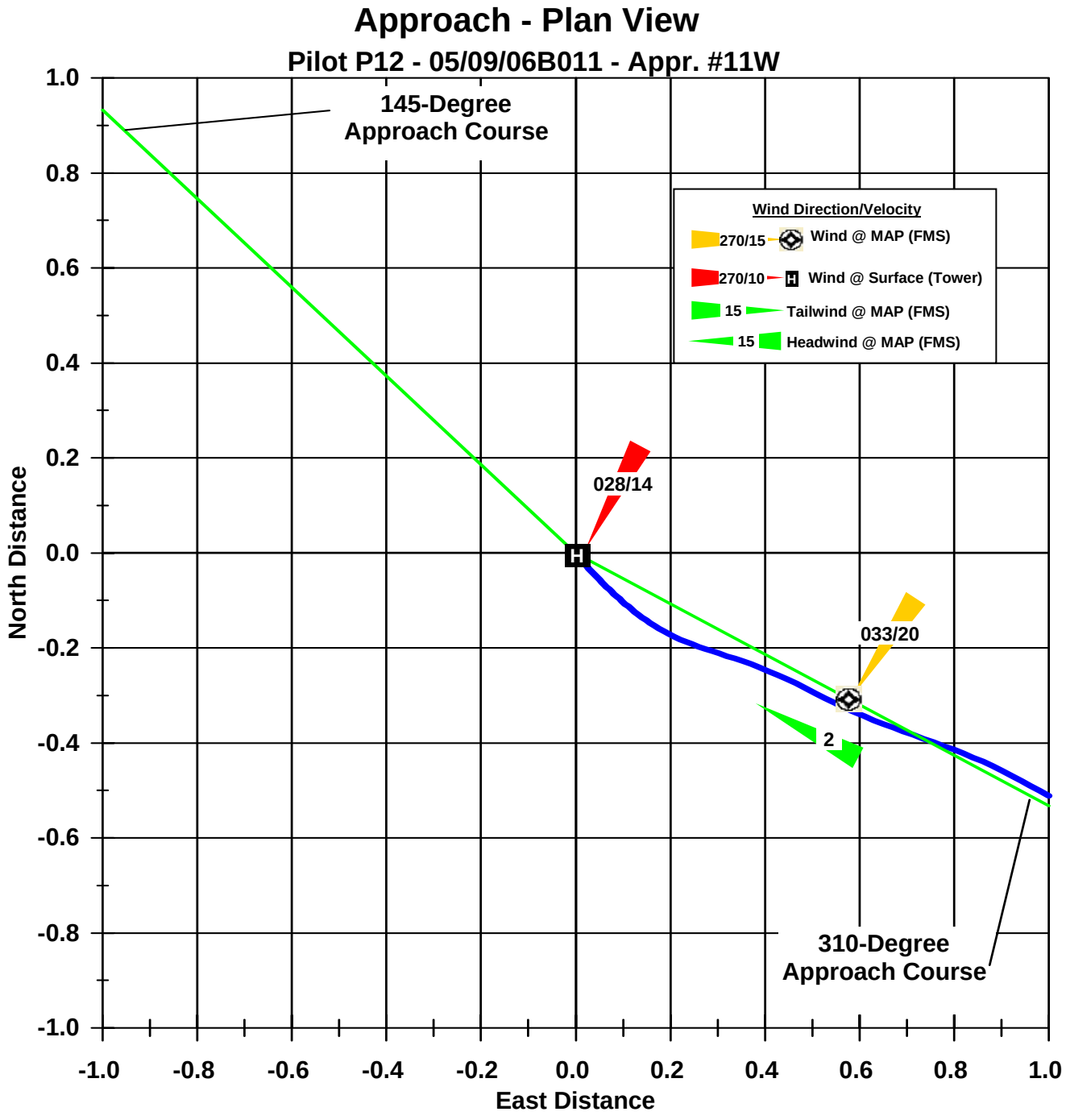


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06B010 - Appr. #10X

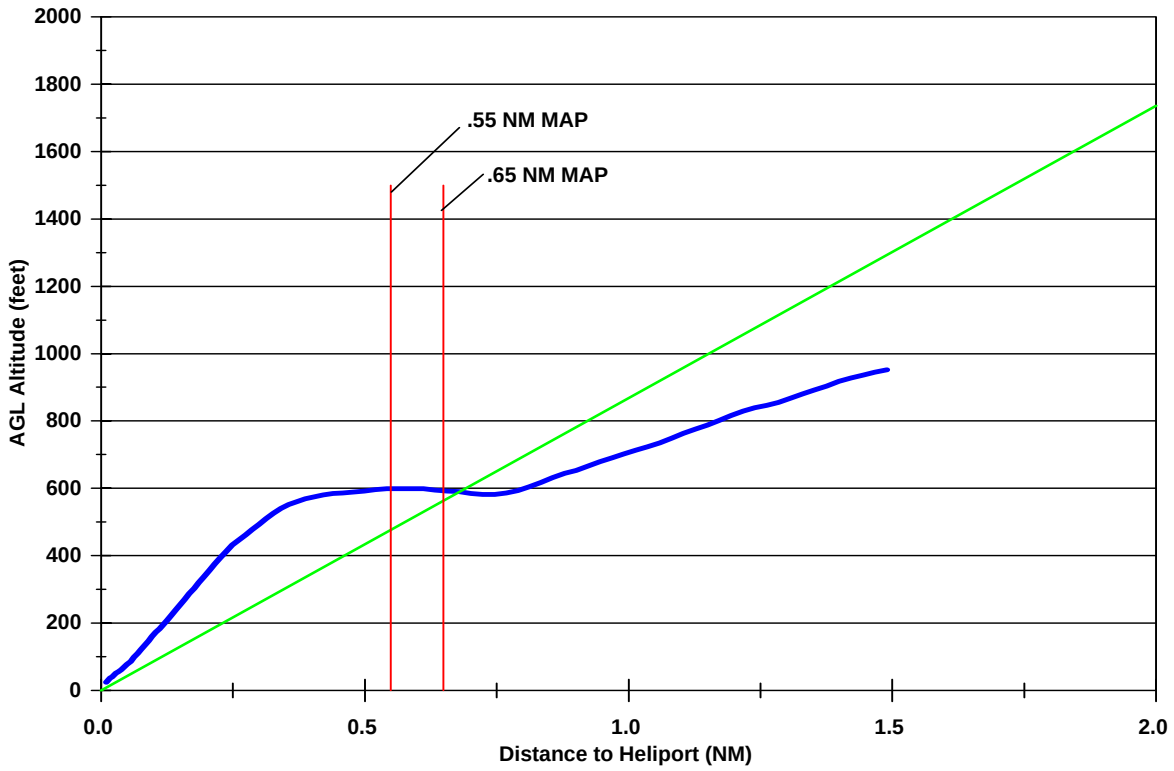


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06B010 - Appr. #10X

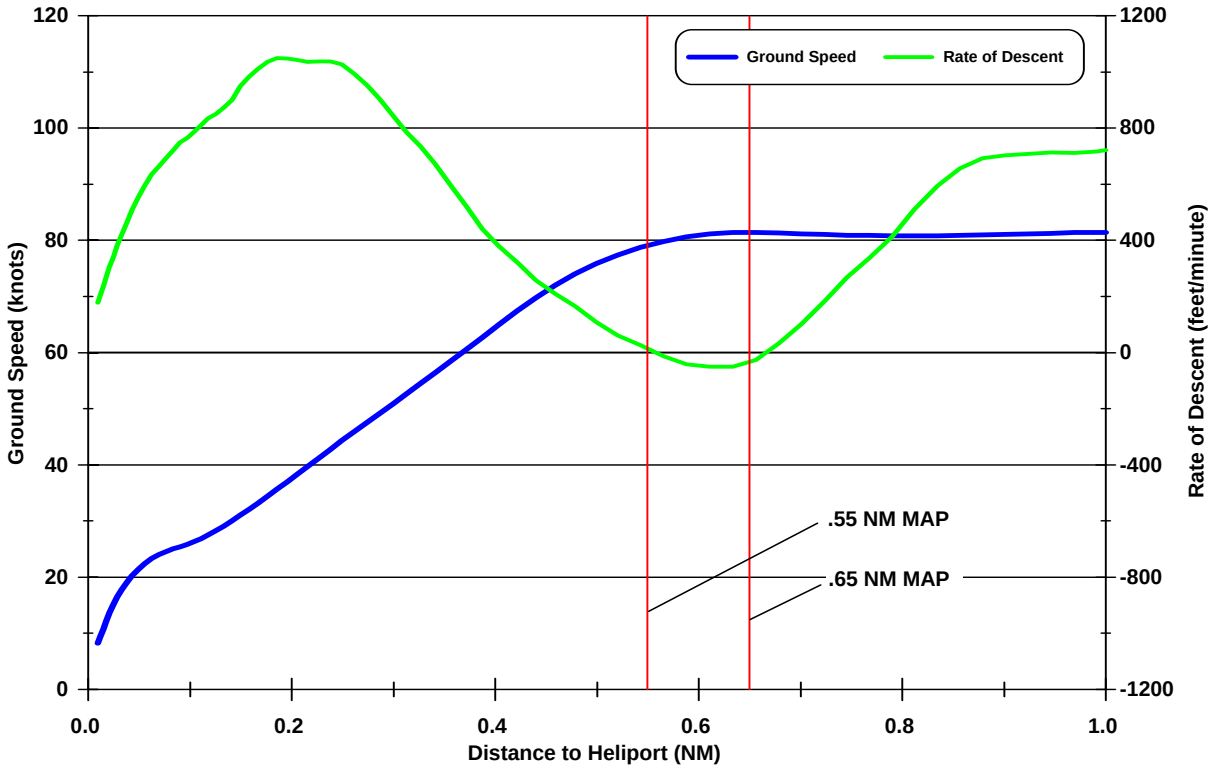



Approach - Plan View
Pilot P12 - 05/09/06B011 - Appr. #11W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
028/14
033/20
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

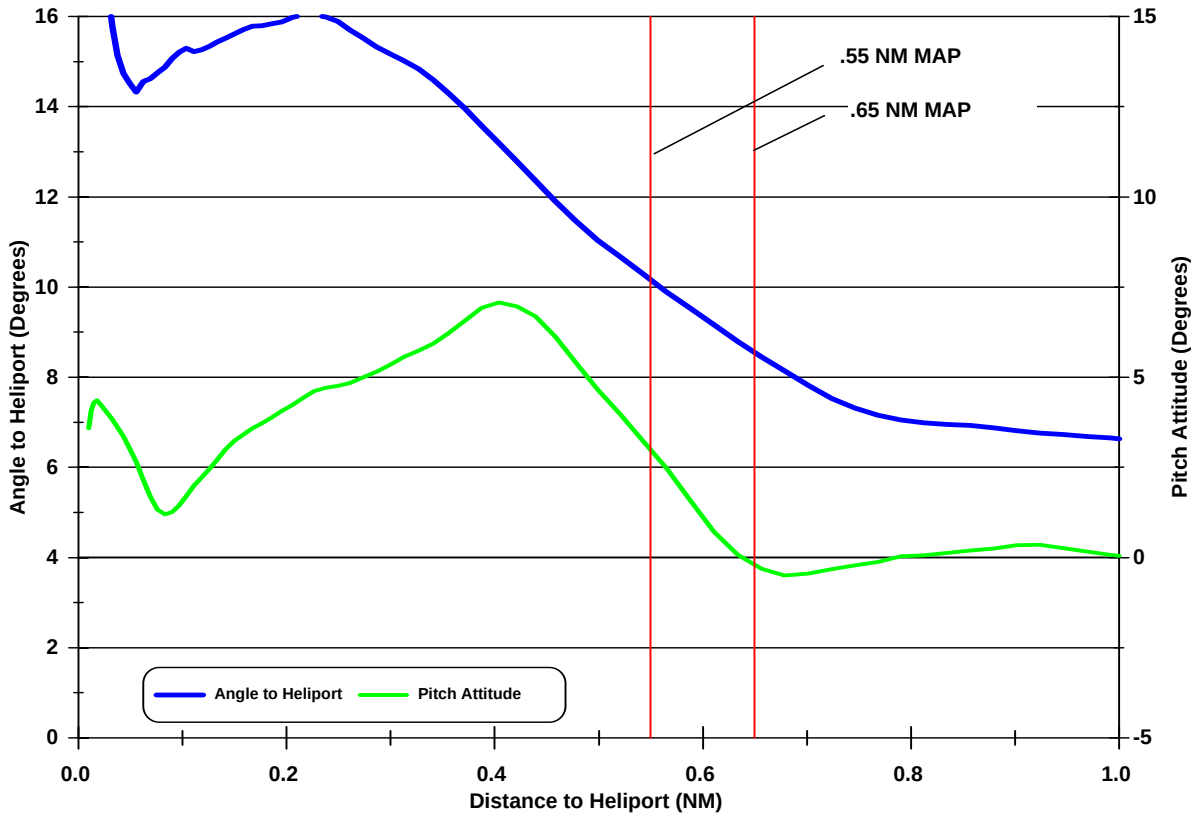
Profile View
Pilot P12 - 05/09/06B011 - Appr. #11W



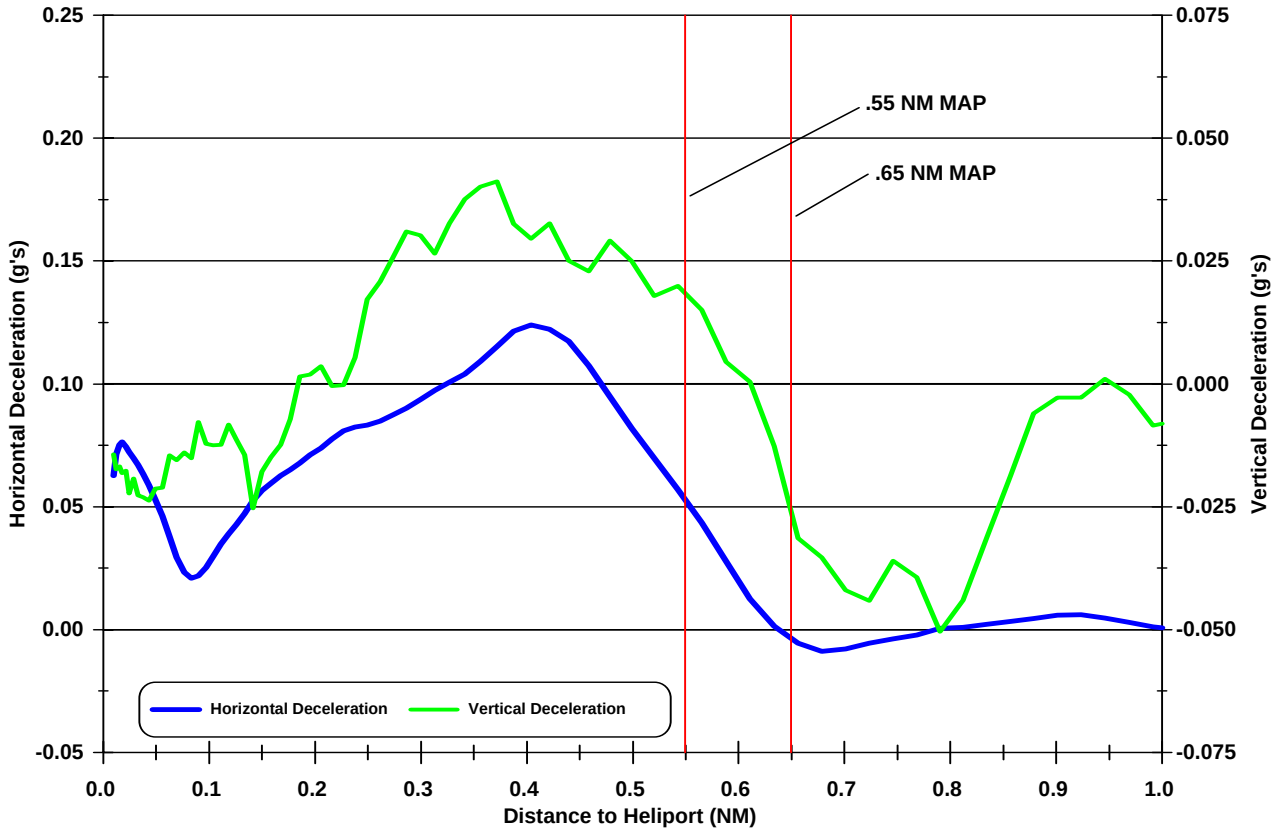
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06B011 - Appr. #11W

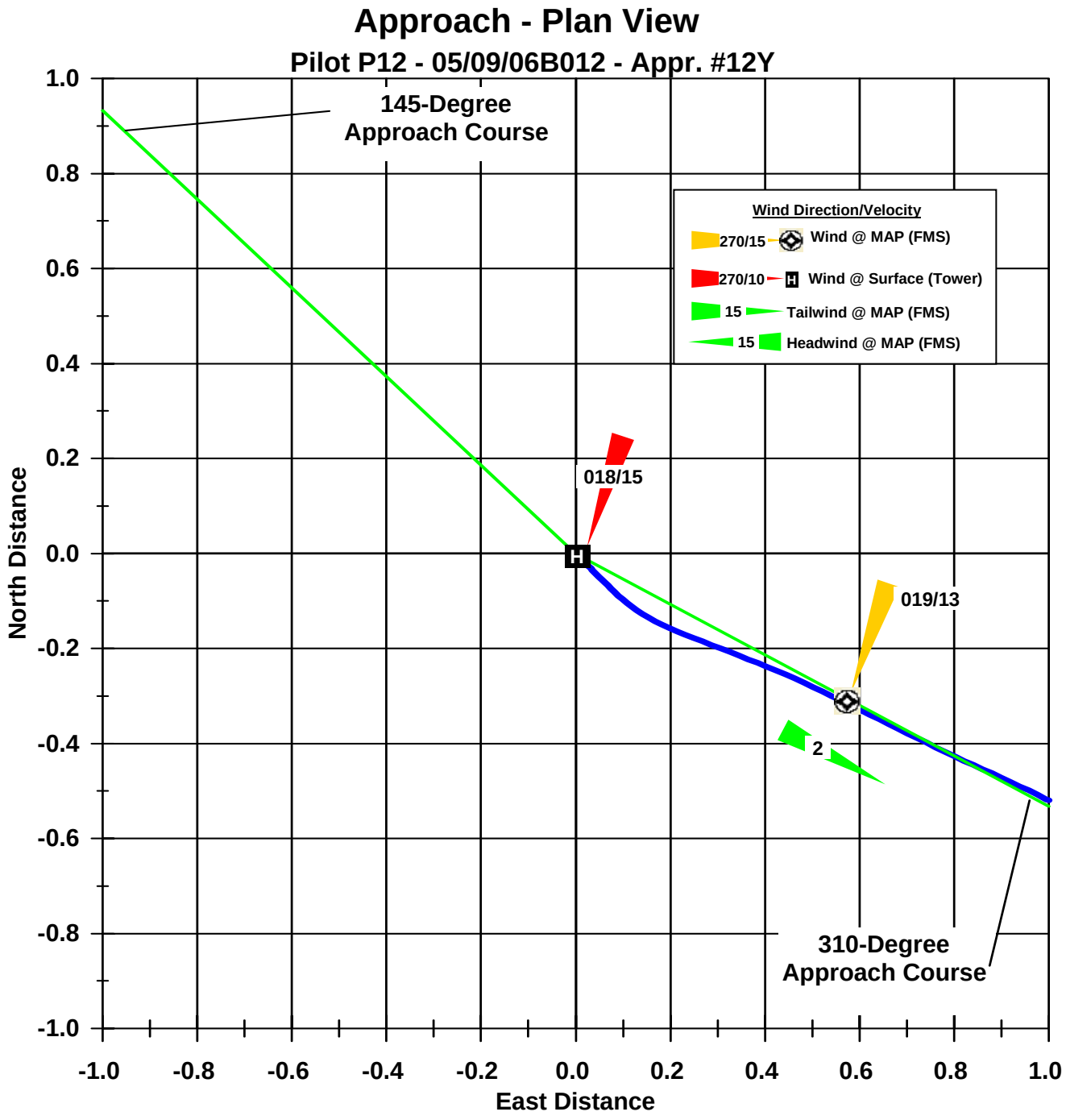


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06B011 - Appr. #11W

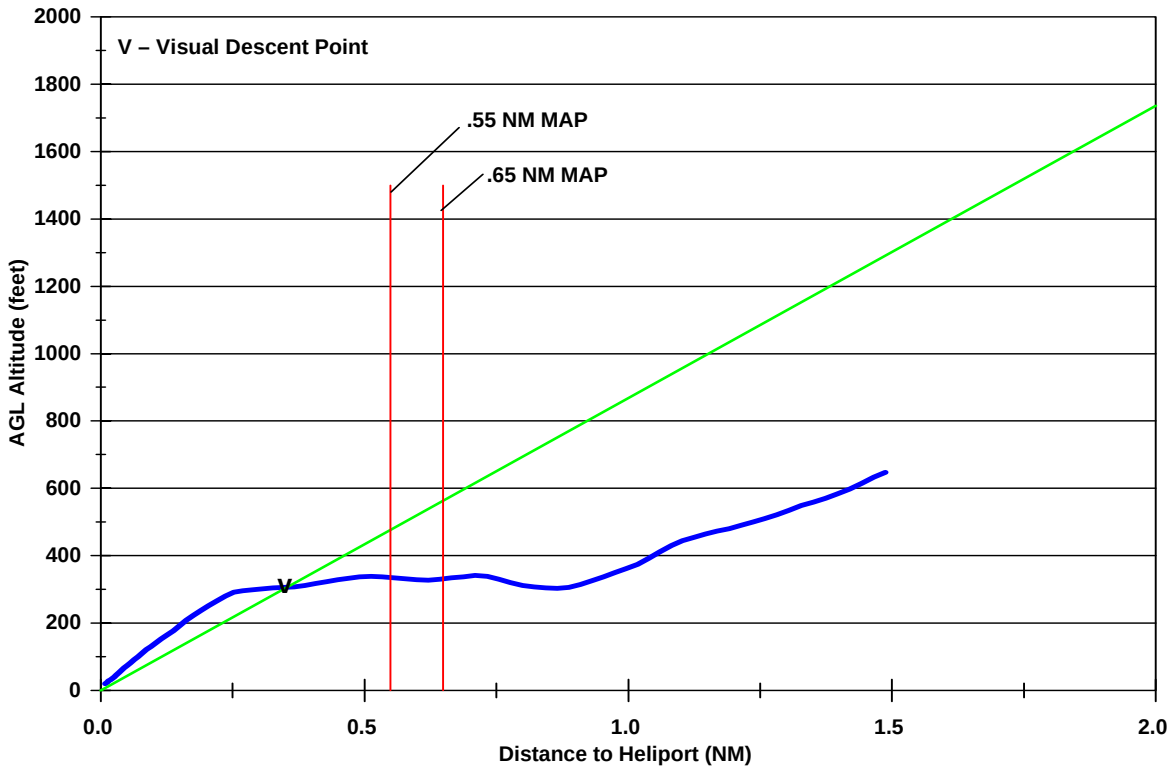


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06B011 - Appr. #11W

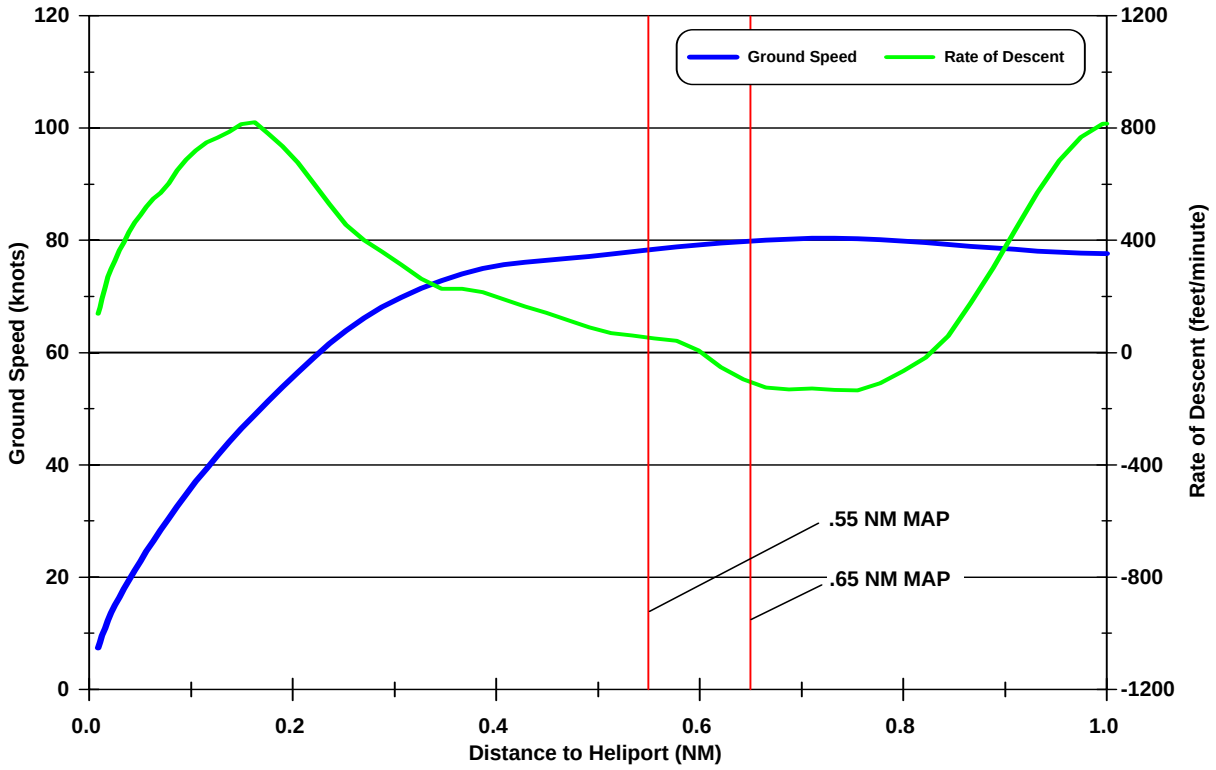



Approach - Plan View
Pilot P12 - 05/09/06B012 - Appr. #12Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
018/15
019/13
2
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

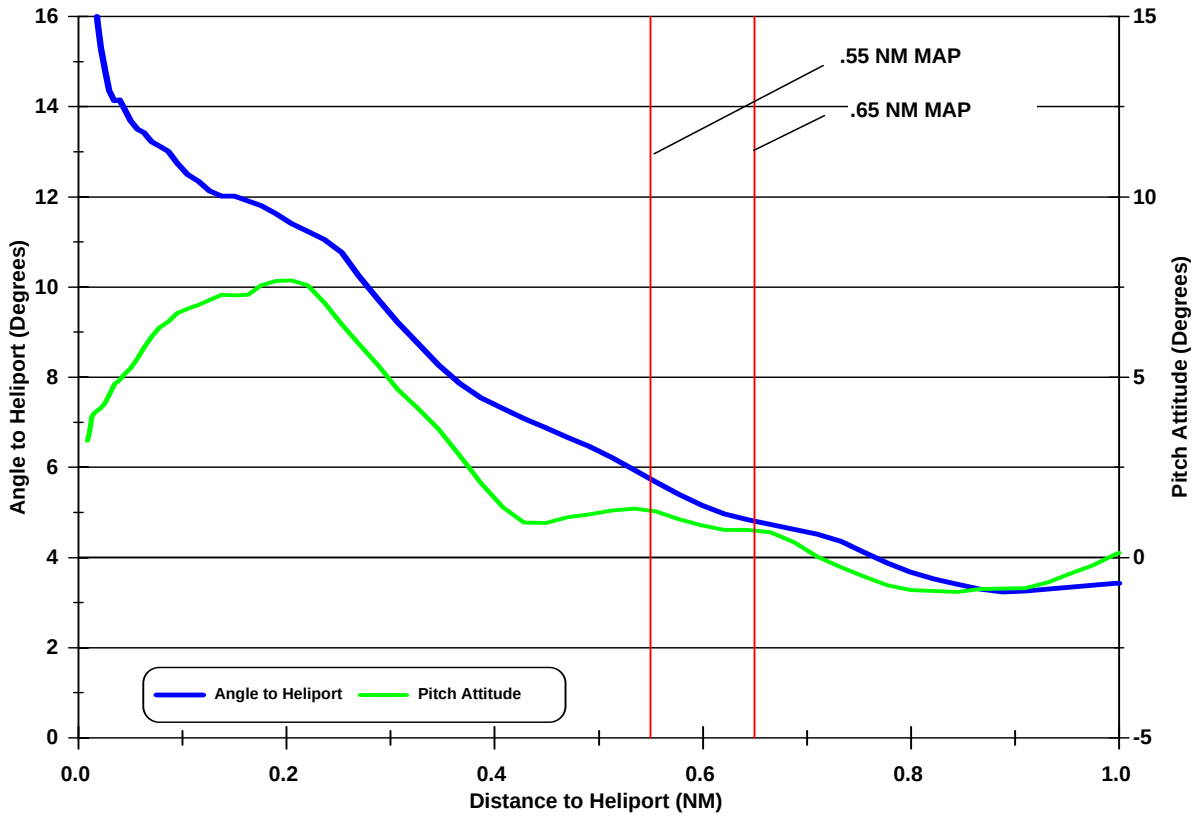
Profile View
Pilot P12 - 05/09/06B012 - Appr. #12Y



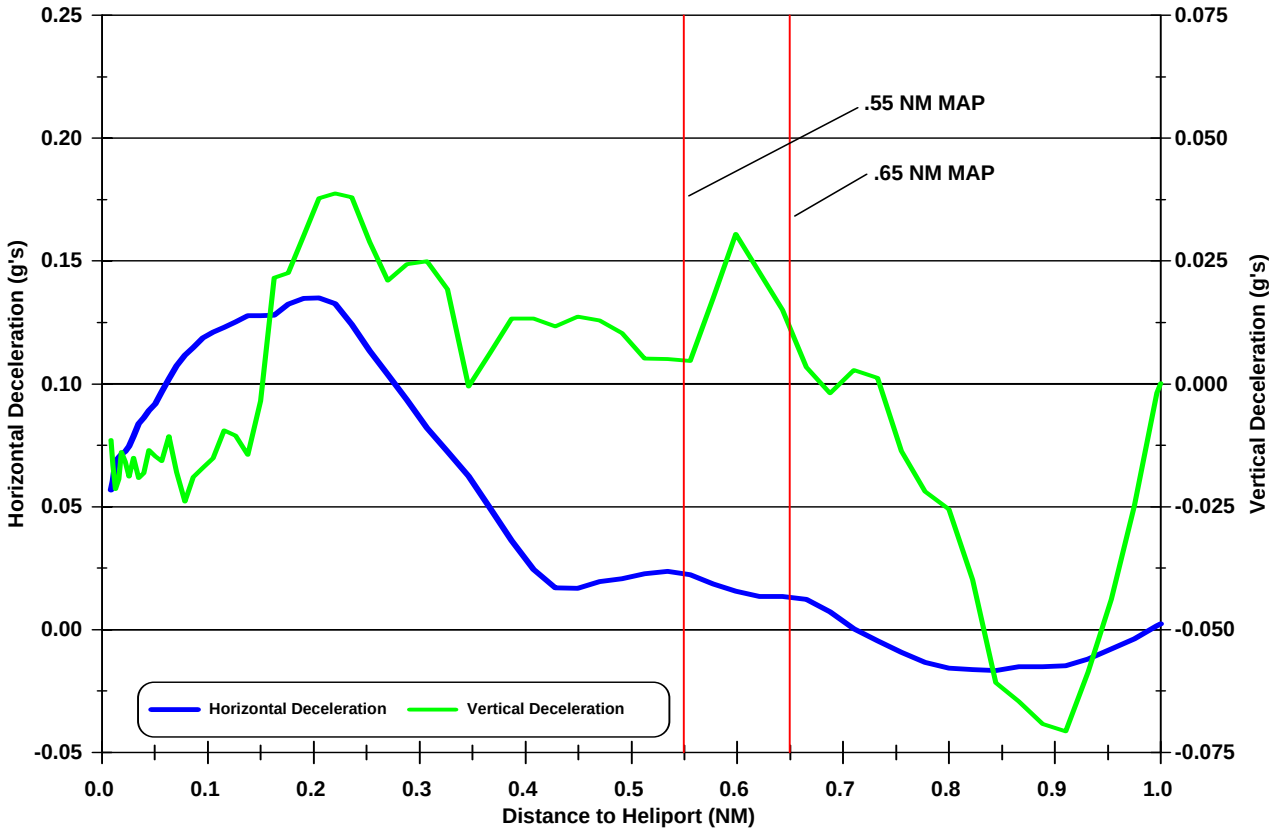
Ground Speed and Rate of Descent
Pilot P12 - 05/09/06B012 - Appr. #12Y

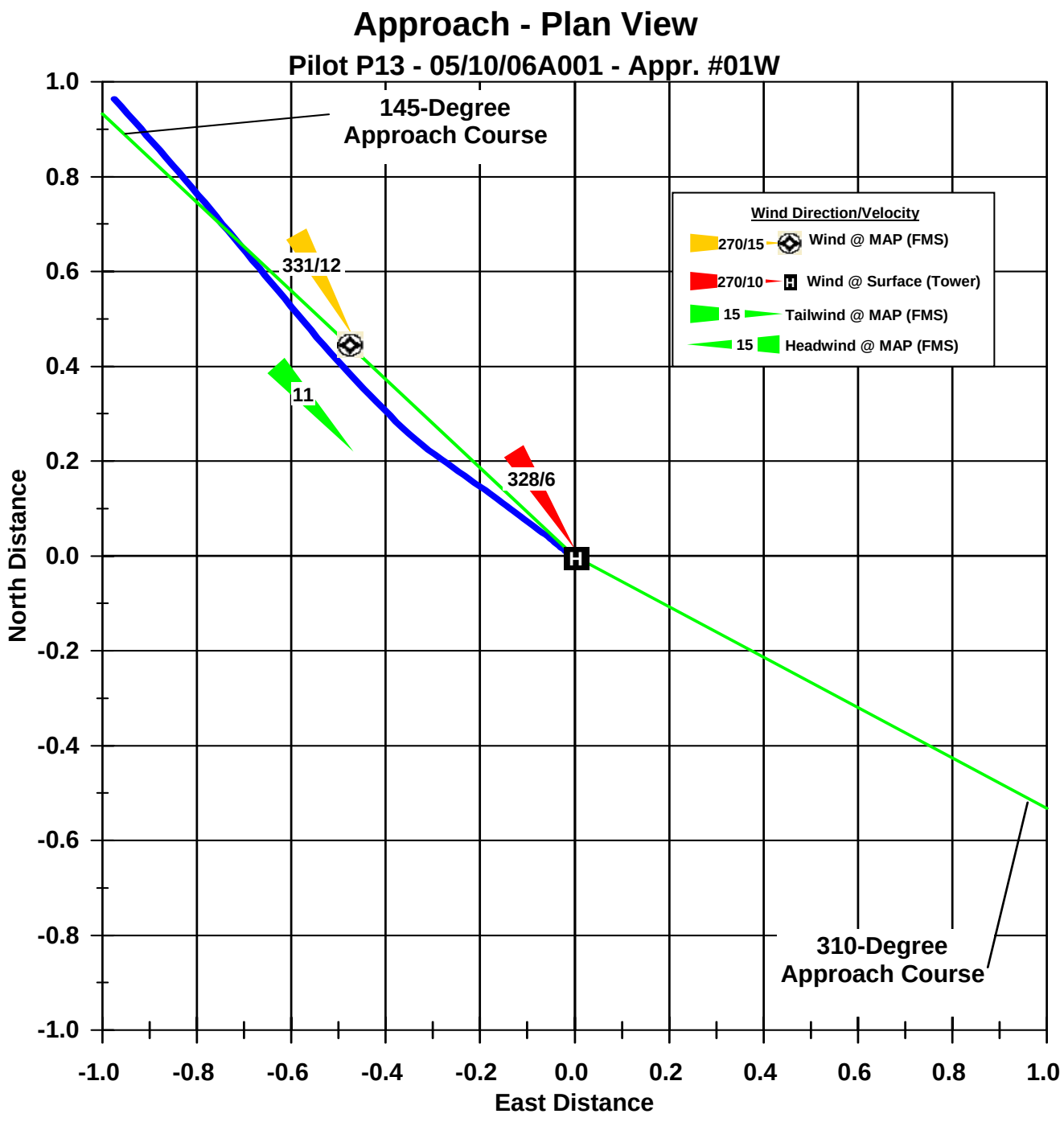


Angle to Heliport and Pitch Attitude
Pilot P12 - 05/09/06B012 - Appr. #12Y

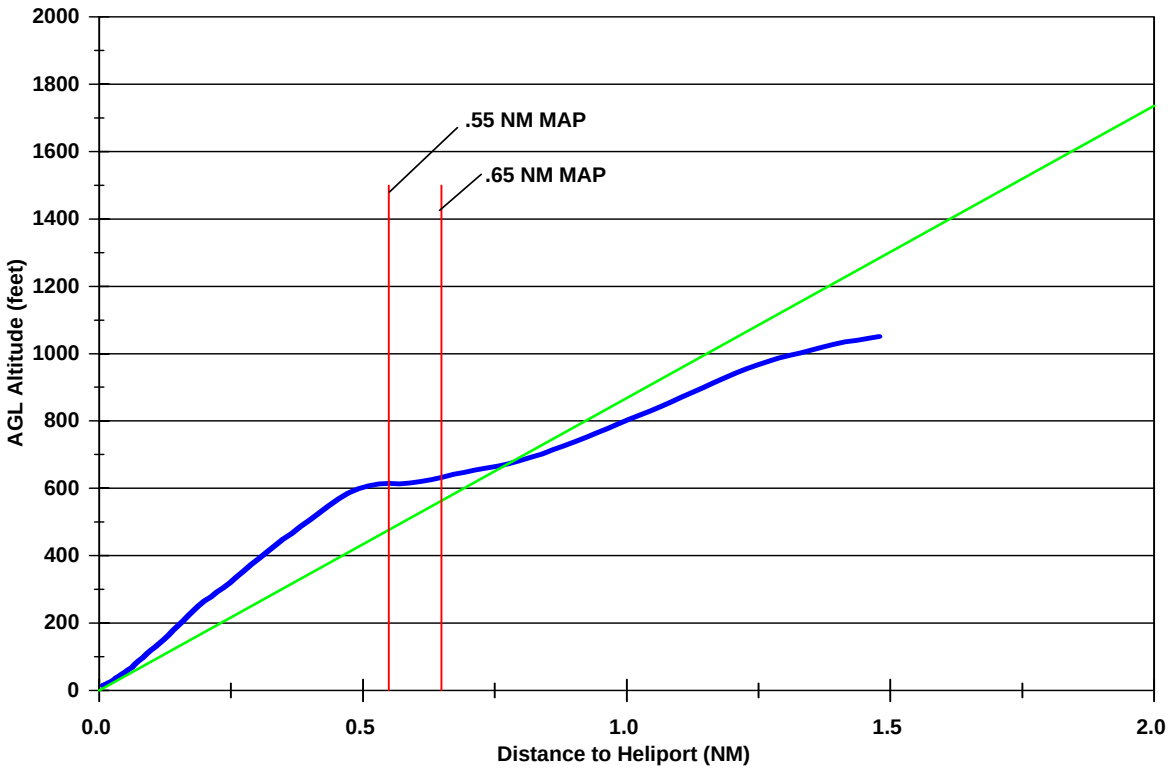


Horizontal and Vertical Deceleration
Pilot P12 - 05/09/06B012 - Appr. #12Y

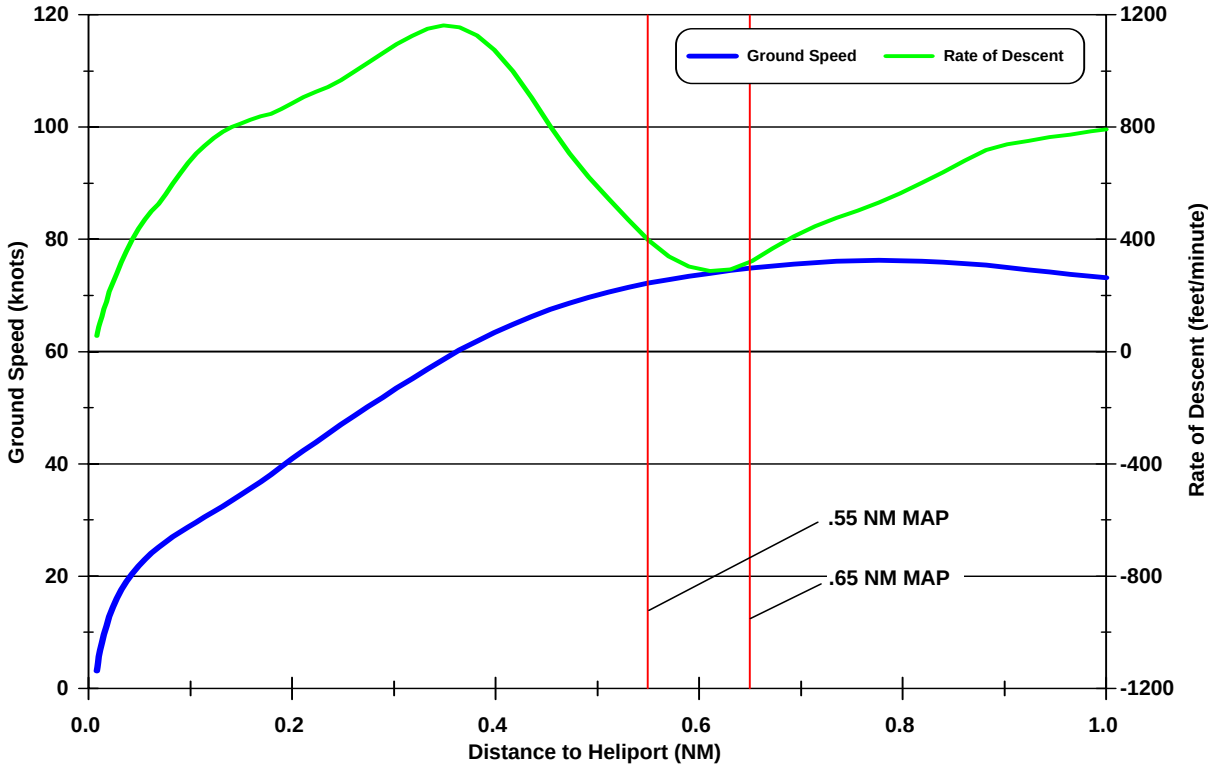



Approach - Plan View
Pilot P13 - 05/10/06A001 - Appr. #01W
145-Degree
Approach Course
310-Degree
Approach Course
331/12
11
328/6
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

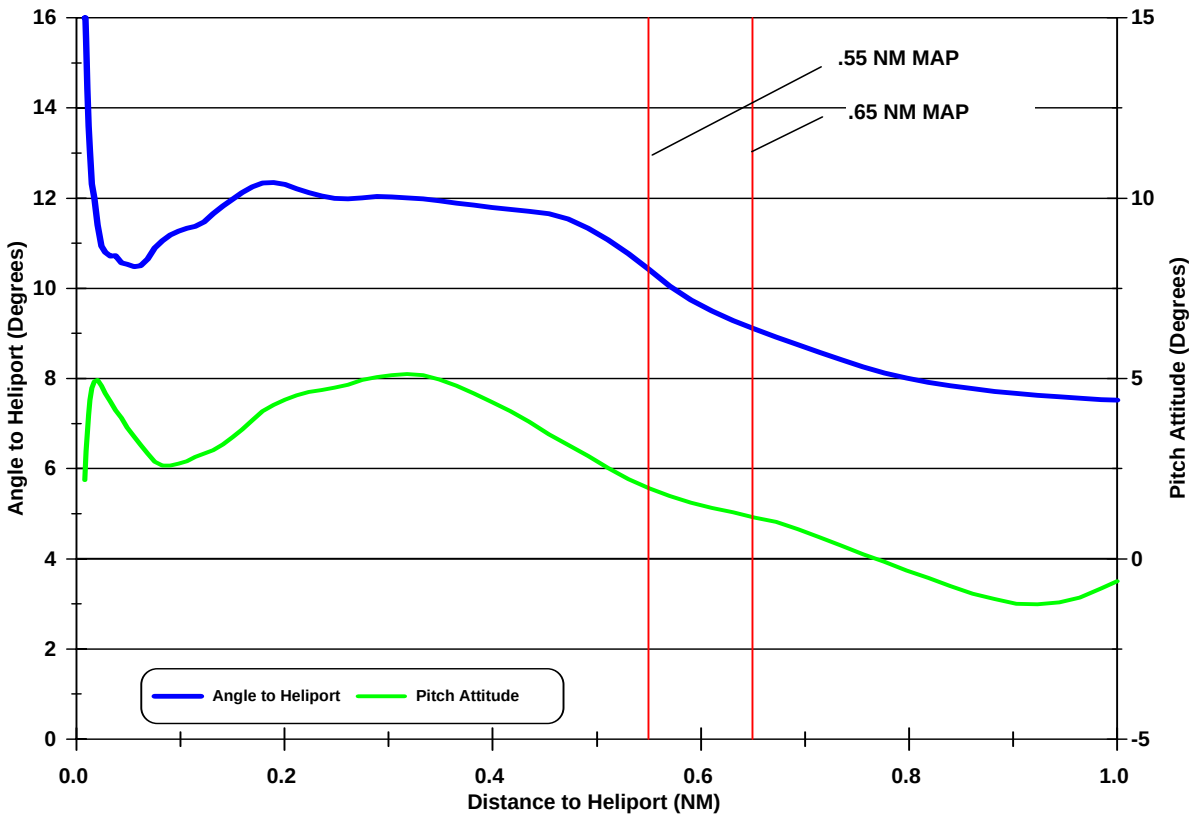
Profile View
Pilot P13 - 05/10/06A001 - Appr. #01W



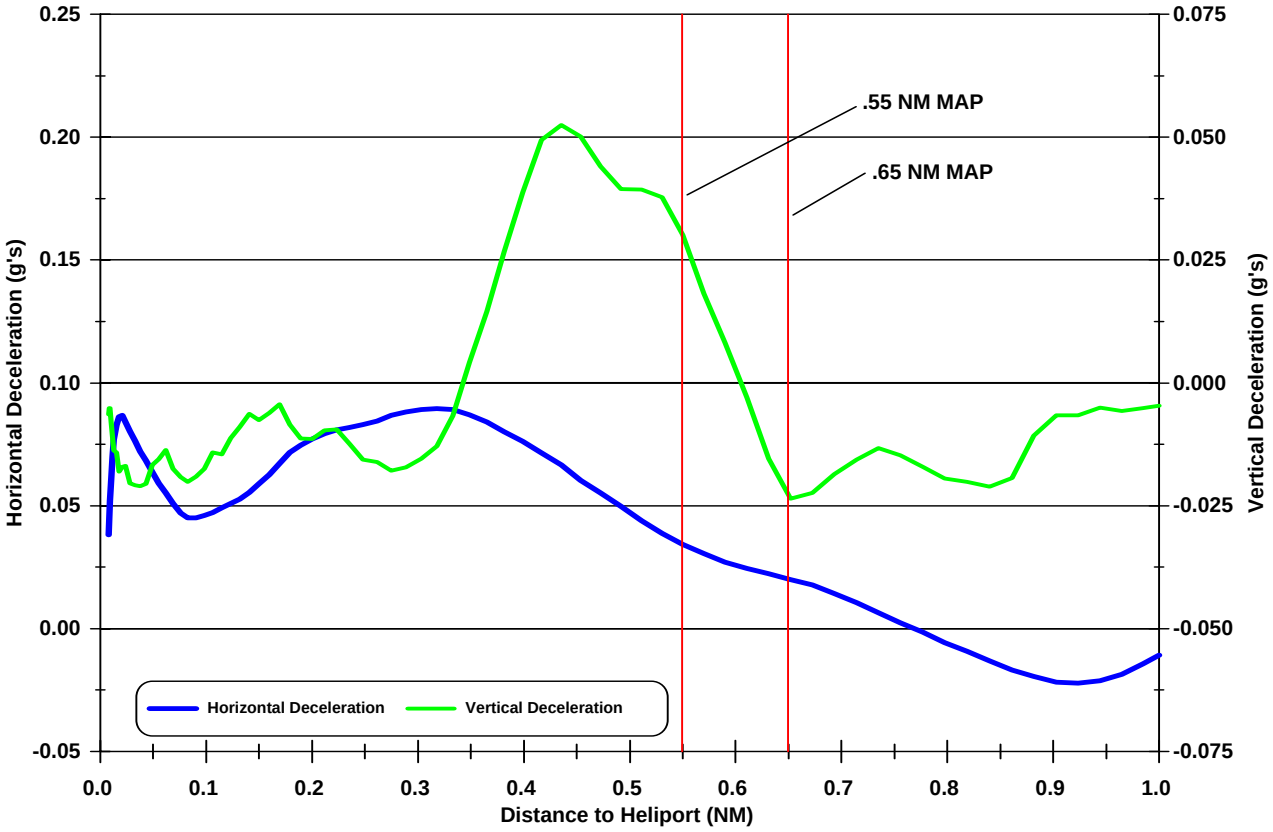
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06A001 - Appr. #01W

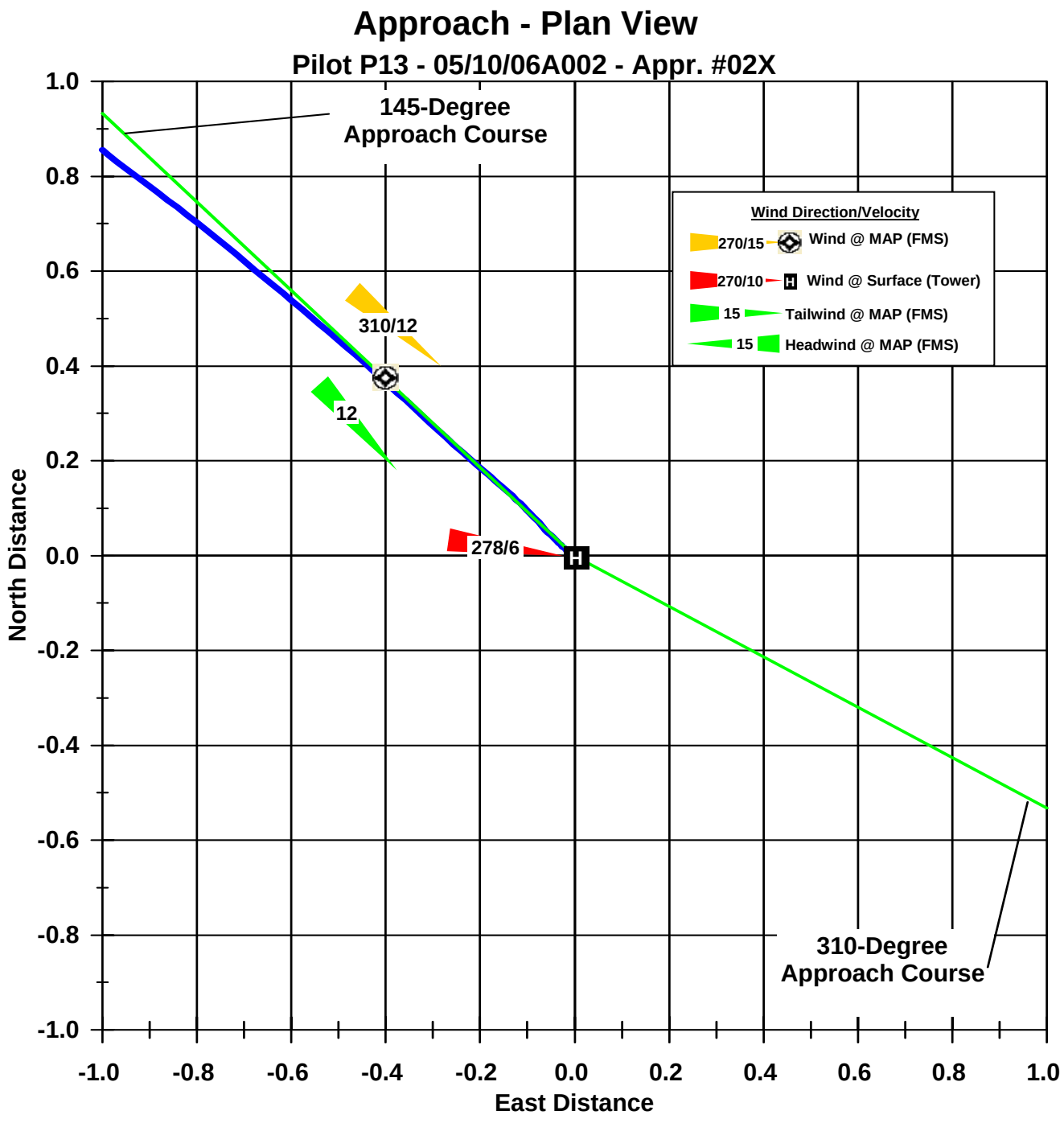


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06A001 - Appr. #01W

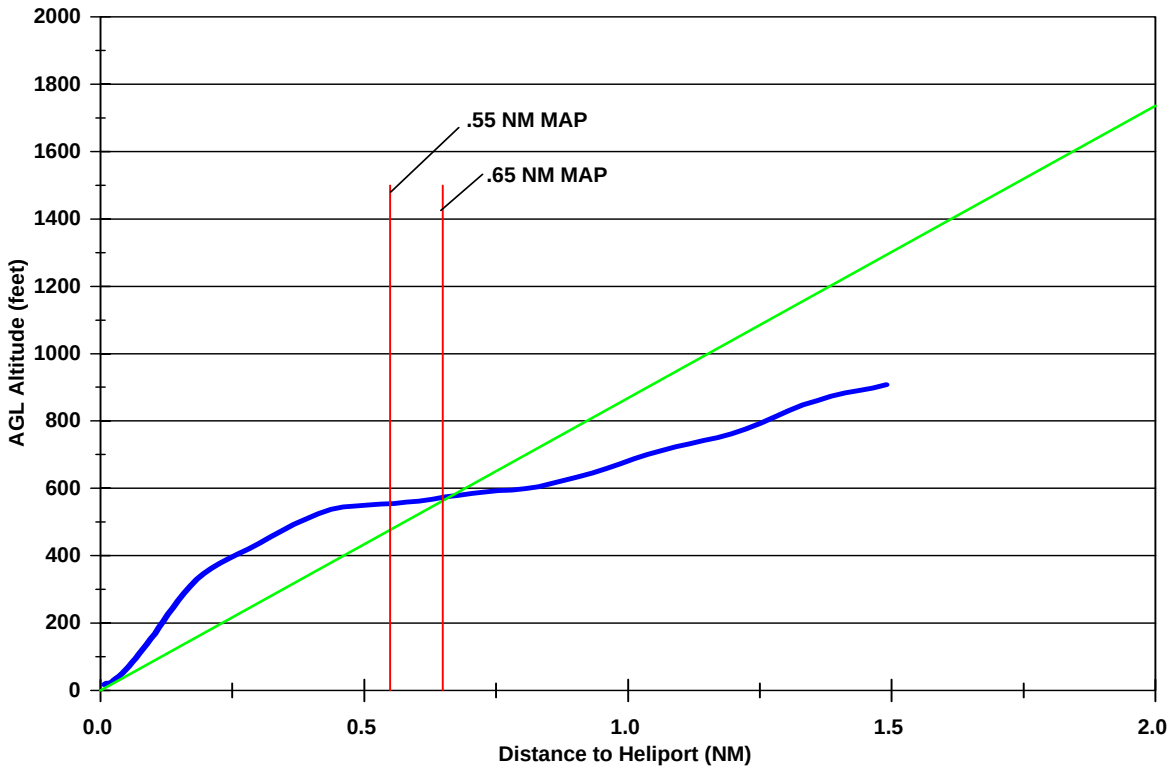


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06A001 - Appr. #01W

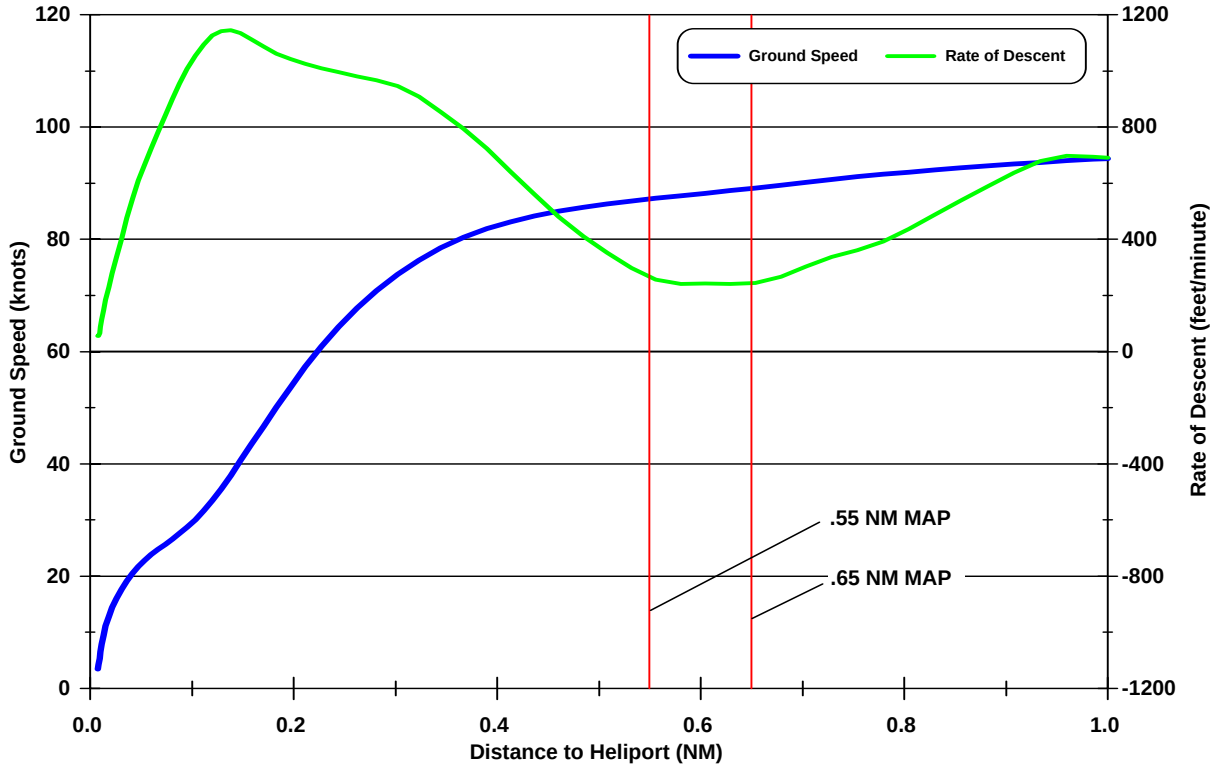



Approach - Plan View
Pilot P13 - 05/10/06A002 - Appr. #02X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
310/12
12
278/6
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

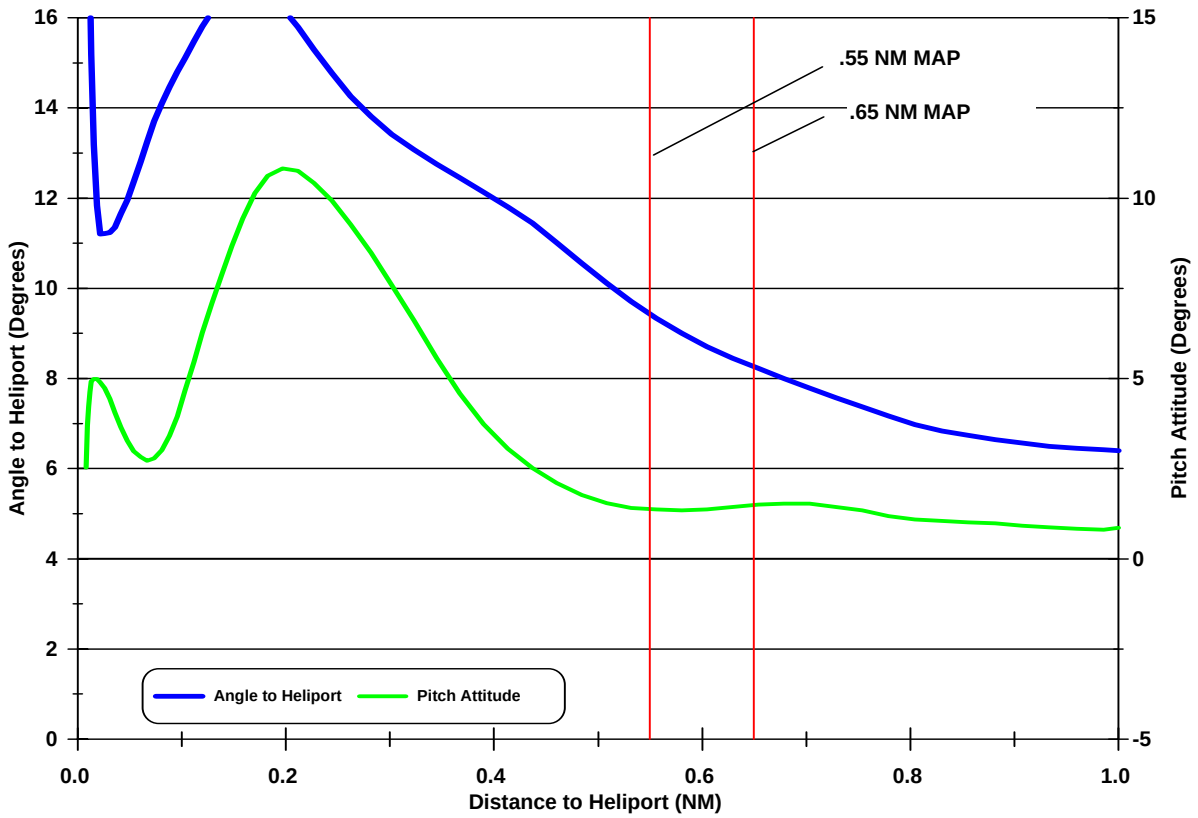
Profile View
Pilot P13 - 05/10/06A002 - Appr. #02X



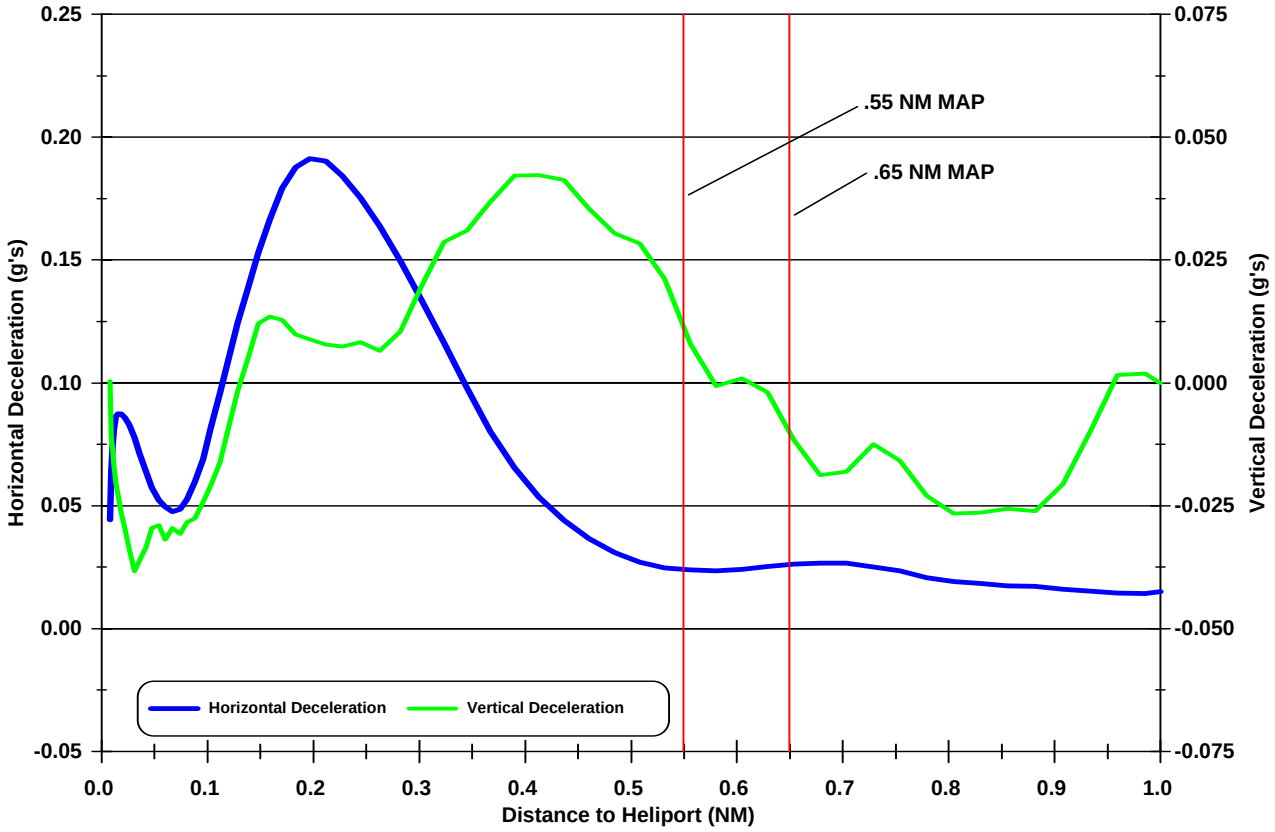
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06A002 - Appr. #02X

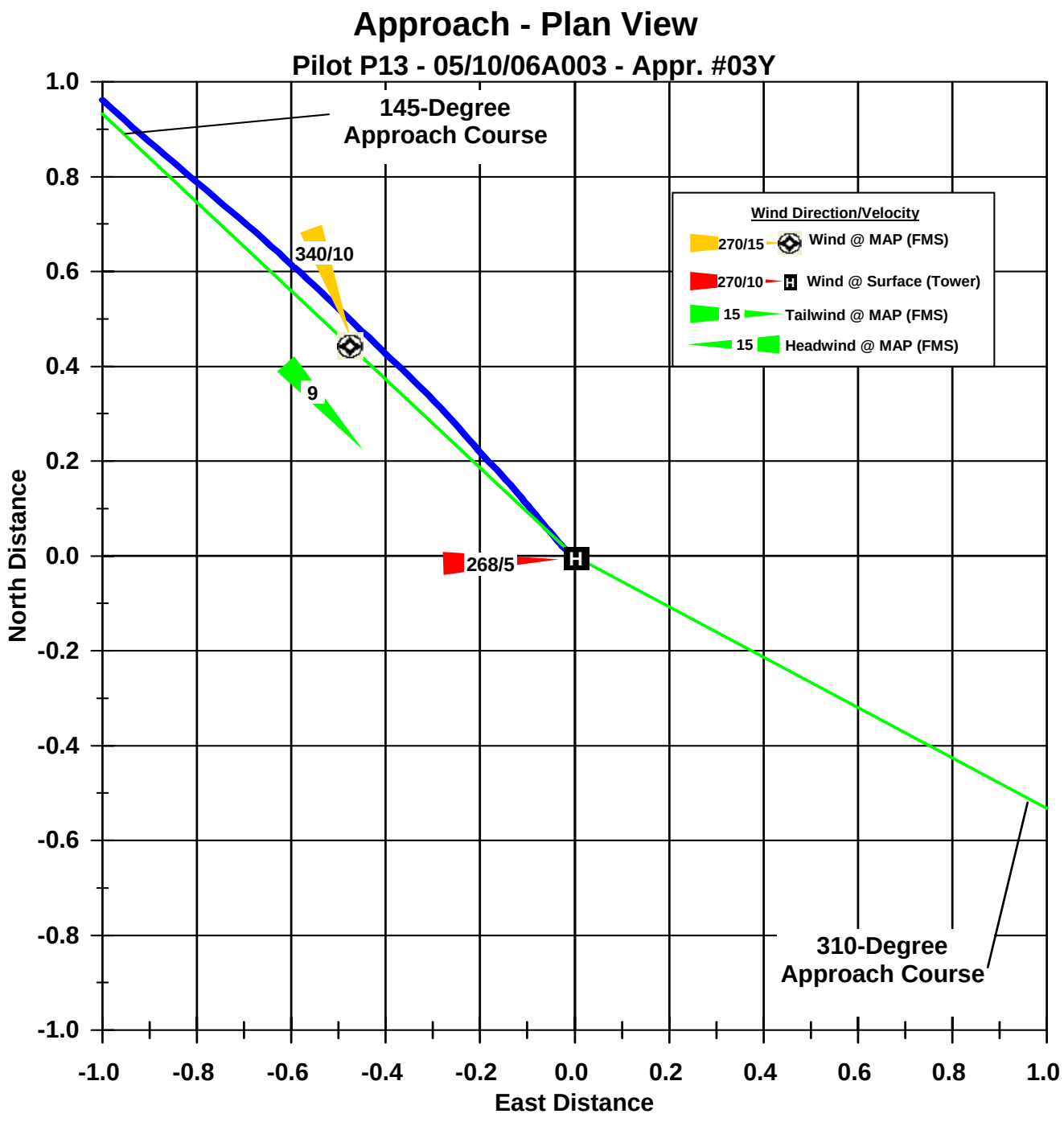


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06A002 - Appr. #02X

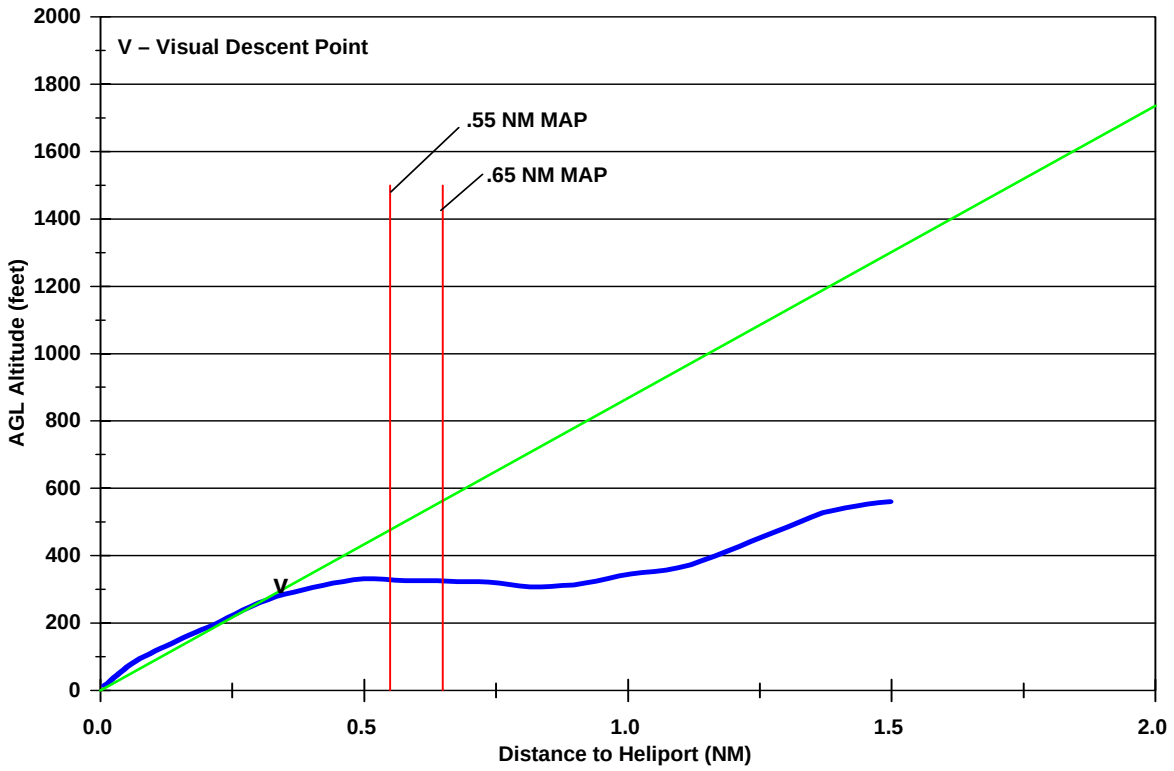


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06A002 - Appr. #02X

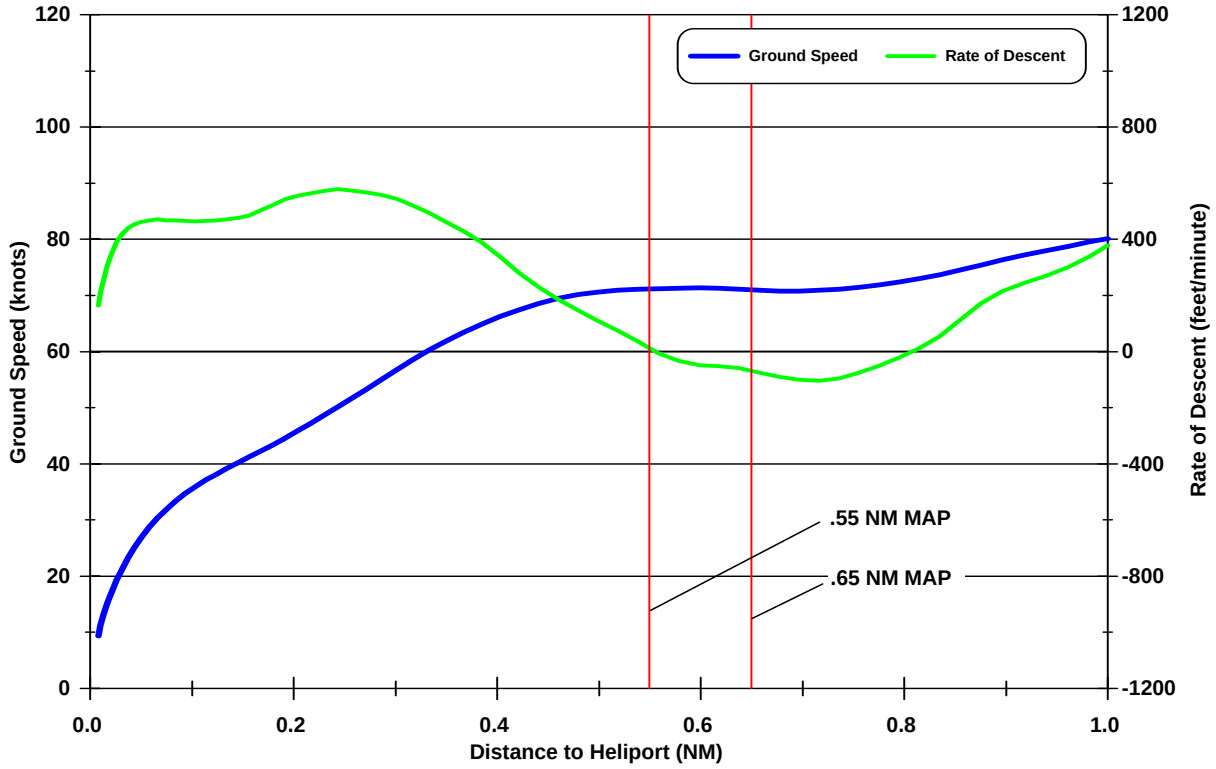



Approach - Plan View
Pilot P13 - 05/10/06A003 - Appr. #03Y
145-Degree
Approach Course
310-Degree
Approach Course
340/10
9
268/5
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

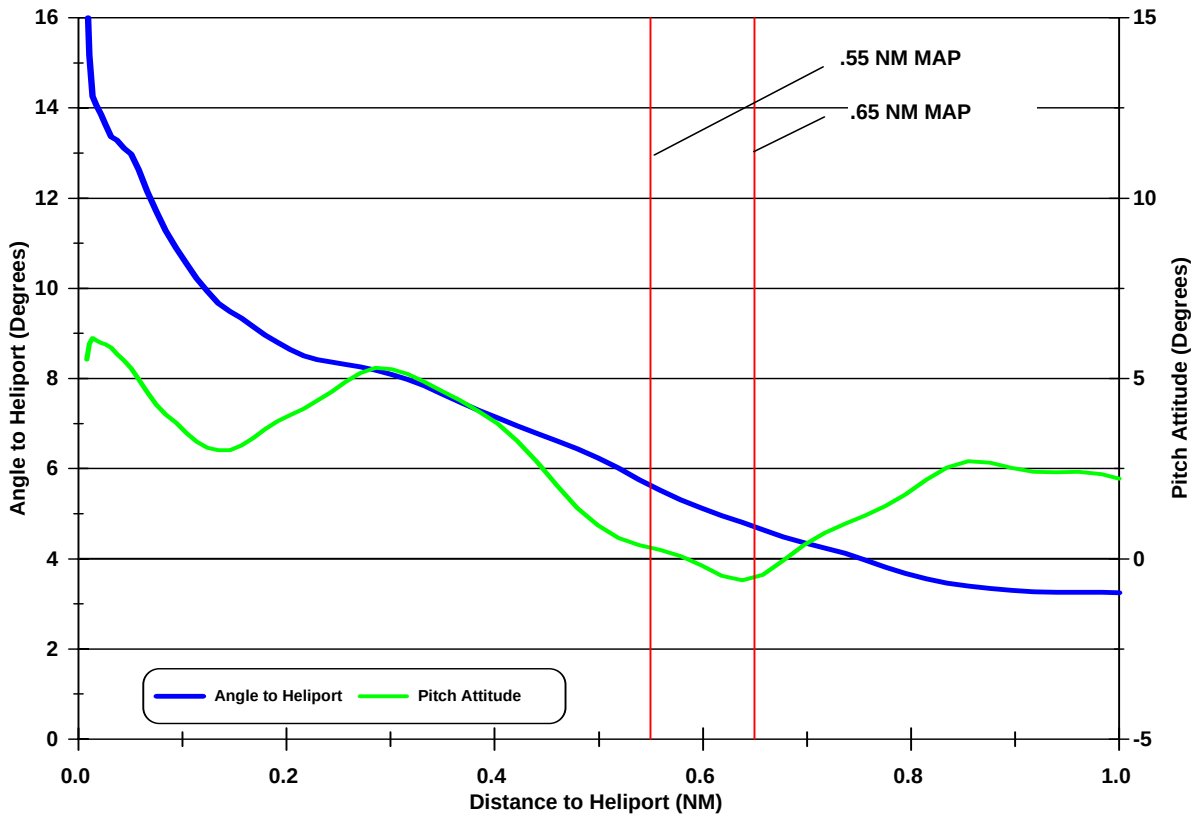
Profile View
Pilot P13 - 05/10/06A003 - Appr. #03Y



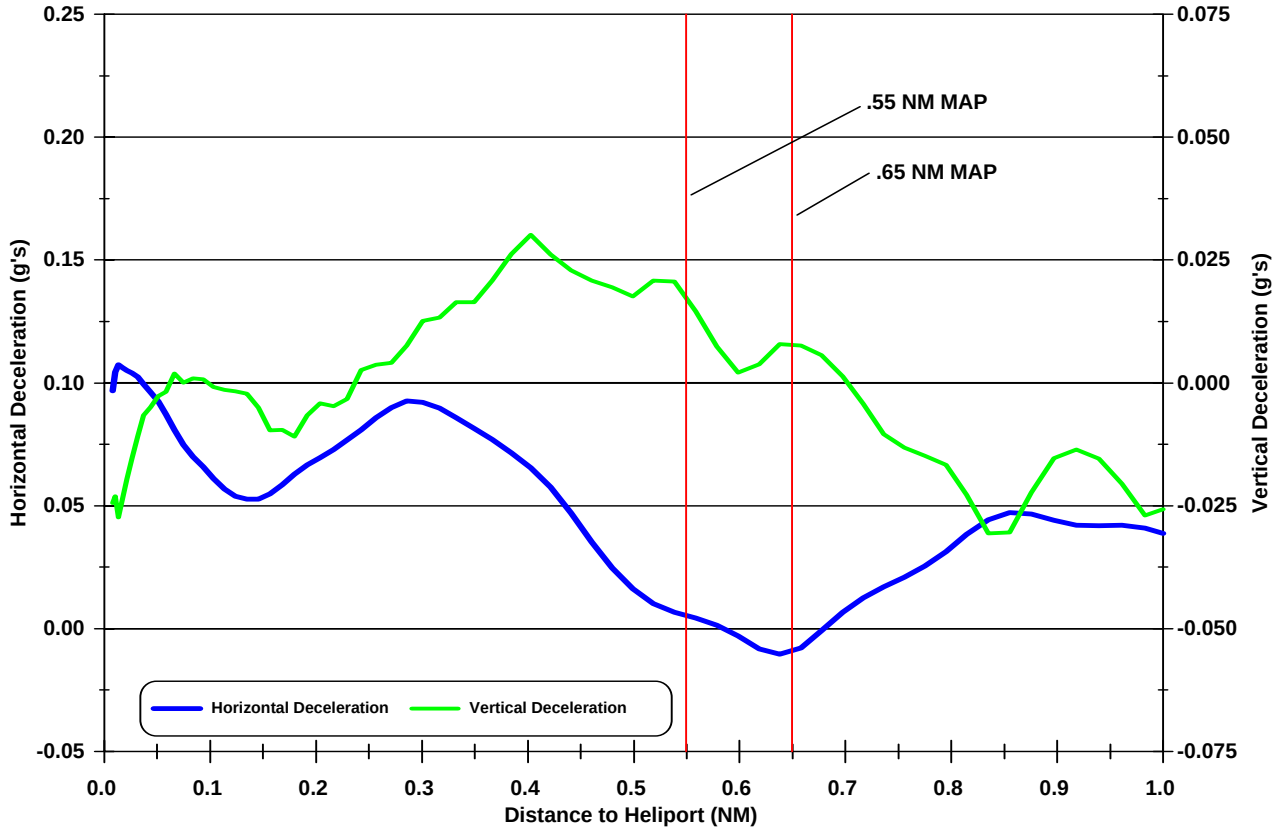
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06A003 - Appr. #03Y

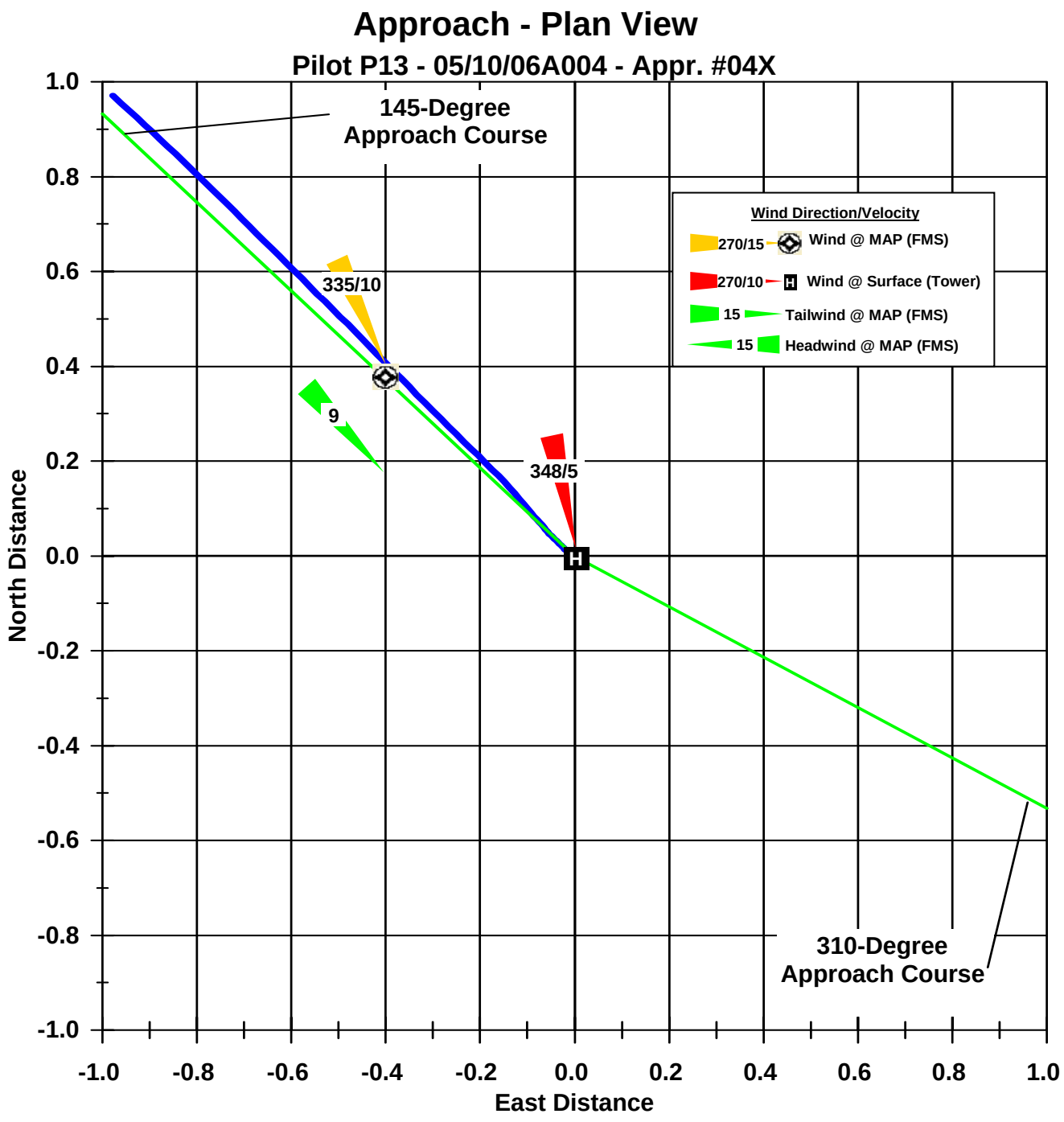


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06A003 - Appr. #03Y

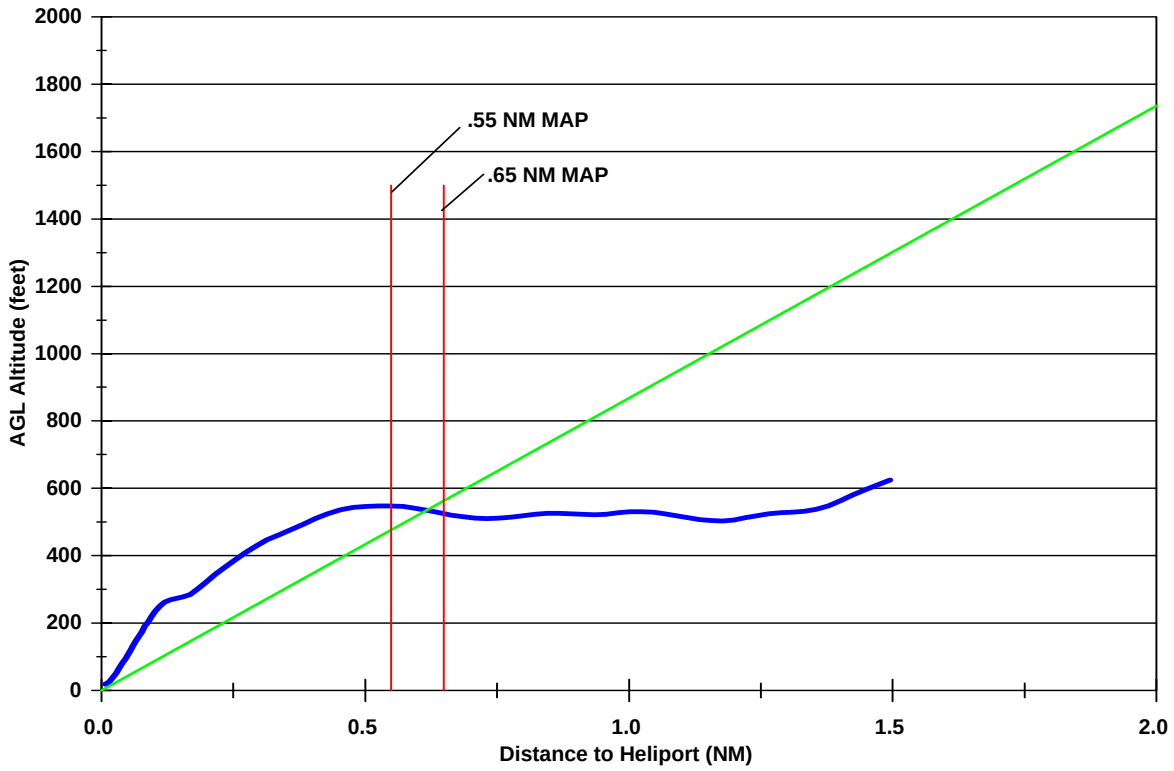


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06A003 - Appr. #03Y

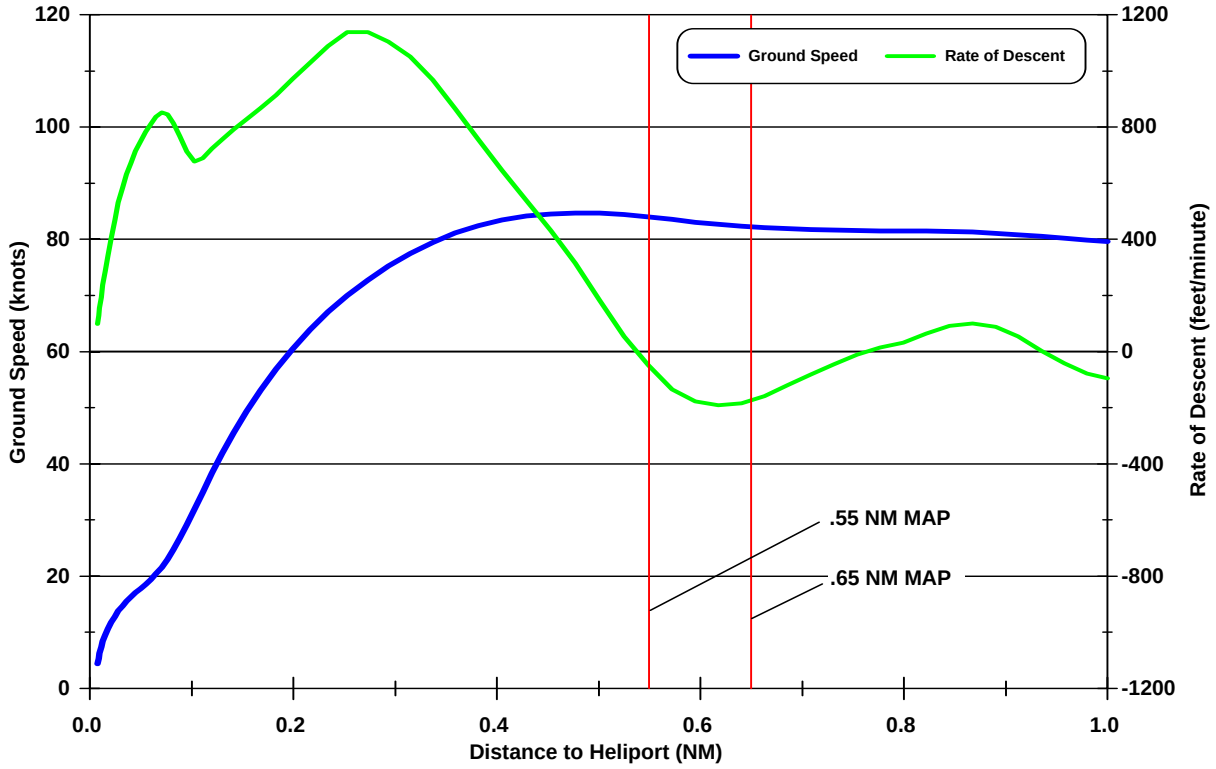



Approach - Plan View
Pilot P13 - 05/10/06A004 - Appr. #04X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
335/10
9
348/5
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

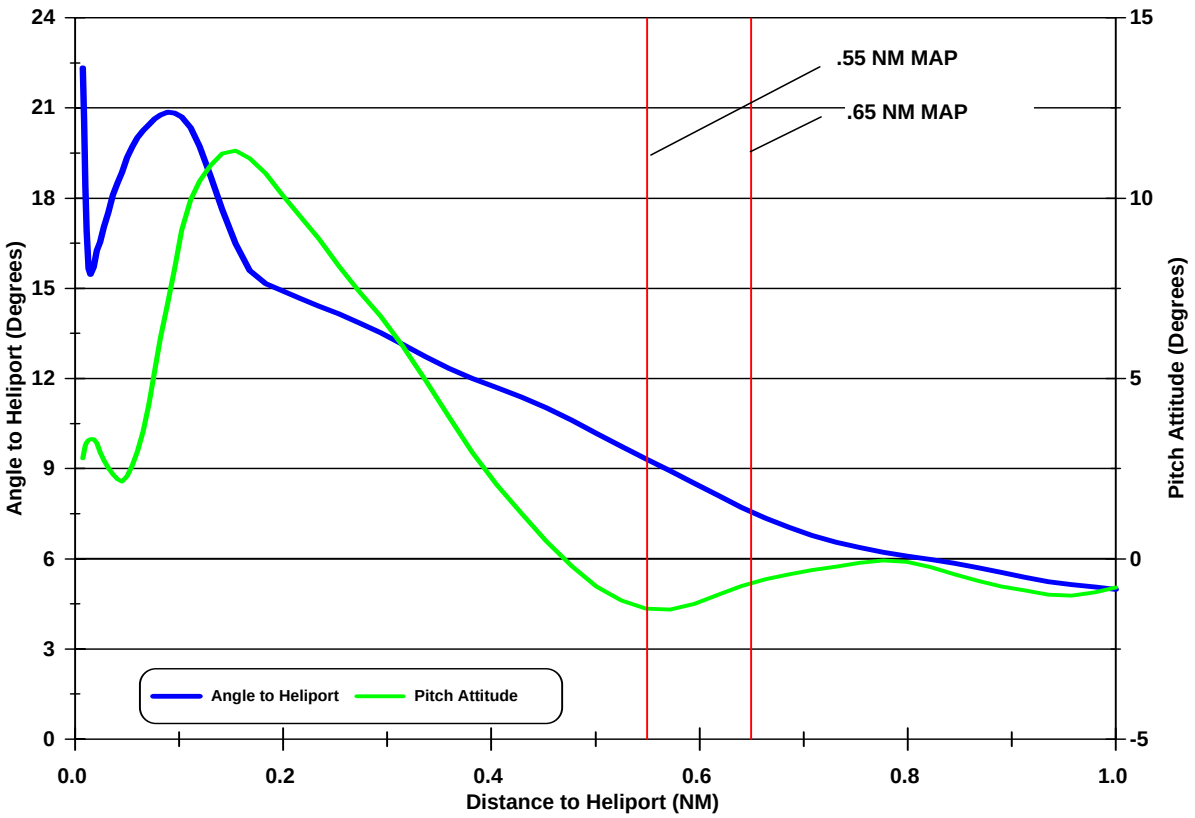
Profile View
Pilot P13 - 05/10/06A004 - Appr. #04X



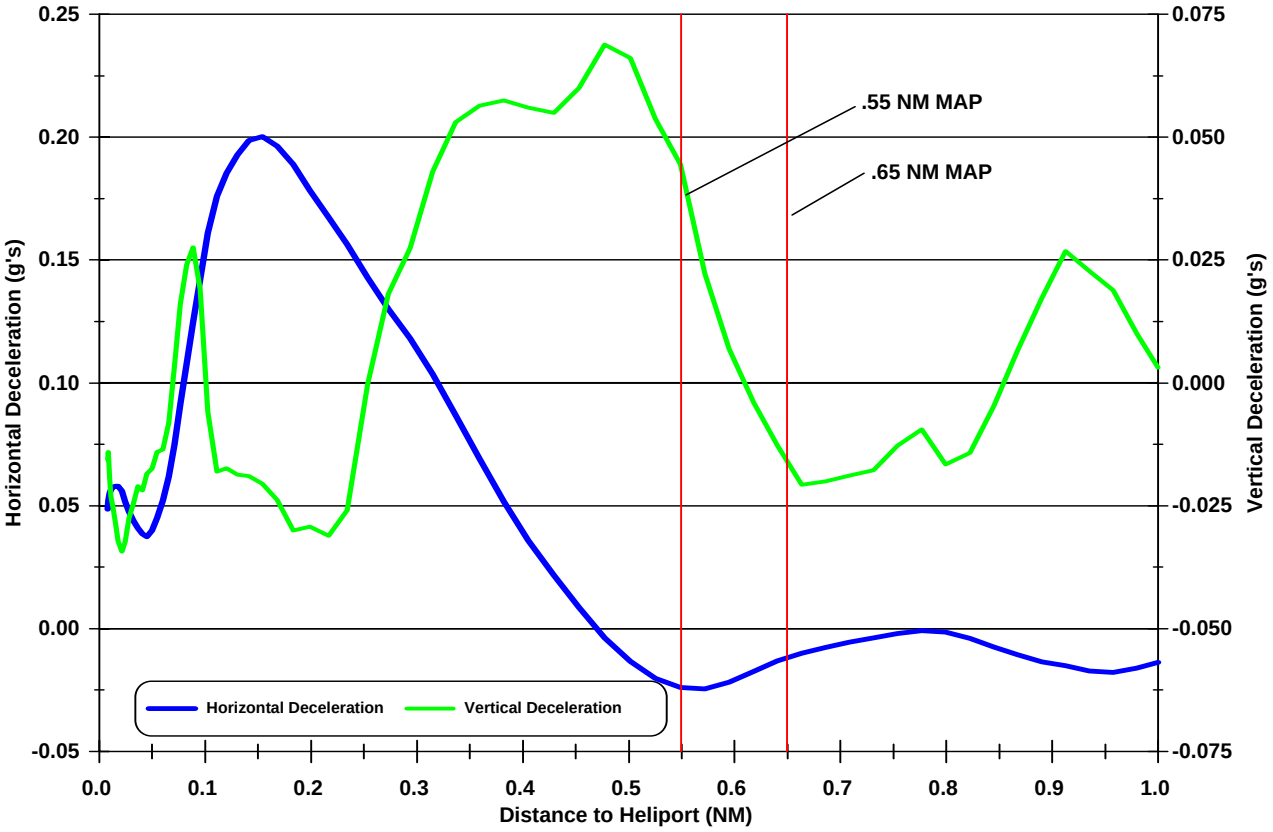
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06A004 - Appr. #04X

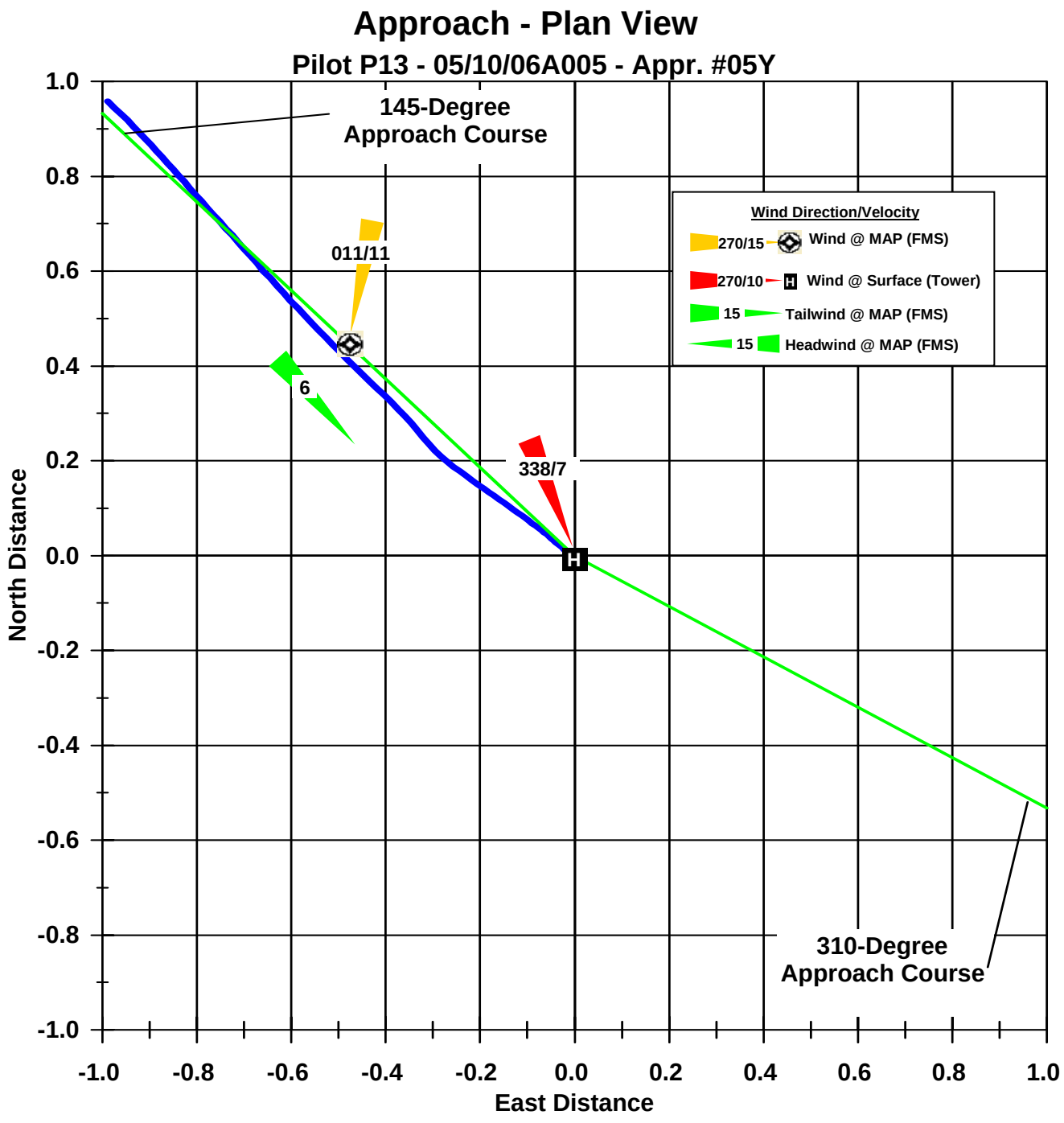


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06A004 - Appr. #04X

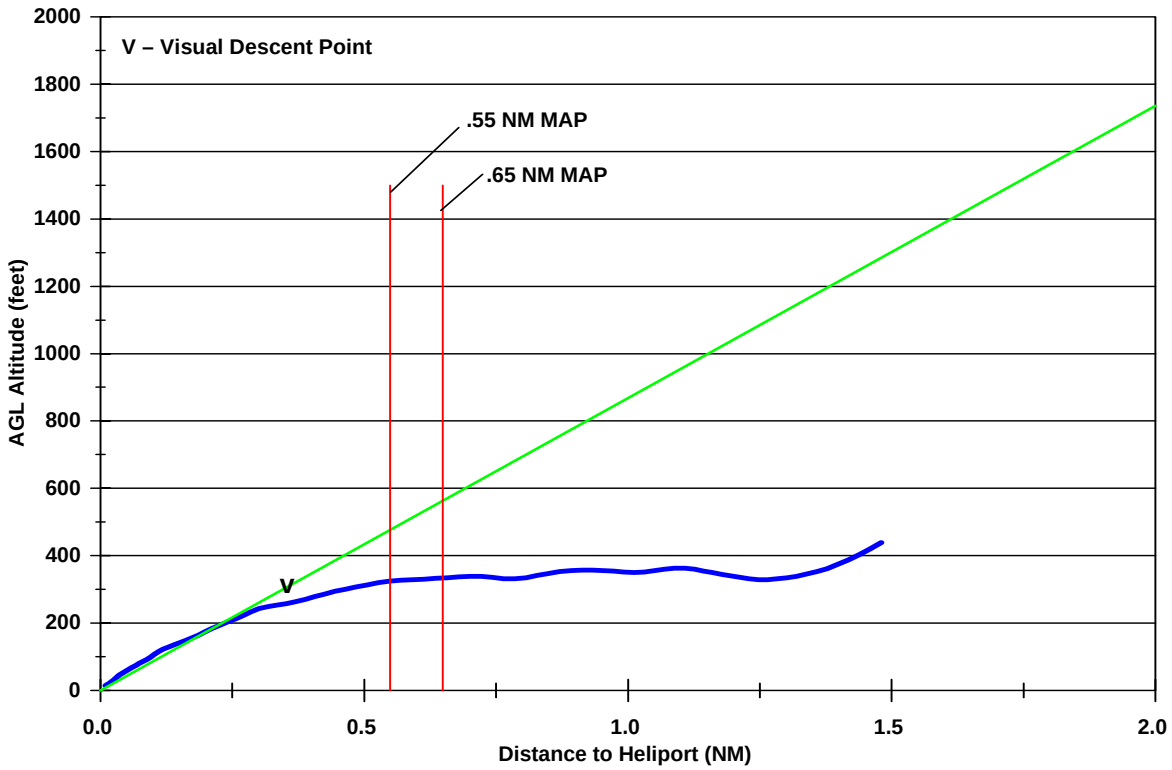


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06A004 - Appr. #04X

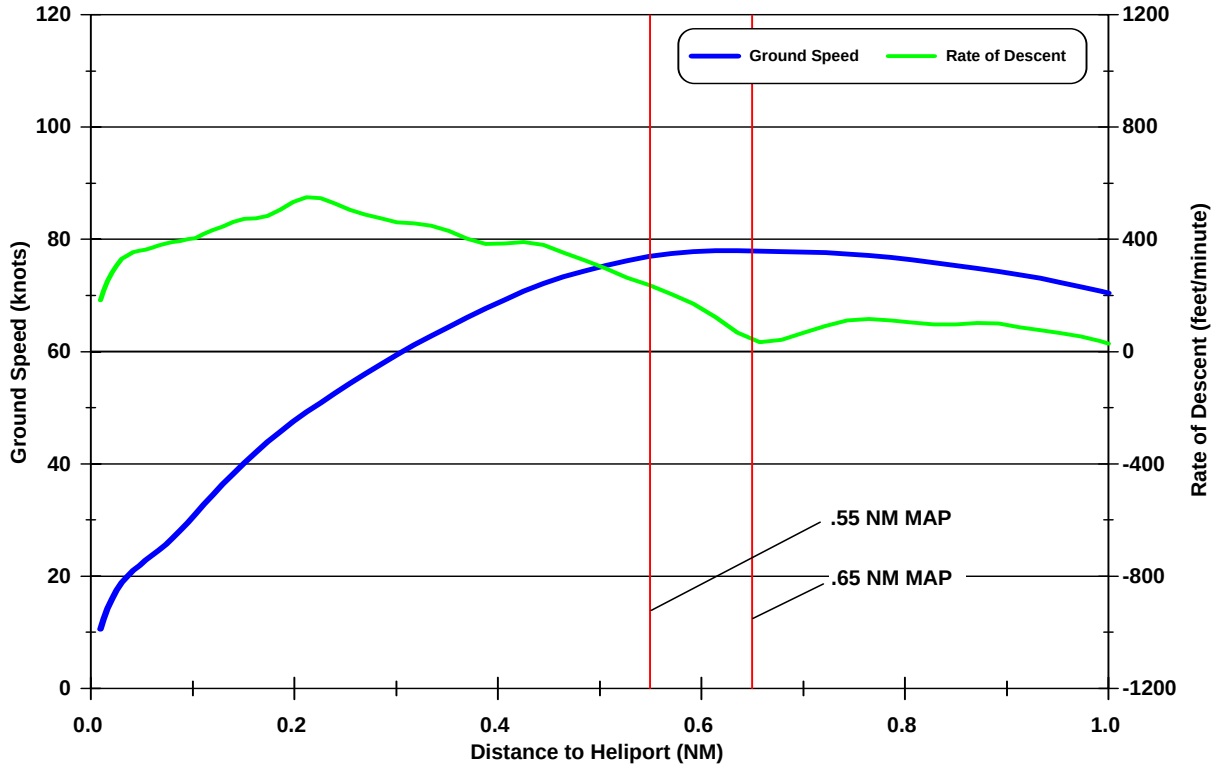



Approach - Plan View
Pilot P13 - 05/10/06A005 - Appr. #05Y
145-Degree
Approach Course
310-Degree
Approach Course
011/11
6
338/7
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

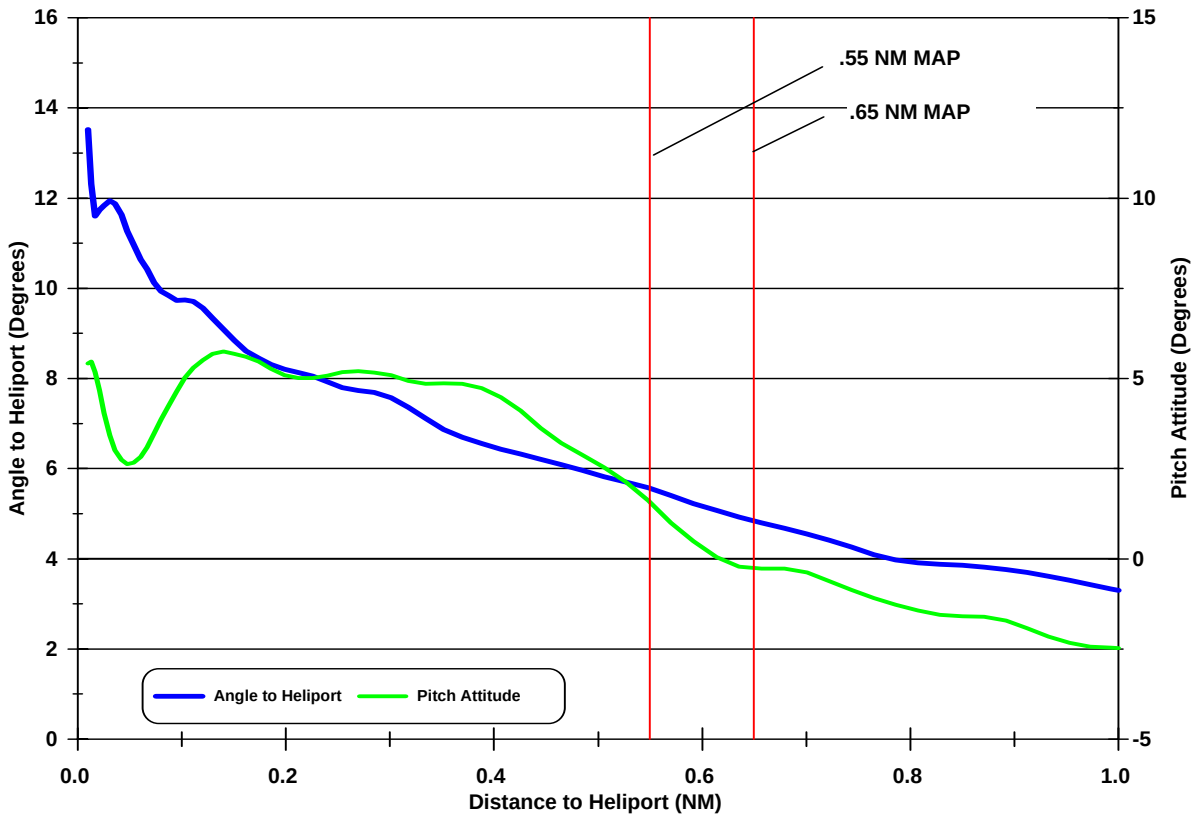
Profile View
Pilot P13 - 05/10/06A005 - Appr. #05Y



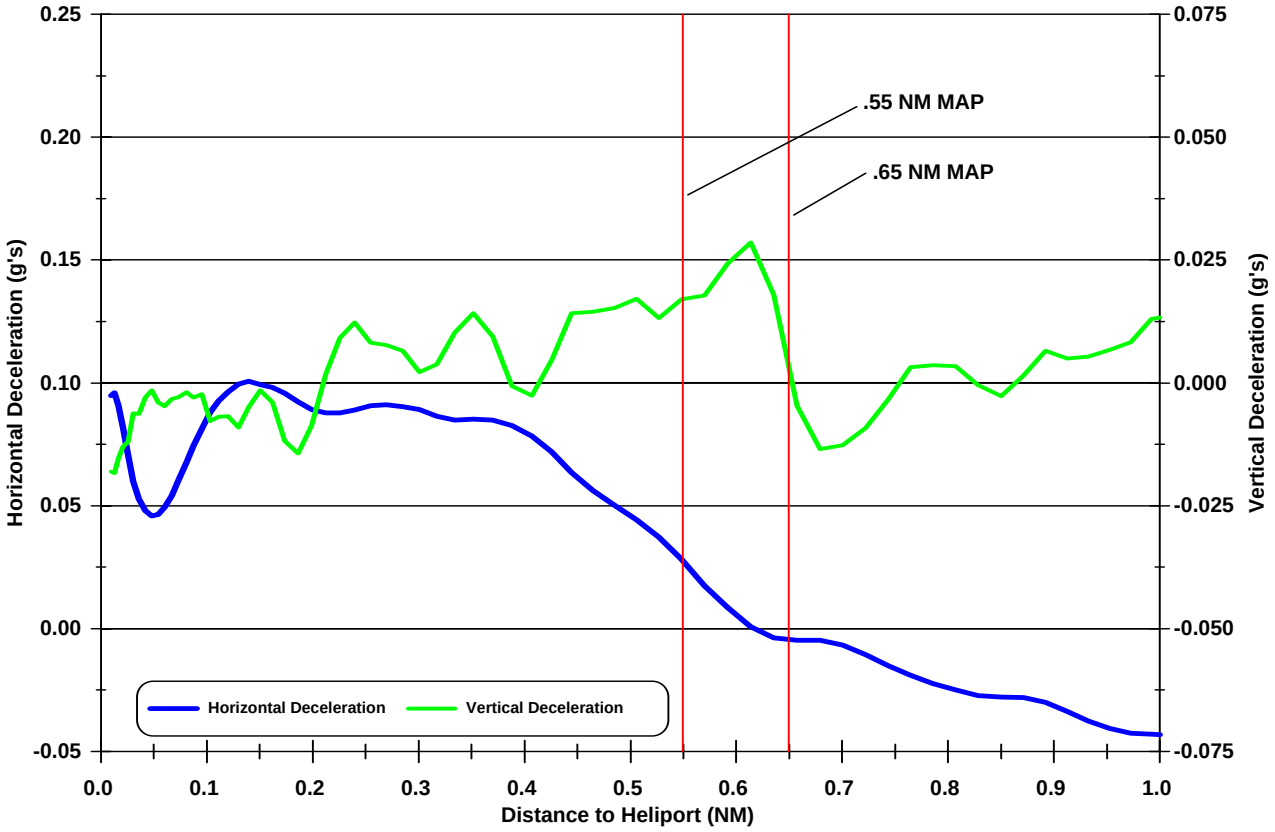
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06A005 - Appr. #05Y

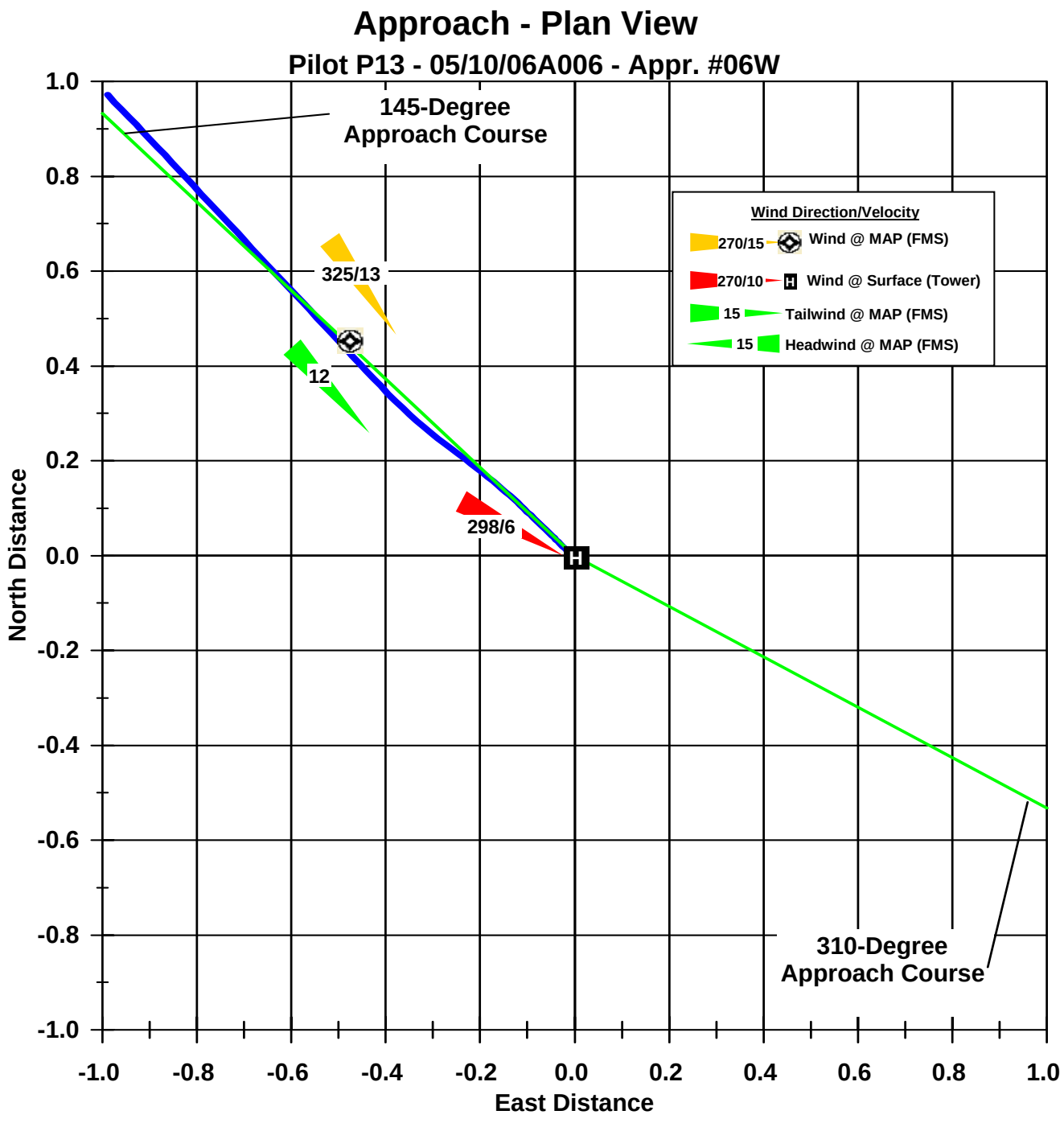


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06A005 - Appr. #05Y

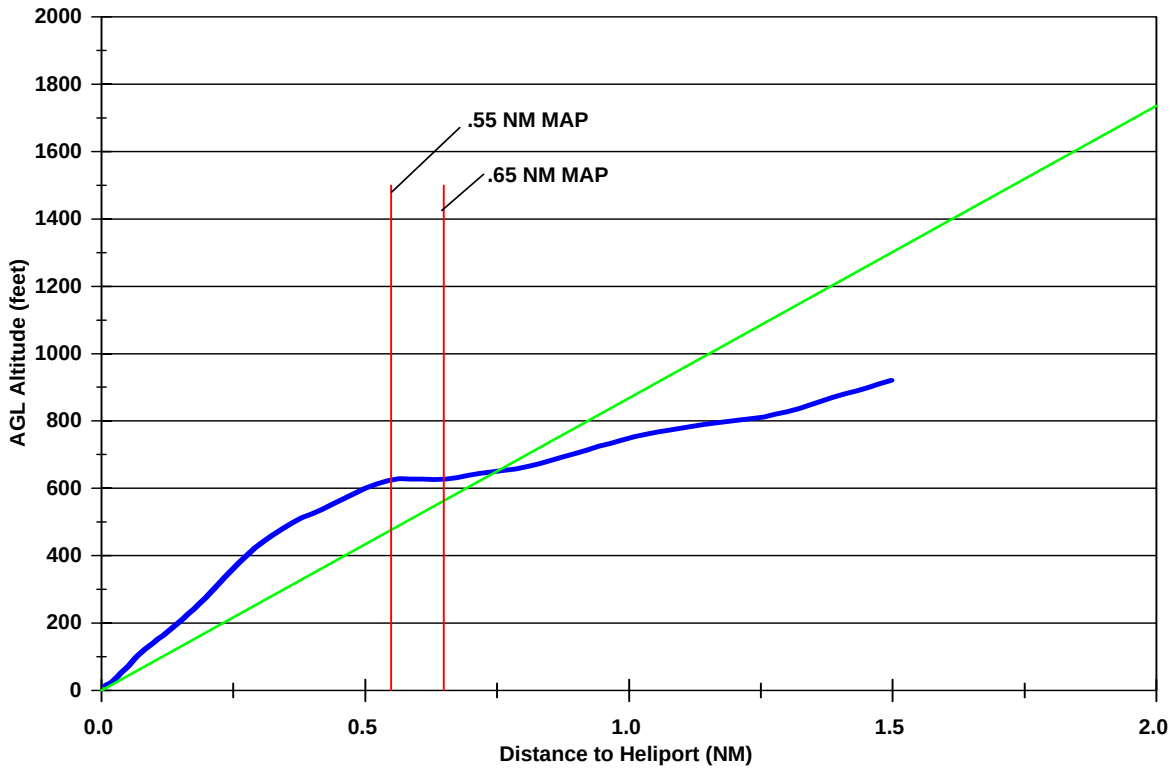


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06A005 - Appr. #05Y

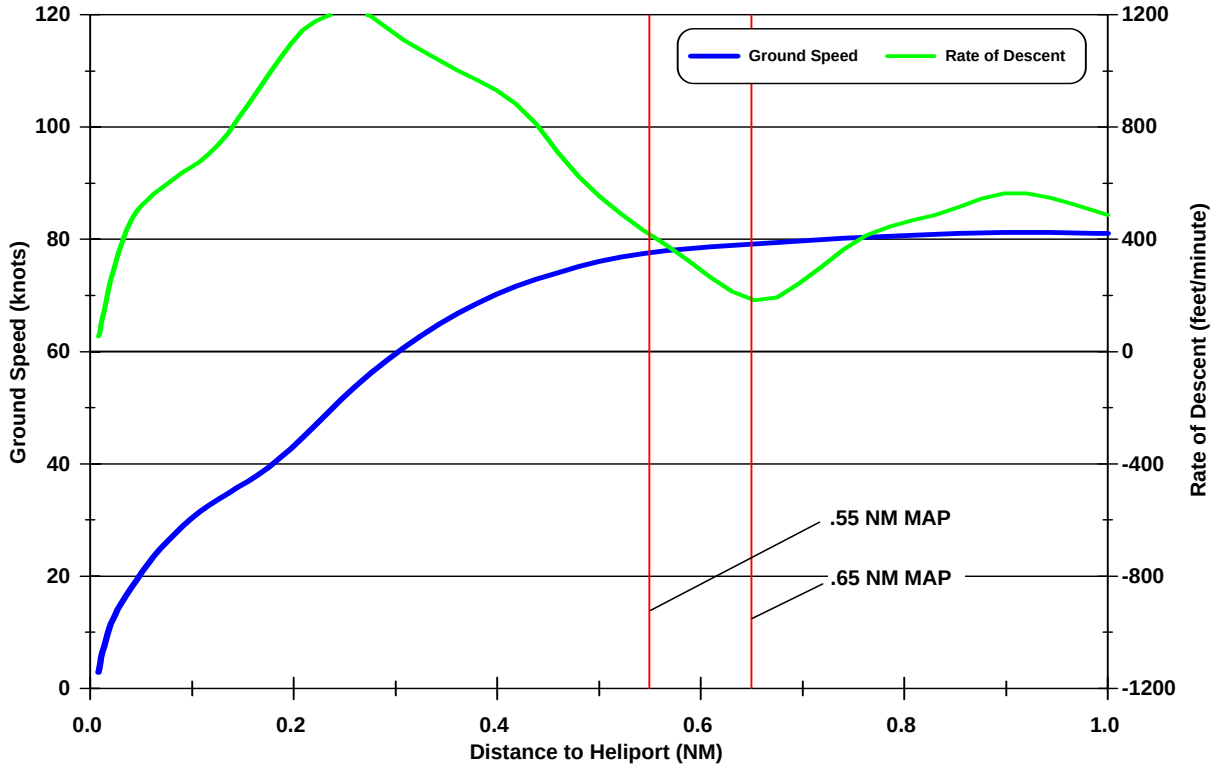



Approach - Plan View
Pilot P13 - 05/10/06A006 - Appr. #06W
145-Degree
Approach Course
310-Degree
Approach Course
325/13
12
298/6
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

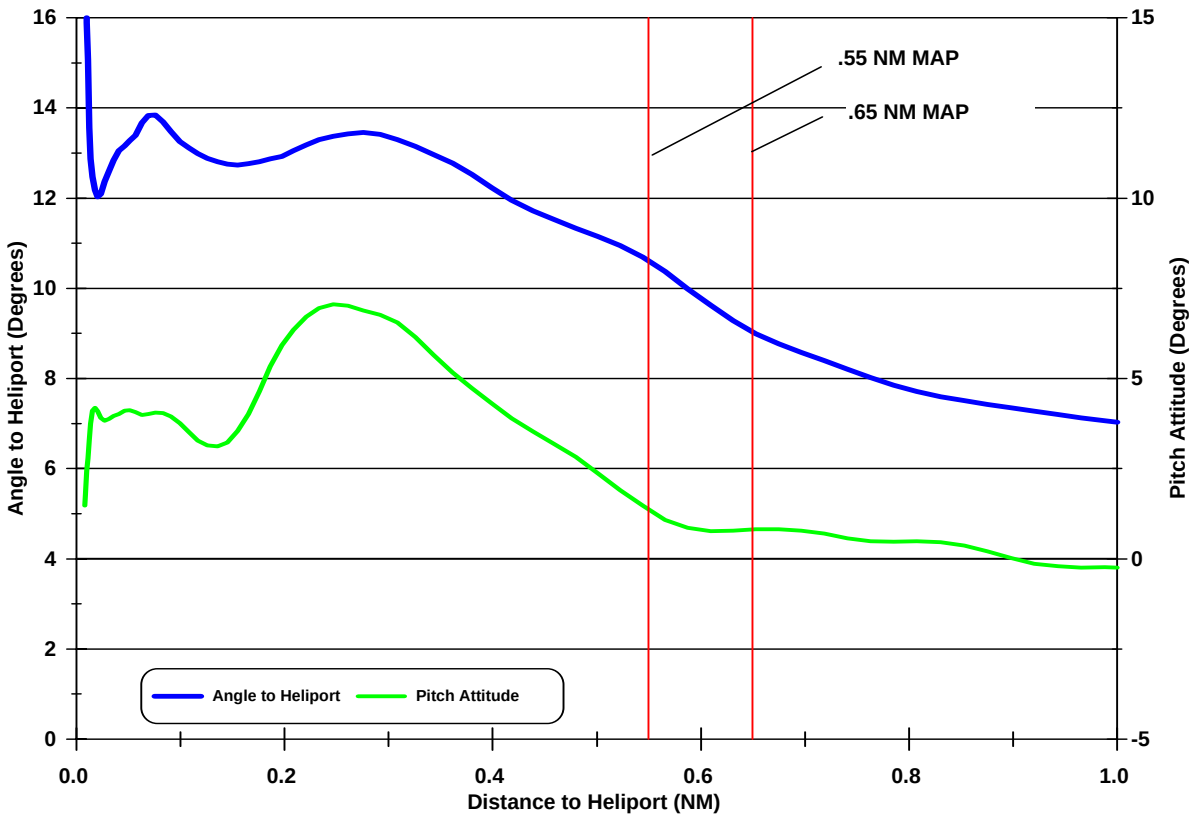
Profile View
Pilot P13 - 05/10/06A006 - Appr. #06W



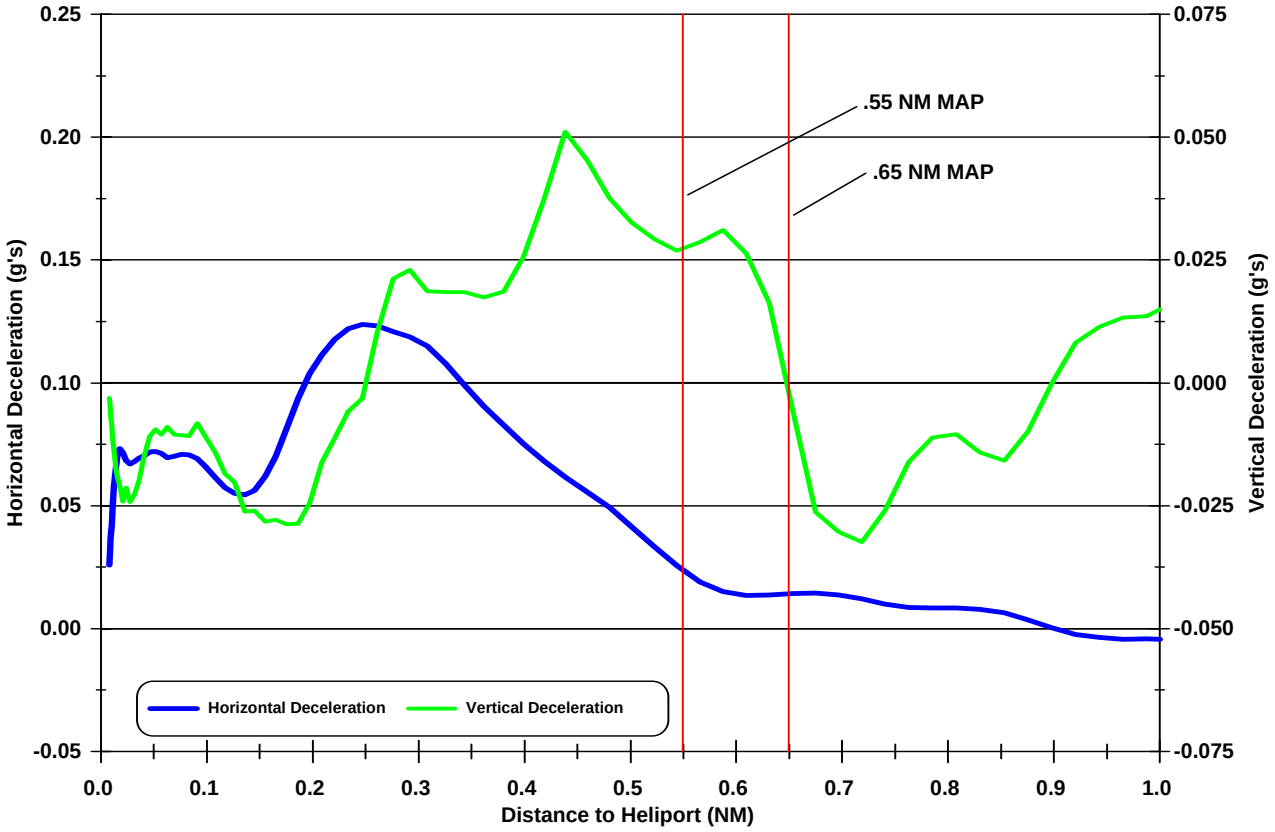
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06A006 - Appr. #06W

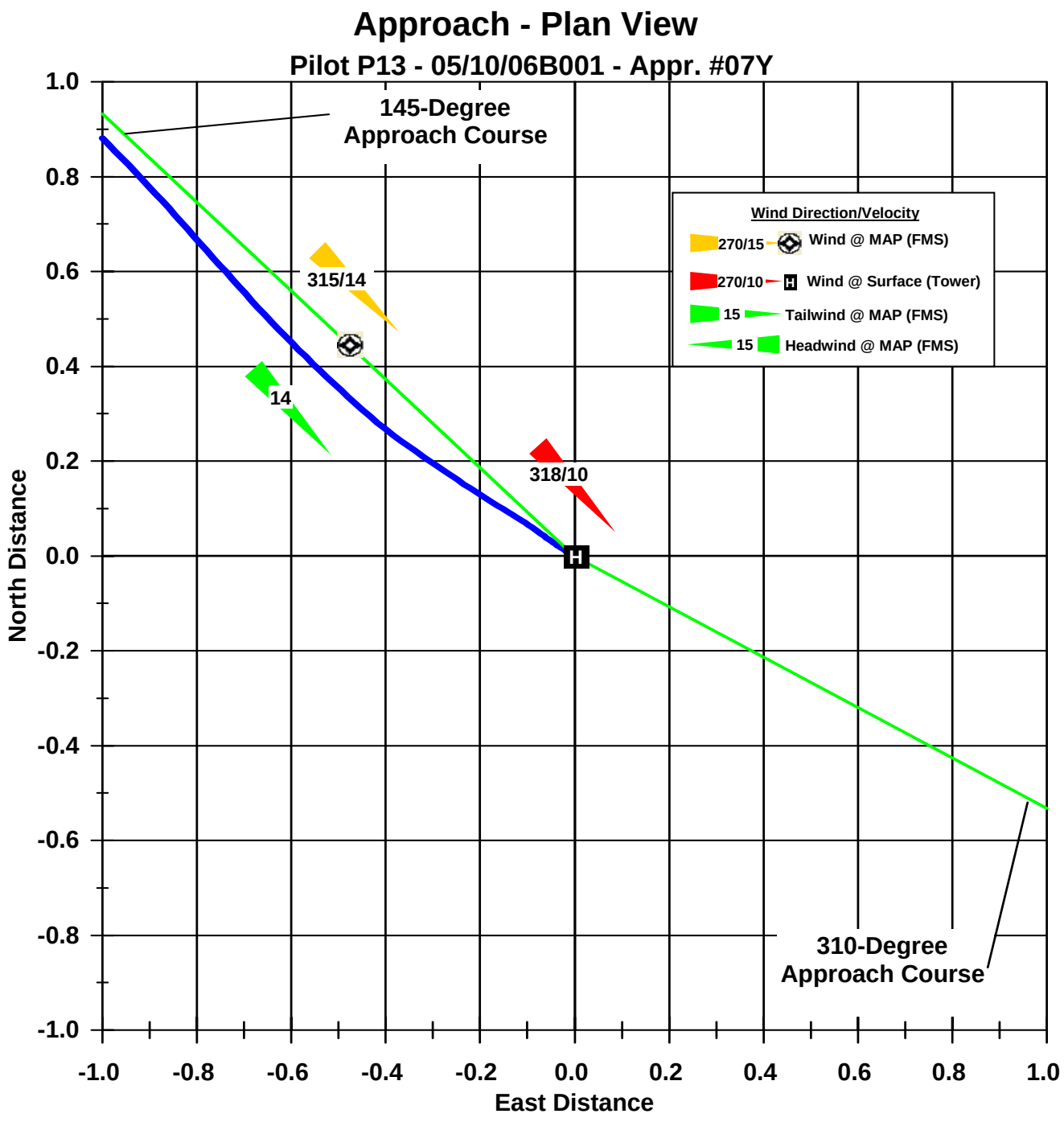


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06A006 - Appr. #06W

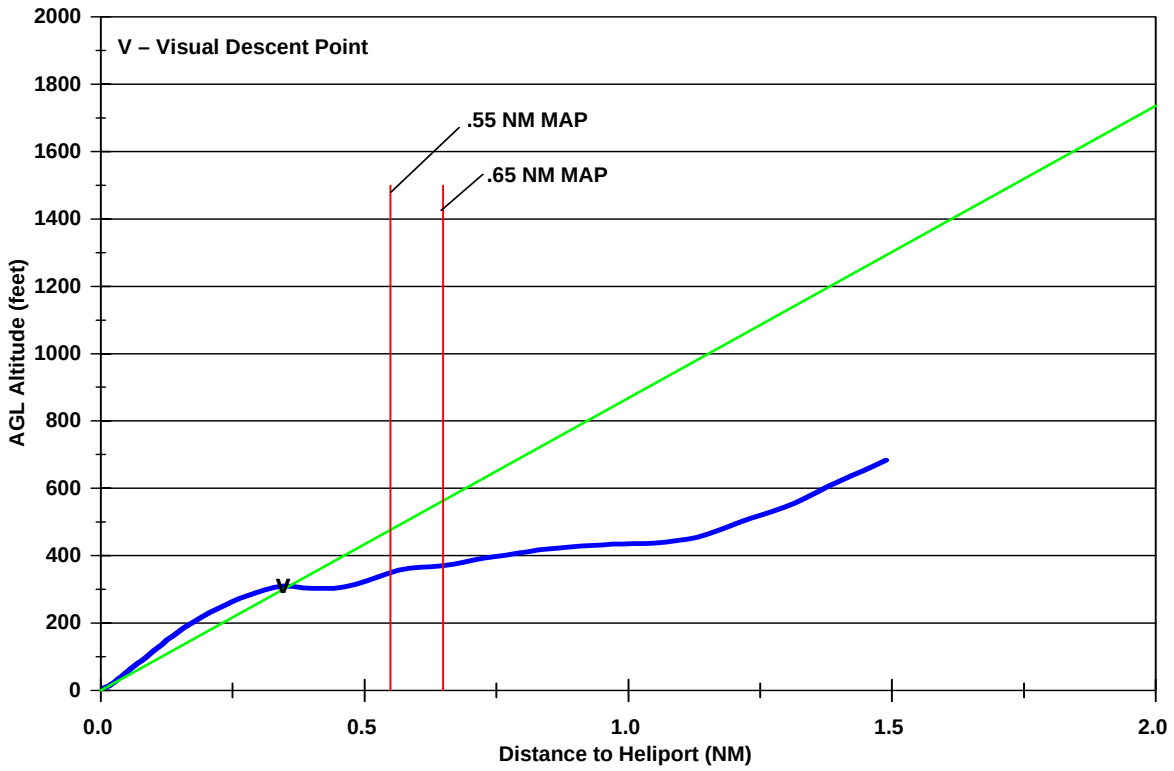


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06A006 - Appr. #06W

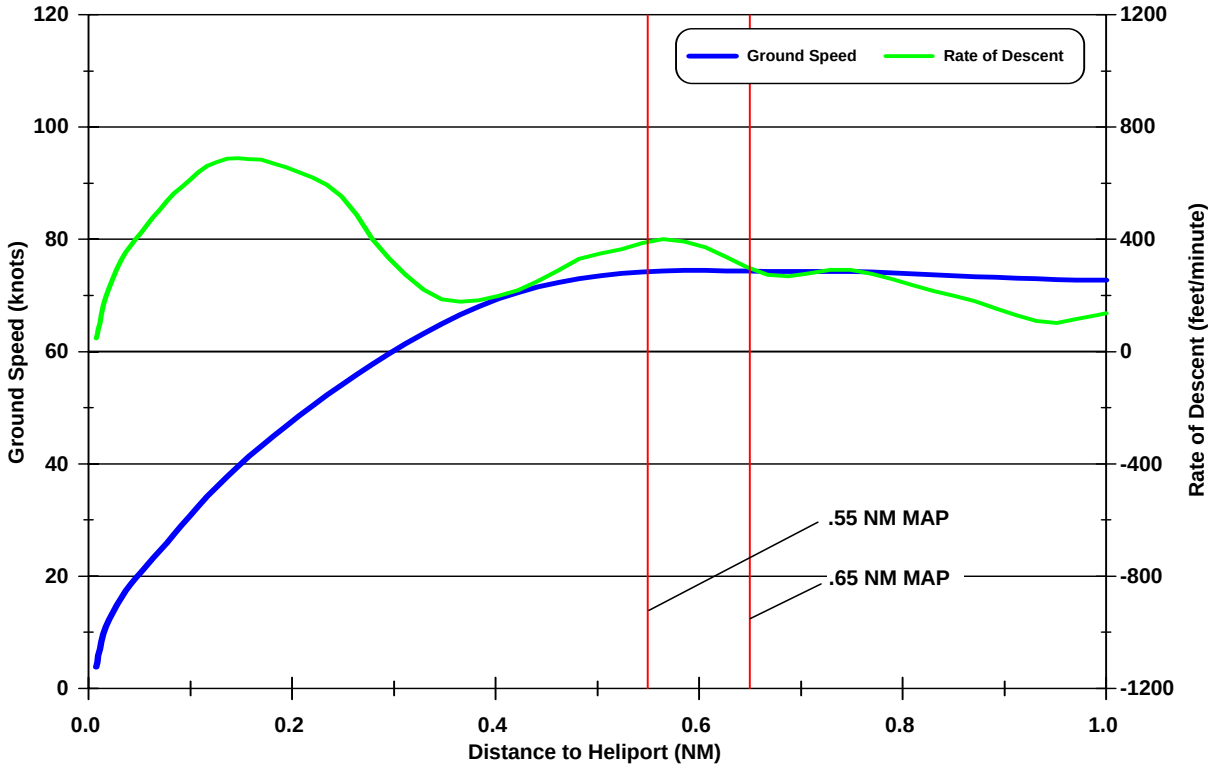



Approach - Plan View
Pilot P13 - 05/10/06B001 - Appr. #07Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
315/14
14
318/10
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

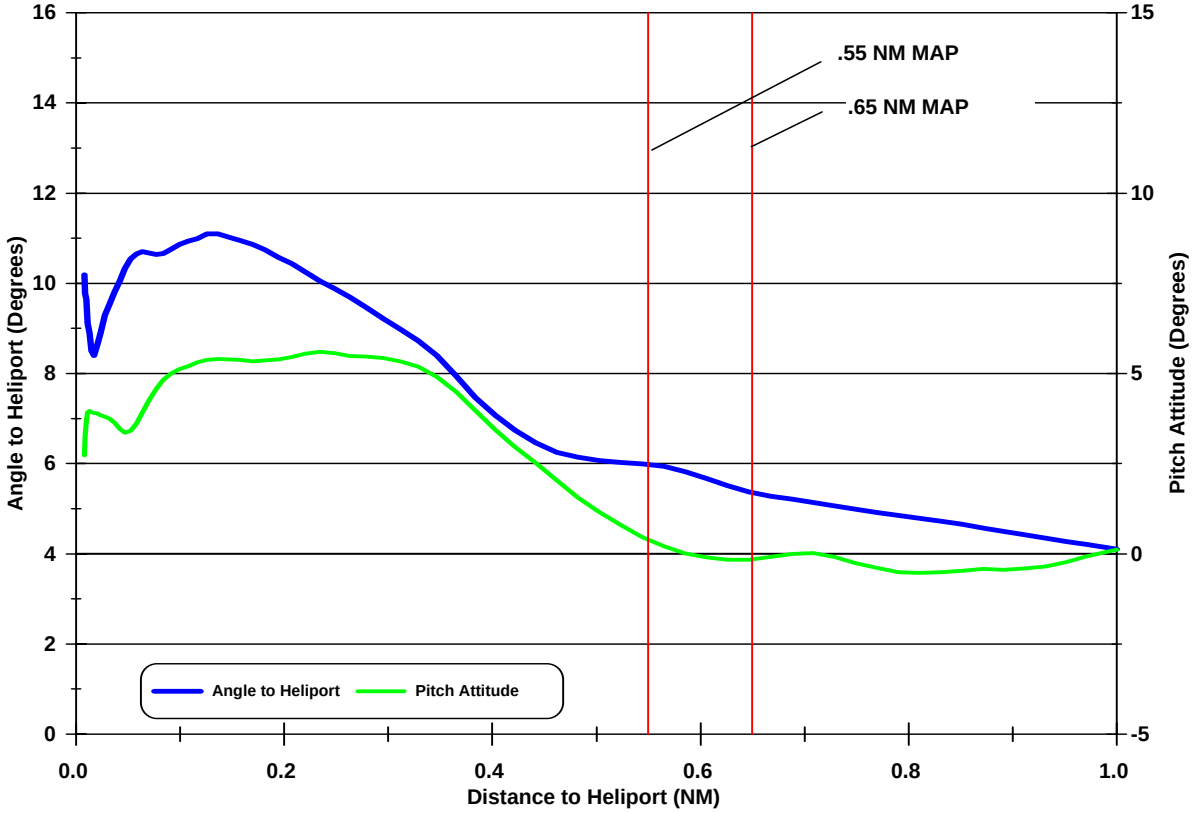
Profile View
Pilot P13 - 05/10/06B001 - Appr. #07Y



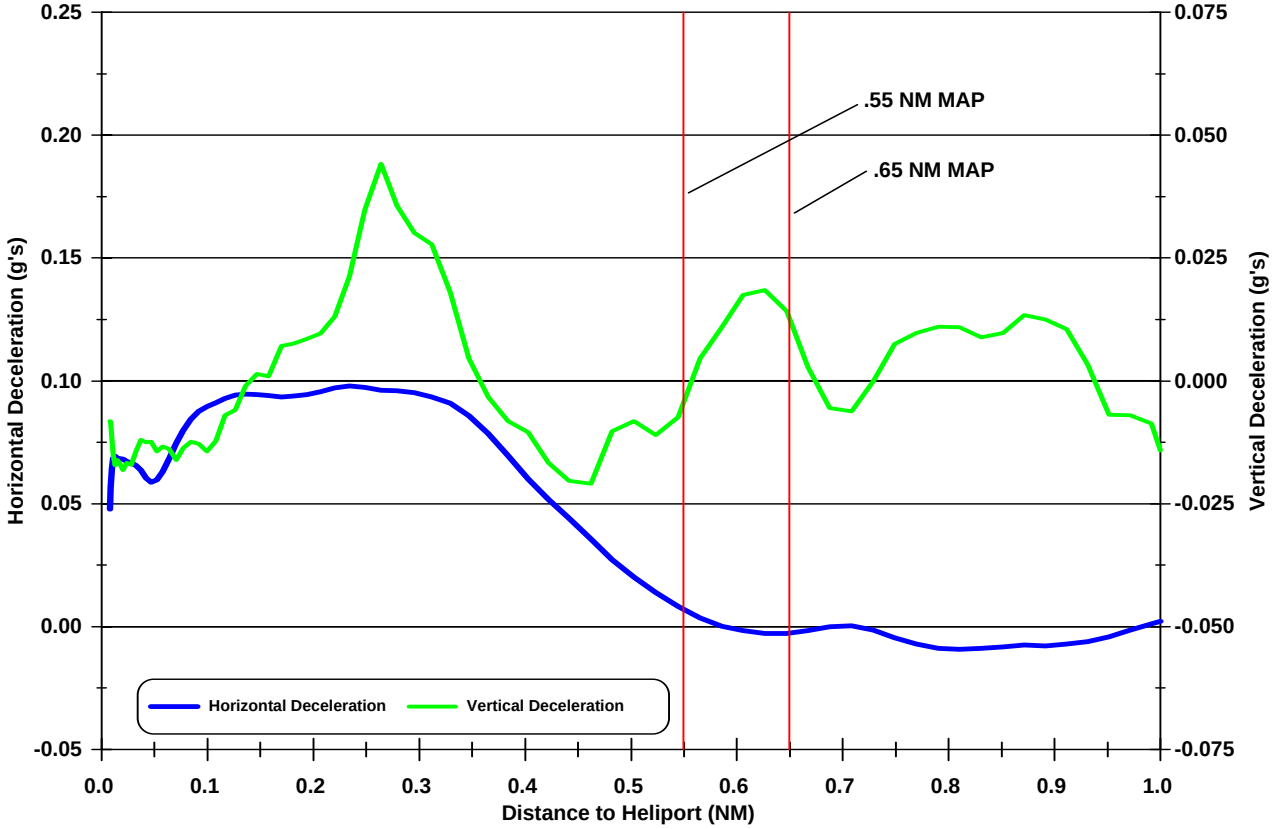
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06B001 - Appr. #07Y

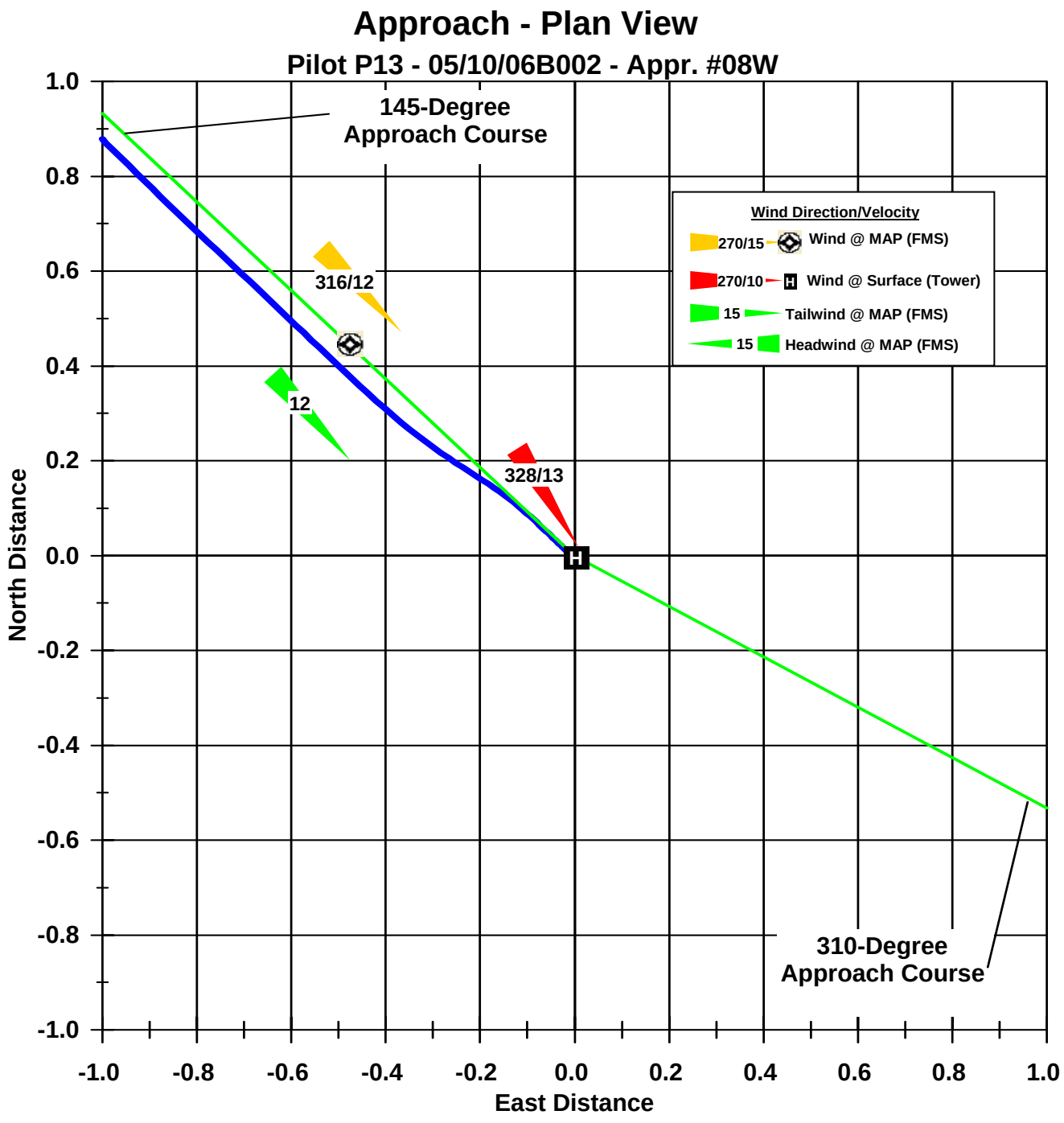


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06B001 - Appr. #07Y

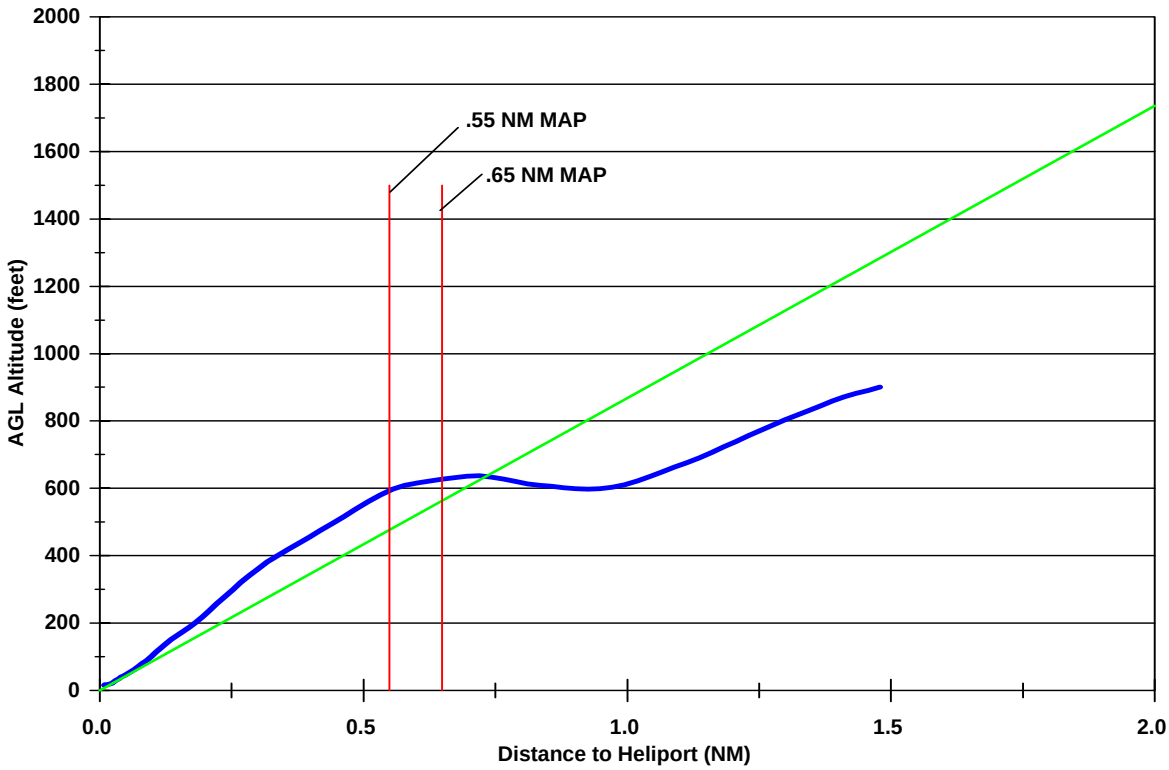


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06B001 - Appr. #07Y

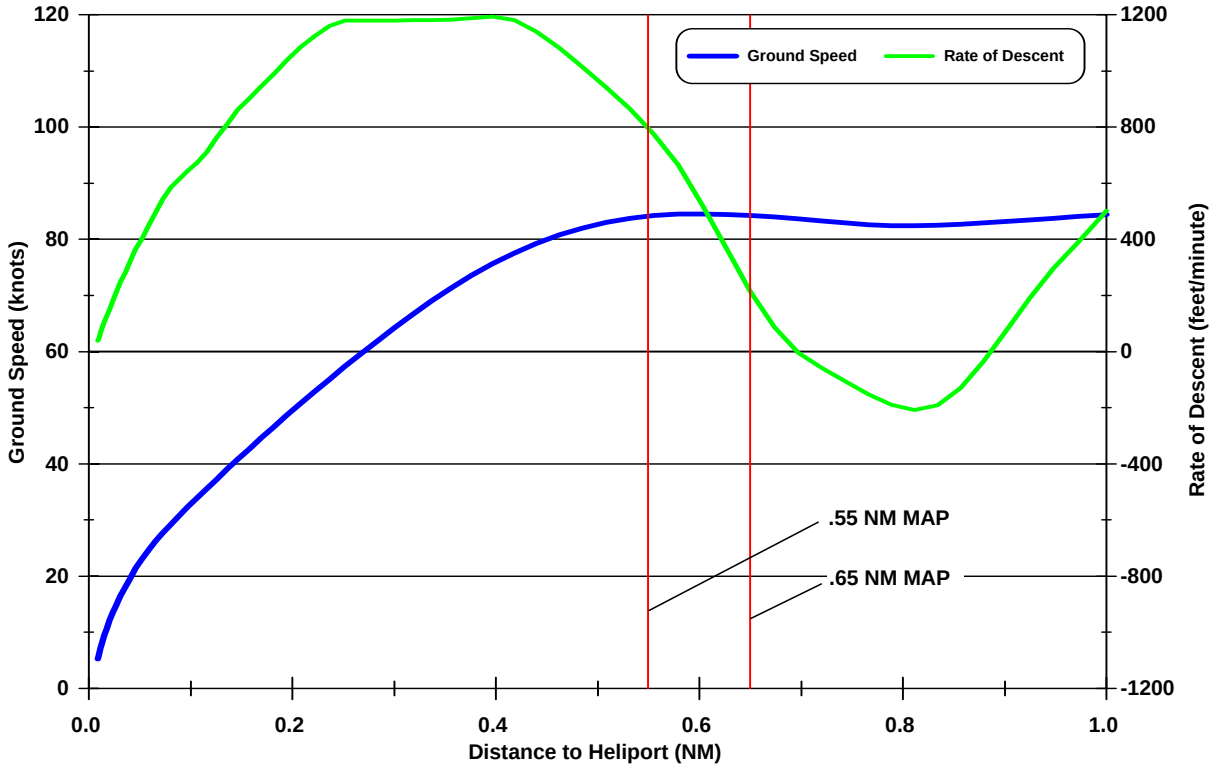



Approach - Plan View
Pilot P13 - 05/10/06B002 - Appr. #08W
145-Degree
Approach Course
310-Degree
Approach Course
316/12
12
328/13
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

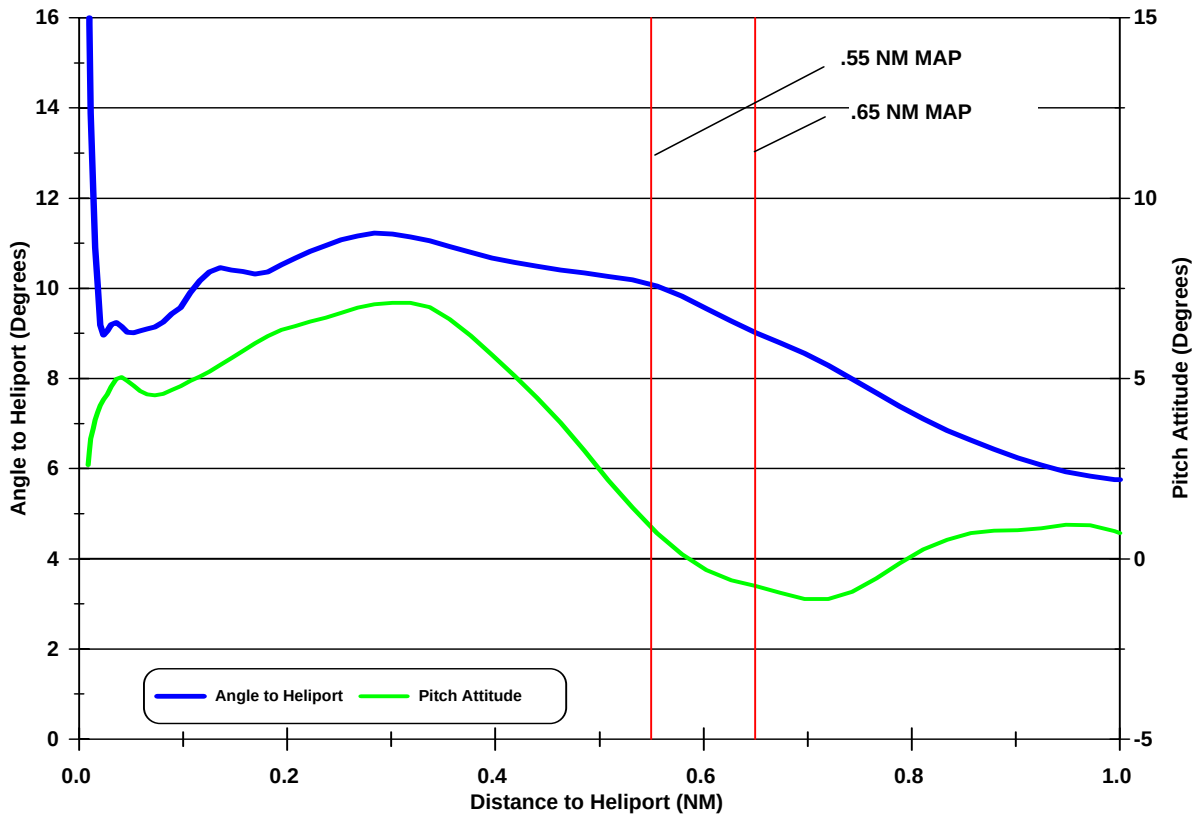
Profile View
Pilot P13 - 05/10/06B002 - Appr. #08W



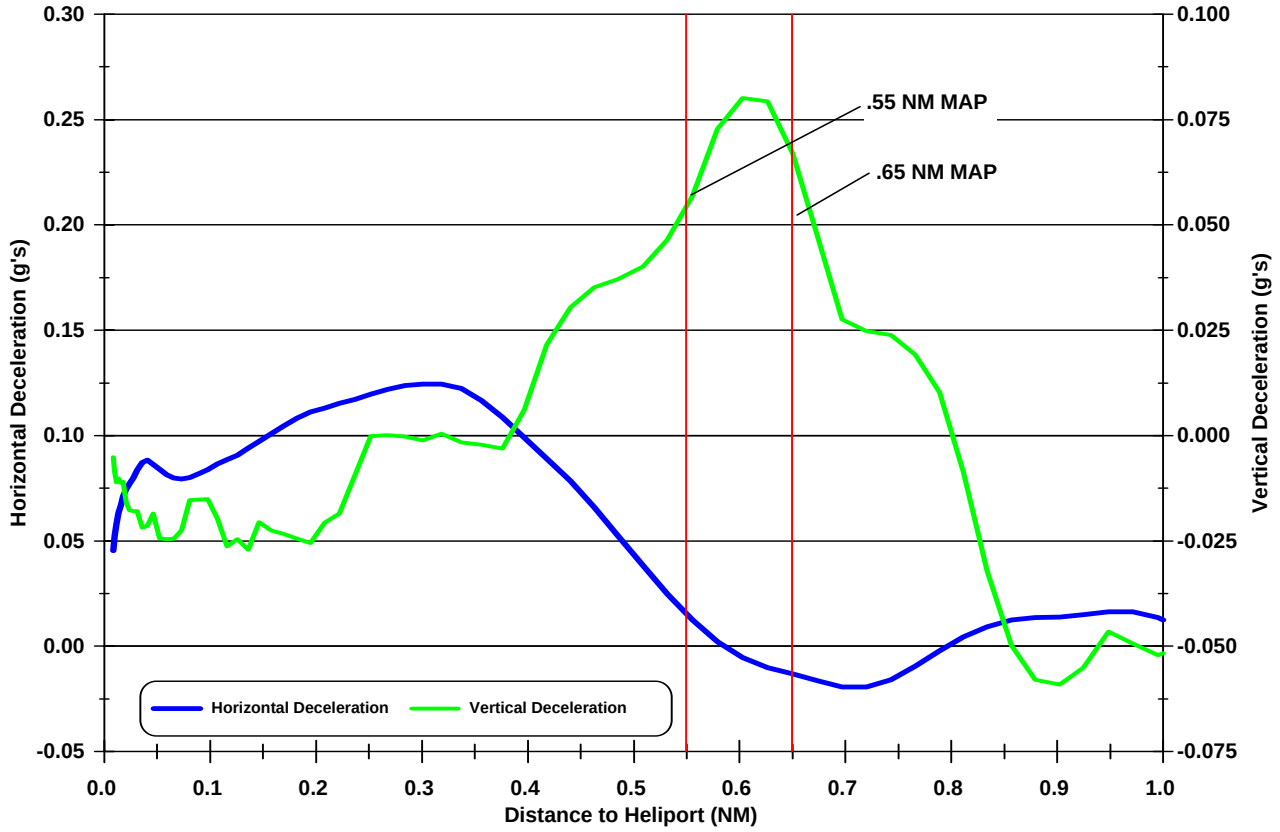
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06B002 - Appr. #08W

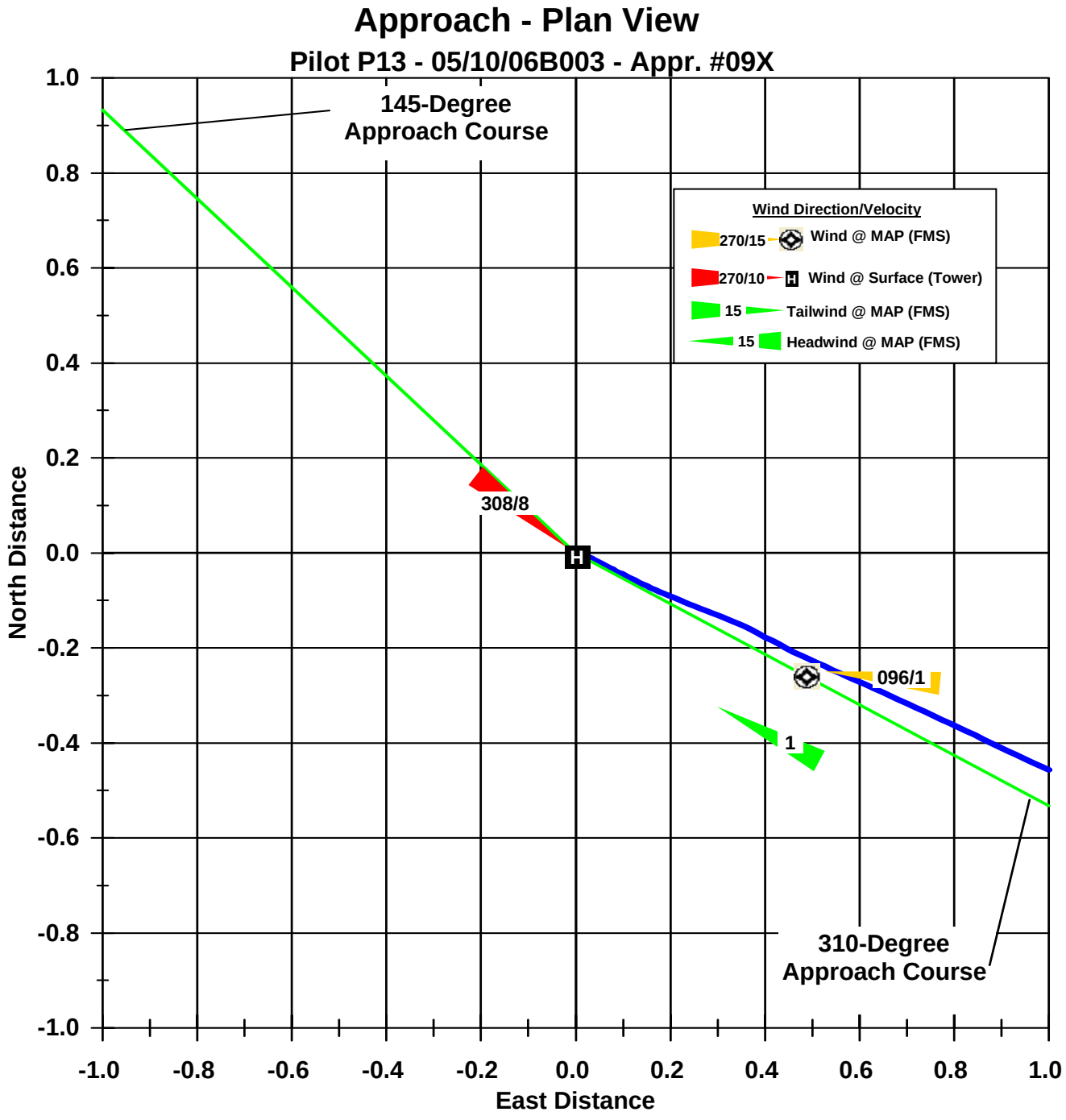


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06B002 - Appr. #08W

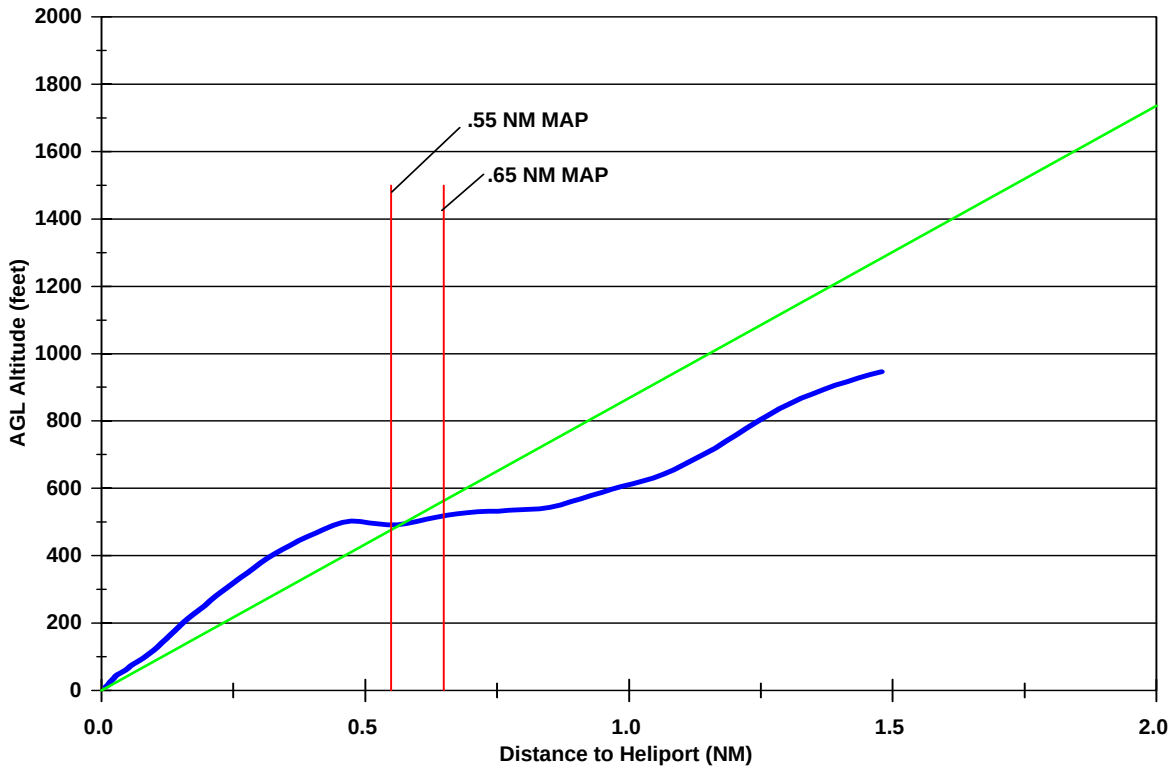


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06B002 - Appr. #08W

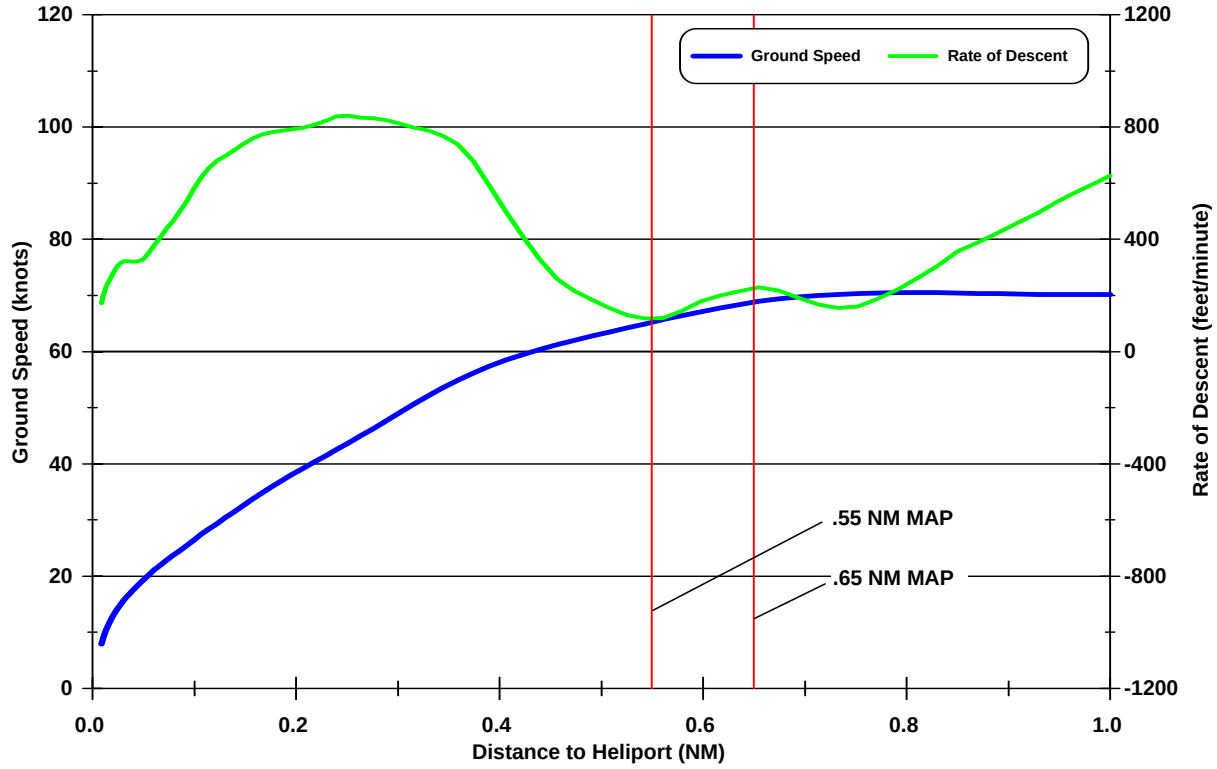



Approach - Plan View
Pilot P13 - 05/10/06B003 - Appr. #09X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
308/8
096/1
1
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

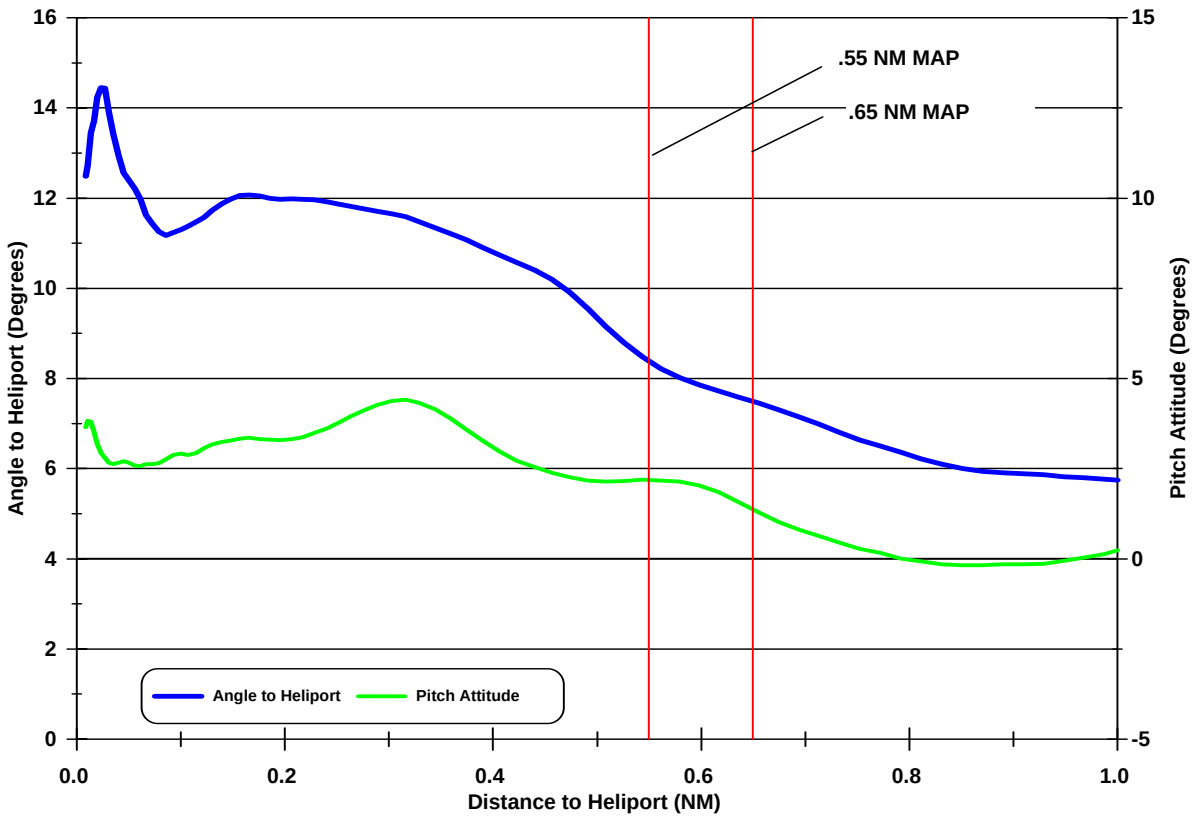
Profile View
Pilot P13 - 05/10/06B003 - Appr. #09X



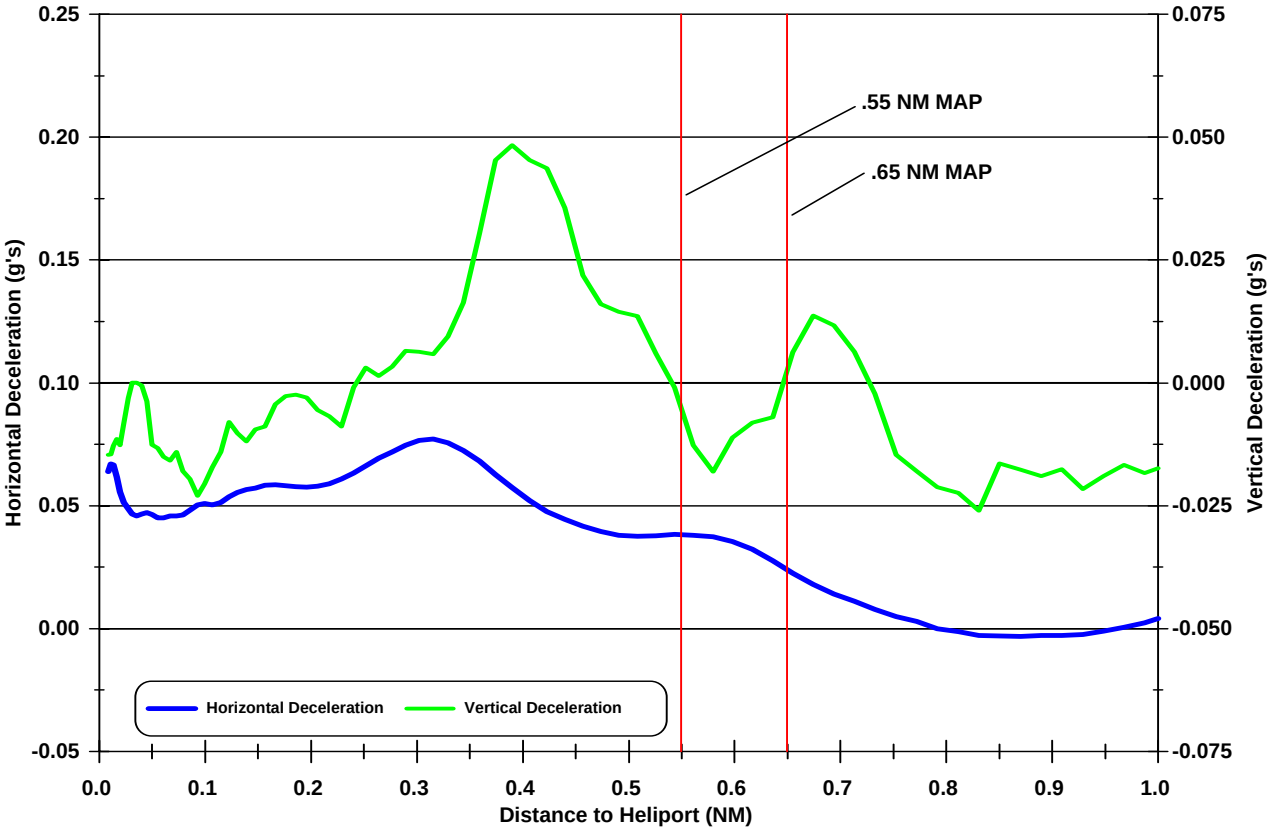
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06B003 - Appr. #09X

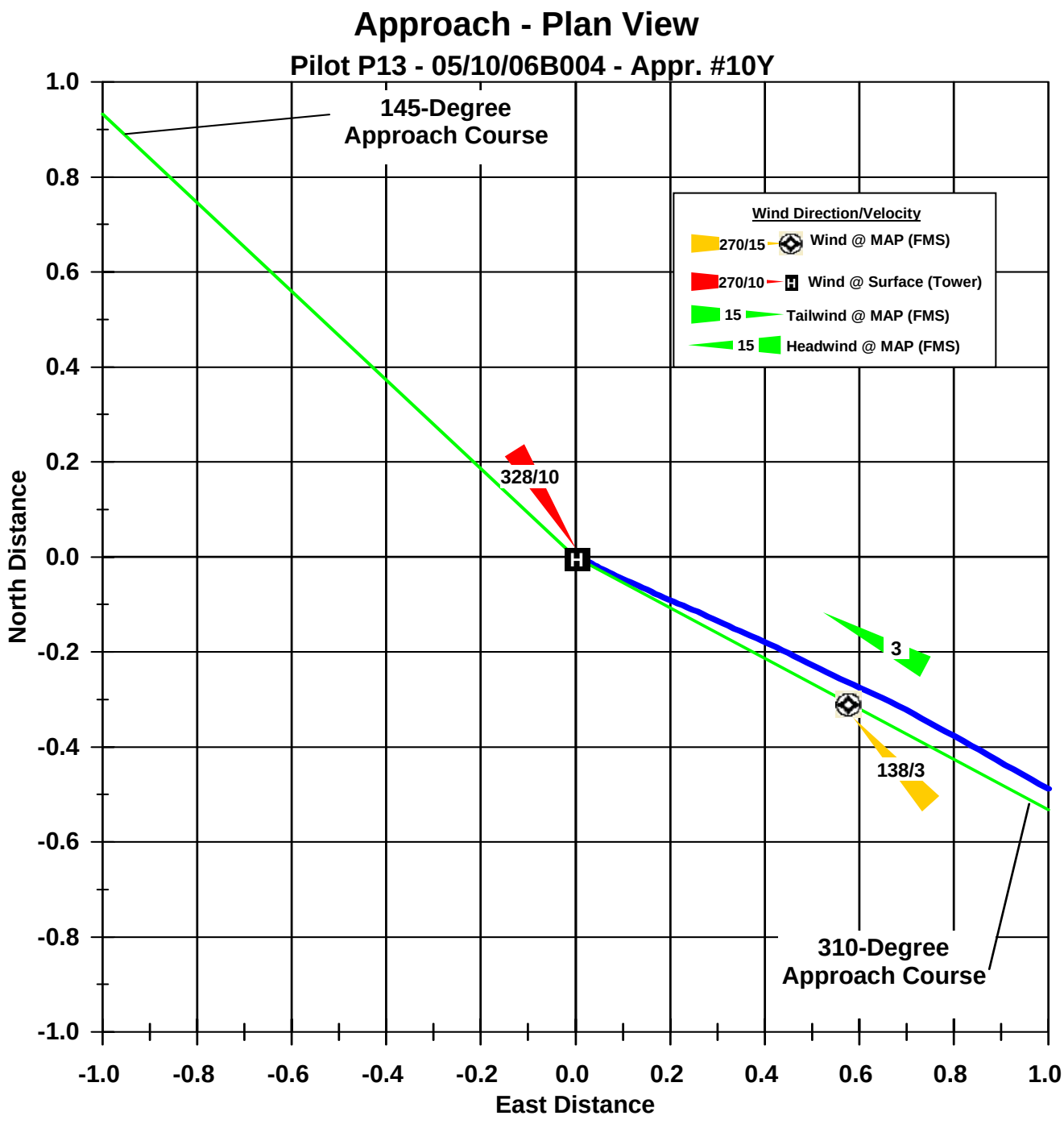


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06B003 - Appr. #09X

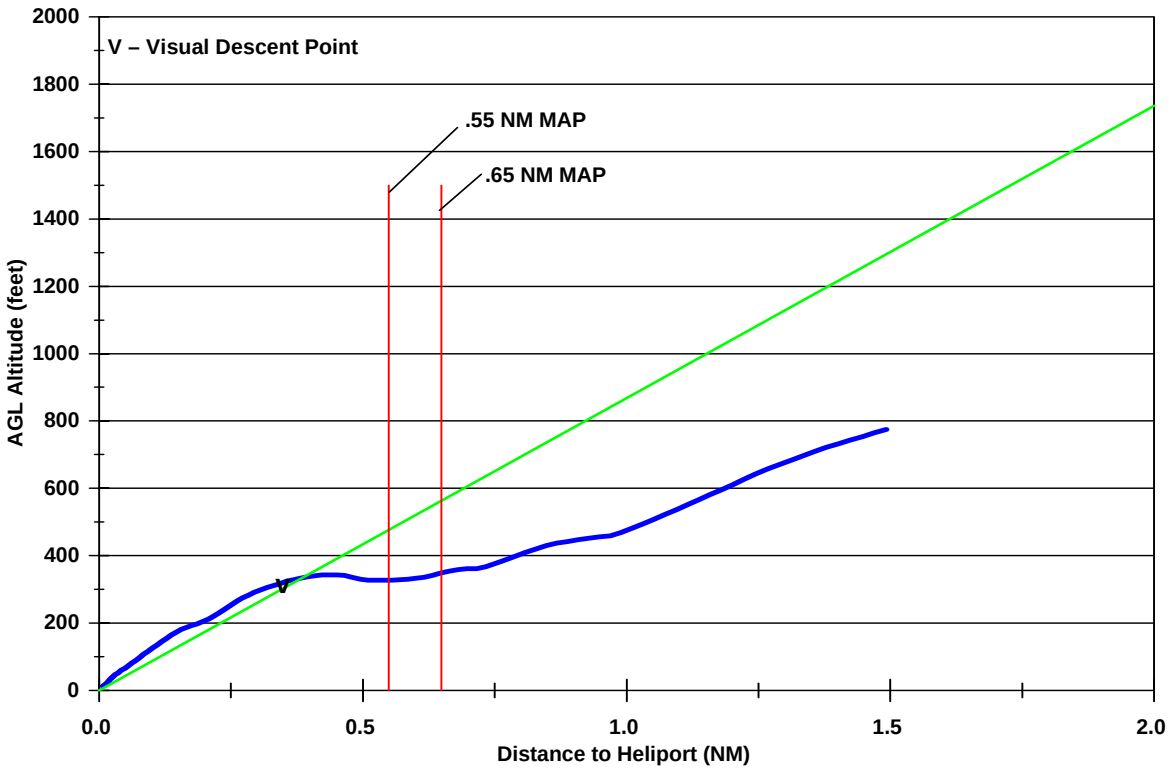


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06B003 - Appr. #09X

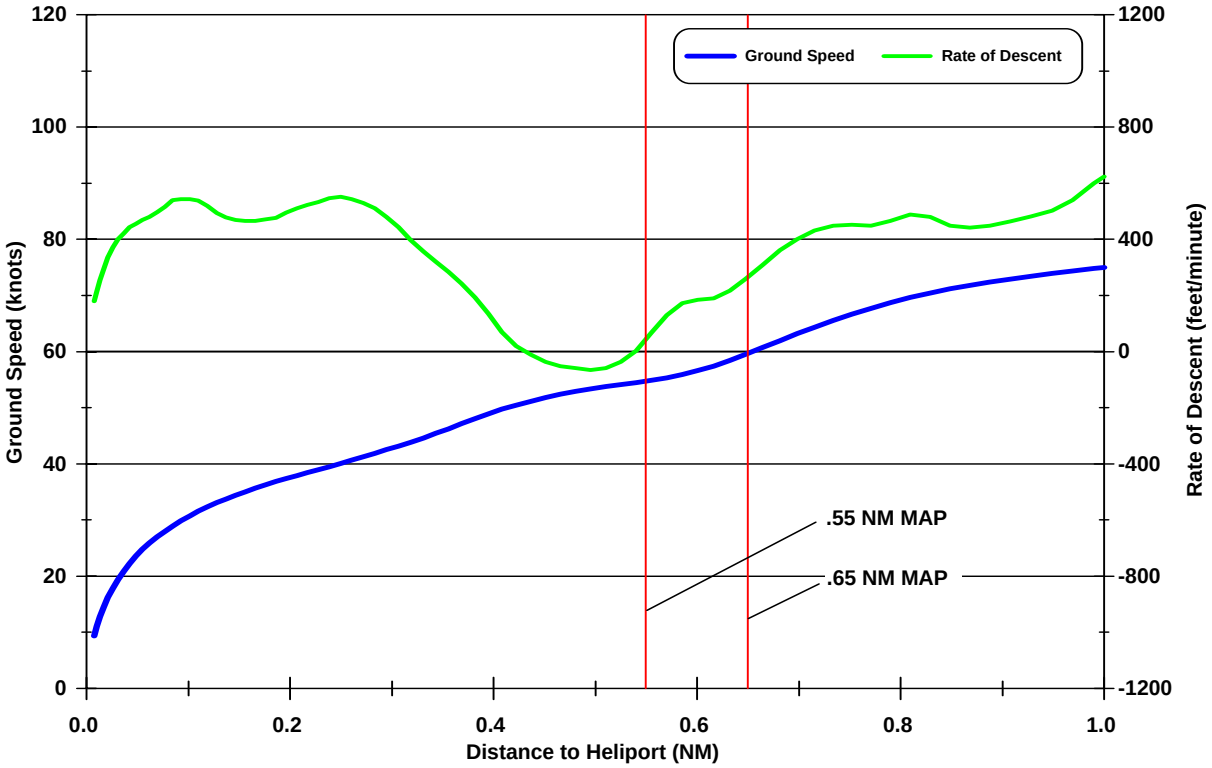



Approach - Plan View
Pilot P13 - 05/10/06B004 - Appr. #10Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
328/10
3
138/3
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

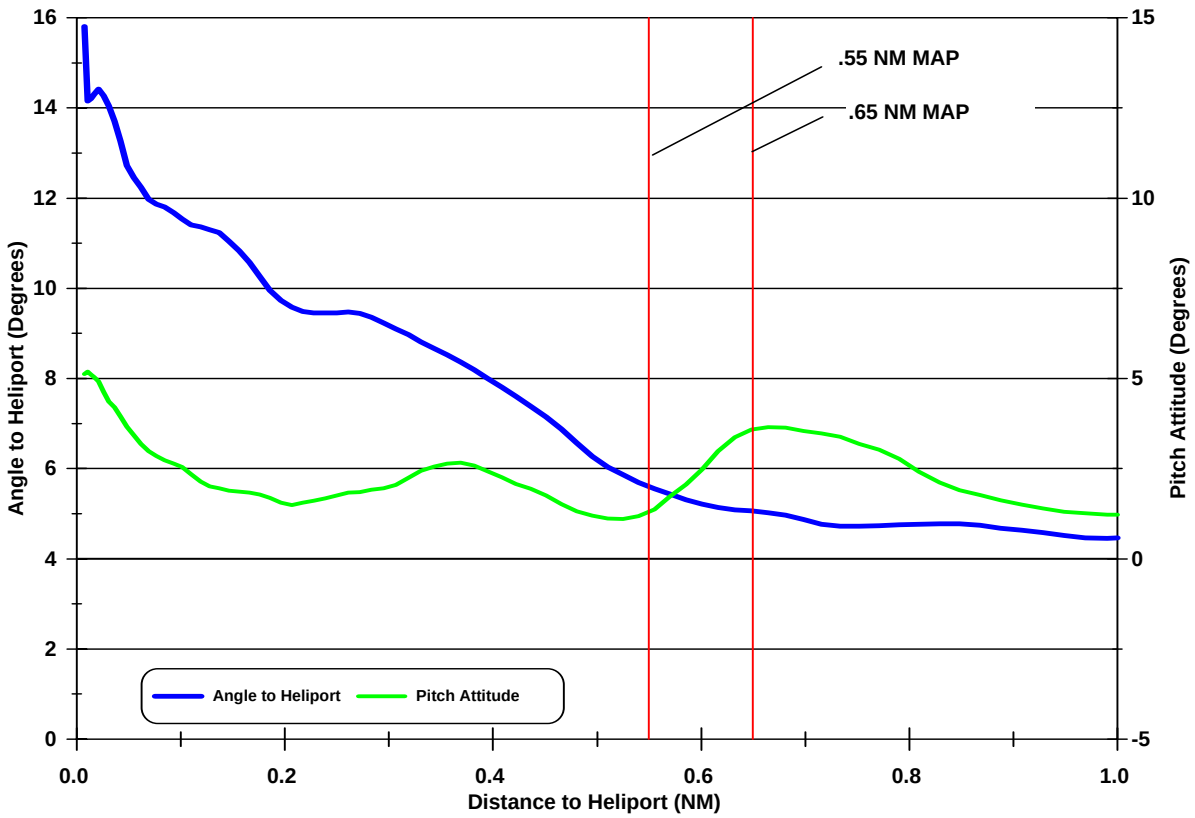
Profile View
Pilot P13 - 05/10/06B004 - Appr. #10Y



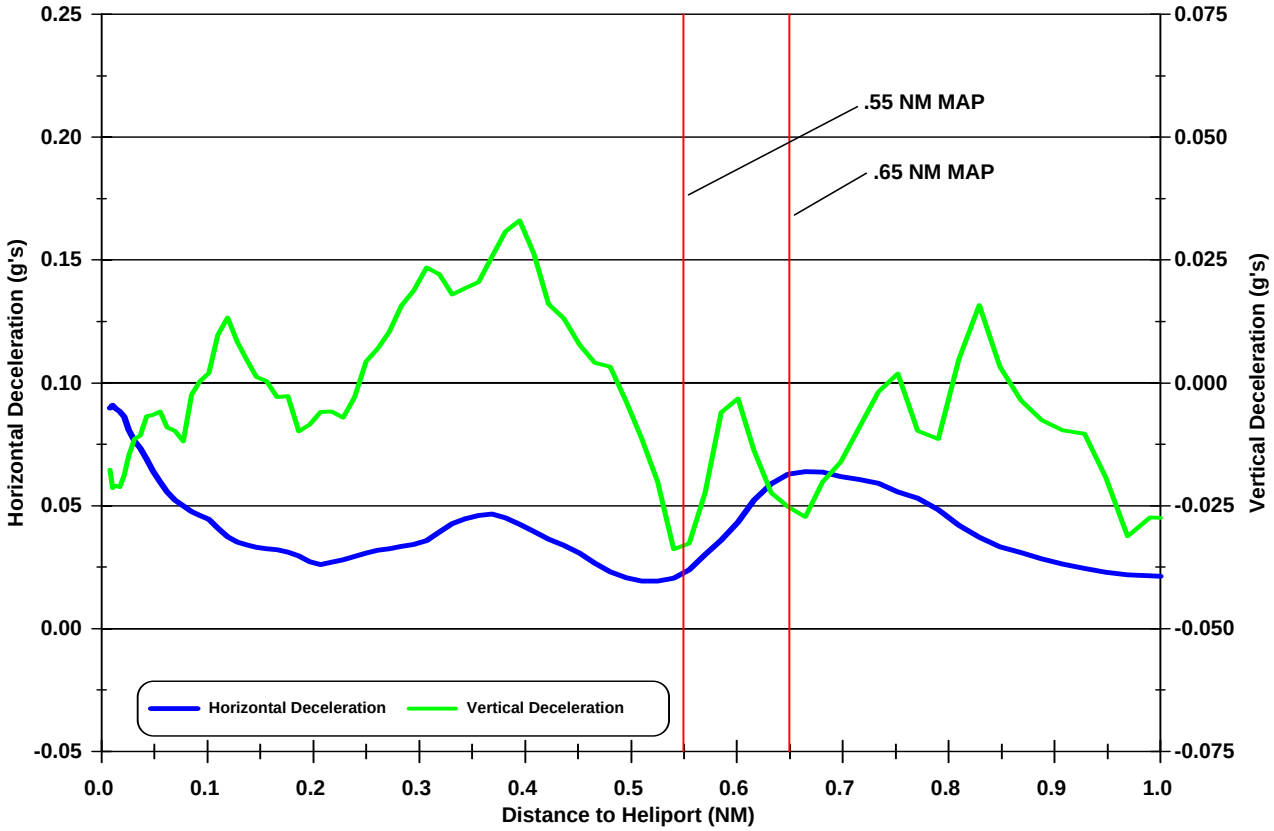
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06B004 - Appr. #10Y

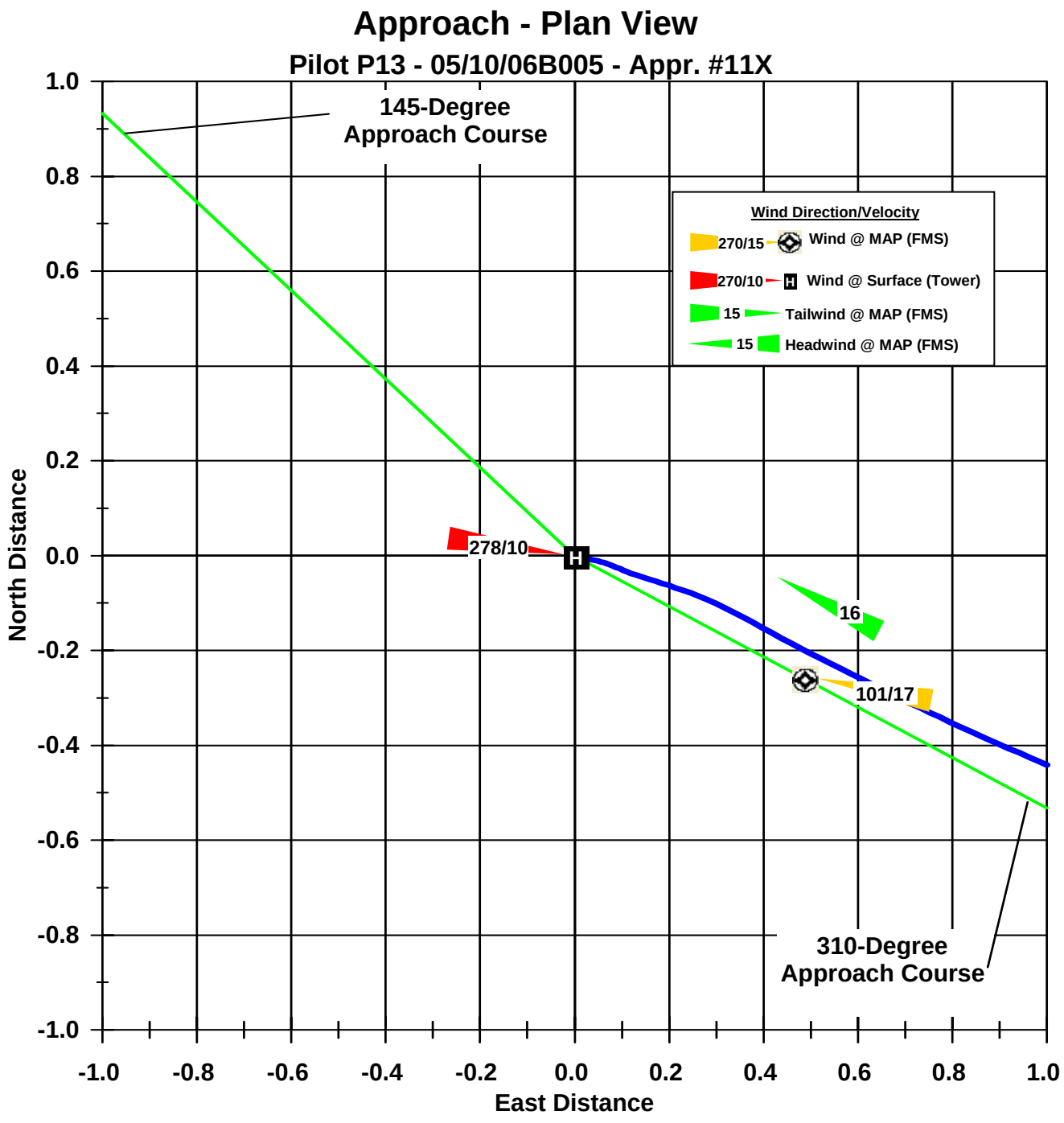


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06B004 - Appr. #10Y

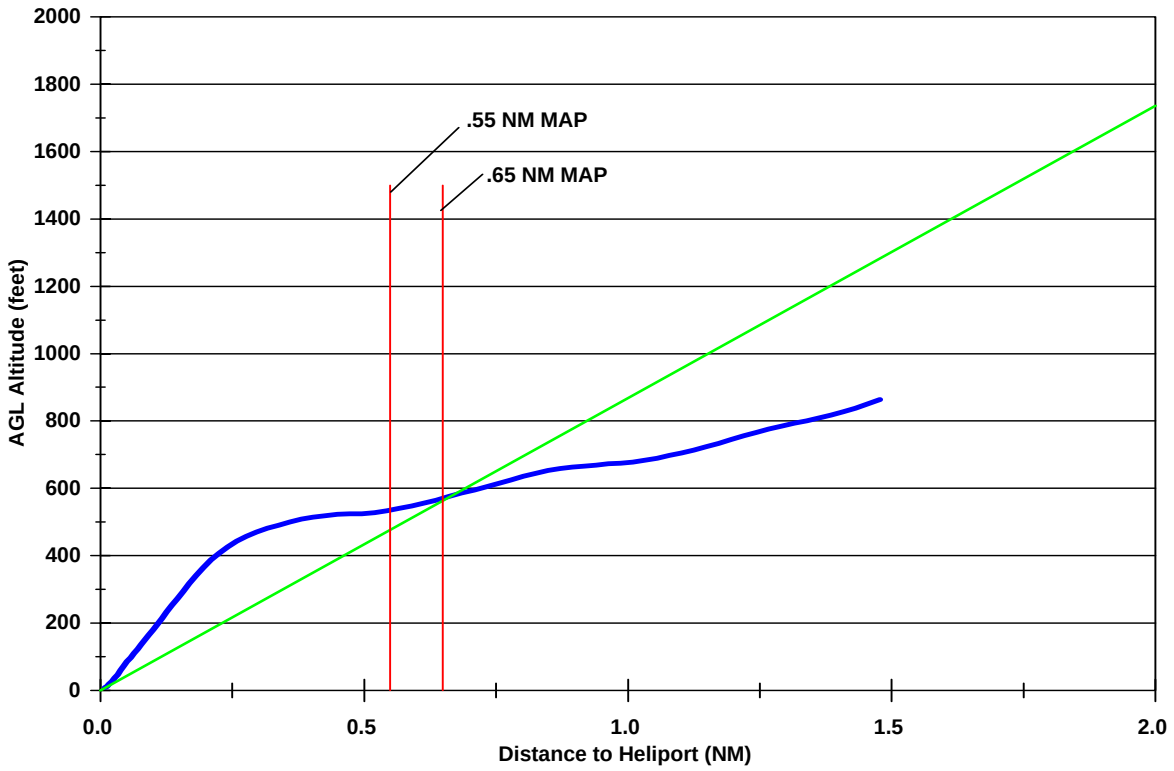


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06B004 - Appr. #10Y

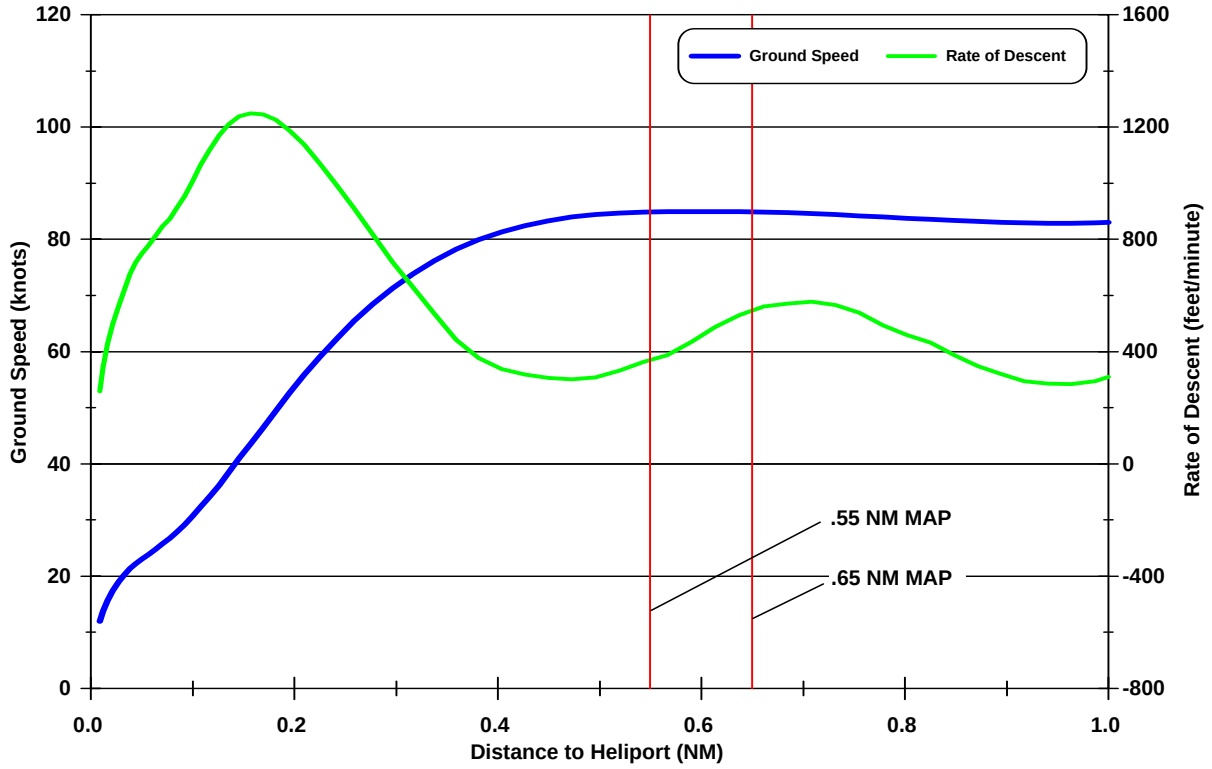



Approach - Plan View
Pilot P13 - 05/10/06B005 - Appr. #11X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
278/10
16
101/17
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

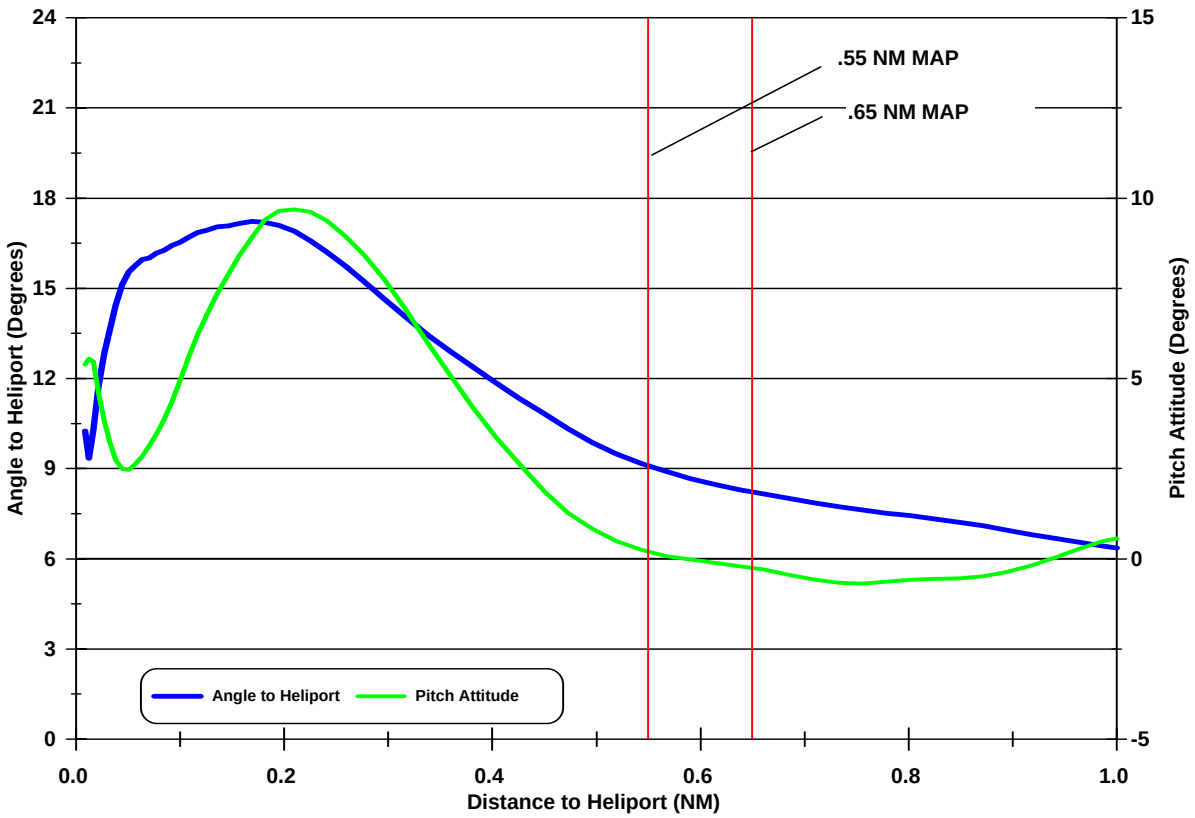
Profile View
Pilot P13 - 05/10/06B005 - Appr. #11X



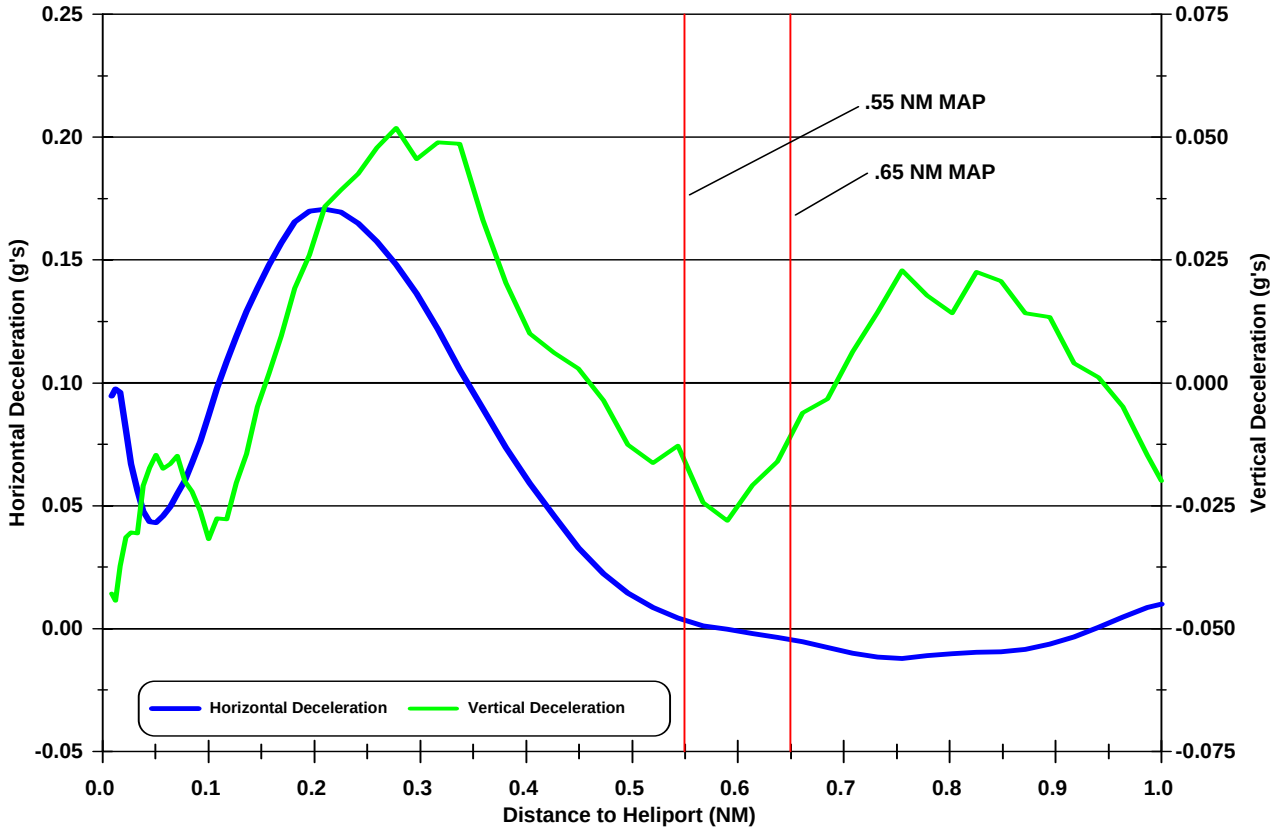
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06B005 - Appr. #11X

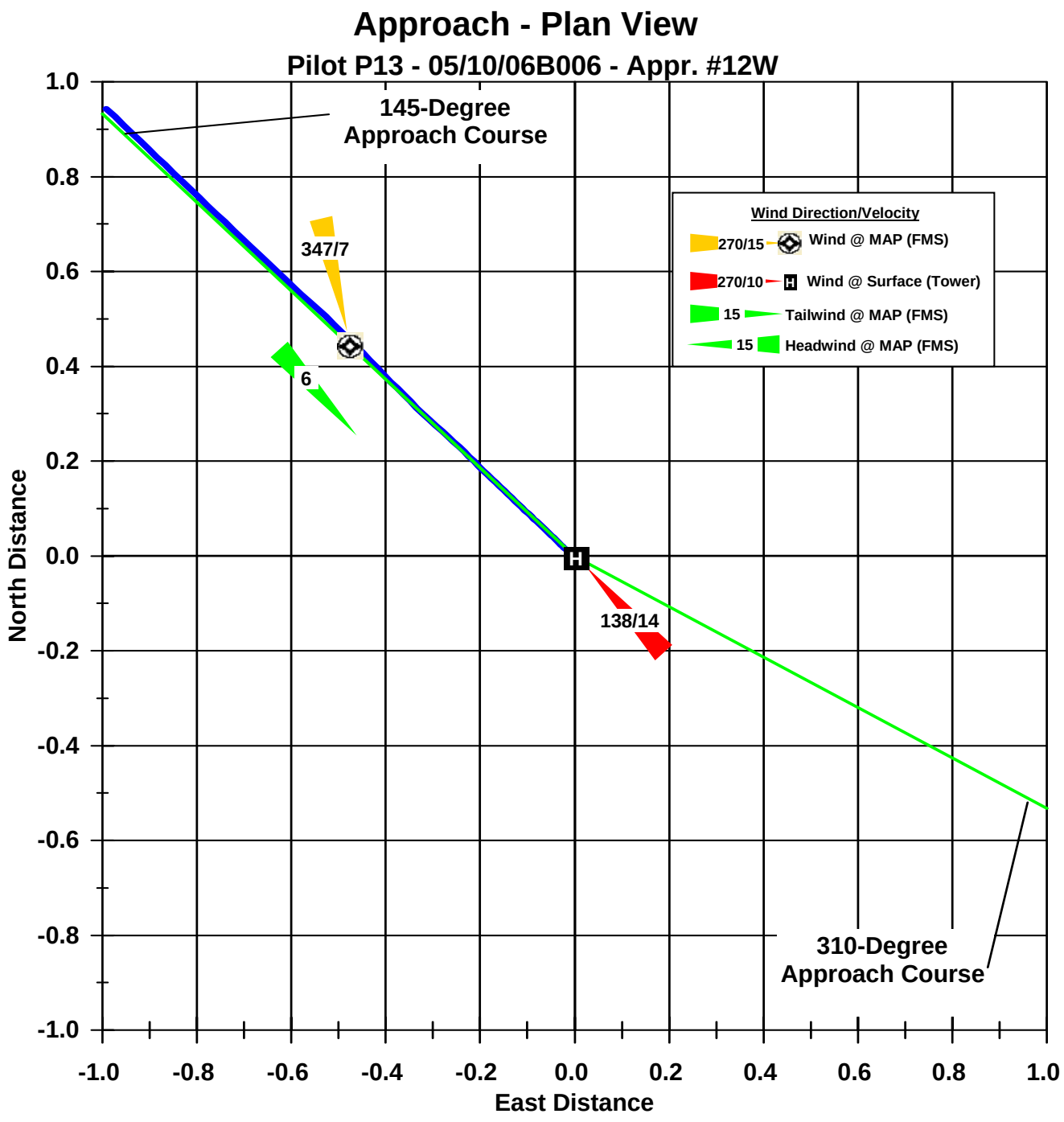


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06B005 - Appr. #11X

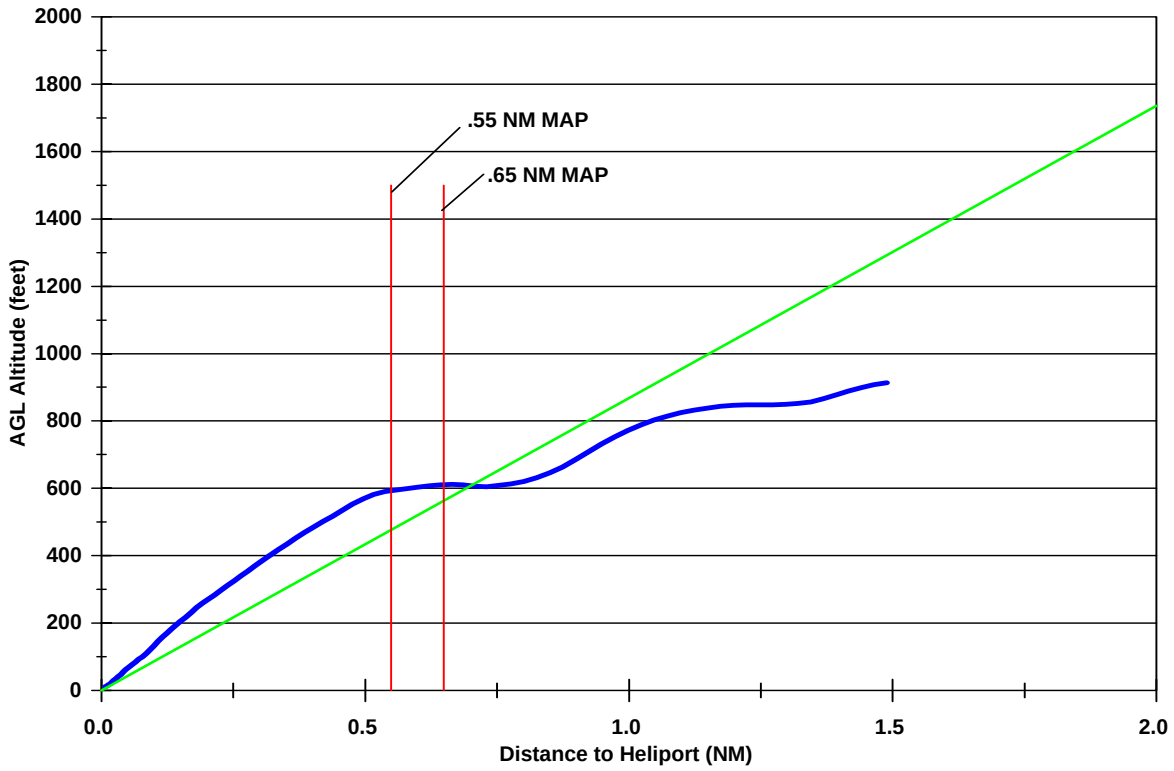


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06B005 - Appr. #11X

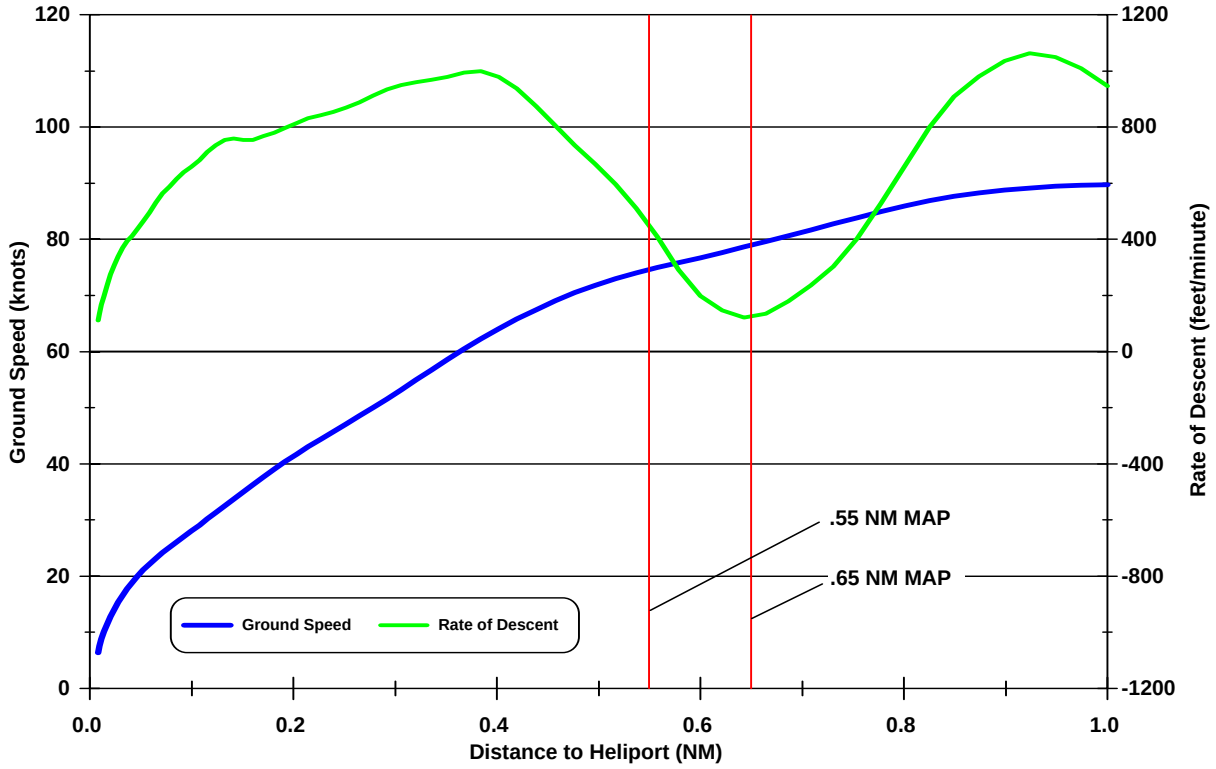



Approach - Plan View
Pilot P13 - 05/10/06B006 - Appr. #12W
145-Degree
Approach Course
310-Degree
Approach Course
347/7
6
138/14
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

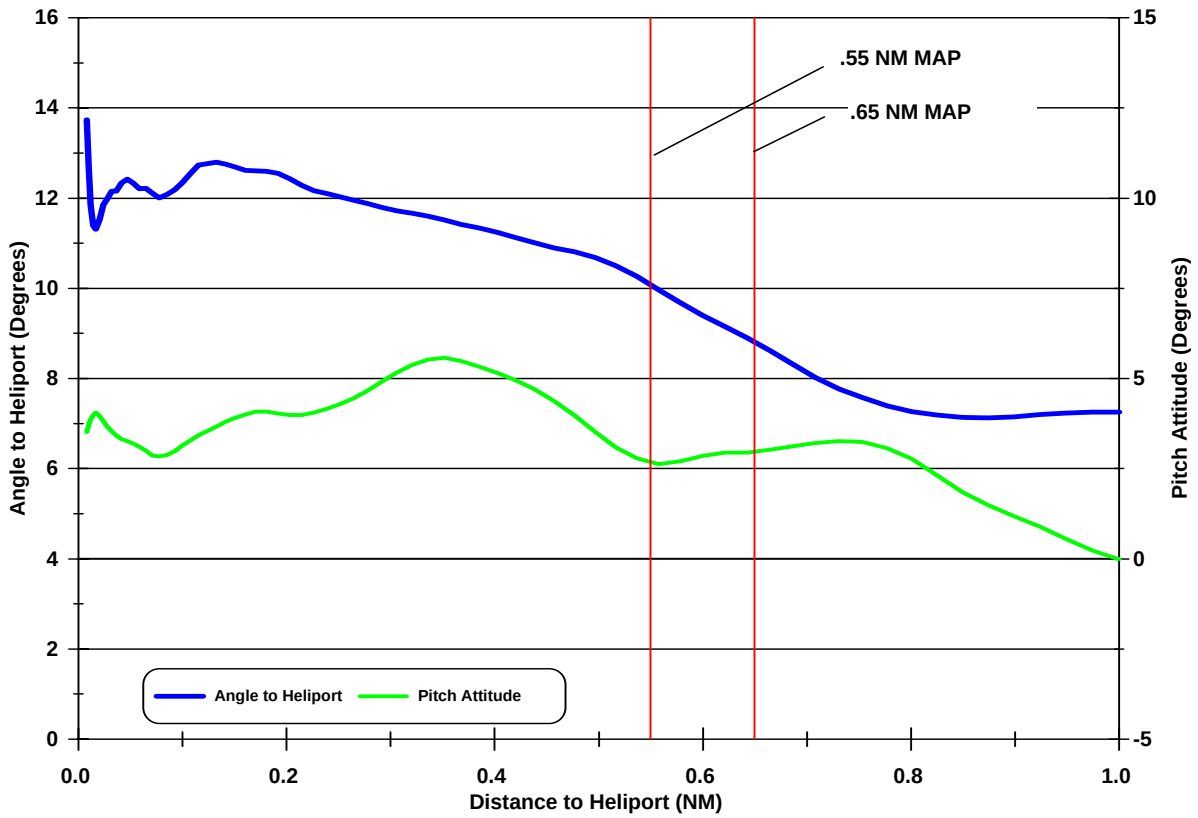
Profile View
Pilot P13 - 05/10/06B006 - Appr. #12W



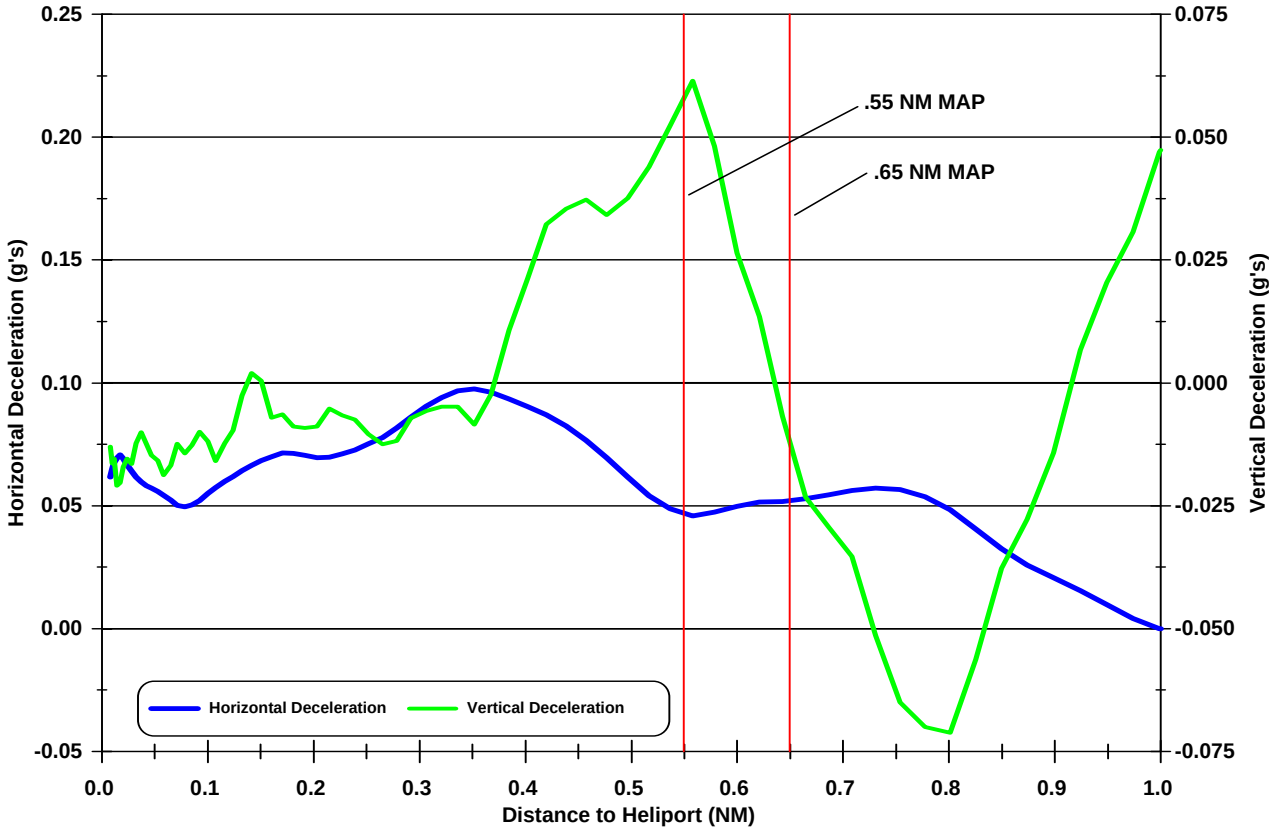
Ground Speed and Rate of Descent
Pilot P13 - 05/10/06B006 - Appr. #12W

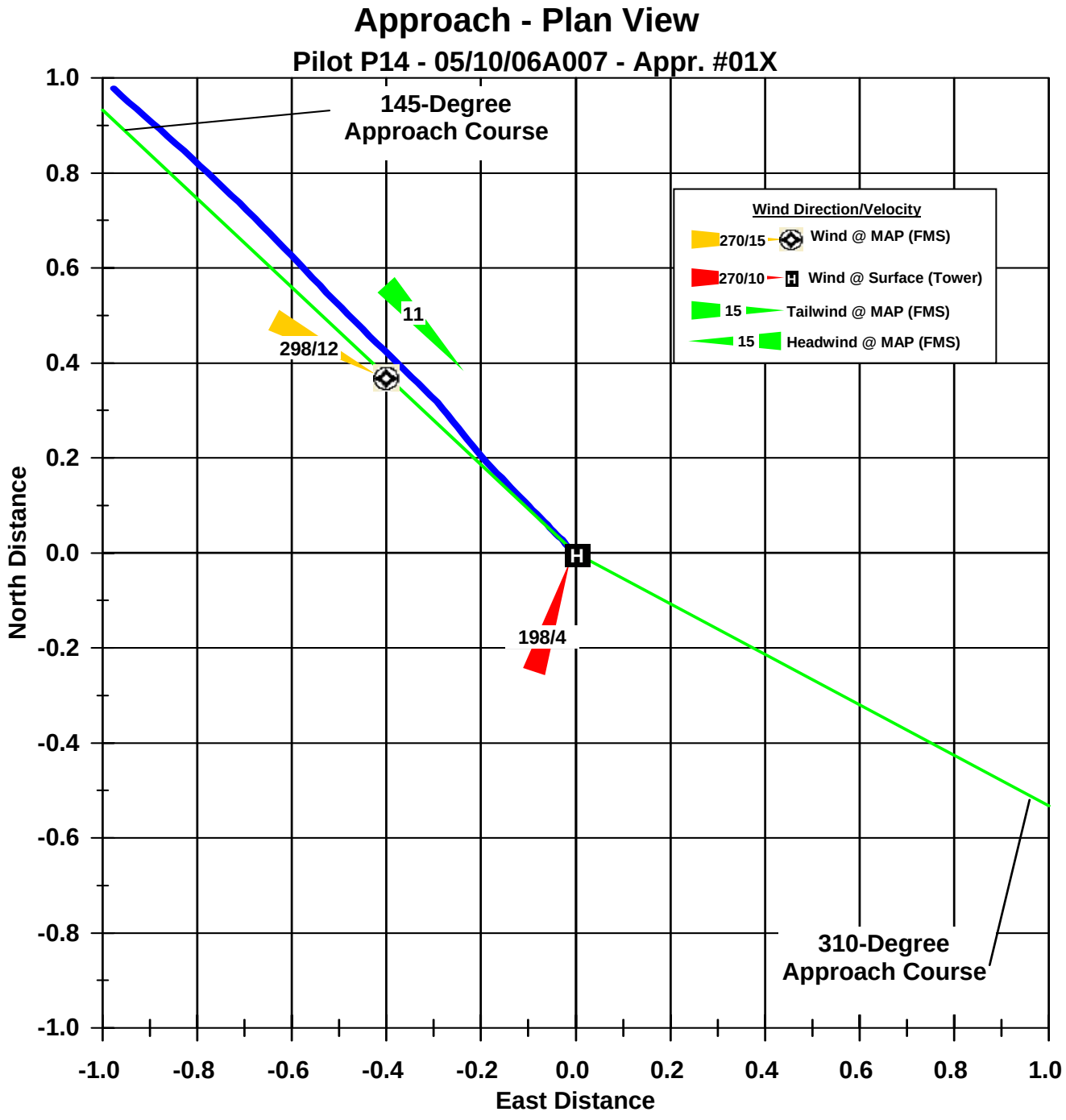


Angle to Heliport and Pitch Attitude
Pilot P13 - 05/10/06B006 - Appr. #12W

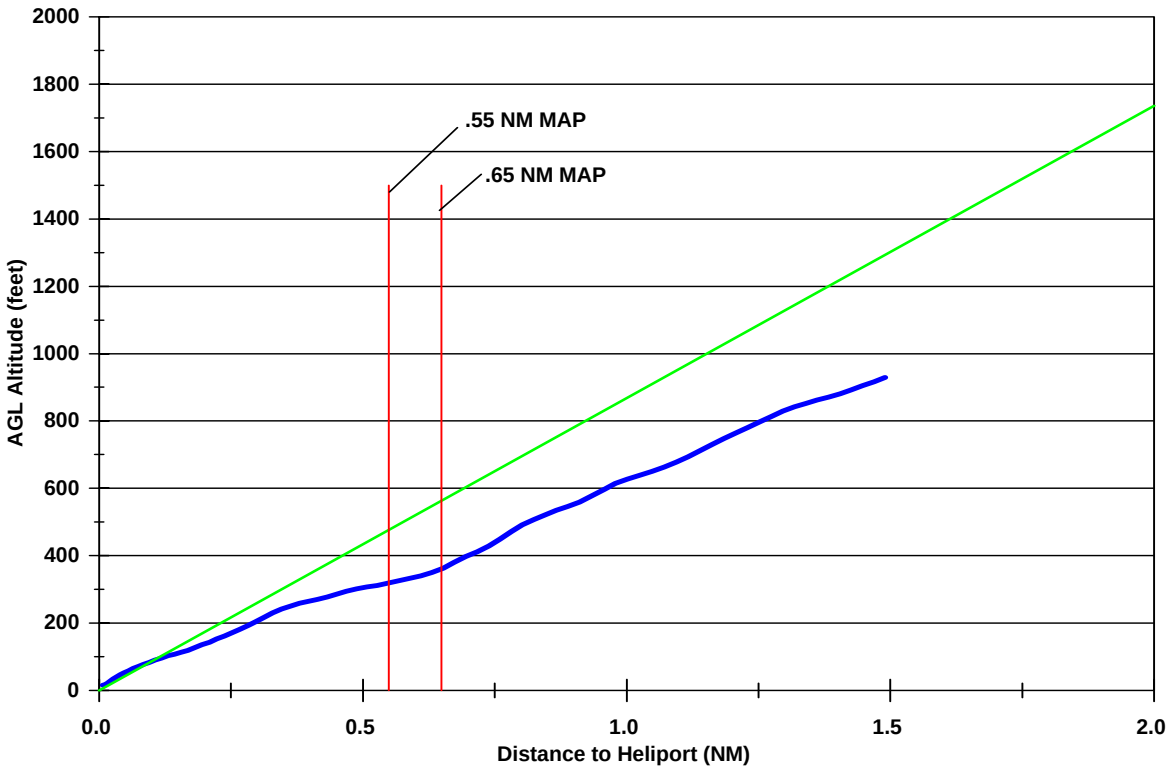


Horizontal and Vertical Deceleration
Pilot P13 - 05/10/06B006 - Appr. #12W

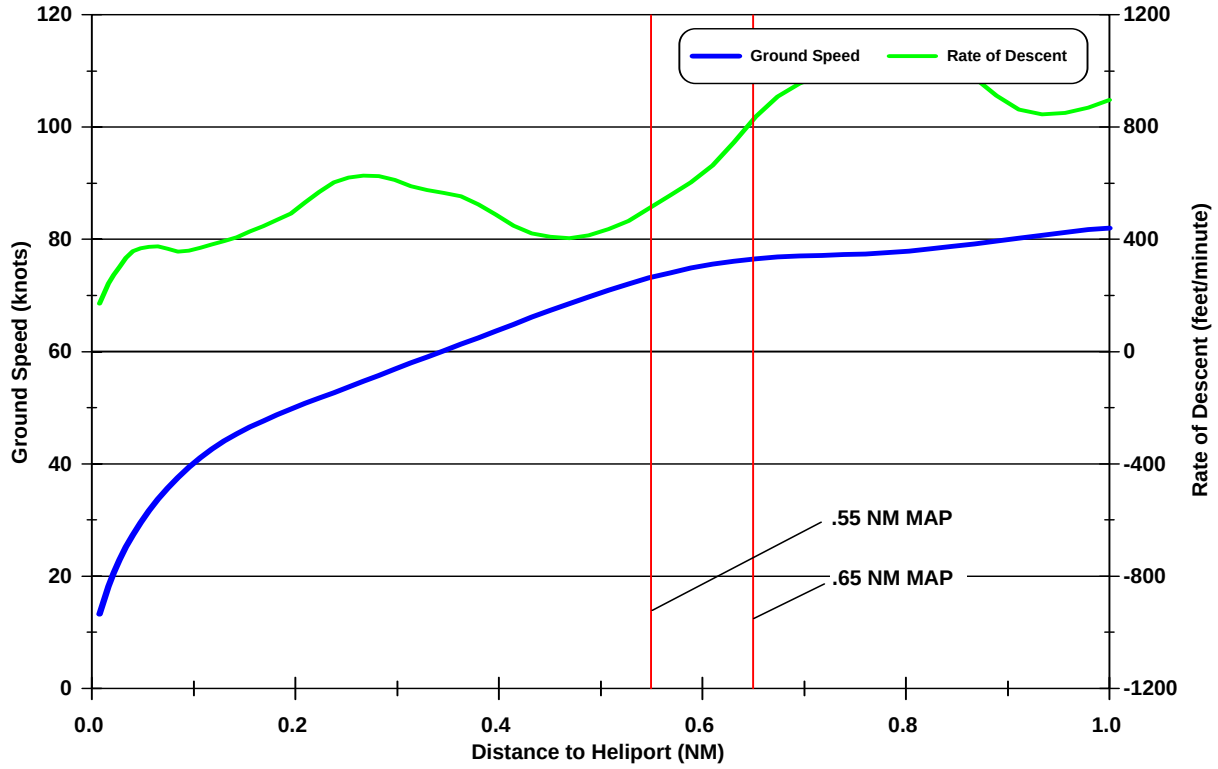



Approach - Plan View
Pilot P14 - 05/10/06A007 - Appr. #01X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
11
298/12
198/4
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

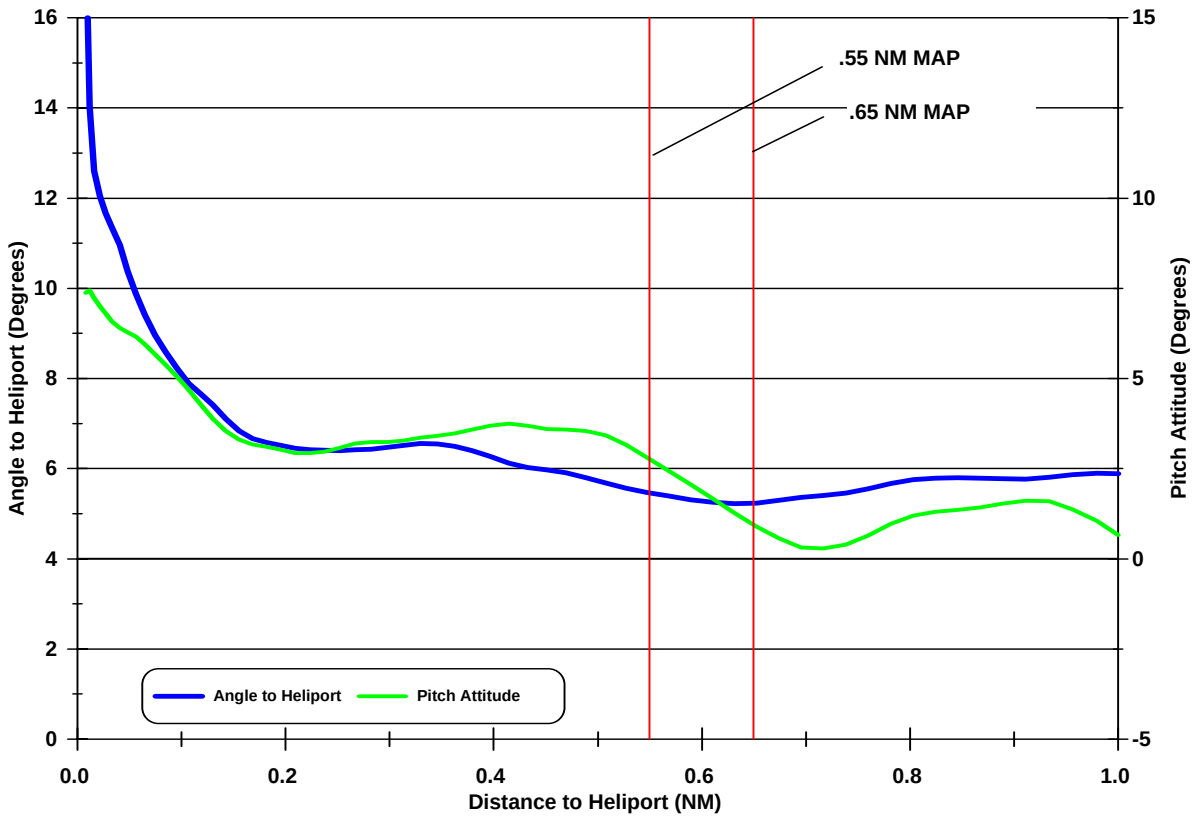
Profile View
Pilot P14 - 05/10/06A007 - Appr. #01X



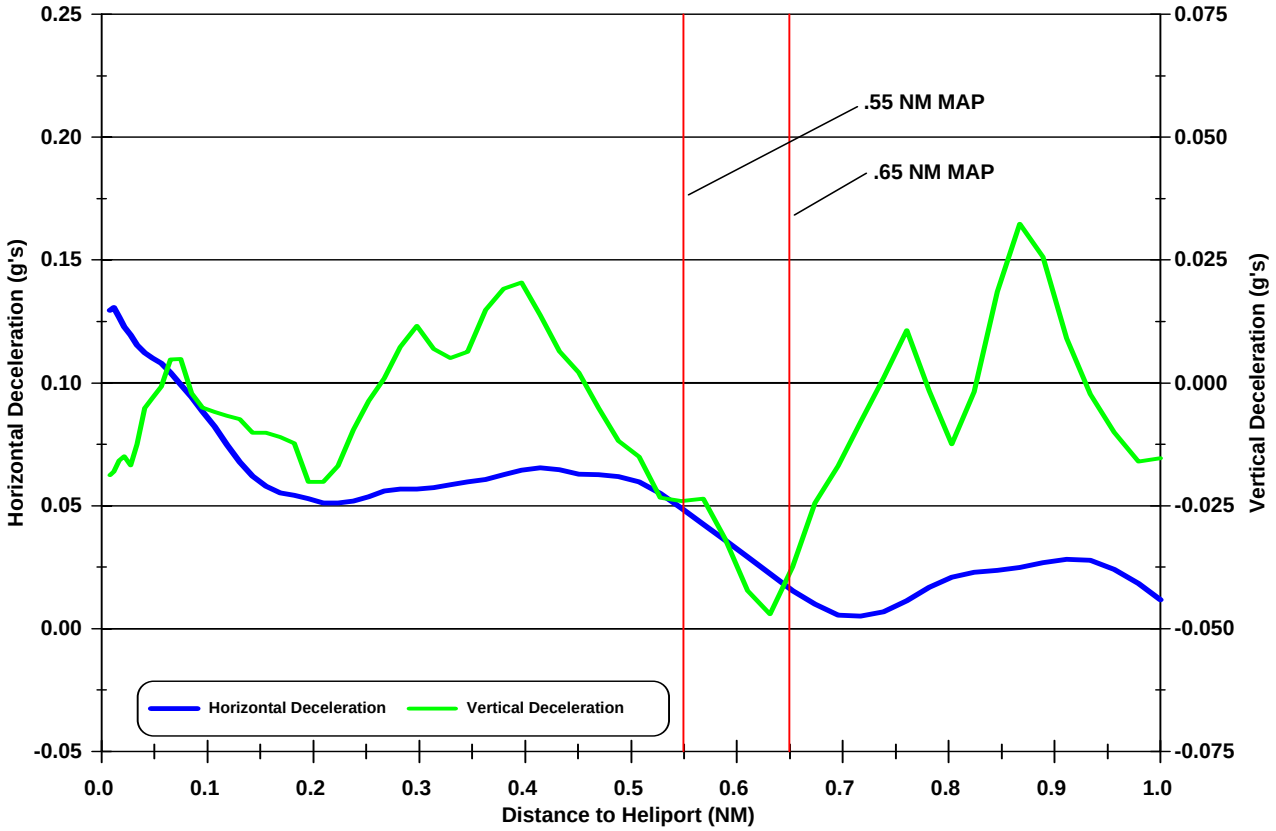
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06A007 - Appr. #01X

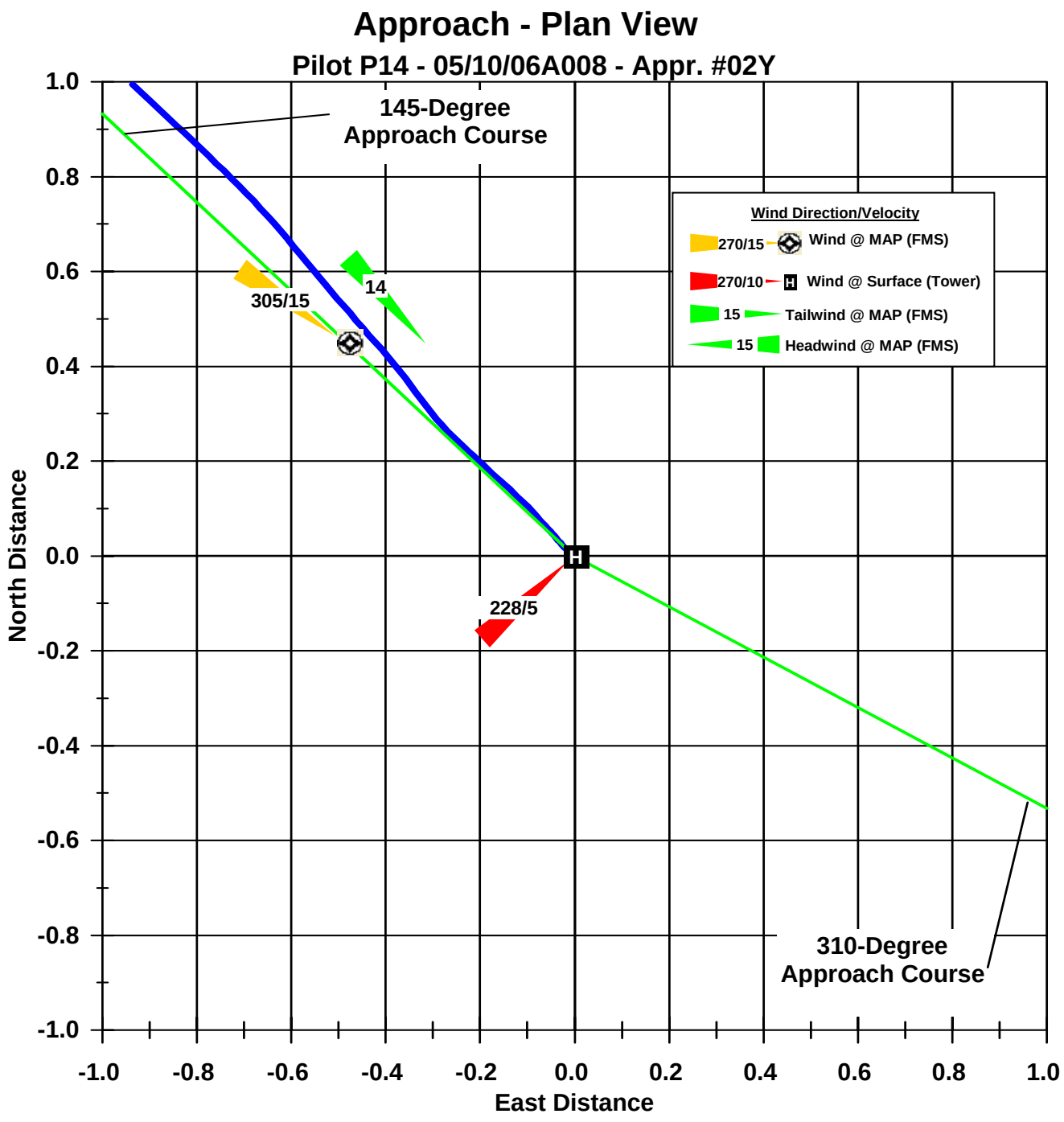


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06A007 - Appr. #01X

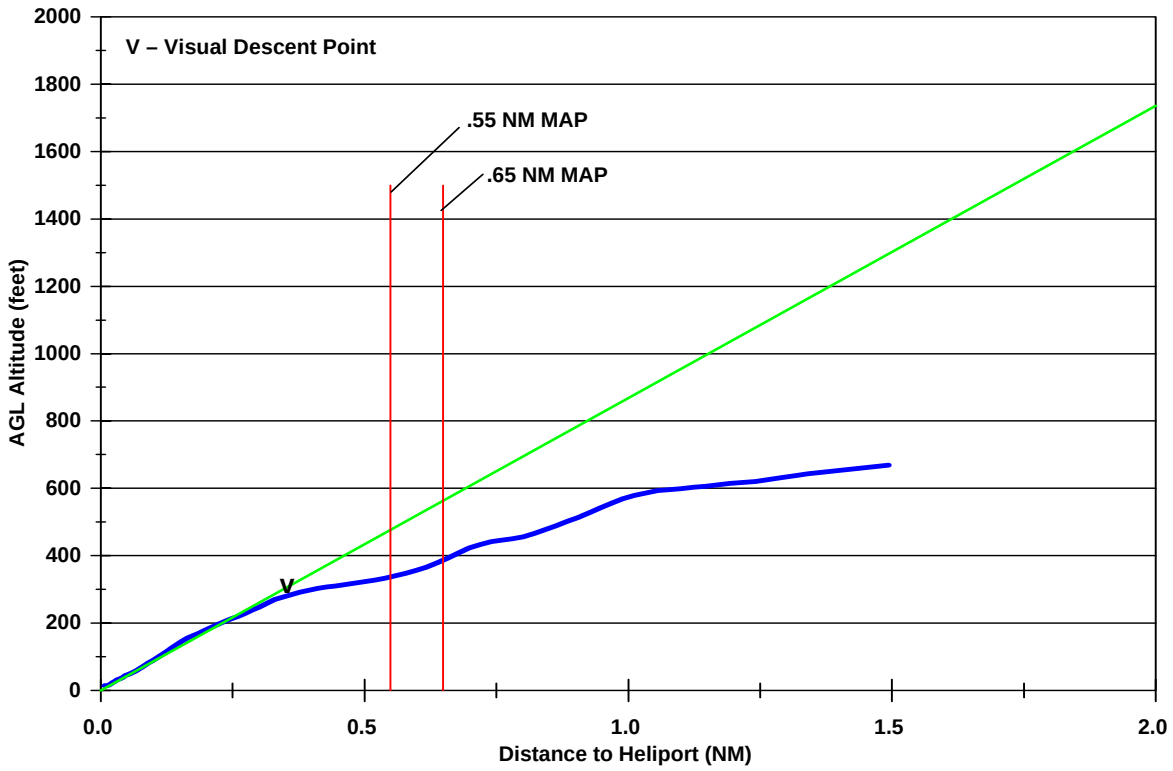


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06A007 - Appr. #01X

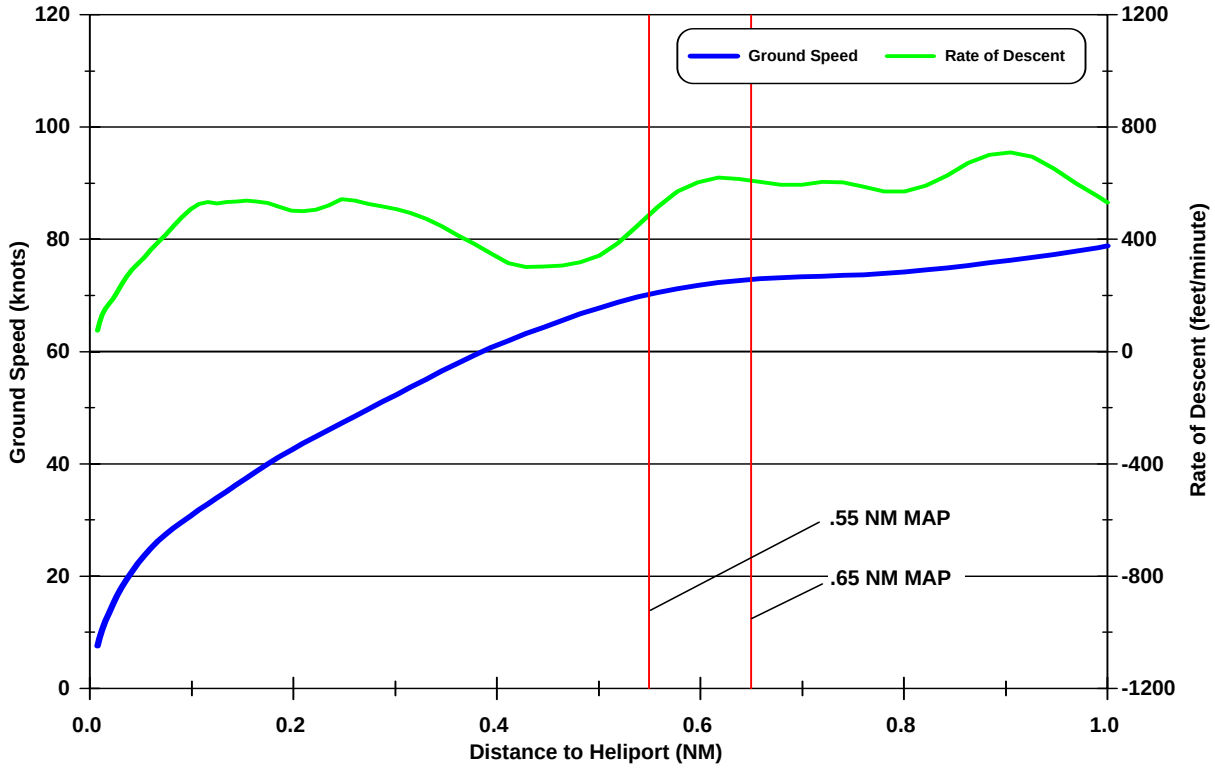



Approach - Plan View
Pilot P14 - 05/10/06A008 - Appr. #02Y
145-Degree
Approach Course
310-Degree
Approach Course
305/15
14
228/5
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

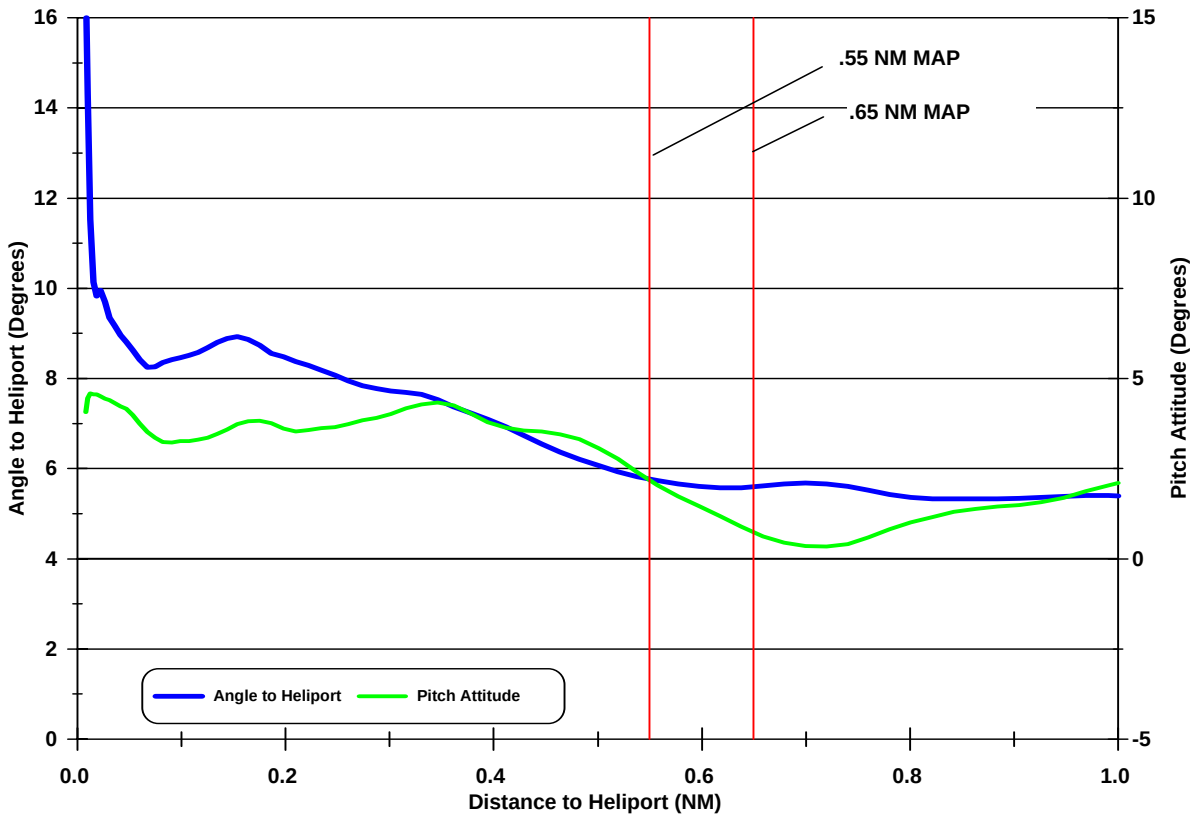
Profile View
Pilot P14 - 05/10/06A008 - Appr. #02Y



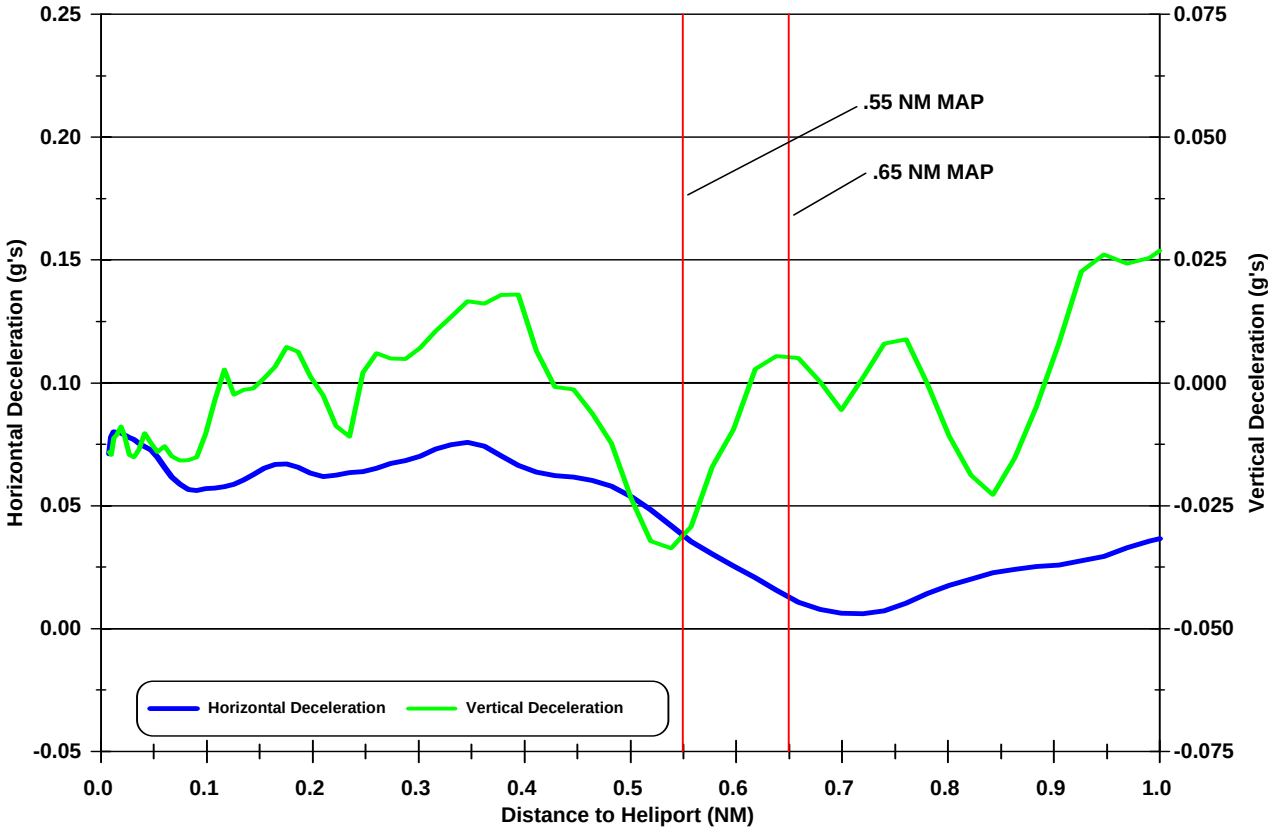
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06A008 - Appr. #02Y

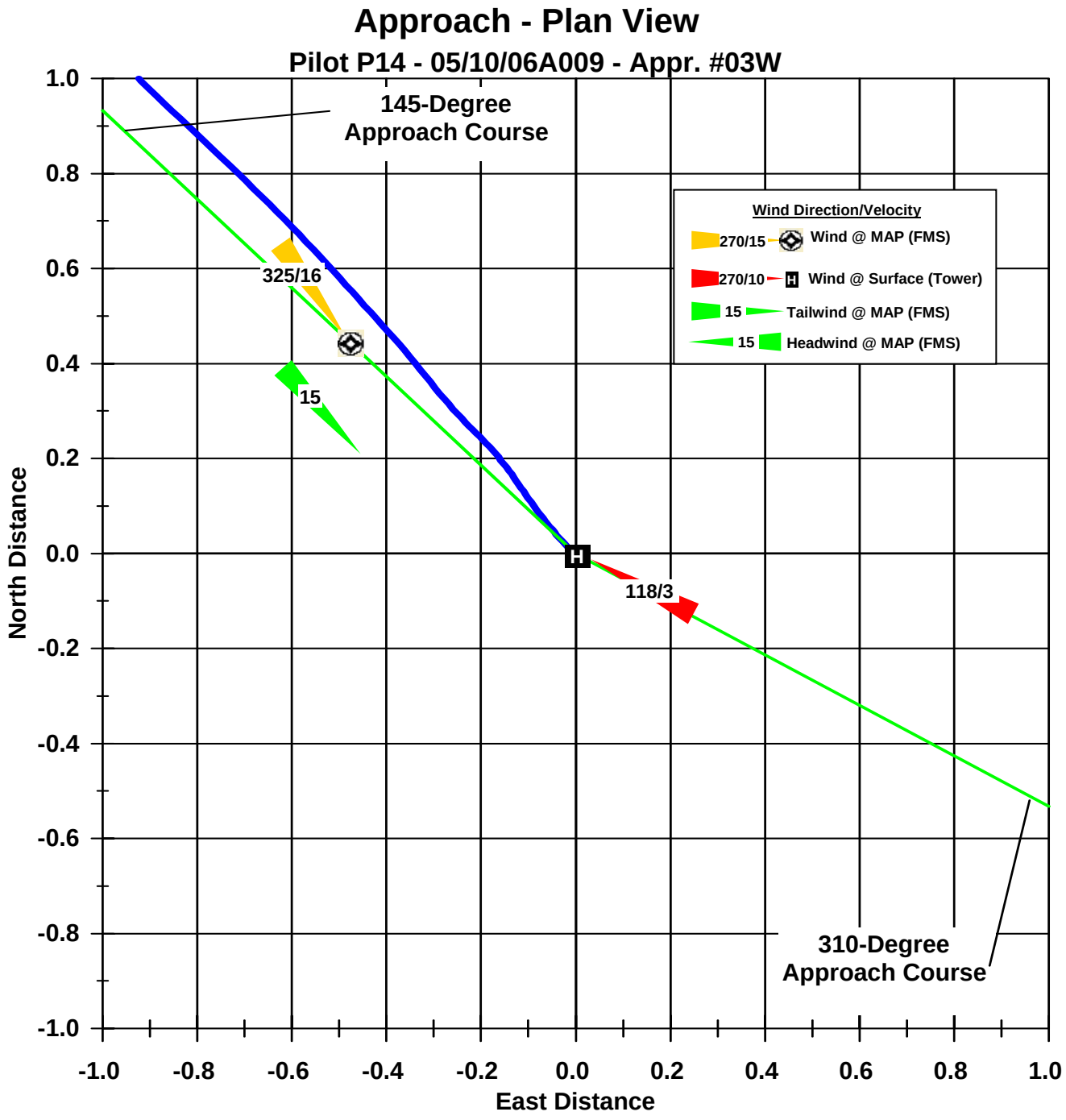


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06A008 - Appr. #02Y

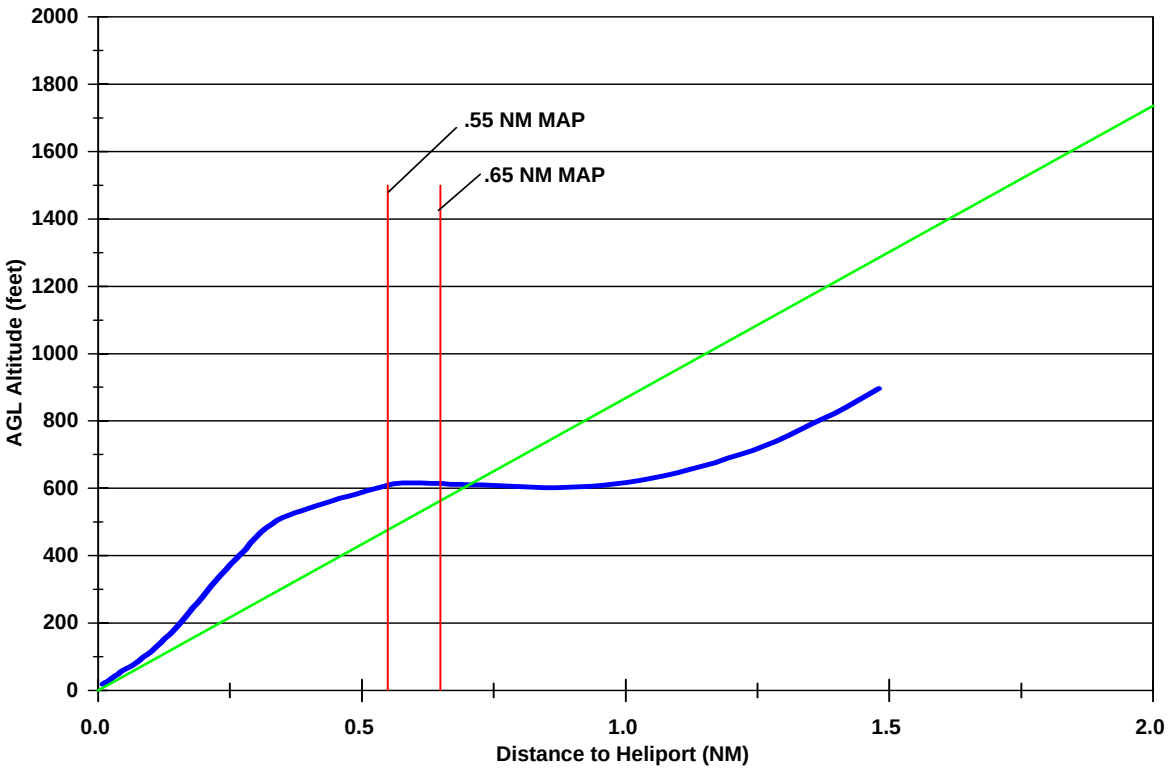


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06A008 - Appr. #02Y

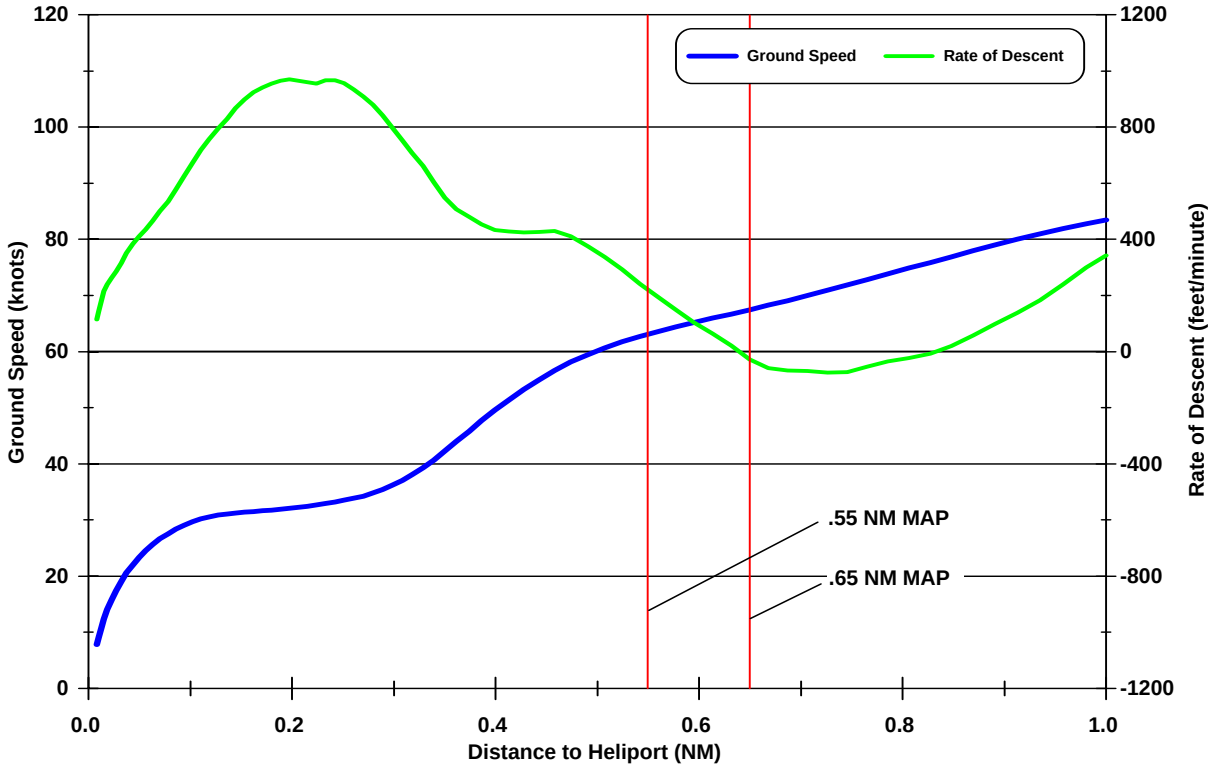



Approach - Plan View
Pilot P14 - 05/10/06A009 - Appr. #03W
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
325/16
15
118/3
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

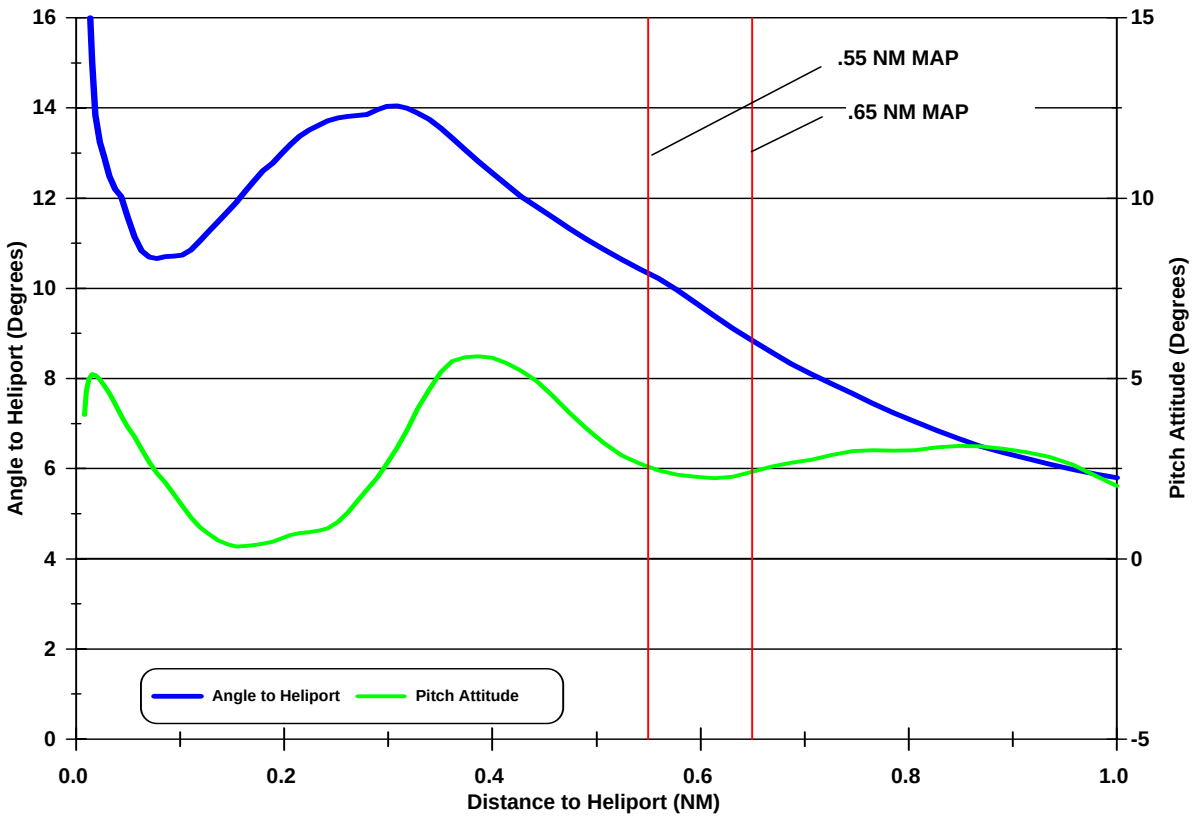
Profile View
Pilot P14 - 05/10/06A009 - Appr. #03W



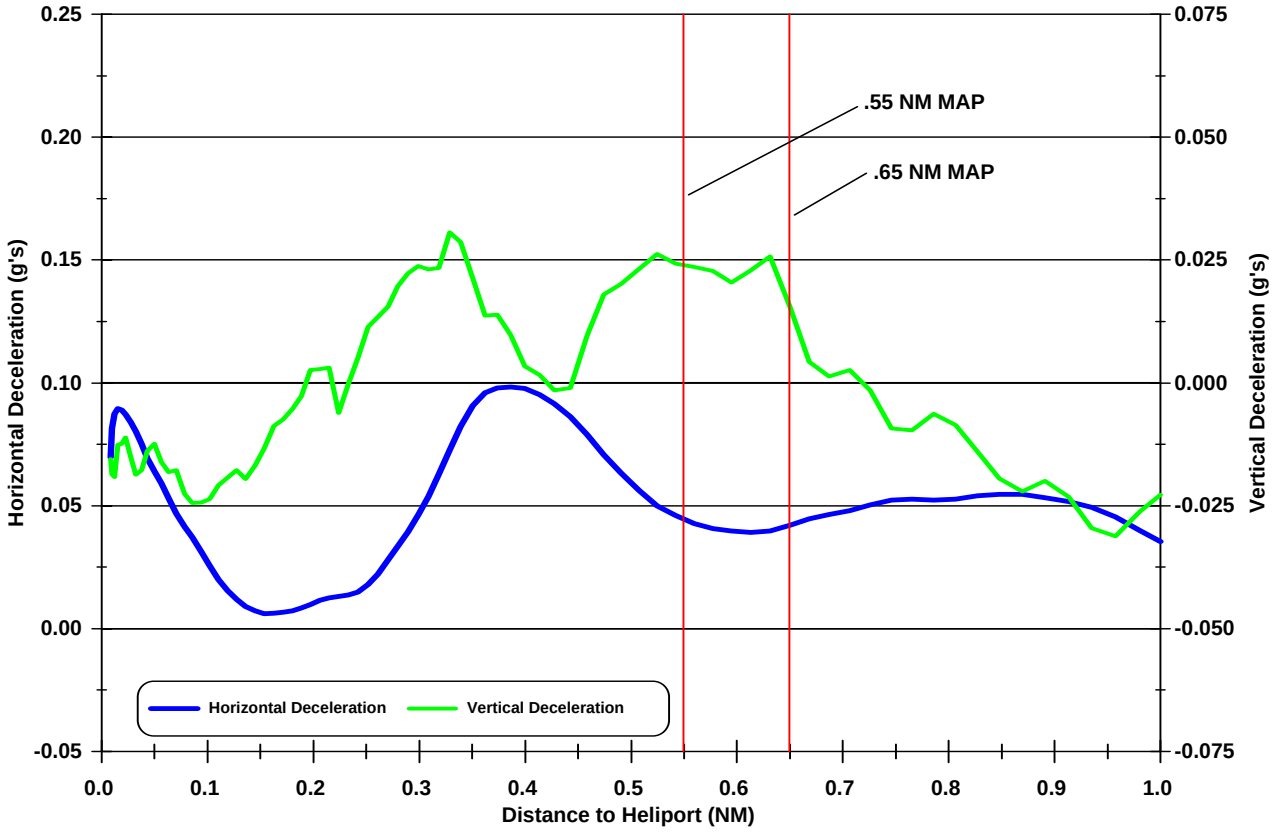
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06A009 - Appr. #03W

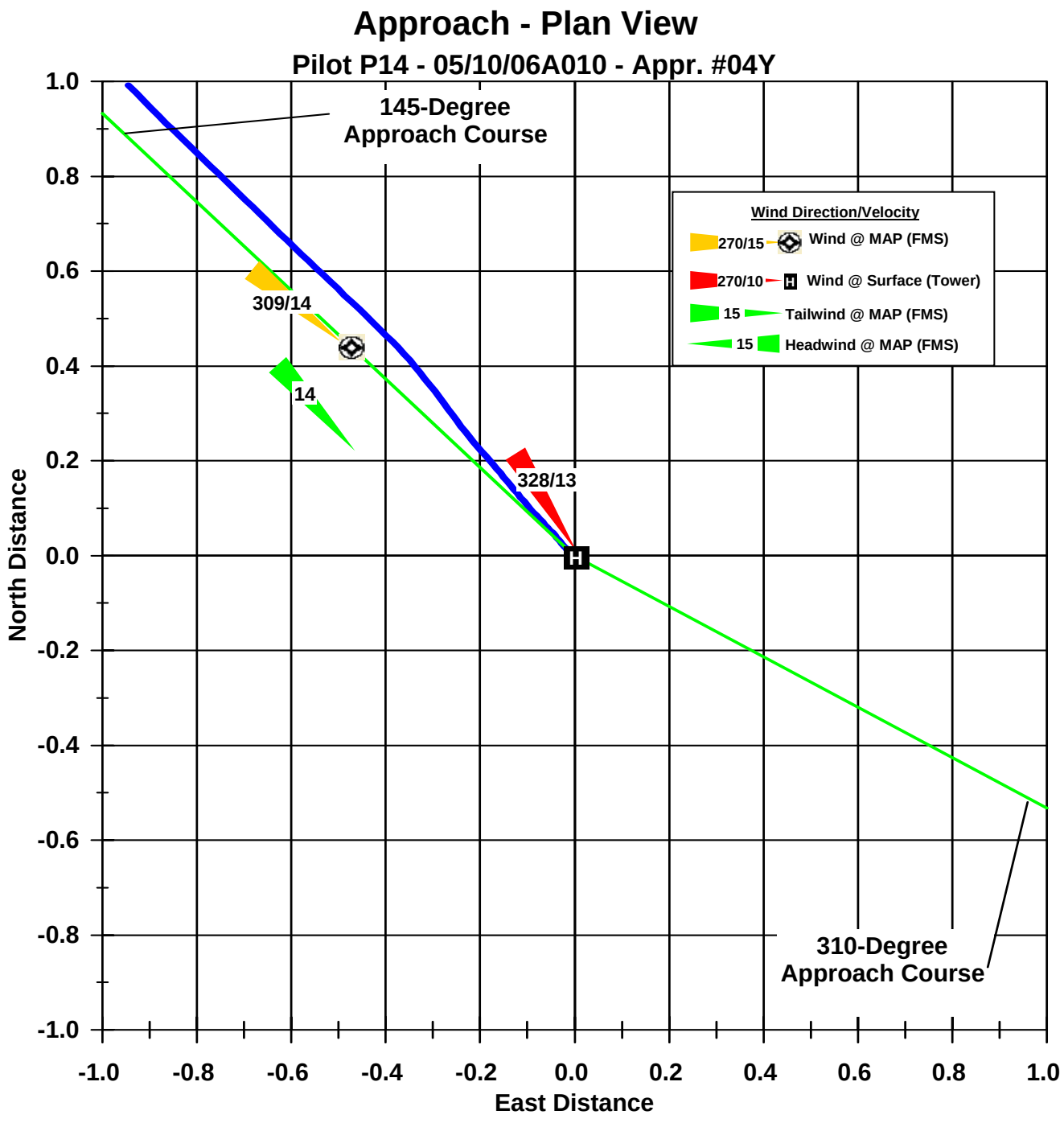


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06A009 - Appr. #03W

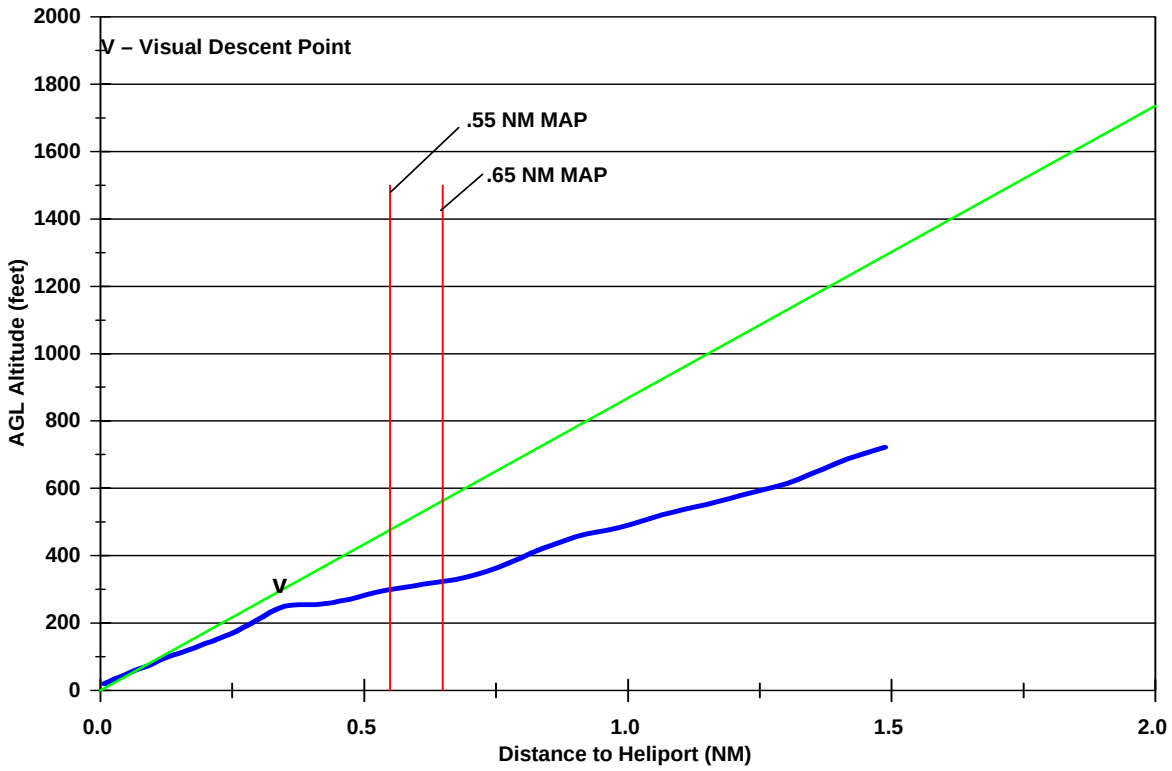


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06A009 - Appr. #03W

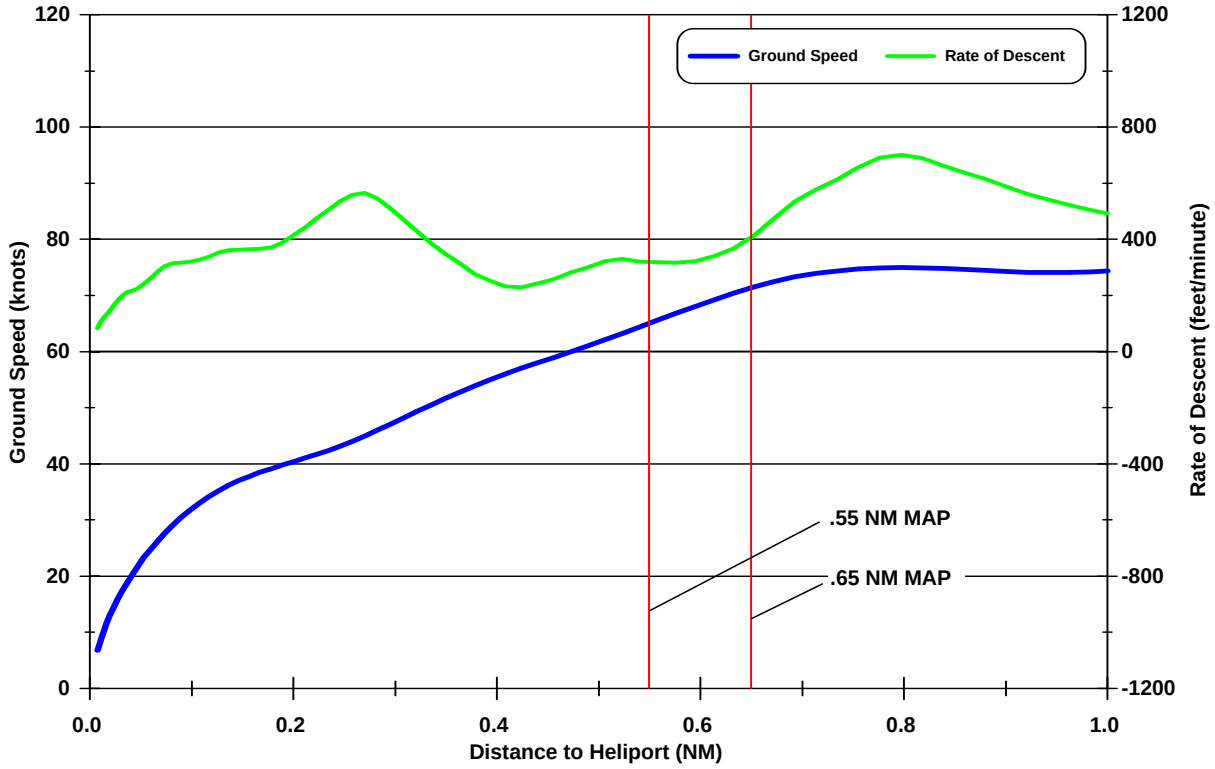



Approach - Plan View
Pilot P14 - 05/10/06A010 - Appr. #04Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
309/14
14
328/13
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

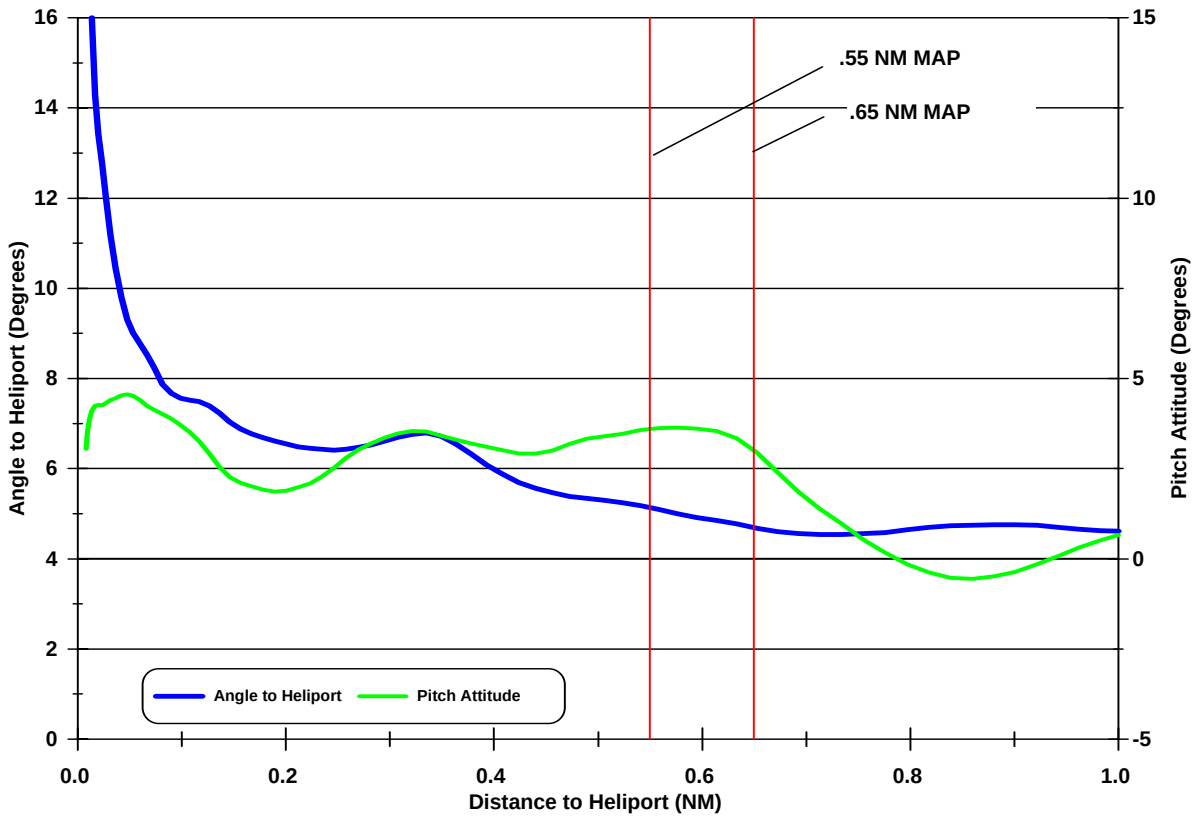
Profile View
Pilot P14 - 05/10/06A010 - Appr. #04Y



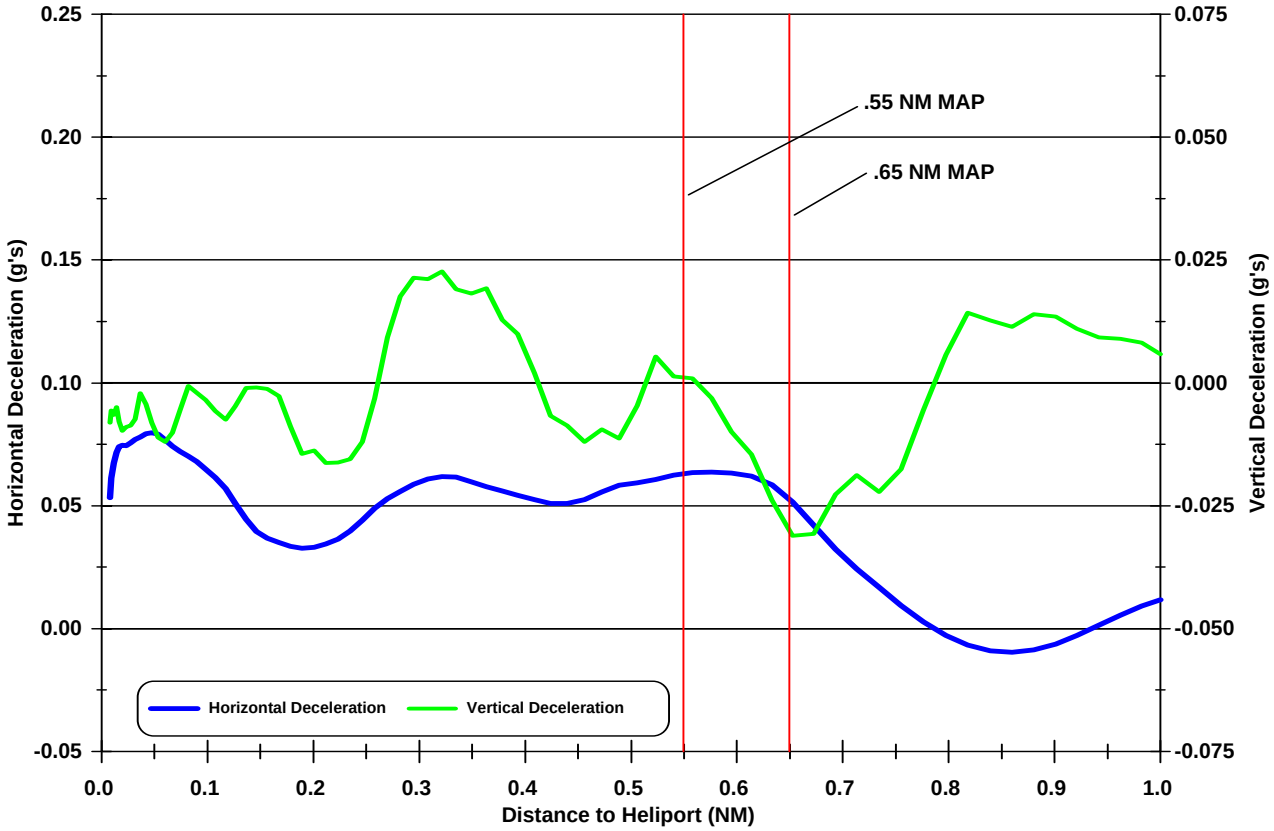
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06A010 - Appr. #04Y

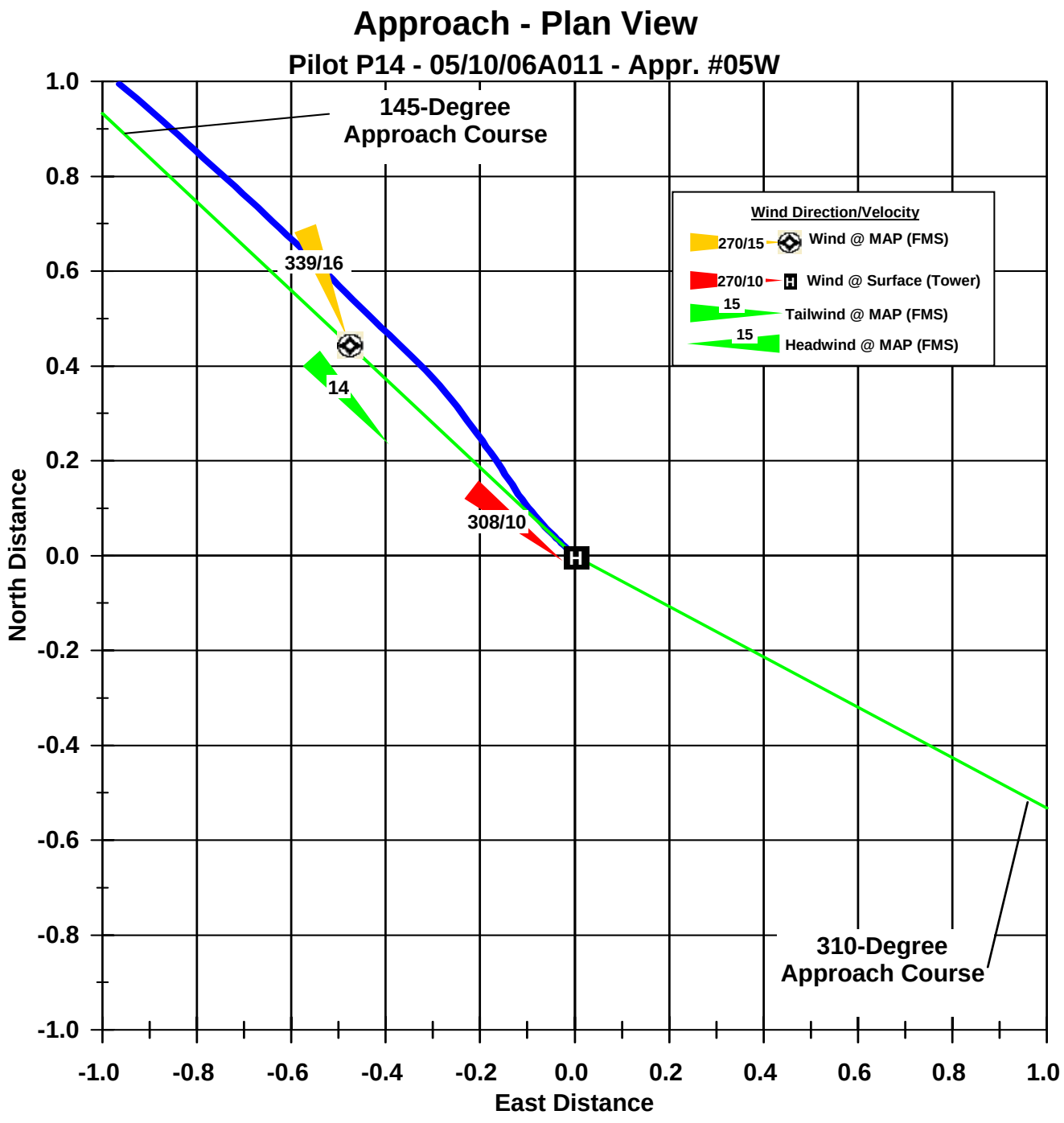


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06A010 - Appr. #04Y

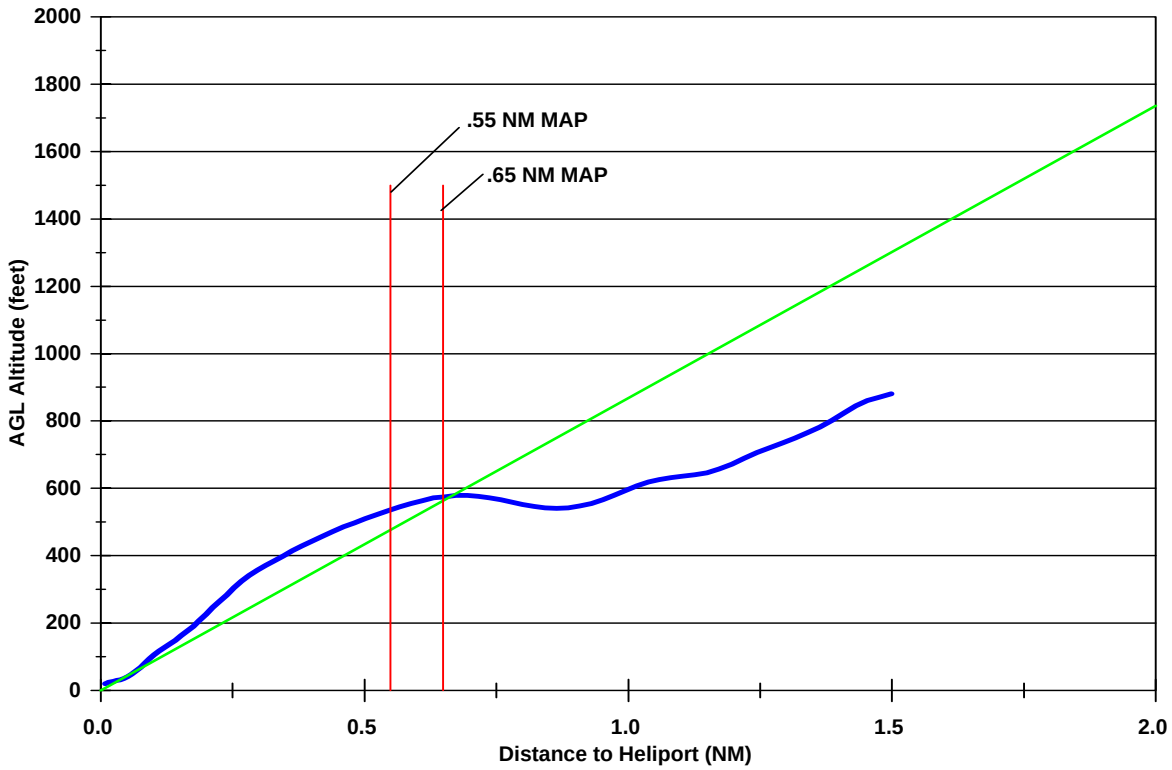


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06A010 - Appr. #04Y

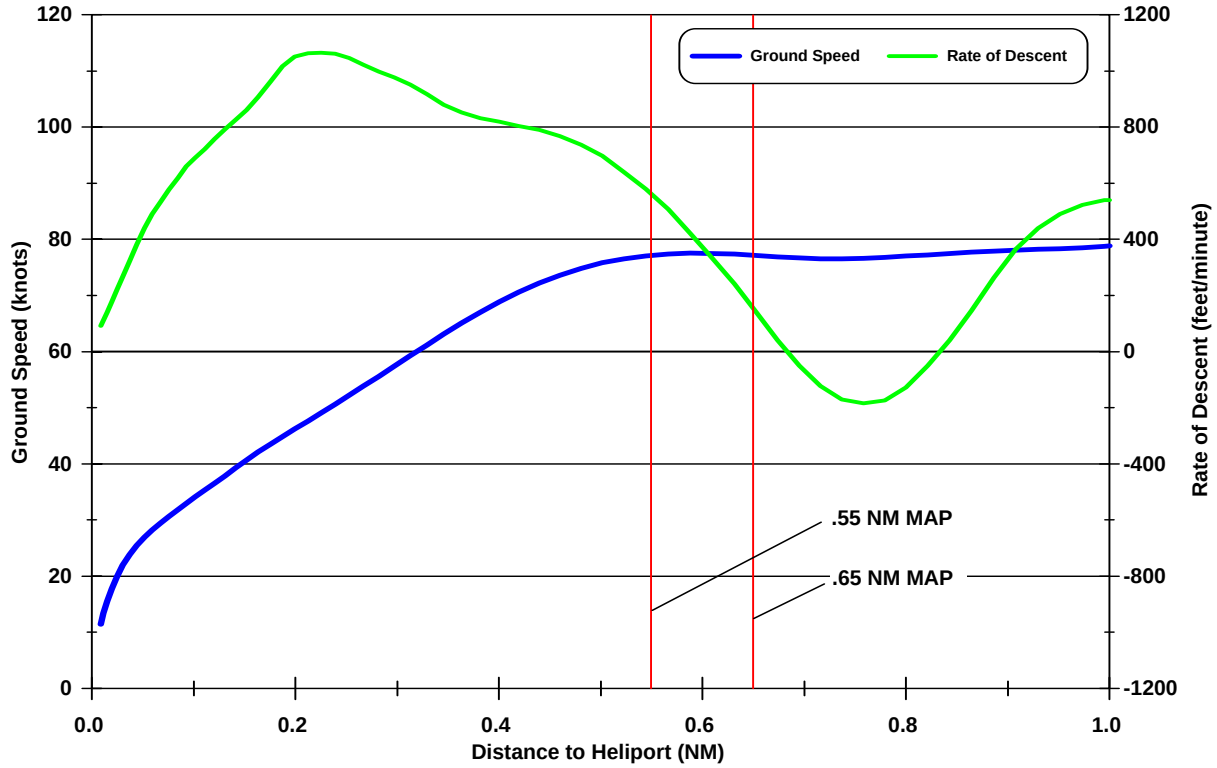



Approach - Plan View
Pilot P14 - 05/10/06A011 - Appr. #05W
145-Degree
Approach Course
310-Degree
Approach Course
339/16
14
308/10
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

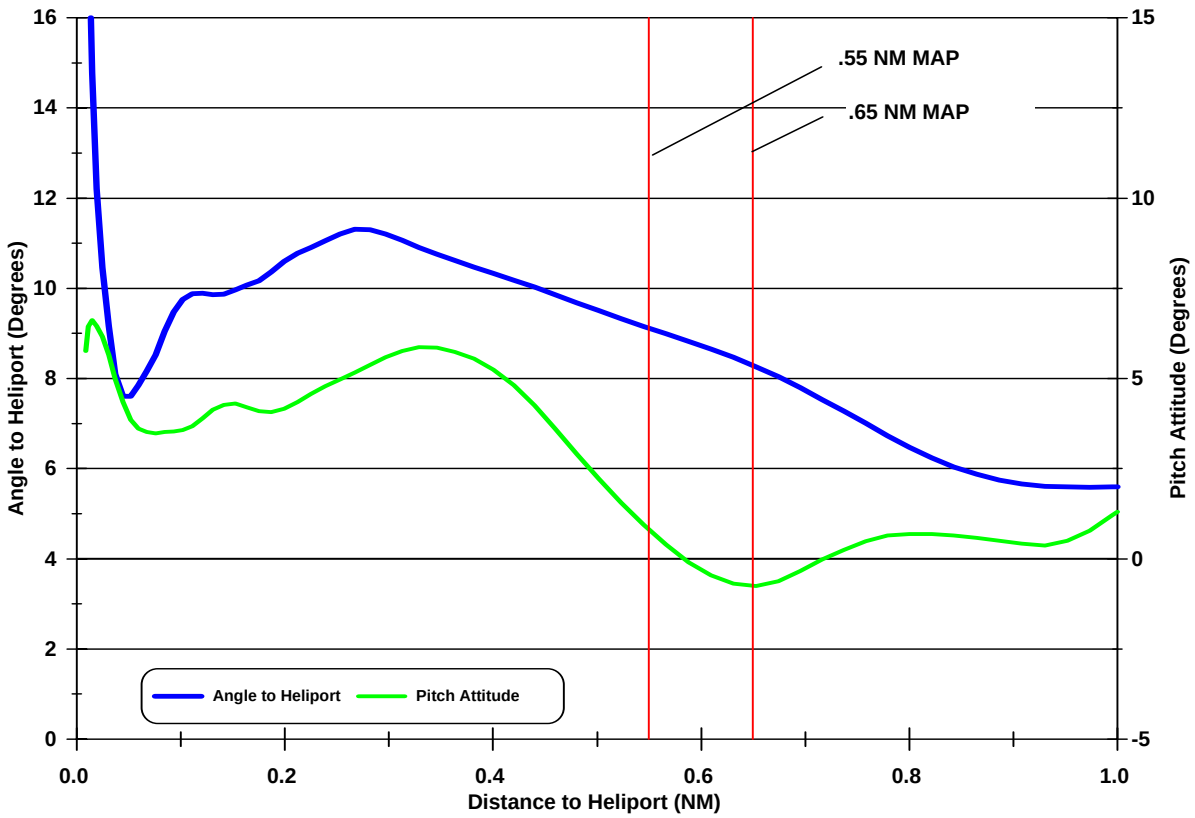
Profile View
Pilot P14 - 05/10/06A011 - Appr. #05W



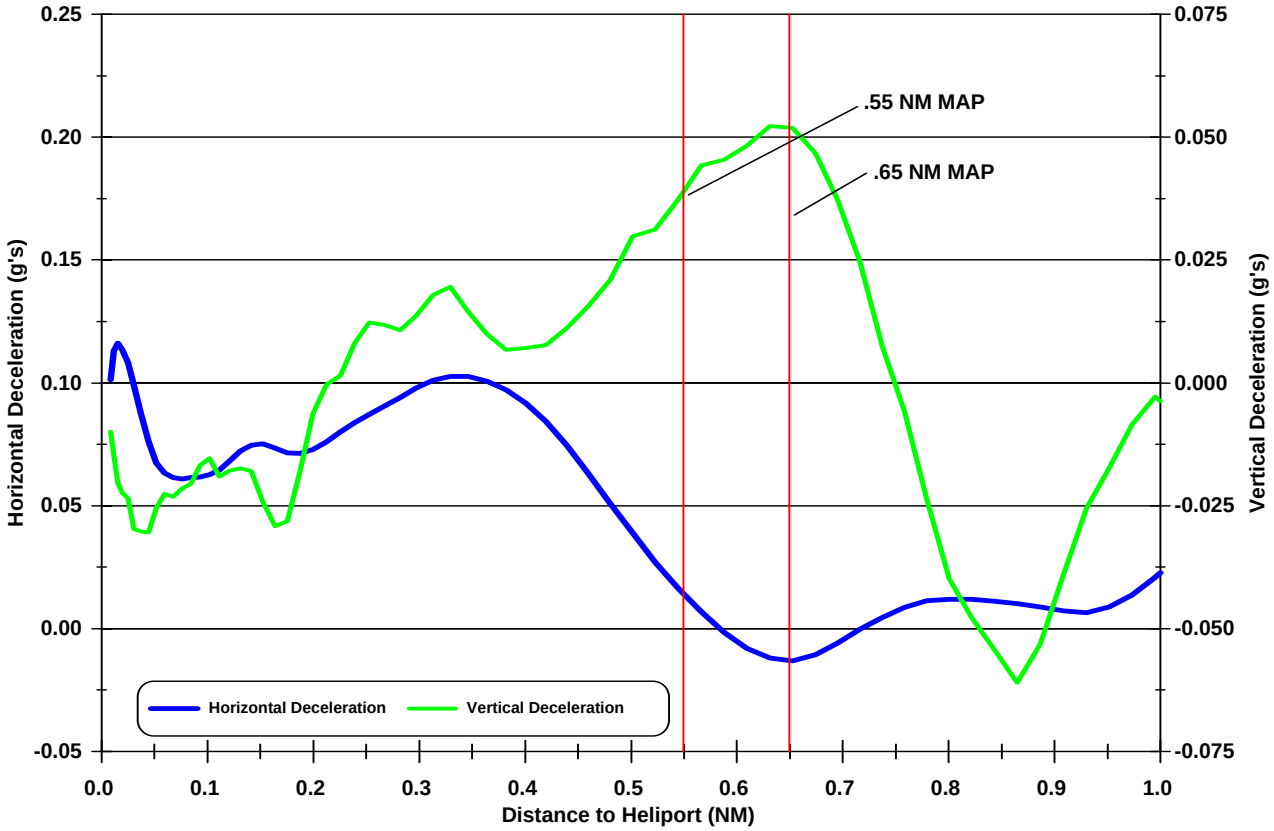
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06A011 - Appr. #05W

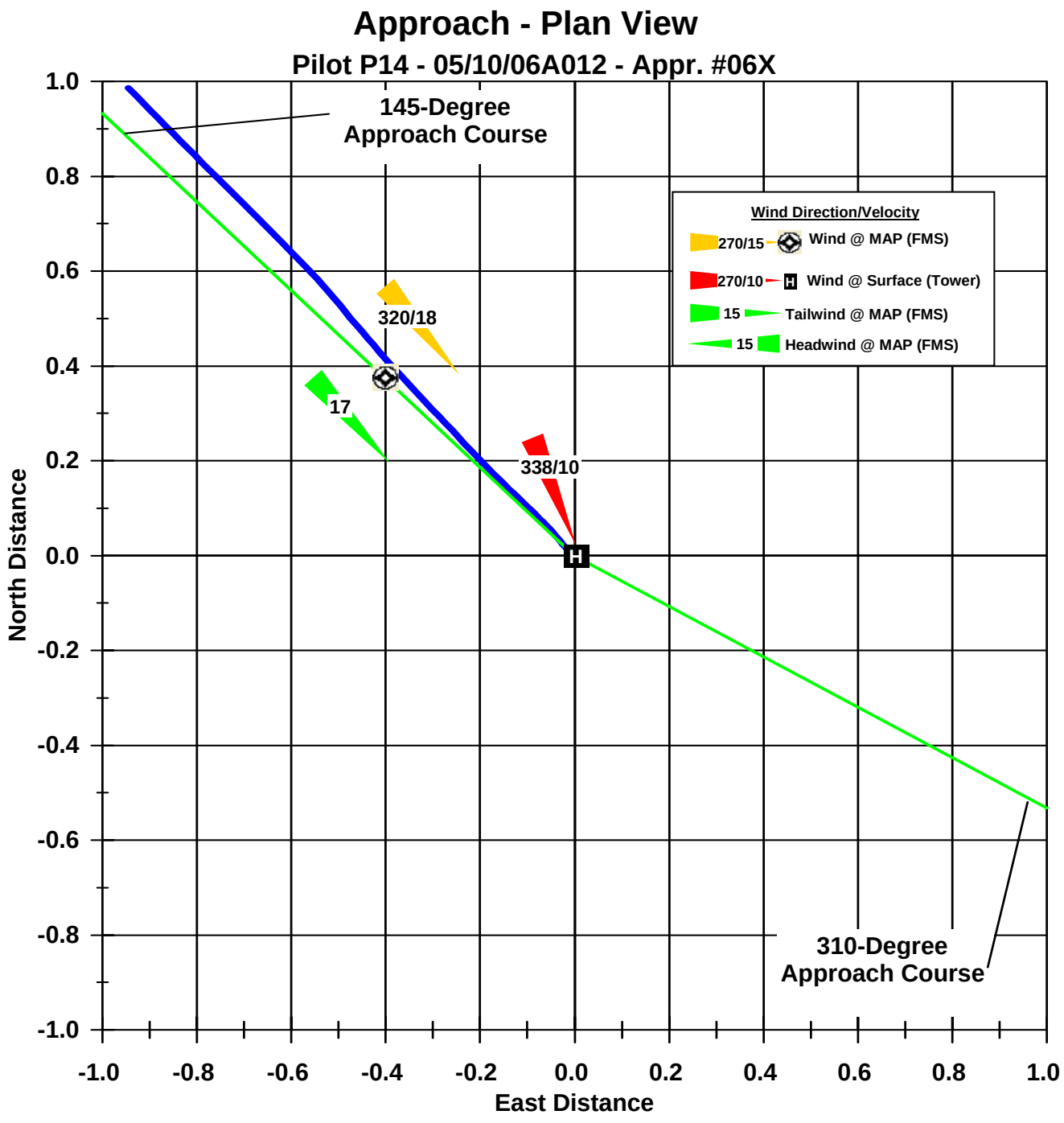


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06A011 - Appr. #05W

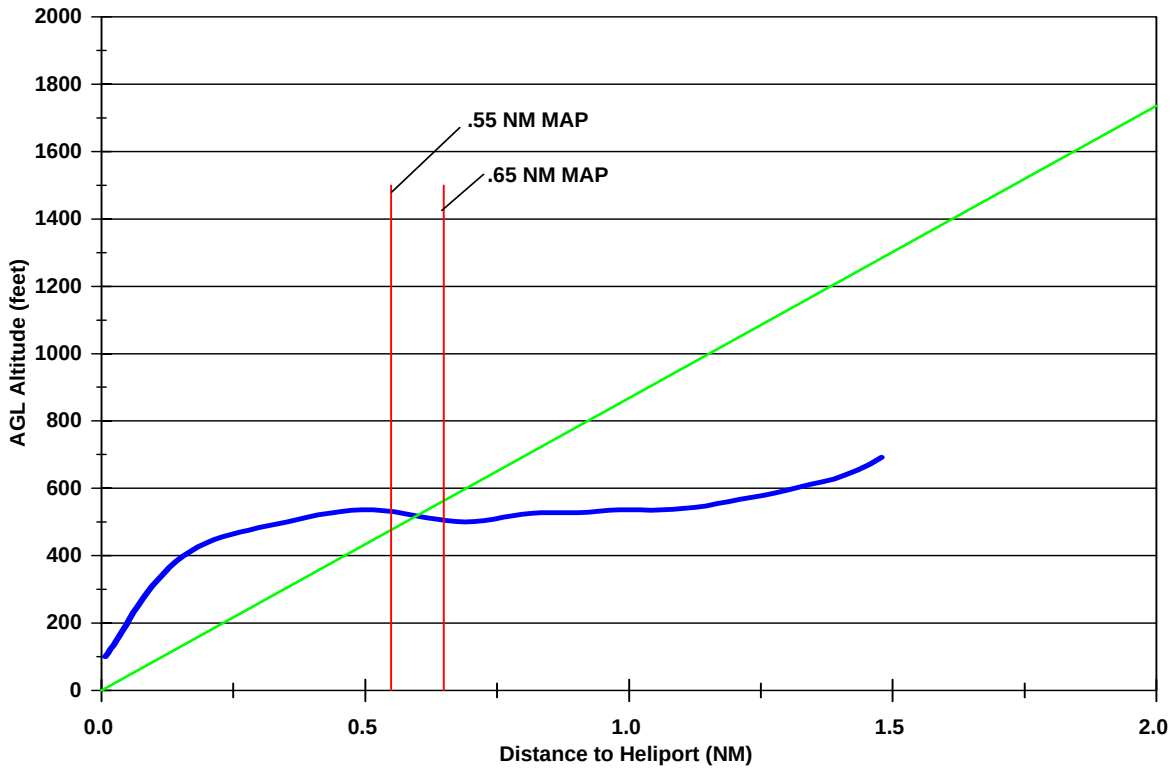


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06A011 - Appr. #05W

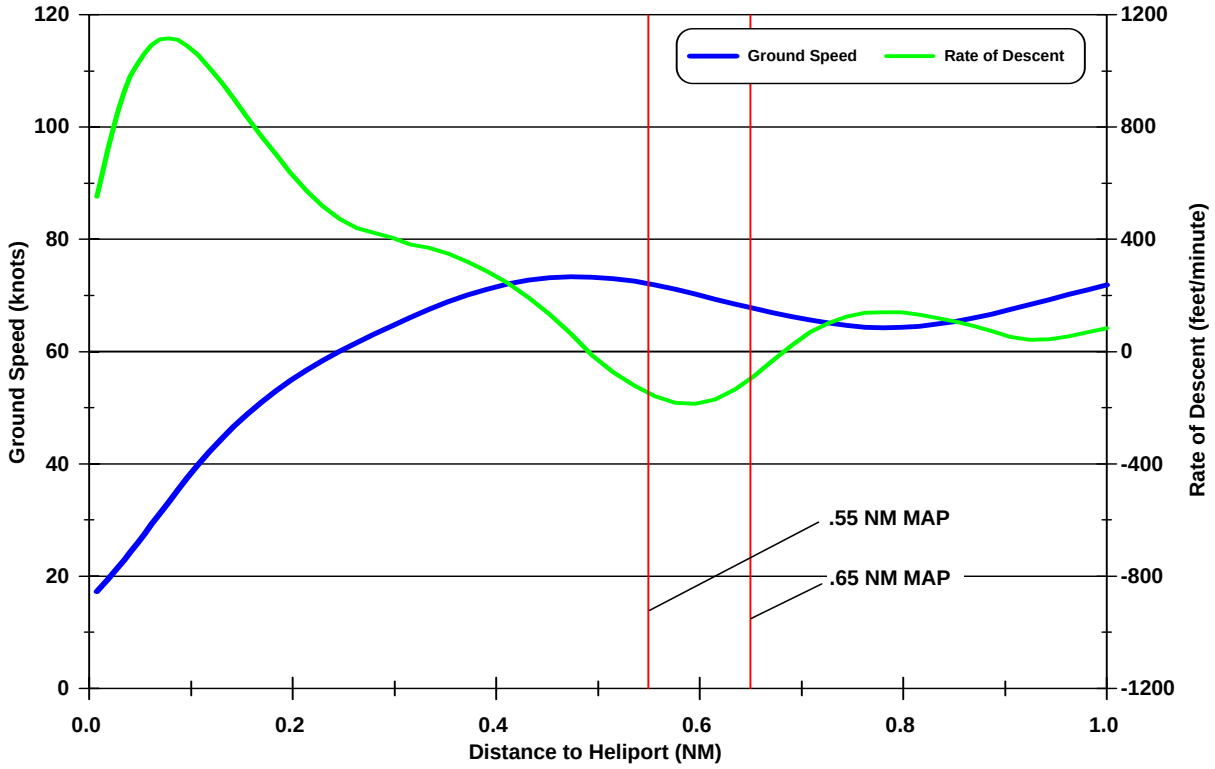



Approach - Plan View
Pilot P14 - 05/10/06A012 - Appr. #06X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
320/18
17
338/10
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

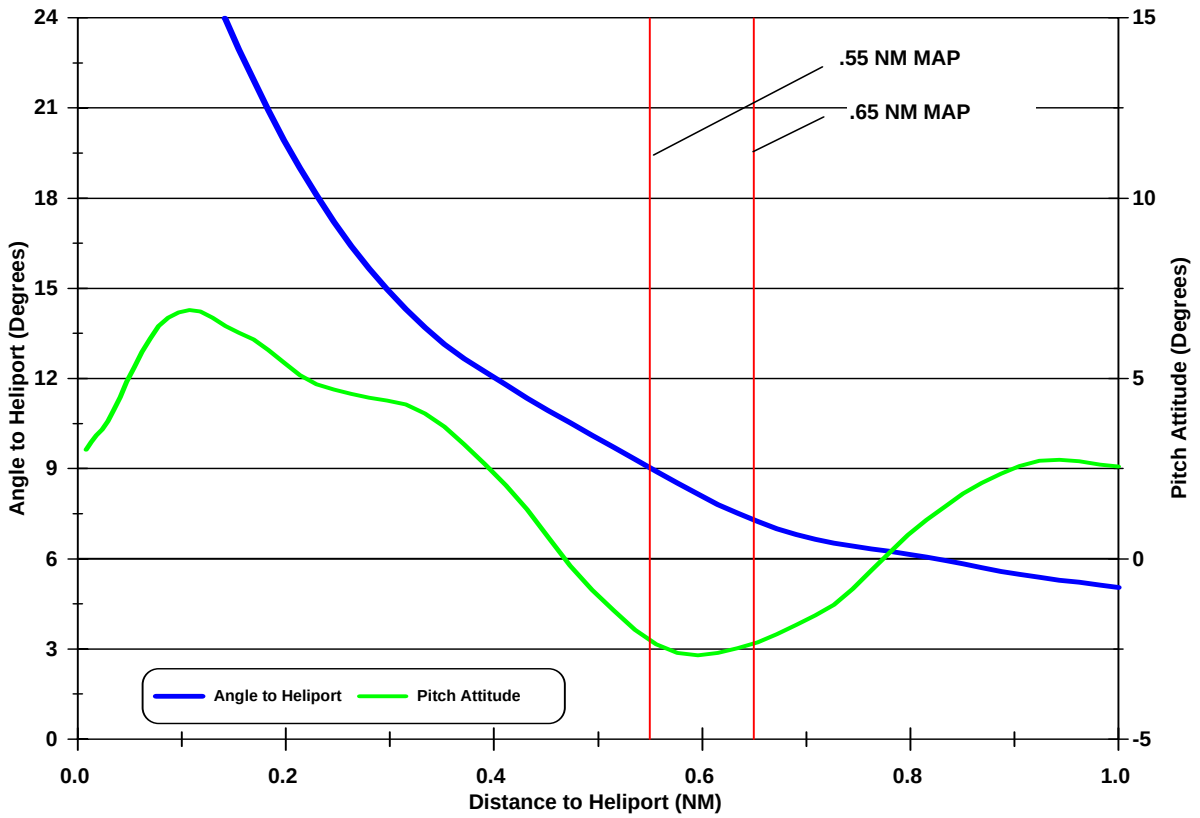
Profile View
Pilot P14 - 05/10/06A012 - Appr. #06X



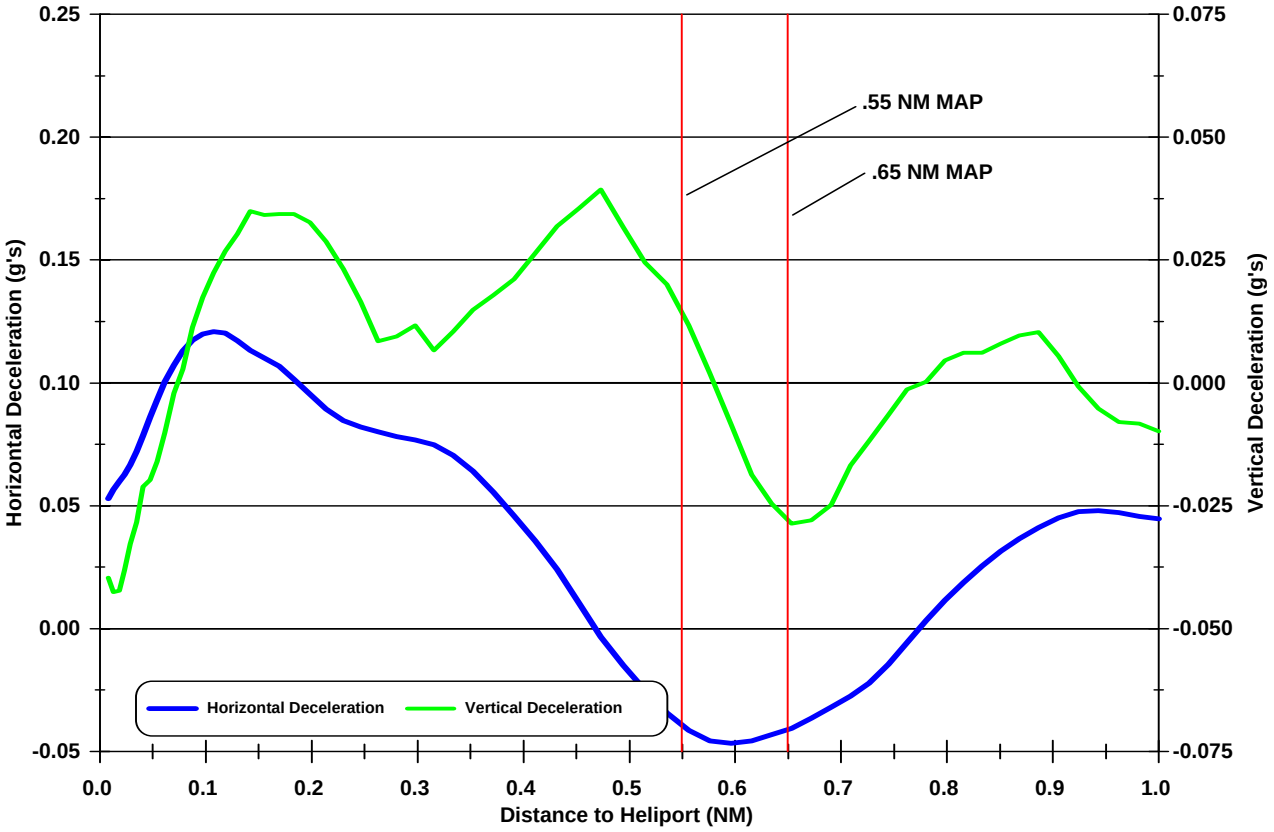
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06A012 - Appr. #06X

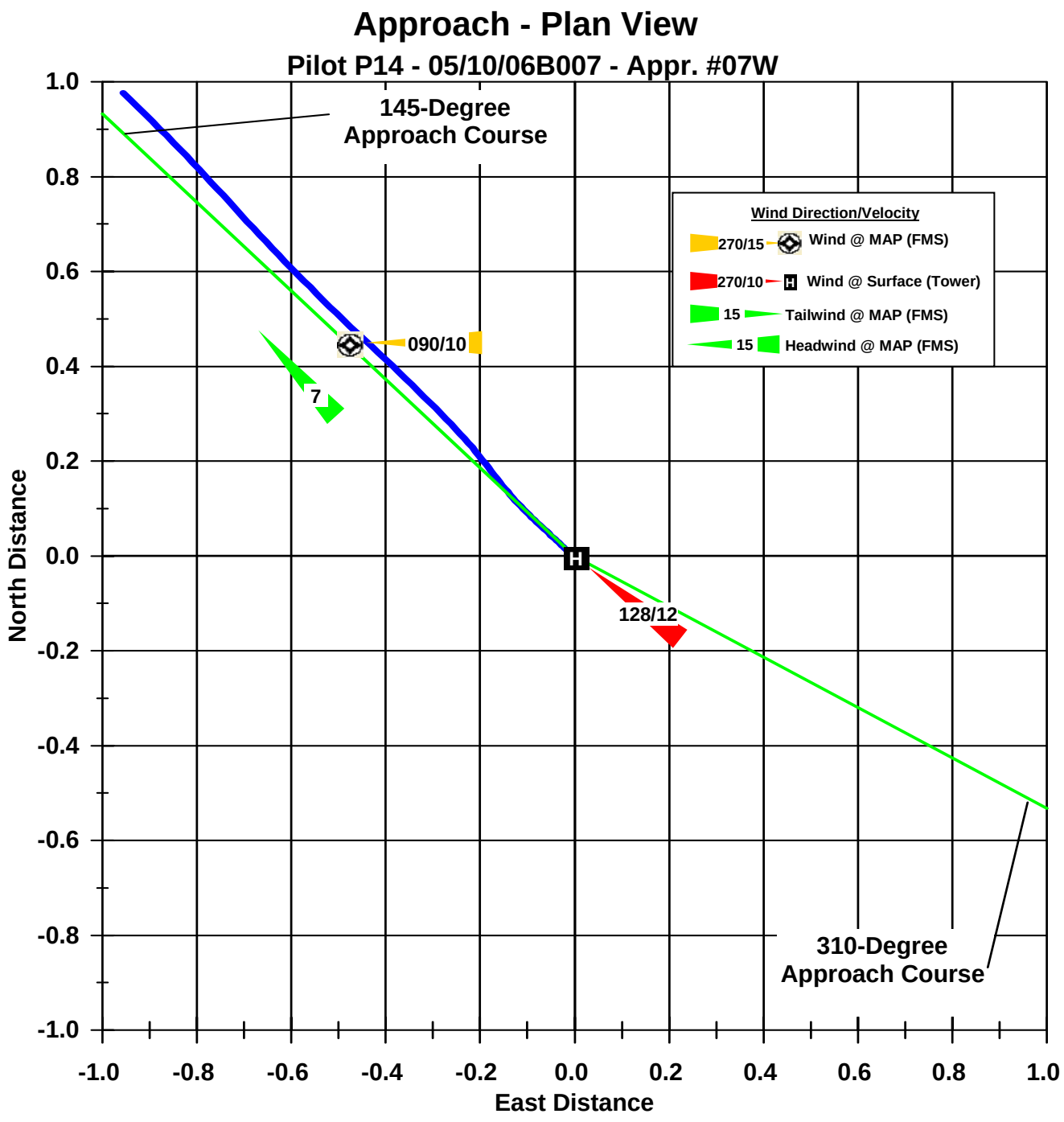


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06A012 - Appr. #06X

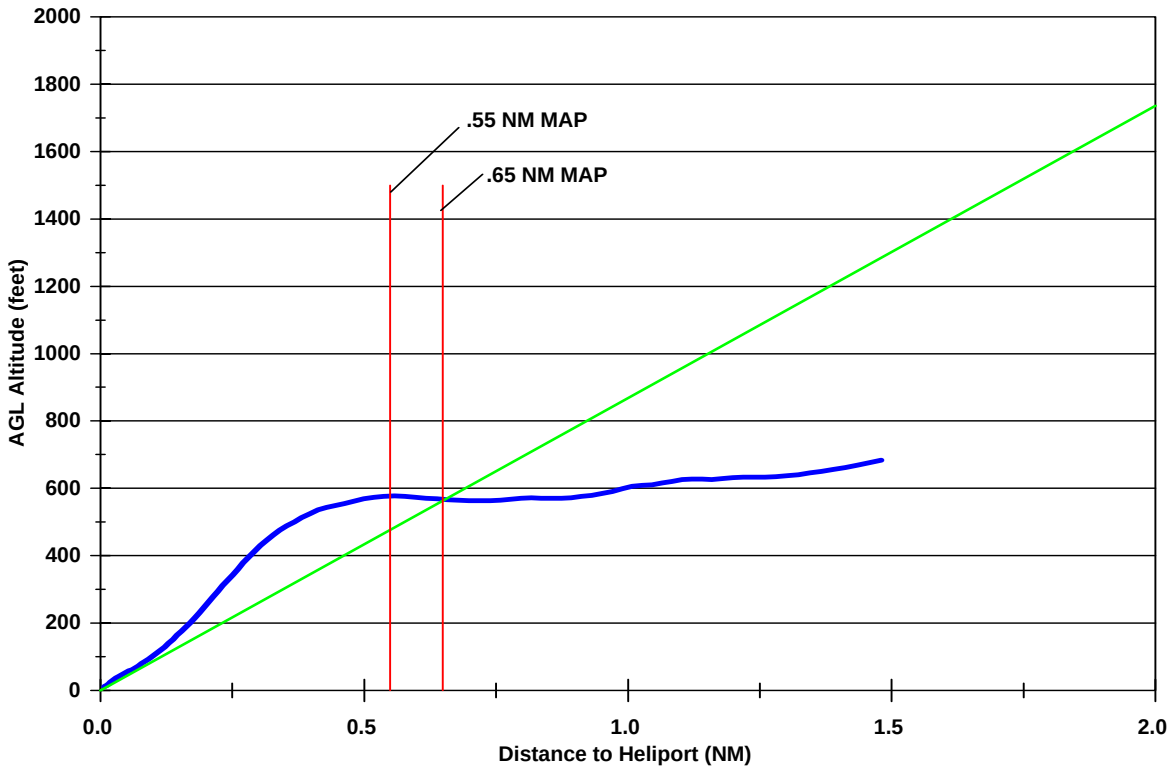


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06A012 - Appr. #06X

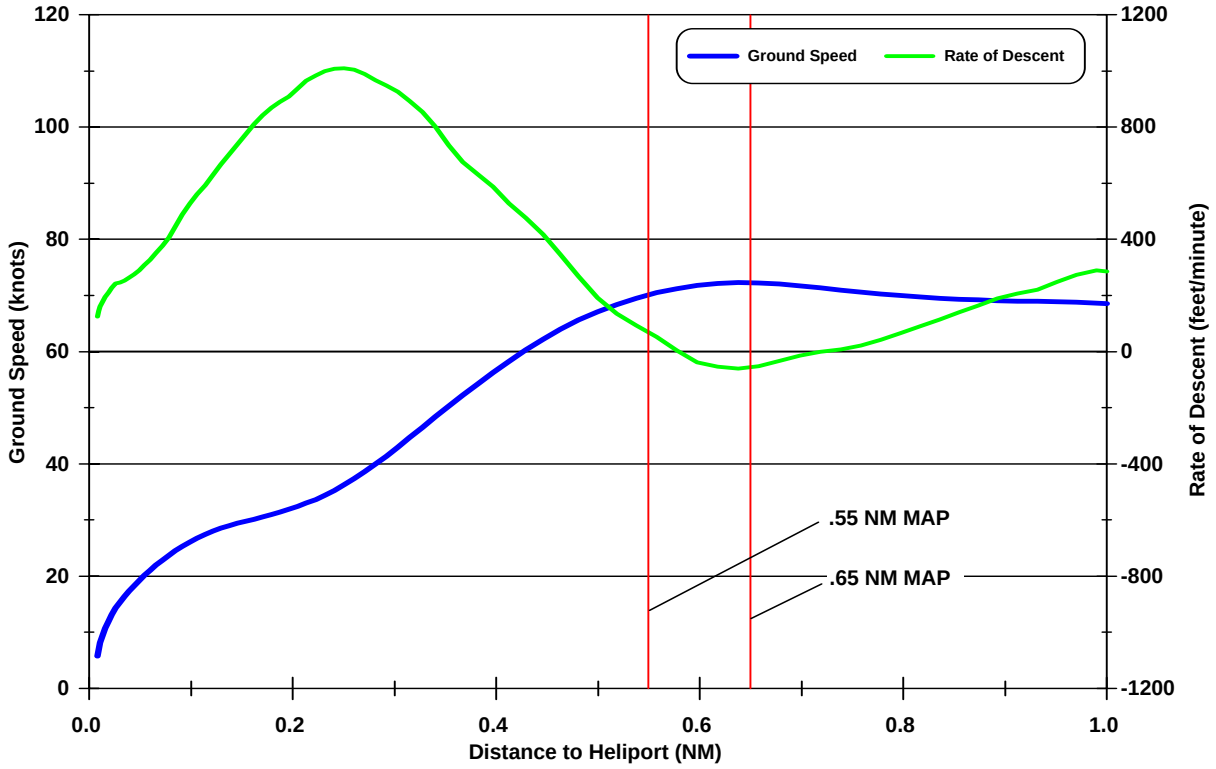



Approach - Plan View
Pilot P14 - 05/10/06B007 - Appr. #07W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
090/10
7
128/12
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

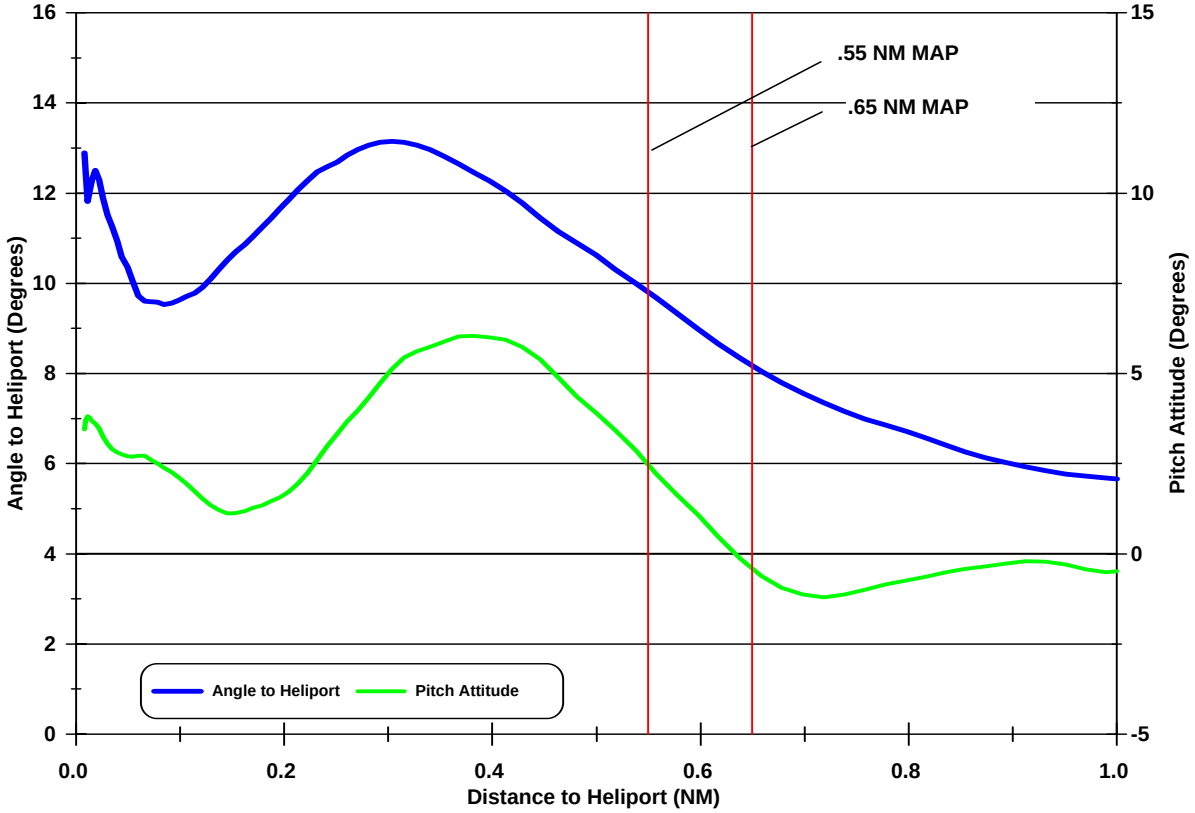
Profile View
Pilot P14 - 05/10/06B007 - Appr. #07W



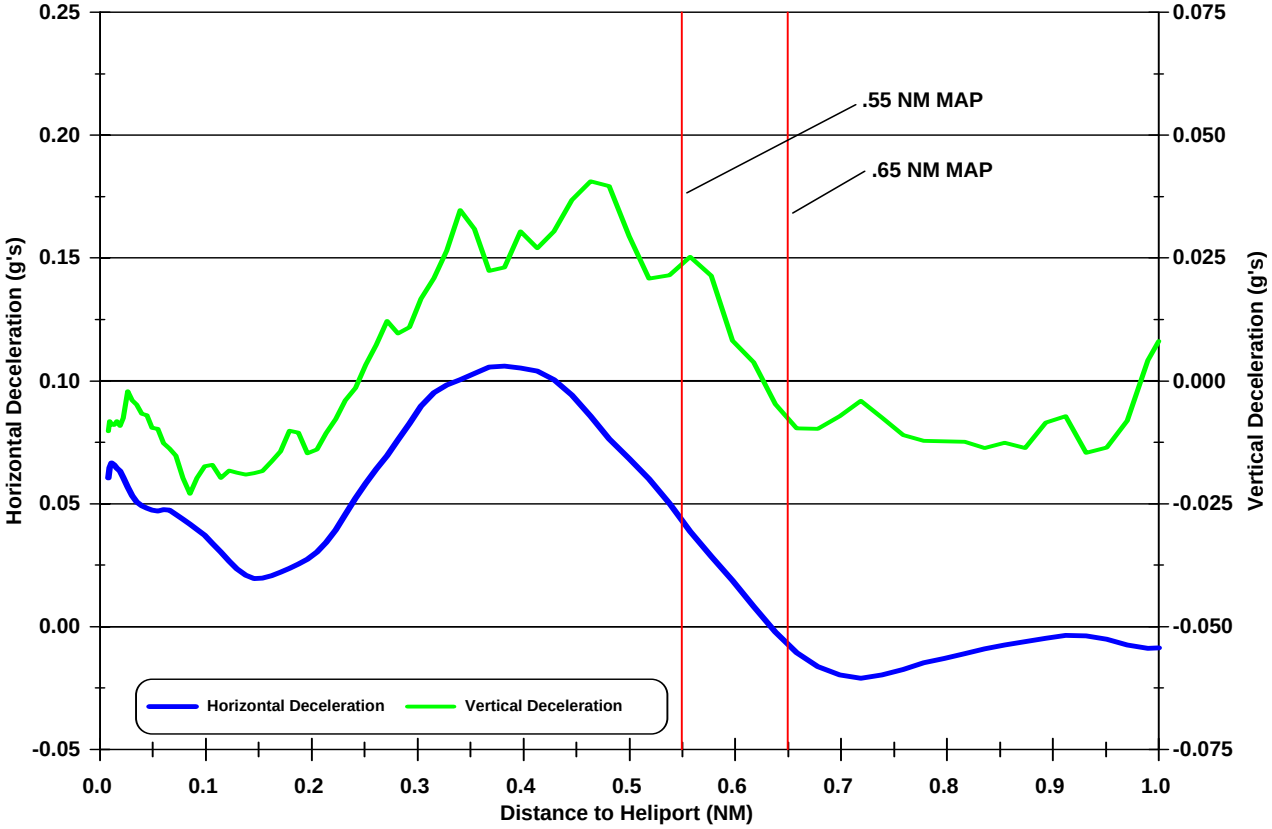
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06B007 - Appr. #07W

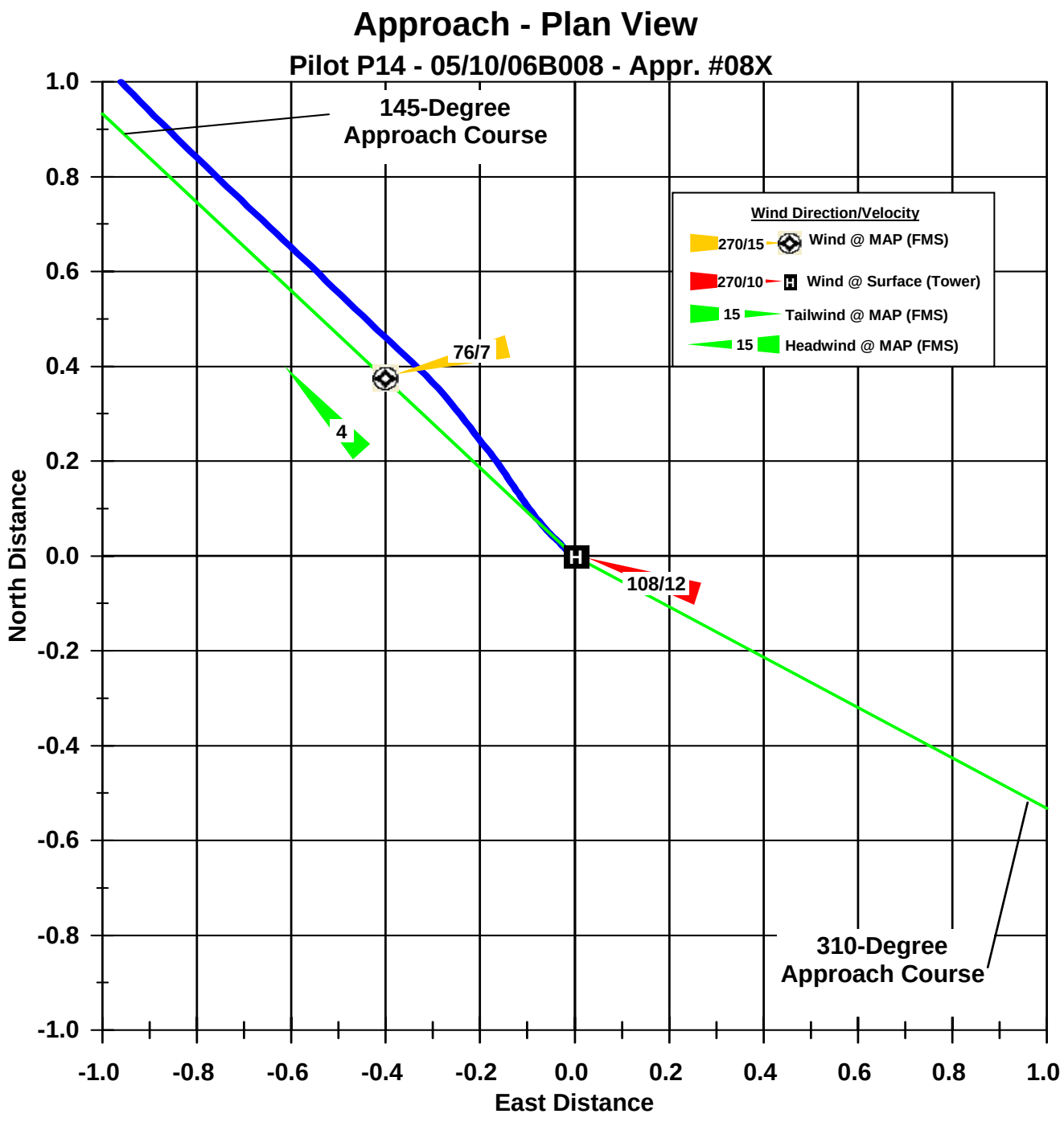


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06B007 - Appr. #07W

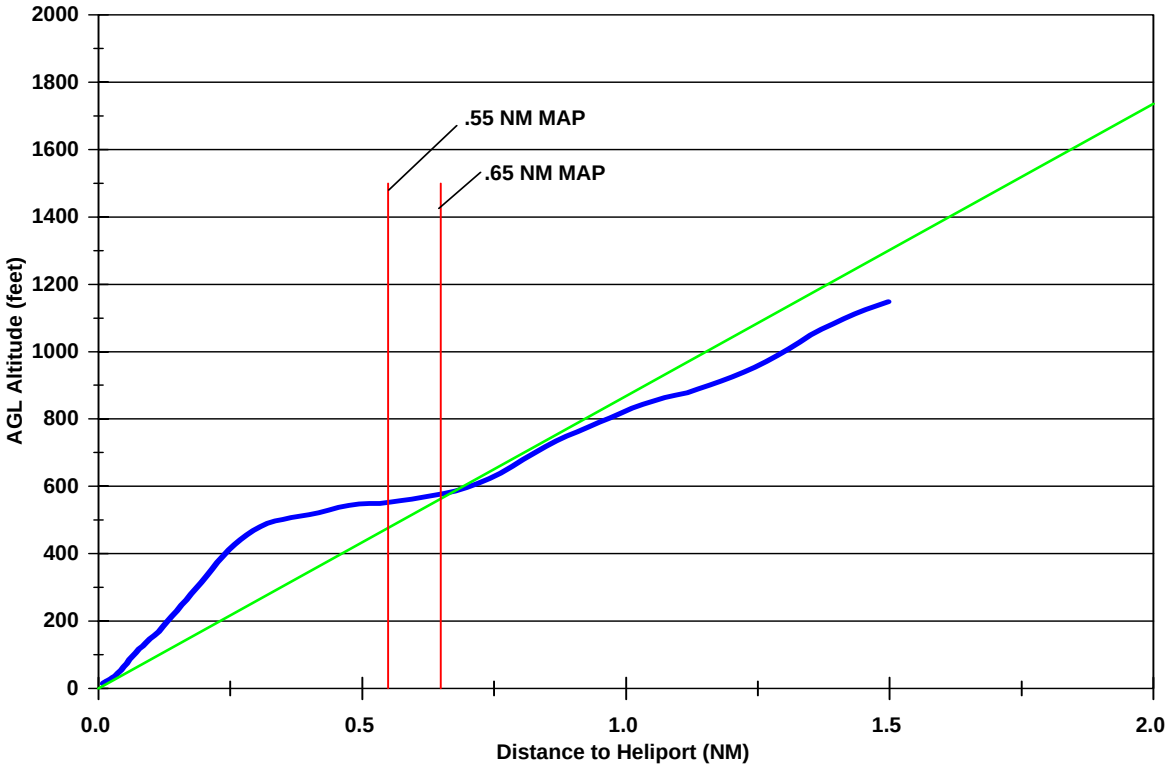


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06B007 - Appr. #07W

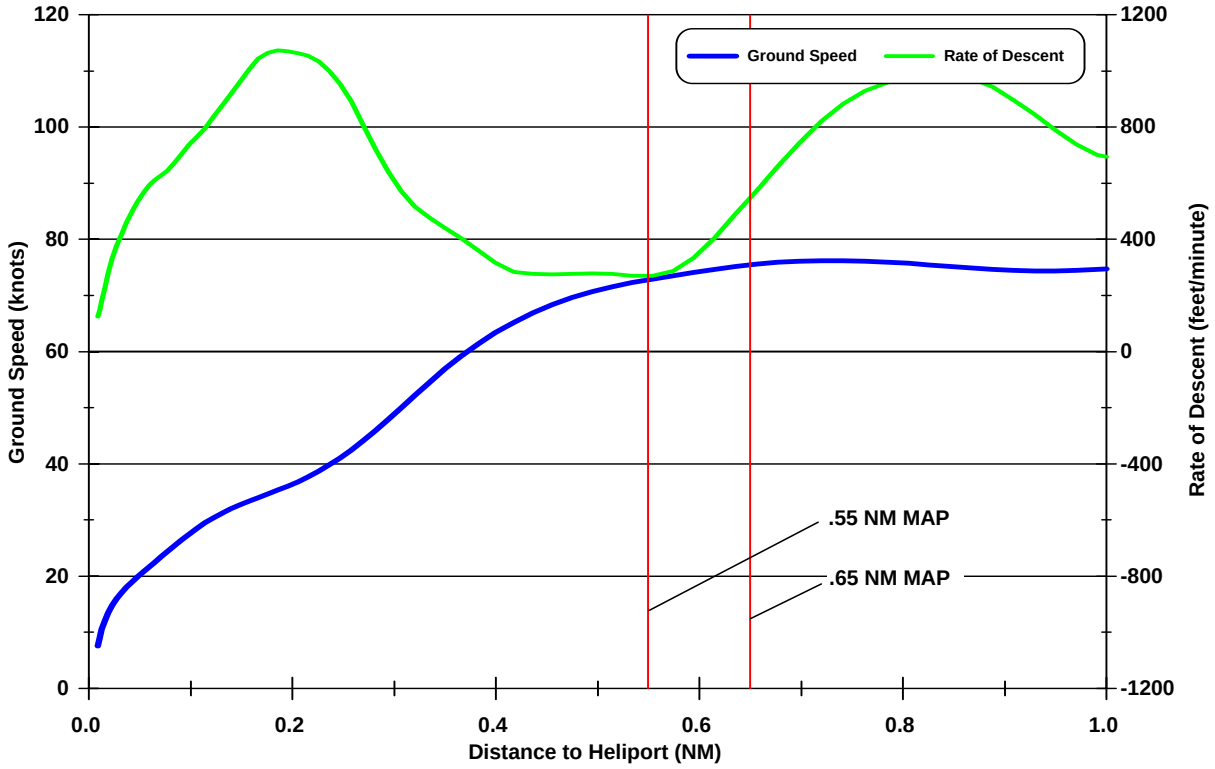



Approach - Plan View
Pilot P14 - 05/10/06B008 - Appr. #08X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
76/7
4
108/12
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

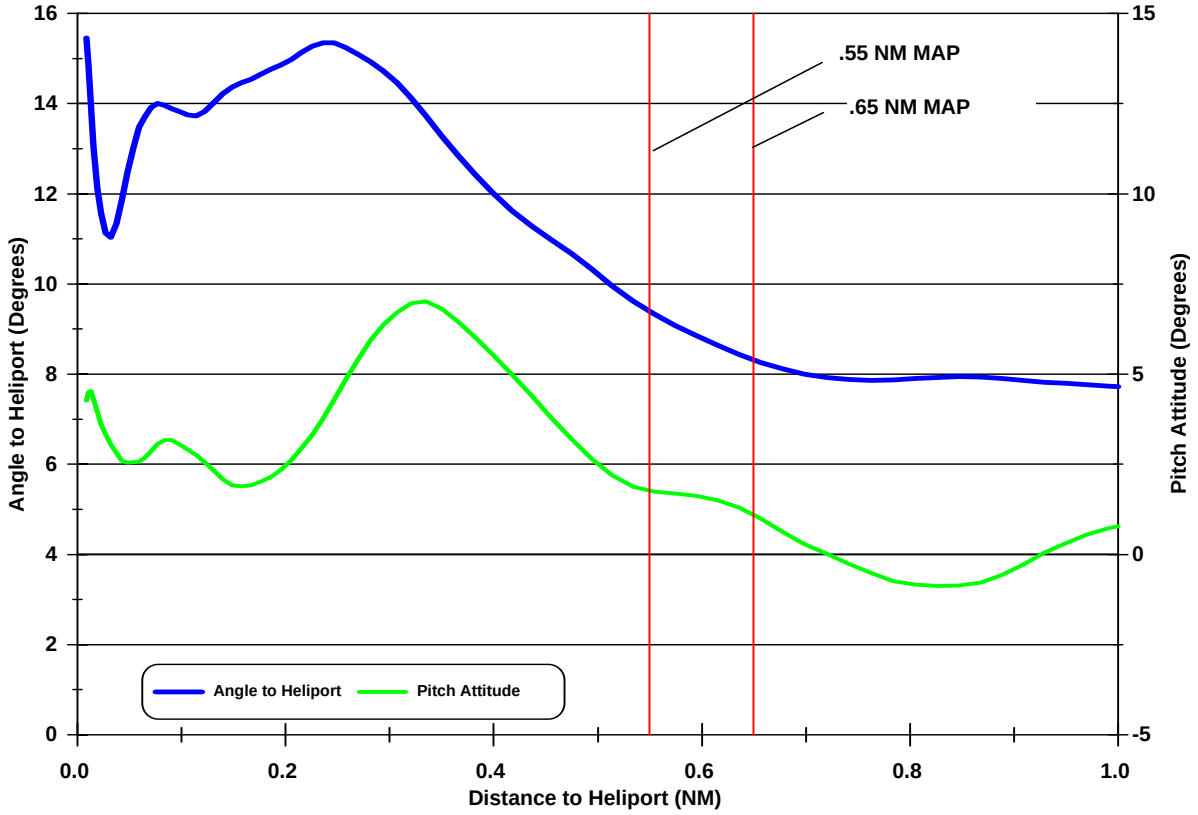
Profile View
Pilot P14 - 05/10/06B008 - Appr. #08X



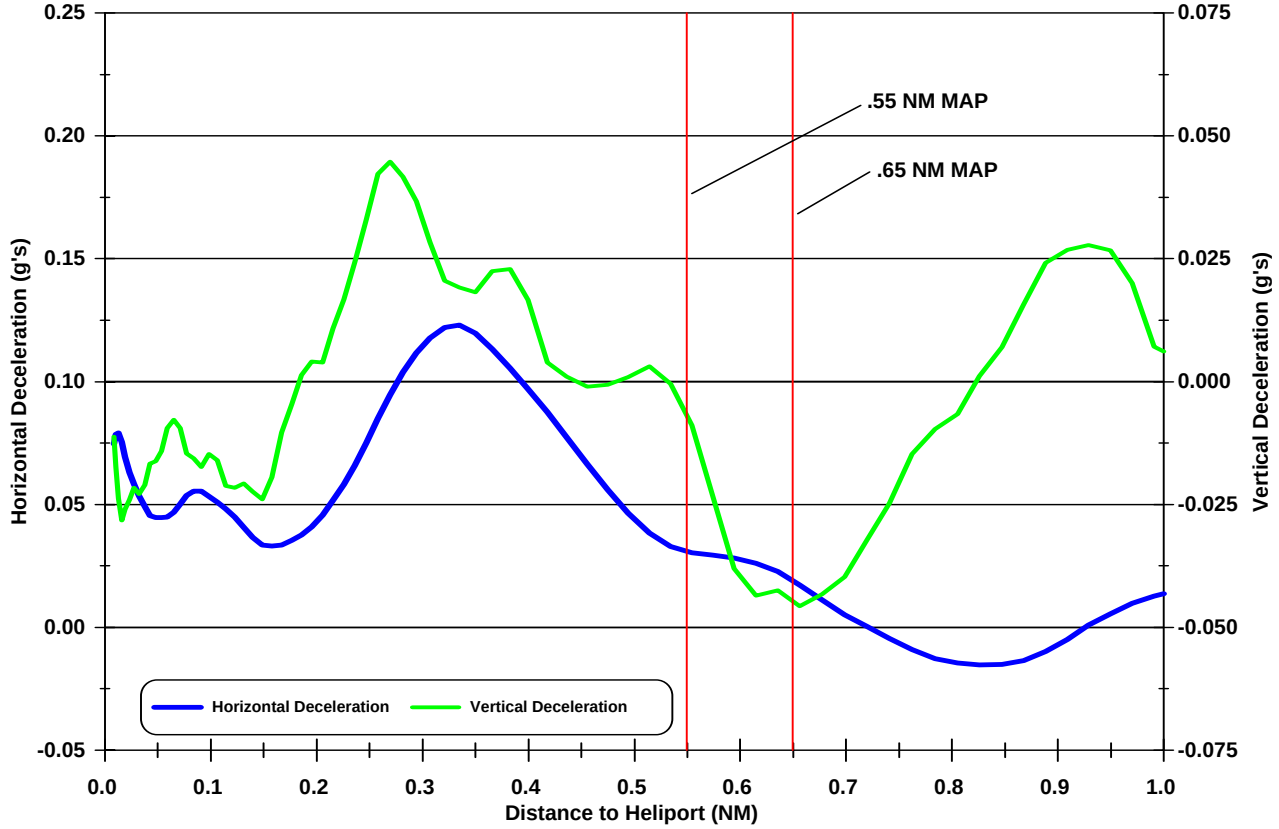
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06B008 - Appr. #08X

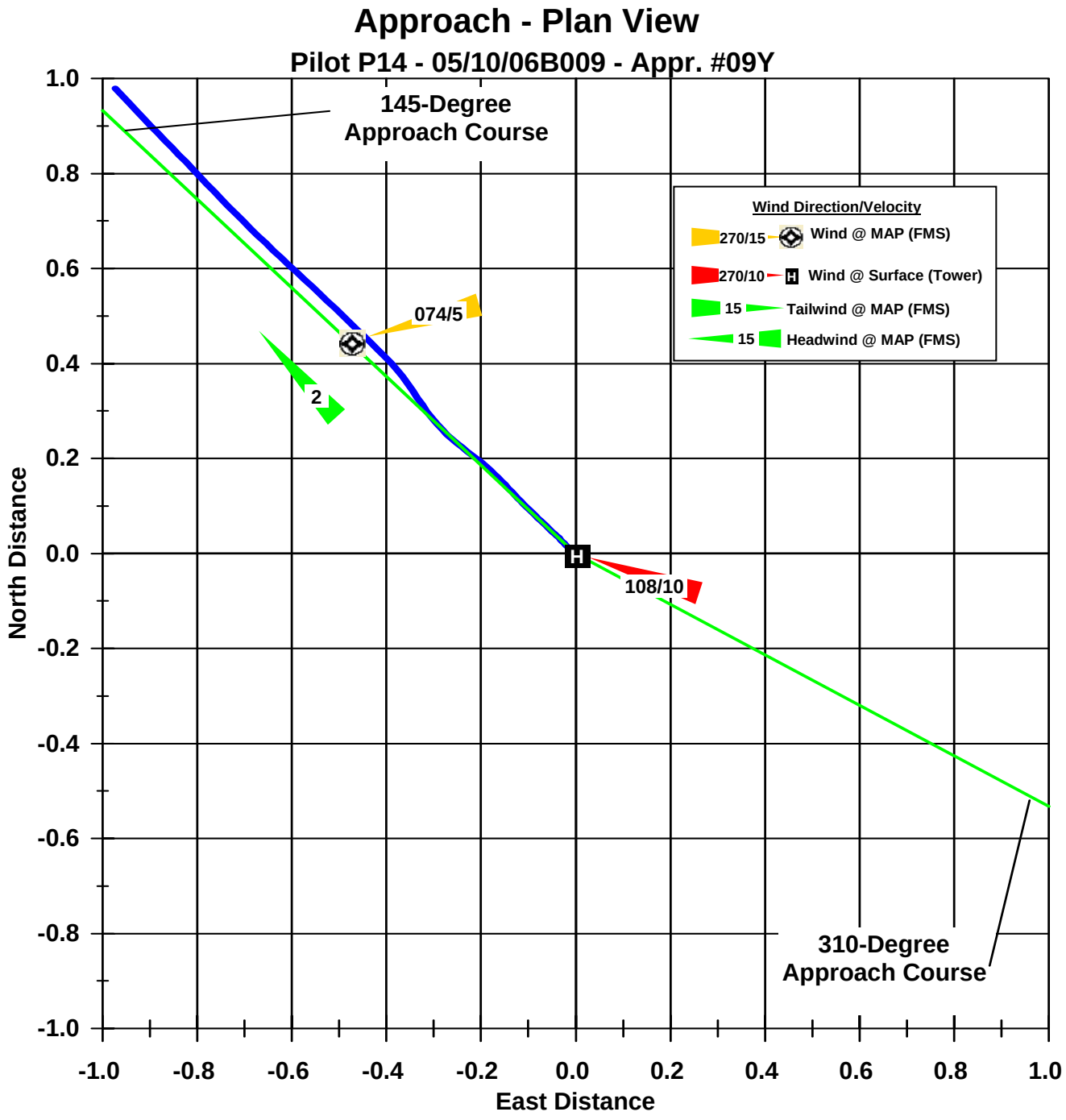


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06B008 - Appr. #08X

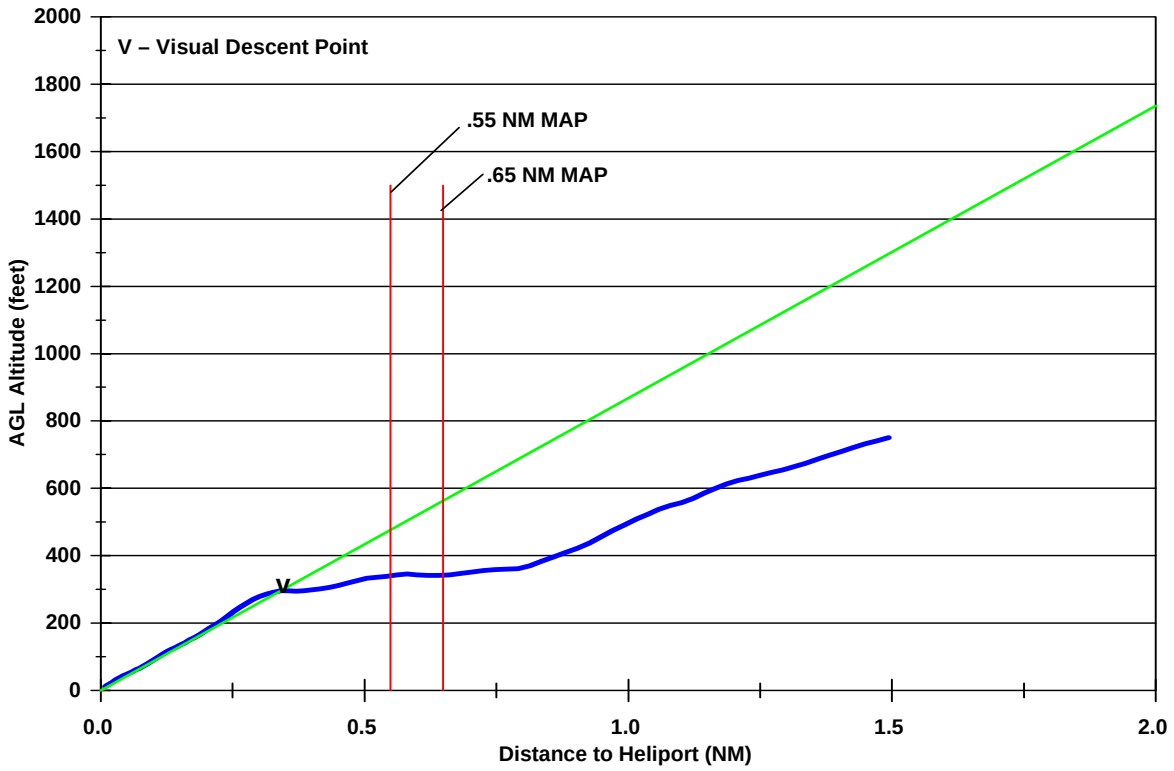


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06B008 - Appr. #08X

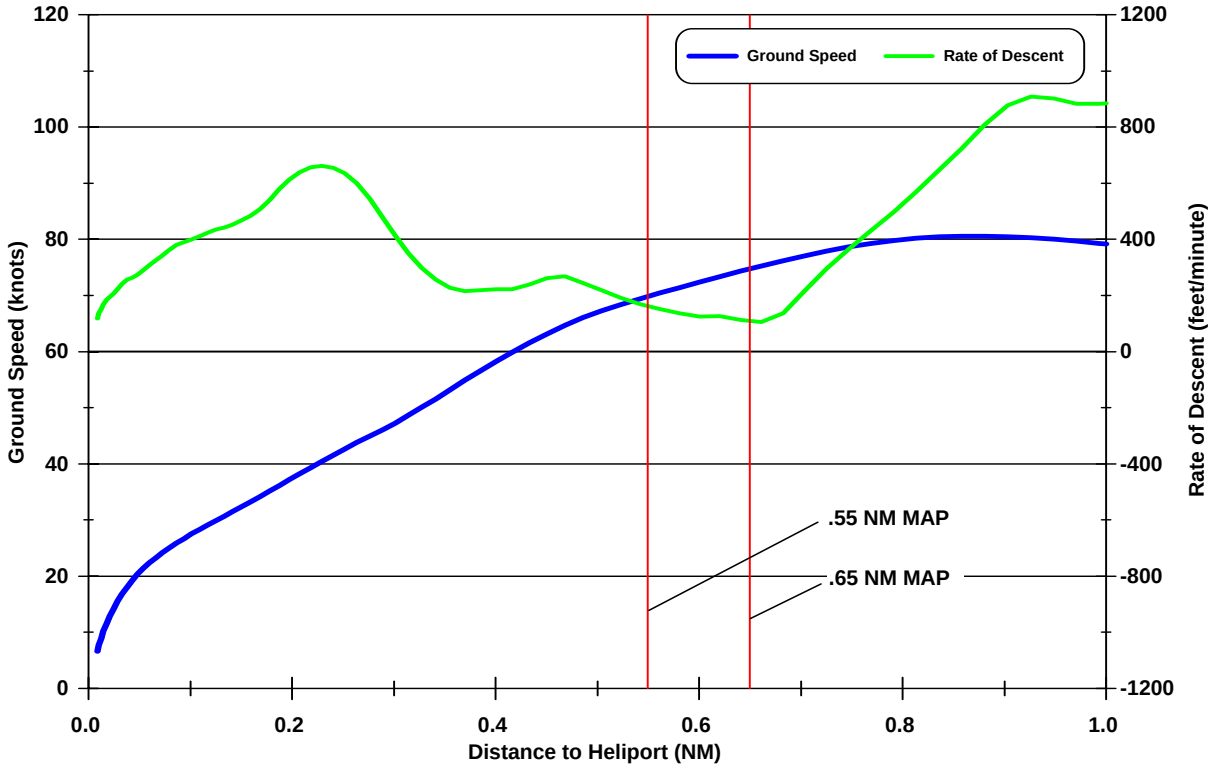



Approach - Plan View
Pilot P14 - 05/10/06B009 - Appr. #09Y
145-Degree
Approach Course
310-Degree
Approach Course
074/5
2
108/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

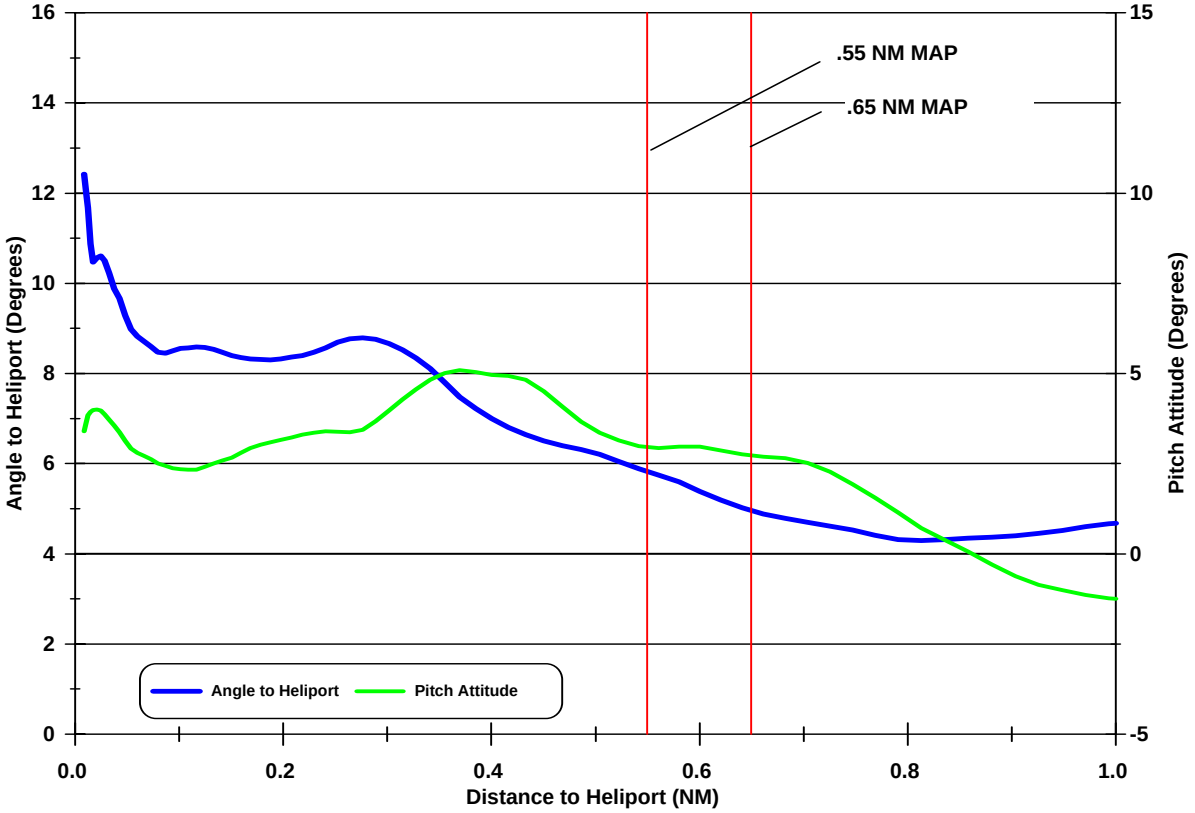
Profile View
Pilot P14 - 05/10/06B009 - Appr. #09Y



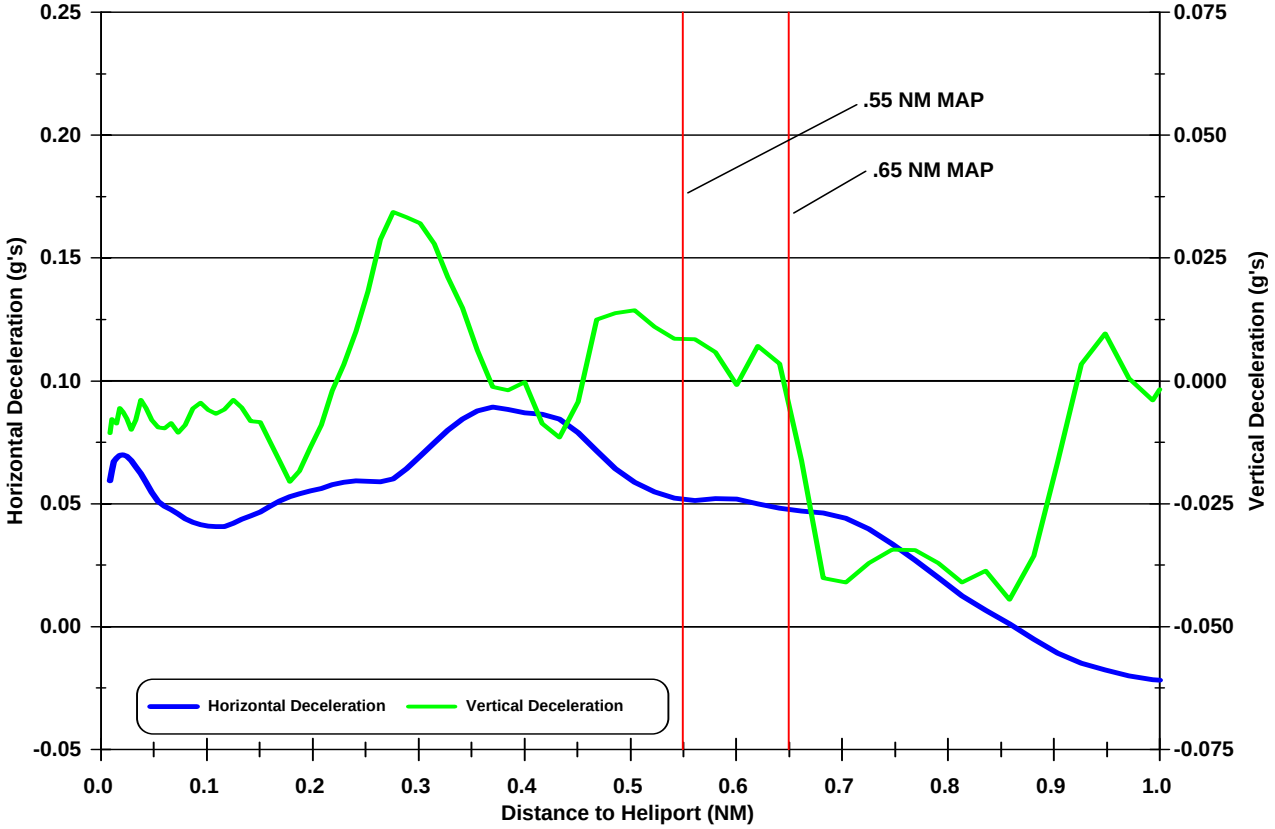
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06B009 - Appr. #09Y

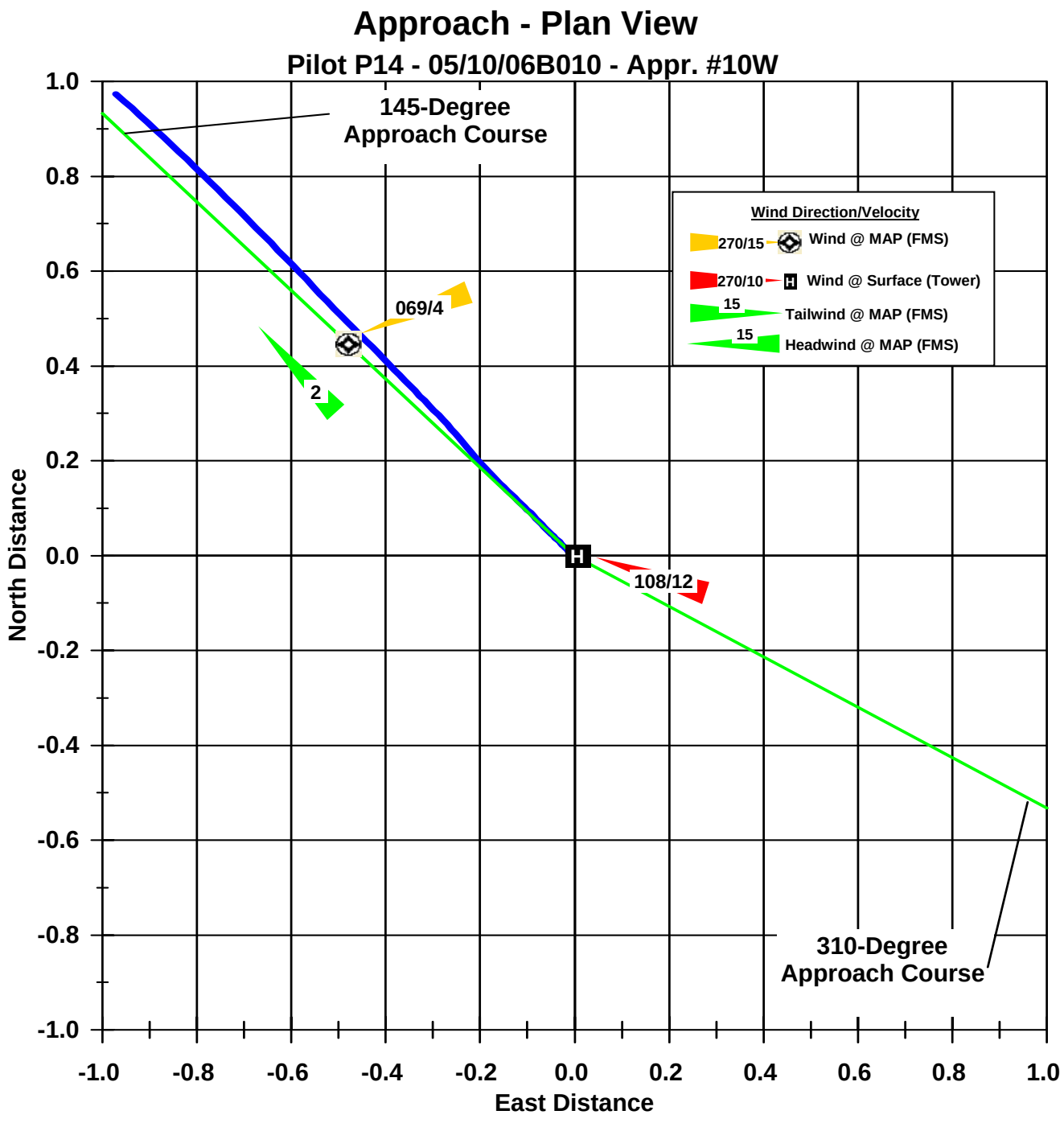


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06B009 - Appr. #09Y

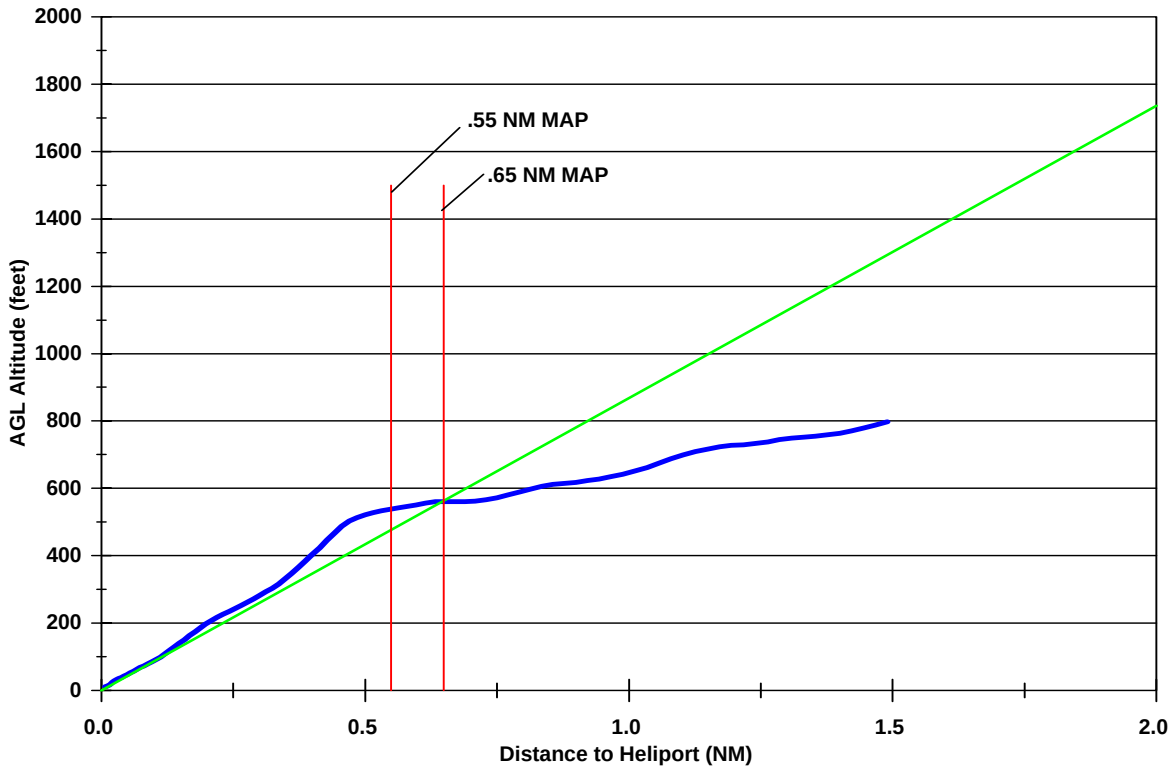


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06B009 - Appr. #09Y

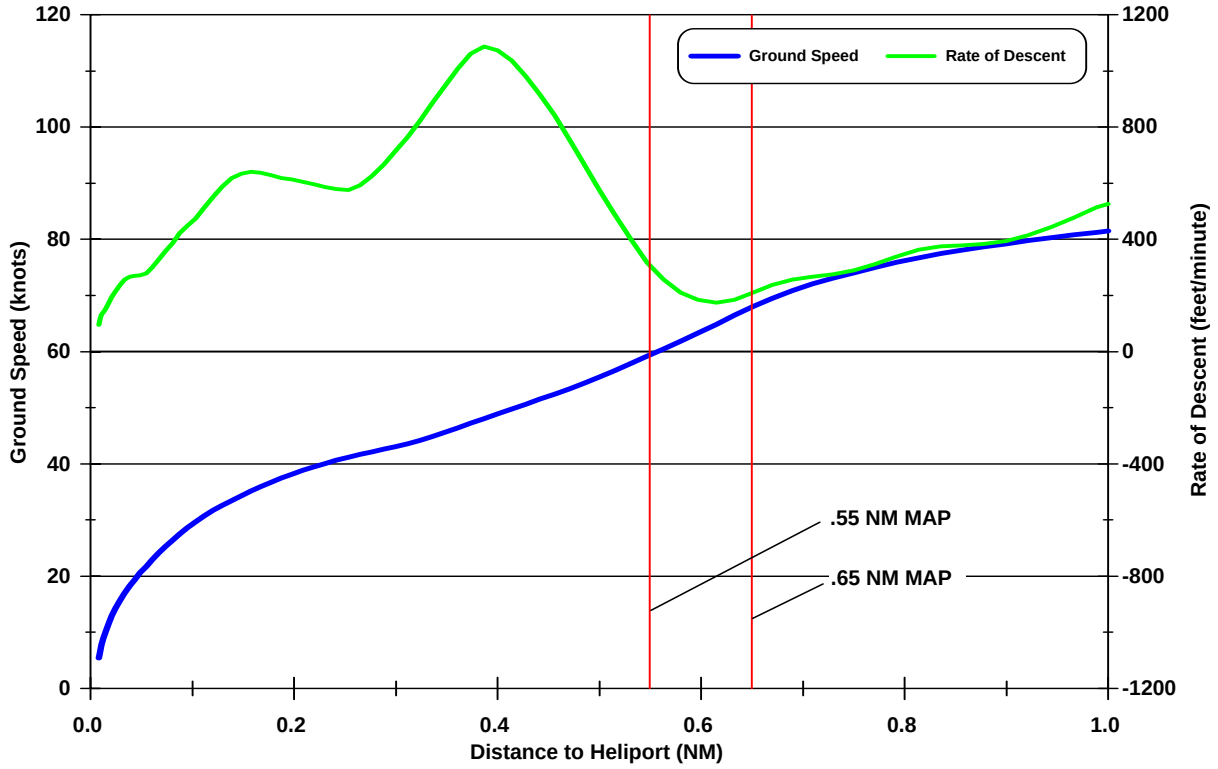



Approach - Plan View
Pilot P14 - 05/10/06B010 - Appr. #10W
145-Degree
Approach Course
310-Degree
Approach Course
069/4
2
108/12
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

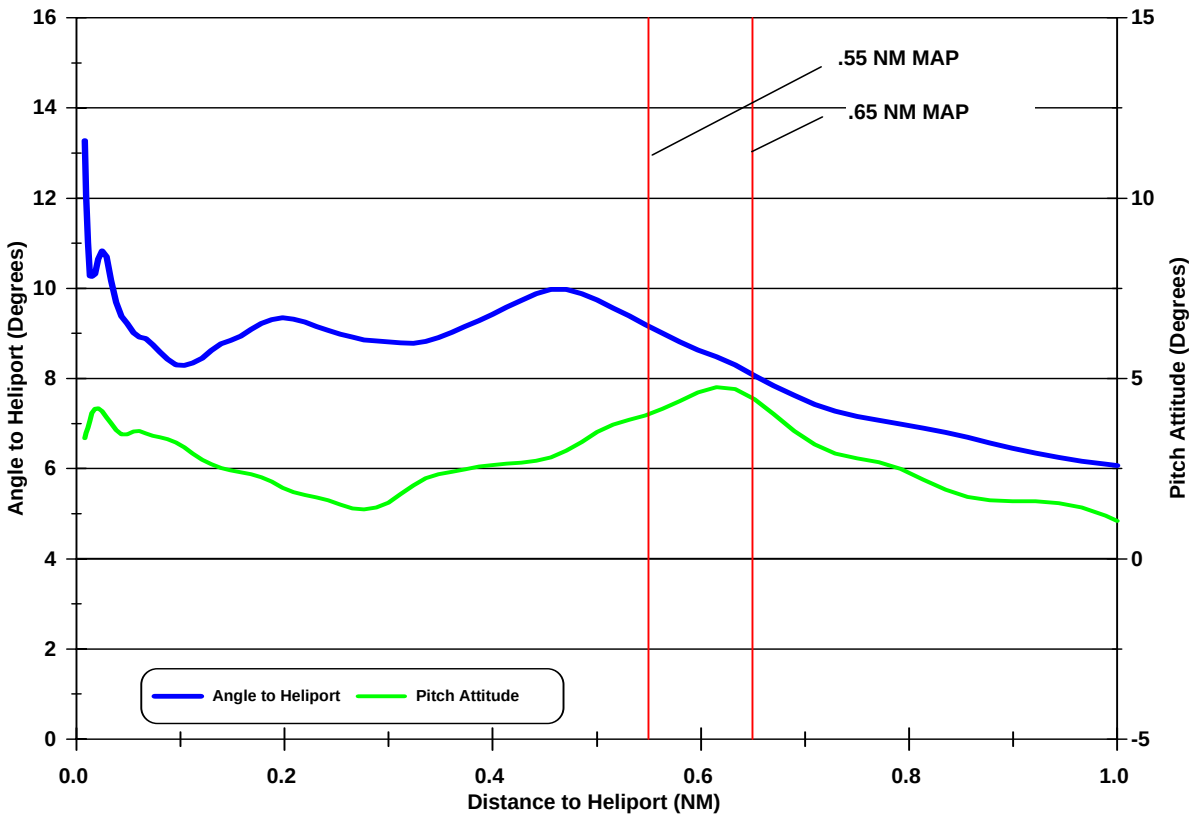
Profile View
Pilot P14 - 05/10/06B010 - Appr. #10W



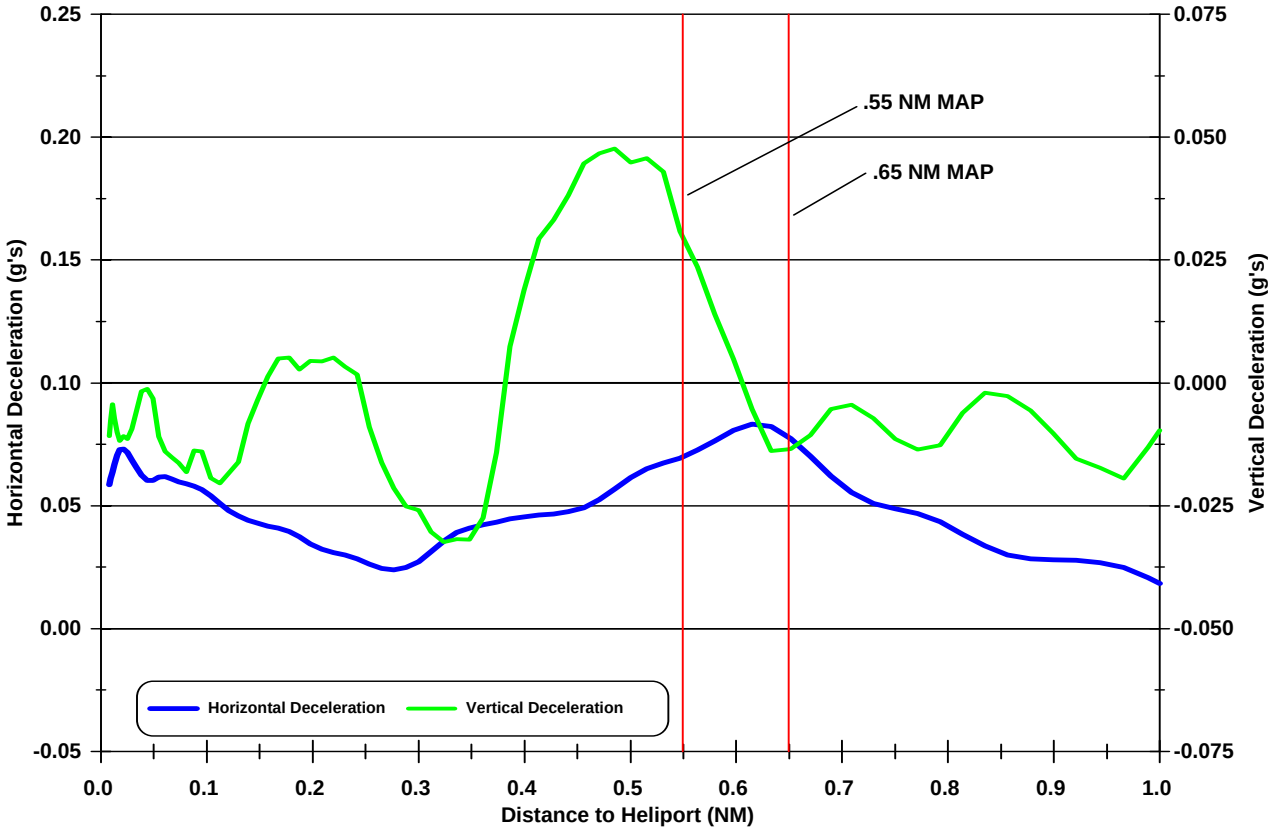
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06B010 - Appr. #10W

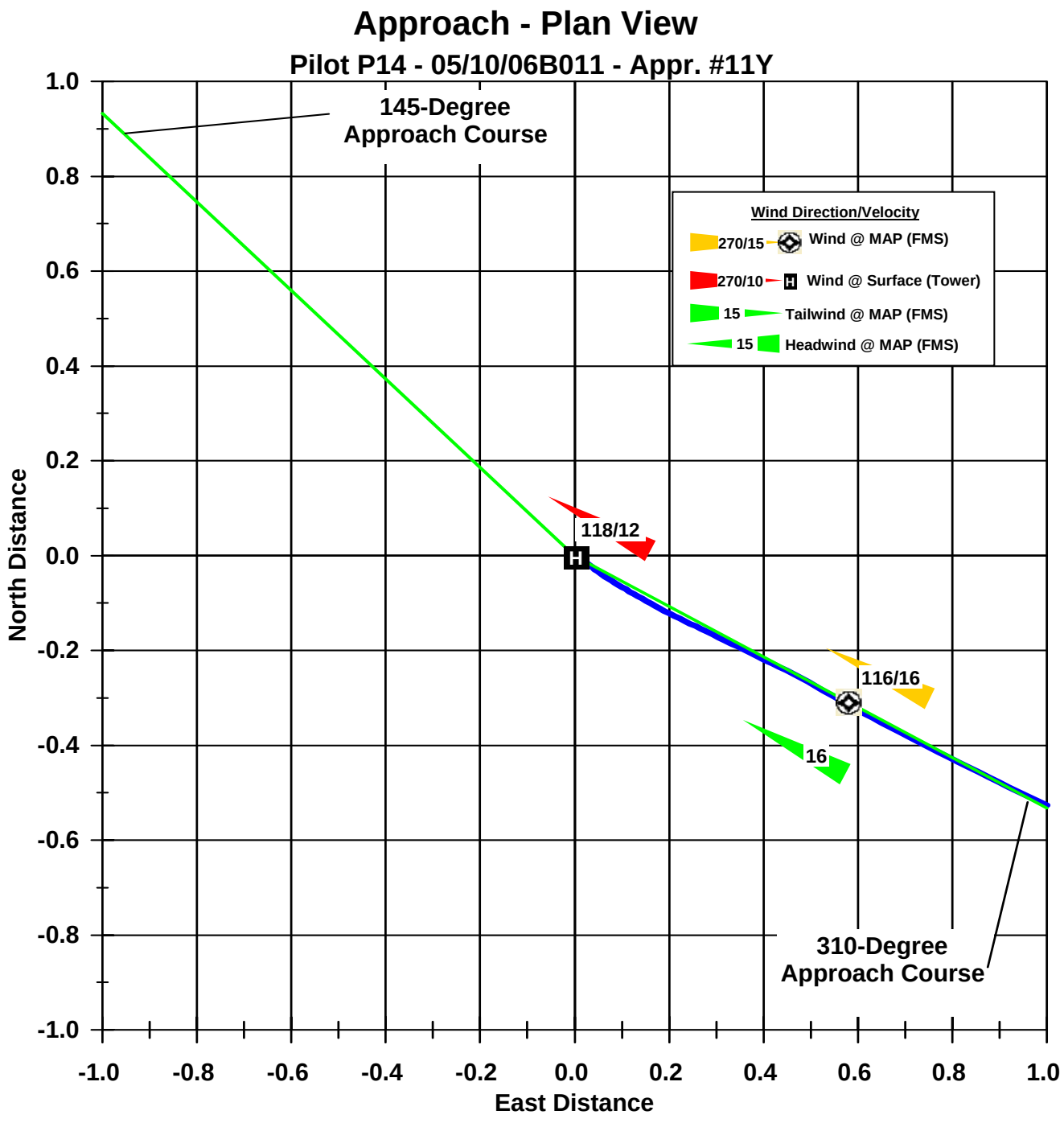


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06B010 - Appr. #10W

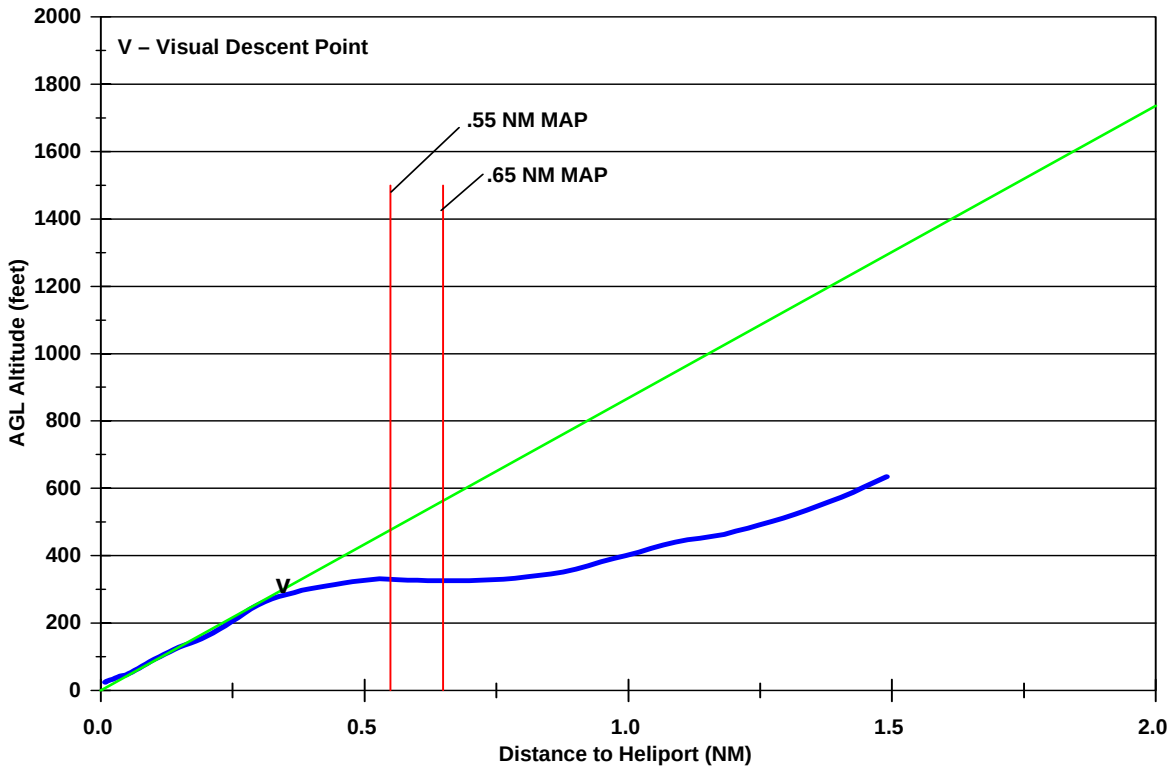


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06B010 - Appr. #10W

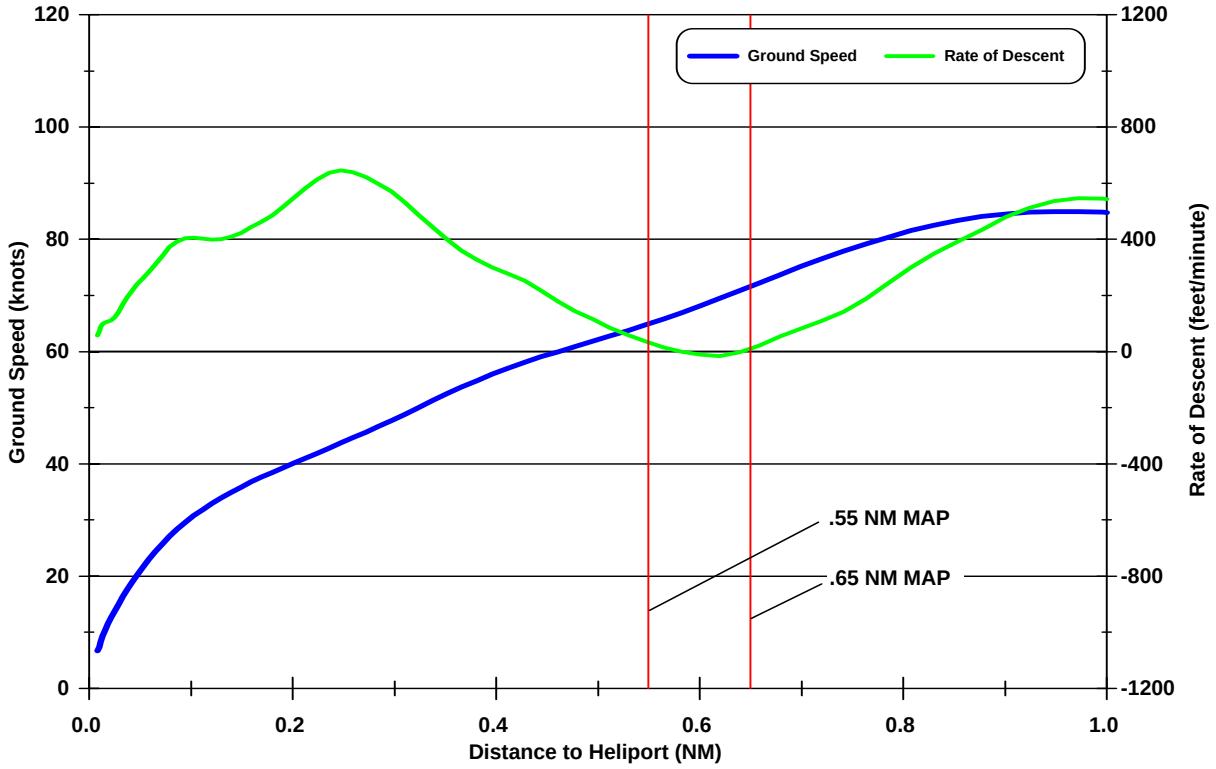



Approach - Plan View
Pilot P14 - 05/10/06B011 - Appr. #11Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
118/12
116/16
16
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

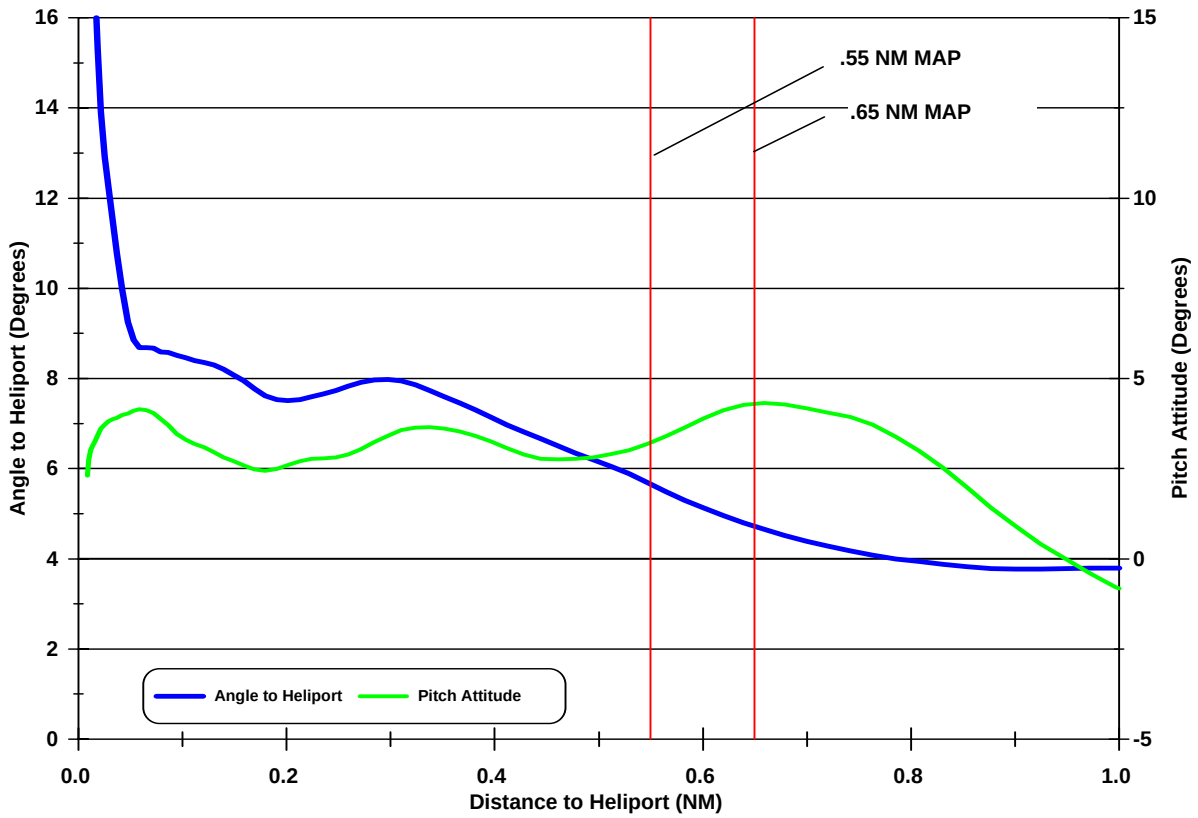
Profile View
Pilot P14 - 05/10/06B011 - Appr. #11Y



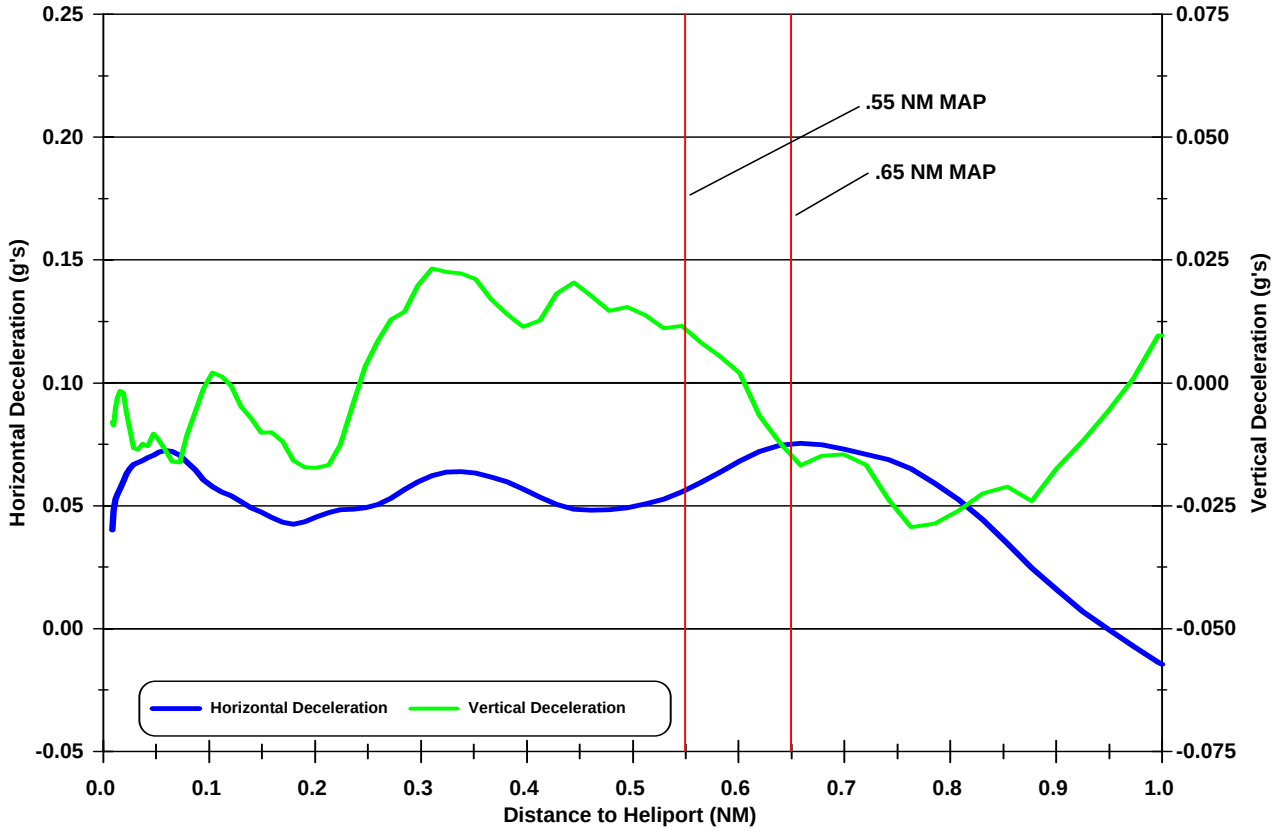
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06B011 - Appr. #11Y

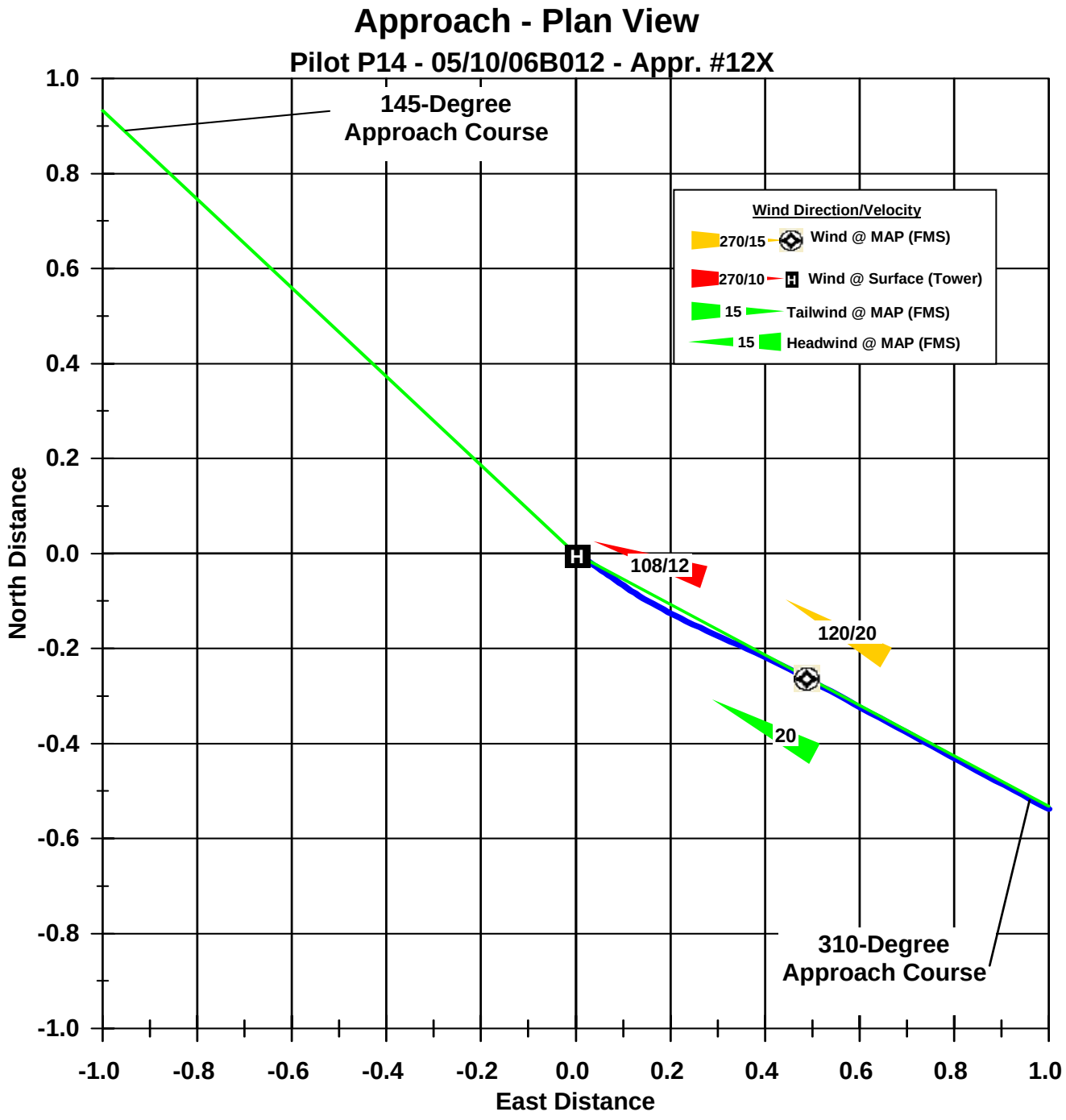


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06B011 - Appr. #11Y

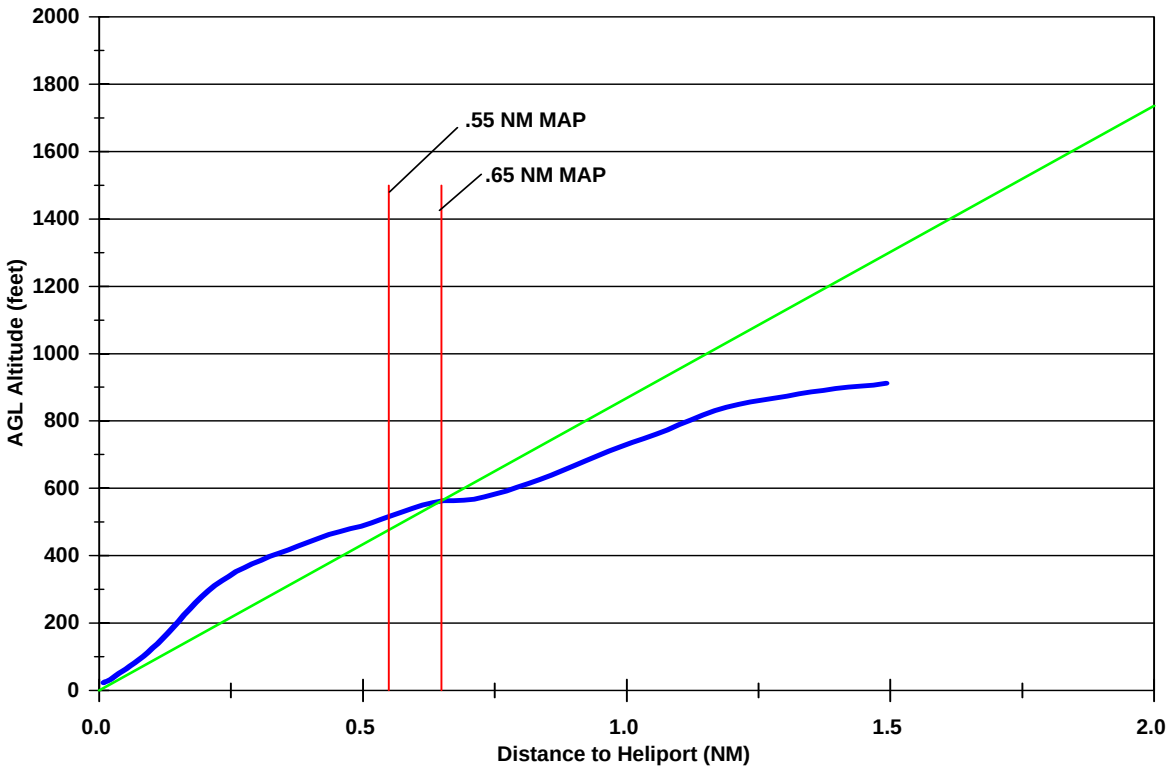


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06B011 - Appr. #11Y

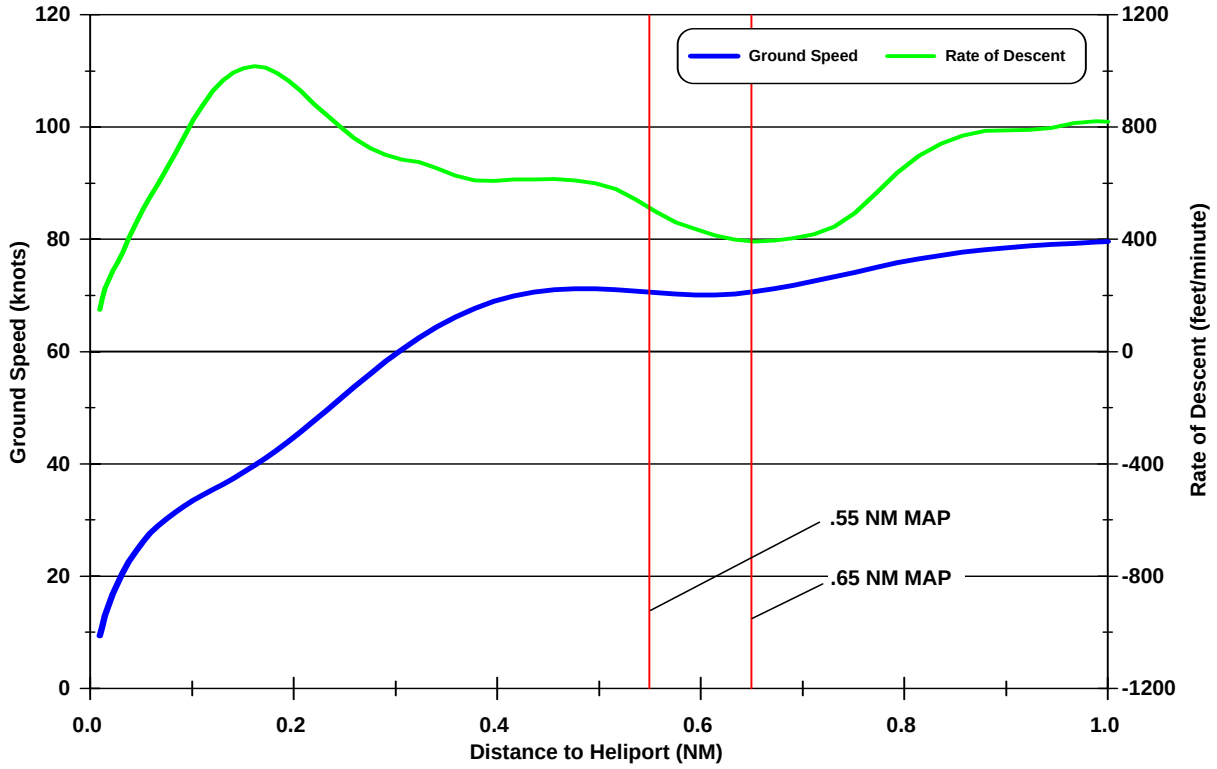



Approach - Plan View
Pilot P14 - 05/10/06B012 - Appr. #12X
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
108/12
120/20
20
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

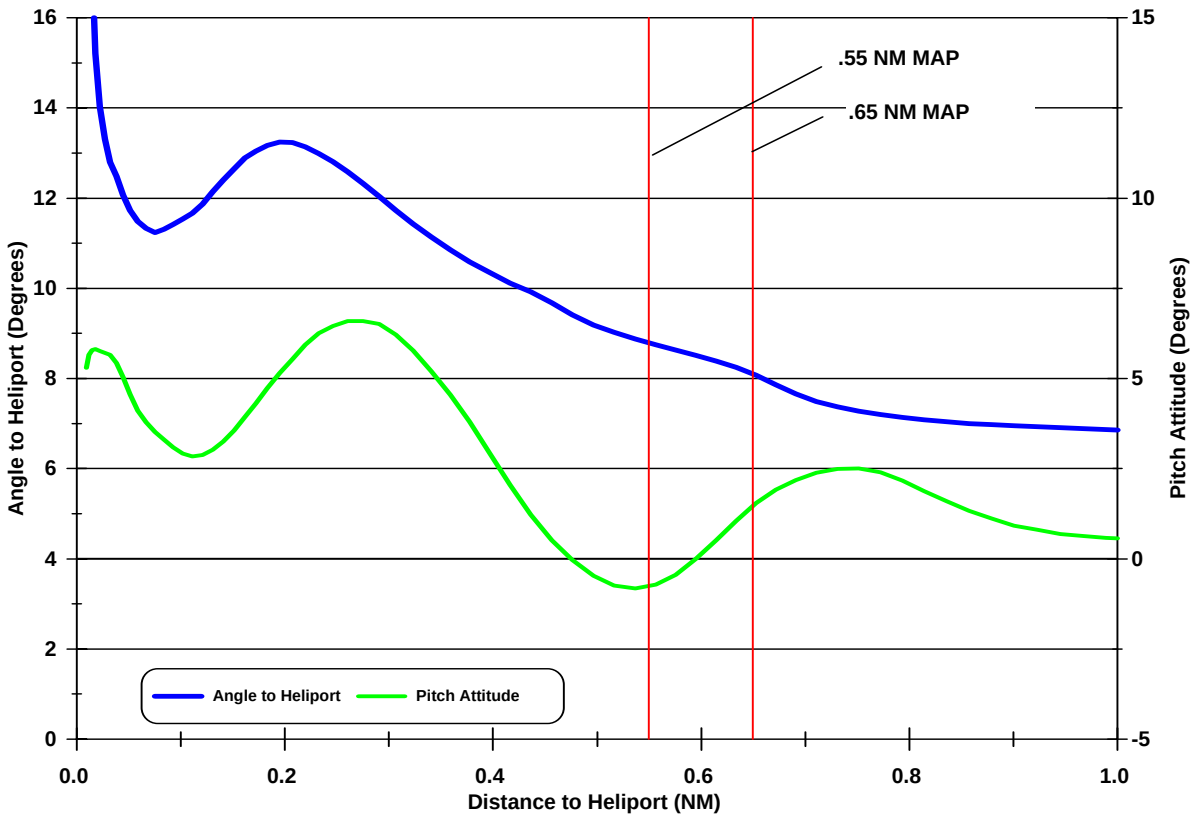
Profile View
Pilot P14 - 05/10/06B012 - Appr. #12X



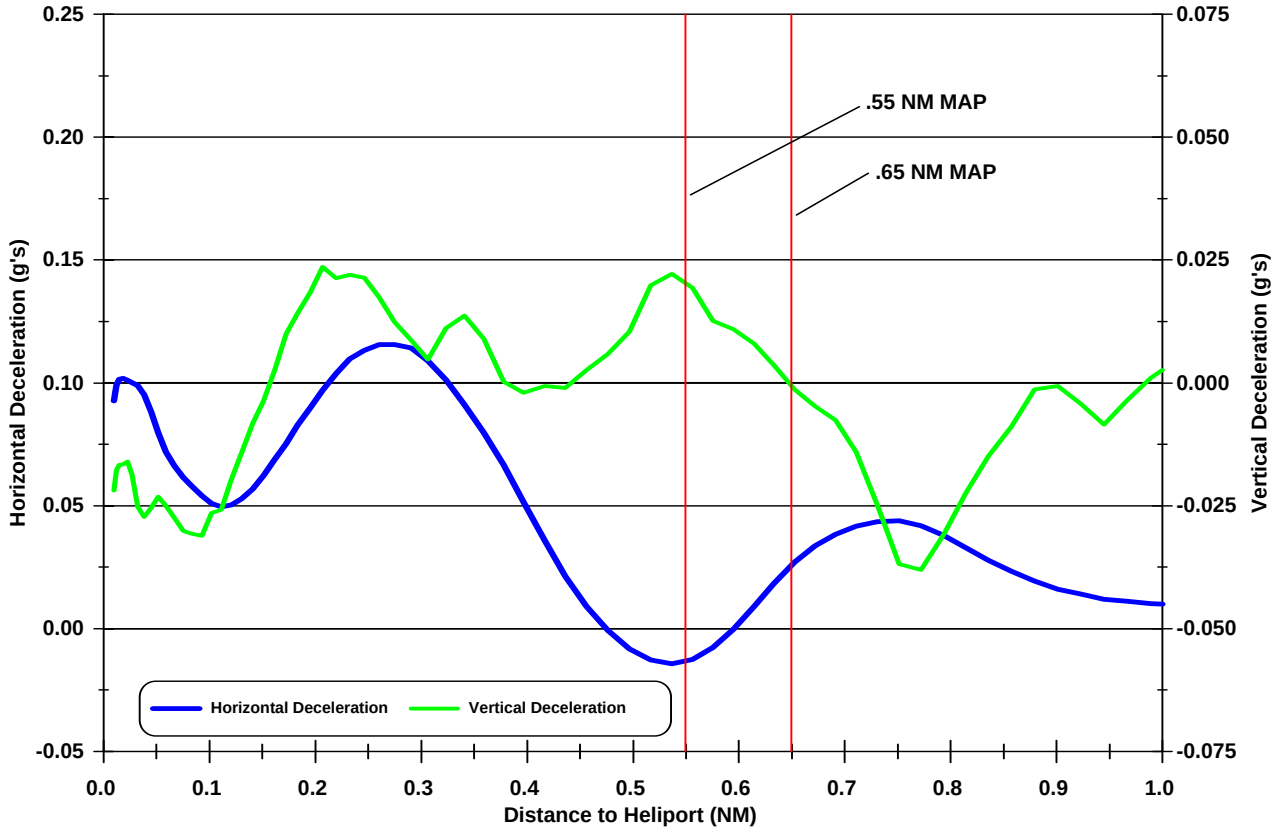
Ground Speed and Rate of Descent
Pilot P14 - 05/10/06B012 - Appr. #12X

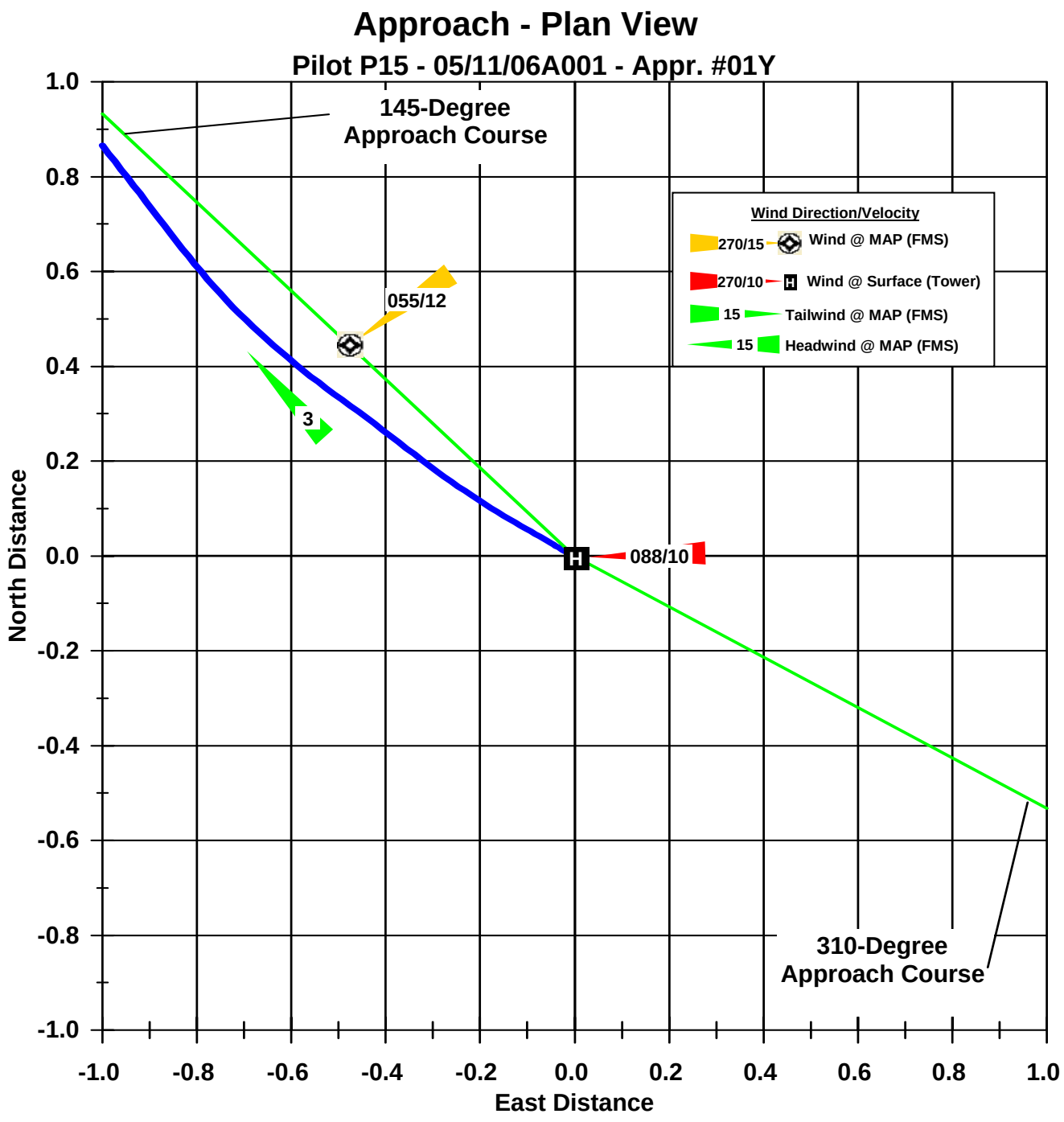


Angle to Heliport and Pitch Attitude
Pilot P14 - 05/10/06B012 - Appr. #12X

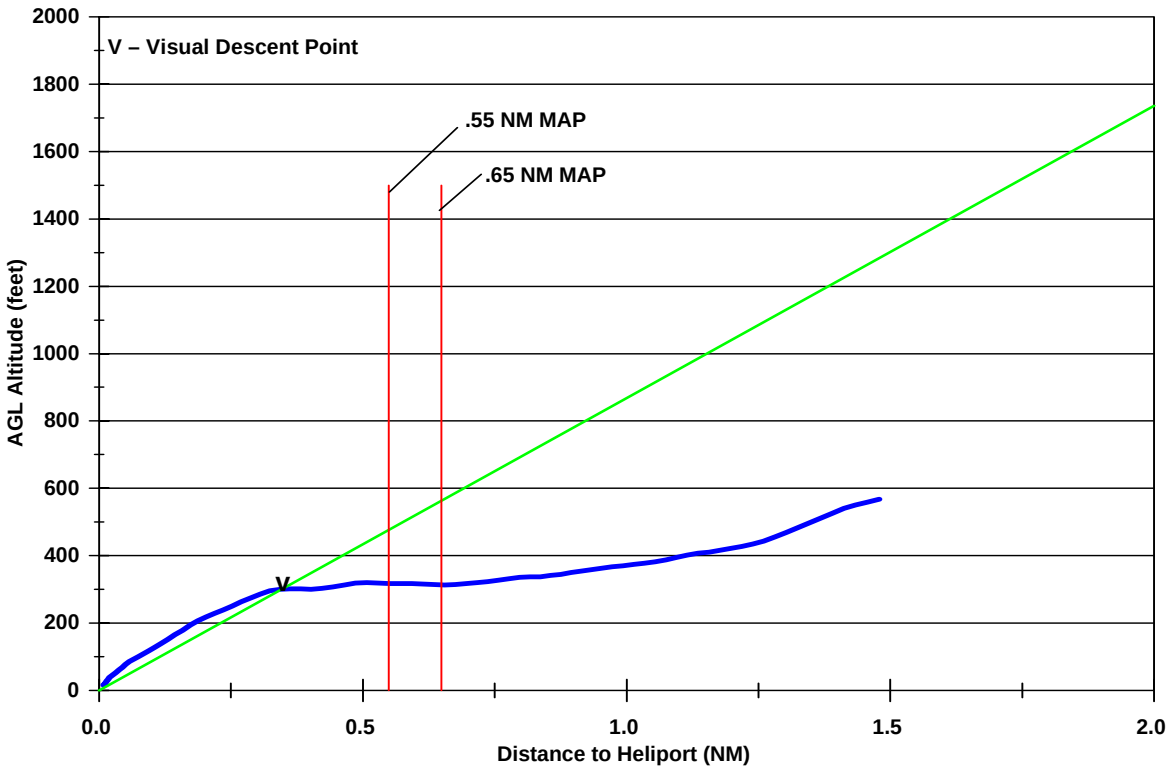


Horizontal and Vertical Deceleration
Pilot P14 - 05/10/06B012 - Appr. #12X

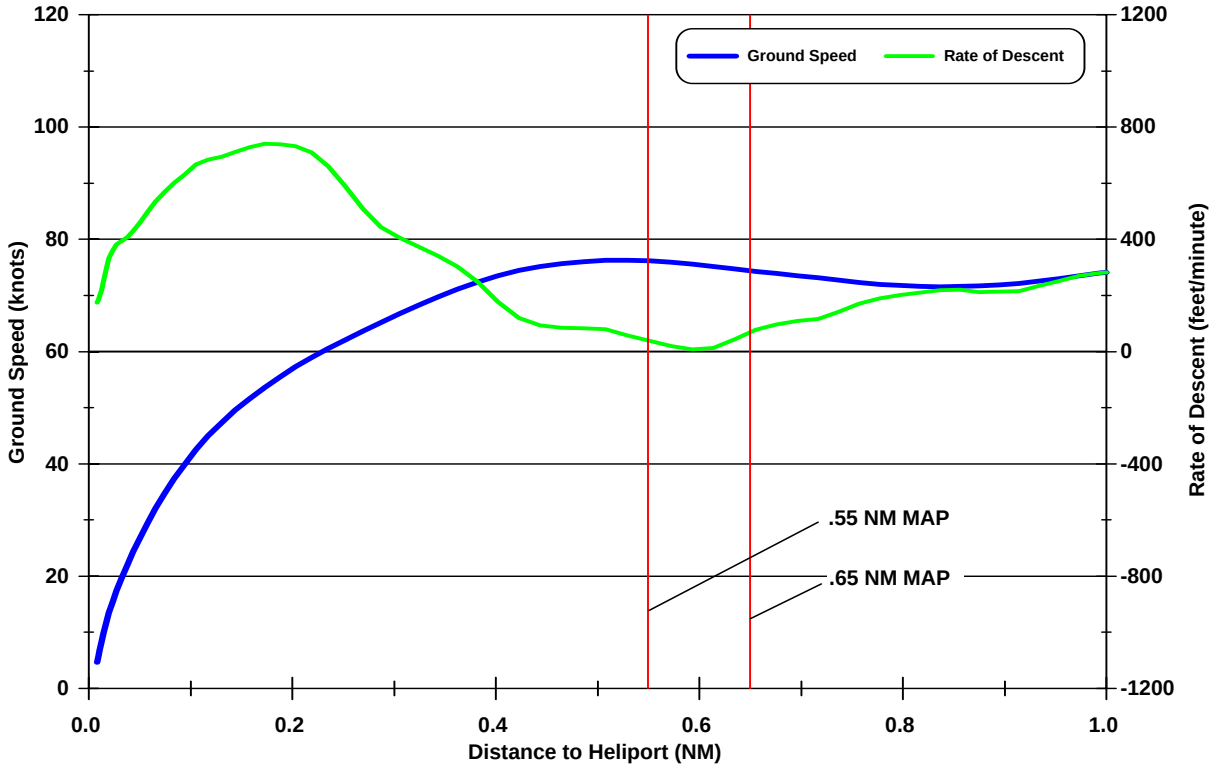



Approach - Plan View
Pilot P15 - 05/11/06A001 - Appr. #01Y
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
055/12
3
088/10
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

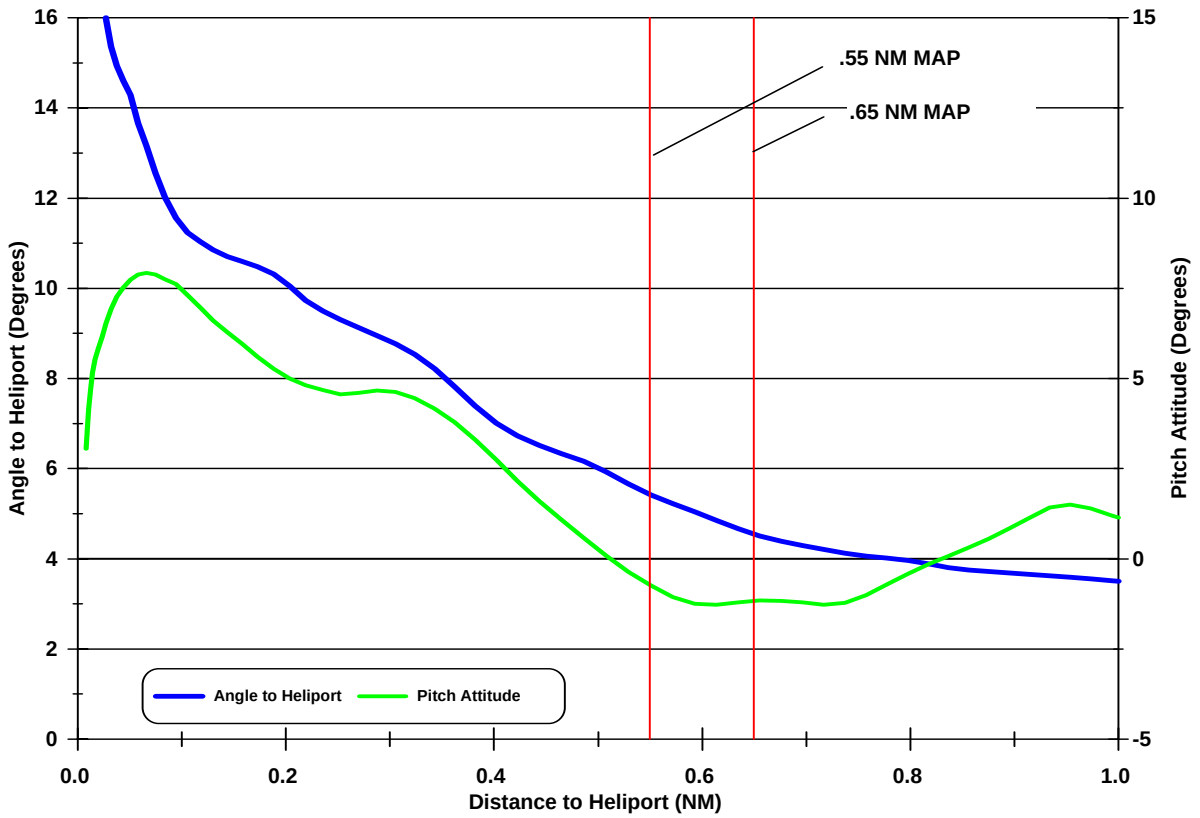
Profile View
Pilot P15 - 05/11/06A001 - Appr. #01Y



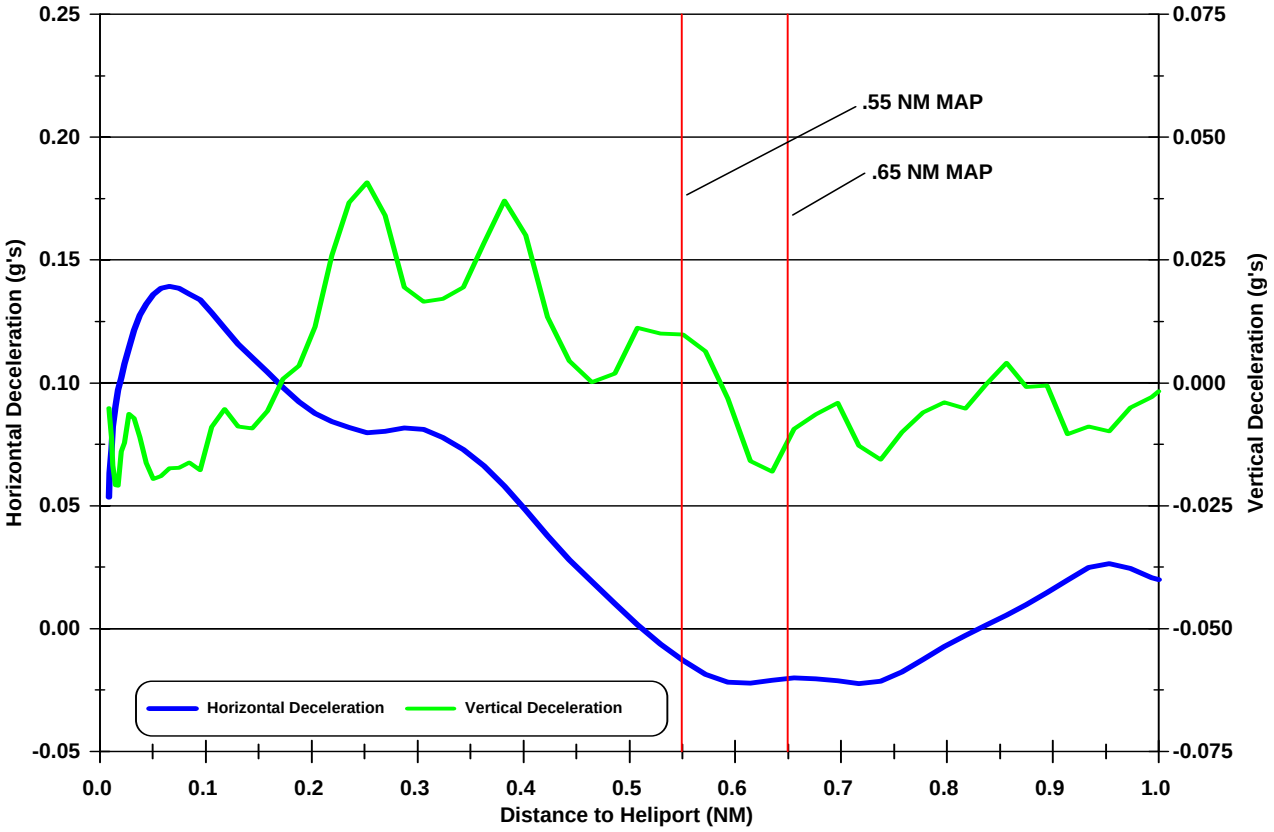
Ground Speed and Rate of Descent
Pilot P15 - 05/11/06A001 - Appr. #01Y

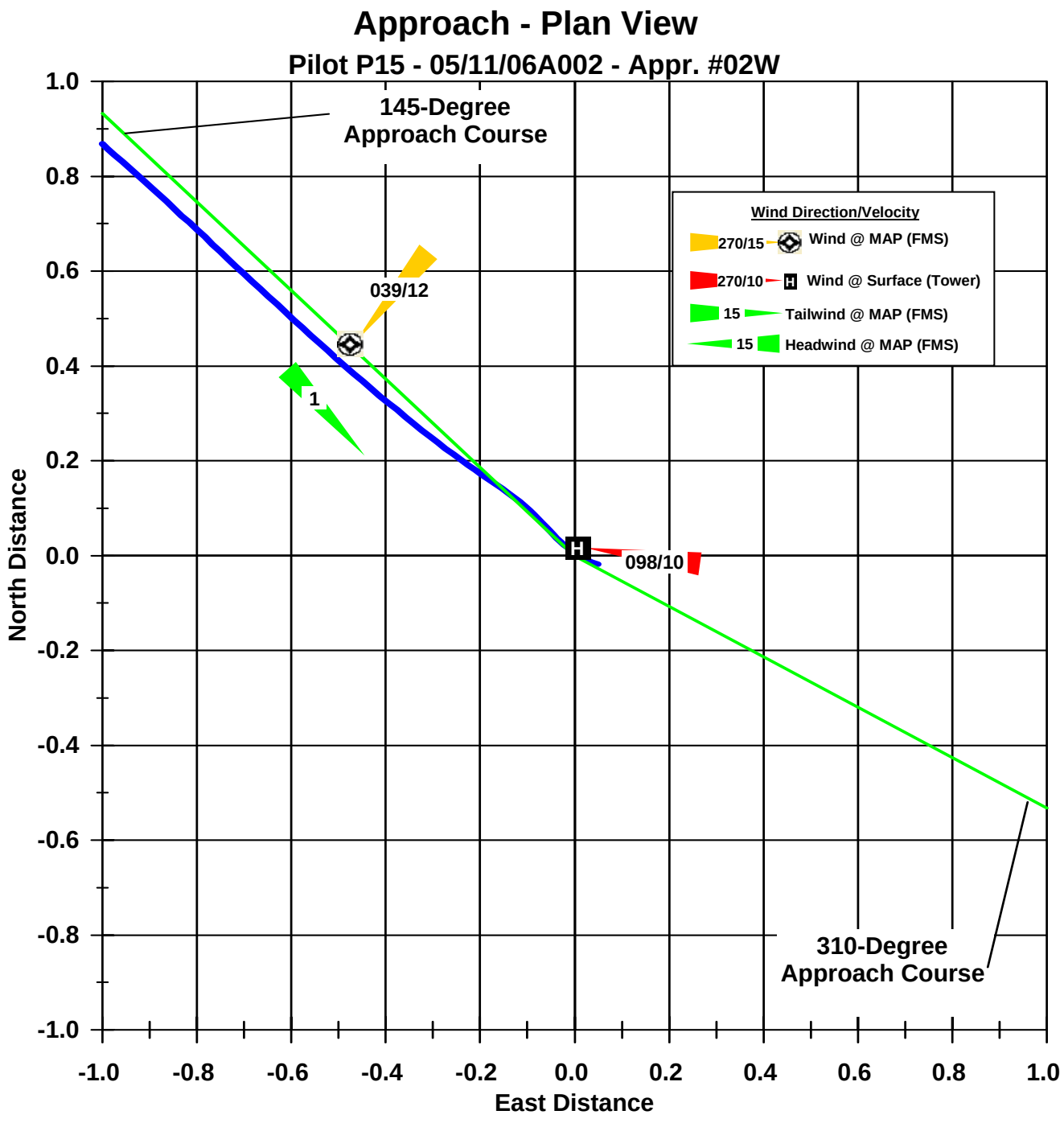


Angle to Heliport and Pitch Attitude
Pilot P15 - 05/11/06A001 - Appr. #01Y

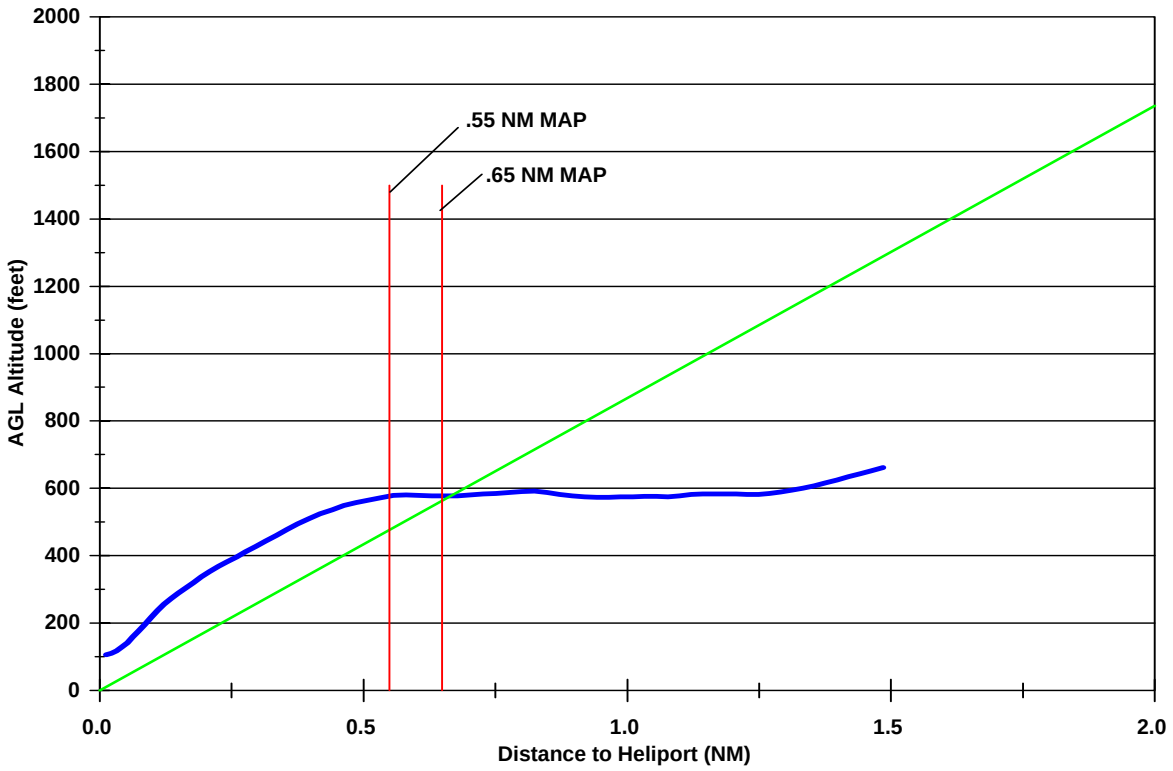


Horizontal and Vertical Deceleration
Pilot P15 - 05/11/06A001 - Appr. #01Y

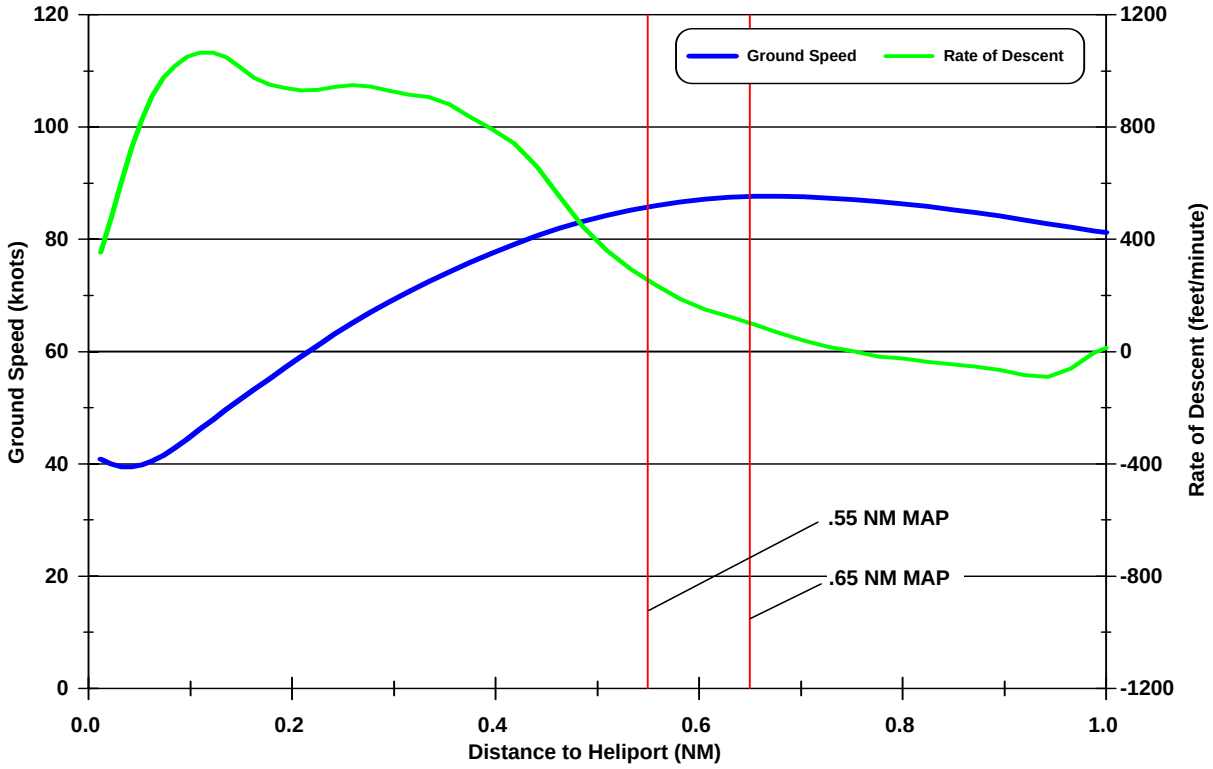



Approach - Plan View
Pilot P15 - 05/11/06A002 - Appr. #02W
145-Degree
Approach Course
310-Degree
Approach Course
039/12
1
098/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

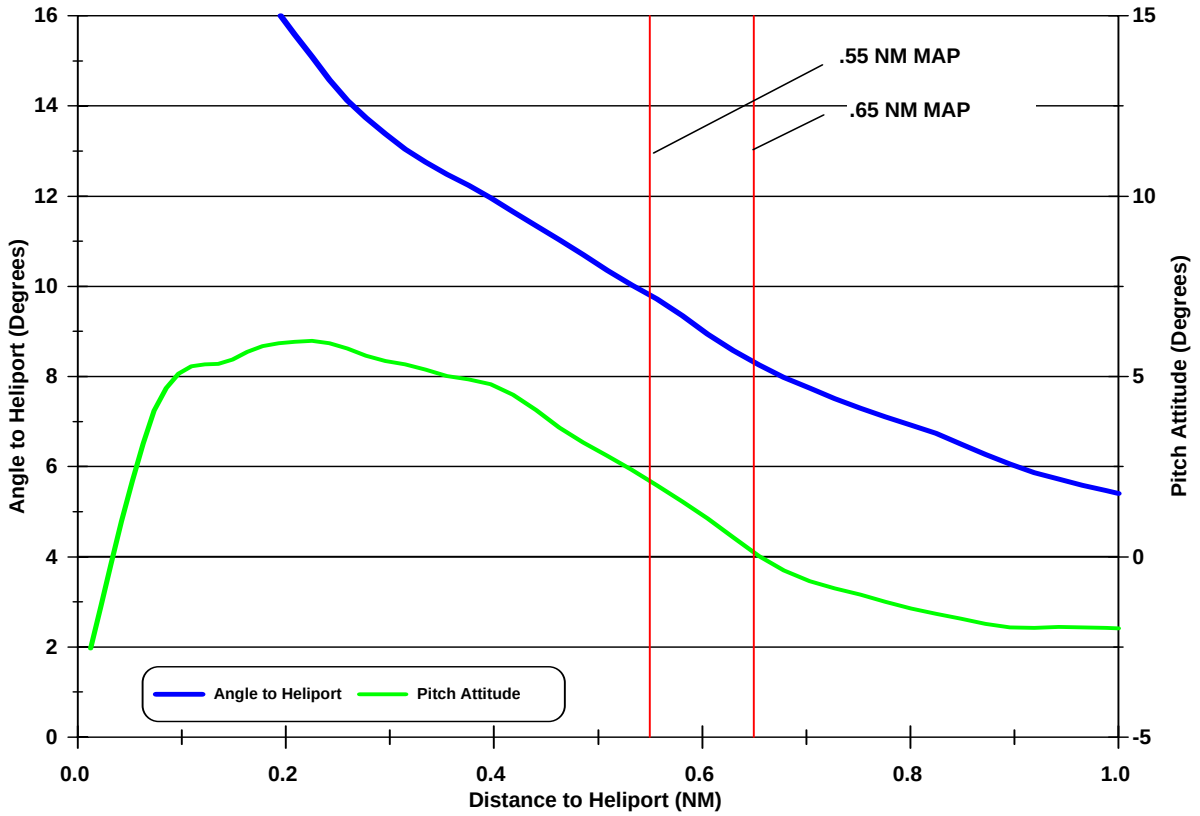
Profile View
Pilot P15 - 05/11/06A002 - Appr. #02W



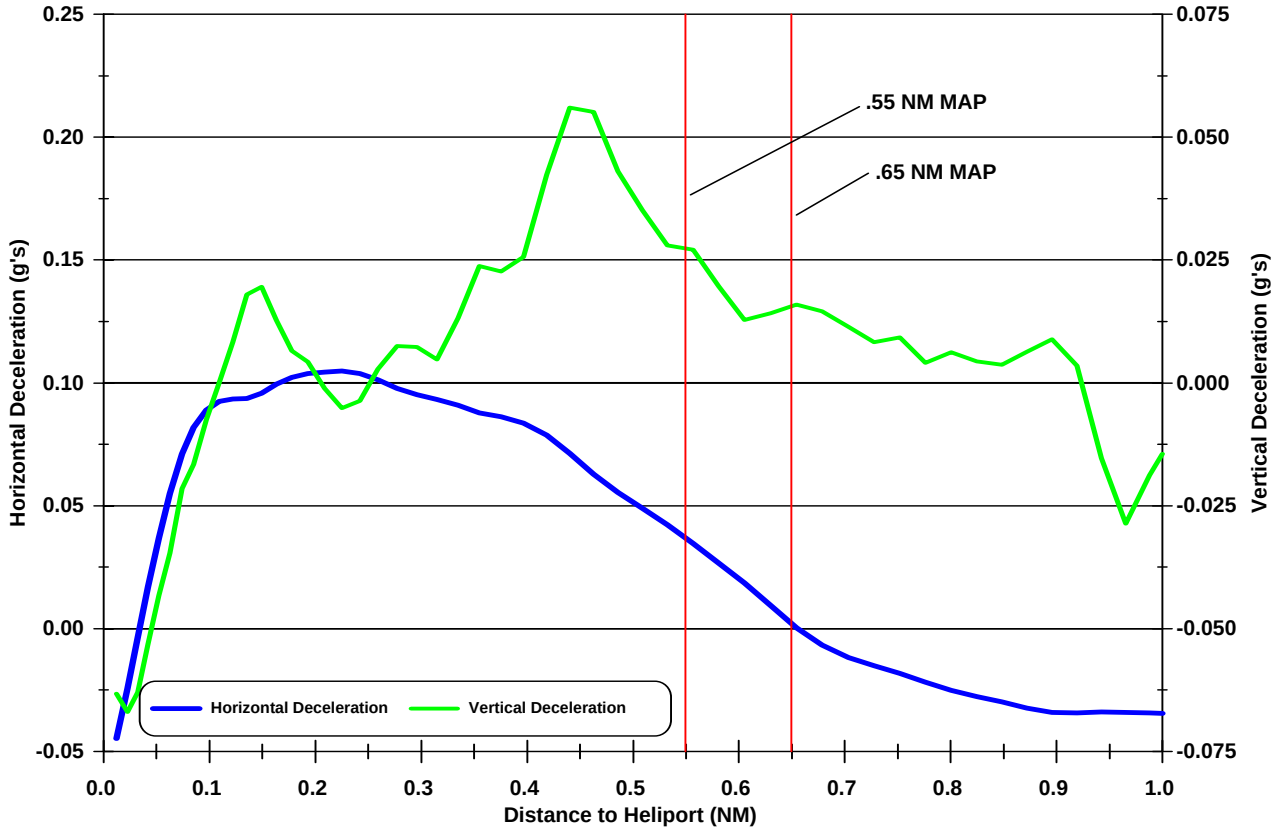
Ground Speed and Rate of Descent
Pilot P15 - 05/11/06A002 - Appr. #02W

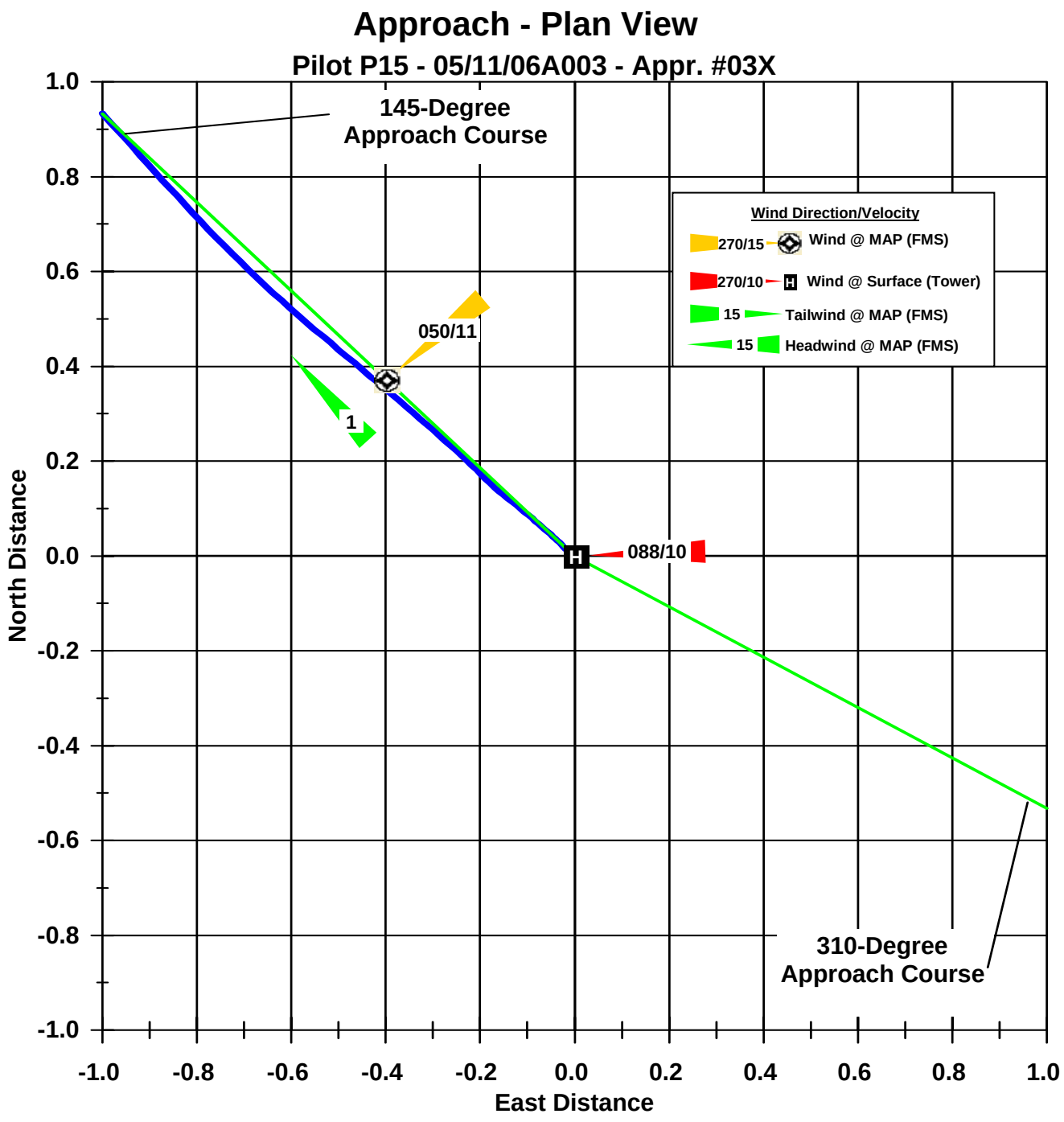


Angle to Heliport and Pitch Attitude
Pilot P15 - 05/11/06A002 - Appr. #02W

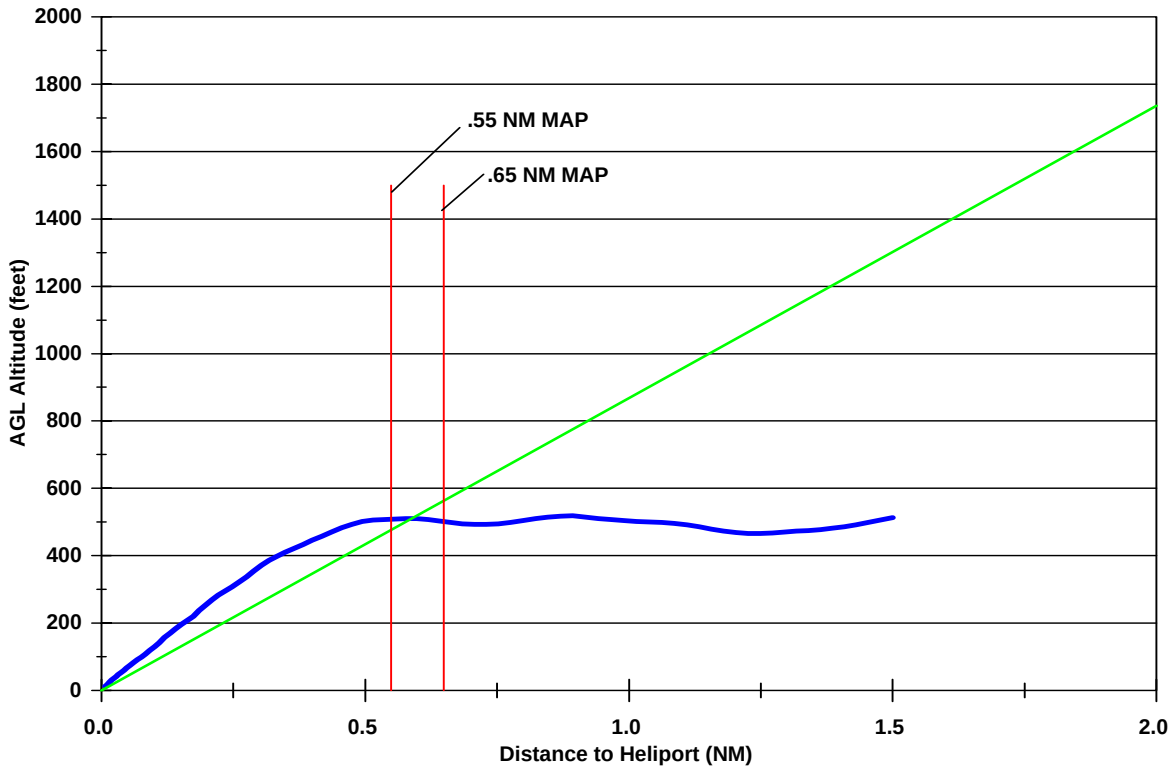


Horizontal and Vertical Deceleration
Pilot P15 - 05/11/06A002 - Appr. #02W

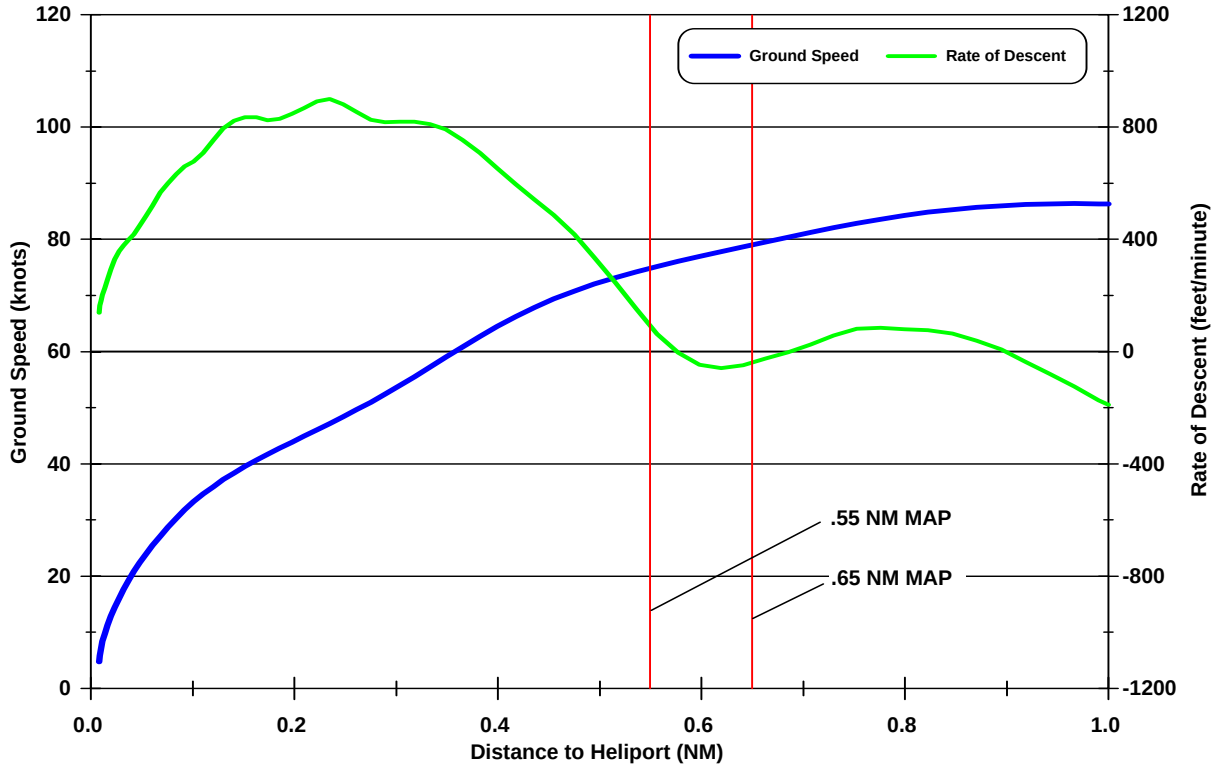



Approach - Plan View
Pilot P15 - 05/11/06A003 - Appr. #03X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
050/11
1
088/10
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

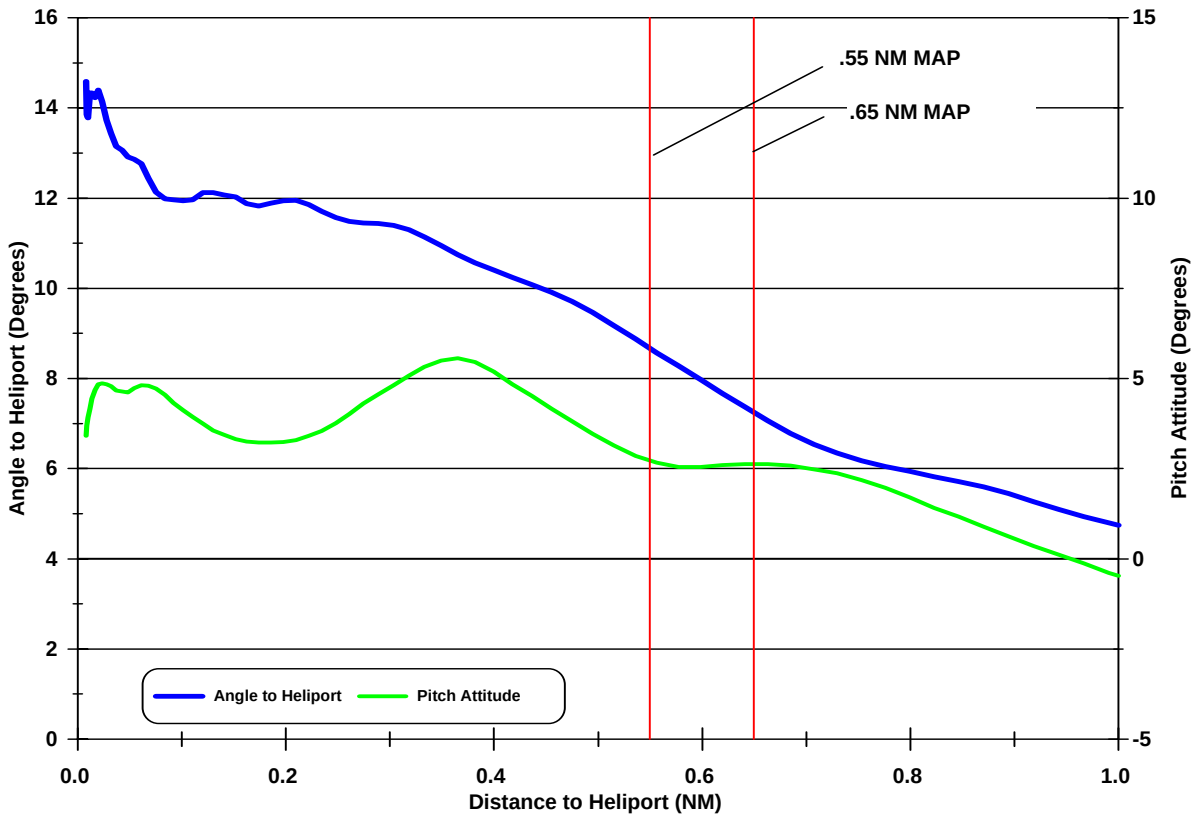
Profile View
Pilot P15 - 05/11/06A003 - Appr. #03X



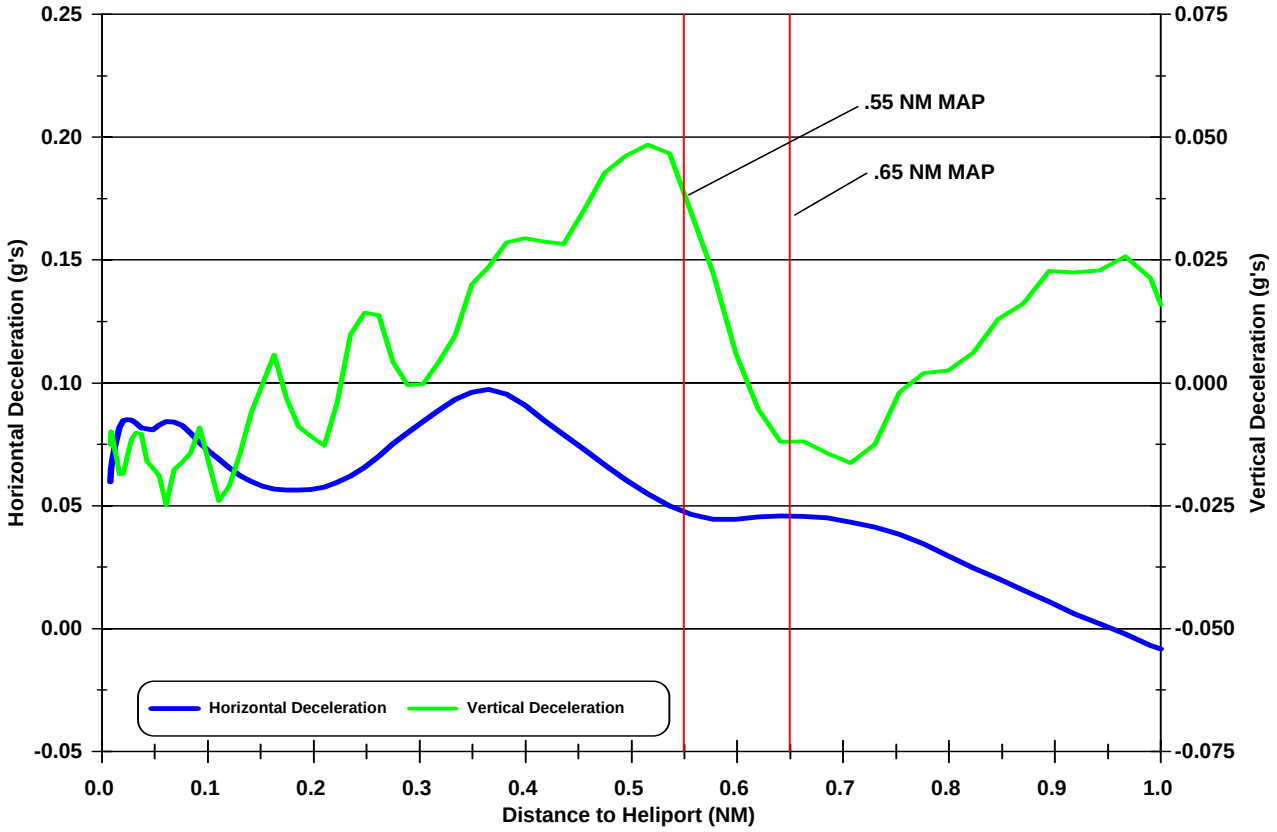
Ground Speed and Rate of Descent
Pilot P15 - 05/11/06A003 - Appr. #03X

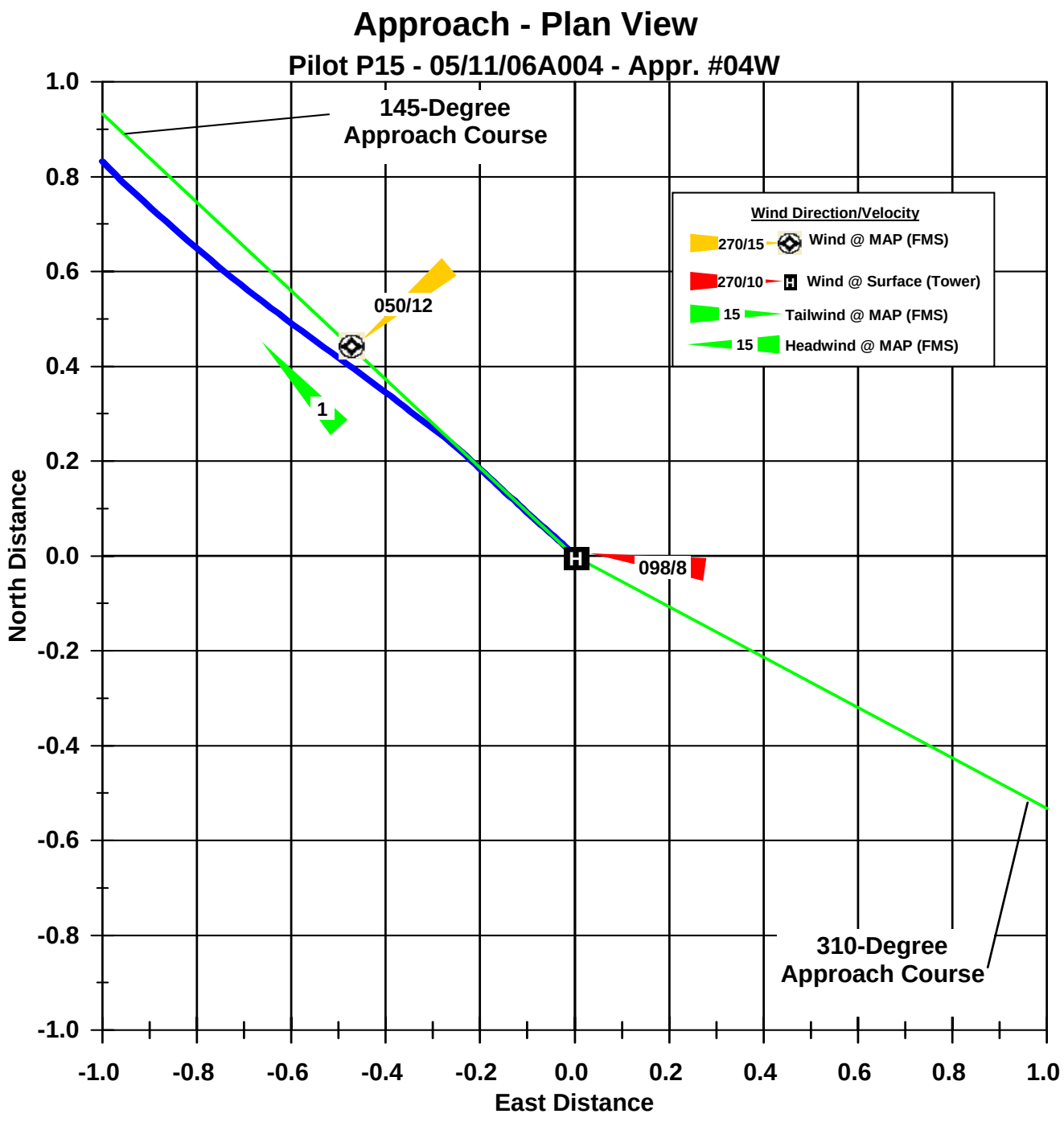


Angle to Heliport and Pitch Attitude
Pilot P15 - 05/11/06A003 - Appr. #03X

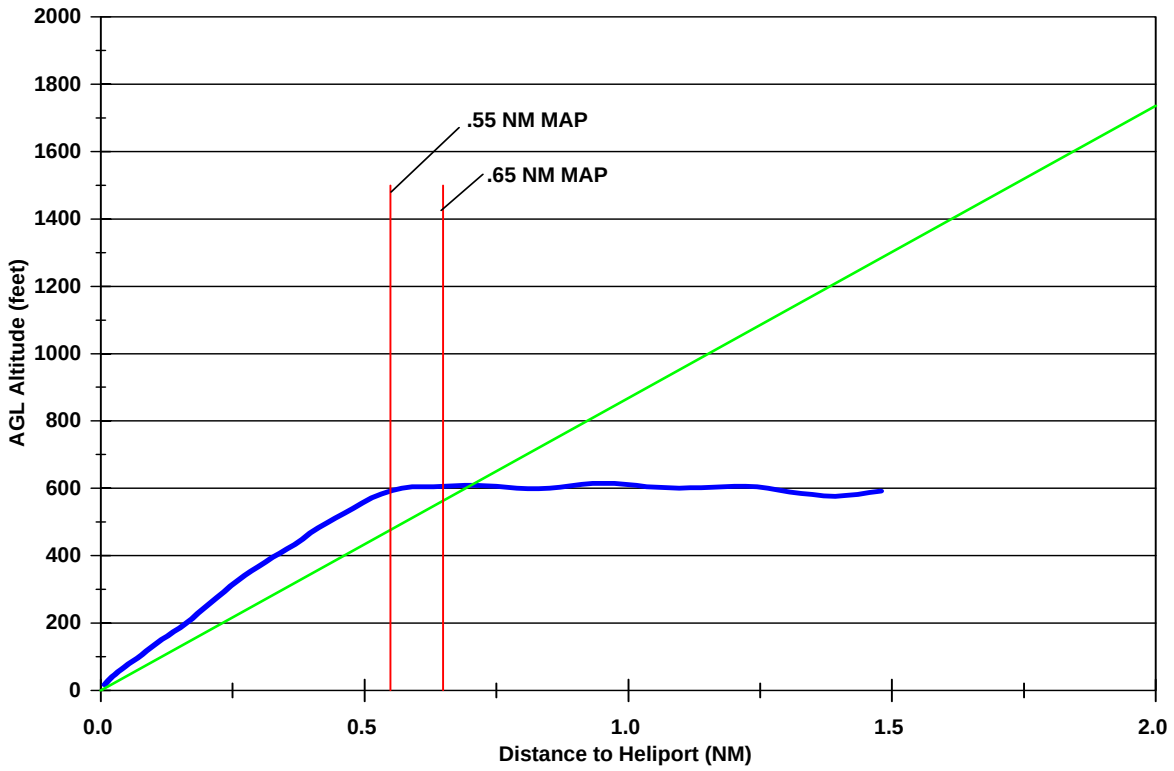


Horizontal and Vertical Deceleration
Pilot P15 - 05/11/06A003 - Appr. #03X

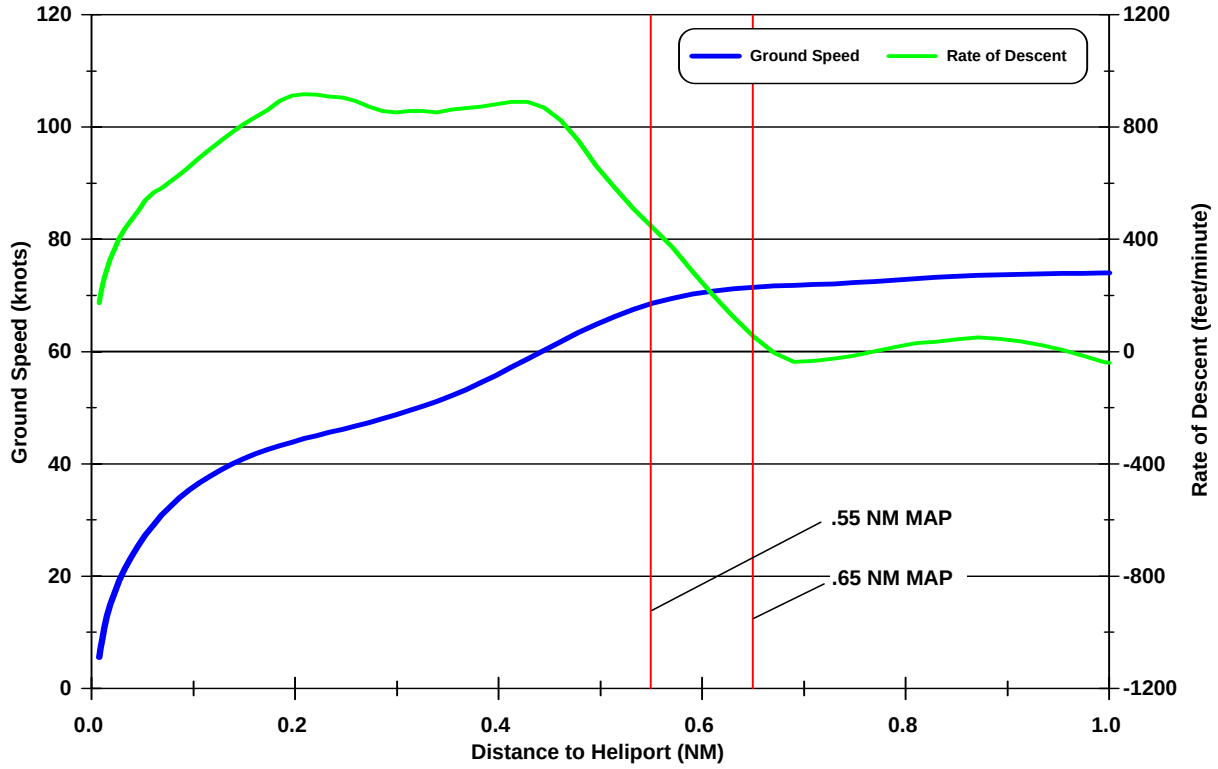



Approach - Plan View
Pilot P15 - 05/11/06A004 - Appr. #04W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
050/12
1
098/8
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

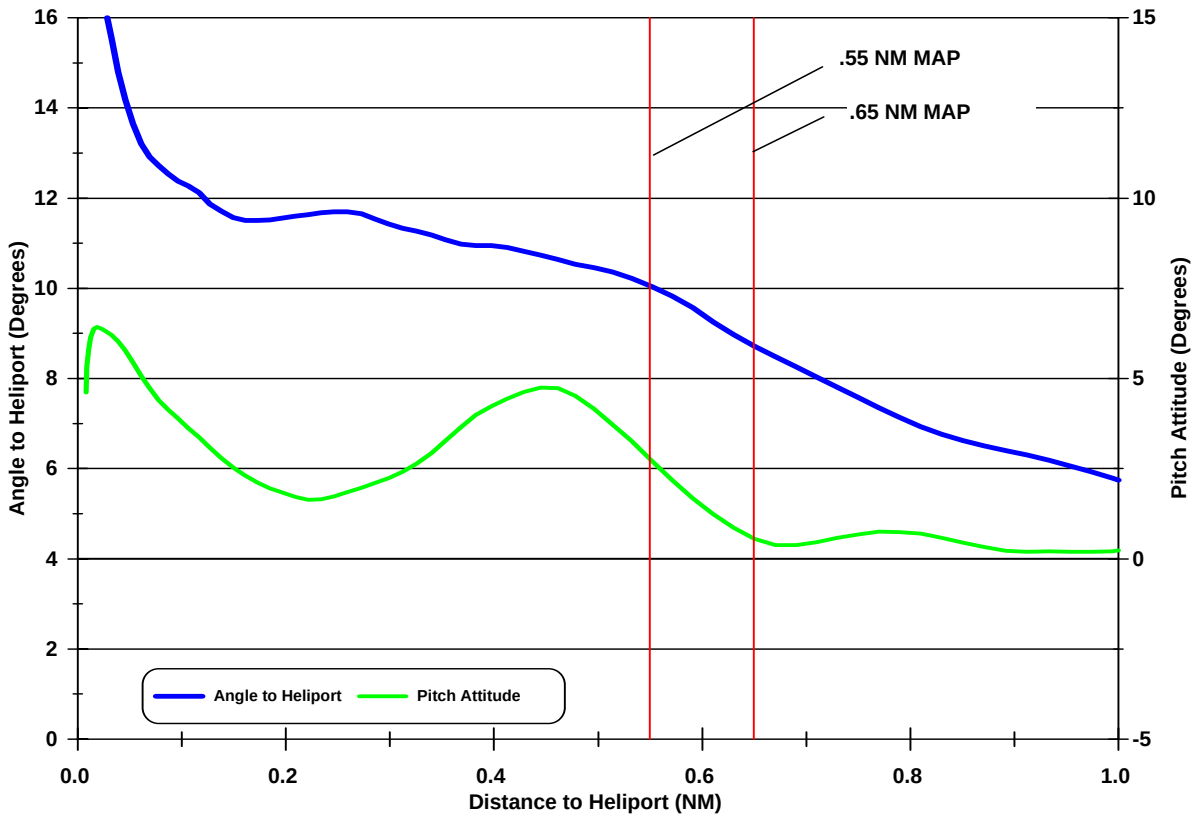
Profile View
Pilot P15 - 05/11/06A004 - Appr. #04W



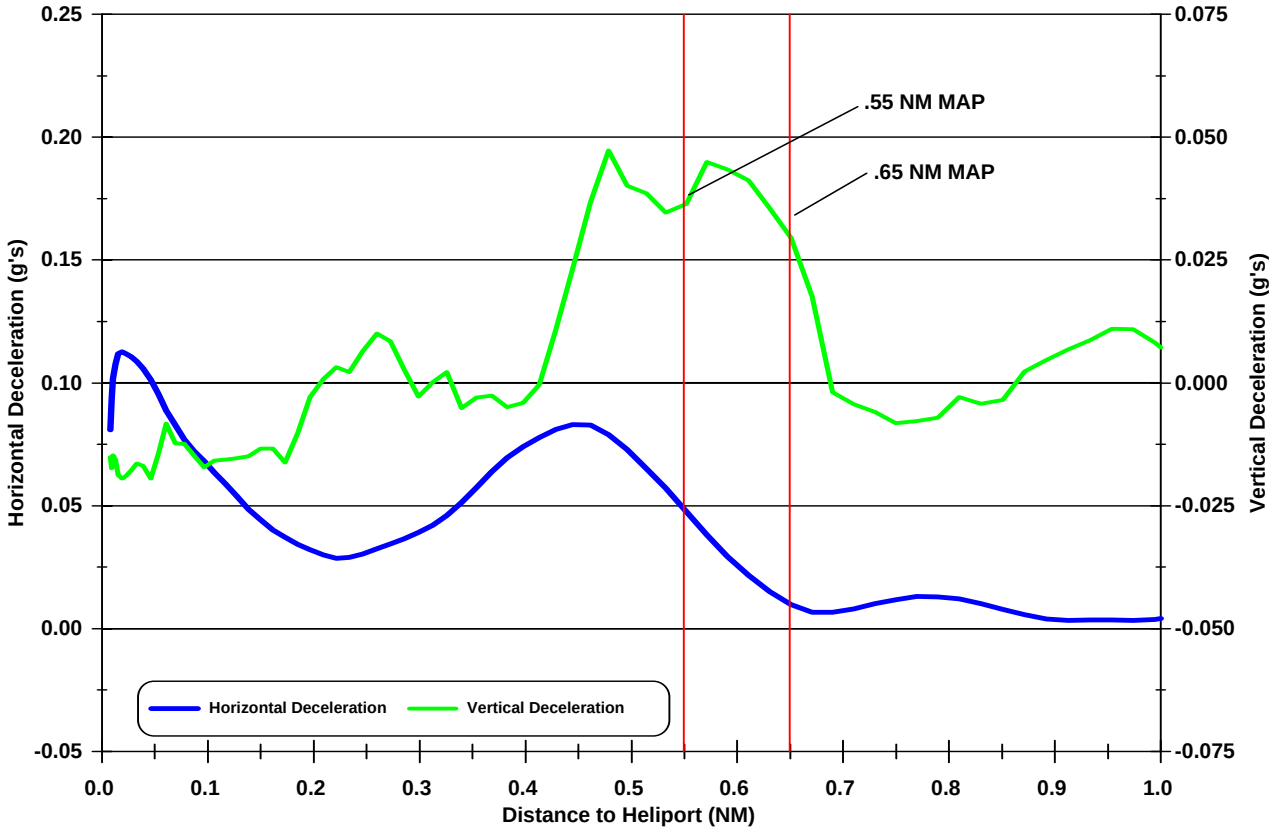
Ground Speed and Rate of Descent
Pilot P15 - 05/11/06A004 - Appr. #04W

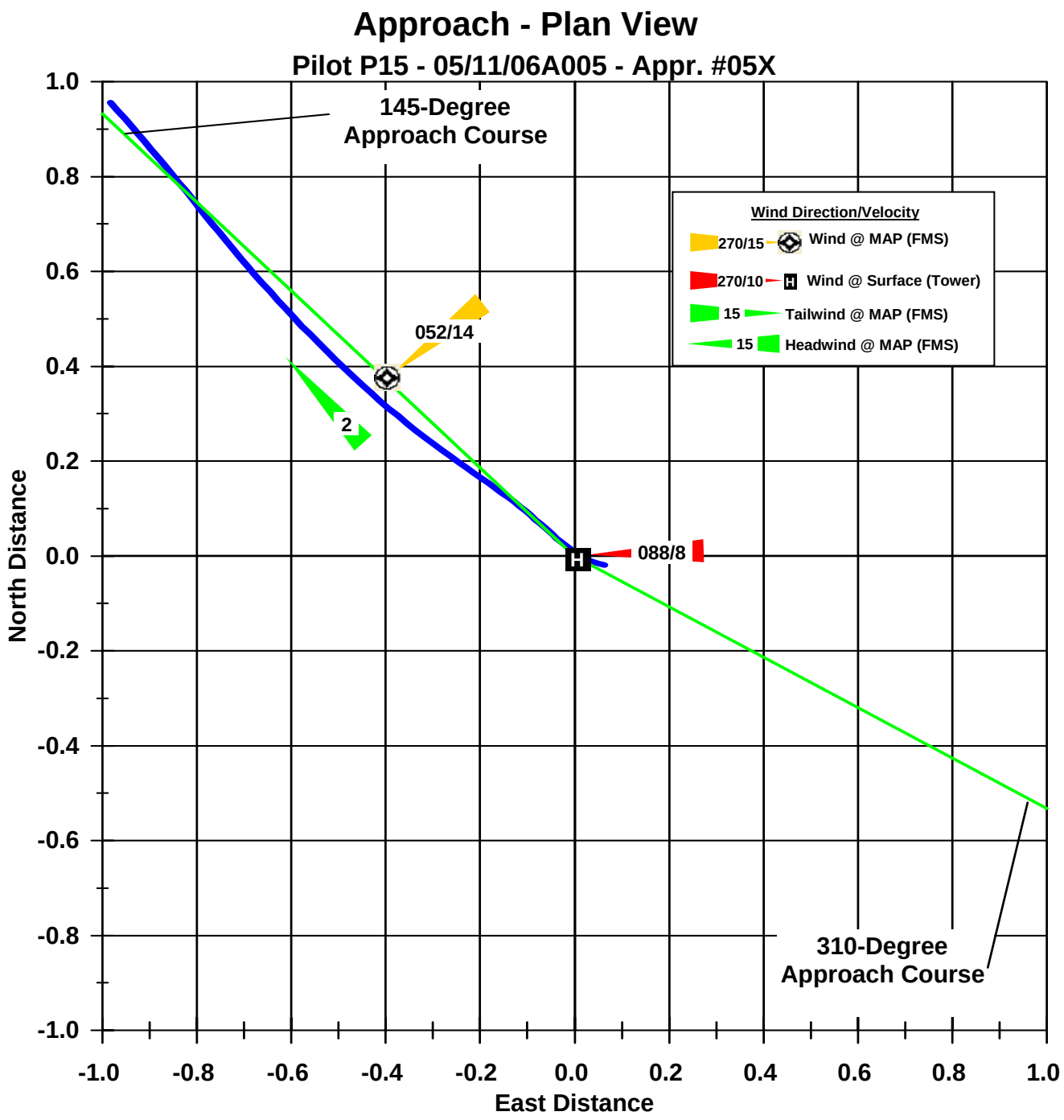


Angle to Heliport and Pitch Attitude
Pilot P15 - 05/11/06A004 - Appr. #04W

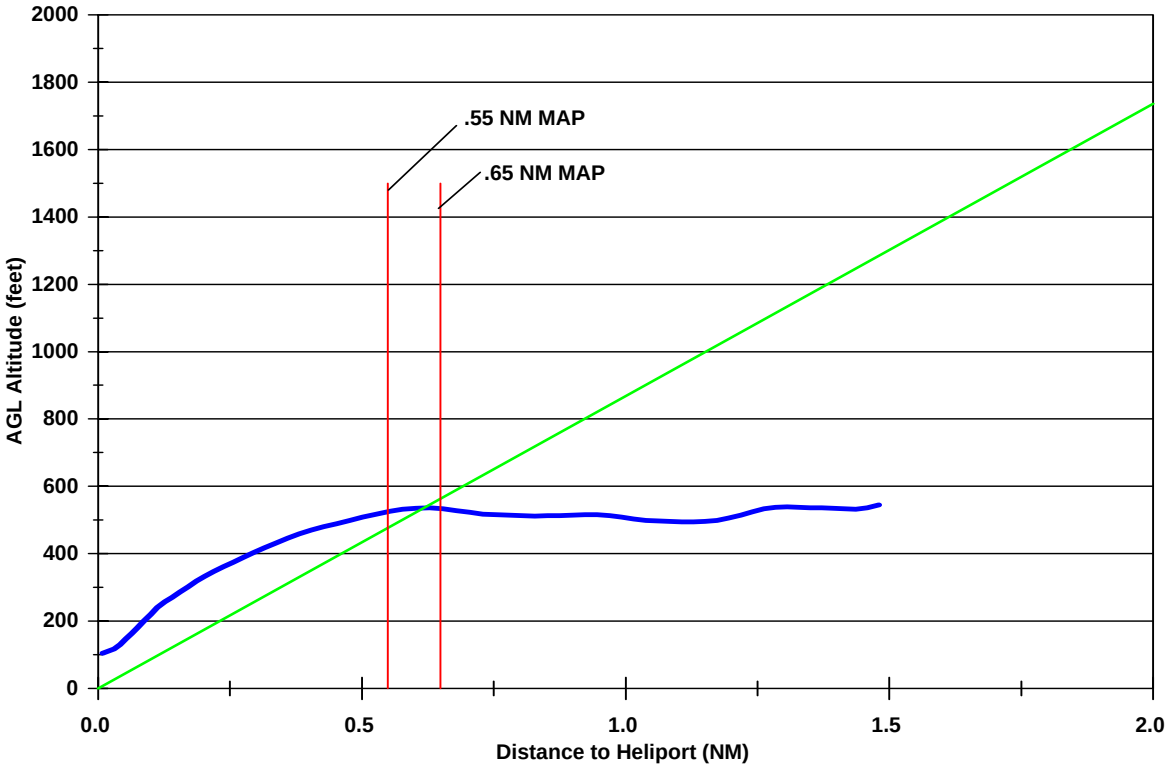


Horizontal and Vertical Deceleration
Pilot P15 - 05/11/06A004 - Appr. #04W

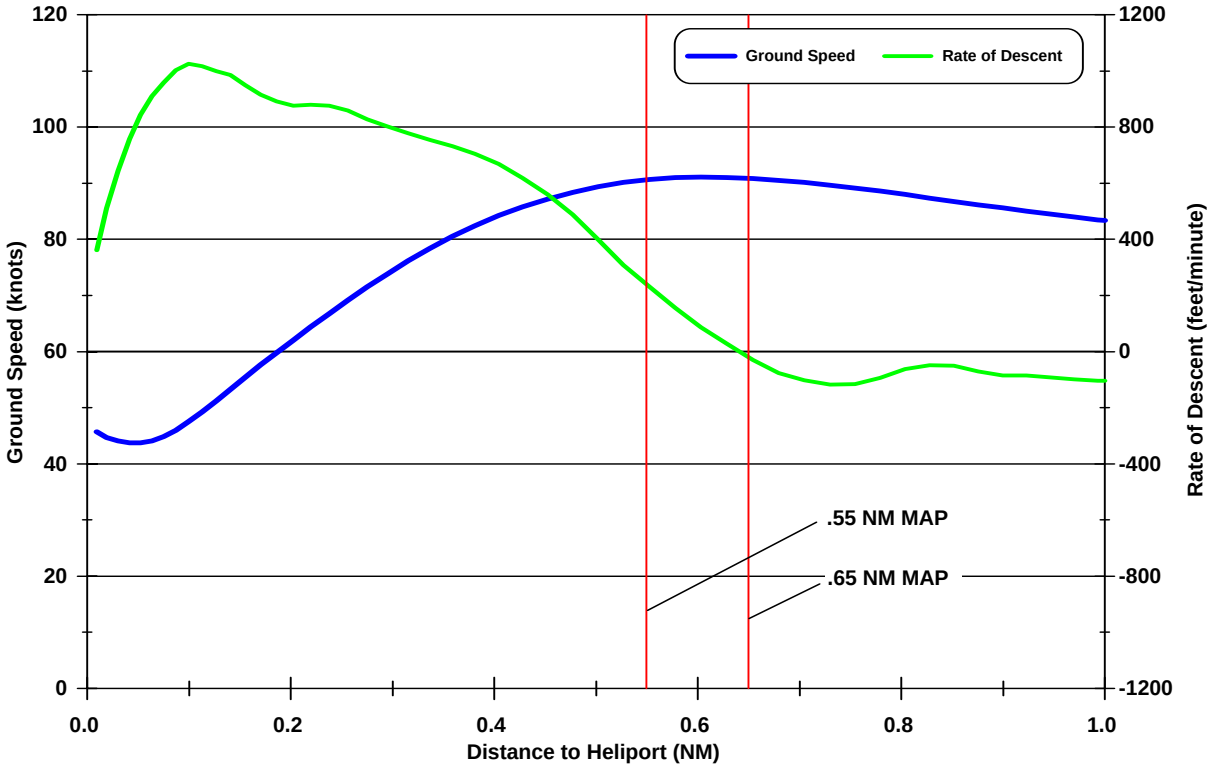



Approach - Plan View
Pilot P15 - 05/11/06A005 - Appr. #05X
145-Degree
Approach Course
310-Degree
Approach Course
052/14
2
088/8
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

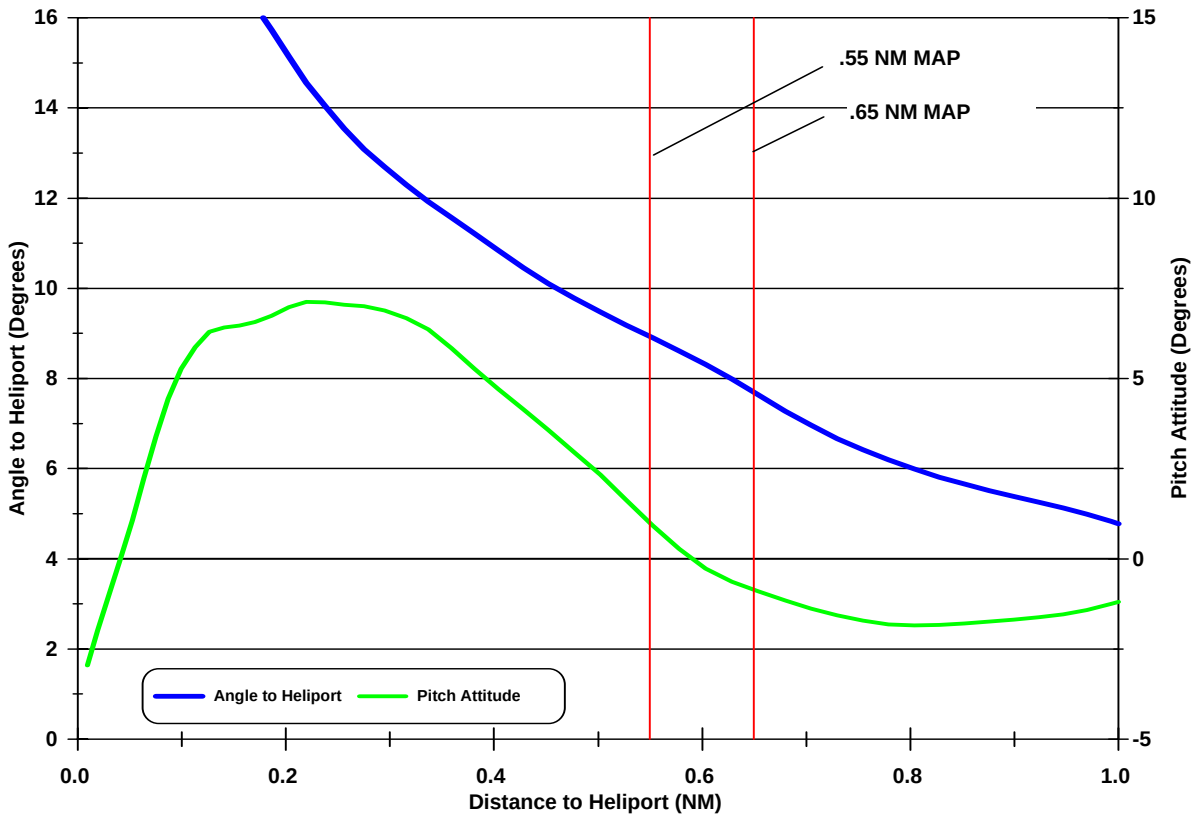
Profile View
Pilot P15 - 05/11/06A005 - Appr. #05X



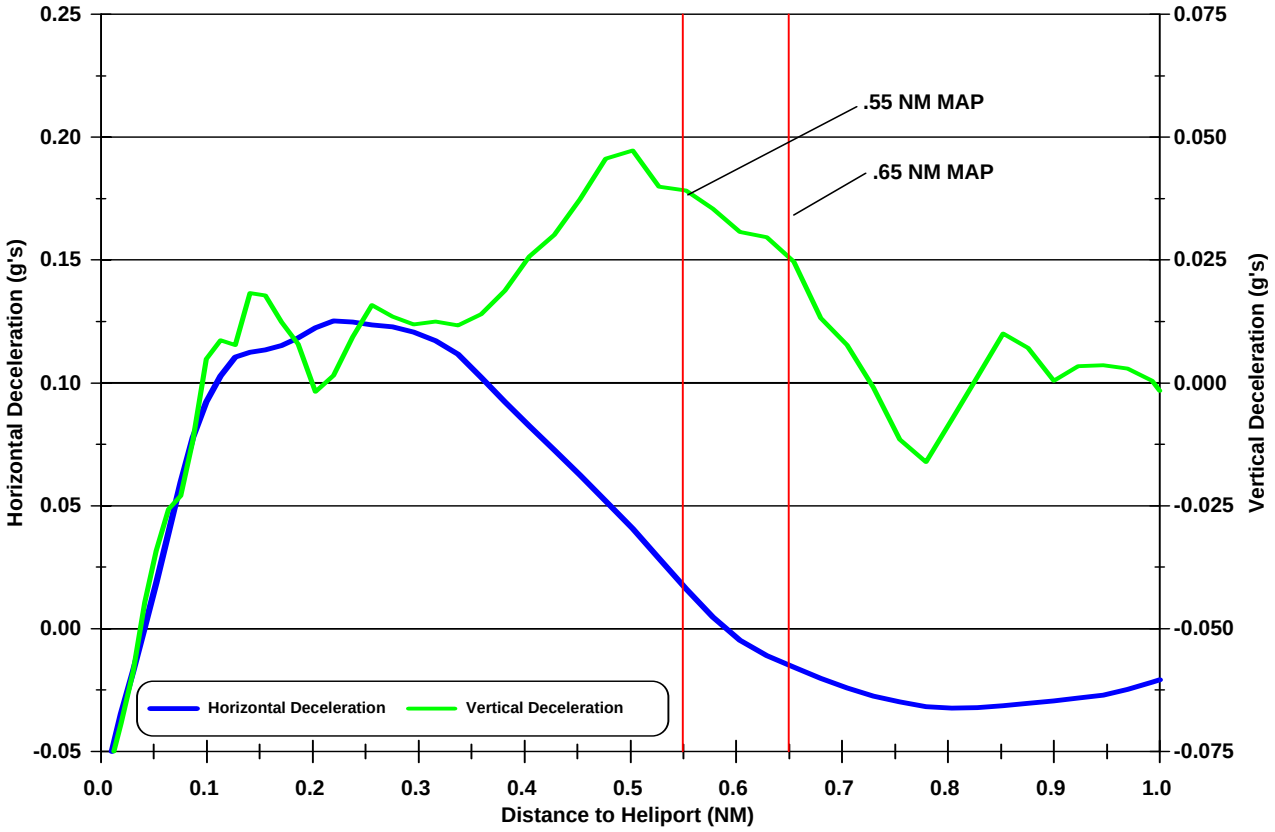
Ground Speed and Rate of Descent
Pilot P15 - 05/11/06A005 - Appr. #05X

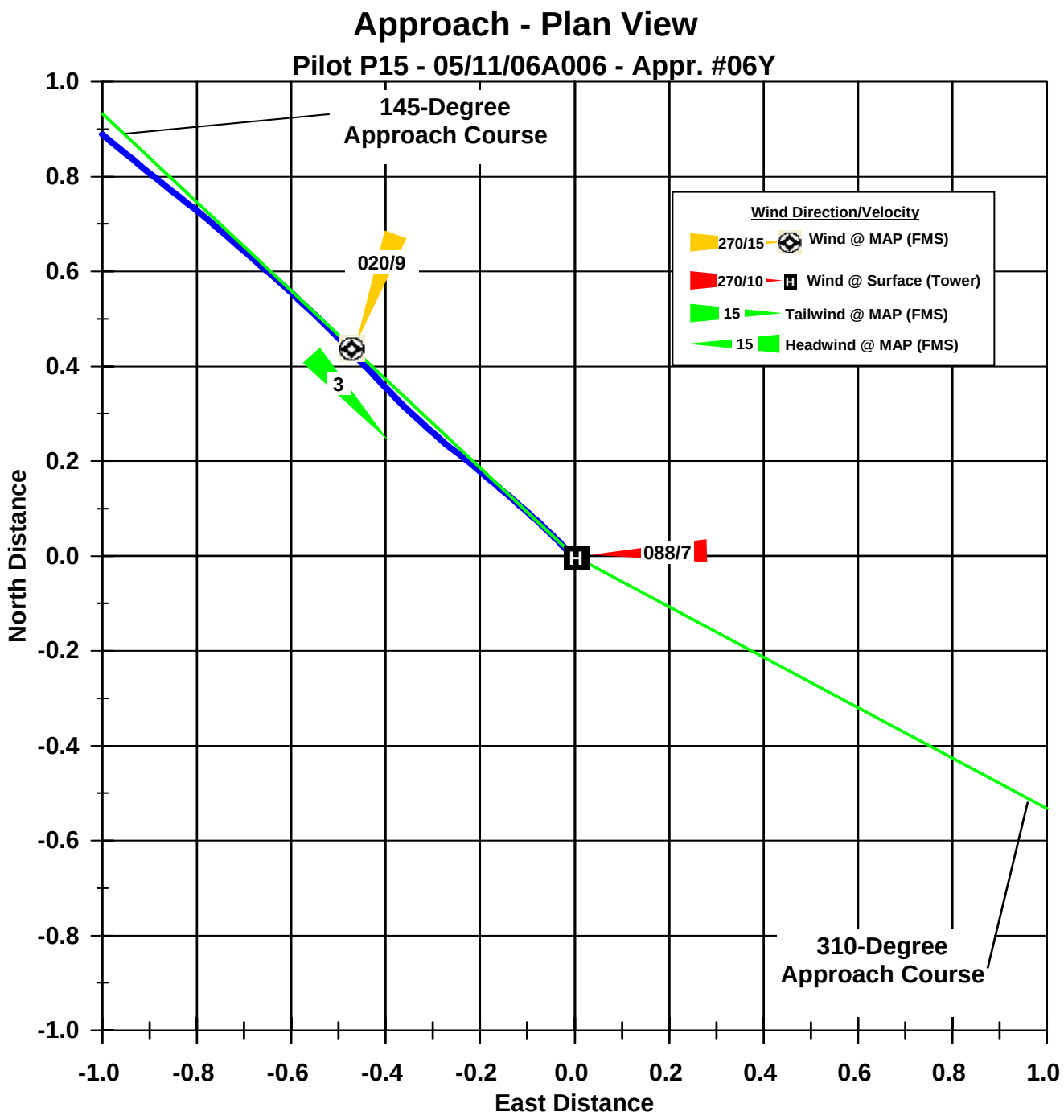


Angle to Heliport and Pitch Attitude
Pilot P15 - 05/11/06A005 - Appr. #05X

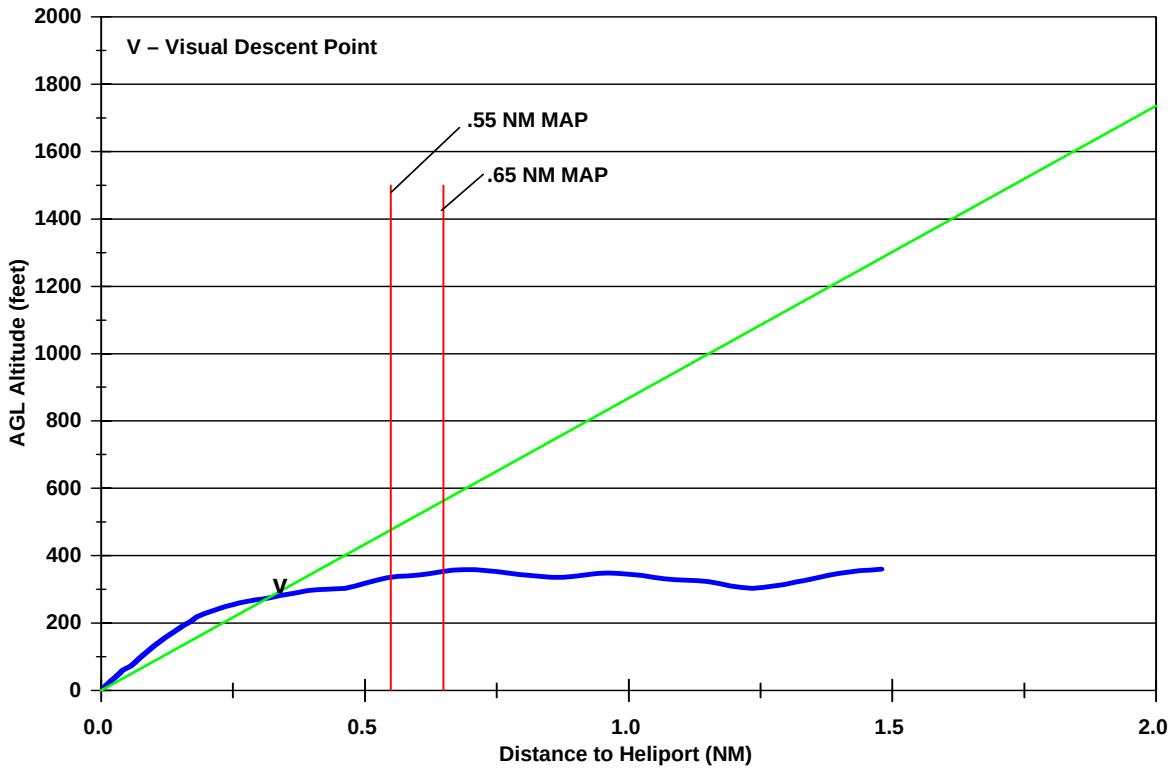


Horizontal and Vertical Deceleration
Pilot P15 - 05/11/06A005 - Appr. #05X

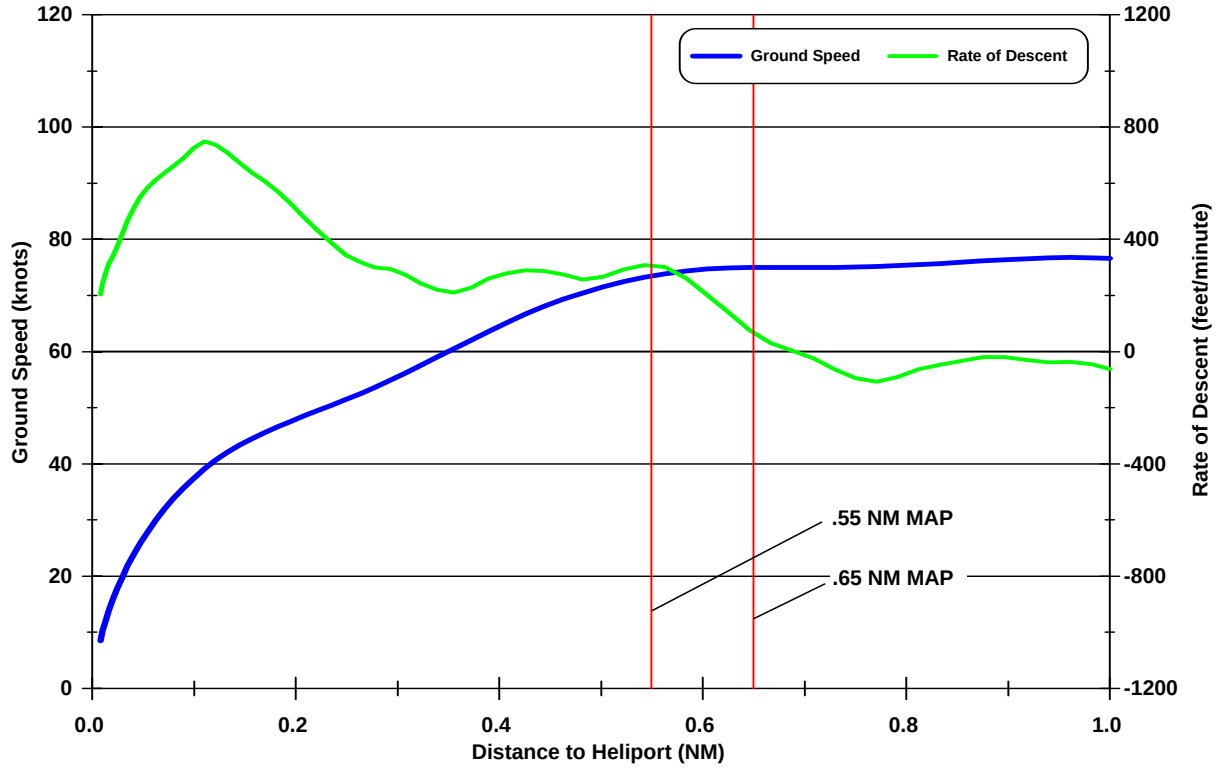



Approach - Plan View
Pilot P15 - 05/11/06A006 - Appr. #06Y
145-Degree
Approach Course
310-Degree
Approach Course
020/9
3
088/7
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

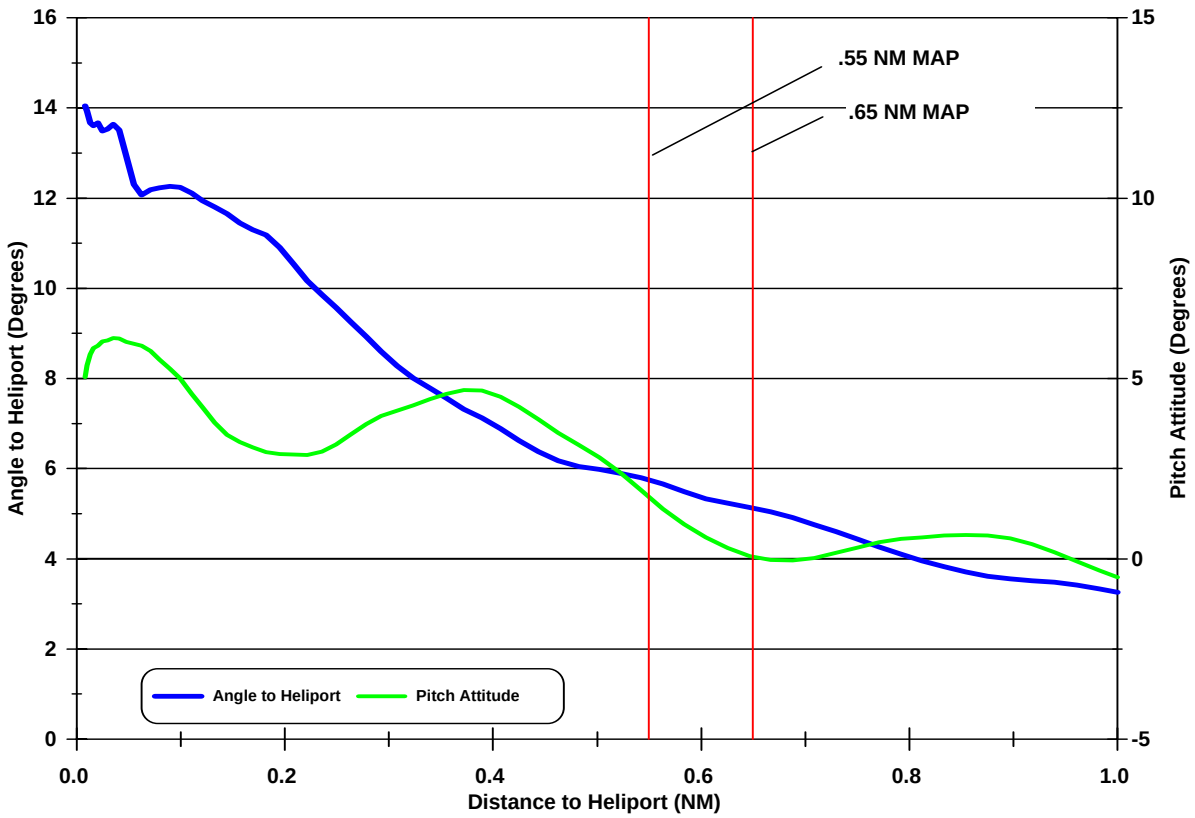
Profile View
Pilot P15 - 05/11/06A006 - Appr. #06Y



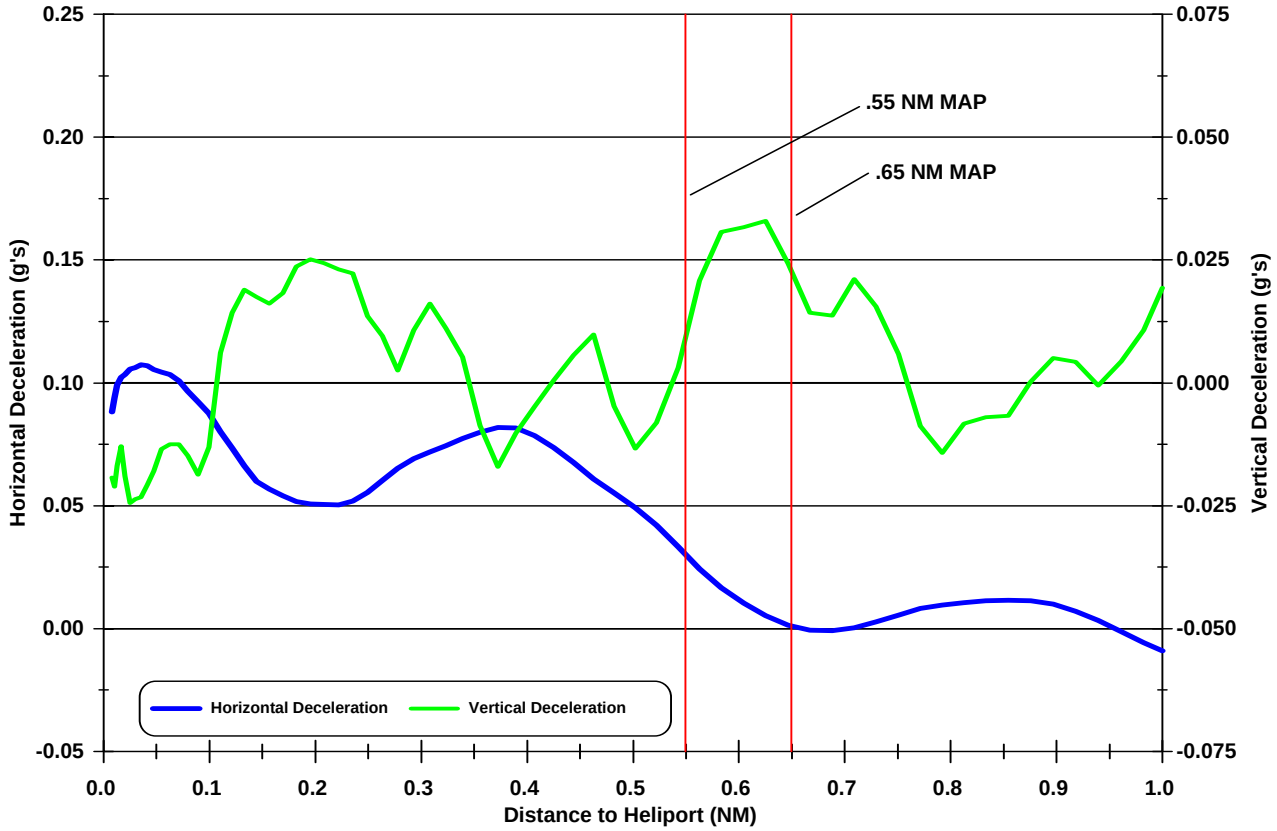
Ground Speed and Rate of Descent
Pilot P15 - 05/11/06A006 - Appr. #06Y

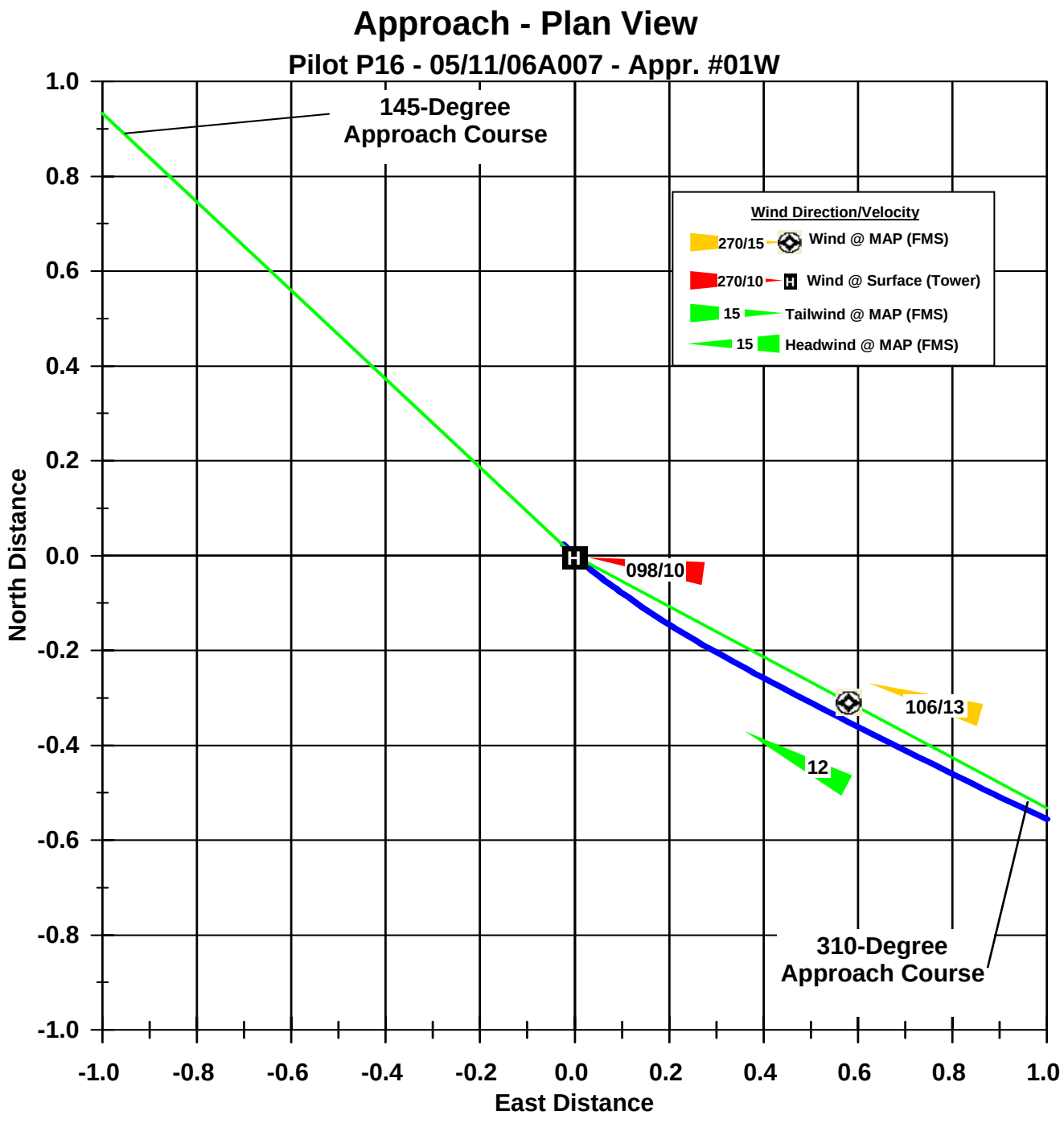


Angle to Heliport and Pitch Attitude
Pilot P15 - 05/11/06A006 - Appr. #06Y

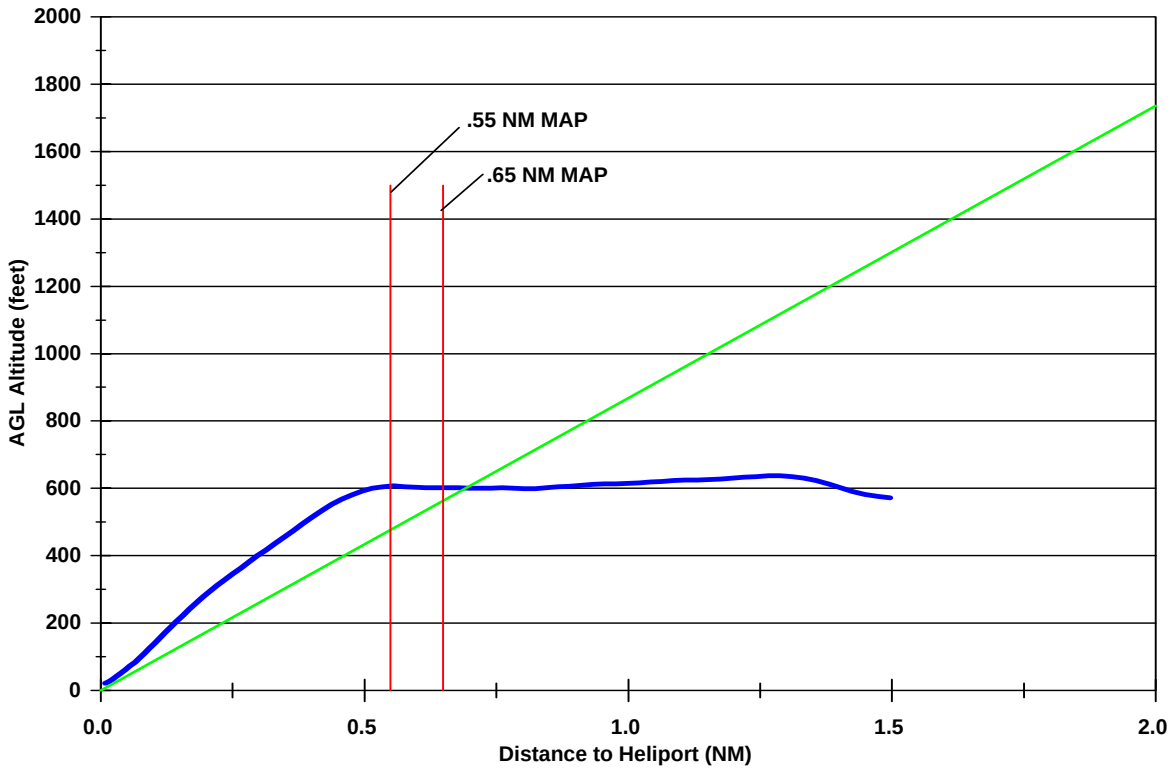


Horizontal and Vertical Deceleration
Pilot P15 - 05/11/06A006 - Appr. #06Y

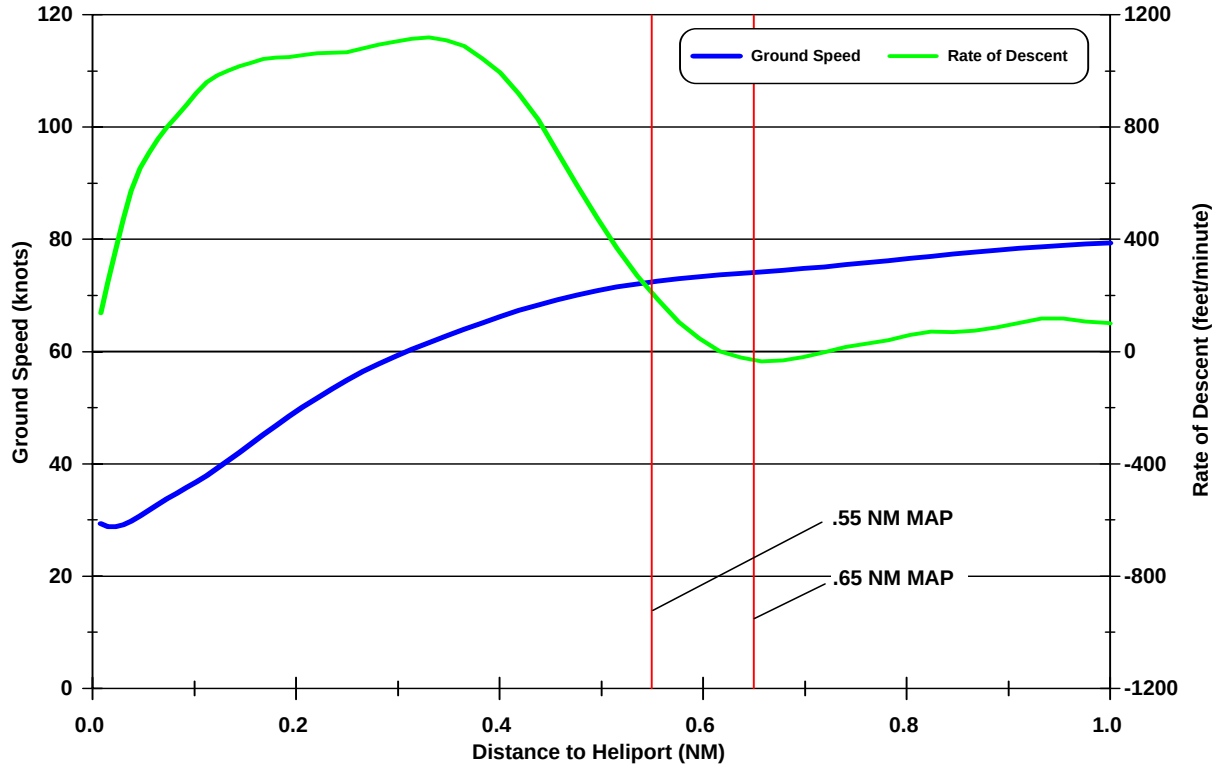



Approach - Plan View
Pilot P16 - 05/11/06A007 - Appr. #01W
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
098/10
106/13
12
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

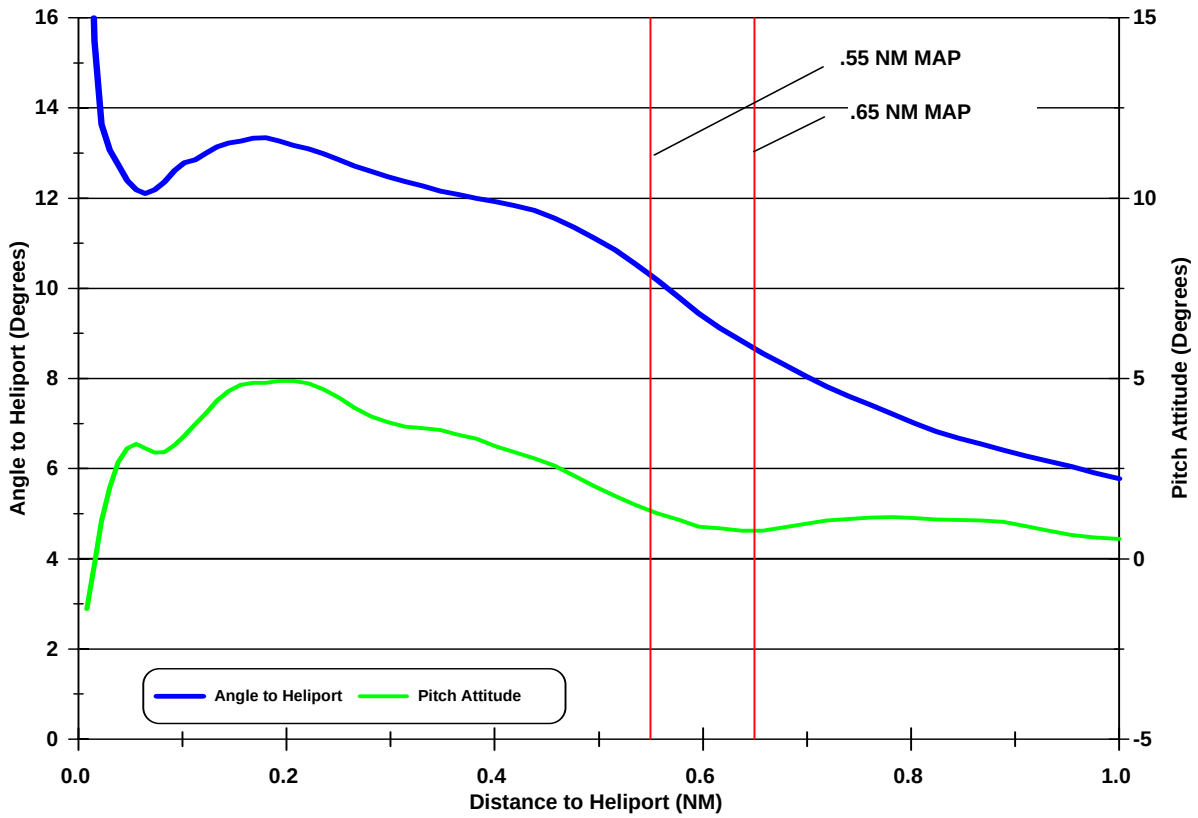
Profile View
Pilot P16 - 05/11/06A007 - Appr. #01W



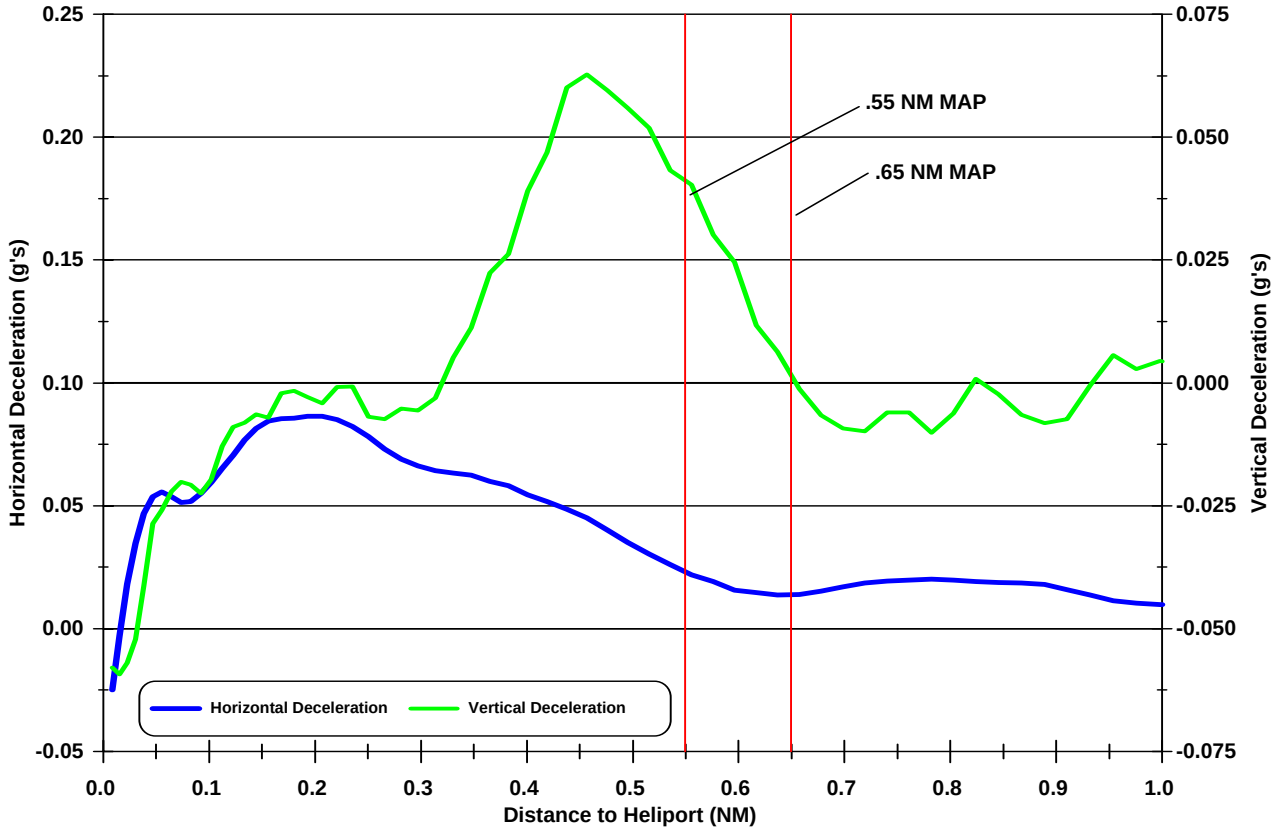
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06A007 - Appr. #01W

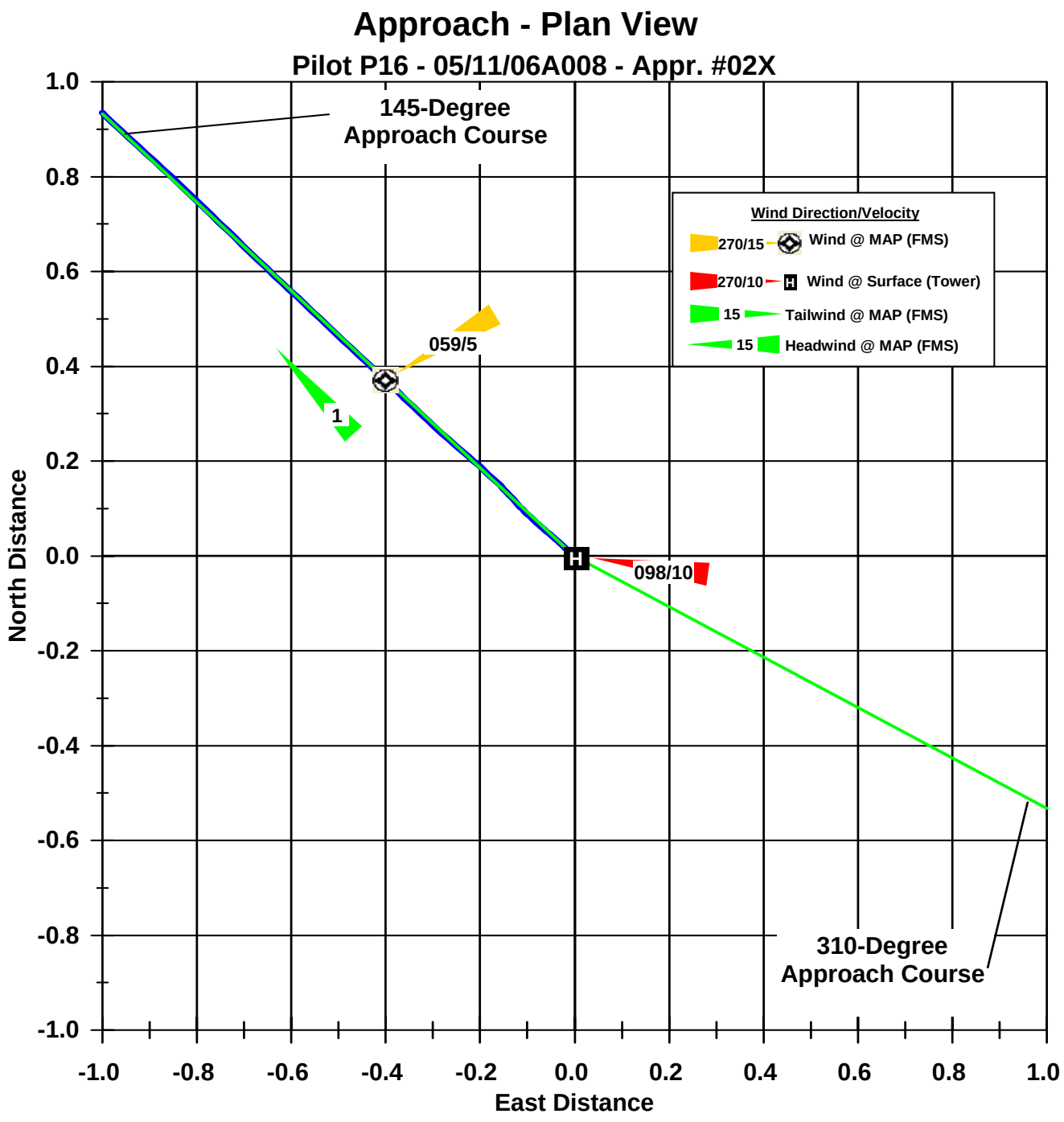


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06A007 - Appr. #01W

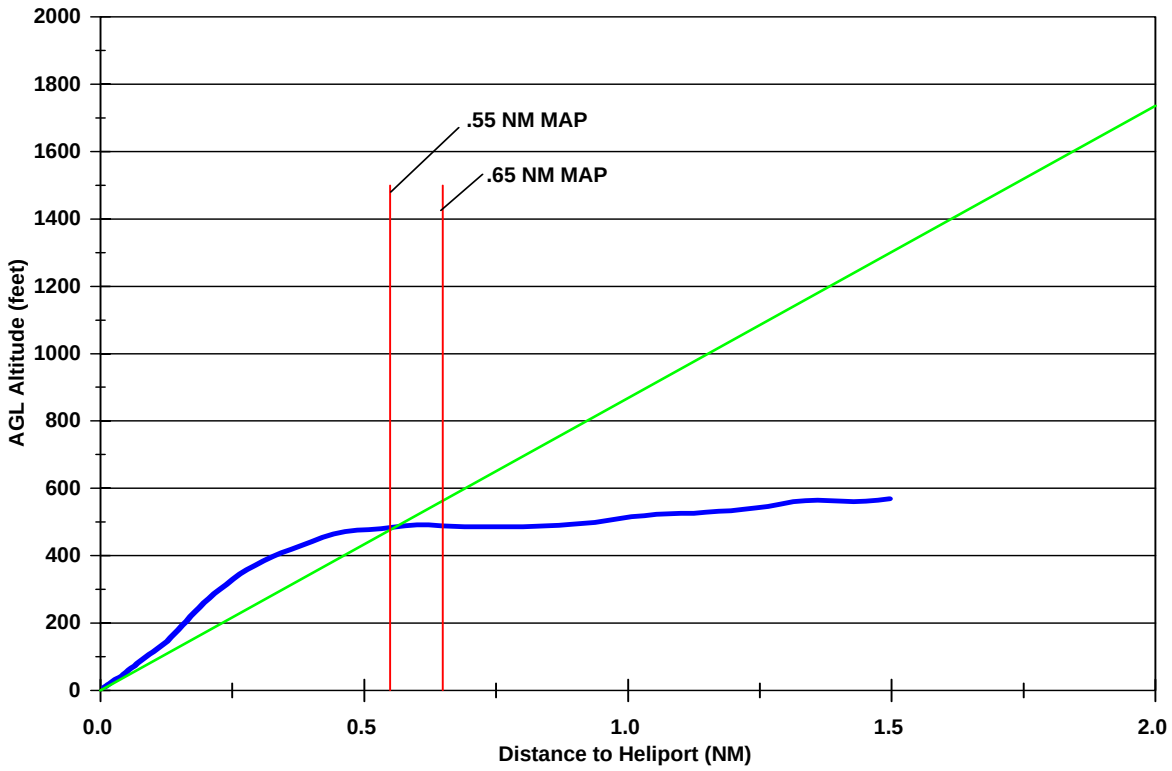


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06A007 - Appr. #01W

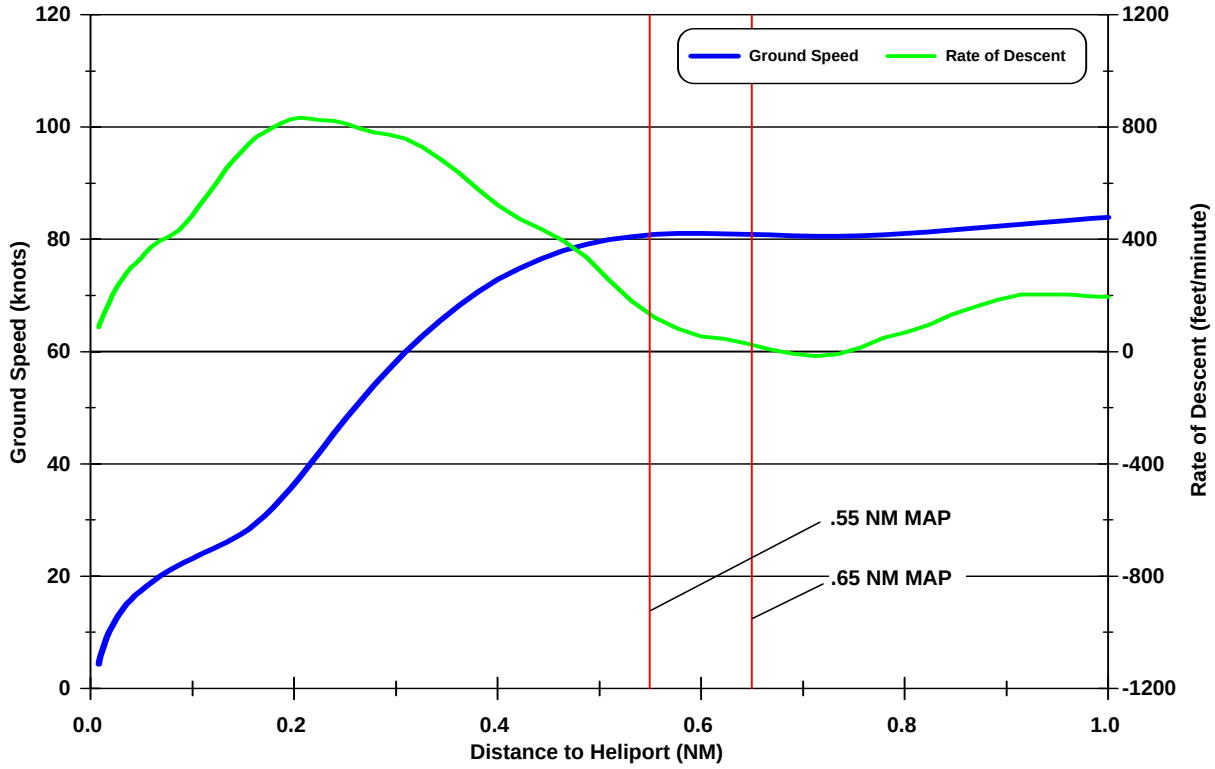



Approach - Plan View
Pilot P16 - 05/11/06A008 - Appr. #02X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
059/5
1
098/10
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

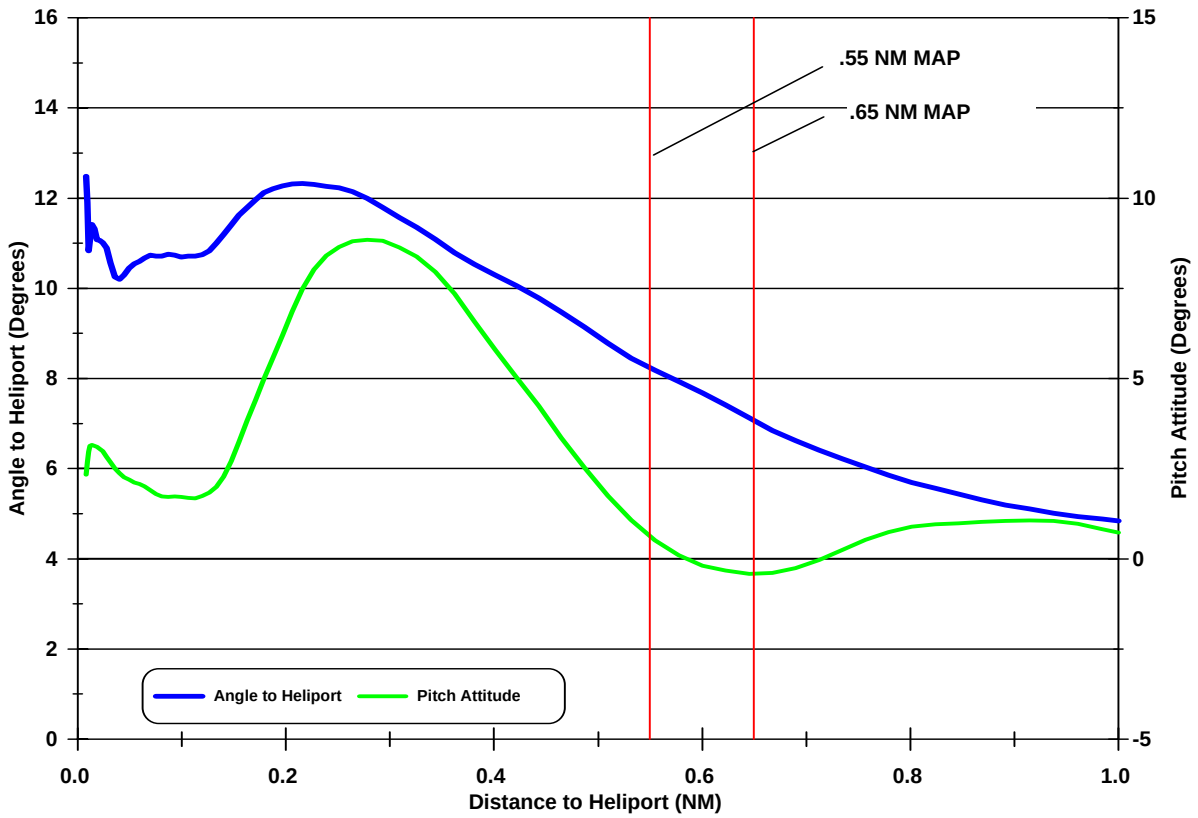
Profile View
Pilot P16 - 05/11/06A008 - Appr. #02X



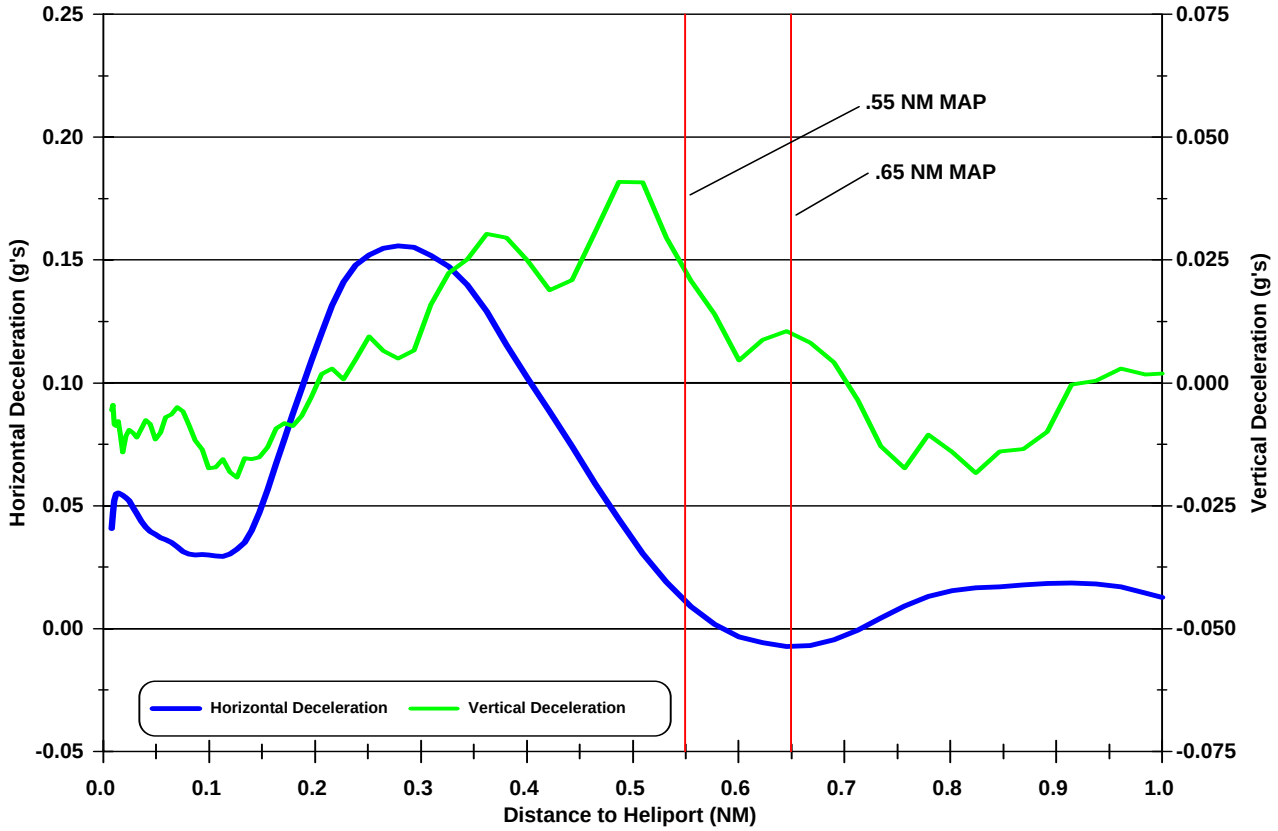
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06A008 - Appr. #02X

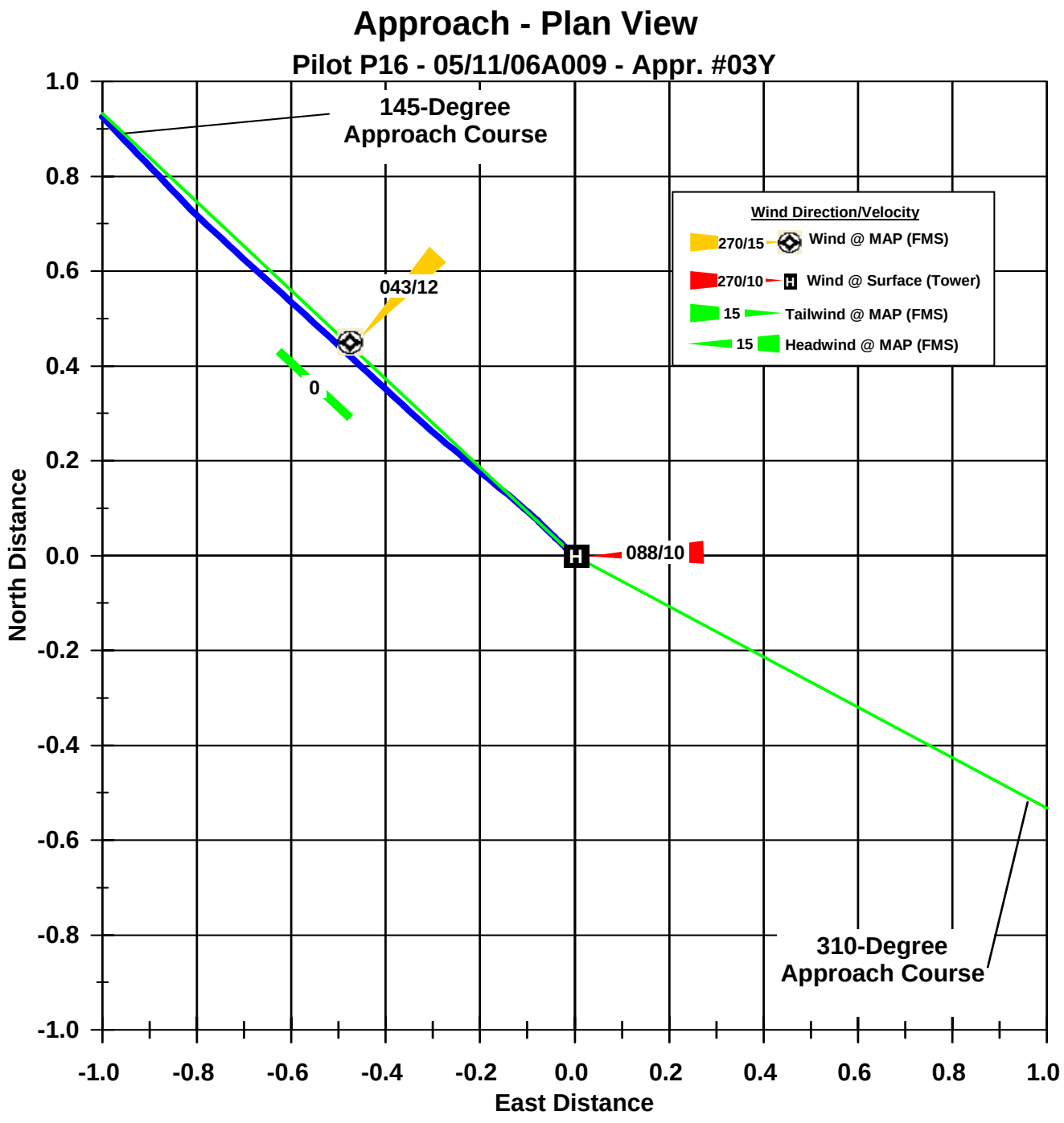


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06A008 - Appr. #02X

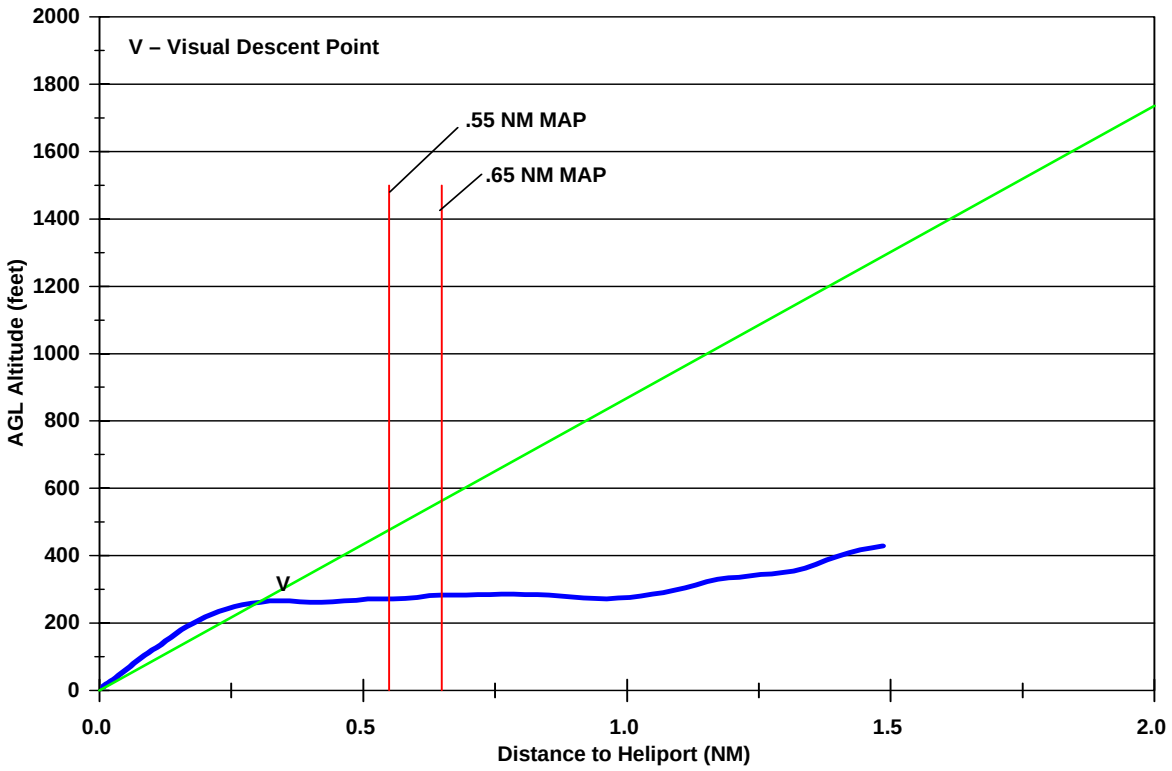


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06A008 - Appr. #02X

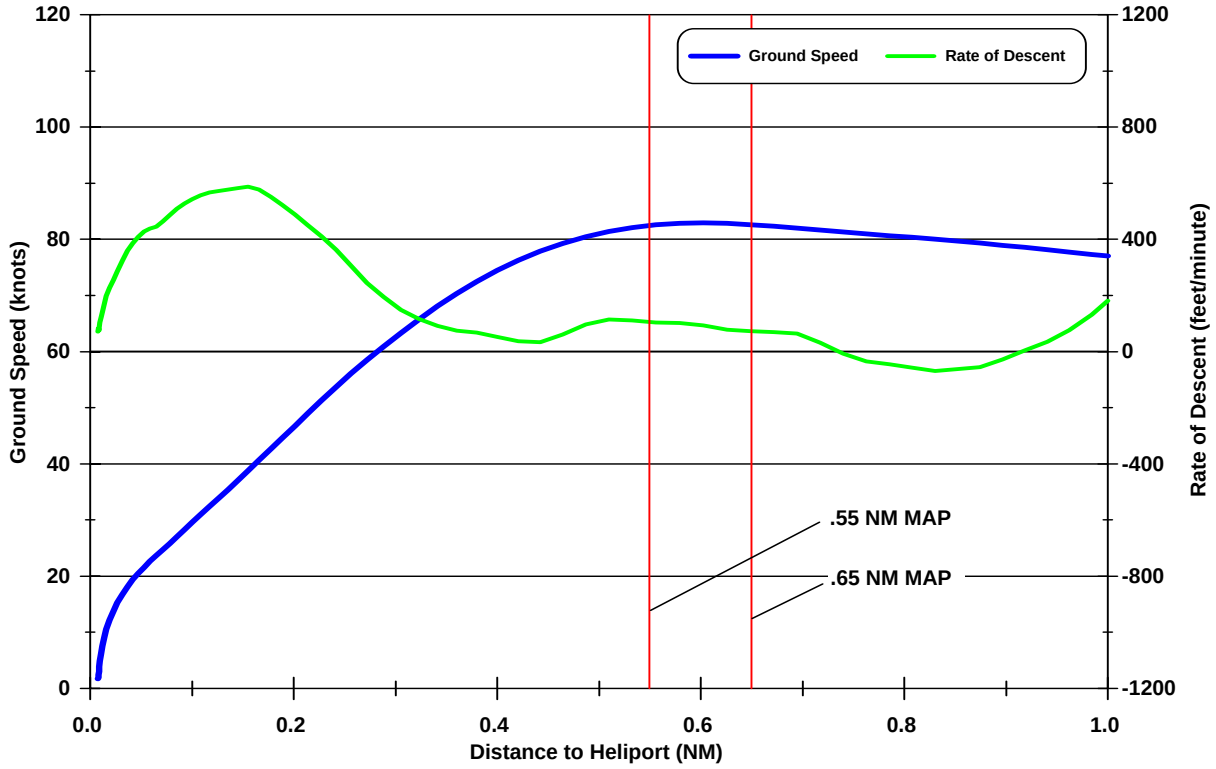



Approach - Plan View
Pilot P16 - 05/11/06A009 - Appr. #03Y
145-Degree
Approach Course
310-Degree
Approach Course
043/12
0
088/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

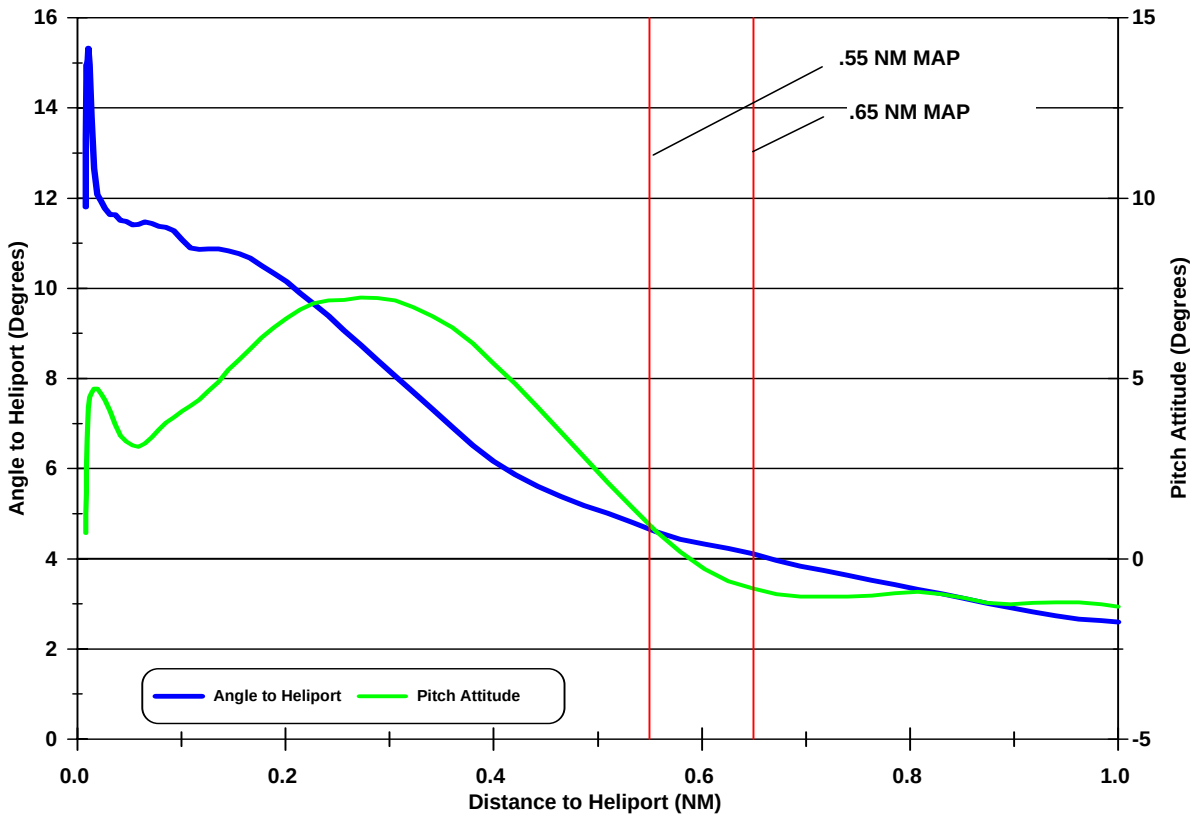
Profile View
Pilot P16 - 05/11/06A009 - Appr. #03Y



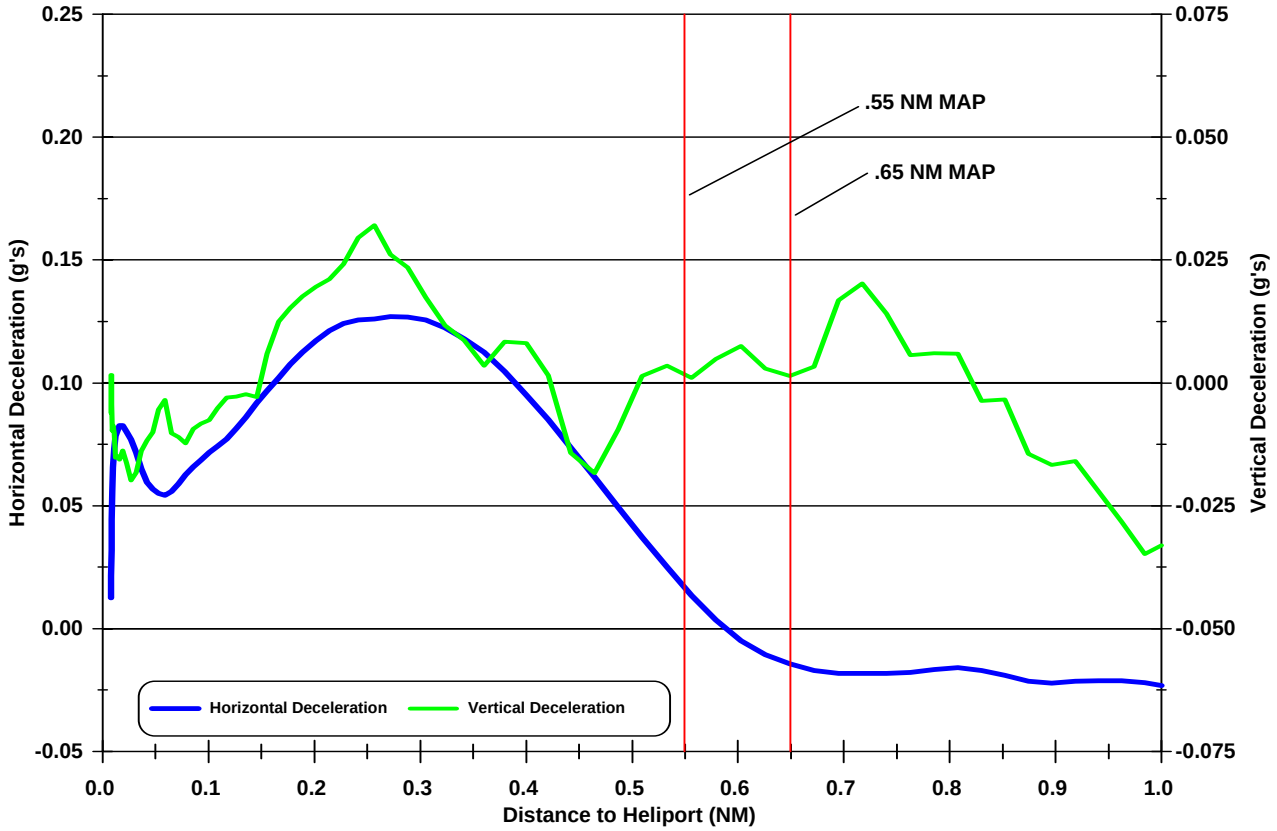
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06A009 - Appr. #03Y

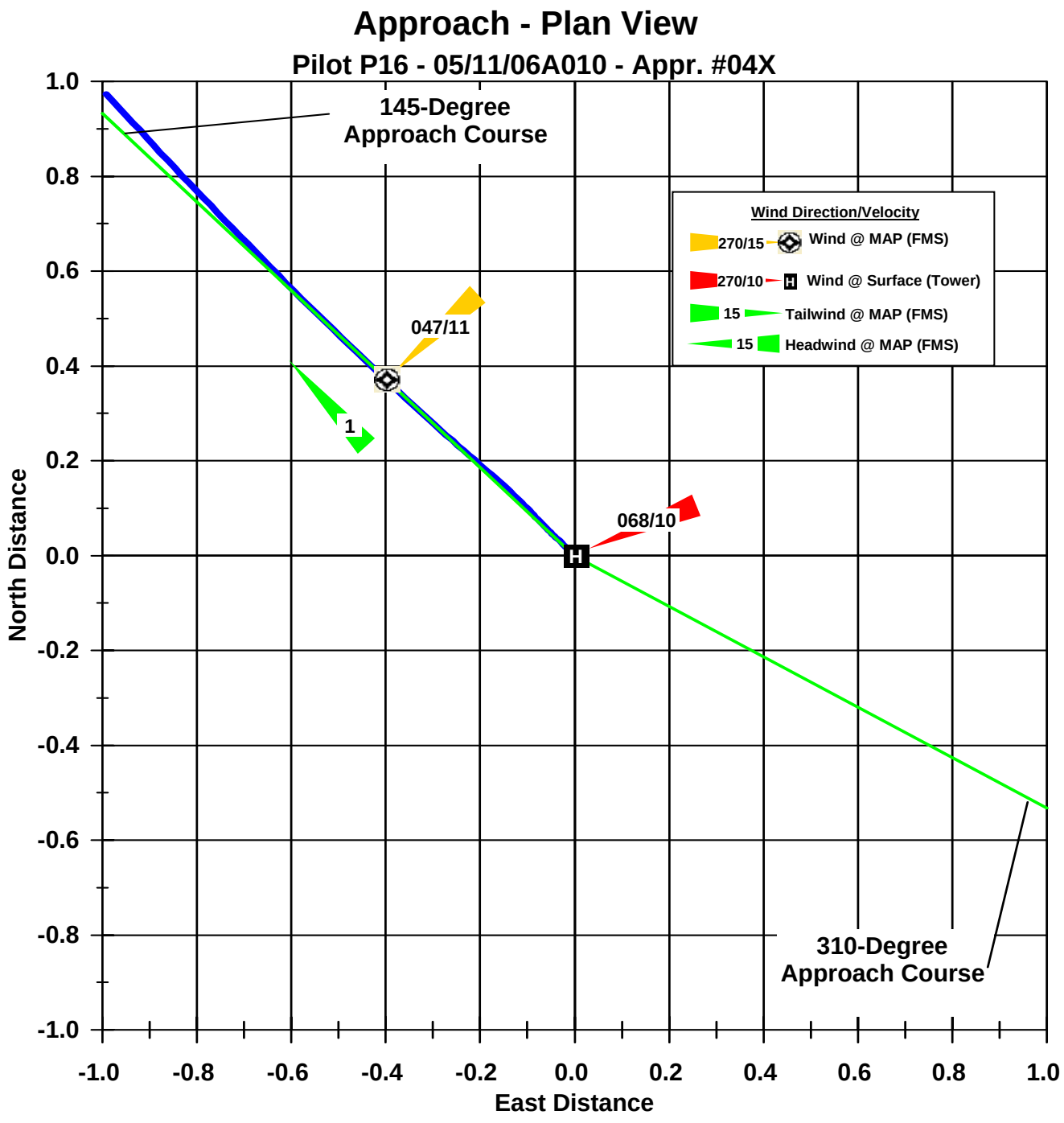


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06A009 - Appr. #03Y

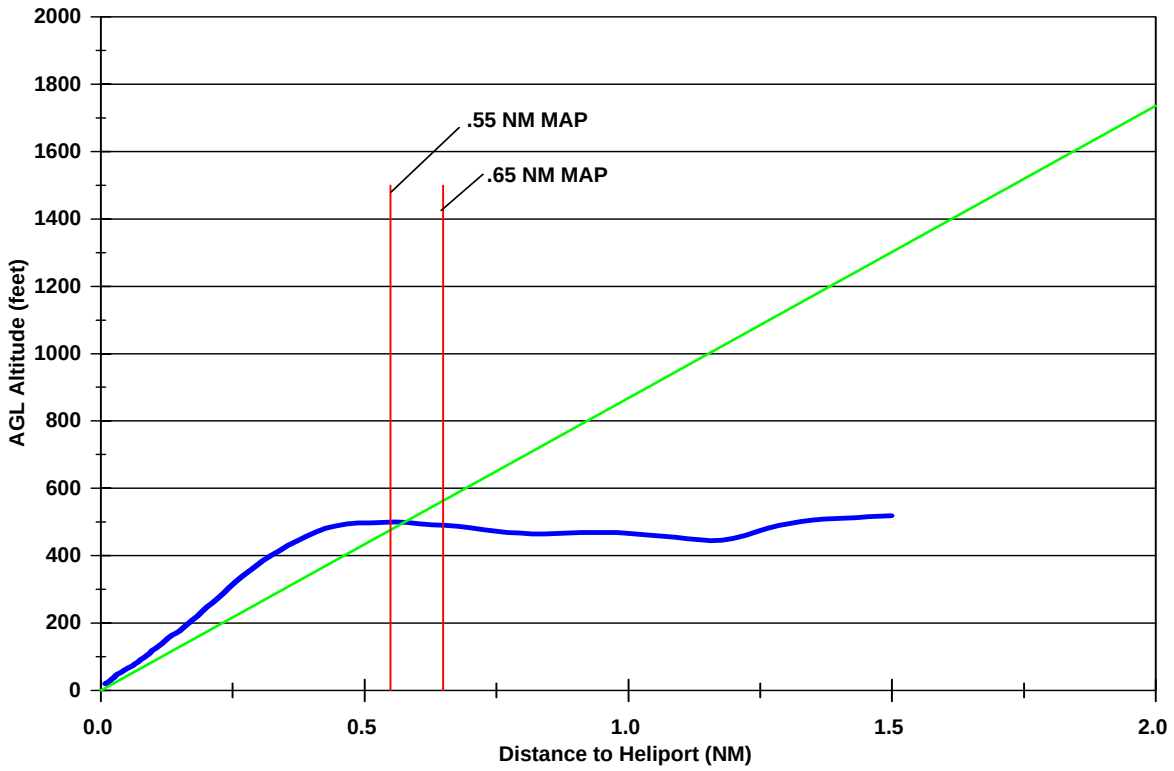


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06A009 - Appr. #03Y

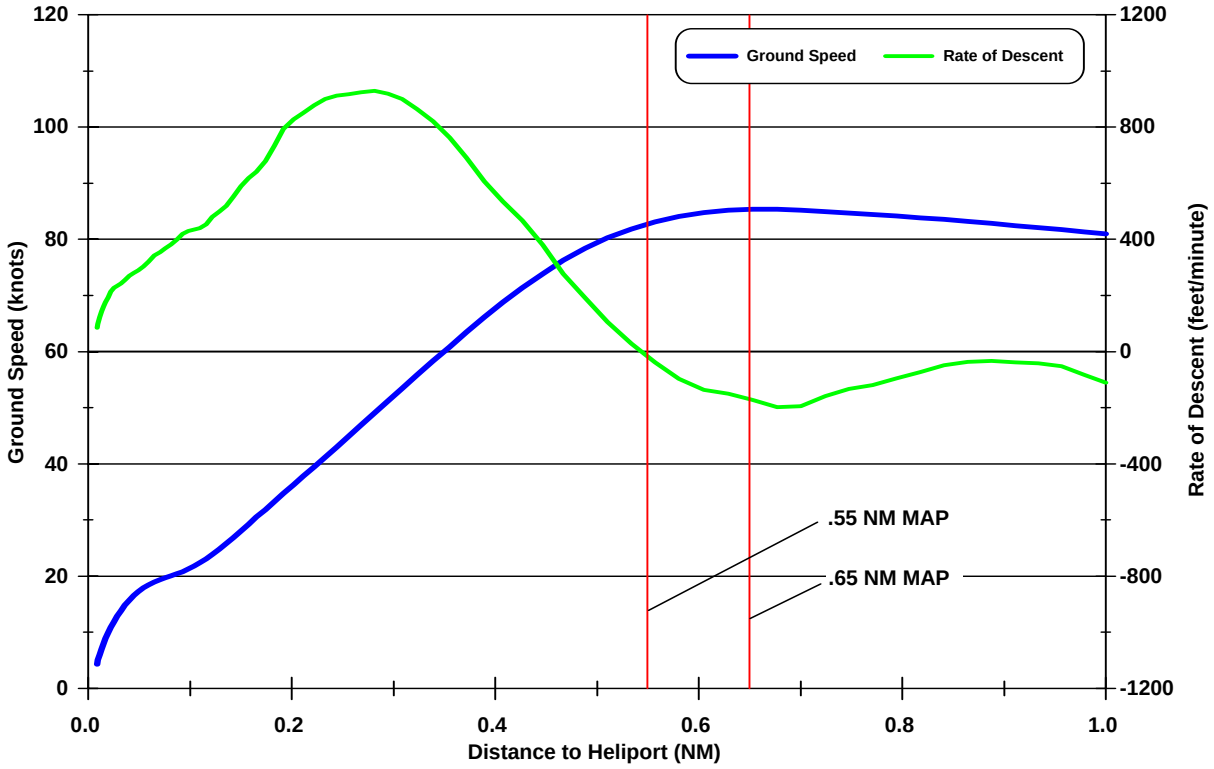



Approach - Plan View
Pilot P16 - 05/11/06A010 - Appr. #04X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
047/11
068/10
1
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

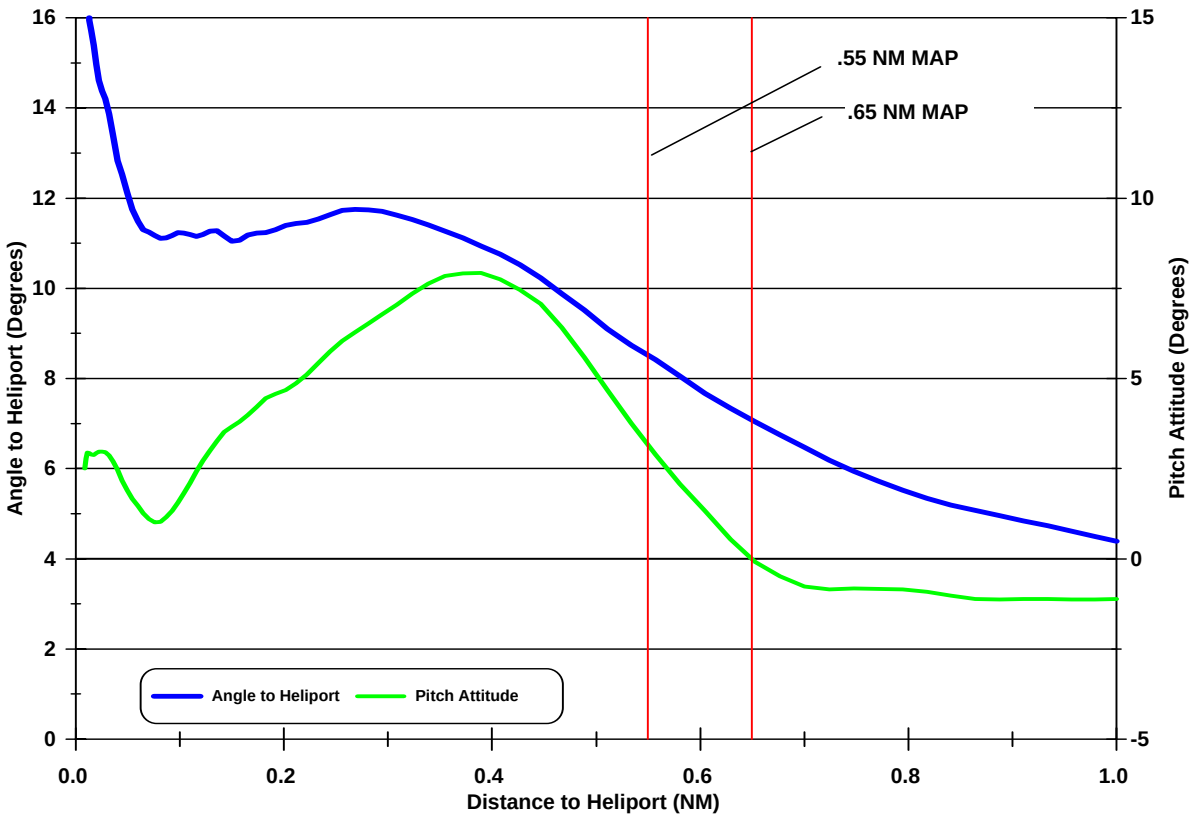
Profile View
Pilot P16 - 05/11/06A010 - Appr. #04X



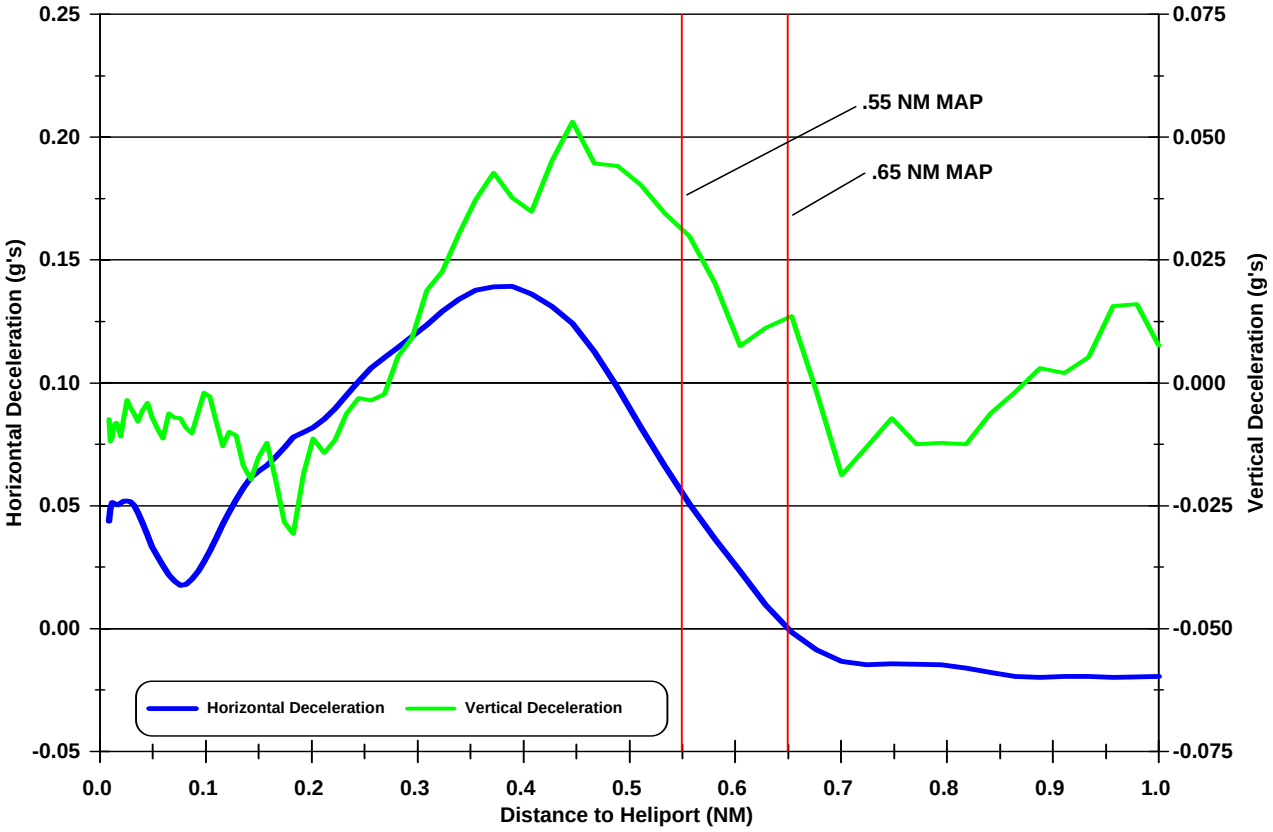
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06A010 - Appr. #04X

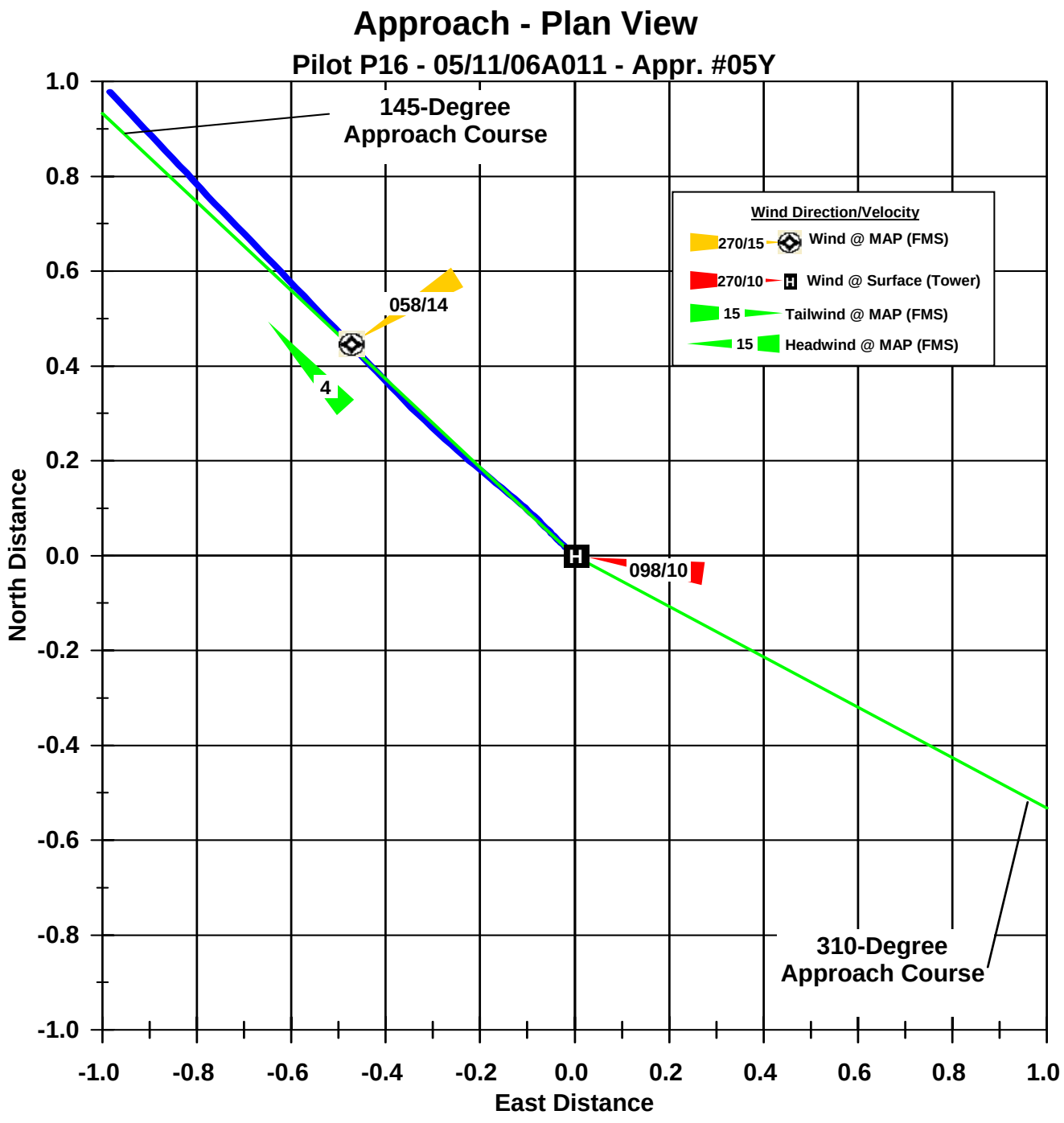


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06A010 - Appr. #04X

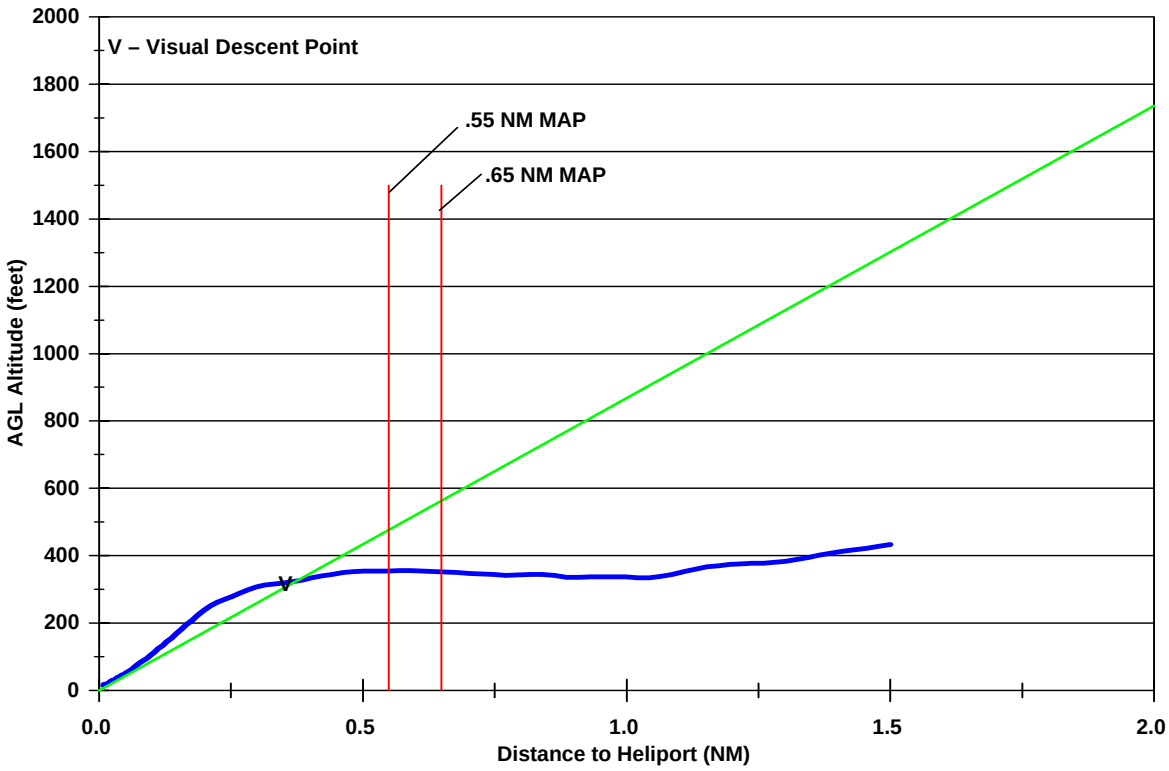


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06A010 - Appr. #04X

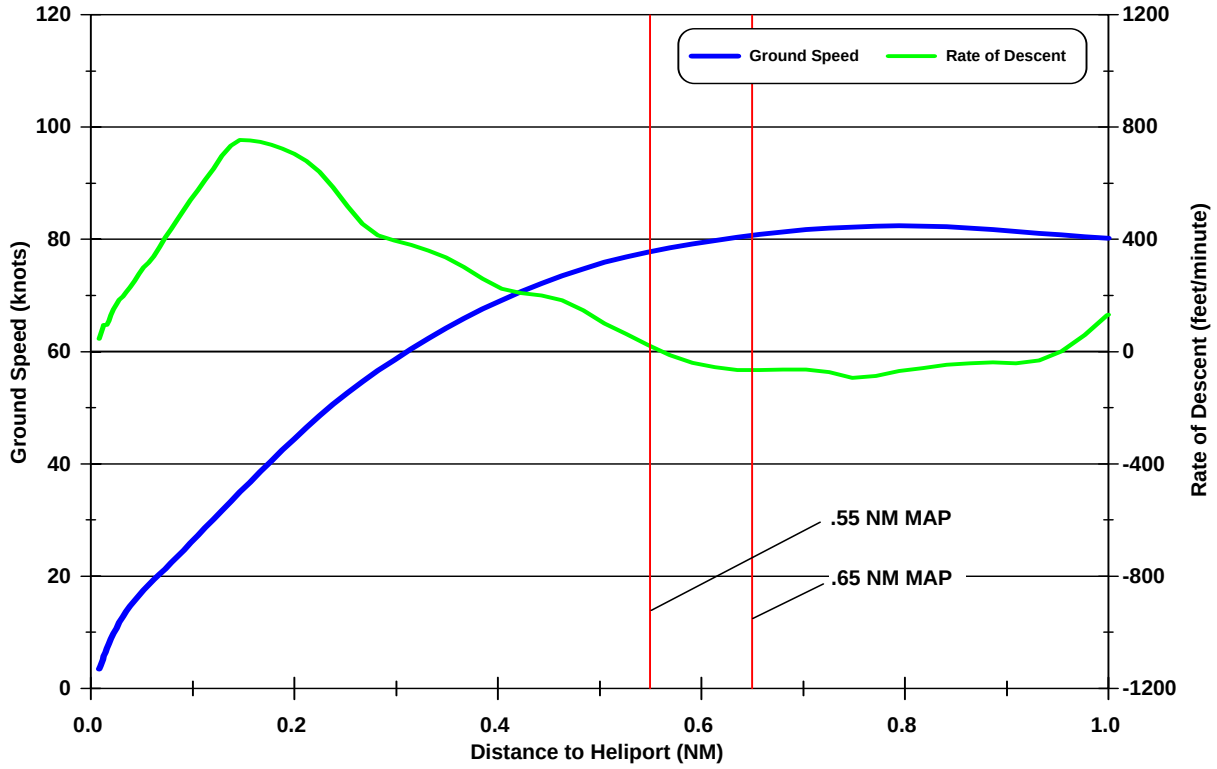



Approach - Plan View
Pilot P16 - 05/11/06A011 - Appr. #05Y
145-Degree
Approach Course
310-Degree
Approach Course
058/14
4
098/10
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

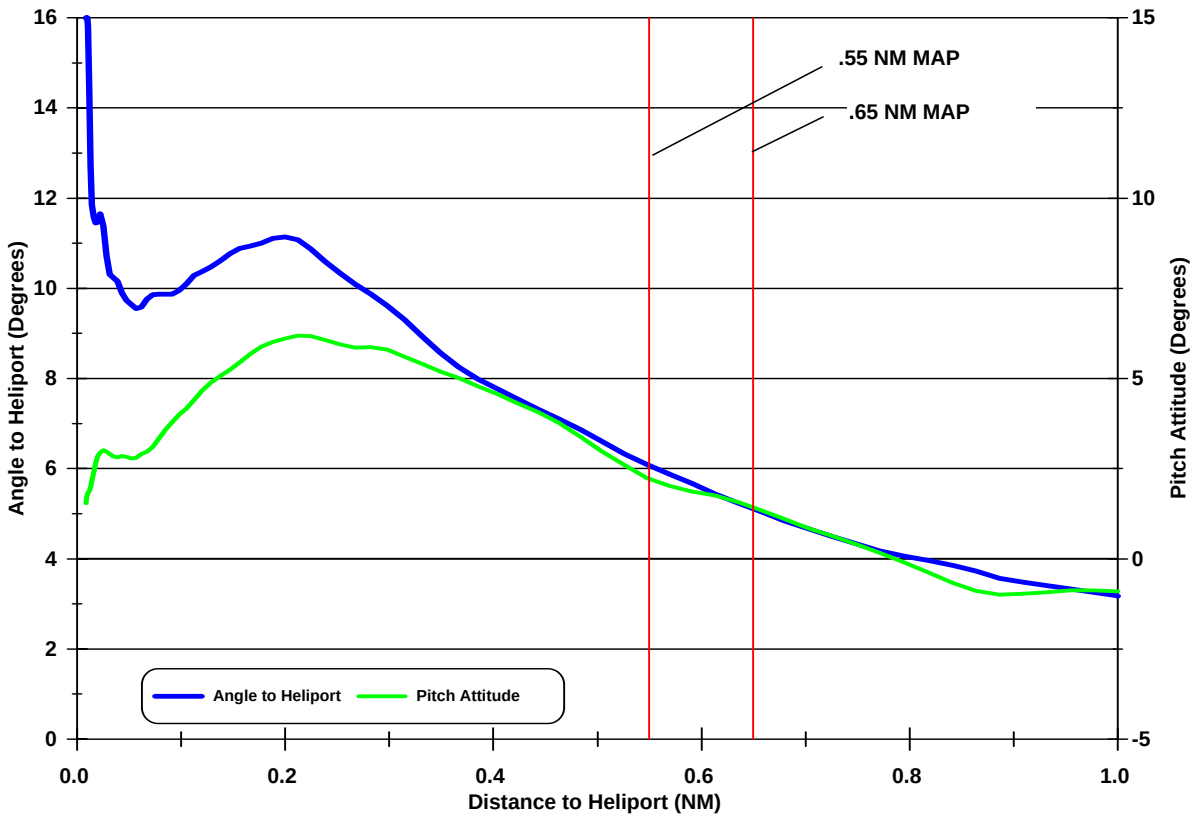
Profile View
Pilot P16 - 05/11/06A011 - Appr. #05Y



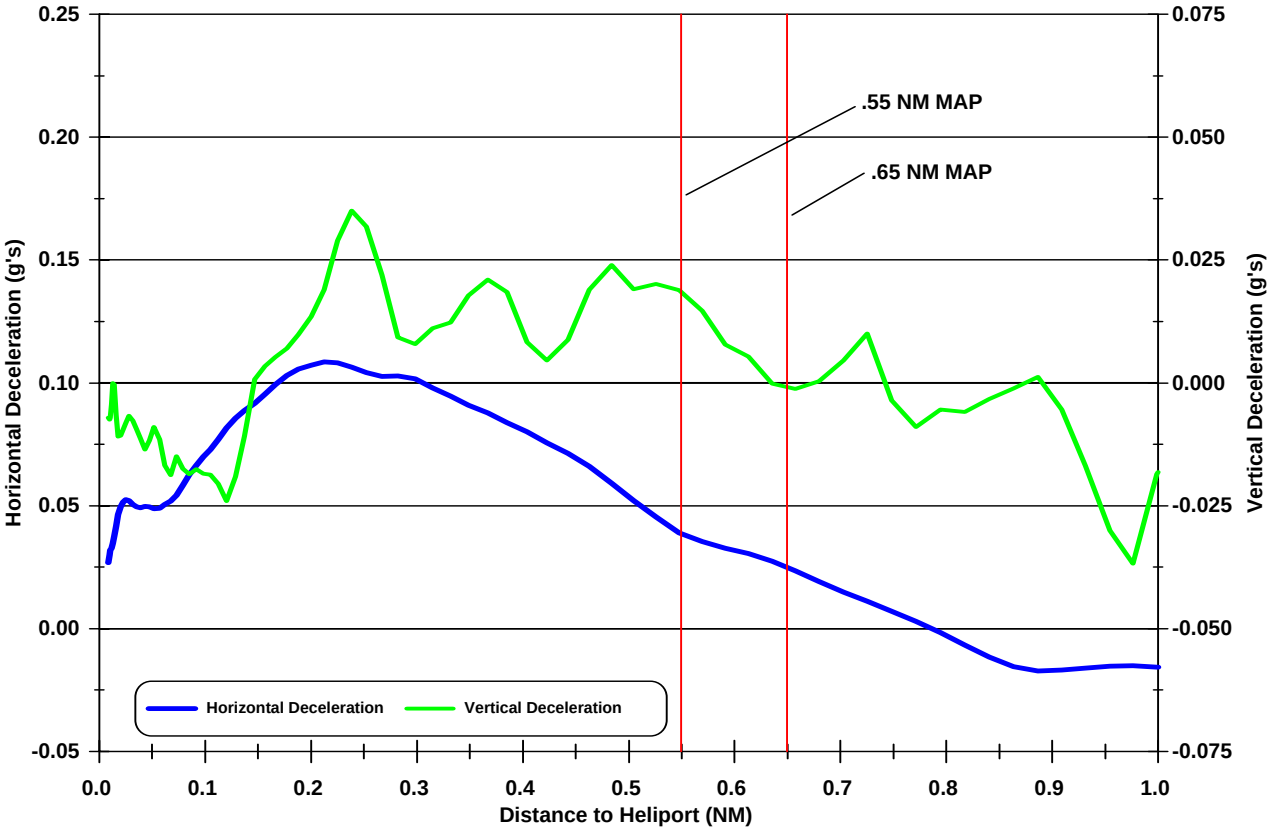
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06A011 - Appr. #05Y

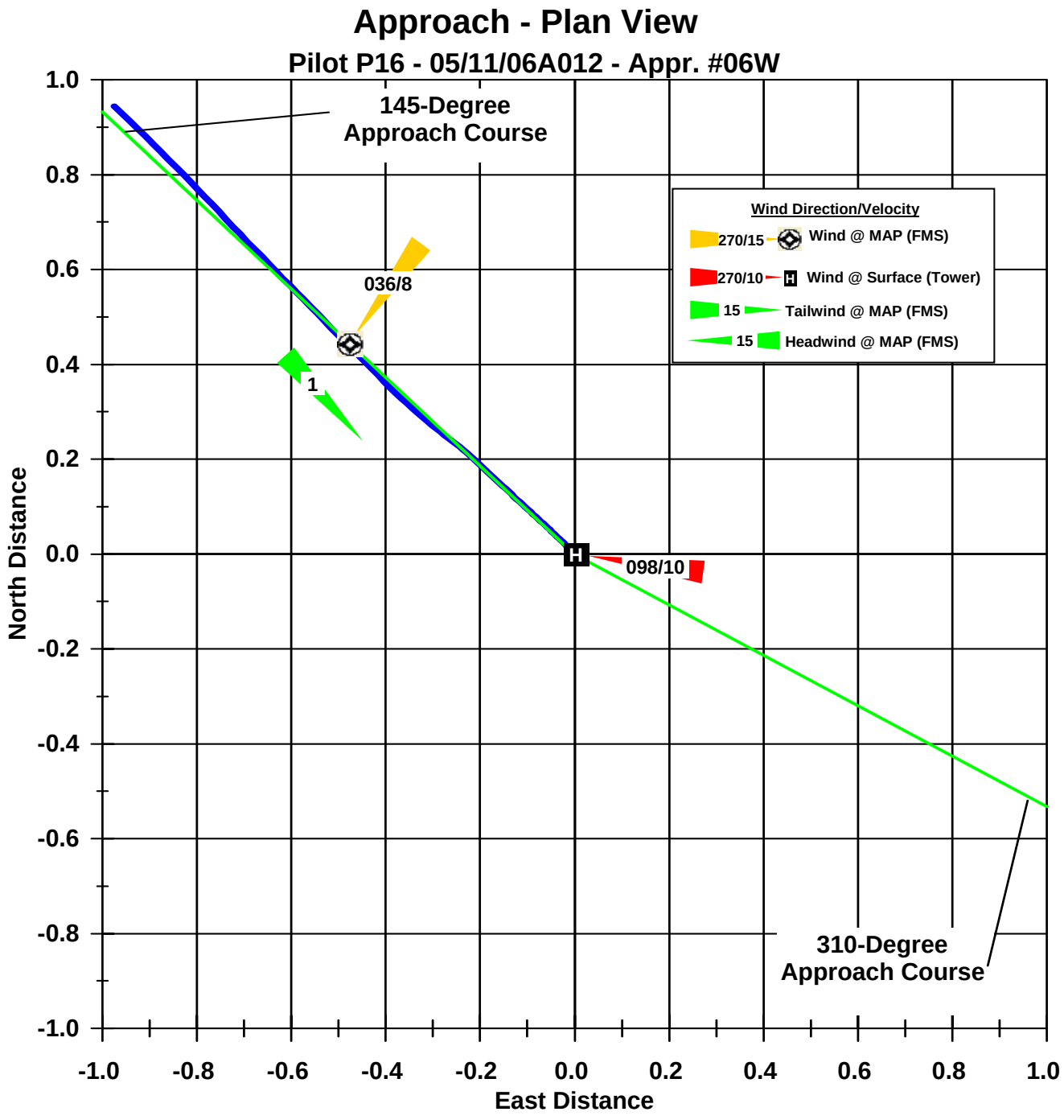


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06A011 - Appr. #05Y

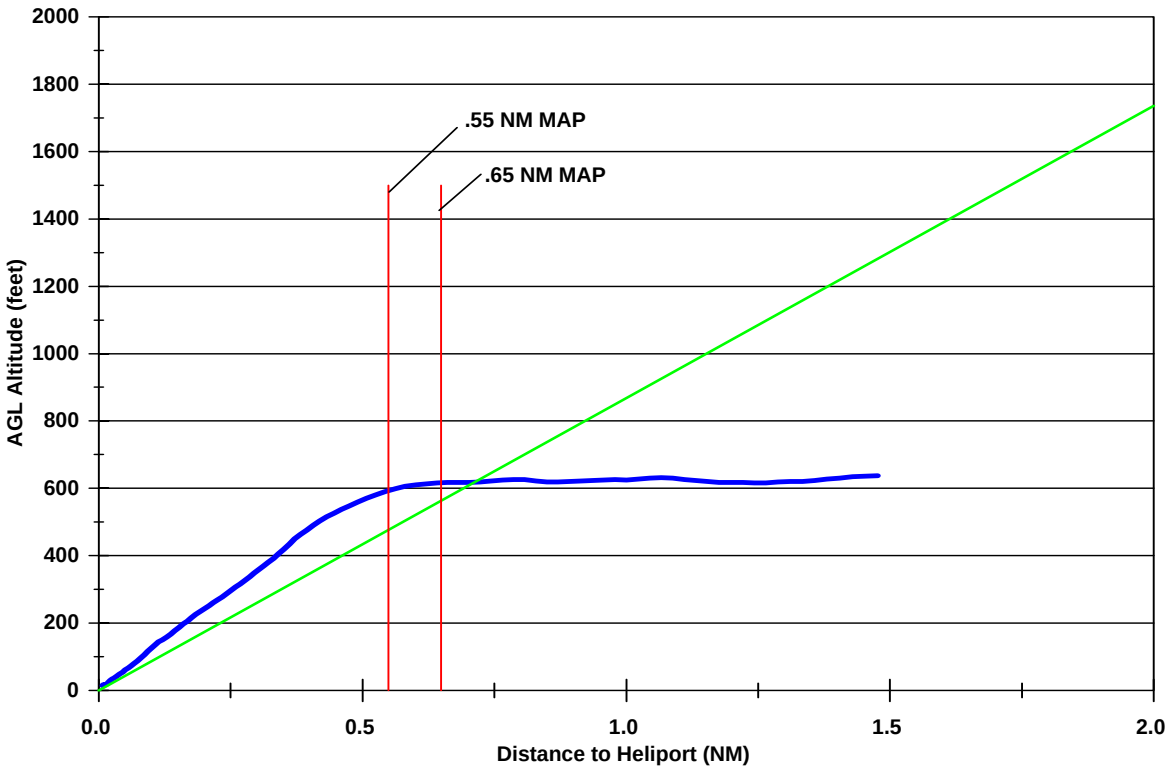


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06A011 - Appr. #05Y

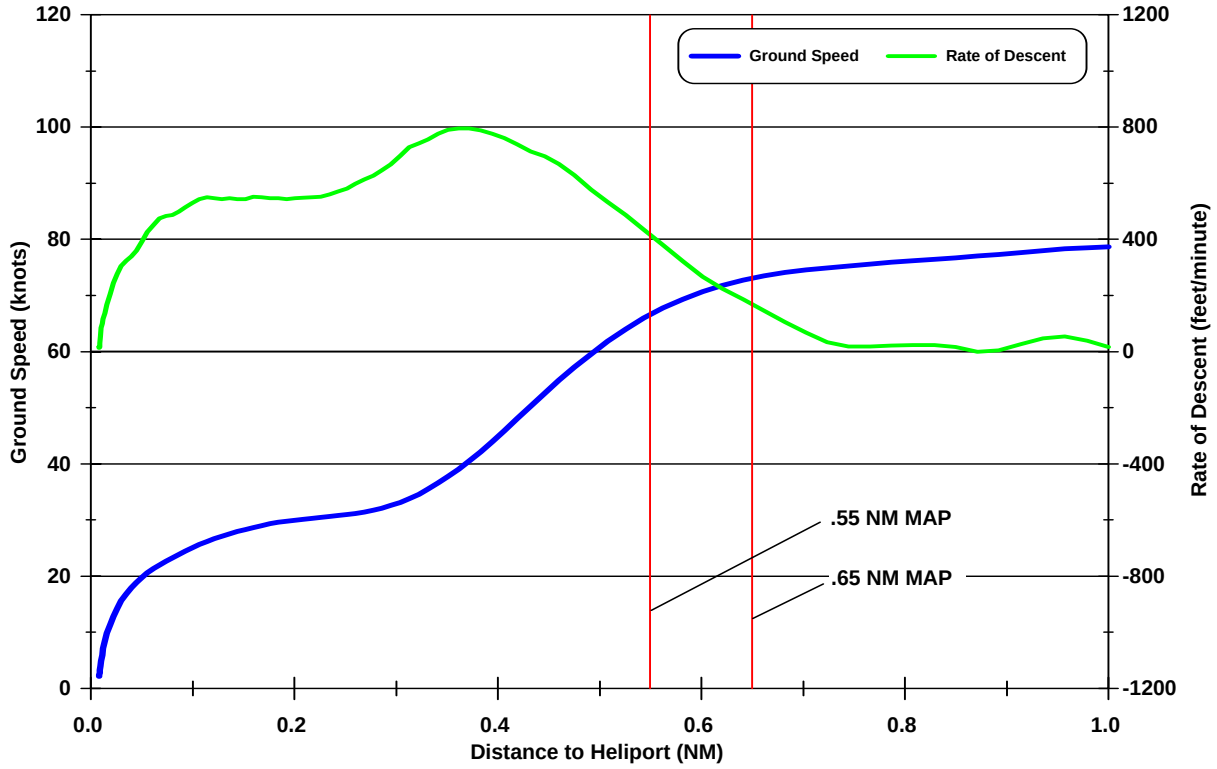



Approach - Plan View
Pilot P16 - 05/11/06A012 - Appr. #06W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
036/8
1
098/10
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

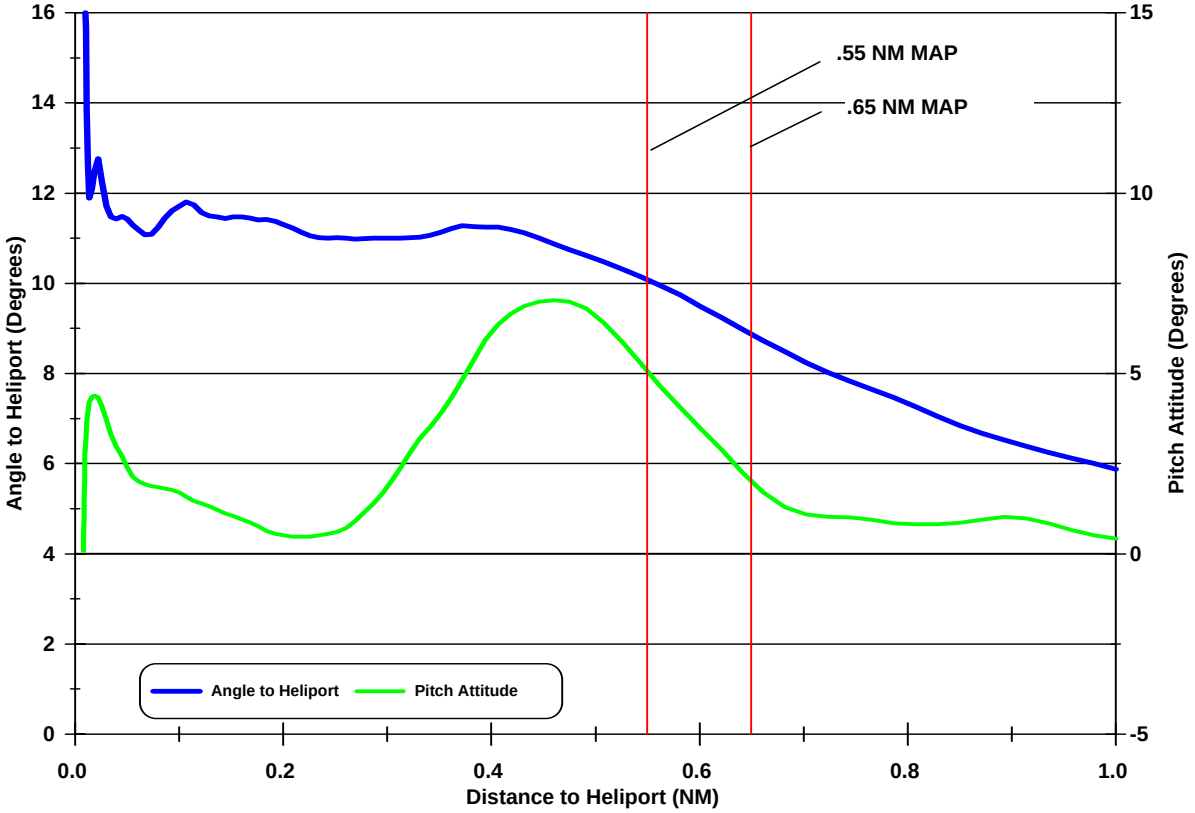
Profile View
Pilot P16 - 05/11/06A012 - Appr. #06W



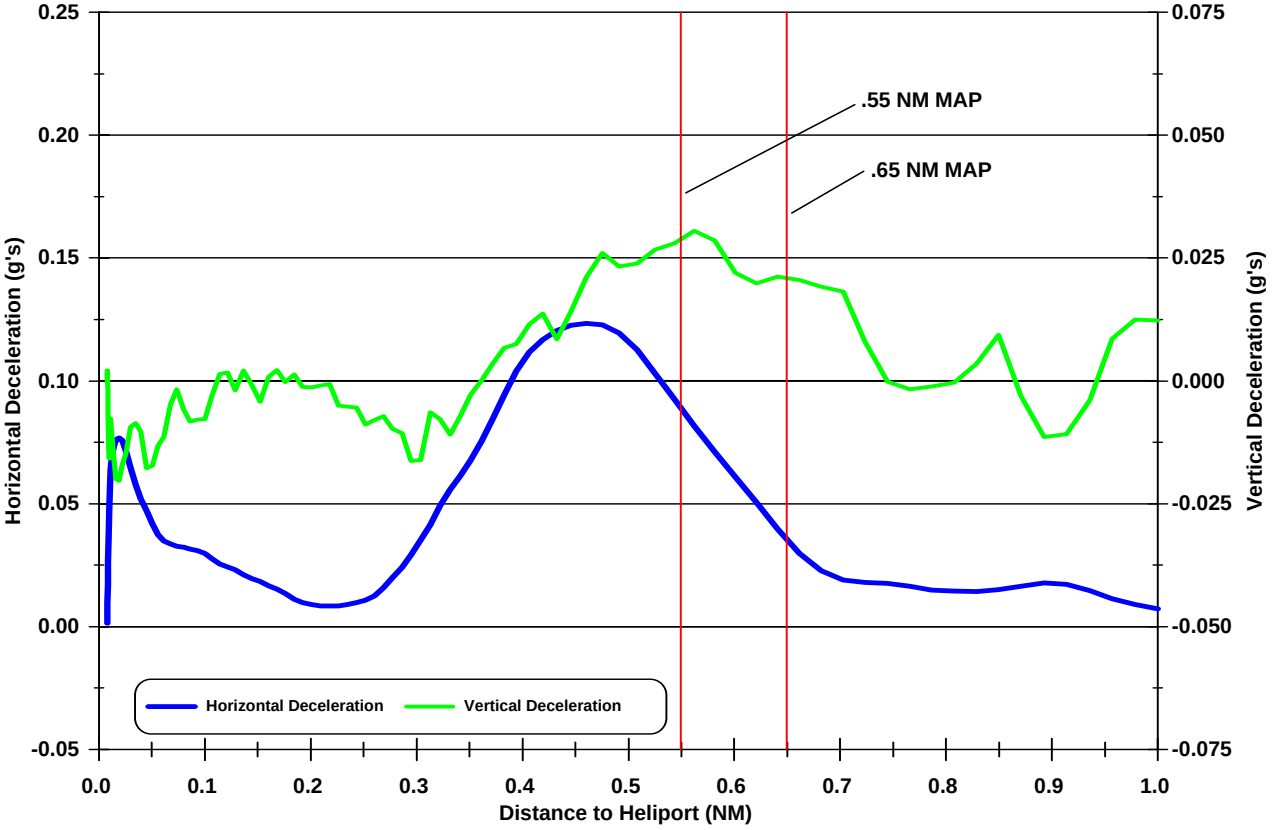
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06A012 - Appr. #06W

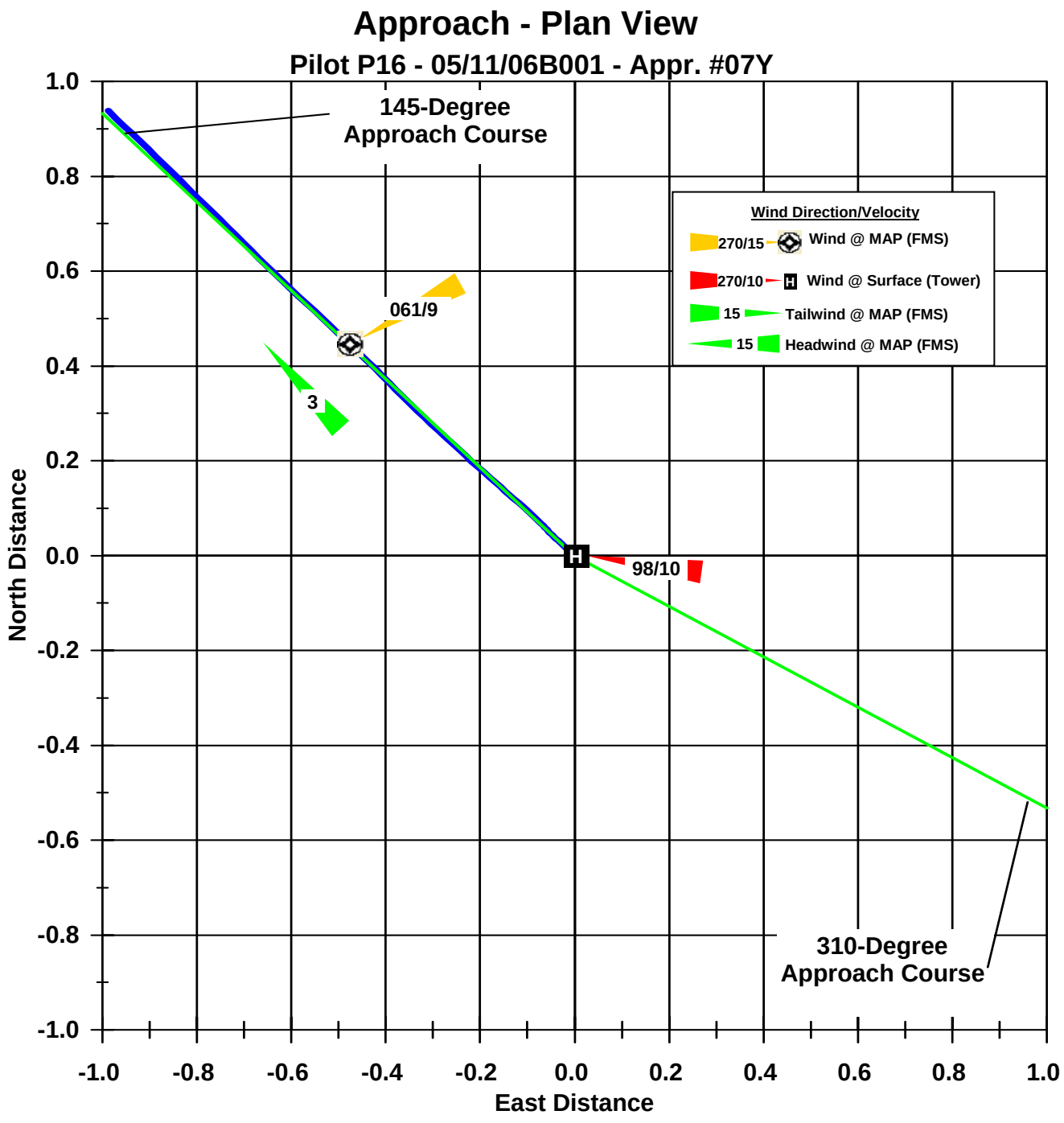


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06A012 - Appr. #06W

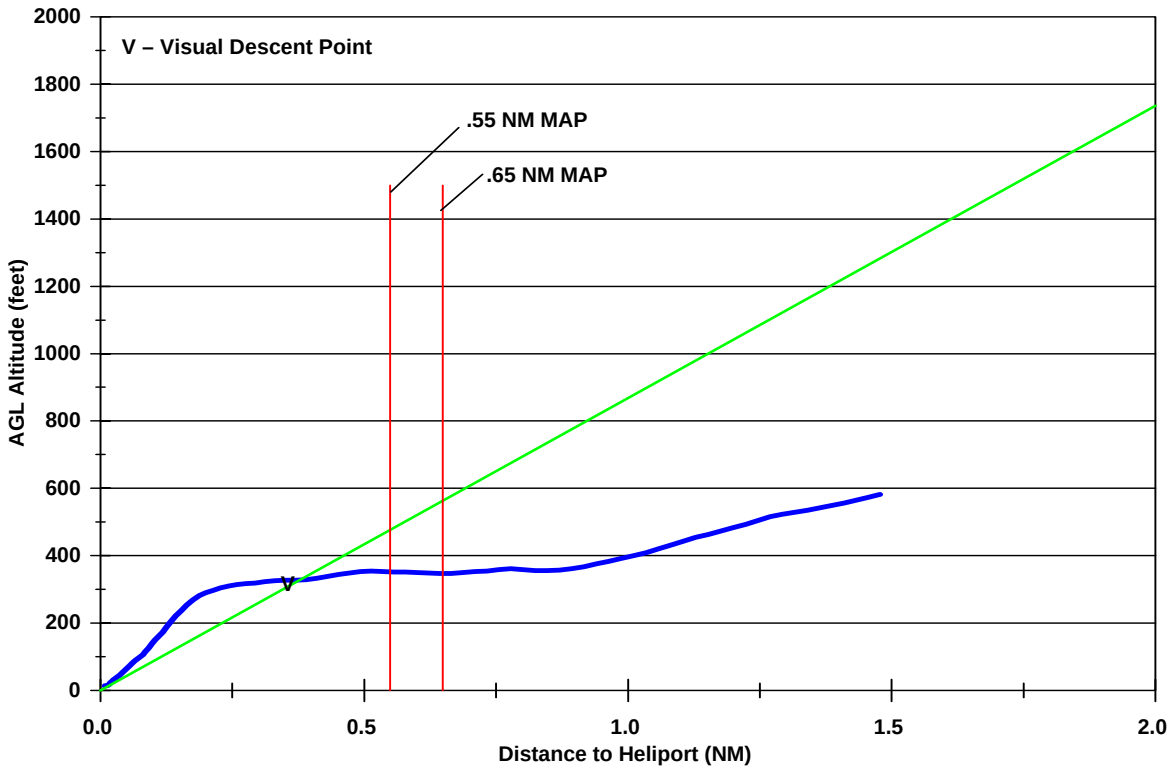


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06A012 - Appr. #06W

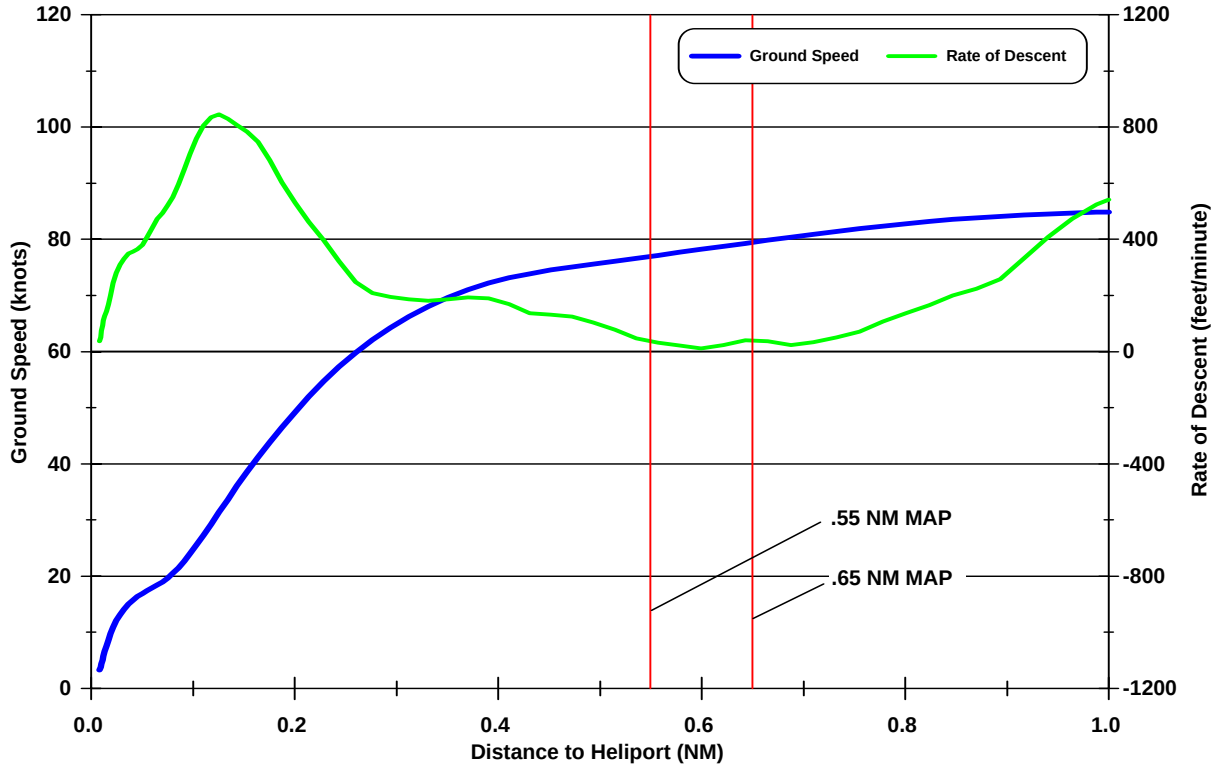



Approach - Plan View
Pilot P16 - 05/11/06B001 - Appr. #07Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
061/9
3
98/10
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

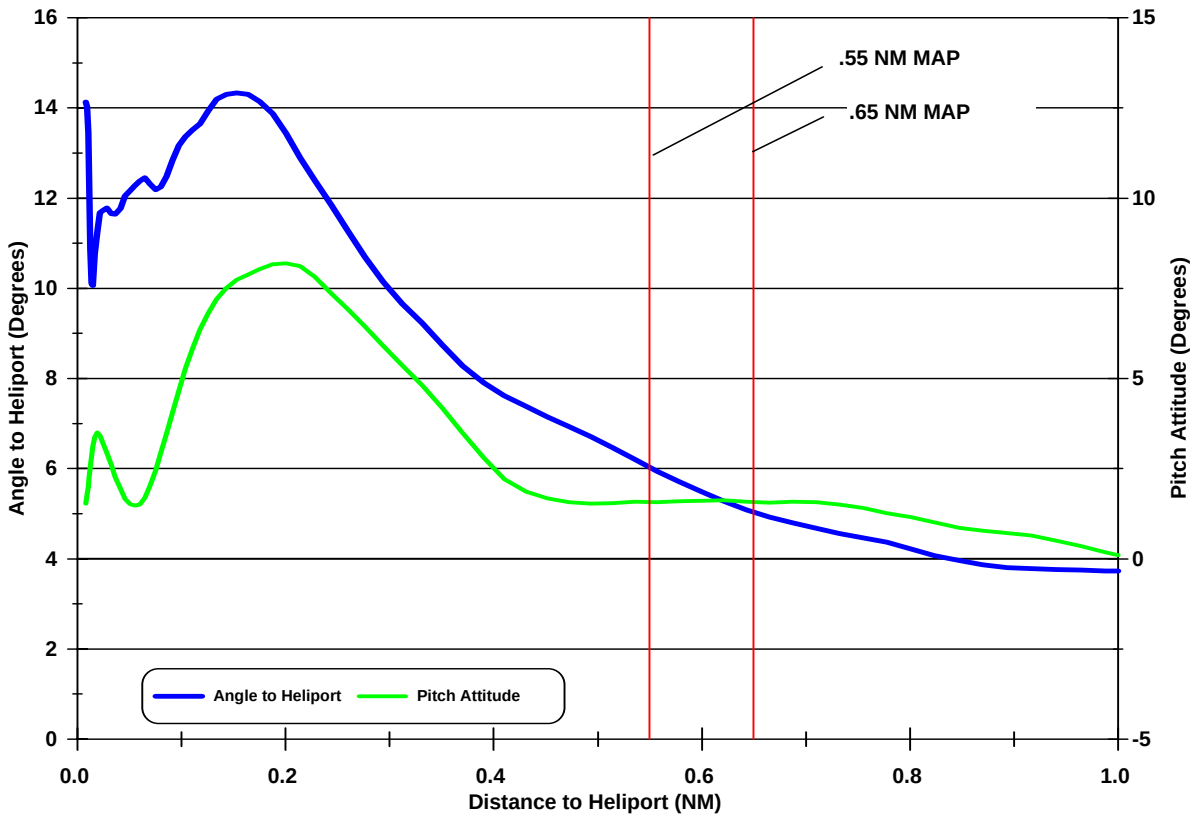
Profile View
Pilot P16 - 05/11/06B001 - Appr. #07Y



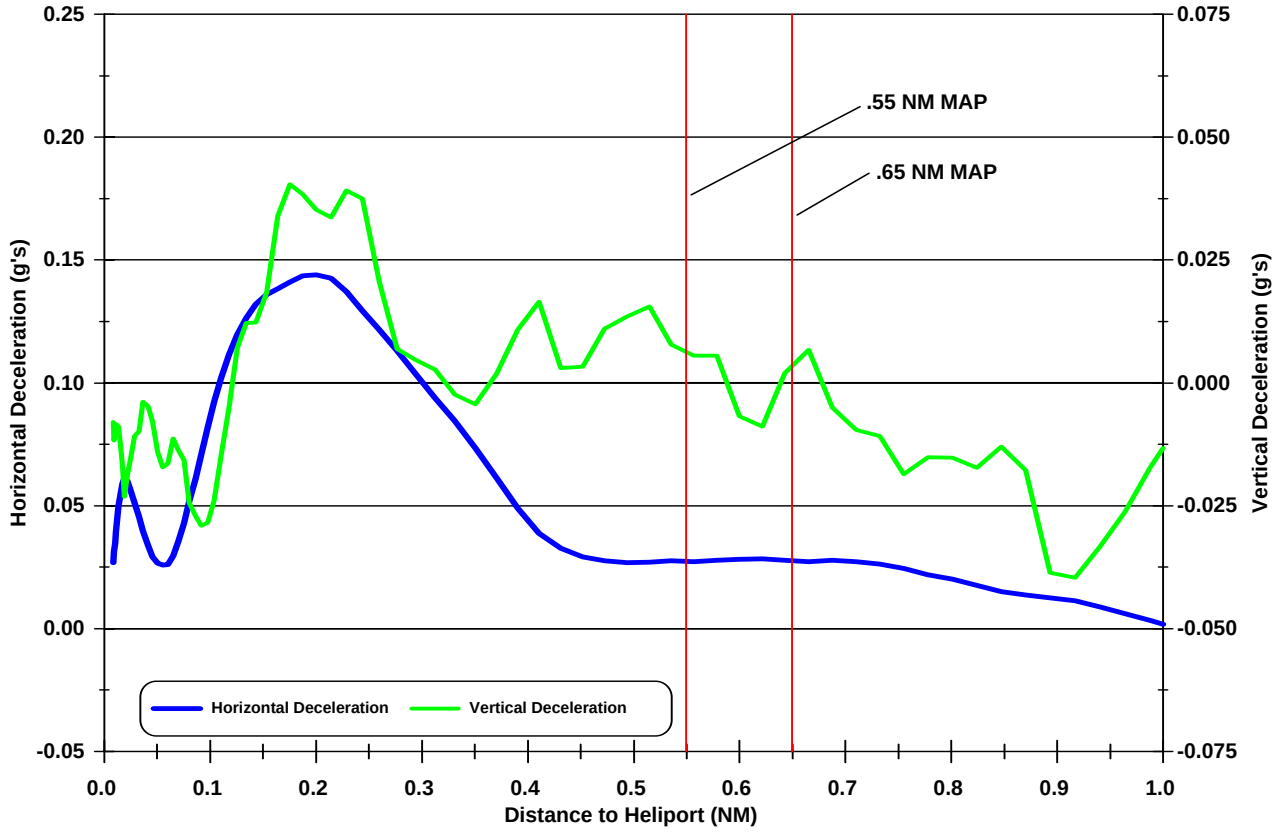
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06B001 - Appr. #07Y

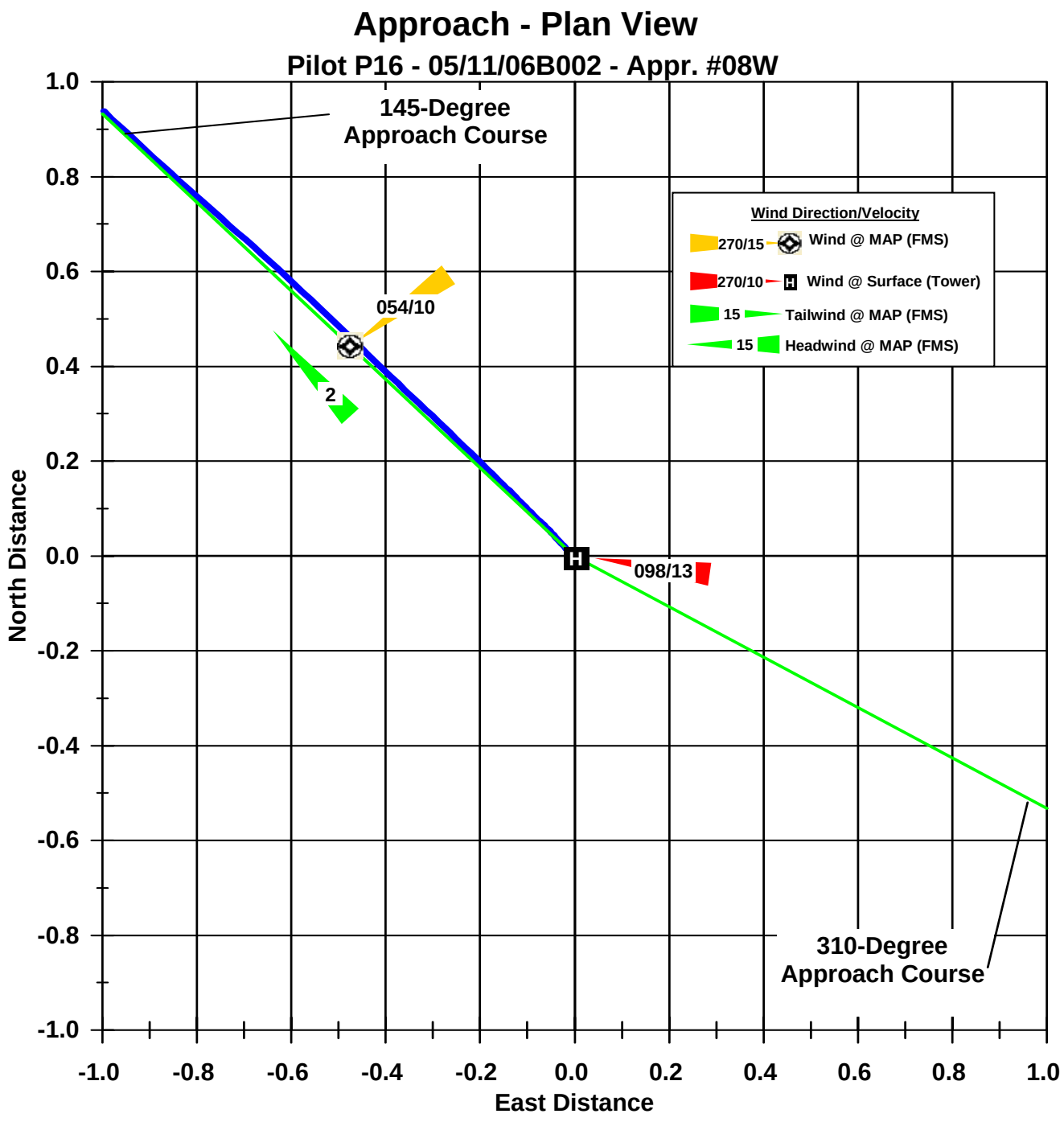


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06B001 - Appr. #07Y

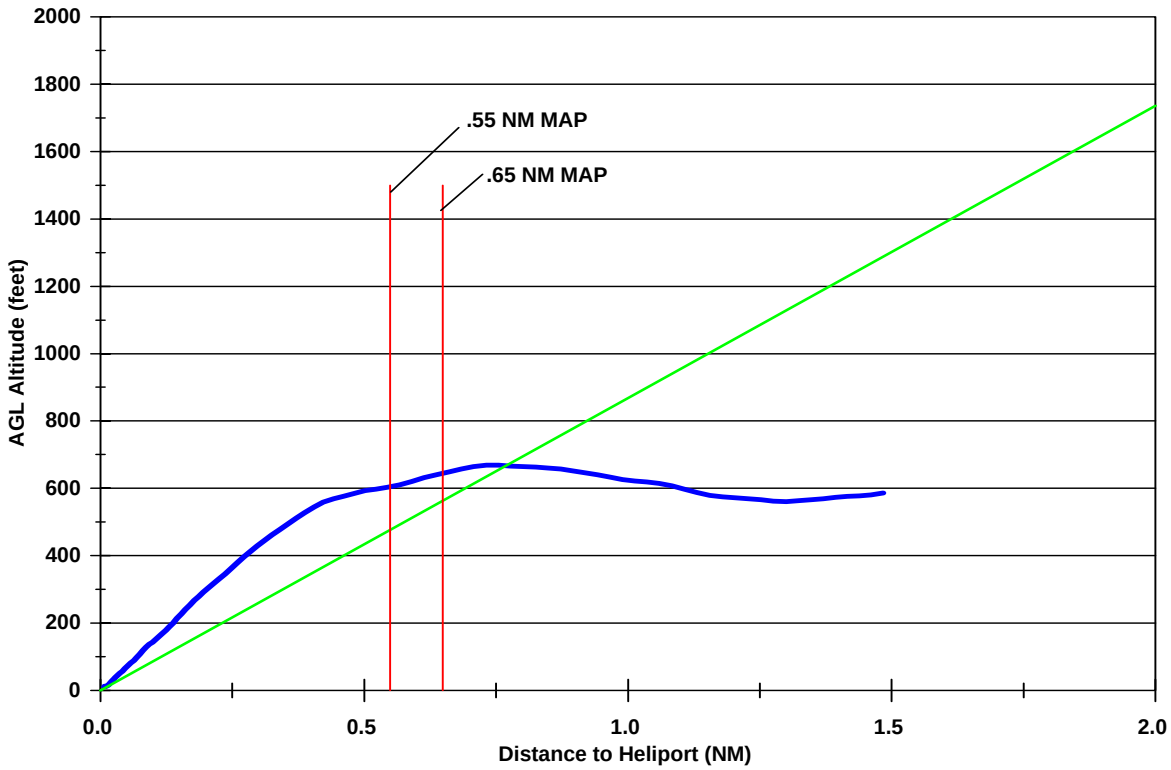


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06B001 - Appr. #07Y

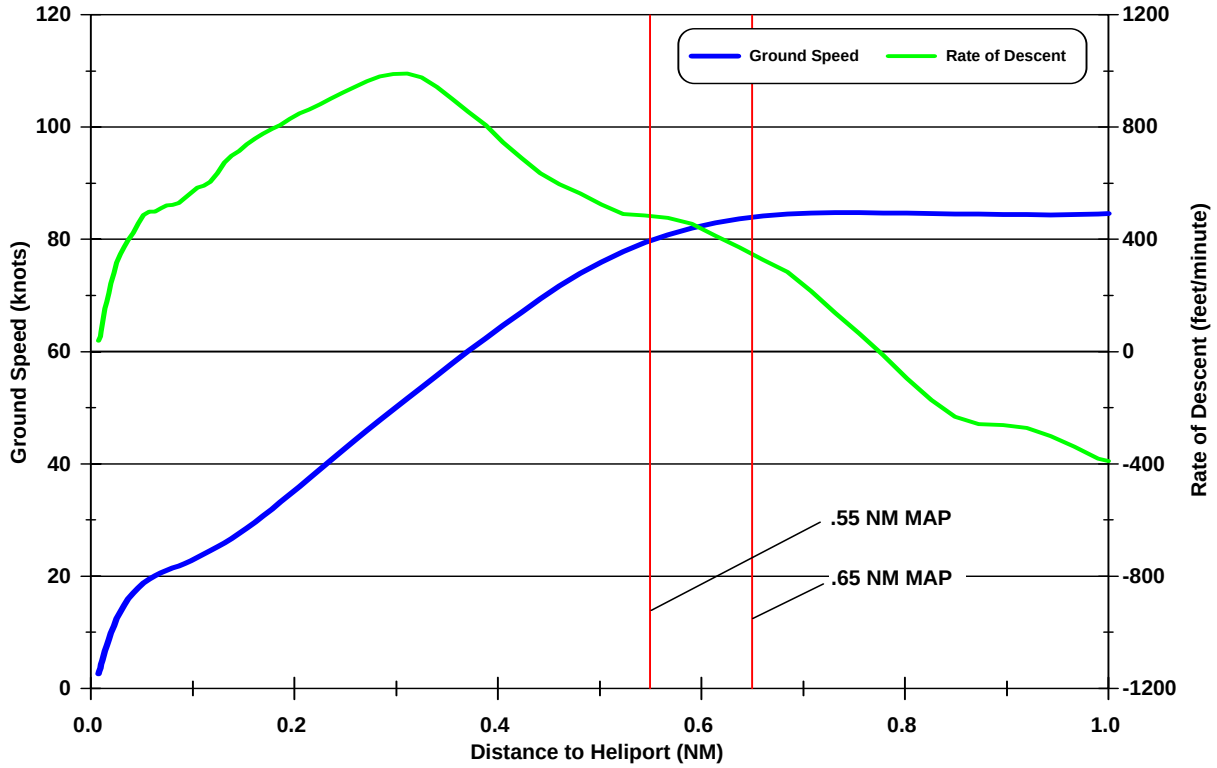



Approach - Plan View
Pilot P16 - 05/11/06B002 - Appr. #08W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
054/10
2
098/13
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

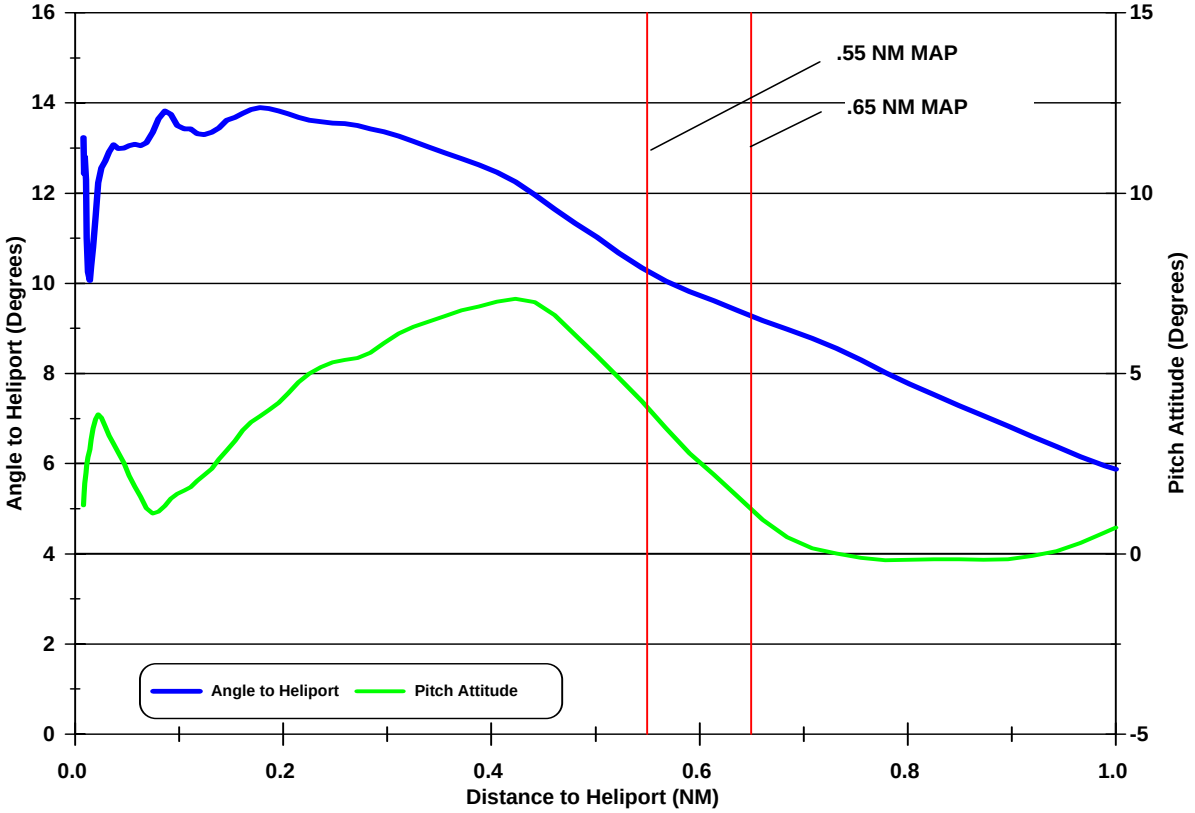
Profile View
Pilot P16 - 05/11/06B002 - Appr. #08W



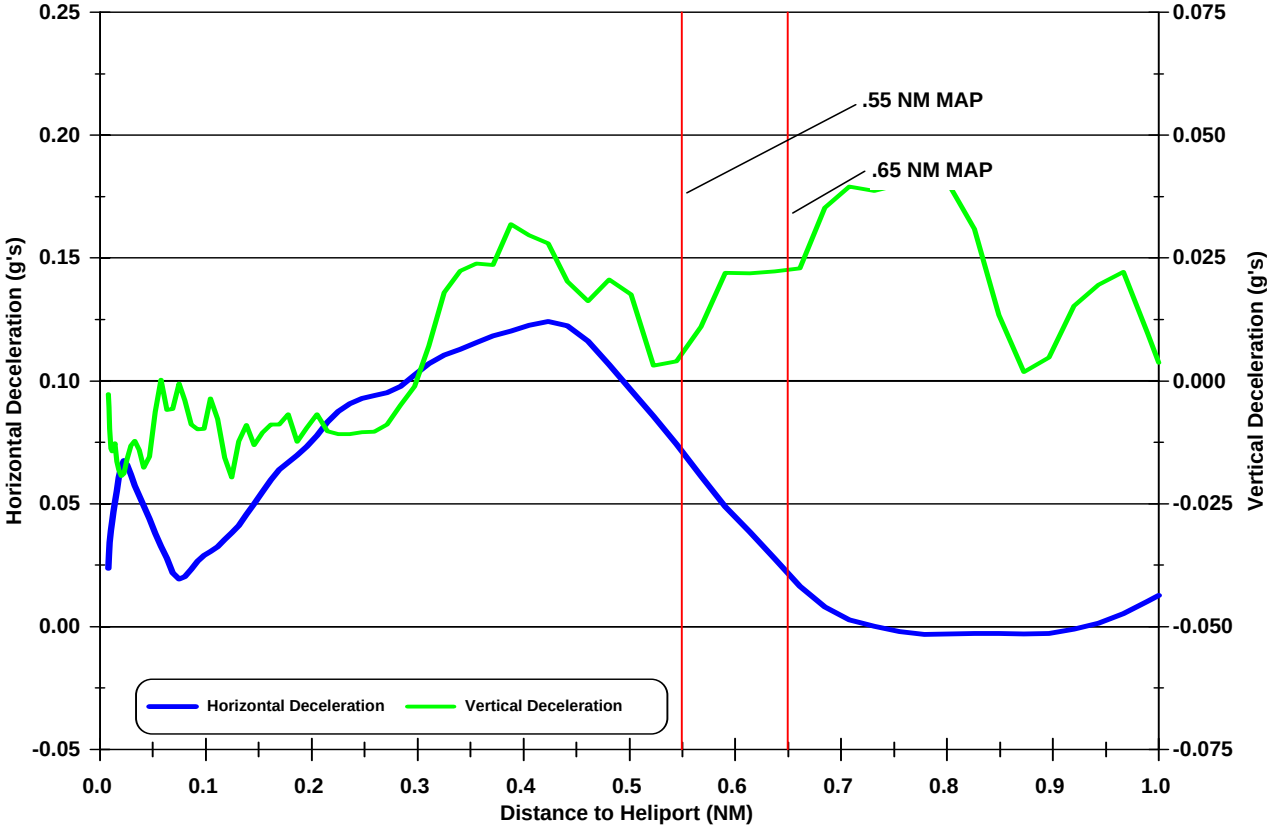
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06B002 - Appr. #08W

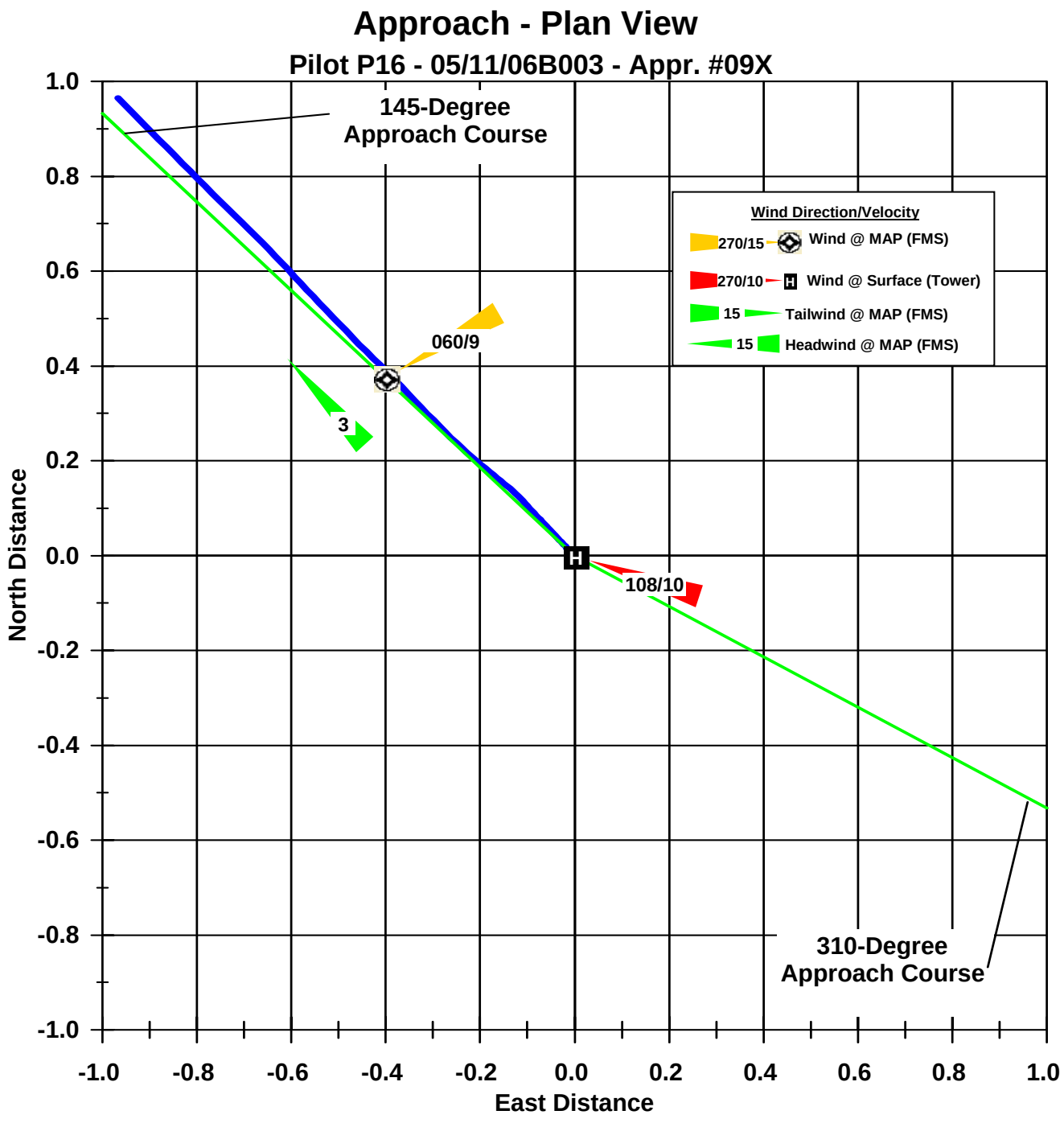


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06B002 - Appr. #08W

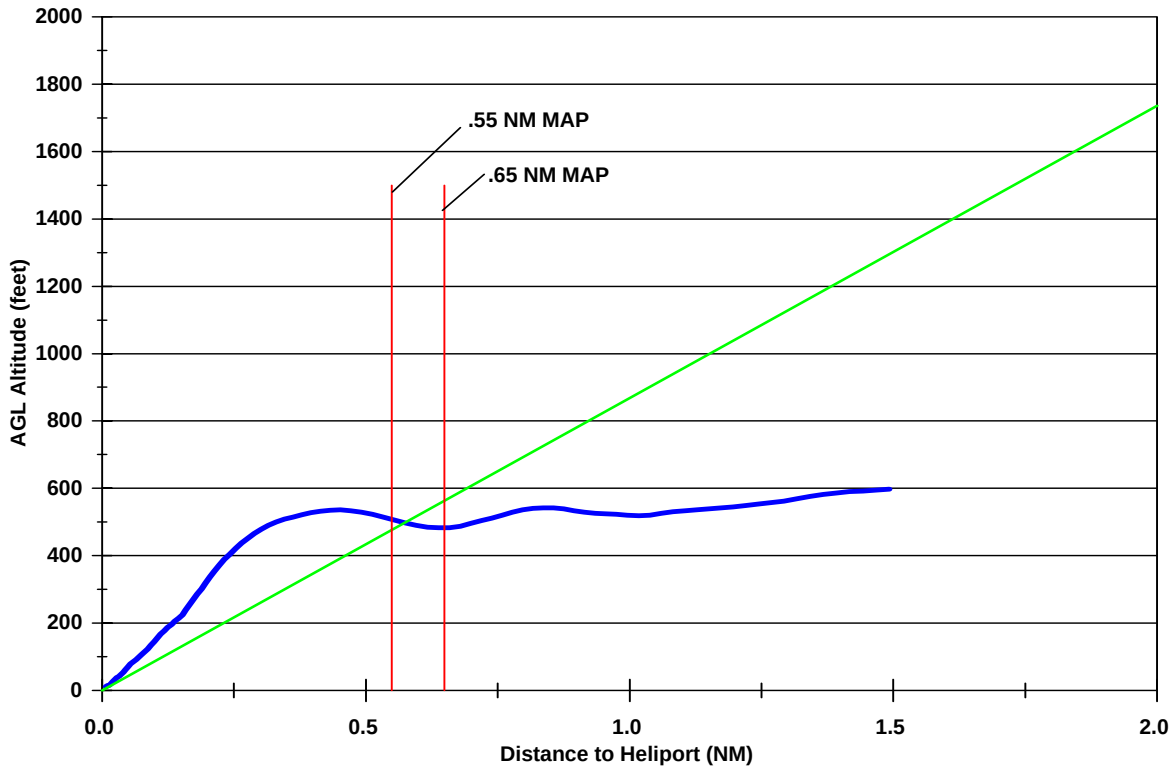


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06B002 - Appr. #08W

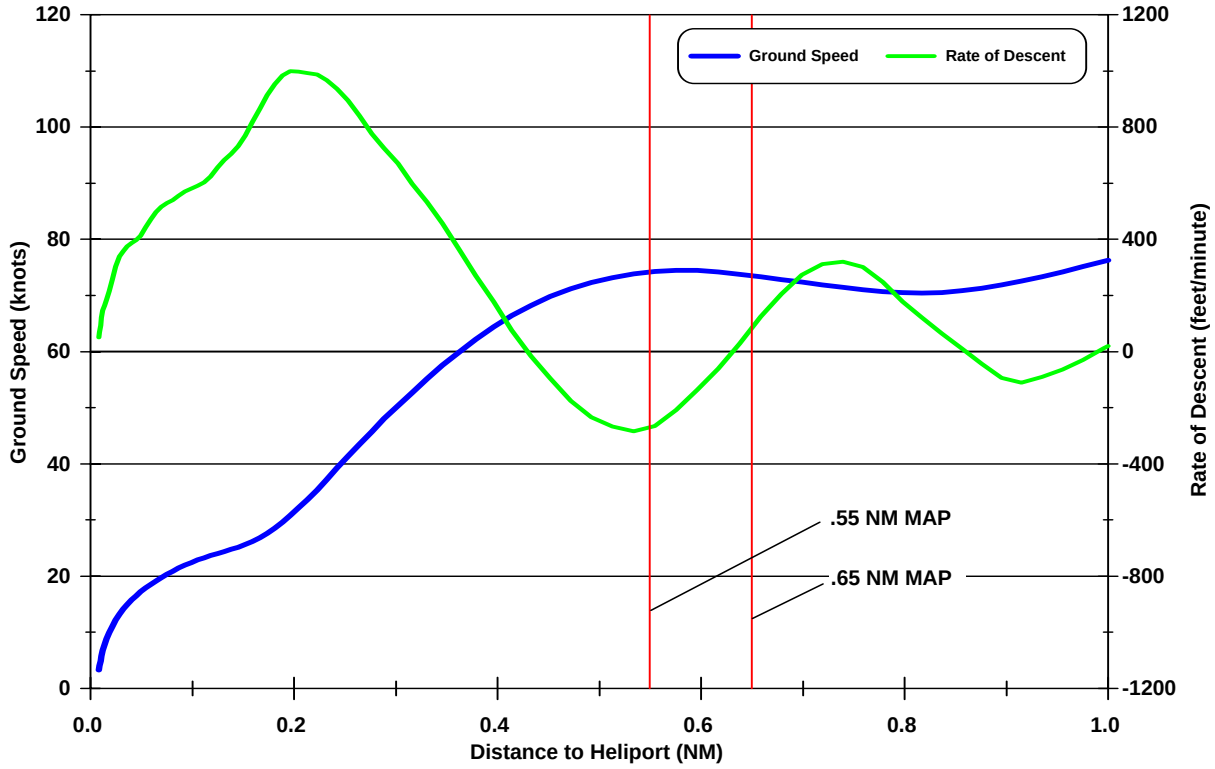



Approach - Plan View
Pilot P16 - 05/11/06B003 - Appr. #09X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
060/9
3
108/10
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

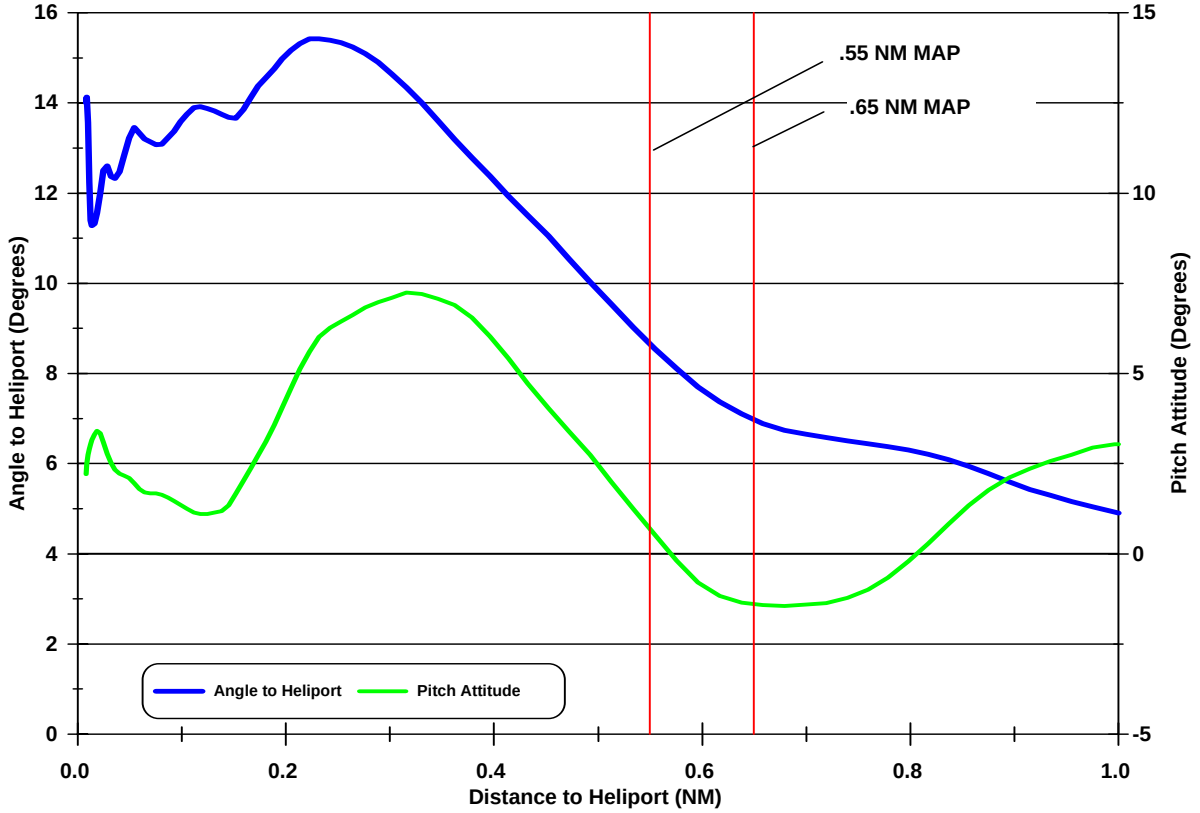
Profile View
Pilot P16 - 05/11/06B003 - Appr. #09X



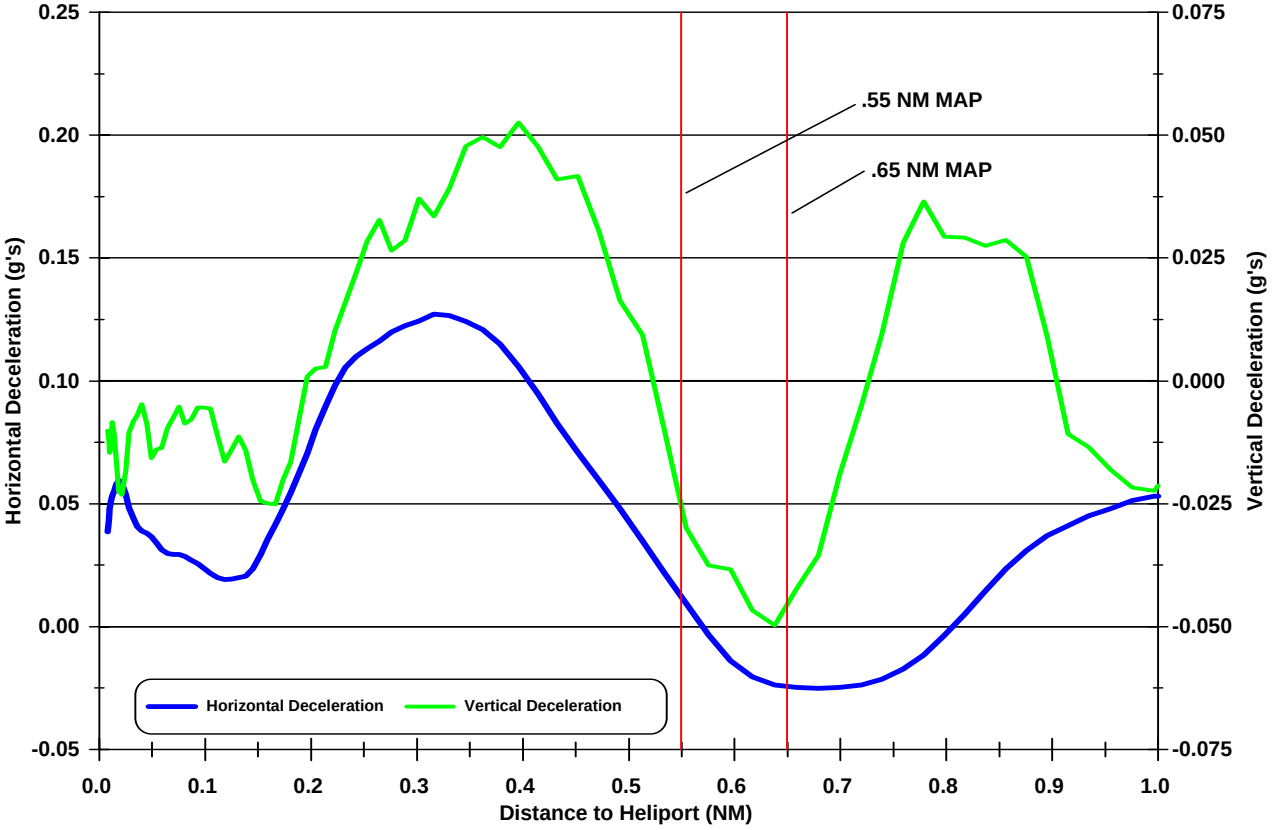
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06B003 - Appr. #09X

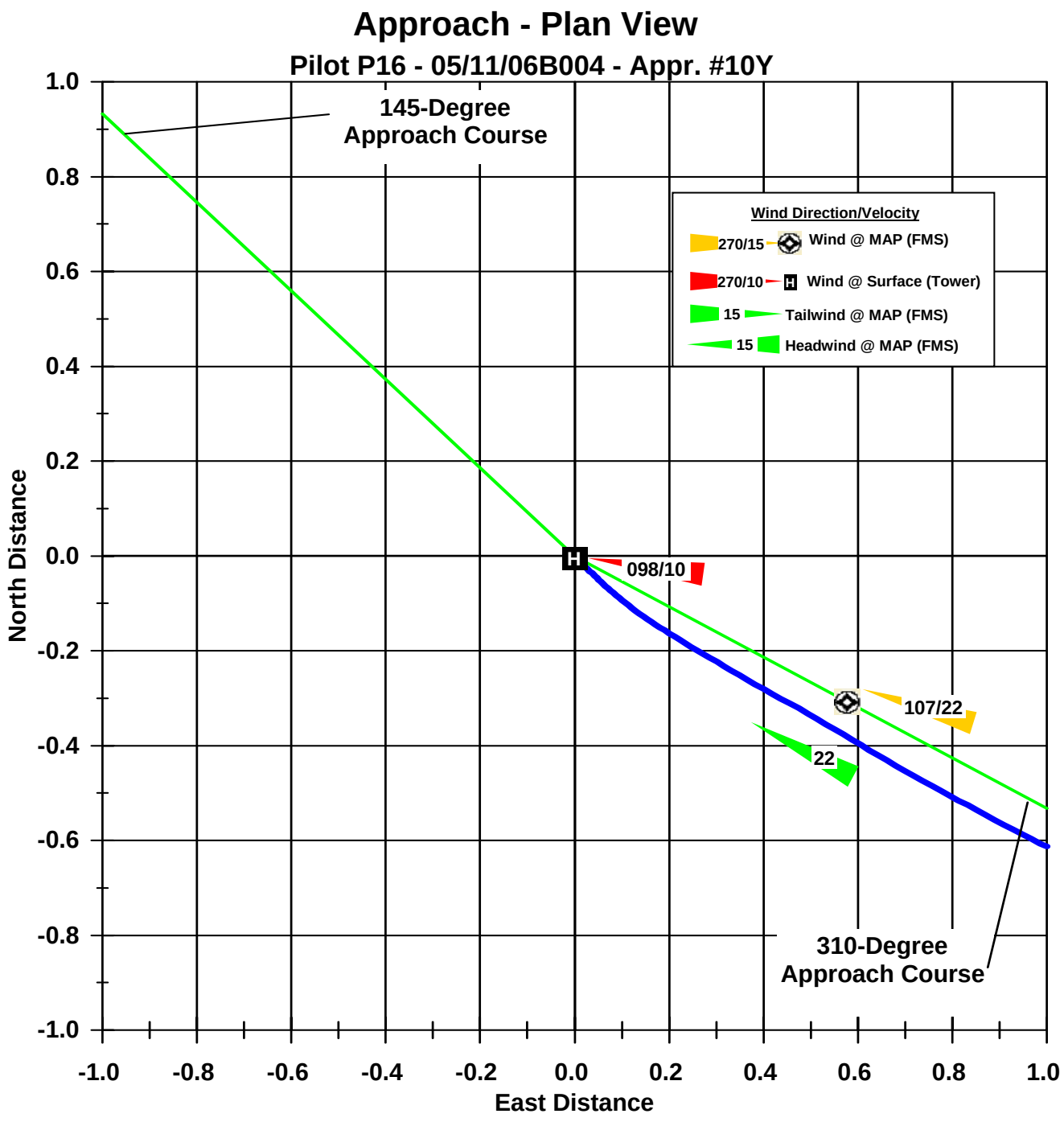


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06B003 - Appr. #09X

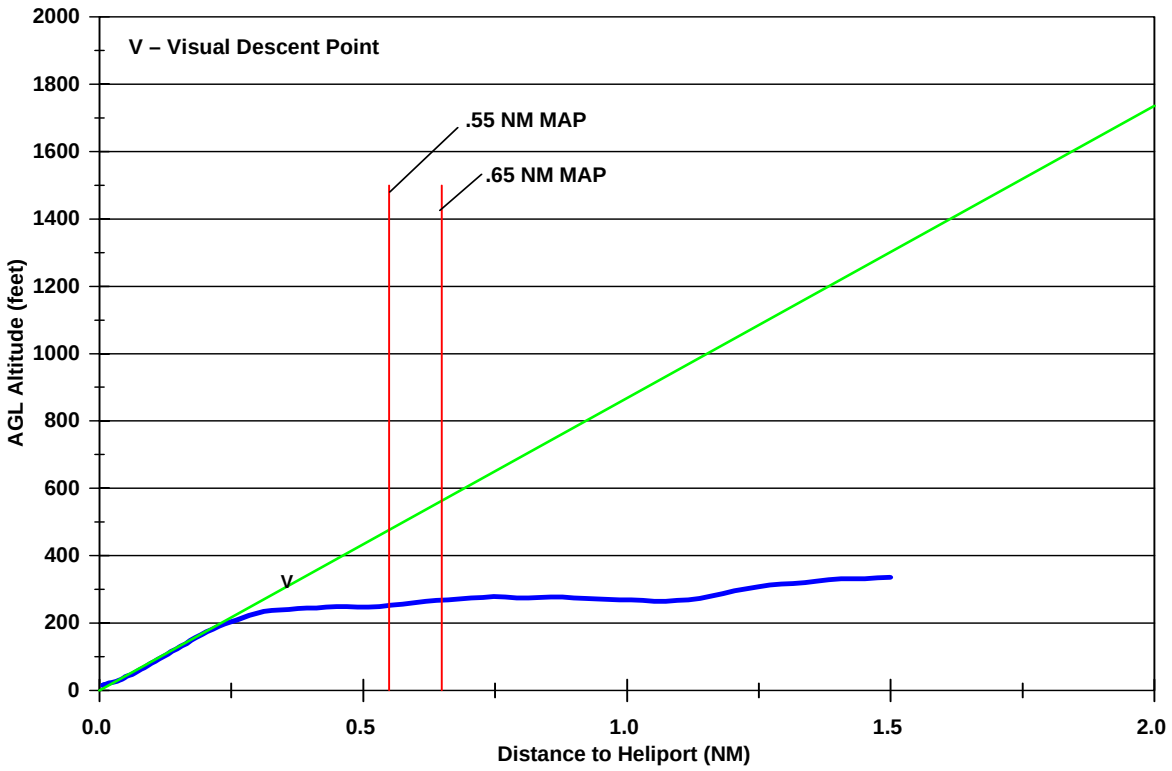


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06B003 - Appr. #09X

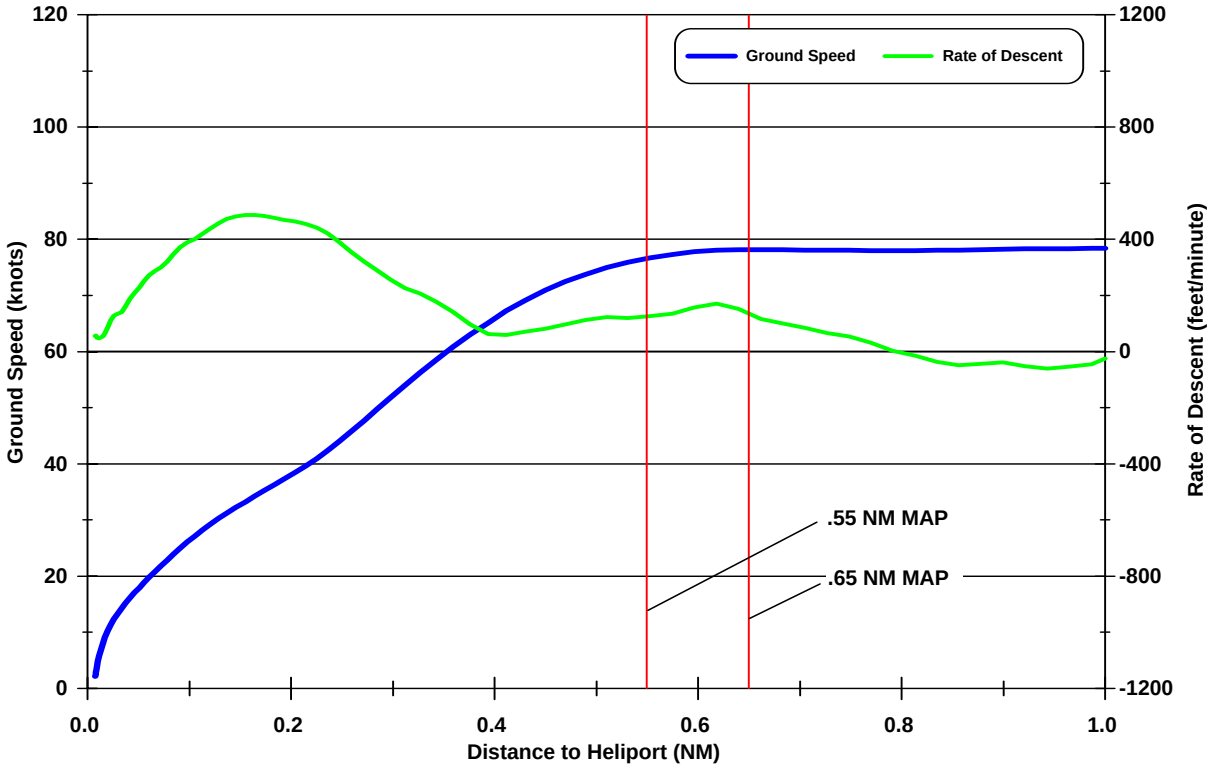



Approach - Plan View
Pilot P16 - 05/11/06B004 - Appr. #10Y
145-Degree
Approach Course
Wind Direction/Velocity
270/15
Wind @ MAP (FMS)
270/10
Wind @ Surface (Tower)
15
Tailwind @ MAP (FMS)
15
Headwind @ MAP (FMS)
098/10
107/22
22
310-Degree
Approach Course
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

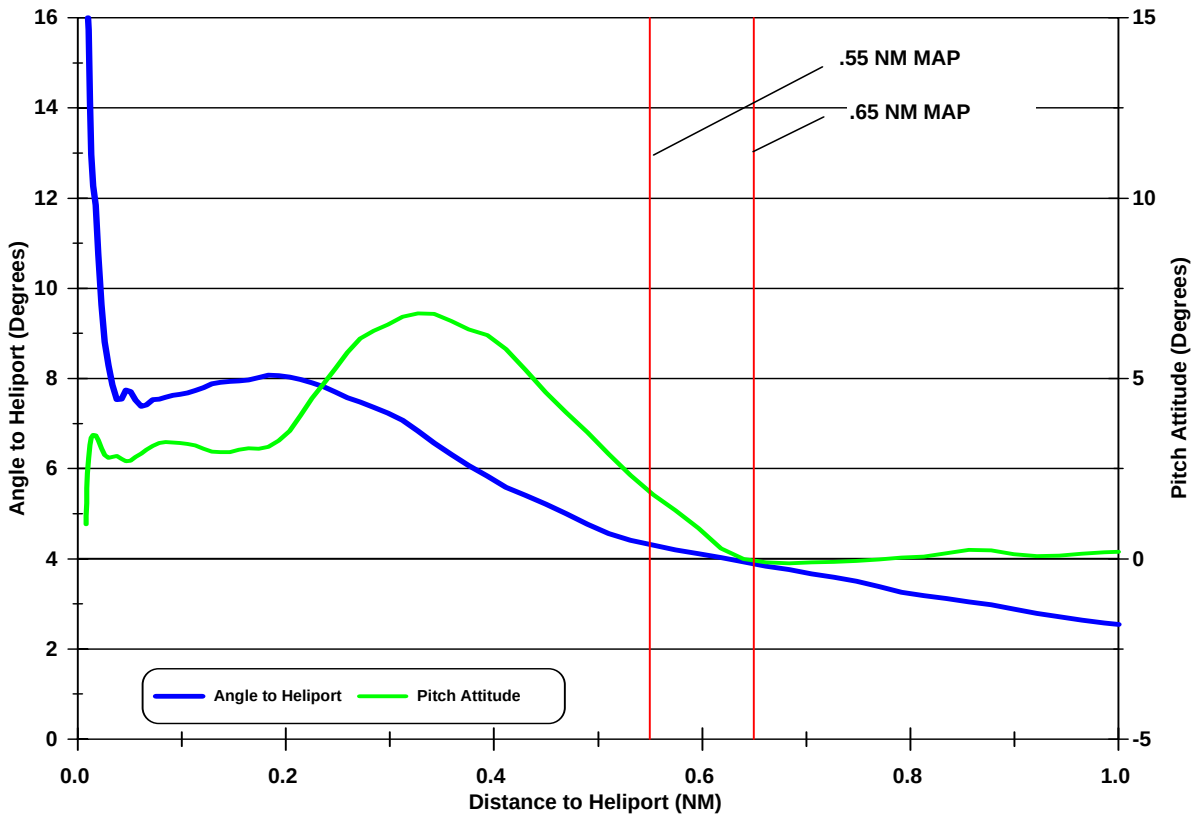
Profile View
Pilot P16 - 05/11/06B004 - Appr. #10Y



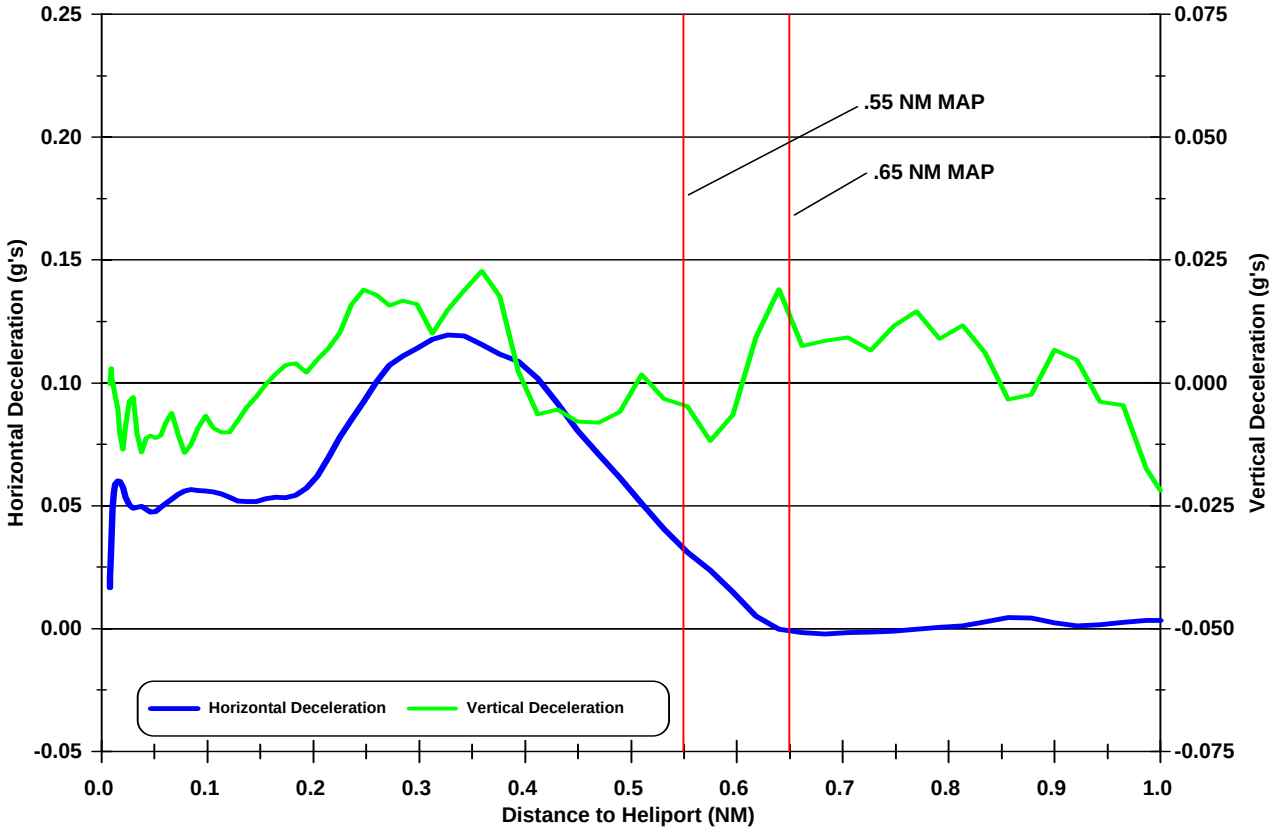
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06B004 - Appr. #10Y

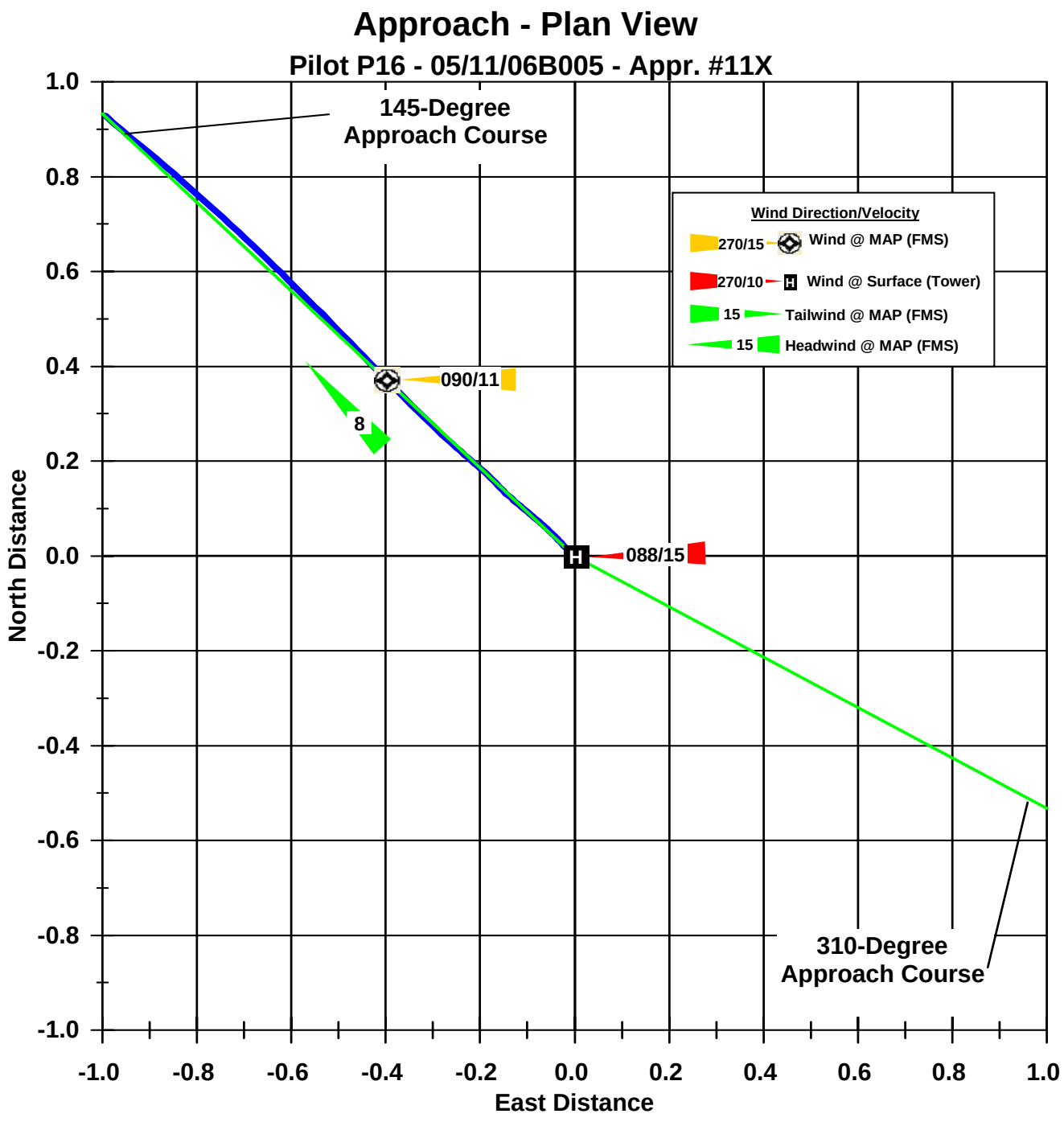


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06B004 - Appr. #10Y

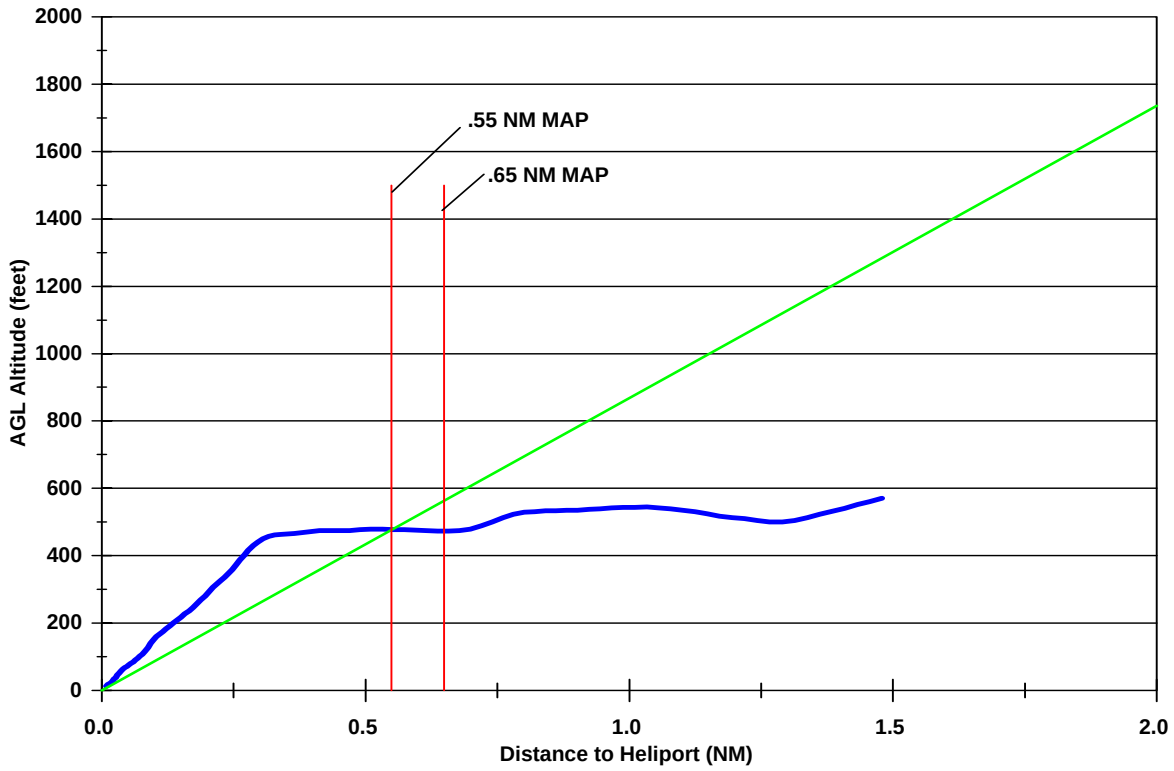


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06B004 - Appr. #10Y

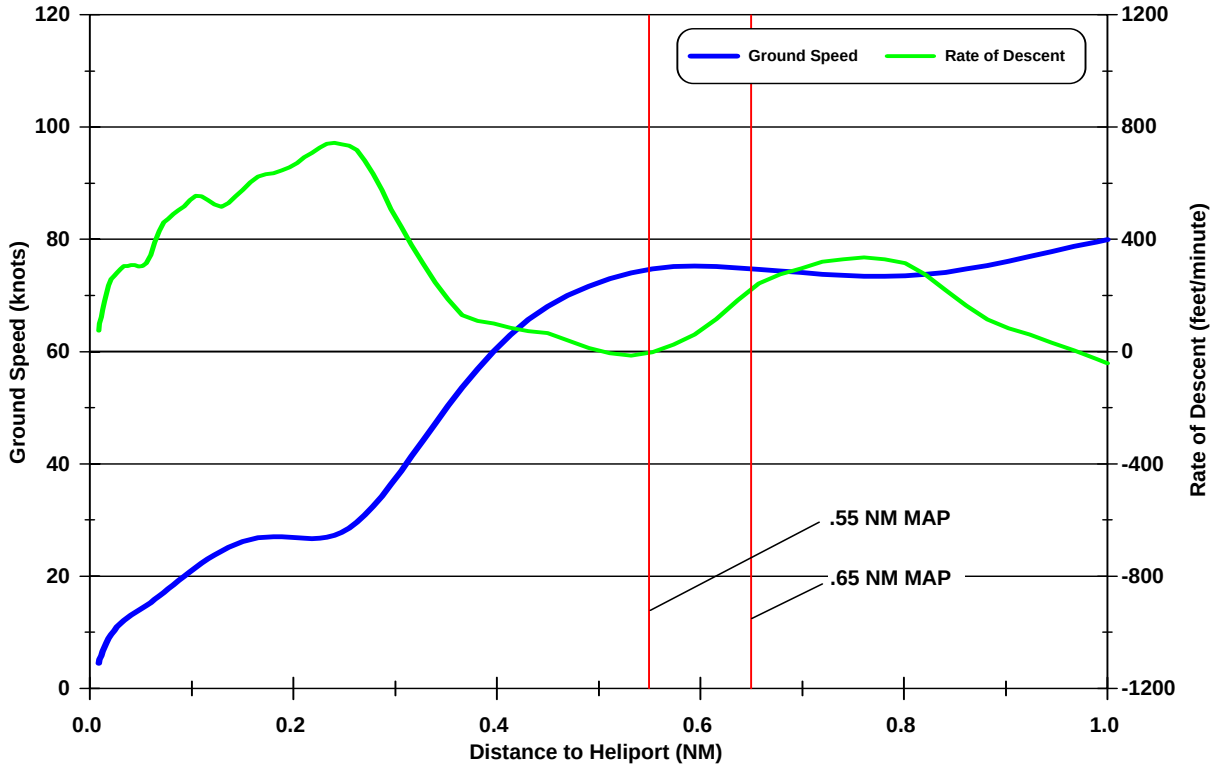



Approach - Plan View
Pilot P16 - 05/11/06B005 - Appr. #11X
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
090/11
8
088/15
H
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0
-1.0
-0.8
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
0.8
1.0

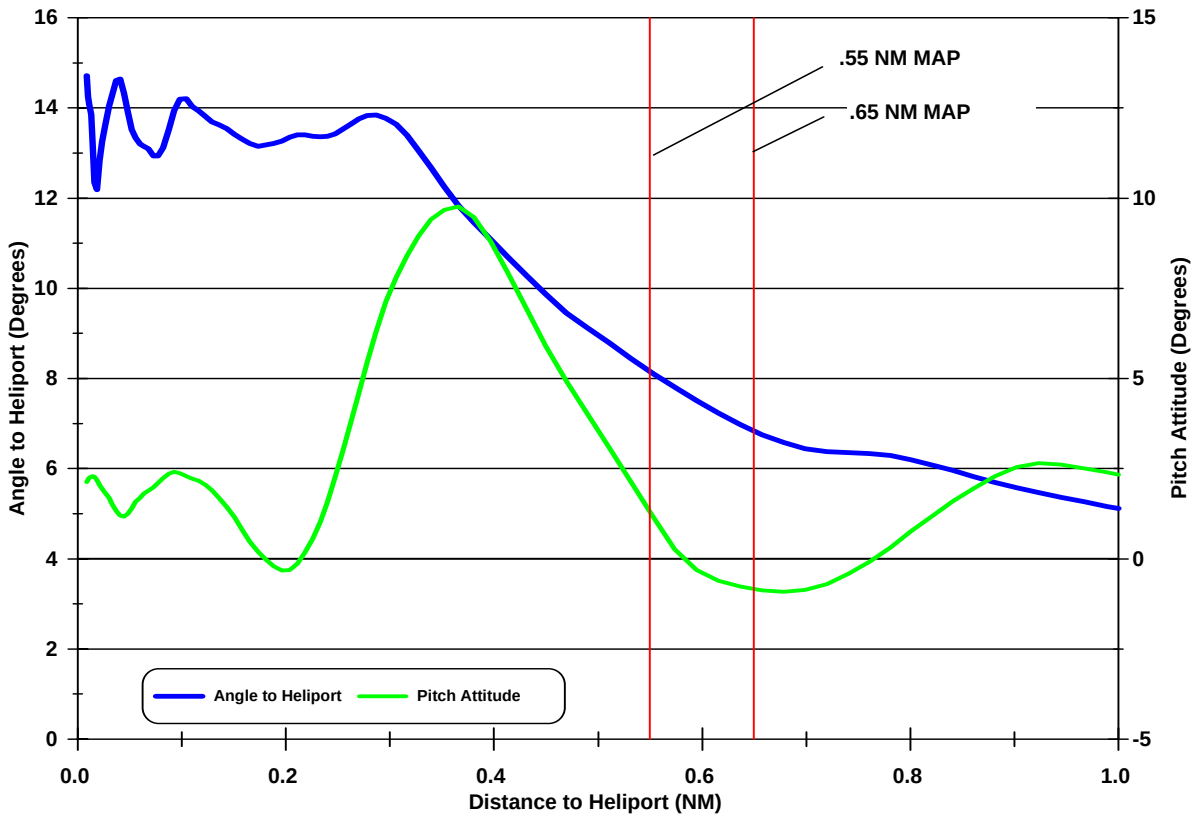
Profile View
Pilot P16 - 05/11/06B005 - Appr. #11X



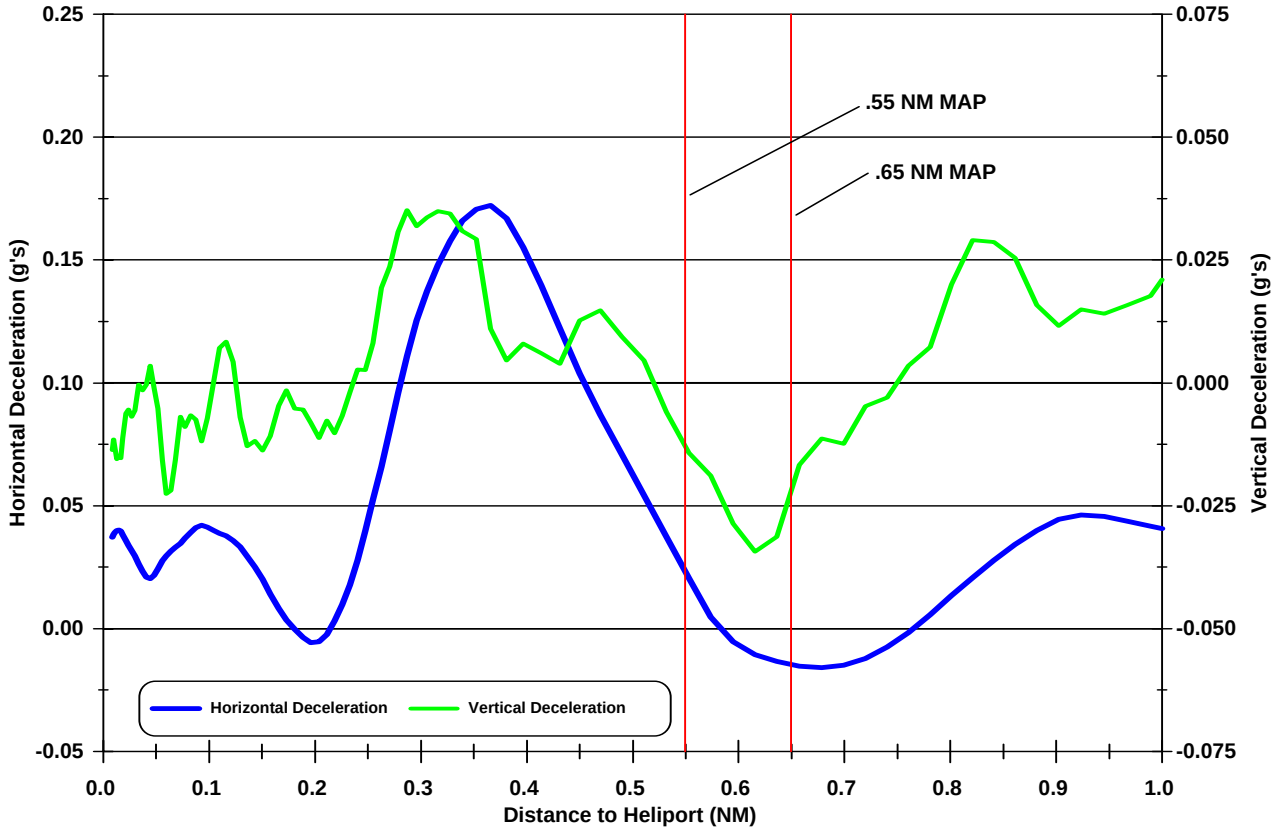
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06B005 - Appr. #11X

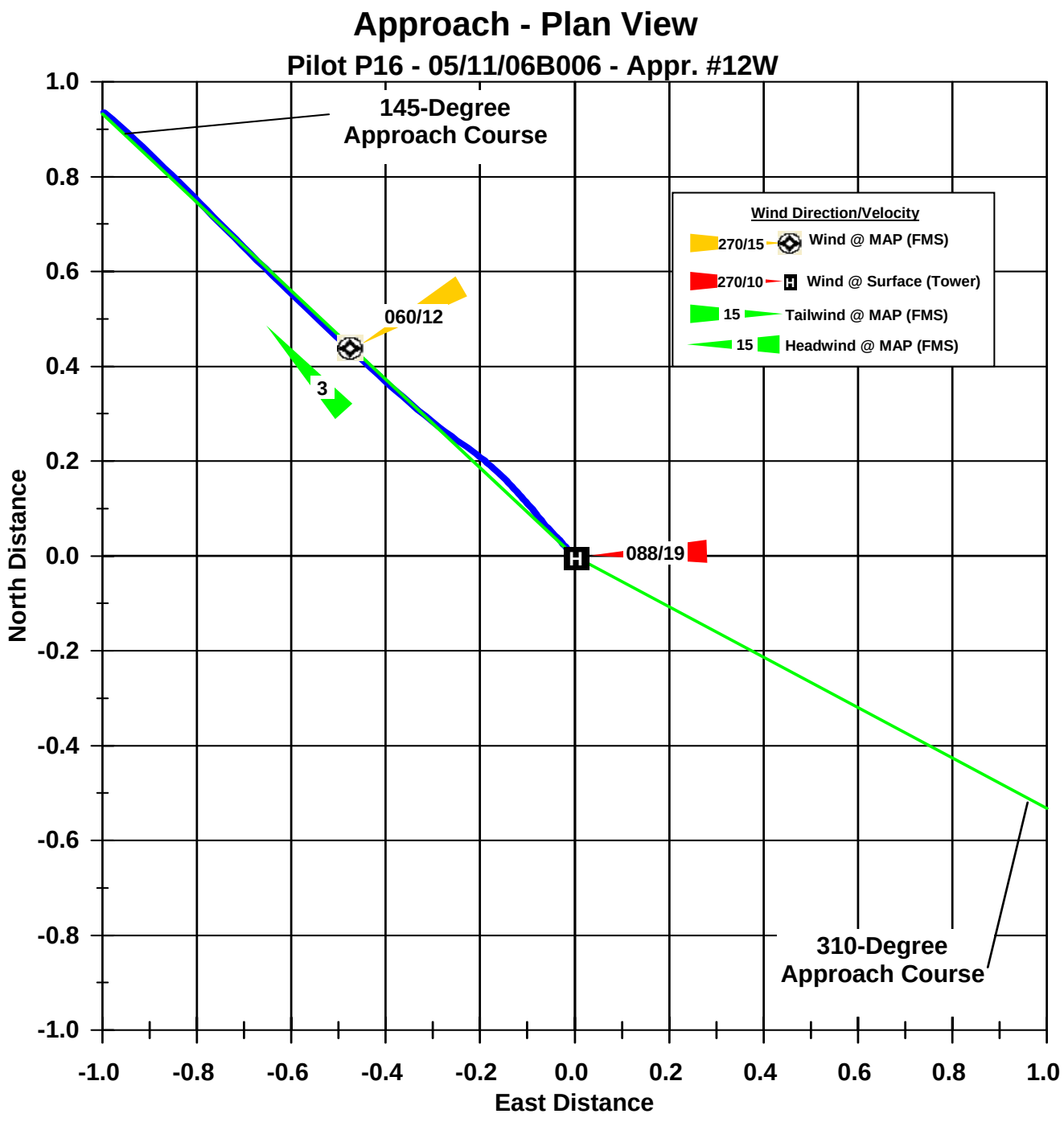


Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06B005 - Appr. #11X

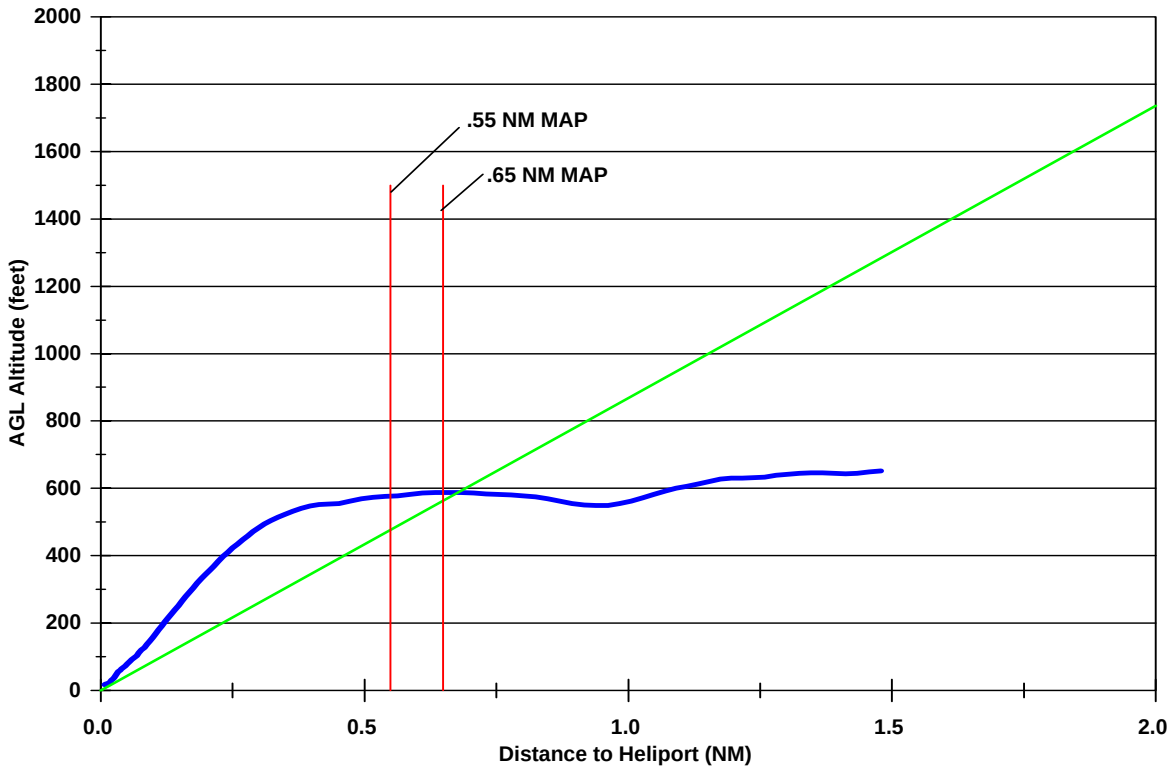


Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06B005 - Appr. #11X

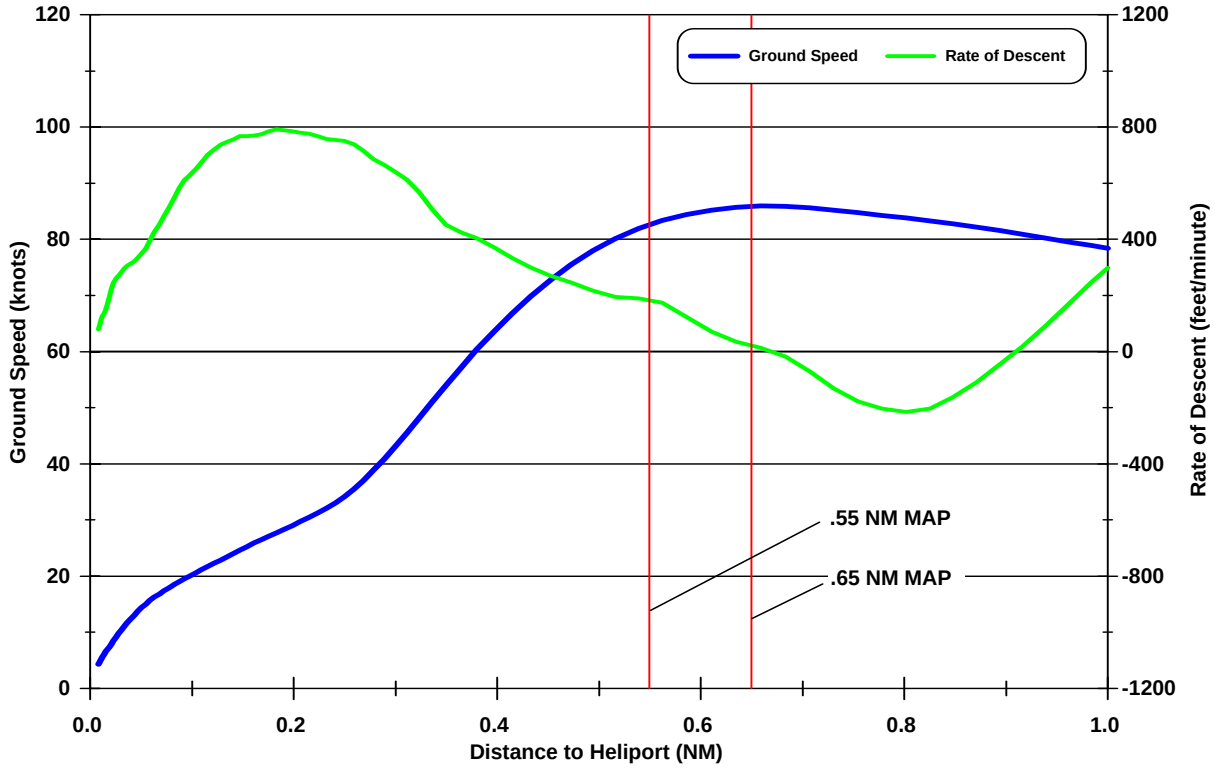



Approach - Plan View
Pilot P16 - 05/11/06B006 - Appr. #12W
145-Degree
Approach Course
310-Degree
Approach Course
Wind Direction/Velocity
270/15 Wind @ MAP (FMS)
270/10 Wind @ Surface (Tower)
15 Tailwind @ MAP (FMS)
15 Headwind @ MAP (FMS)
060/12
3
088/19
North Distance
East Distance
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
-1.0

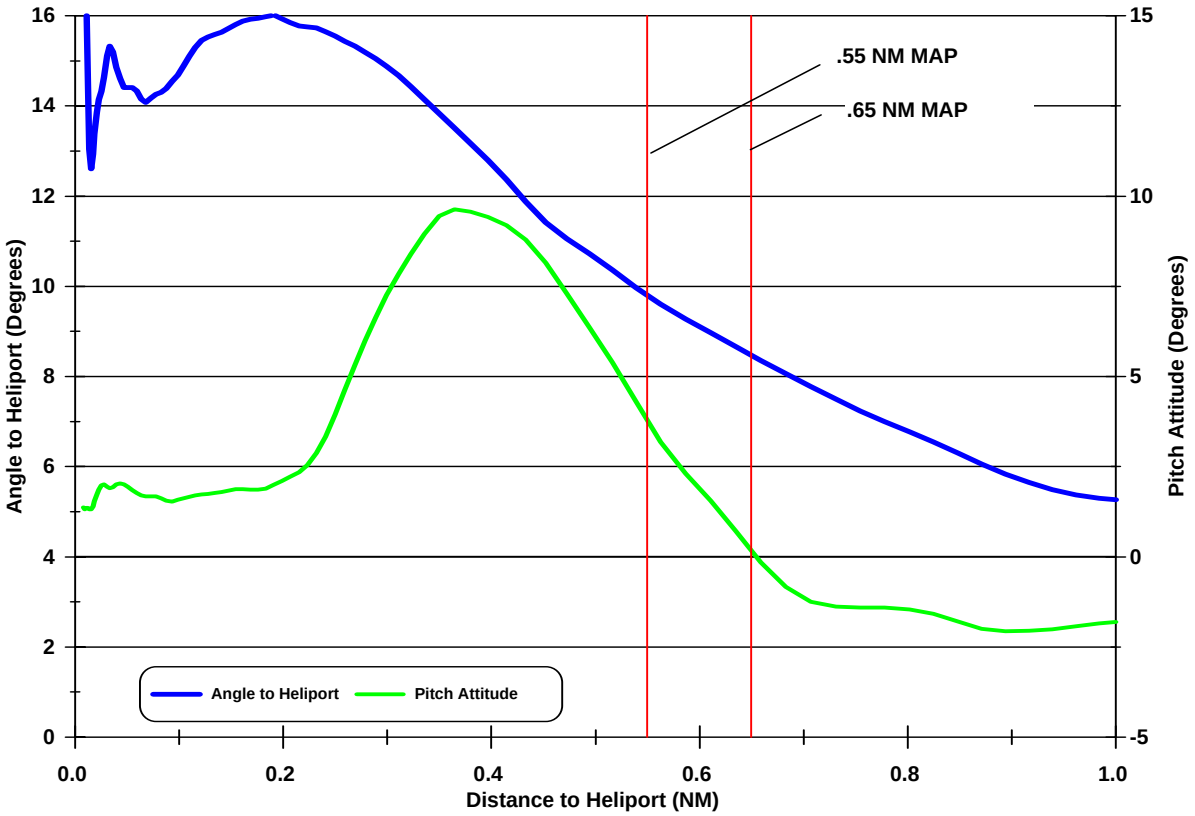
Profile View
Pilot P16 - 05/11/06B006 - Appr. #12W



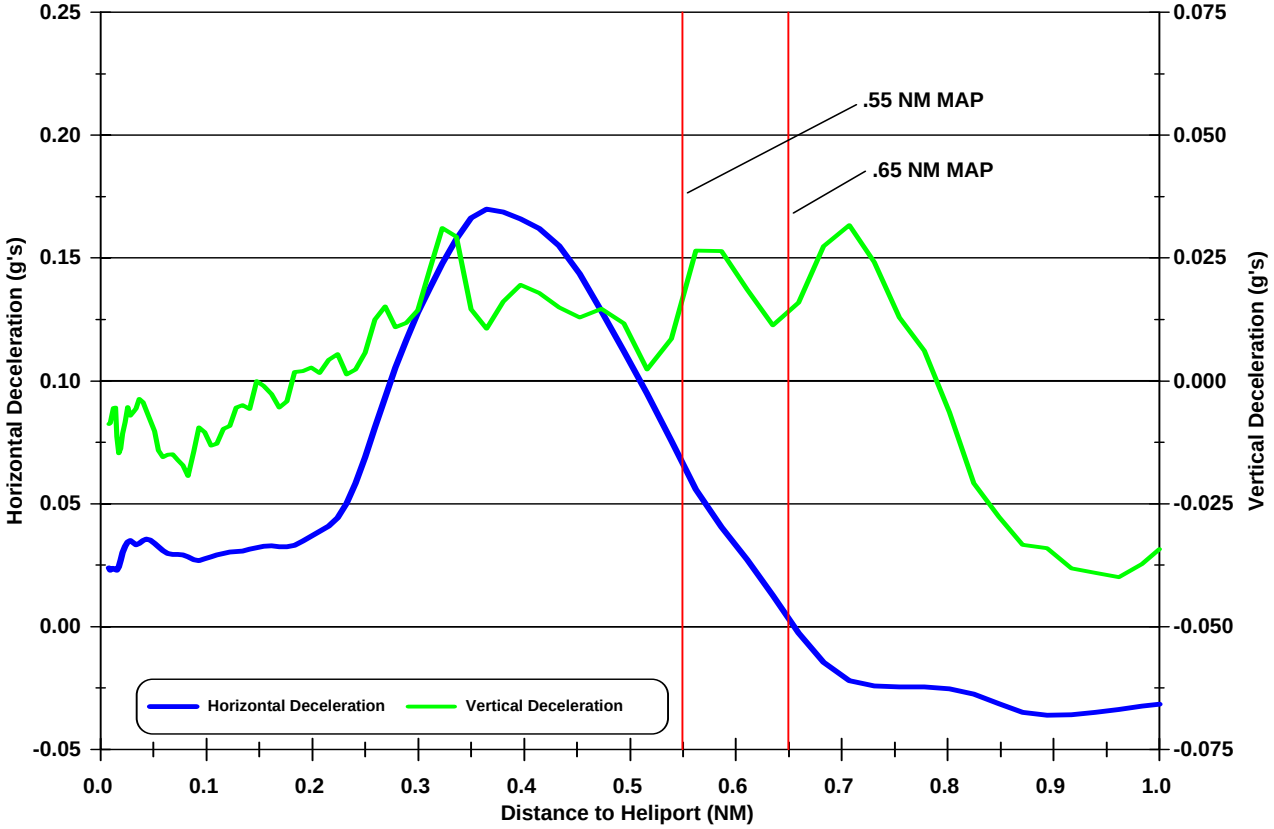
Ground Speed and Rate of Descent
Pilot P16 - 05/11/06B006 - Appr. #12W



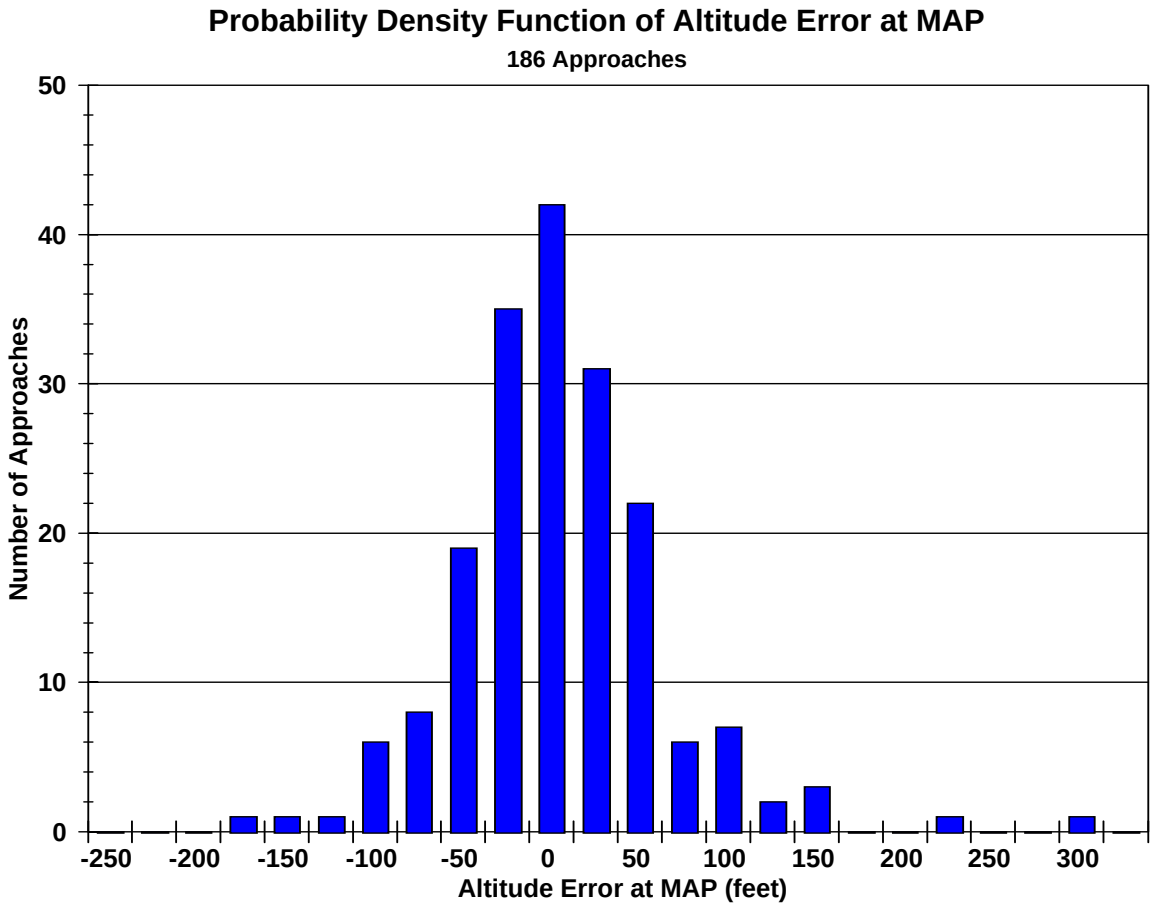
Angle to Heliport and Pitch Attitude
Pilot P16 - 05/11/06B006 - Appr. #12W

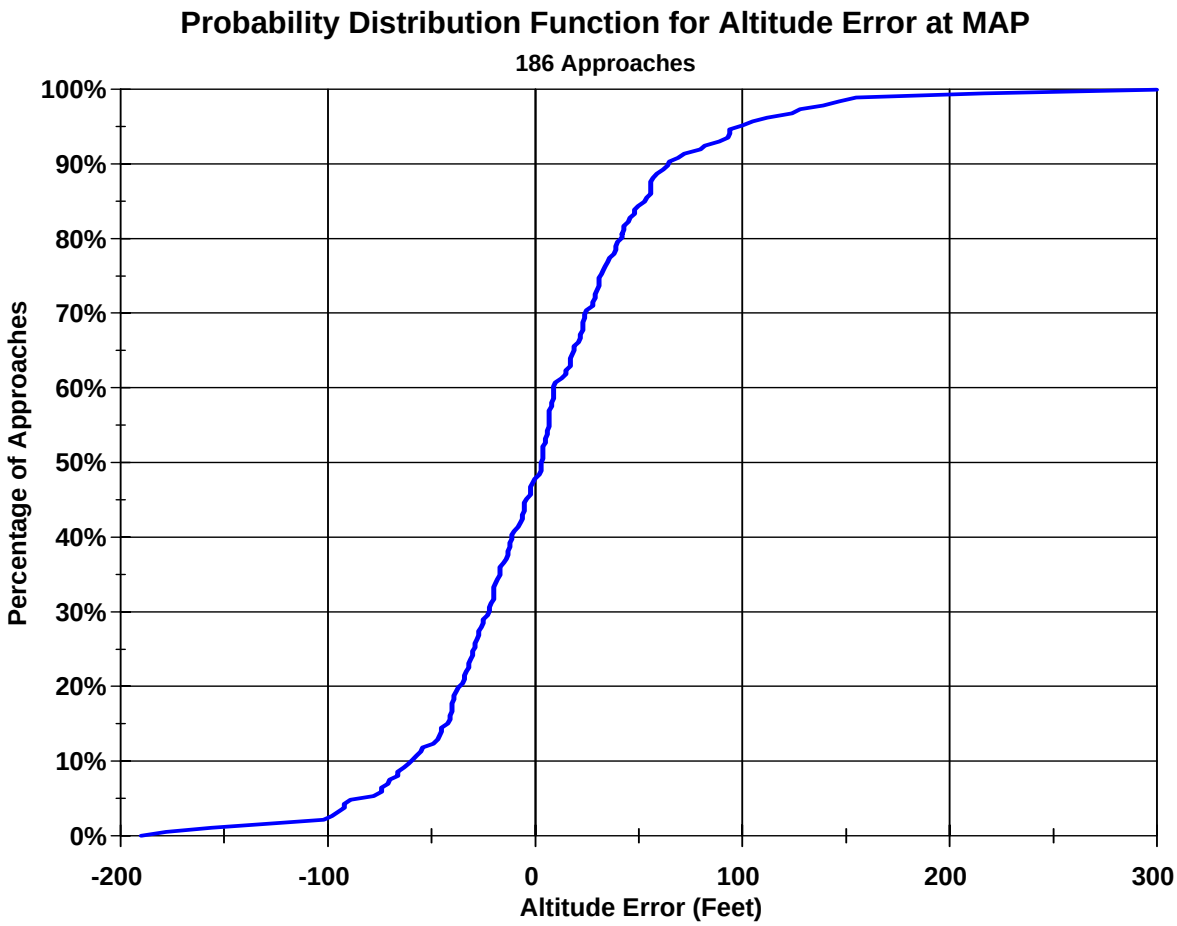


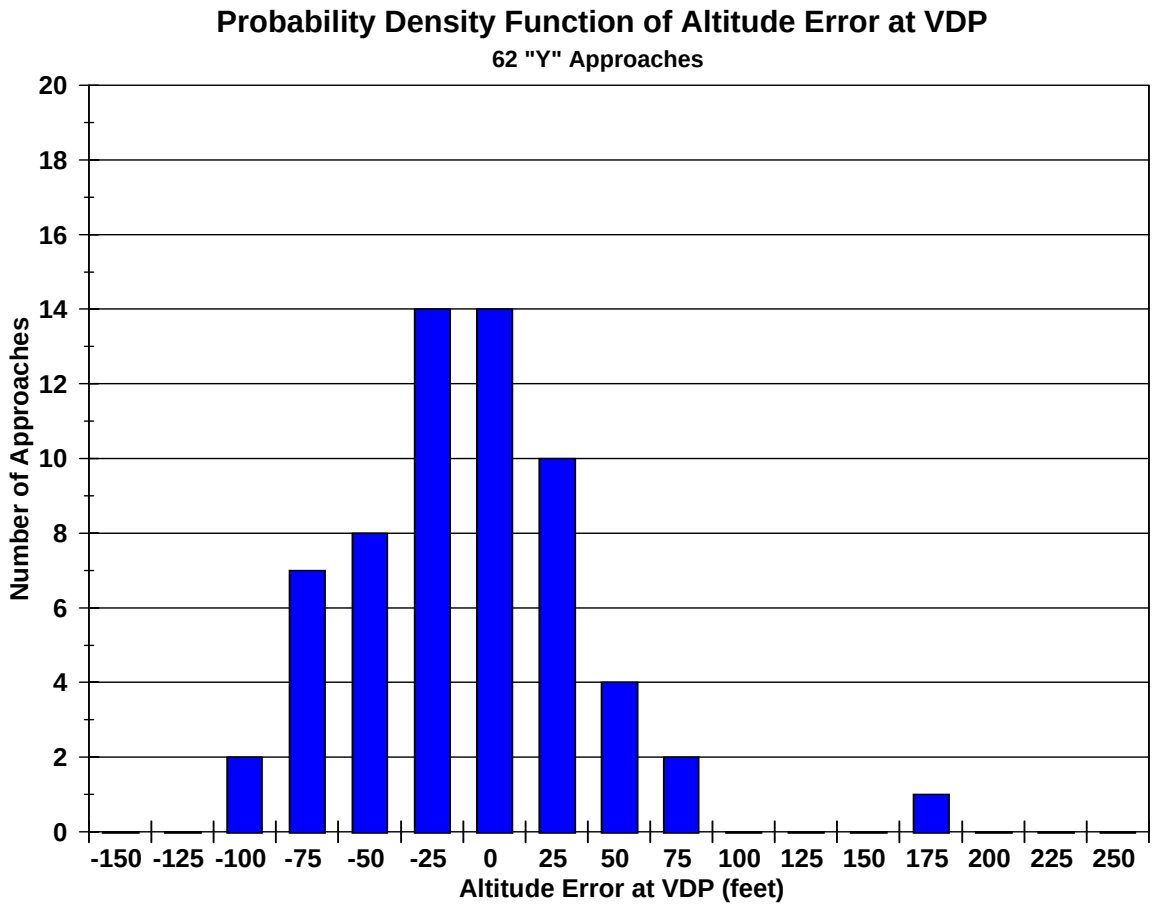
Horizontal and Vertical Deceleration
Pilot P16 - 05/11/06B006 - Appr. #12W

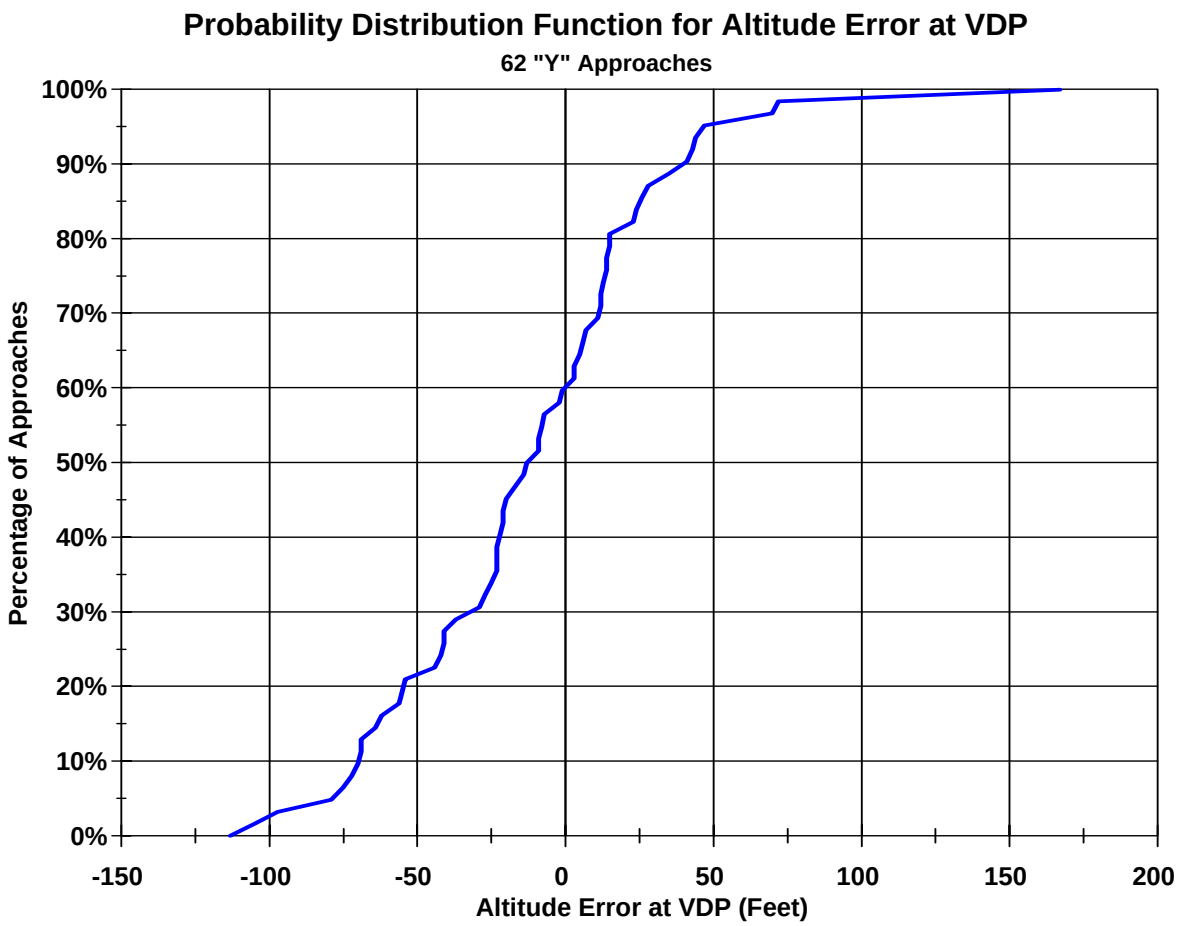


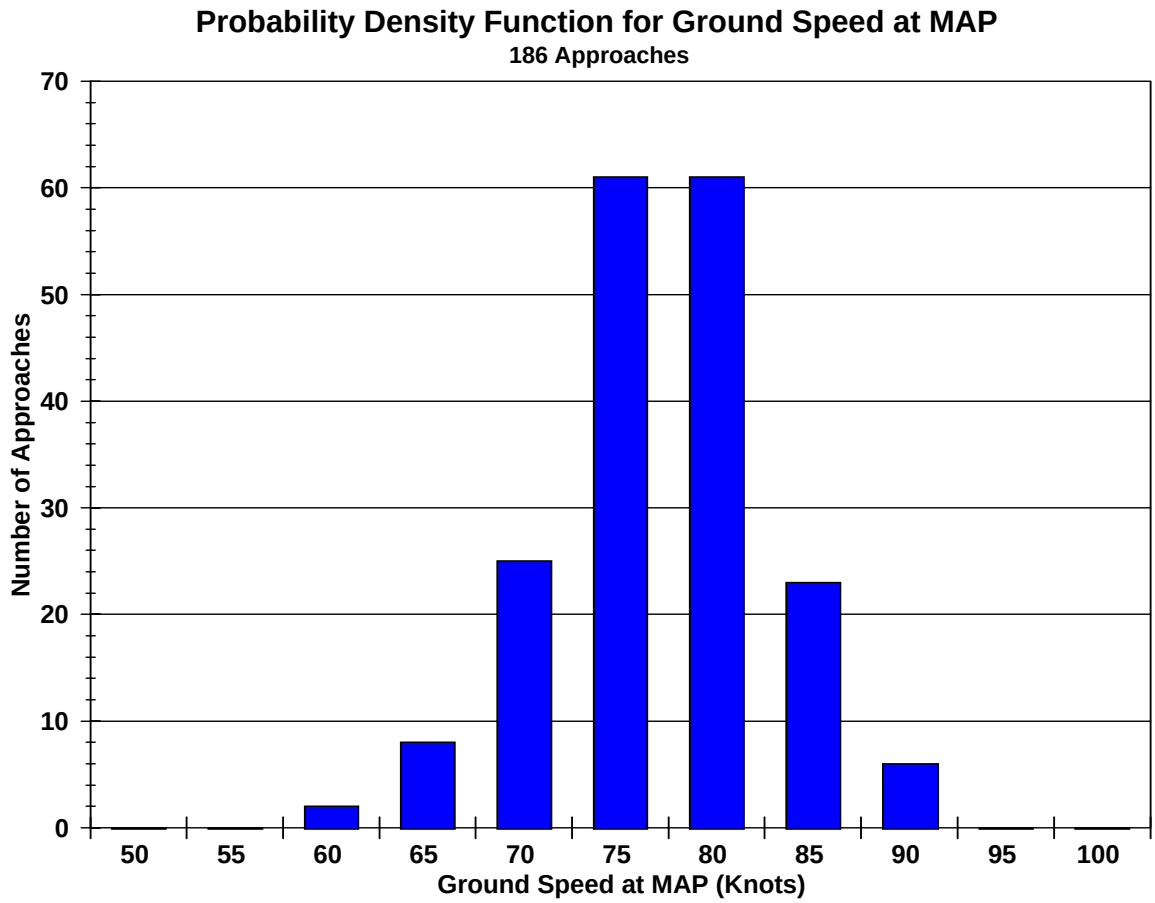
APPENDIX C—SUBJECT PILOT PERFORMANCE DATA BASED ON STATISTICAL ANALYSIS OF FLIGHT MANAGEMENT SYSTEM AND TIME AND SPACE POSITION INDICATOR DATA

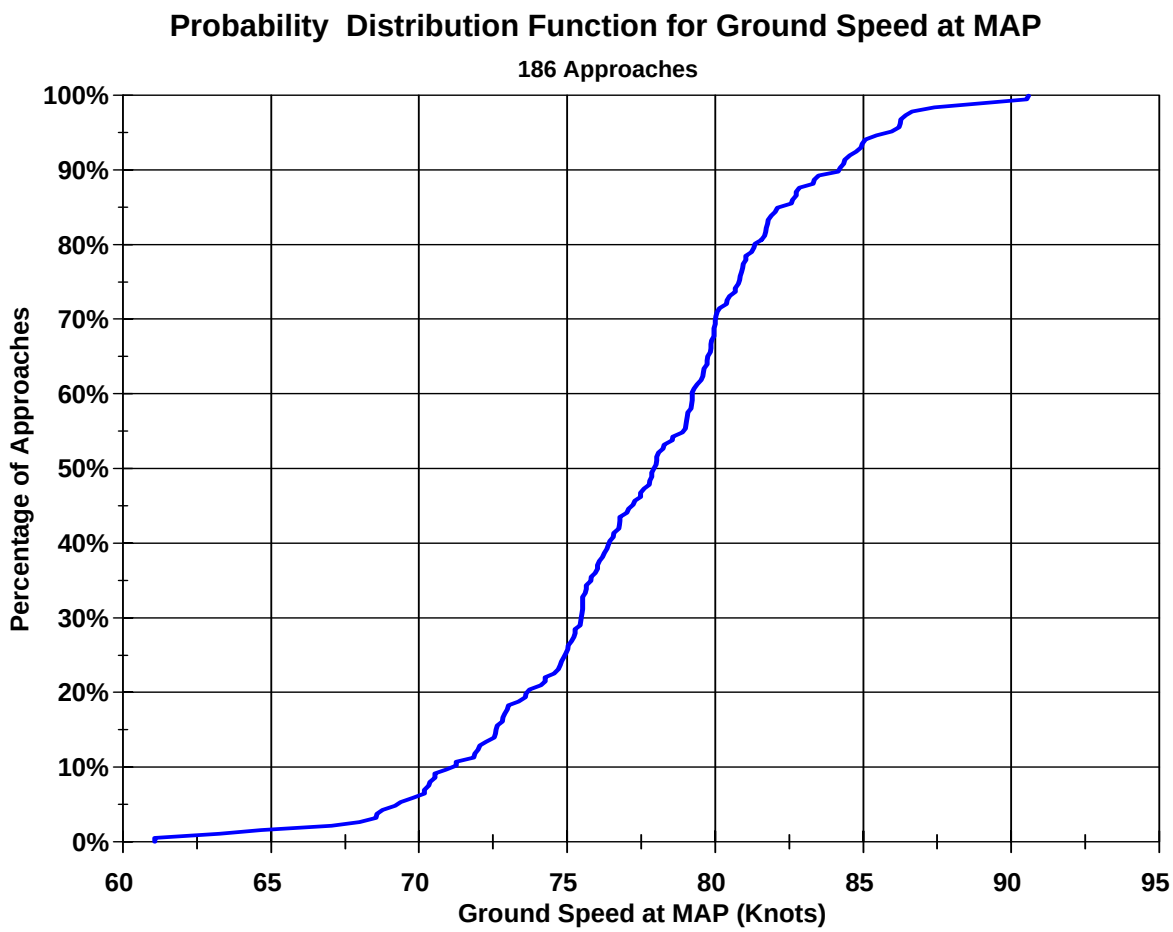

Probability Density Function of Altitude Error at MAP
186 Approaches
Number of Approaches
50
40
30
20
10
0
-250
-200
-150
-100
-50
0
50
100
150
200
250
300
Altitude Error at MAP (feet)

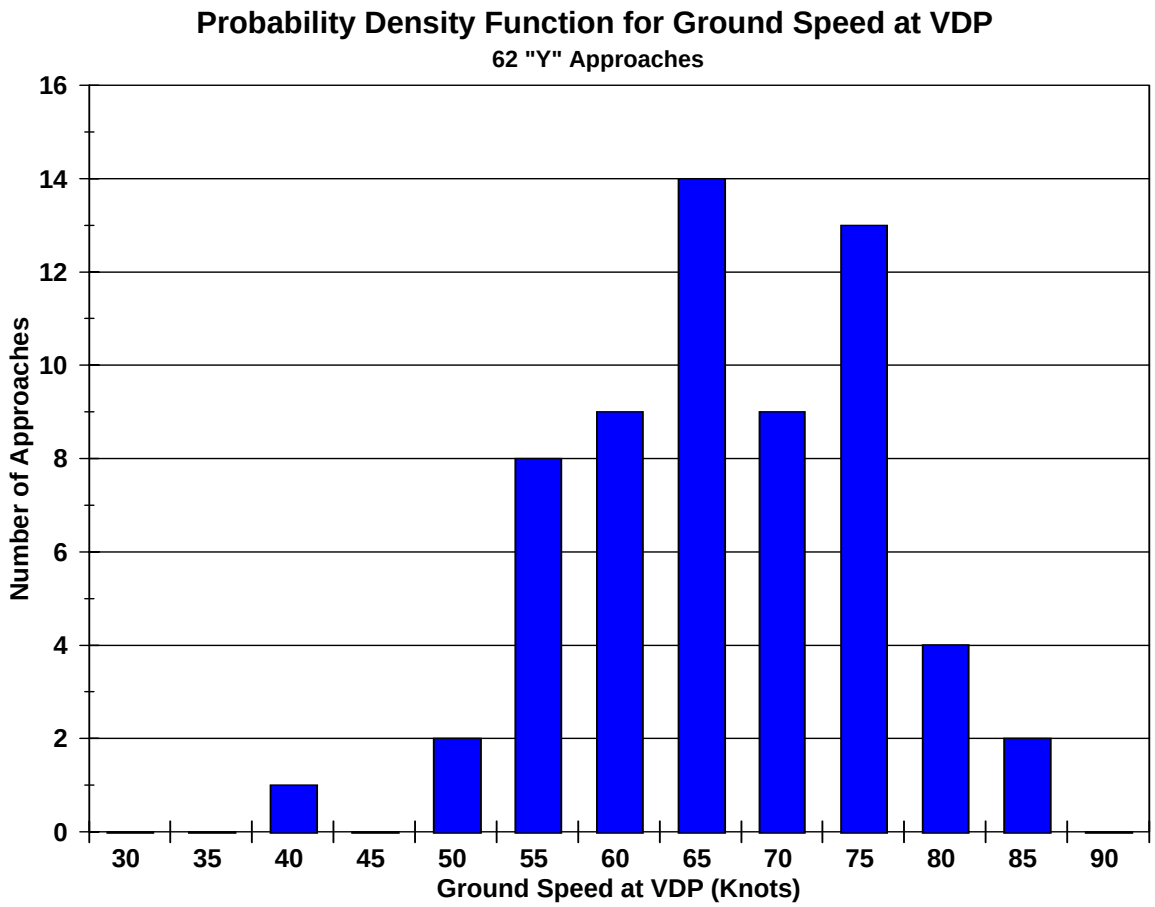

Probability Distribution Function for Altitude Error at MAP
186 Approaches
Percentage of Approaches
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
-200
-100
0
100
200
300
Altitude Error (Feet)

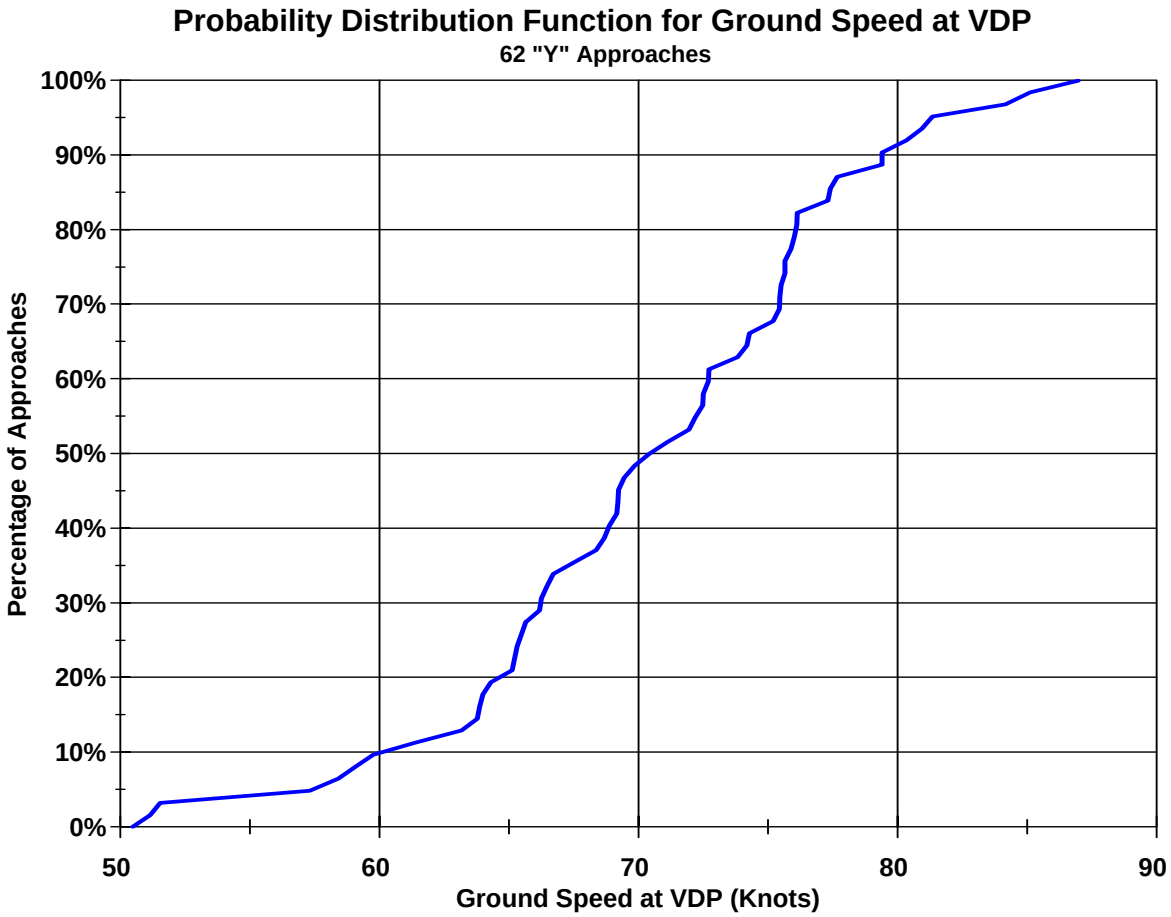

Probability Density Function of Altitude Error at VDP
62 "Y" Approaches
Number of Approaches
0
2
4
6
8
10
12
14
16
18
20
-150 -125 -100 -75 -50 -25 0 25 50 75 100 125 150 175 200 225 250
Altitude Error at VDP (feet)

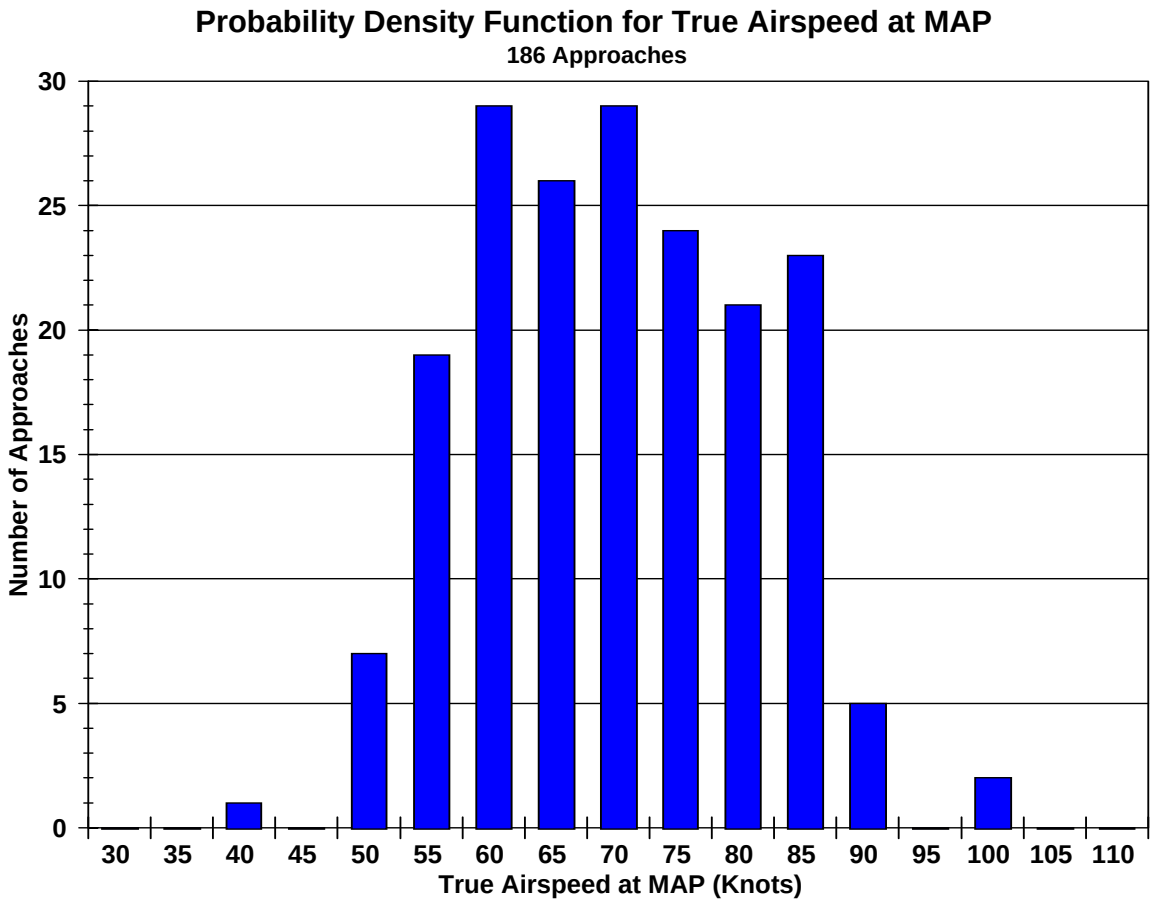

Probability Distribution Function for Altitude Error at VDP
62 "Y" Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
-150 -100 -50 0 50 100 150 200
Altitude Error at VDP (Feet)

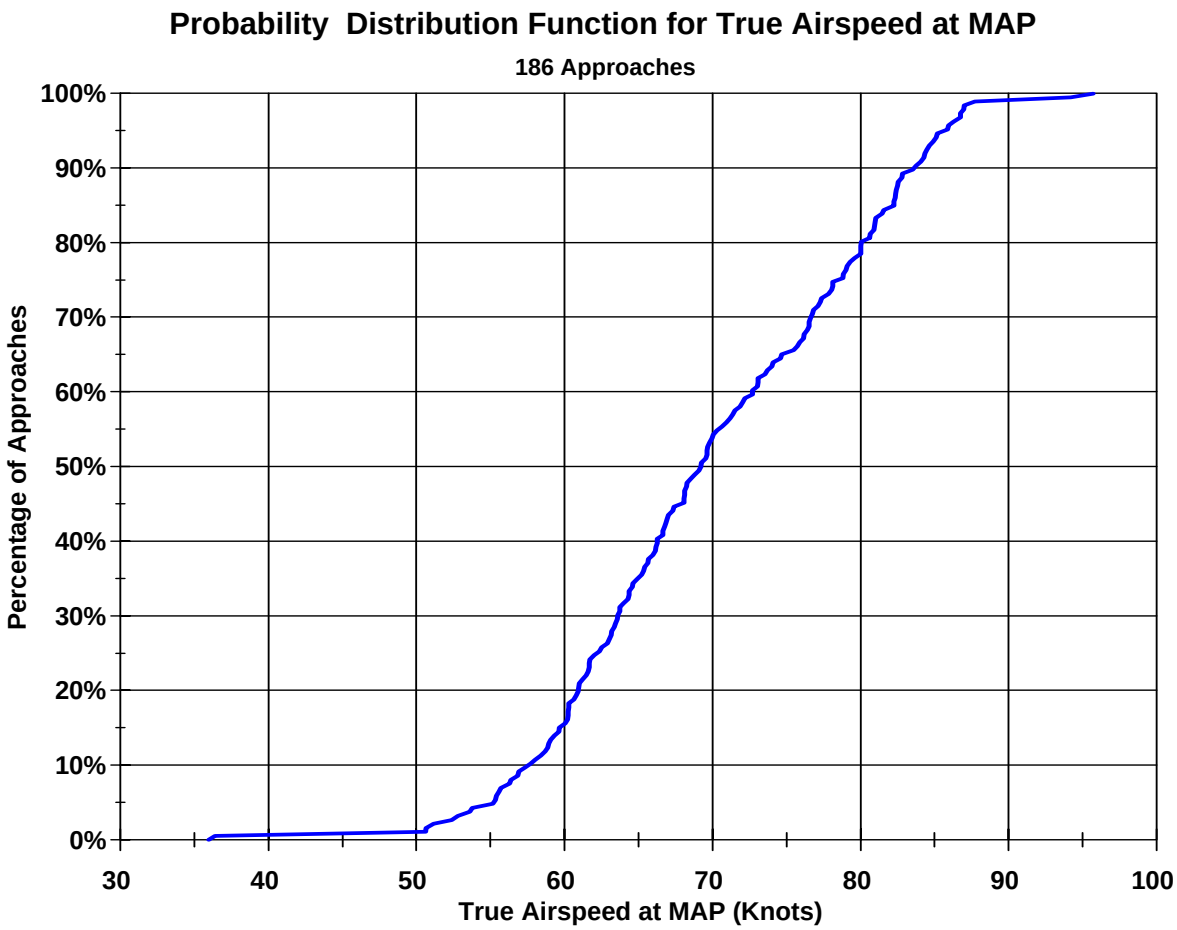

Probability Density Function for Ground Speed at MAP
186 Approaches
Number of Approaches
0
10
20
30
40
50
60
70
50
55
60
65
70
75
80
85
90
95
100
Ground Speed at MAP (Knots)

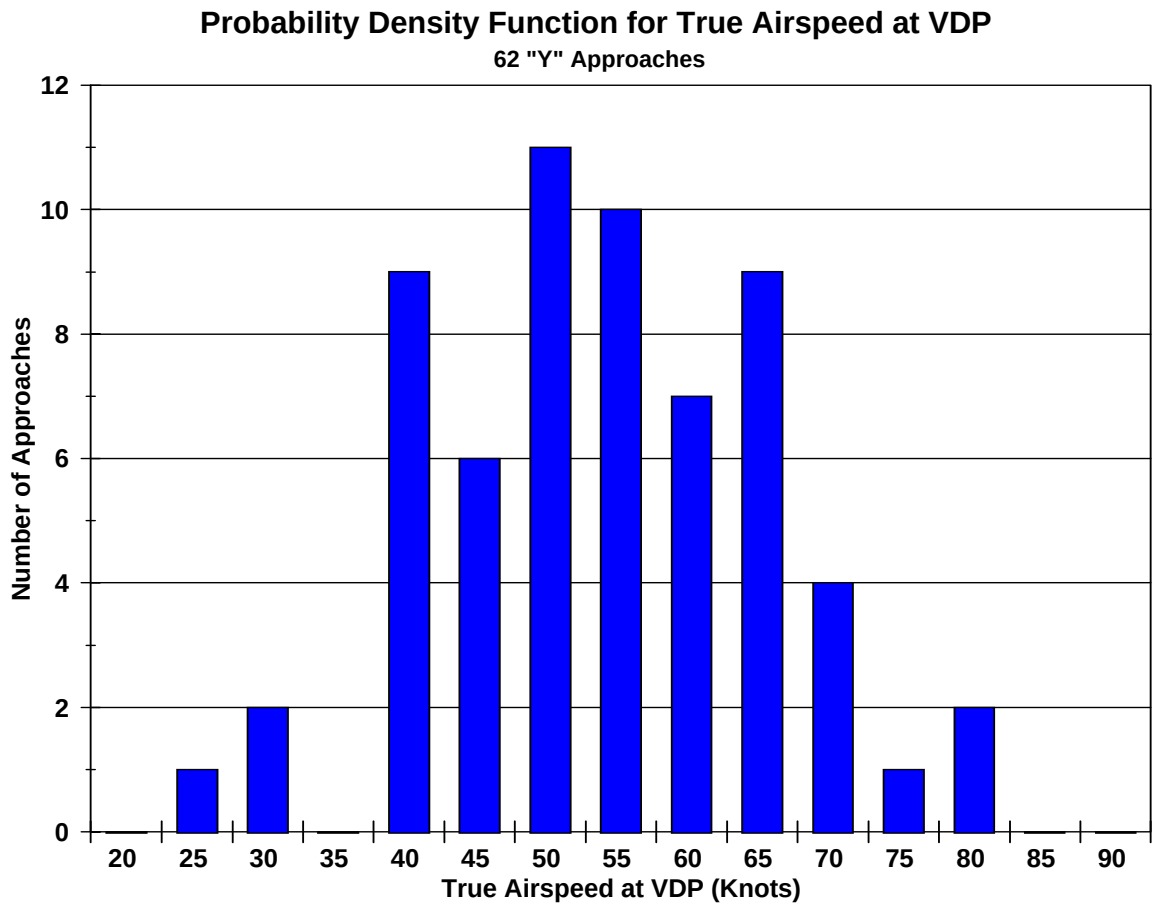

Probability Distribution Function for Ground Speed at MAP
186 Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
60
65
70
75
80
85
90
95
Ground Speed at MAP (Knots)

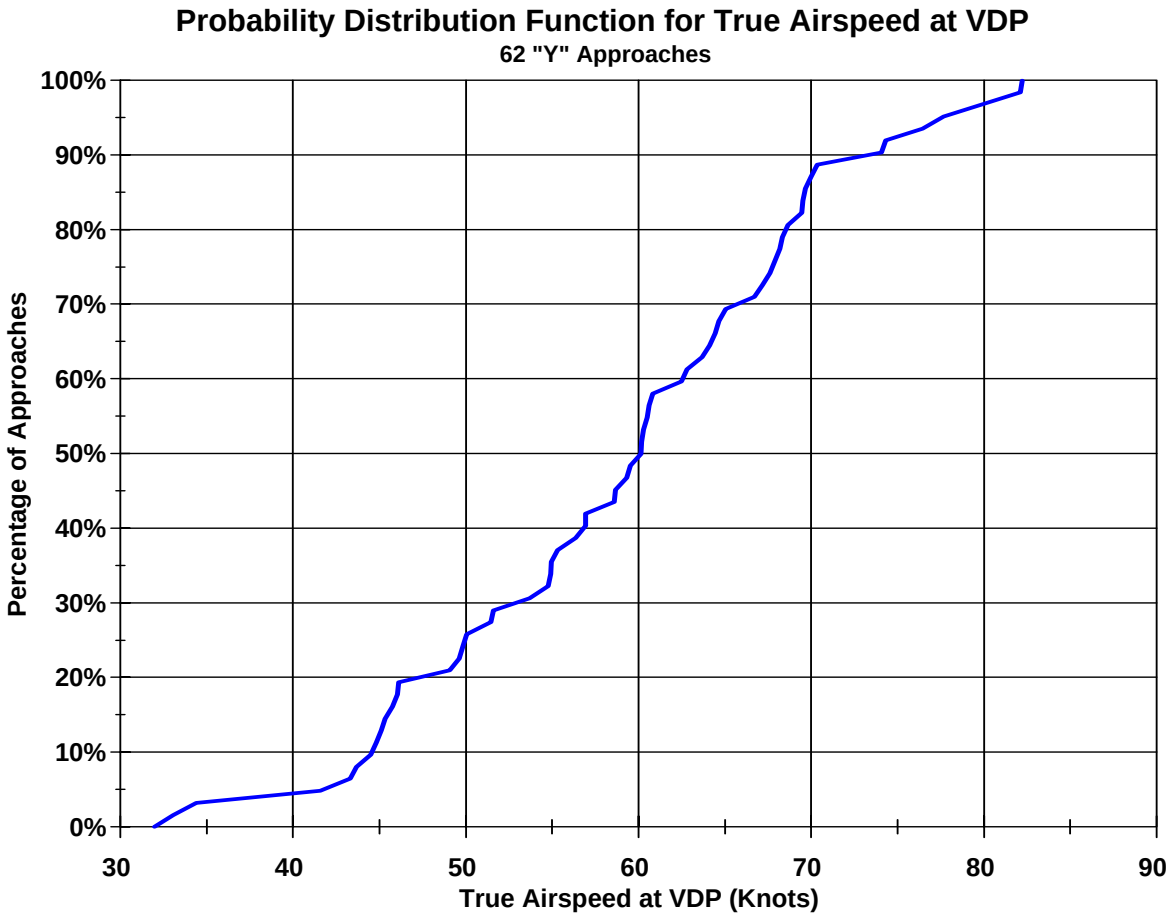

Probability Density Function for Ground Speed at VDP
62 "Y" Approaches
Number of Approaches
0
2
4
6
8
10
12
14
16
30
35
40
45
50
55
60
65
70
75
80
85
90
Ground Speed at VDP (Knots)

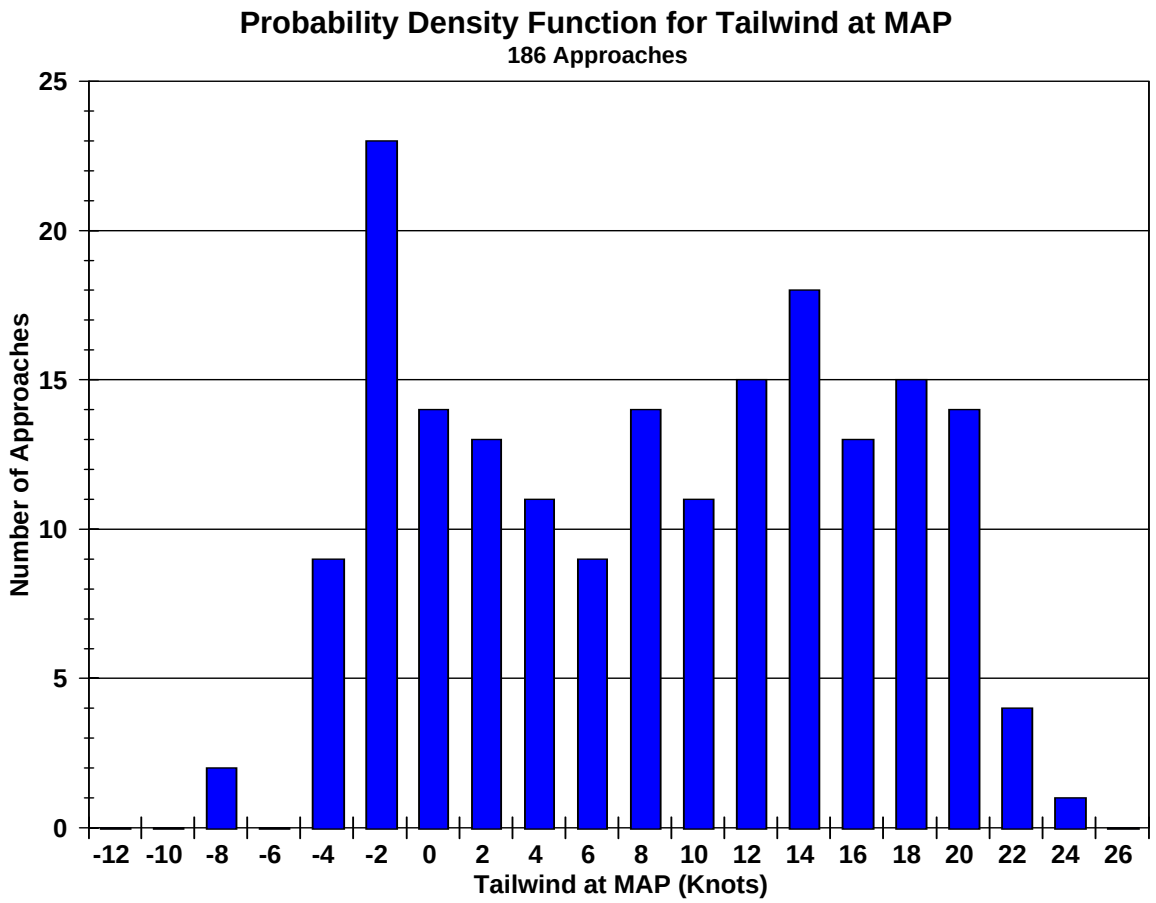

Probability Distribution Function for Ground Speed at VDP
62 "Y" Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
50
60
70
80
90
Ground Speed at VDP (Knots)

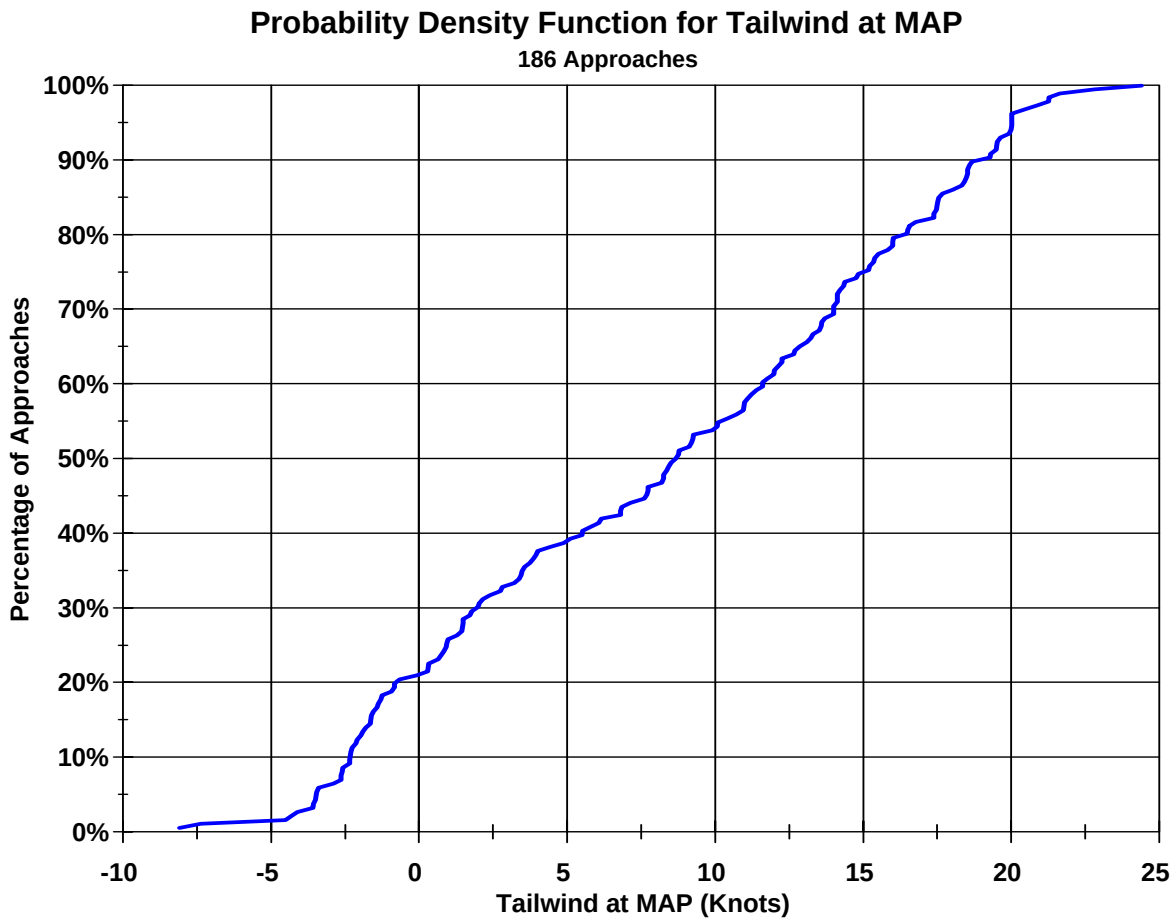

Probability Density Function for True Airspeed at MAP
186 Approaches
Number of Approaches
0
5
10
15
20
25
30
30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110
True Airspeed at MAP (Knots)

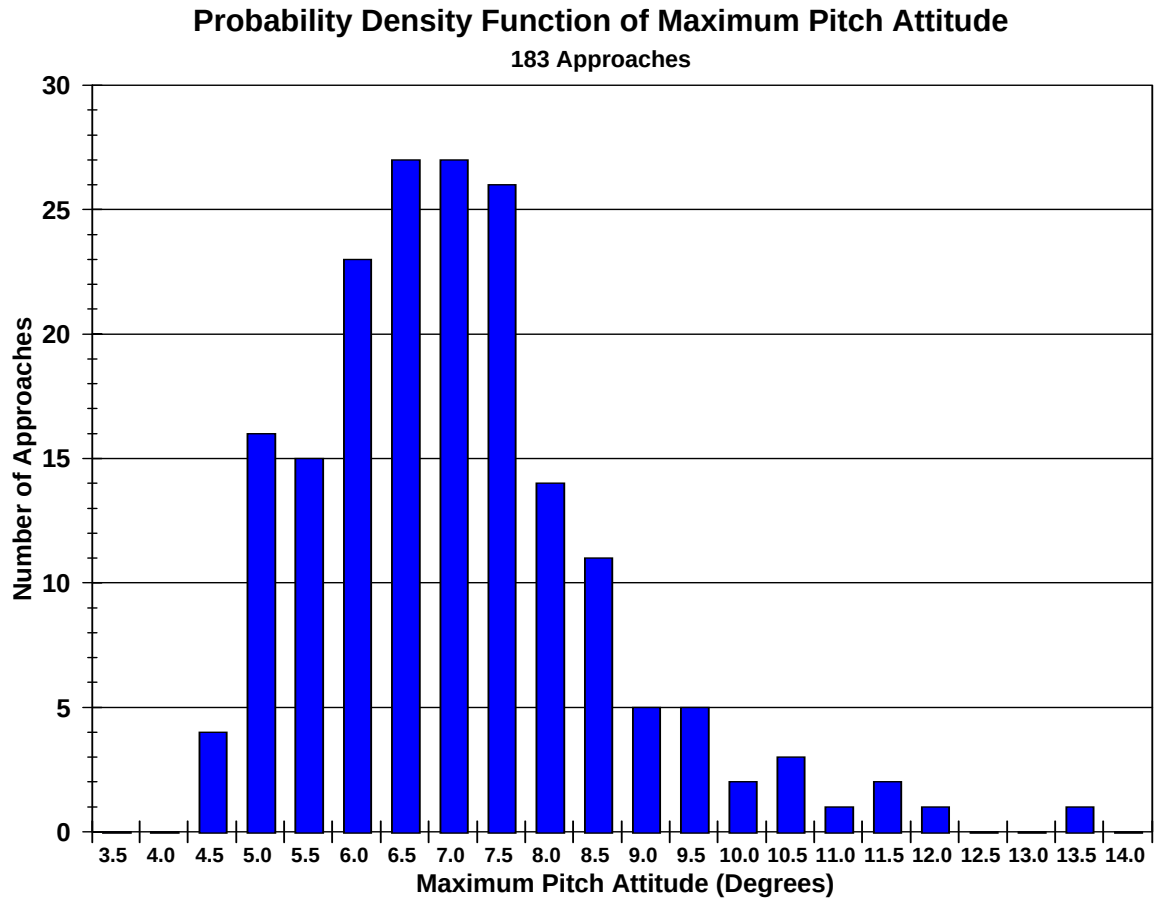

Probability Distribution Function for True Airspeed at MAP
186 Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
30 40 50 60 70 80 90 100
True Airspeed at MAP (Knots)

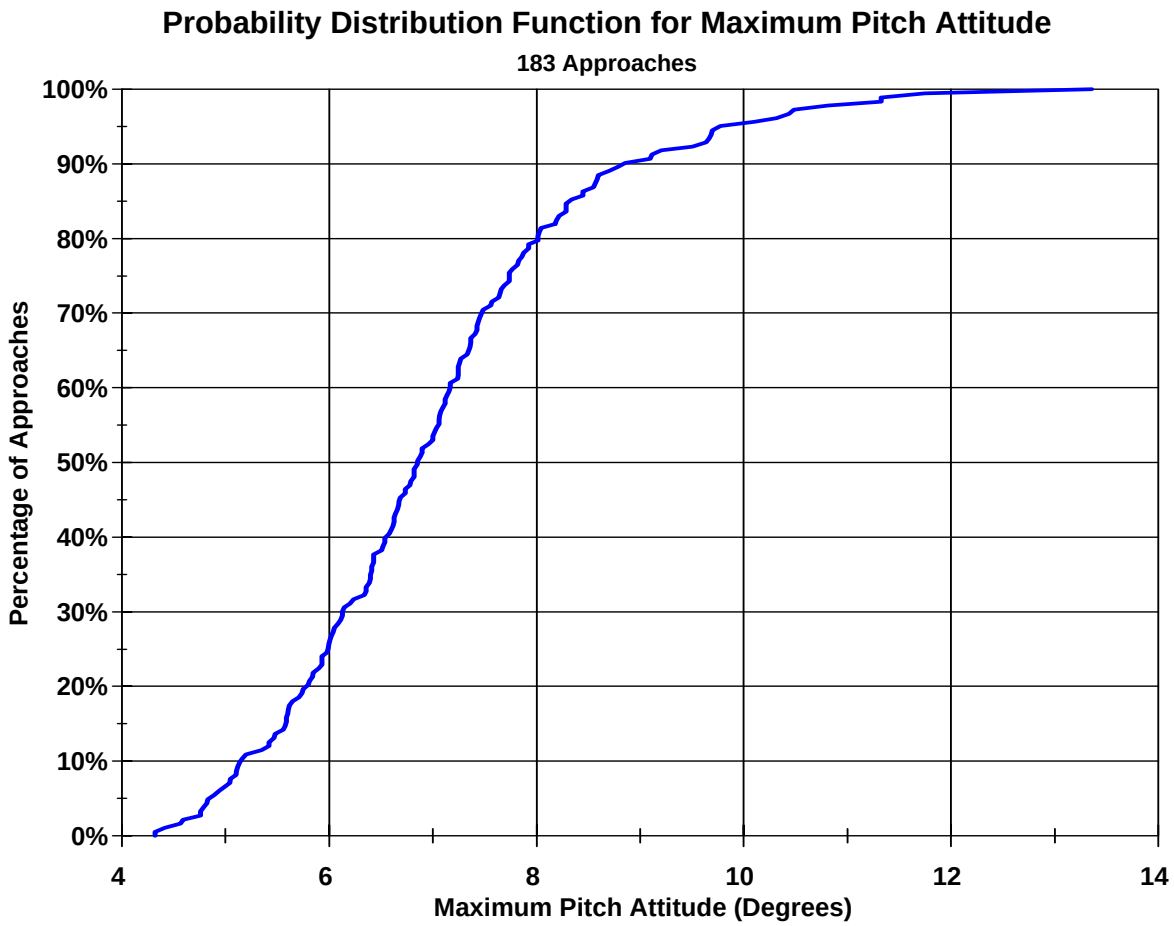

Probability Density Function for True Airspeed at VDP
62 "Y" Approaches
Number of Approaches
0
2
4
6
8
10
12
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
True Airspeed at VDP (Knots)

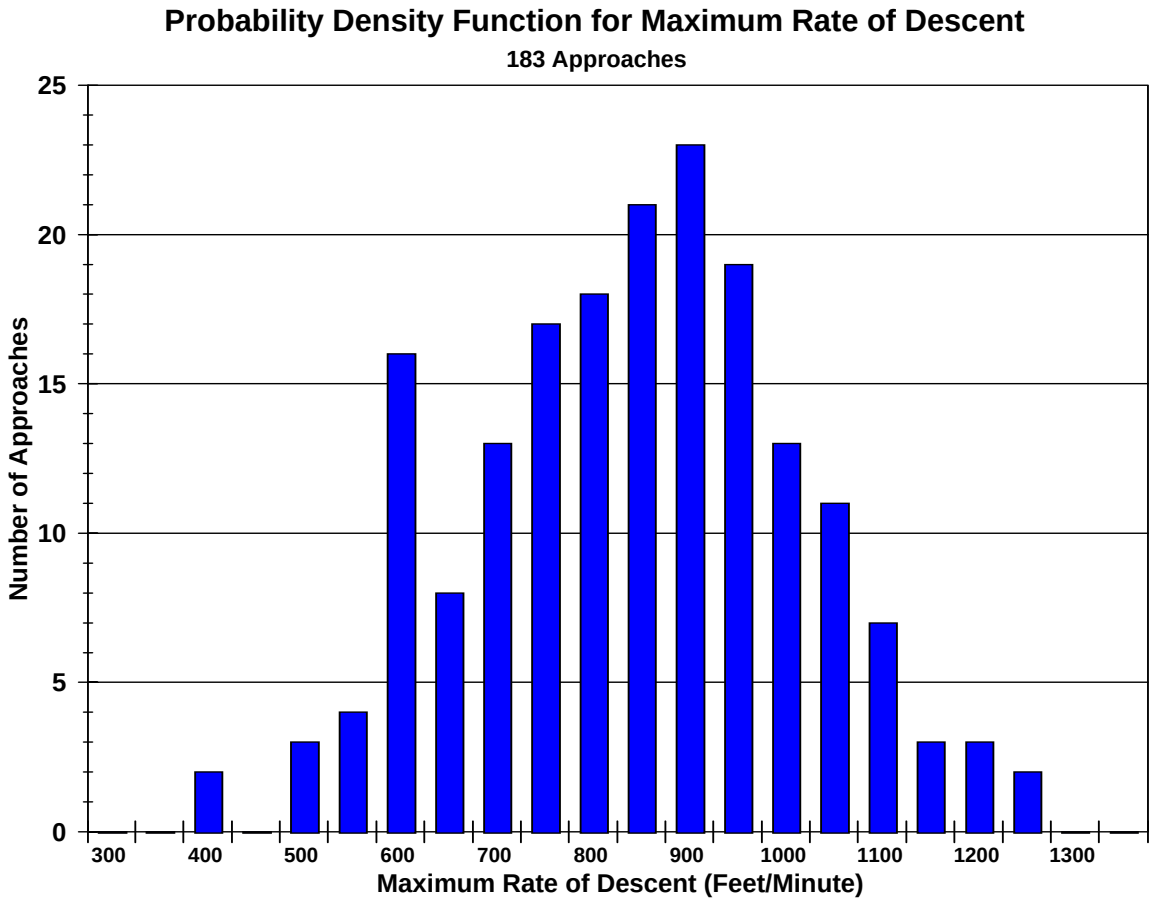

Probability Distribution Function for True Airspeed at VDP
62 "Y" Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
30
40
50
60
70
80
90
True Airspeed at VDP (Knots)

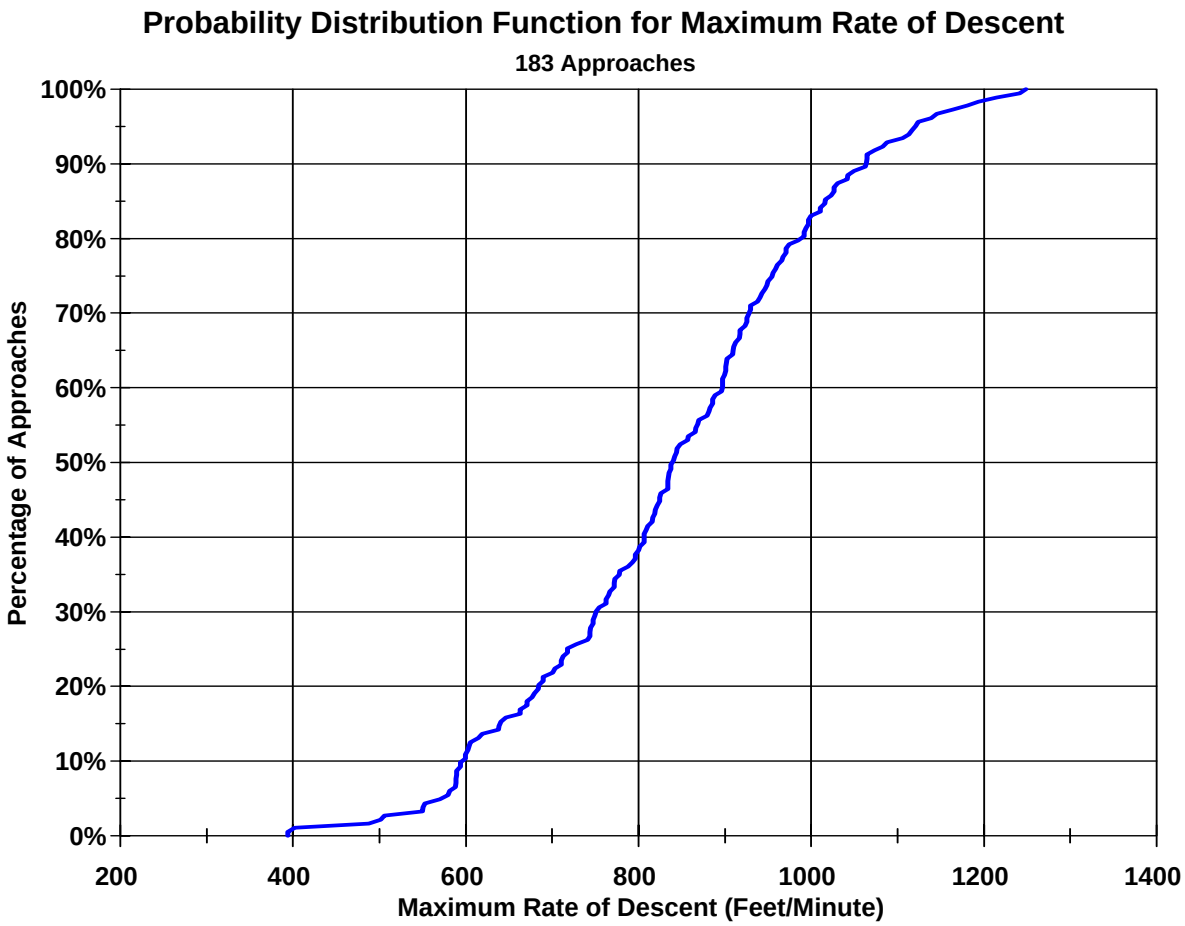

Probability Density Function for Tailwind at MAP
186 Approaches
Number of Approaches
0
5
10
15
20
25
-12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20 22 24 26
Tailwind at MAP (Knots)


Probability Density Function for Tailwind at MAP
186 Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
-10 -5 0 5 10 15 20 25
Tailwind at MAP (Knots)


Probability Density Function of Maximum Pitch Attitude
183 Approaches
Number of Approaches
0
5
10
15
20
25
30
3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0
Maximum Pitch Attitude (Degrees)


Probability Distribution Function for Maximum Pitch Attitude
183 Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
4
6
8
10
12
14
Maximum Pitch Attitude (Degrees)


Probability Density Function for Maximum Rate of Descent
183 Approaches
Number of Approaches
0
5
10
15
20
25
300
400
500
600
700
800
900
1000
1100
1200
1300
Maximum Rate of Descent (Feet/Minute)


Probability Distribution Function for Maximum Rate of Descent
183 Approaches
Percentage of Approaches
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
200
400
600
800
1000
1200
1400
Maximum Rate of Descent (Feet/Minute)

APPENDIX D—HVSE II APPROACH PLATES

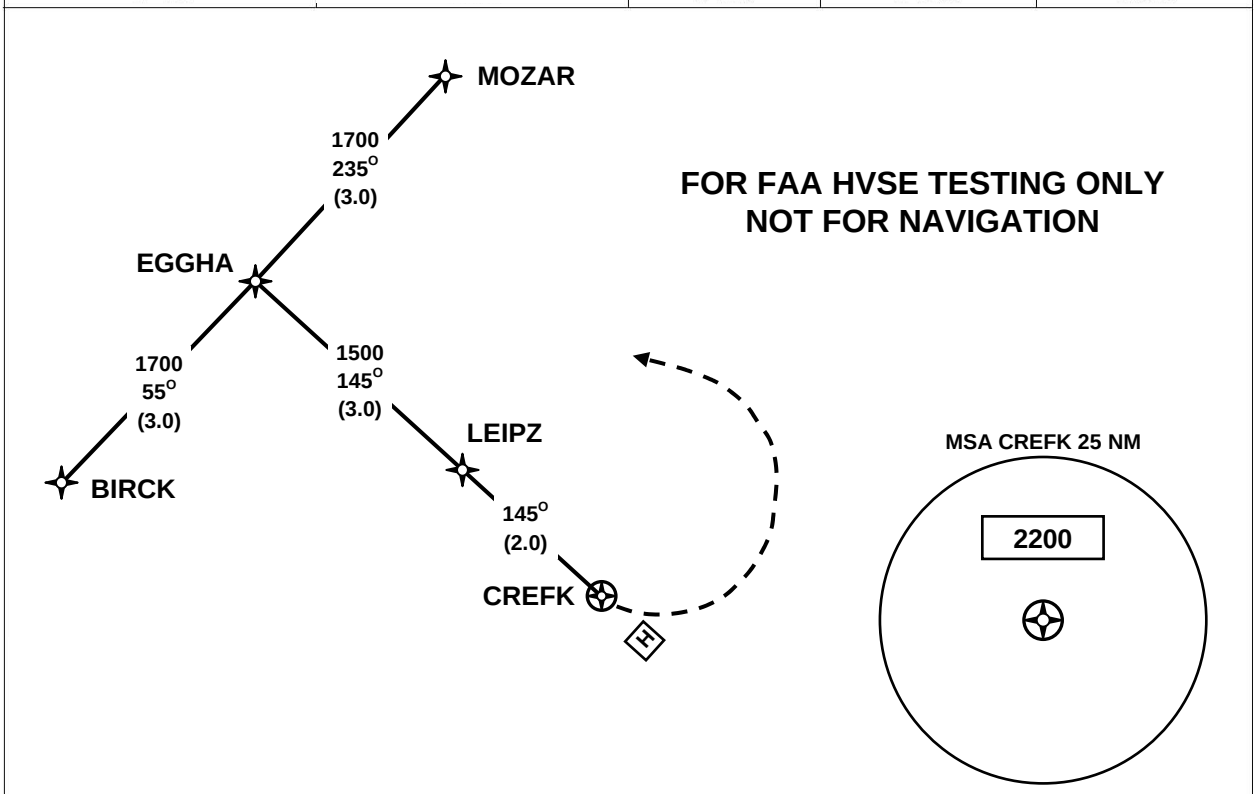
COPTER RNAV (GPS) W 145°

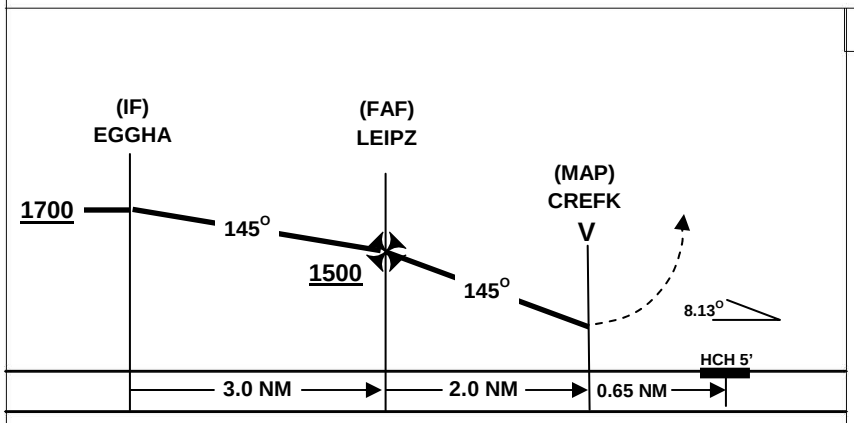
FAA HELIPORT
ATLANTIC CITY, NEW JERSEY

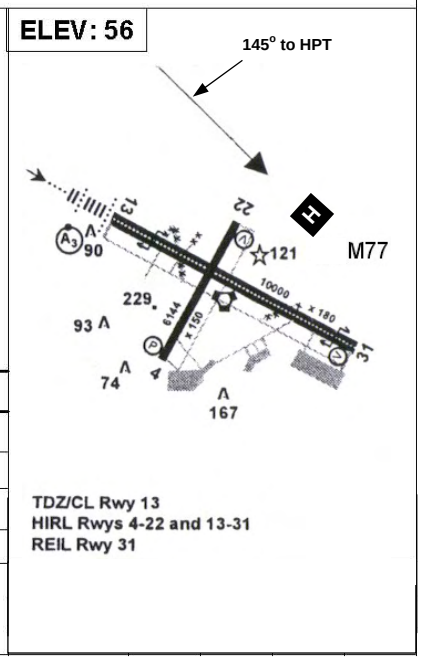
APP CRS	HPT ELEV
145	56

FAA HVSE evaluation only – Not for Navigation	**MISSED APPROACH: CLIMBING LEFT TURN to 1700' DIRECT EGGHA and HOLD.**

ATLANTIC CITY APP CON	ATLANTIC CITY TOWER	GND CON	CLNC DEL	ATIS
124.6	120.3	121.9	127.85	108.6







CATEGORY	COPTER ONLY
RNAV	625 – 3/4 569
CIRCLING	N/A

Limit final approach ground speed to 80 knots or as directed by project pilot. Proceed visually from CREFK or conduct the specified missed approach.

COPTER RNAV (GPS) W 145°

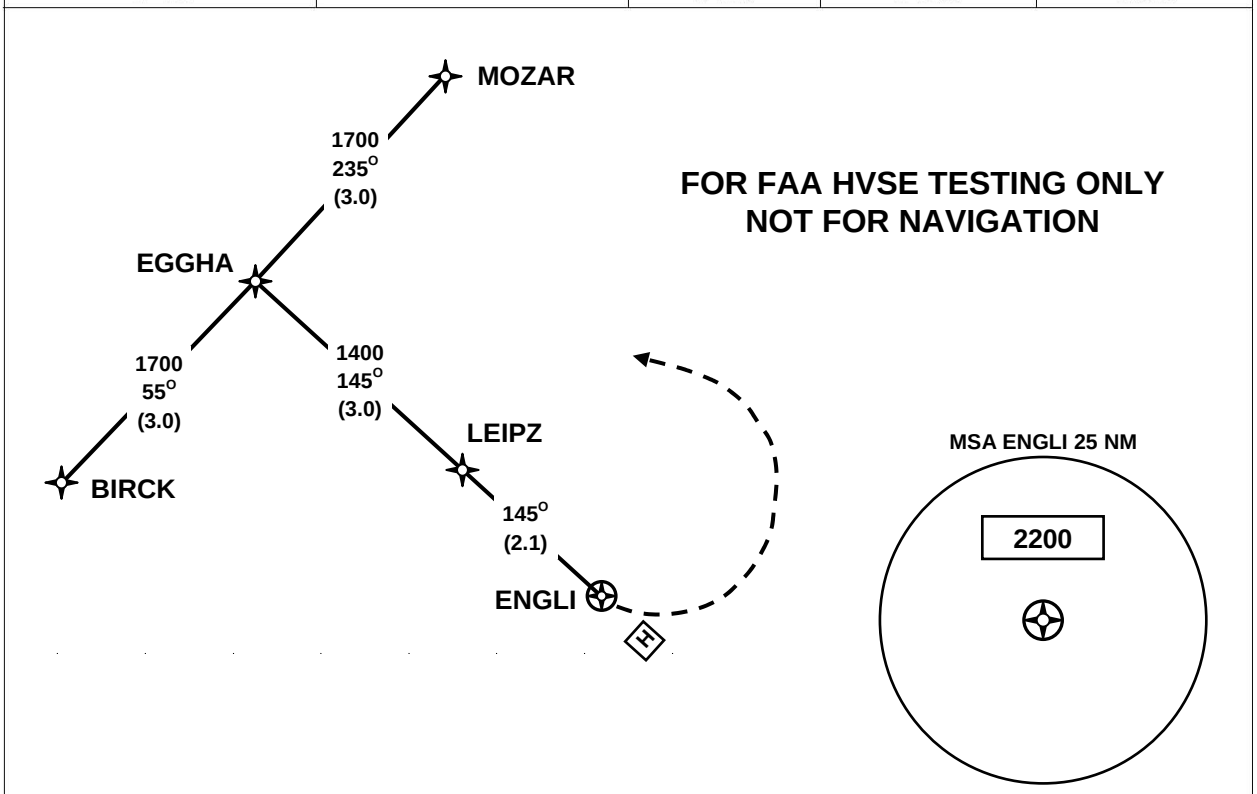
COPTER RNAV (GPS) X 145°

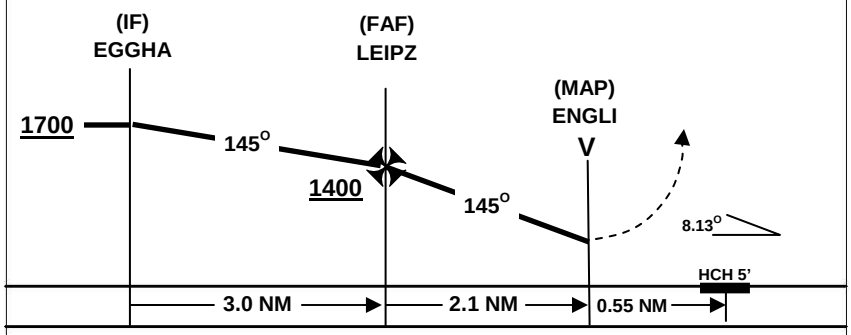
FAA HELIPORT
ATLANTIC CITY, NEW JERSEY

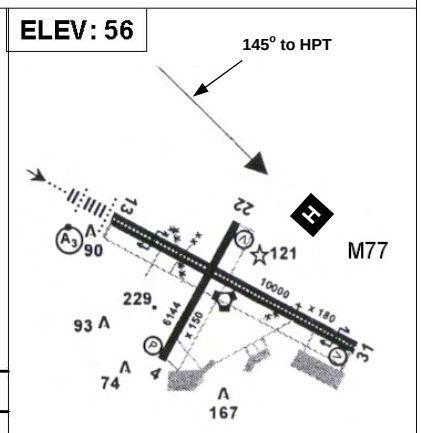
APP CRS	HPT ELEV
145	56

FAA HVSE evaluation only – Not for Navigation	**MISSED APPROACH: CLIMBING LEFT TURN to 1700' DIRECT EGGHA and HOLD.**

ATLANTIC CITY APP CON	ATLANTIC CITY TOWER	GND CON	CLNC DEL	ATIS
124.6	120.3	121.9	127.85	108.6







CATEGORY	COPTER ONLY
RNAV	540 – 3/4 484
CIRCLING	N/A

Limit final approach ground speed to 80 knots or as directed by project pilot. Proceed visually from ENGLI or conduct the specified missed approach.

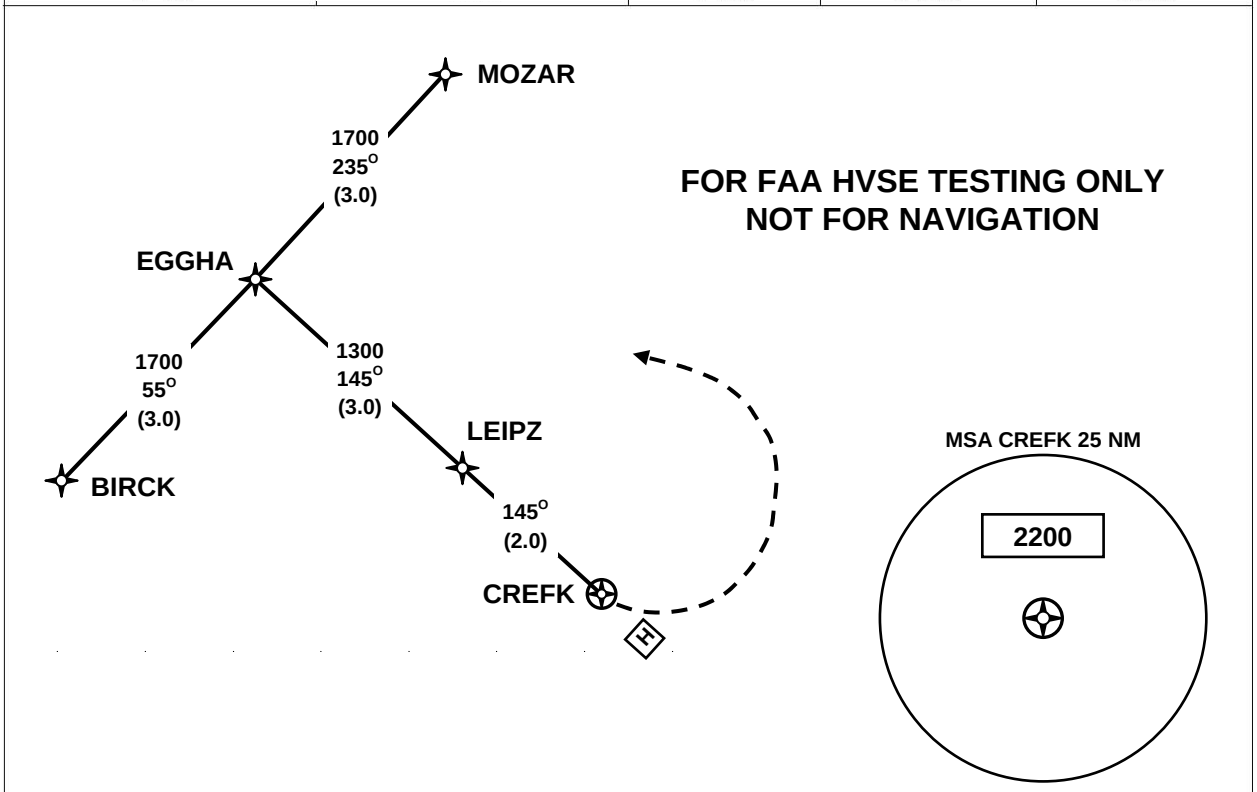
COPTER RNAV (GPS) Y 145°

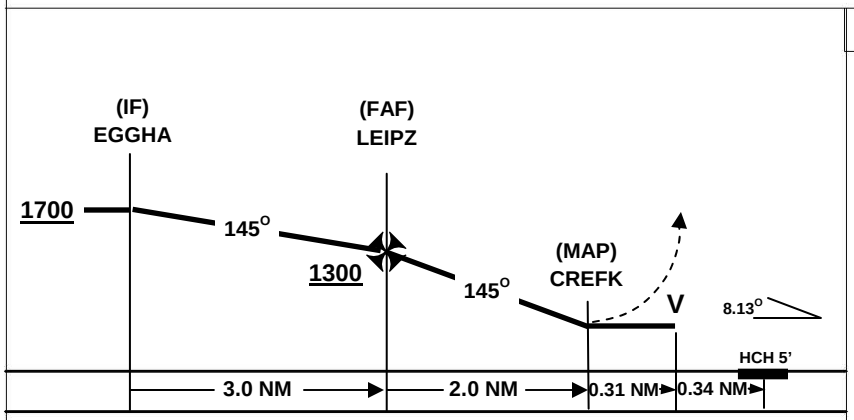
FAA HELIPORT
ATLANTIC CITY, NEW JERSEY

APP CRS	HPT ELEV
145	56

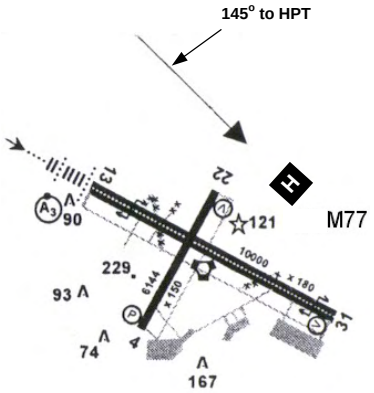
FAA HVSE evaluation only – Not for Navigation	**MISSED APPROACH: CLIMBING LEFT TURN to 1700' DIRECT EGGHA and HOLD.**

ATLANTIC CITY APP CON	ATLANTIC CITY TOWER	GND CON	CLNC DEL	ATIS
124.6	120.3	121.9	127.85	108.6





ELEV: 56



TDZ/CL Rwy 13
HIRL Rwys 4-22 and 13-31
REIL Rwy 31

CATEGORY	COPTER ONLY
RNAV	355 – 3/4 299
CIRCLING	N/A

Limit final approach ground speed to 80 knots or as indicated by project pilot.
Proceed visually from CREFK or conduct the specified missed approach.
From CREFK maintain MDA 355' MSL and proceed visually on approach course 145° 0.31NM to Visual Descent Point (VDP). At VDP transition to land.

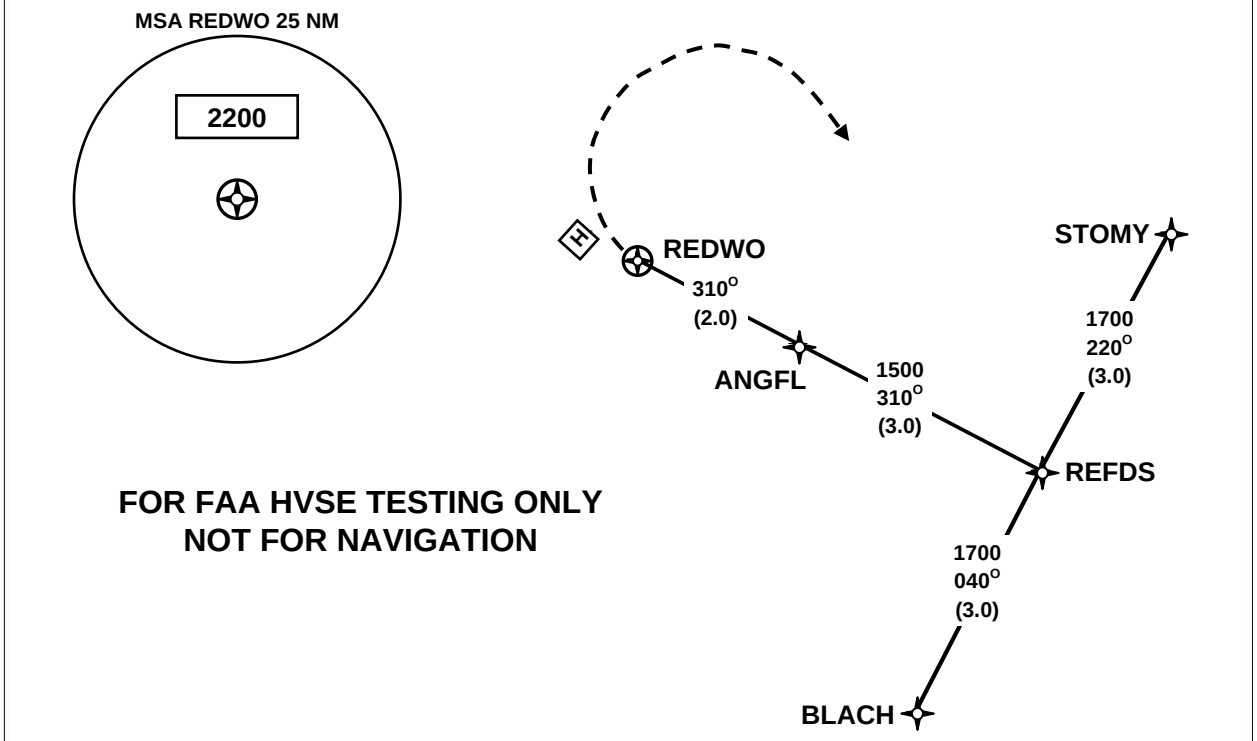
COPTER RNAV (GPS) W 310°

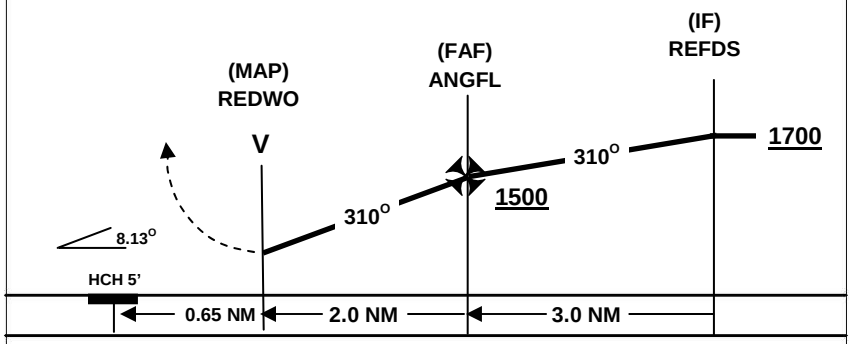
FAA HELIPORT
ATLANTIC CITY, NEW JERSEY

APP CRS	HPT ELEV
310	56

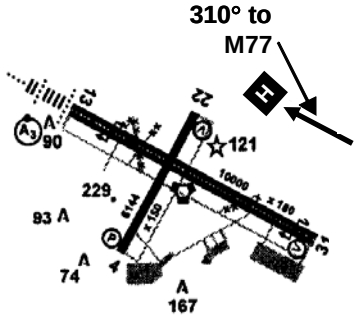
FAA HVSE evaluation only – Not for Navigation	**MISSED APPROACH: CLIMBING RIGHT TURN to 1700' DIRECT REFDS and HOLD.**

ATLANTIC CITY APP CON	ATLANTIC CITY TOWER	GND CON	CLNC DEL	ATIS
124.6	120.3	121.9	127.85	108.6





ELEV: 56



TDZ/CL Rwy 13
HIRL Rwys 4-22 and 13-31
REIL Rwy 31

CATEGORY	COPTER ONLY
RNAV	625 – 3/4 569
CIRCLING	N/A

Limit final approach ground speed to 80 knots or as indicated by project pilot. Proceed visually from REDWO or conduct the specified missed approach.

COPTER RNAV (GPS) W 310°

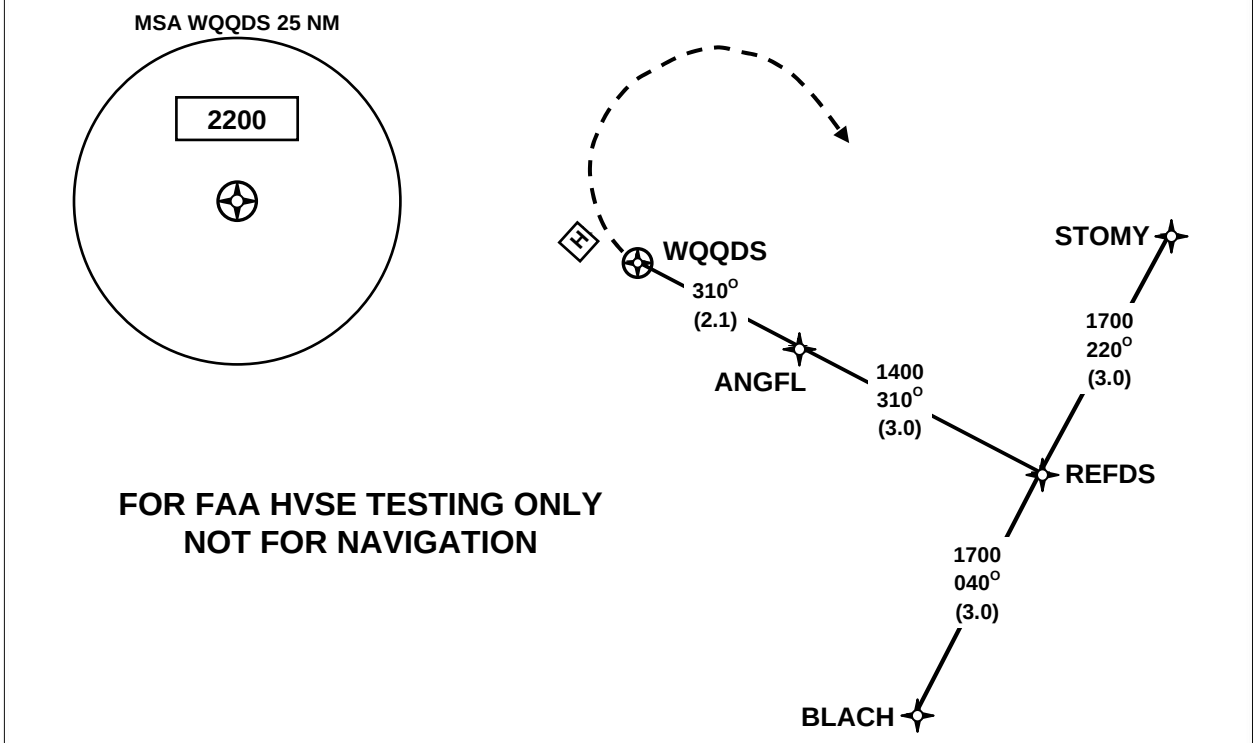
COPTER RNAV (GPS) X 310°

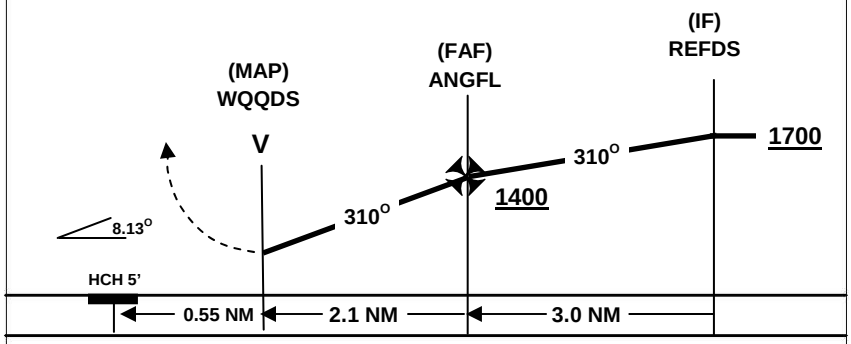
FAA HELIPORT
ATLANTIC CITY, NEW JERSEY

APP CRS	HPT ELEV
310	56

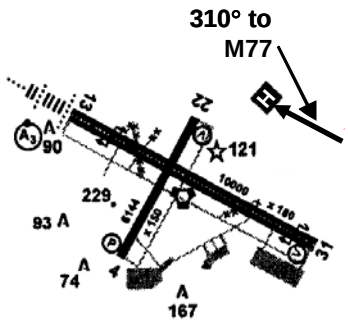
FAA HVSE evaluation only – Not for Navigation	**MISSED APPROACH: CLIMBING RIGHT TURN to 1700' DIRECT REFDS and HOLD.**

ATLANTIC CITY APP CON	ATLANTIC CITY TOWER	GND CON	CLNC DEL	ATIS
124.6	120.3	121.9	127.85	108.6





ELEV: 56



CATEGORY	COPTER ONLY
RNAV	540 – 3/4 484
CIRCLING	N/A

Limit final approach ground speed to 80 knots or as specified by project pilot. Proceed visually from WQQDS or conduct the specified missed approach.

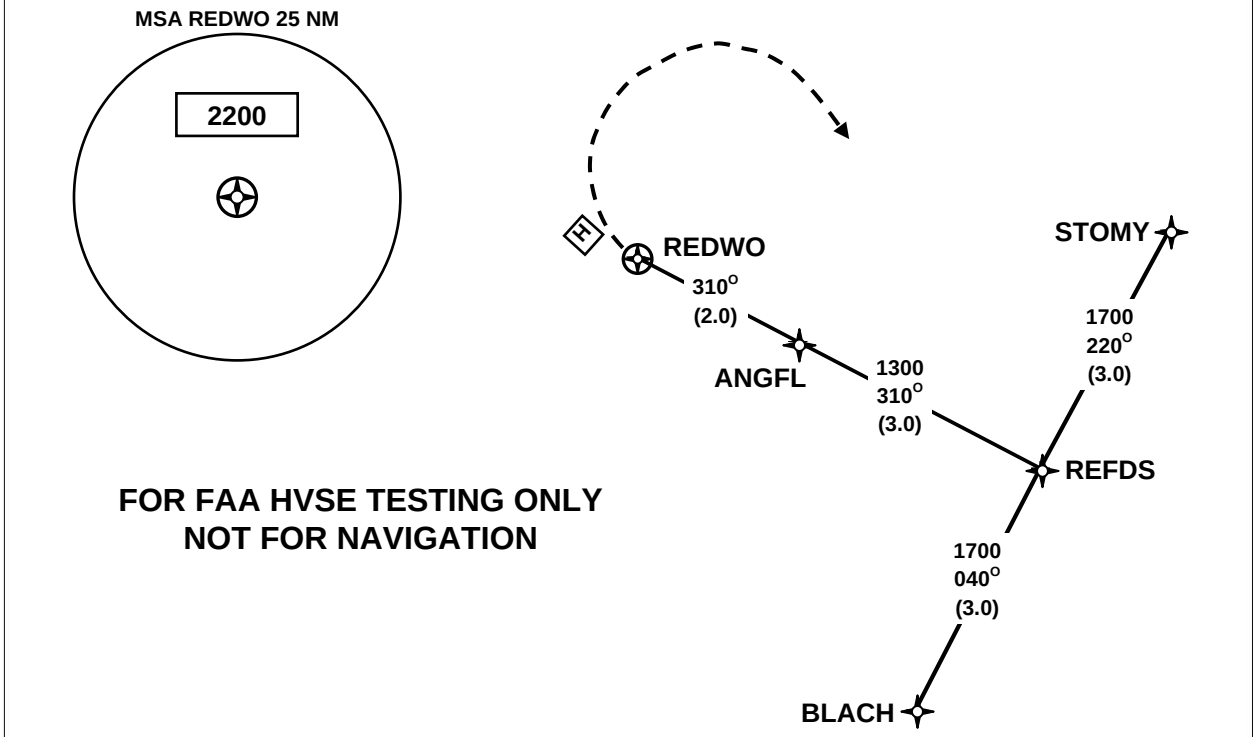
COPTER RNAV (GPS) Y 310°

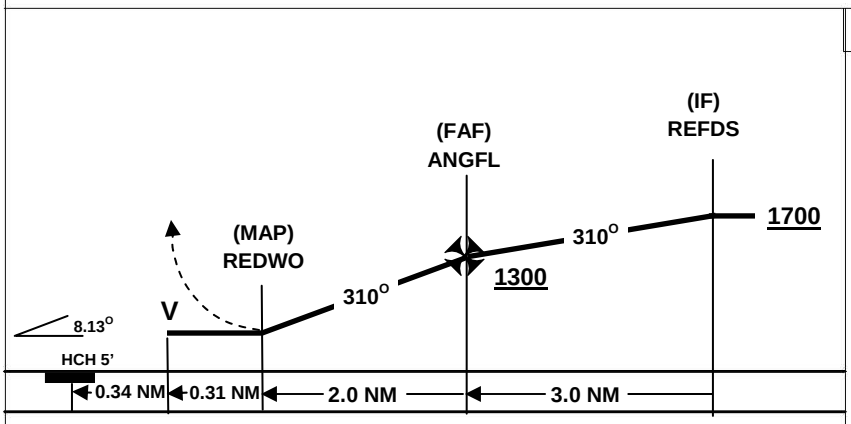
FAA HELIPORT
ATLANTIC CITY, NEW JERSEY

APP CRS	HPT ELEV
310	56

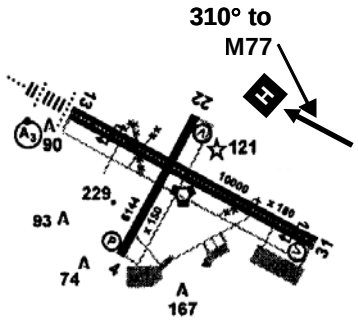
FAA HVSE evaluation only – Not for Navigation	**MISSED APPROACH: CLIMBING RIGHT TURN to 1700' DIRECT REFDS and HOLD.**

ATLANTIC CITY APP CON	ATLANTIC CITY TOWER	GND CON	CLNC DEL	ATIS
124.6	120.3	121.9	127.85	108.6





ELEV: 56



TDZ/CL Rwy 13
HIRL Rwys 4-22 and 13-31
REIL Rwy 31

CATEGORY	COPTER ONLY
RNAV	355 – 3/4 299
CIRCLING	N/A

Limit final approach ground speed to 80 knots or as specified by project pilot.
Proceed visually from REDWO or conduct the specified missed approach.
From REDWO maintain MDA 355' MSL and proceed visually on approach course 310° 0.31NM to Visual Descent Point (VDP). At VDP transition to land.

COPTER RNAV (GPS) Y 310°

APPENDIX E—MATHEMATICAL MODEL OF HELICOPTER PERFORMANCE IN THE VISUAL SEGMENT

A simplified formulation of the performance of a helicopter on approach to a heliport is presented in this appendix. This formulation assumes the helicopter is decelerating throughout the approach. The resulting formulas predict that the vertical profile is a curved path that increases in slope as the helicopter approaches the heliport. In mathematical terms, the shape of the curved path is that of a parabola. It will be shown that the resulting vertical profile and speed curves are in general agreement in shape and value as the statistical curves described in section 4.6 and appendix F.

E.1 ASSUMPTIONS.

The model development assumes the following pilot actions:

- Increase pitch to raise the nose and begin the deceleration at the missed approach point (MAP).
- Lower the collective to begin the descent at the MAP or visual descent point (VDP).
- Adjust power to maintain rotor revolutions per minute (rpm) within accepted limits

The following simplifying assumptions are made:

- The deceleration begins at the MAP and is constant with value Decel throughout the visual segment.
- A small time delay occurs after reaching the MAP before descent is initiated by the pilot (or VDP, if one is used in the procedure). Note that the time delay is related to pilot and aircraft response time and is becoming widely used in approach criteria development. After the specified time delay, the rate of descent (ROD) remains constant with value ROD for the remainder of the visual segment.

E.2 MODEL DEVELOPMENT—HORIZONTAL PERFORMANCE.

The ground speed of the helicopter (equation E-1) can be found by integrating the deceleration with respect to time and applying initial conditions of the helicopter at the MAP. The position of the helicopter along the path from the MAP to the heliport is likewise determined by integrating the ground speed formula with respect to time (equation E-2). Note that the equations are first developed without regard for conversion of units. The constants required to make the equations dimensionally correct are applied later in the development process.

$$Ground\ Speed = V_0 - Decel \times (Time) \qquad \text{(E-1)}$$

where

V_0 = ground speed at the MAP in knots
Time = the time since passing the MAP in seconds

$$DMAP = V_0 \times (Time) - 0.5 \times Decel \times (Time)^2 \qquad \text{(E-2)}$$

where

DMAP = distance measured from the MAP toward the heliport.

The time required to fly the approach, T_0, is calculated by setting the ground speed (equation E-1) to zero upon reaching the heliport.

$$T_0 = V_0/Decel \qquad \text{(E-3)}$$

At time T_0, the helicopter will have traveled a distance D_0 to arrive at the heliport.

From equation E-2, at the heliport:

$$D_0 = V_0 \times T_0 - 0.5 \times Decel \times (T_0)^2$$

Substituting the value for T_0 in equation E-3 and collecting terms, one obtains

$$D_0 = (0.5 \times V_0^2)/Decel \qquad \text{(E-4)}$$

The required deceleration value, Decel, to achieve distance D_0 and zero ground speed at the heliport is therefore, from equation E-4:

$$Decel = 0.5 \times (V_0^2/D_0) \qquad \text{(E-5)}$$

A dimensionally correct form of equation E-5 is:

$$Decel = 7.286 \times 10^{-6} \times (V_0^2/D_0) \qquad \text{(E-6)}$$

where

Decel = measured in g's
V_0 = measured in knots
D_0 = measured in nautical miles (nm)

Using equations E-3 and E-5, the required time to fly the approach, T_0, can be restated as:

$$T_0 = 2 \times (D_0/V_0) \qquad \text{(E-7)}$$

A dimensionally correct form is:

$$T_0 = 7200 \times (D_0/V_0) \tag{E-8}$$

where

T_0 = measured in seconds
D_0 = measured in nm
V_0 = measured in knots

Using equation E-2 and substituting equation E-5, the distance from the MAP can be calculated as:

$$DMAP = V_0 \times (Time) - 0.25 \times (V_0^2/D_0) \times (Time^2) \tag{E-9}$$

A dimensionally correct form for the distance from the MAP is:

$$DMAP = V_0 \times (Time)/3600 - 1.929 \times 10^{-8} \times (V_0^2/D_0) \times (Time^2) \tag{E-10}$$

where

DMAP - measured in nm
D_0 = measured in nm
V_0 = measured in knots
Time = measured in seconds beginning when the helicopter passes the MAP

The distance to the heliport, D2H, (as contrasted with distance from the MAP) can be calculated as:

$$D2H = D_0 - DMAP \tag{E-11}$$

Substituting equation E-9 in equation E-11, one obtains:

$$D2H = D_0 - V_0 \times (Time) + 0.25 \times (V_0^2/D_0) \times (Time^2) \tag{E-12}$$

A dimensionally correct form for distance to heliport is:

$$D2H = D_0 - V_0 \times (Time)/3600 + 1.929 \times 10^{-8} \times (V_0^2/D_0) \times (Time^2) \tag{E-13}$$

where

D2H = measured in nm
D_0 = measured in nm
V_0 = measured in knots
Time = measured in seconds beginning when the helicopter passes the MAP

A dimensionally correct form for ground speed is:

$$Ground\ Speed = V_0 - [(V_0^2/D_0)/7200] \times (Time) \quad \text{(E-14)}$$

where

Ground Speed = measured in knots
D_0 = measured in nm
V_0 = measured in knots
Time = measured in seconds beginning when the helicopter passes the MAP

E.3 MODEL DEVELOPMENT—VERTICAL PERFORMANCE.

The vertical position of the helicopter can be determined using the relationships developed for the horizontal movement of the helicopter. The helicopter must lose altitude equivalent to the altitude at the MAP, less the altitude of the heliport. On the approach chart, this altitude difference is identified as the height above landing (HAL). This altitude loss must happen during the time required to fly from the MAP to the heliport. According to the second simplifying assumption, this loss of altitude takes place at a constant rate after an initial time delay. The ROD required for the helicopter to reach the heliport elevation at the end of the visual segment is calculated as:

$$ROD = 60 \times HAL/(T_0 - TD) \quad \text{(E-15)}$$

where

ROD = rate of descent in feet per minute
HAL = height above landing area in feet
T_0 = the time required to fly the visual segment in seconds
TD = the time delay for the pilot control input and aircraft response

The value of TD used for this analysis was set at 6 seconds. The standard value of 6 seconds for pilot control input and aircraft response time has been used in international criteria development for some period of time and more recently has been introduced into criteria development in the United States.

By substituting equation E-8, equation E-15 can be restated in terms of the approach procedure parameters as:

$$ROD = 60 \times HAL/[7200 \times (D_0/V_0) - TD] \quad \text{(E-16)}$$

where

ROD = rate of descent in feet per minute
HAL = height above landing area in feet when the helicopter is at the MAP
D_0 = distance from the MAP to heliport measured in nm
V_0 = ground speed at the MAP measured in knots
TD = the time delay in seconds for the pilot control input and helicopter response

The vertical helicopter position (H_H) is calculated as follows:

$$\left.\begin{array}{c} \textit{For Time} < TD,\ H_H = HAL \\ \textit{For Time} >= TD \textit{ and Time} < T_0,\ H_H = HAL - (ROD/60) \times (Time) \\ \textit{For Time} > T_0,\ H_H = 0 \end{array}\right\} \qquad \text{(E-17)}$$

where

H_H = height above the heliport in feet
HAL = height above landing area in feet when the helicopter passes the MAP
ROD = required rate of descent in feet per minute from equation E-16
$Time$ = measured in seconds beginning when the helicopter passes the MAP

E.4 APPLICATION OF THE VISUAL SEGMENT PERFORMANCE MODEL.

Because the helicopter begins the descent at the MAP for the W and X approach procedures, the model can be applied using the HAL, D_0, V_0, and TD values directly to compute values for the required Decel, pitch attitude (Pitch Att.), T_0, and the required ROD.

For the Y approach procedure, the use of a VDP requires some modification of the application. For horizontal performance, the helicopter is assumed to begin deceleration at the MAP and continue the deceleration throughout the visual segment. Hence, the calculation of the required Decel, Pitch Att., and T_0, can be calculated by direct application of equations E-6 and E-8. Because the helicopter does not begin descent until passing the VDP, the calculation of ROD requires extra steps. These steps are:

1. Calculate the time to fly from the MAP to the VDP by applying equation E-12 and substitute the distance from the heliport to the VDP (D_V = .34) for D2H. This involves solving a quadratic equation and choosing the value for time that falls between 0 and T_0 seconds. Identify this time as T_{MV}, the time to fly from the MAP to the VDP (T_{MV} = 16.9 seconds for the Y approach procedure).

2. Substitute T_{MV} into equation E-14 to calculate the ground speed at the VDP. Identify this ground speed as V_V, the ground speed at the VDP (V_V = 57.9 knots for the Y approach procedure).

3. Substitute D_V and V_V for D_0 and V_0 in equation E-8 to calculate the remaining time to fly the visual segment, T_V. Substitute these same values in equation E-16 to calculate the required ROD to descend from the VDP to the heliport elevation.

E.5 SUMMARY OF KEY MODEL RELATIONSHIPS.

The resulting key relationships of helicopter performance in the visual segment are:

$$Decel = 7.286 \times 10^{-6} \times (V_0^2/D_0) \qquad \text{(E-6)}$$

$$T_0 = 7200 \times (D_0/V_0) \qquad \text{(E-8)}$$

$$ROD = 60 \times HAL/(7200 \times (D_0/V_0) - TD) \quad \text{(E-16)}$$

The pitch attitude of the helicopter can be calculated from the deceleration using the following formula:

$$Pitch\ Attitude = (180/\pi) \times \text{arctangent}\ (Decel) \quad \text{(E-18)}$$

where

Pitch Attitude = measured in degrees
Decel = measured in g's

The performance values predicted by the visual segment model were calculated for the three approaches flown during the flight tests. The results are shown in table E-1.

Table E-1. Key Performance Measures From Visual Segment Model

Approach Procedure	HAL (feet)	D_0 (nm)	V_0 (knots)	T_0 (sec)	D_V (nm)	V_V (knots)	T_V (sec)	TD (sec)	Decel (g's)	Pitch Att. (degrees)	ROD (ft/min)
W	569	0.65	80	58.5	NA	NA	NA	6	0.072	4.1	650
X	484	0.55	80	49.5	NA	NA	NA	6	0.085	4.8	668
Y	299	0.65	80	58.5	0.34	57.9	42.3	6	0.072	4.1	494

NA = Not applicable

E.6 GRAPHS OF THE MODEL RESULTS.

Plots of the model results for altitude above heliport, ground speed, rate of descent, pitch attitude, and deceleration are shown in graphics in appendix F. These plots are overlaid on plots showing the results of the statistical analysis of the flight test profiles discussed in section 4.6. The following observations are offered.

E.6.1 Altitude Above Heliport Model.

For the W and X approach procedures, the model agrees well with the test data (mean W and X path) until it reaches 0.3 nm to the heliport. At that point, the test data path becomes shallower than the model path and presents a more linear characteristic. The angle to the heliport at that point is approximately 13 degrees.

For the Y approach procedure, the model correctly identifies the start of descent point from minimal descent altitude (MDA). After that point, the test data path became slightly shallower than the model path.

For all three approach procedures, the altitude model is a much better predictor of the vertical profile than is the linear path along the visual segment descent angle (VSDA).

E.6.2 Ground Speed Model.

For the W and X approach procedures, there is excellent agreement between the test data (mean W and X ground speed) and the model.

For the Y approach procedure, the test data (mean Y ground speed) is 3 to 5 knots greater than the model for distances from the heliport of 0.1 to 0.5 nm.

For all three approach procedures, the ground speed model provides an accurate estimator for the mean ground speed profile in the visual segment.

E.6.3 Rate of Descent Model.

For all three approach procedures, the constant ROD model is an approximation of the mean ROD curve.

For the W approach procedure, the mean ROD curve ramps upward beginning before the MAP and reaches a maximum at 0.25 and 0.30 nm to the heliport. At that point, the ROD declines rapidly and reaches zero value at the heliport.

For the X approach procedure, the mean ROD curve ramps upward beginning before the MAP and reaches a maximum at 0.20 and 0.25 nm to the heliport. At that point, the ROD declines rapidly and reaches zero value at the heliport.

For the Y approach procedure, the mean ROD curve ramps upward beginning before the MAP and reaches a maximum at 0.15 nm to the heliport. At that point, the ROD declines rapidly and reaches zero value at the heliport.

The maximum value of mean ROD for each of the three approach procedure types (W, X, and Y) is about 100 feet/minute greater than the value predicted by the model.

E.6.4 Pitch Attitude and Deceleration Model.

For all three approach procedures, the pitch attitude and deceleration model is an approximation of the mean pitch attitude and deceleration curve.

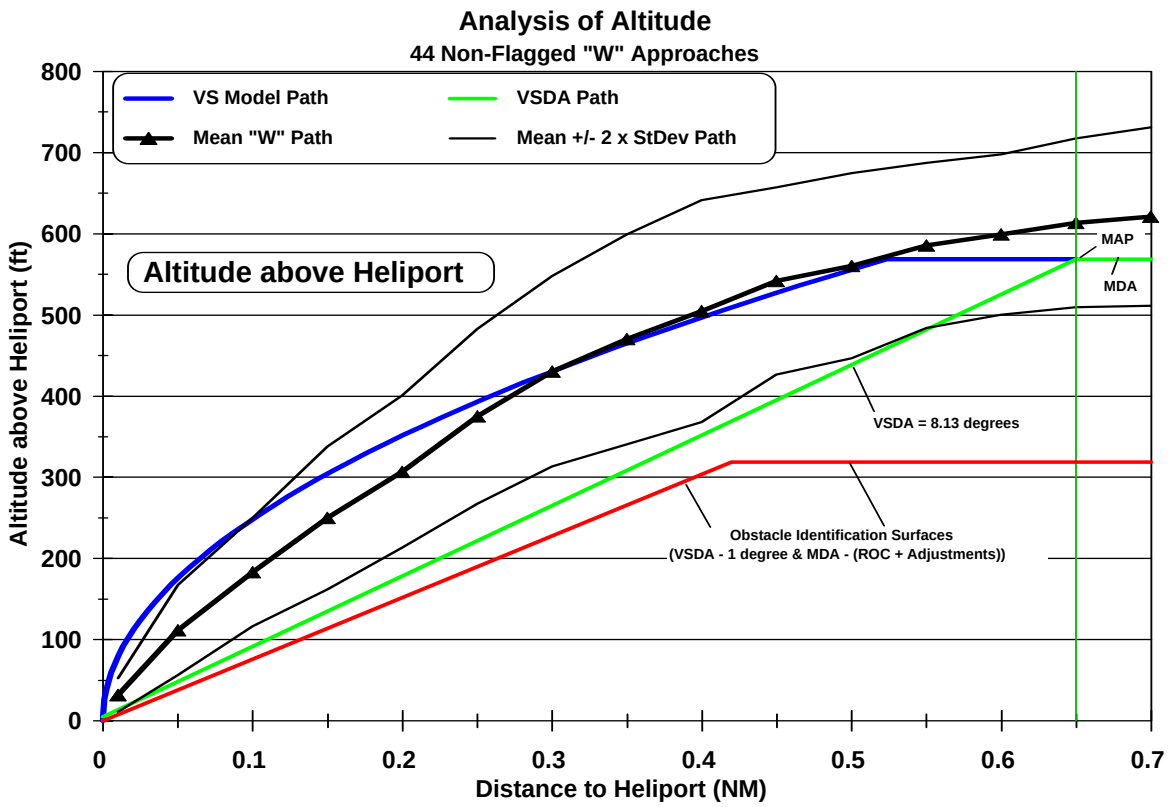
For the W approach procedure, the mean pitch attitude and deceleration curve ramps upward beginning near the MAP and reaches a maximum at 0.40 nm to the heliport. At that point, the pitch attitude and deceleration curve declines slightly with a secondary peak at 0.05 nm to the heliport.

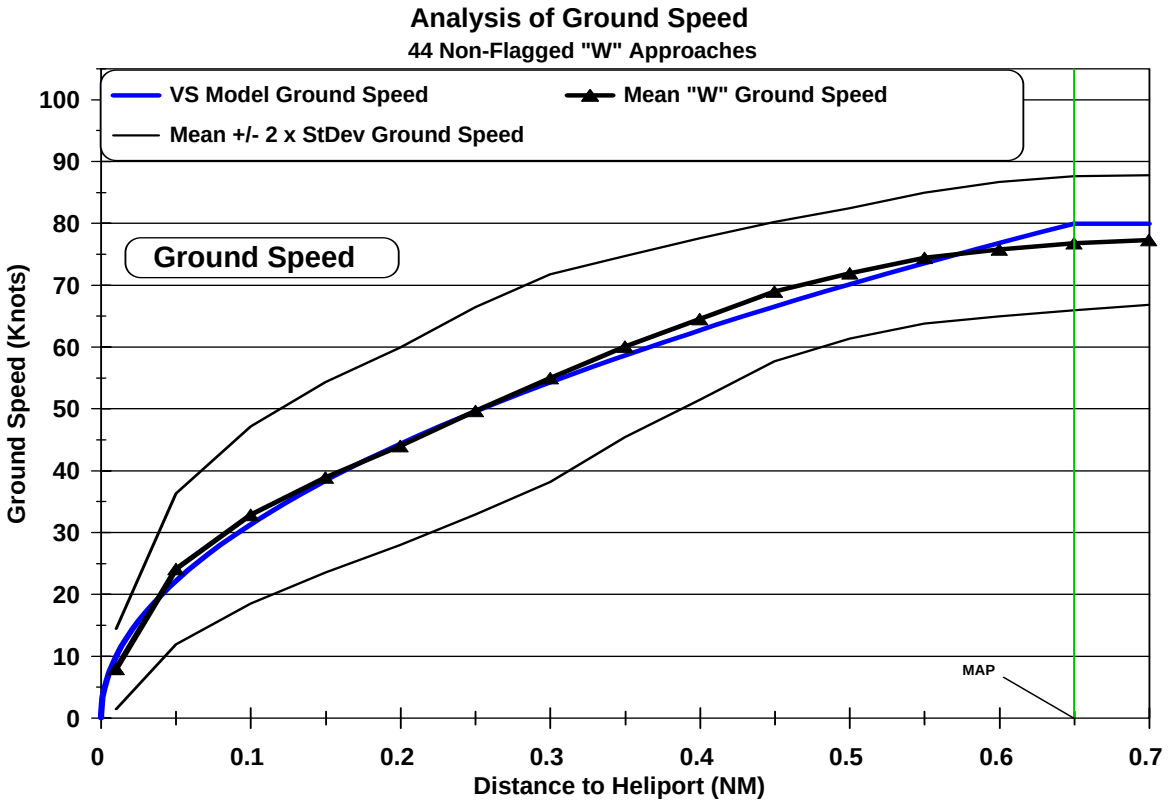
For the X approach procedure, the mean pitch attitude and deceleration curve ramps upward beginning before the MAP and reaches a maximum at 0.3 nm to the heliport. At that point, the pitch attitude and deceleration curve declines slightly with a secondary peak at .05 nm to the heliport.

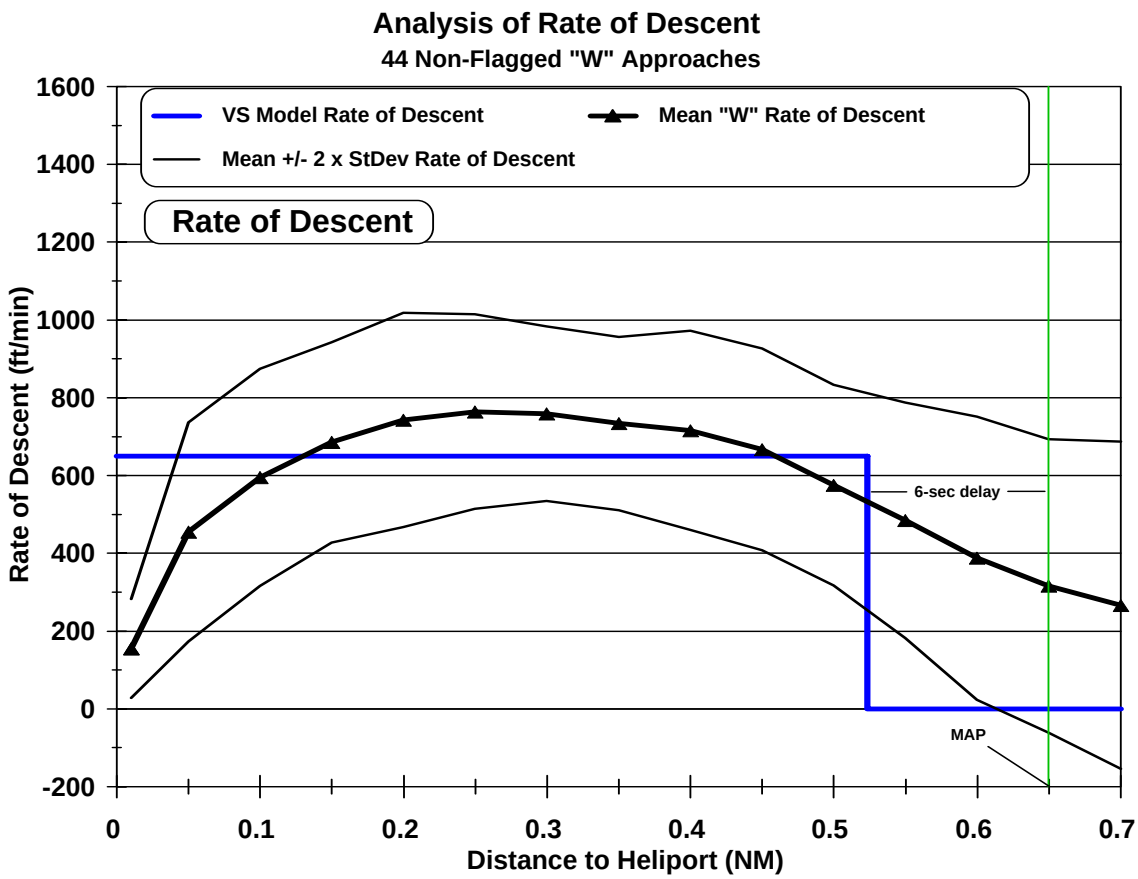
APPENDIX F—GRAPHICAL RESULTS OF THE STATISTICAL ANALYSIS OF THE FLIGHT TEST DATA

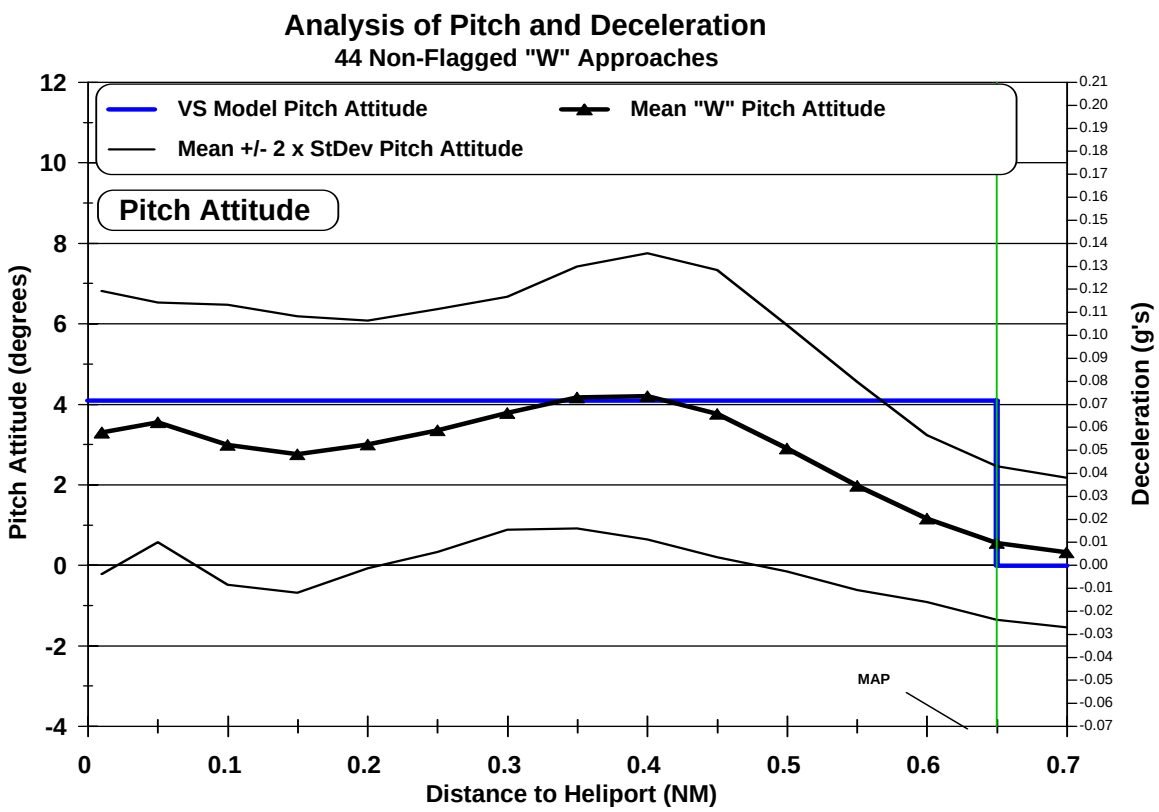
This appendix shows the graphical results of the statistical analysis performance profiles of:

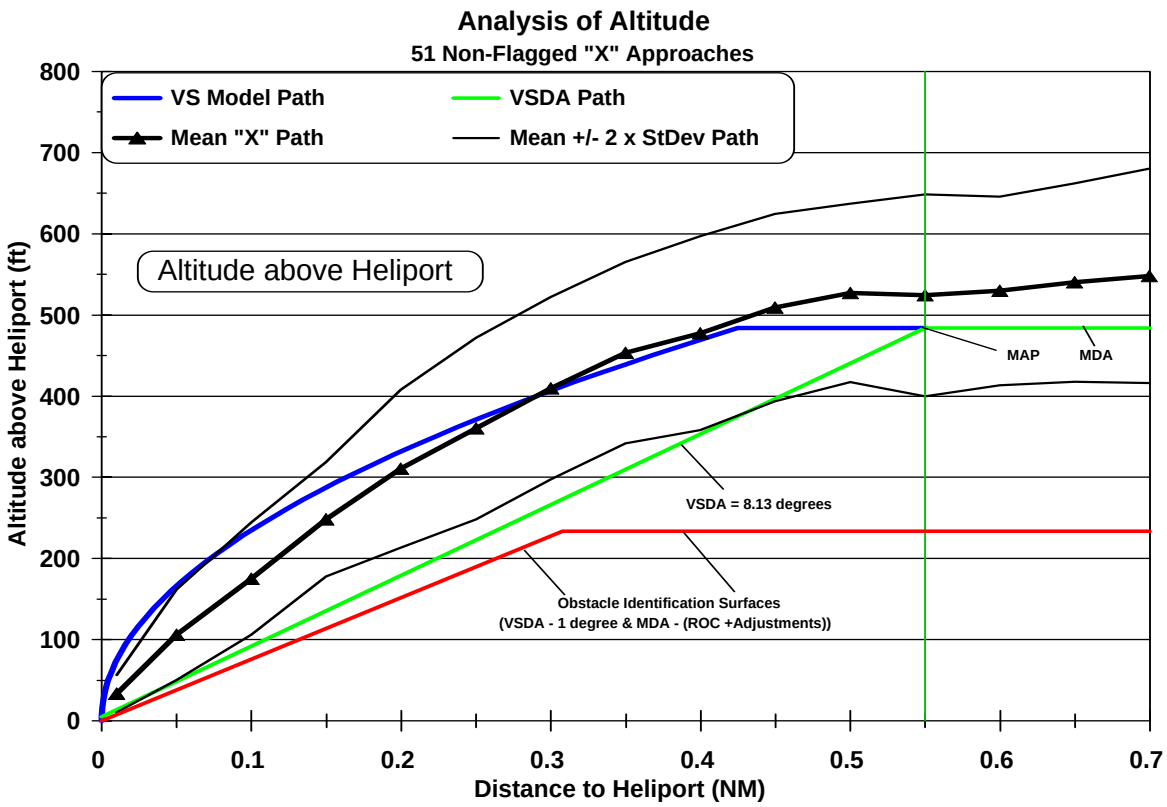
- Altitude above heliport
- Ground speed
- Rate of descent
- Pitch attitude
- Deceleration

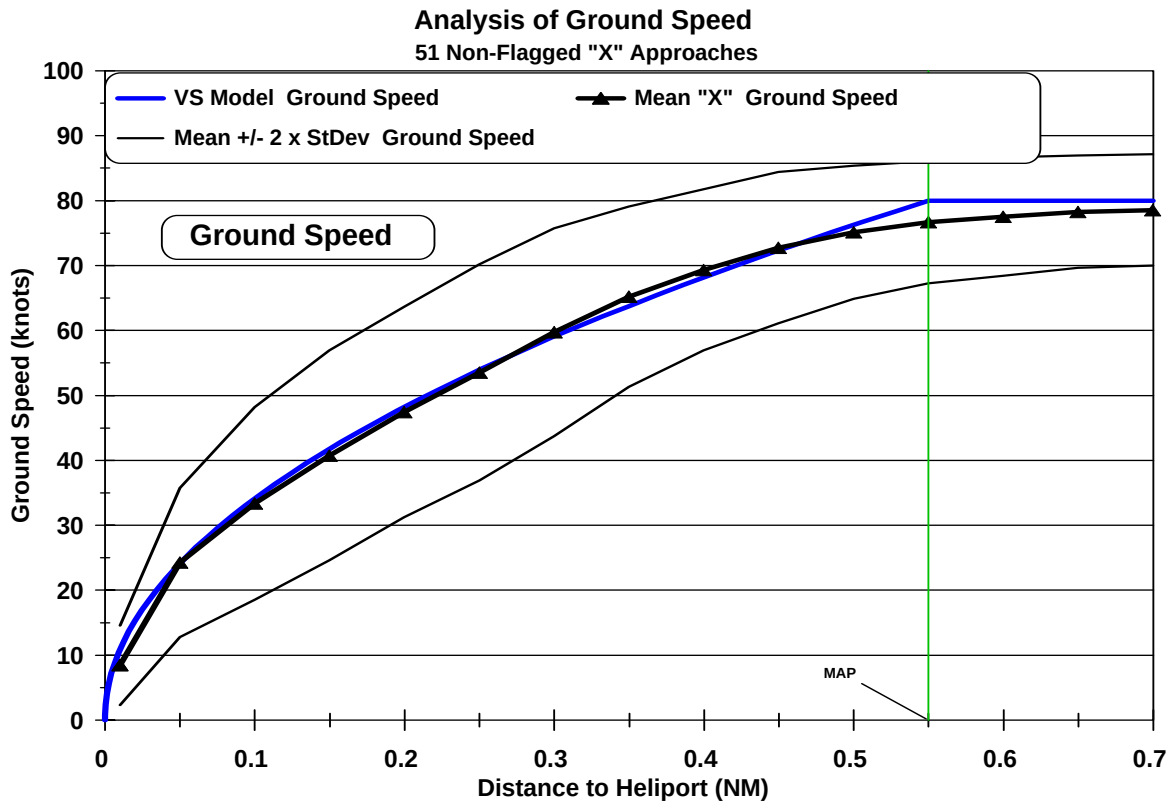

Analysis of Altitude
44 Non-Flagged "W" Approaches
VS Model Path
VSDA Path
Mean "W" Path
Mean +/- 2 x StDev Path
Altitude above Heliport
MAP
MDA
VSDA = 8.13 degrees
Obstacle Identification Surfaces
(VSDA - 1 degree & MDA - (ROC + Adjustments))
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0.1
0.2
0.3
0.4
0.5
0.6
0.7

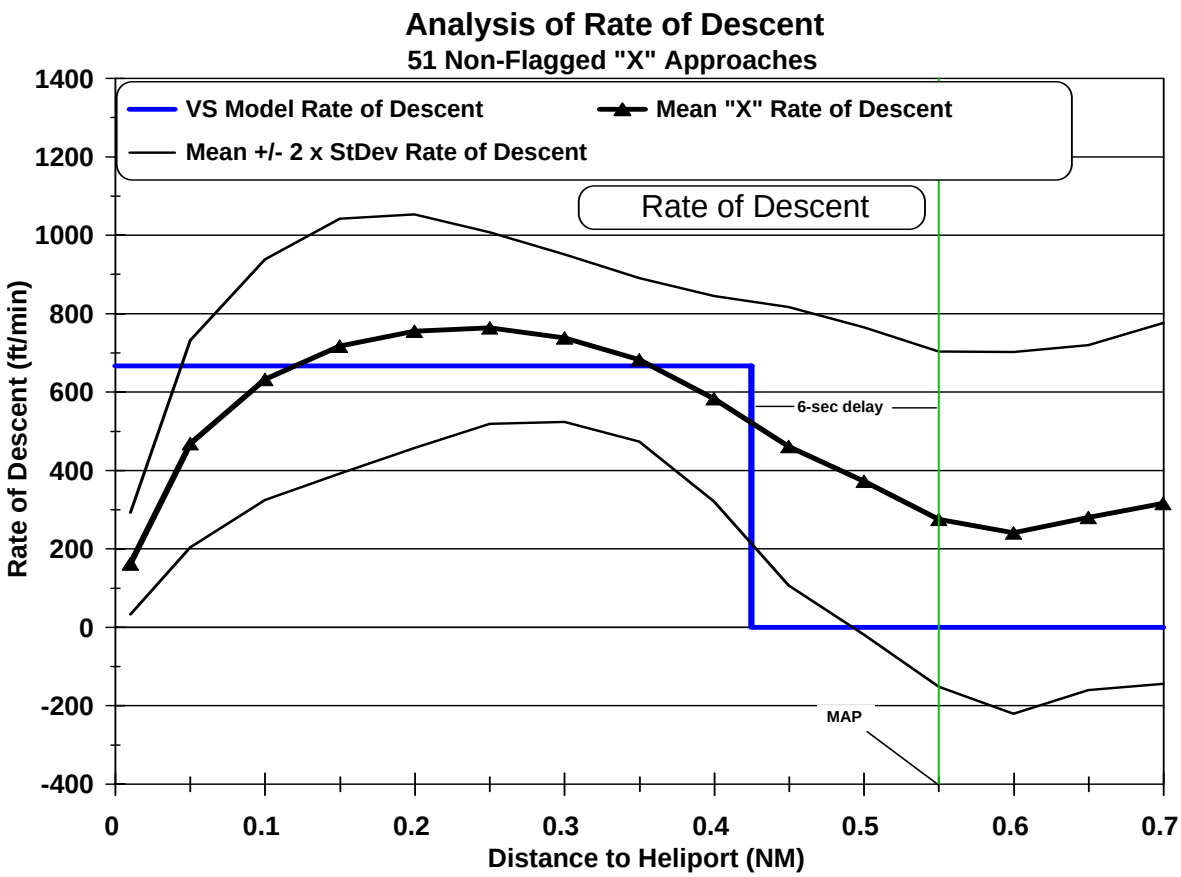

Analysis of Ground Speed
44 Non-Flagged "W" Approaches
VS Model Ground Speed
Mean "W" Ground Speed
Mean +/- 2 x StDev Ground Speed
Ground Speed
MAP
Ground Speed (Knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0.1
0.2
0.3
0.4
0.5
0.6
0.7

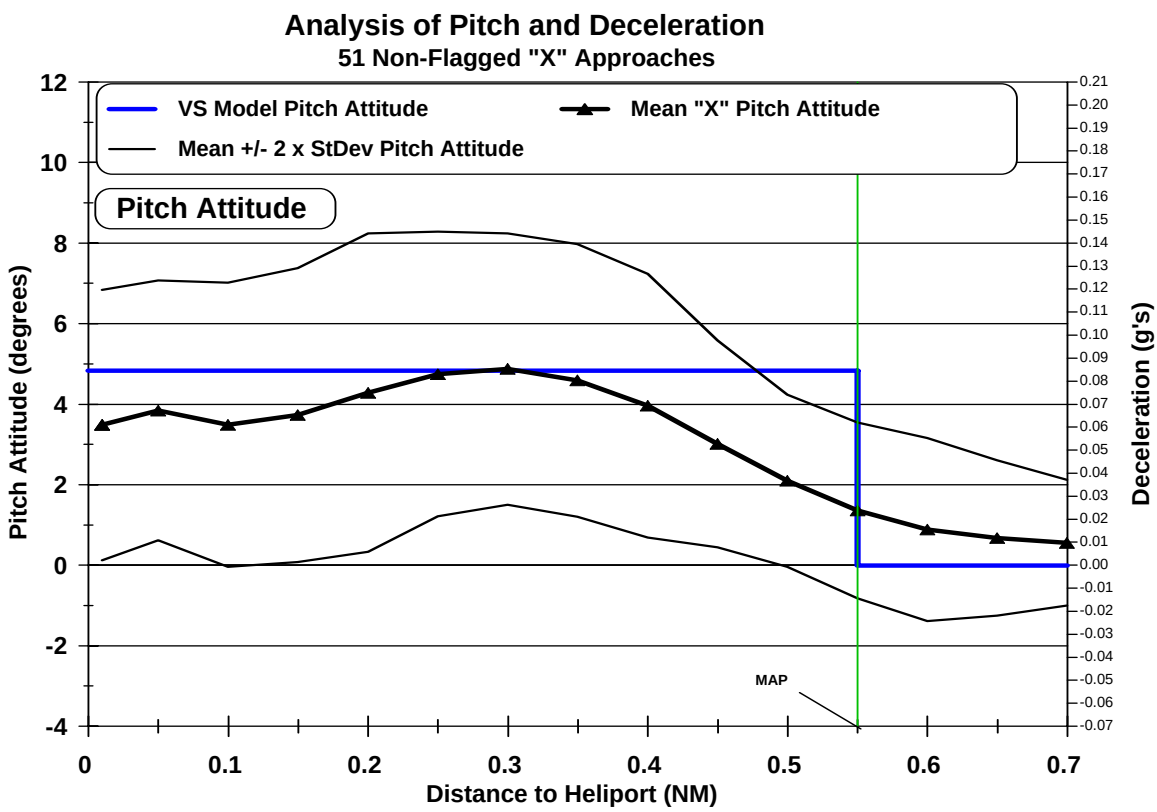

Analysis of Rate of Descent
44 Non-Flagged "W" Approaches
VS Model Rate of Descent
Mean "W" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)
1600
1400
1200
1000
800
600
400
200
0
-200
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

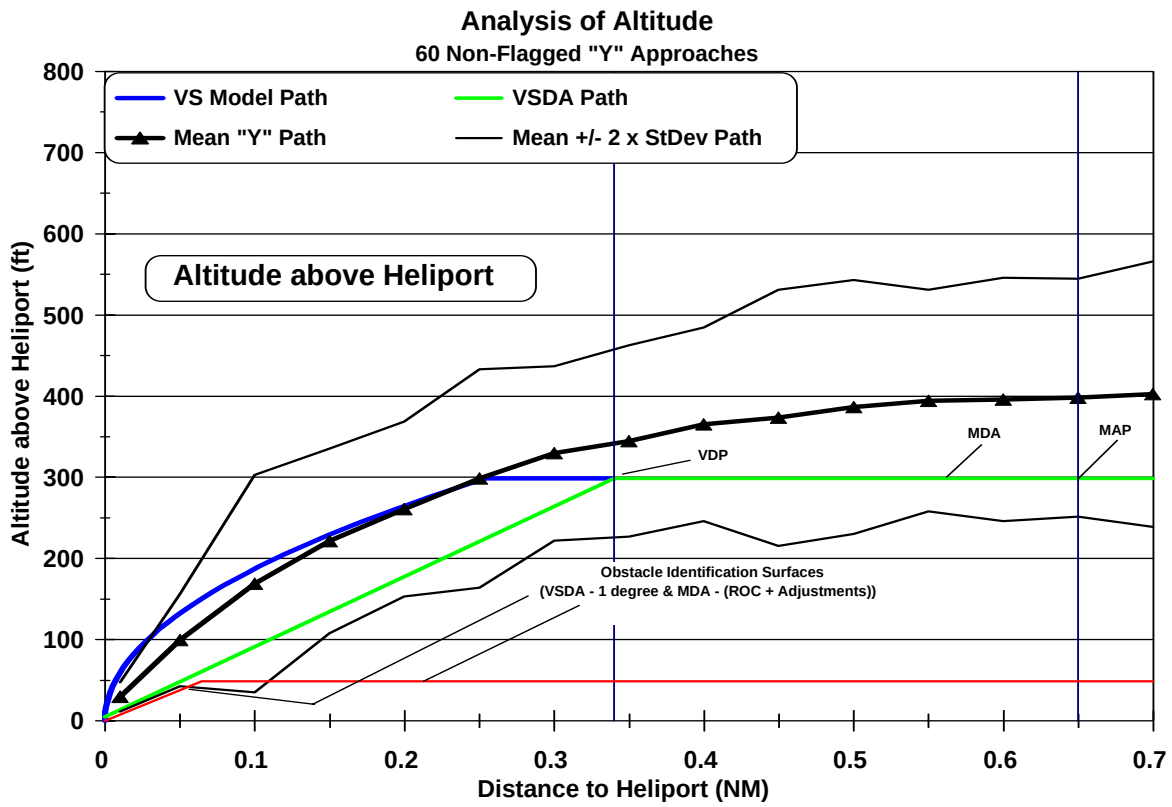

Analysis of Pitch and Deceleration
44 Non-Flagged "W" Approaches
VS Model Pitch Attitude
Mean "W" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)
12
10
8
6
4
2
0
-2
-4
0.21
0.20
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

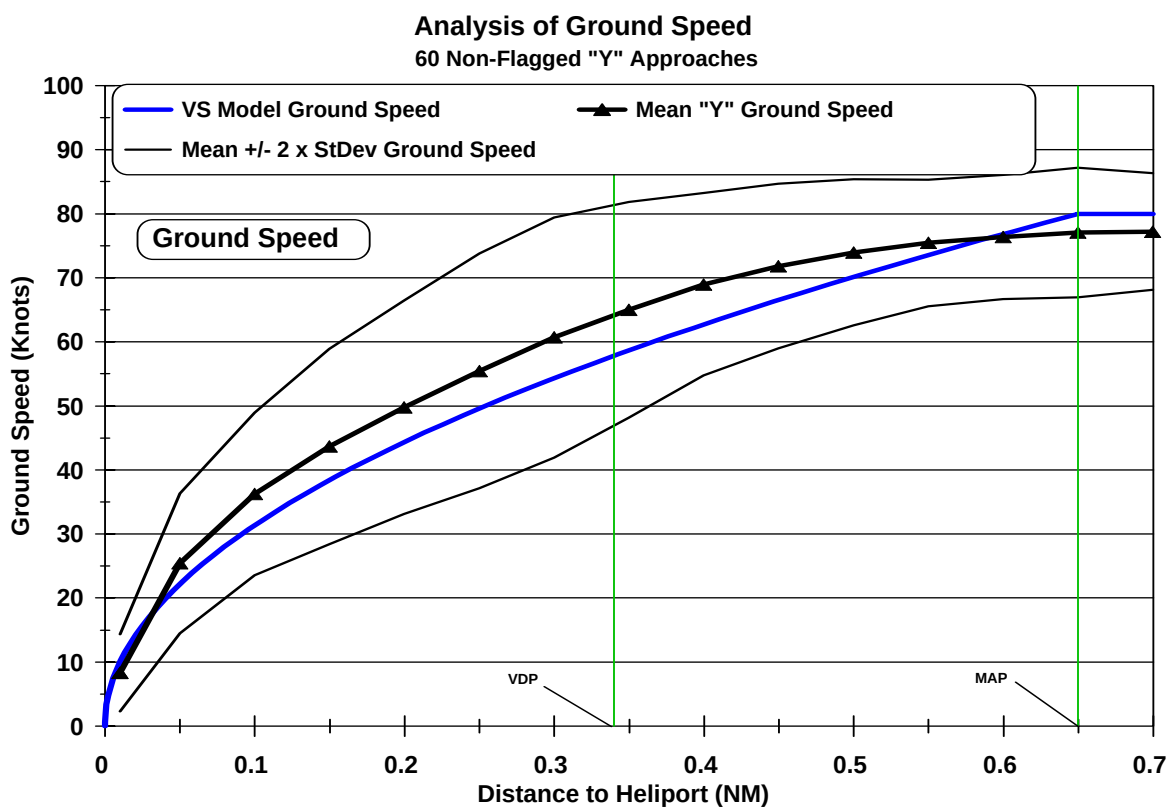

Analysis of Altitude
51 Non-Flagged "X" Approaches
VS Model Path
VSDA Path
Mean "X" Path
Mean +/- 2 x StDev Path
Altitude above Heliport
MAP
MDA
VSDA = 8.13 degrees
Obstacle Identification Surfaces
(VSDA - 1 degree & MDA - (ROC +Adjustments))
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0.1
0.2
0.3
0.4
0.5
0.6
0.7

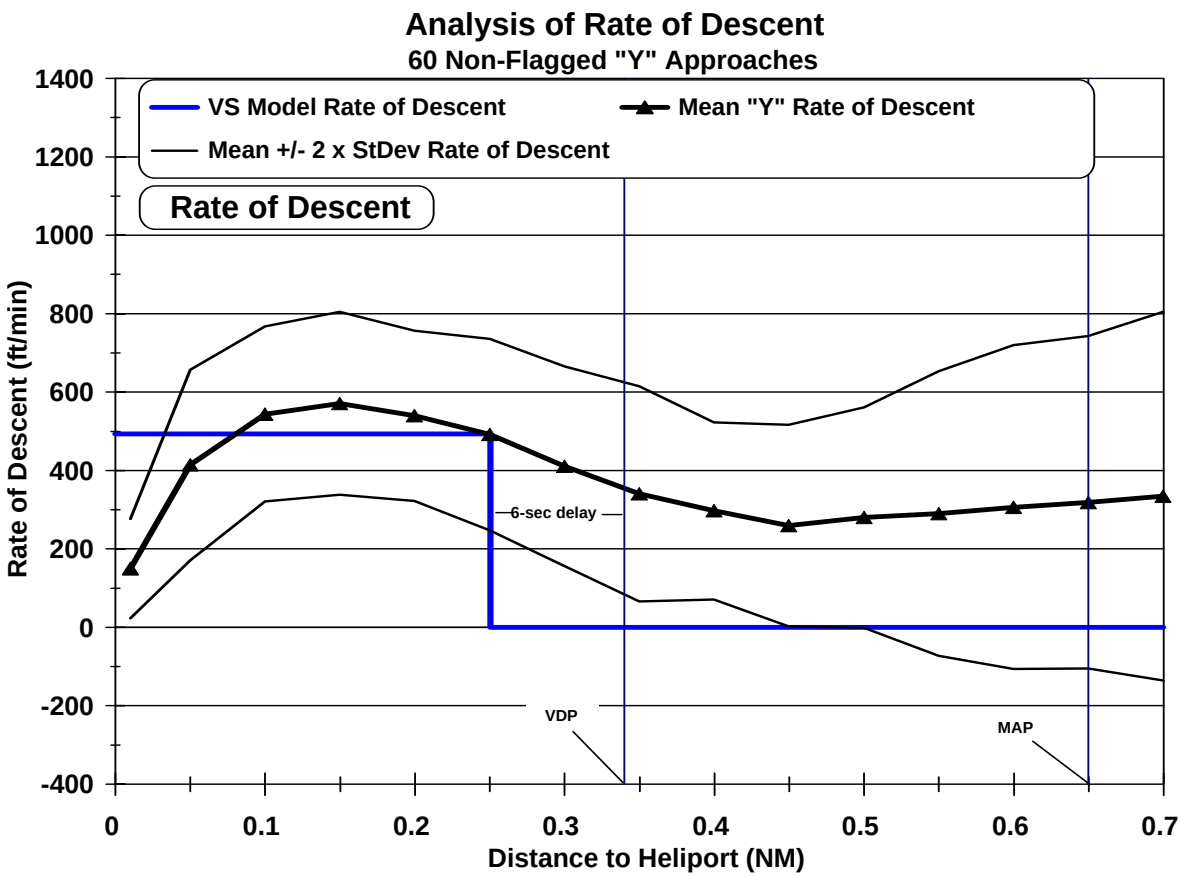

Analysis of Ground Speed
51 Non-Flagged "X" Approaches
VS Model Ground Speed
Mean "X" Ground Speed
Mean +/- 2 x StDev Ground Speed
Ground Speed
MAP
Ground Speed (knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0.1
0.2
0.3
0.4
0.5
0.6
0.7

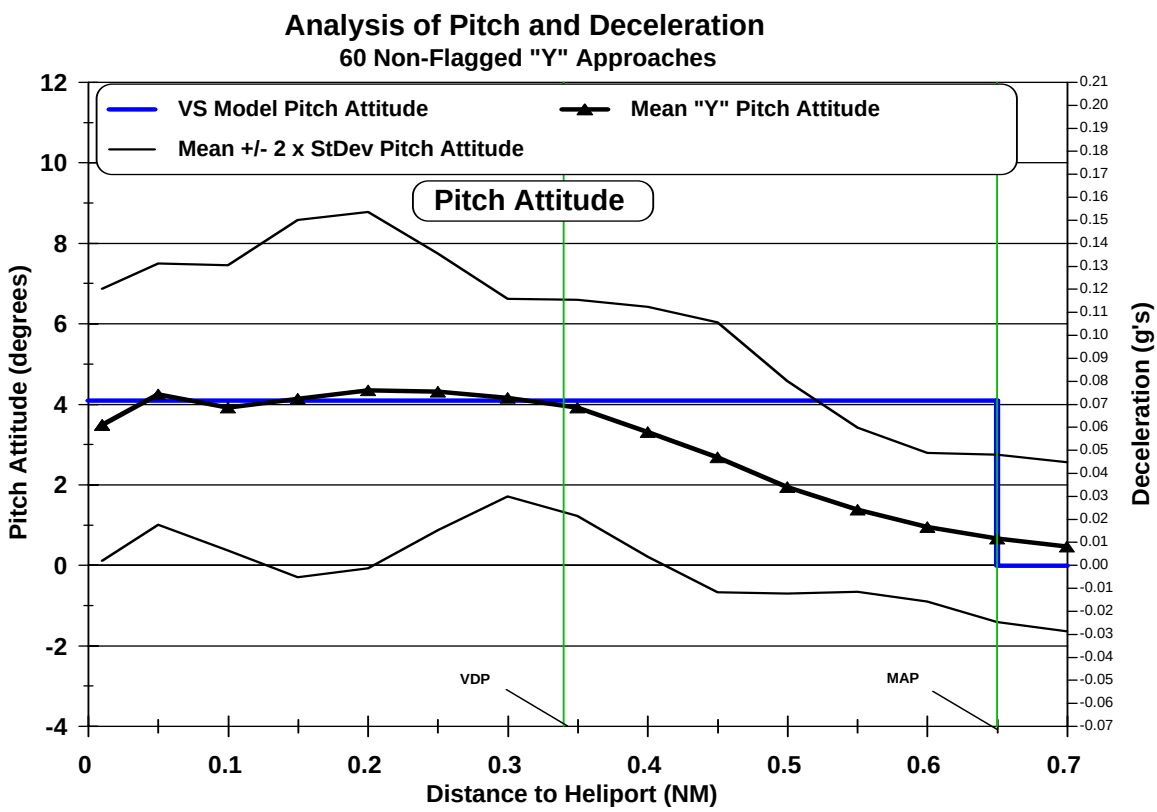

Analysis of Rate of Descent
51 Non-Flagged "X" Approaches
VS Model Rate of Descent
Mean "X" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)
1400
1200
1000
800
600
400
200
0
-200
-400
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7


Analysis of Pitch and Deceleration
51 Non-Flagged "X" Approaches
VS Model Pitch Attitude
Mean "X" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)
12
10
8
6
4
2
0
-2
-4
0.21
0.20
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

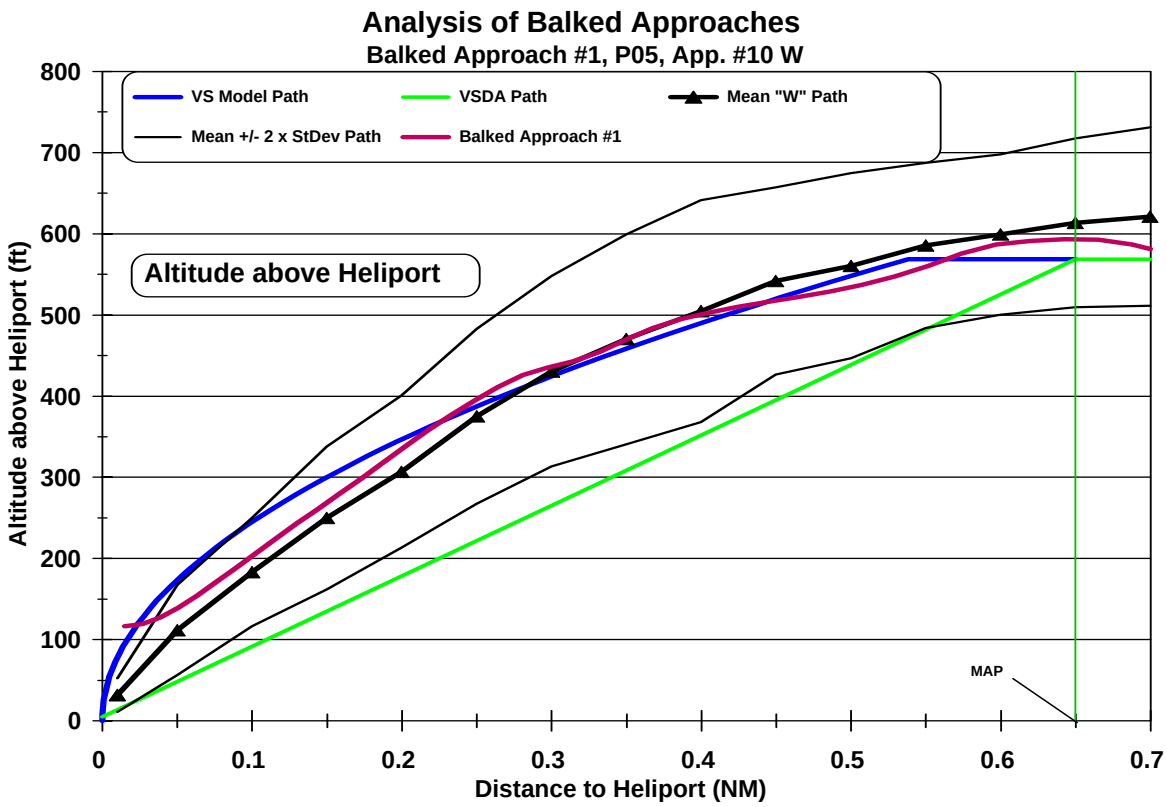

Analysis of Altitude
60 Non-Flagged "Y" Approaches
VS Model Path
VSDA Path
Mean "Y" Path
Mean +/- 2 x StDev Path
Altitude above Heliport
Altitude above Heliport (ft)
Distance to Heliport (NM)
VDP
MDA
MAP
Obstacle Identification Surfaces
(VSDA - 1 degree & MDA - (ROC + Adjustments))
0
100
200
300
400
500
600
700
800
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

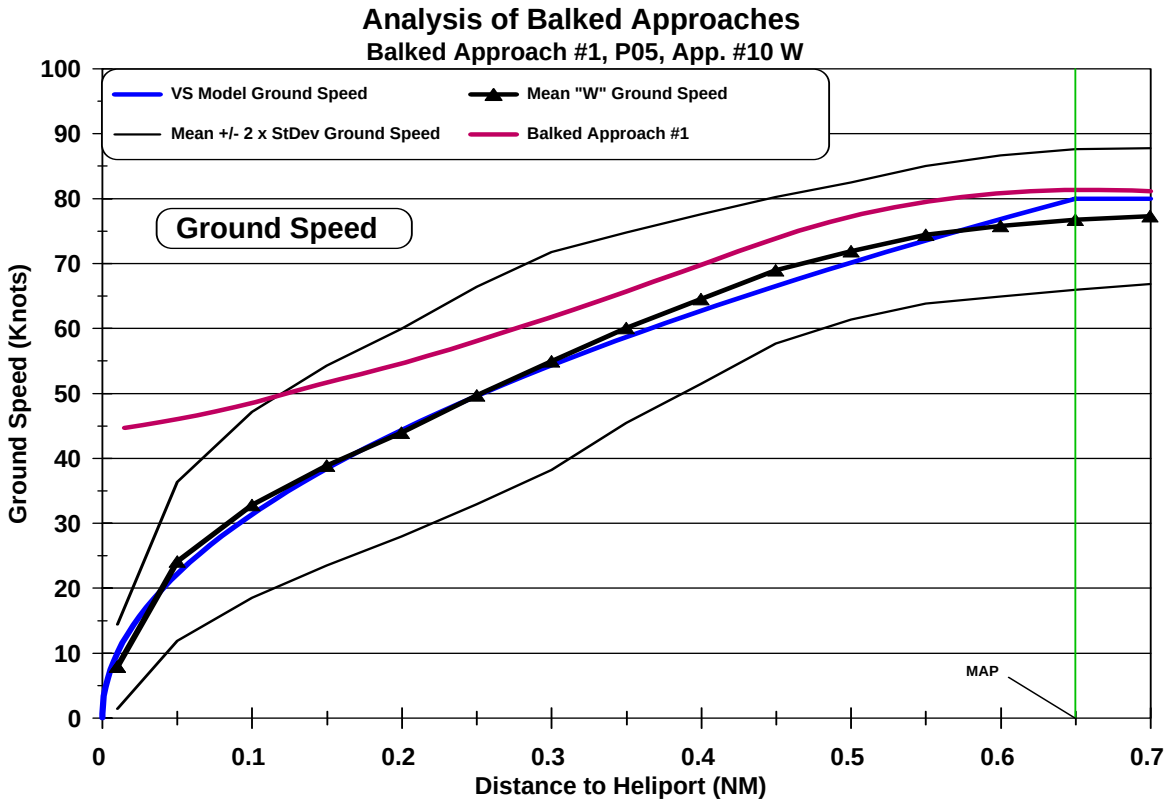

Analysis of Ground Speed
60 Non-Flagged "Y" Approaches
VS Model Ground Speed
Mean "Y" Ground Speed
Mean +/- 2 x StDev Ground Speed
Ground Speed
Ground Speed (Knots)
Distance to Heliport (NM)
VDP
MAP
0
10
20
30
40
50
60
70
80
90
100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

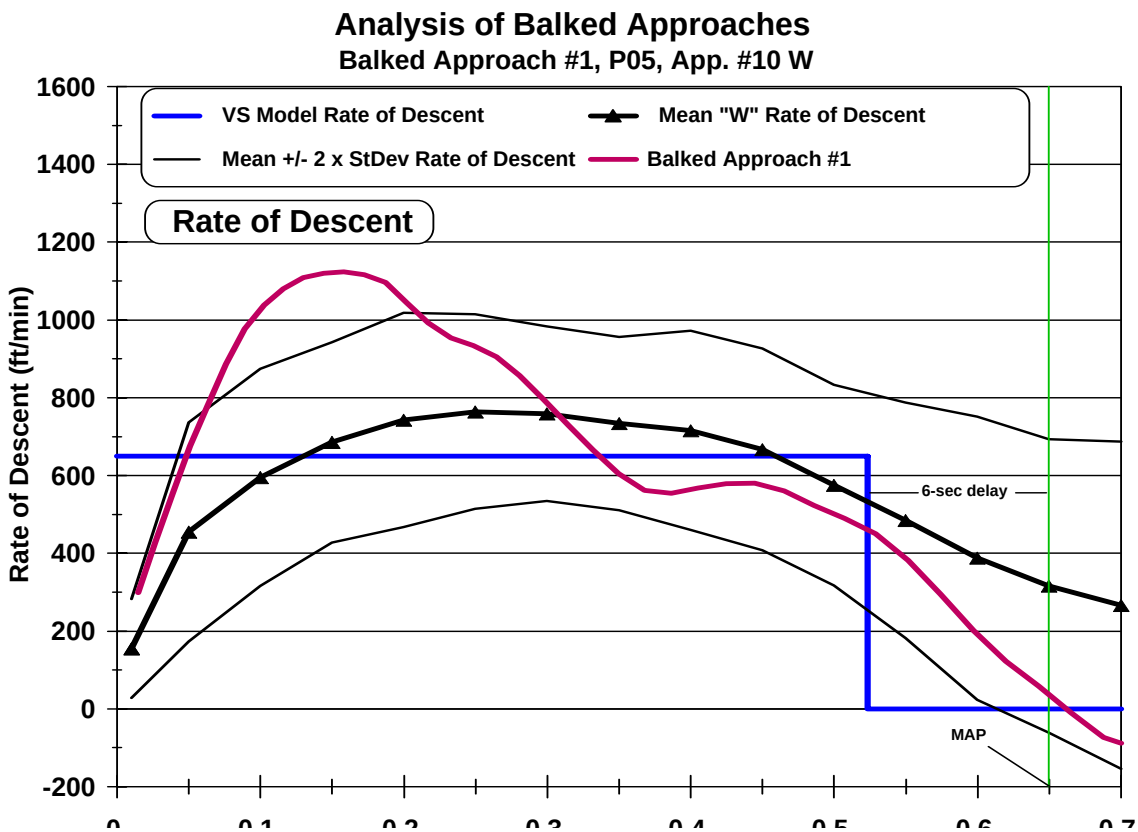

Analysis of Rate of Descent
60 Non-Flagged "Y" Approaches
VS Model Rate of Descent
Mean "Y" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Rate of Descent
6-sec delay
VDP
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)
1400
1200
1000
800
600
400
200
0
-200
-400
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

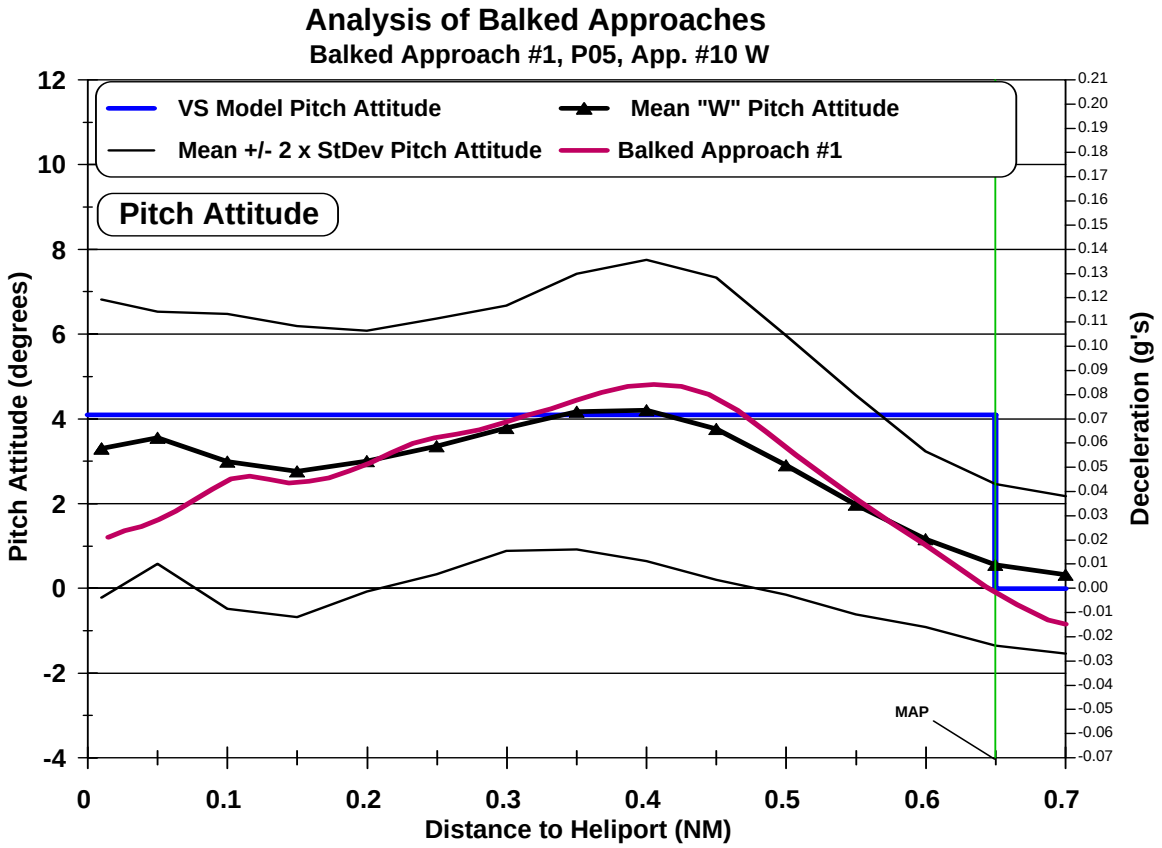

Analysis of Pitch and Deceleration
60 Non-Flagged "Y" Approaches
VS Model Pitch Attitude
Mean "Y" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Pitch Attitude
VDP
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)
12
10
8
6
4
2
0
-2
-4
0.21
0.20
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

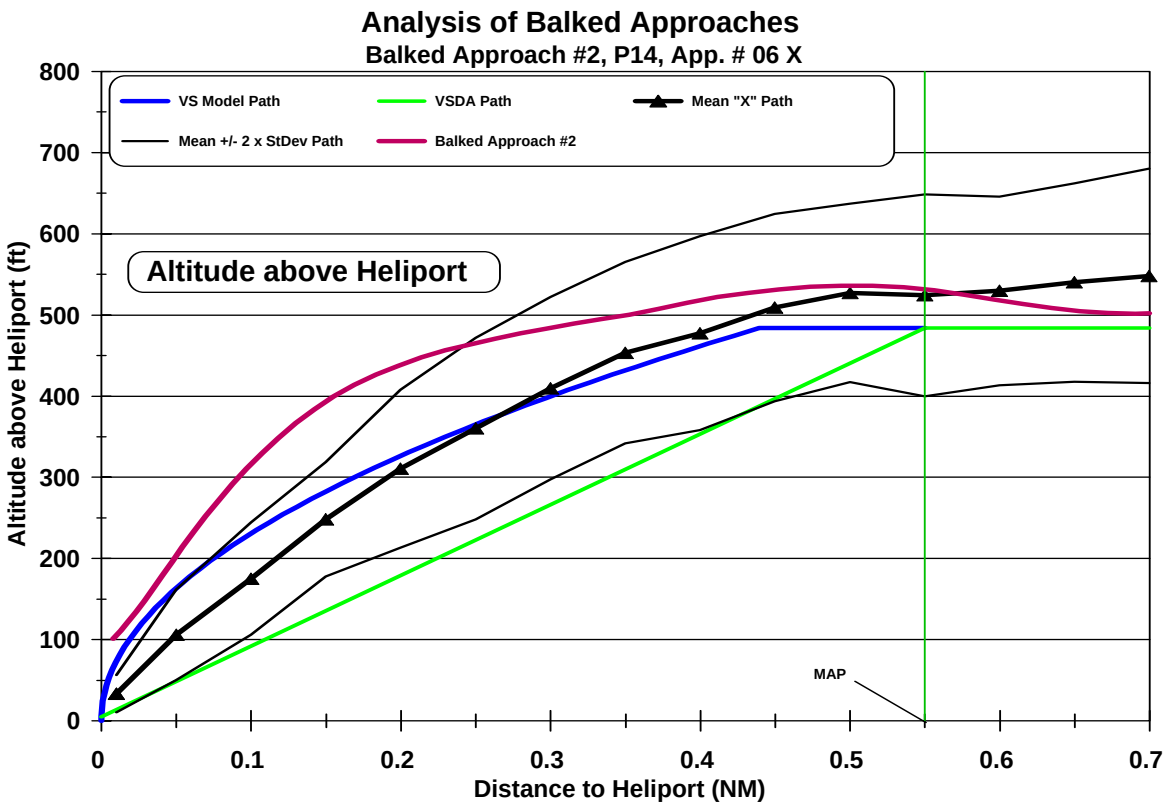
APPENDIX G—ANALYSIS OF BALKED APPROACHES

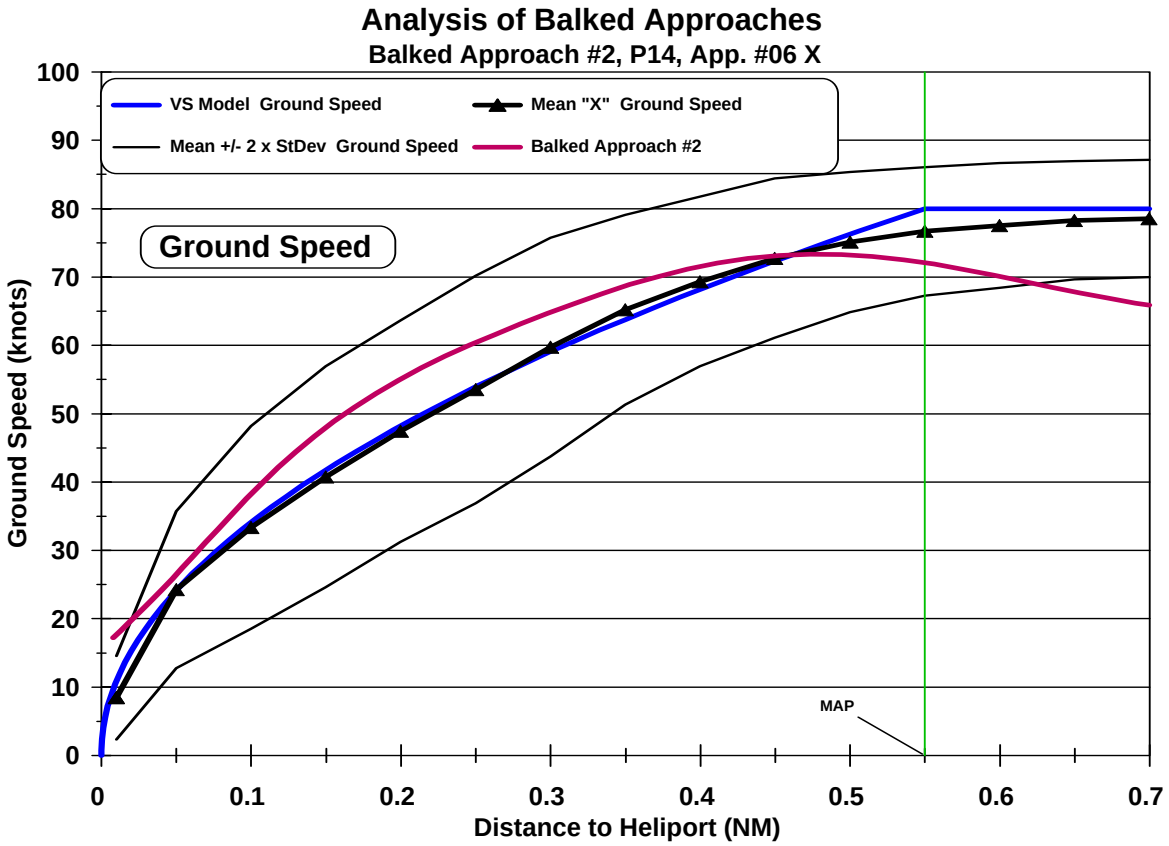

Analysis of Balked Approaches
Balked Approach #1, P05, App. #10 W
VS Model Path
VSDA Path
Mean "W" Path
Mean +/- 2 x StDev Path
Balked Approach #1
Altitude above Heliport
MAP
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

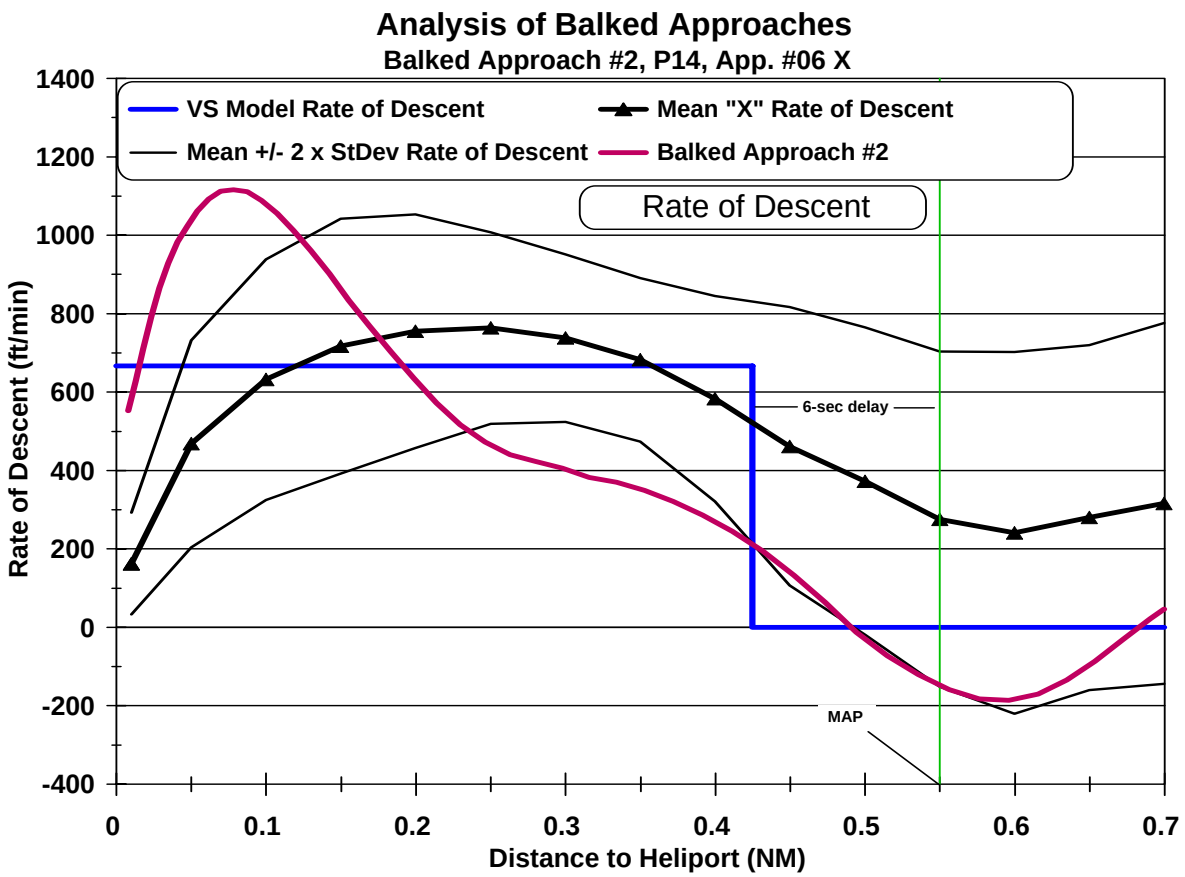

Analysis of Balked Approaches
Balked Approach #1, P05, App. #10 W
VS Model Ground Speed
Mean "W" Ground Speed
Mean +/- 2 x StDev Ground Speed
Balked Approach #1
Ground Speed
MAP
Ground Speed (Knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

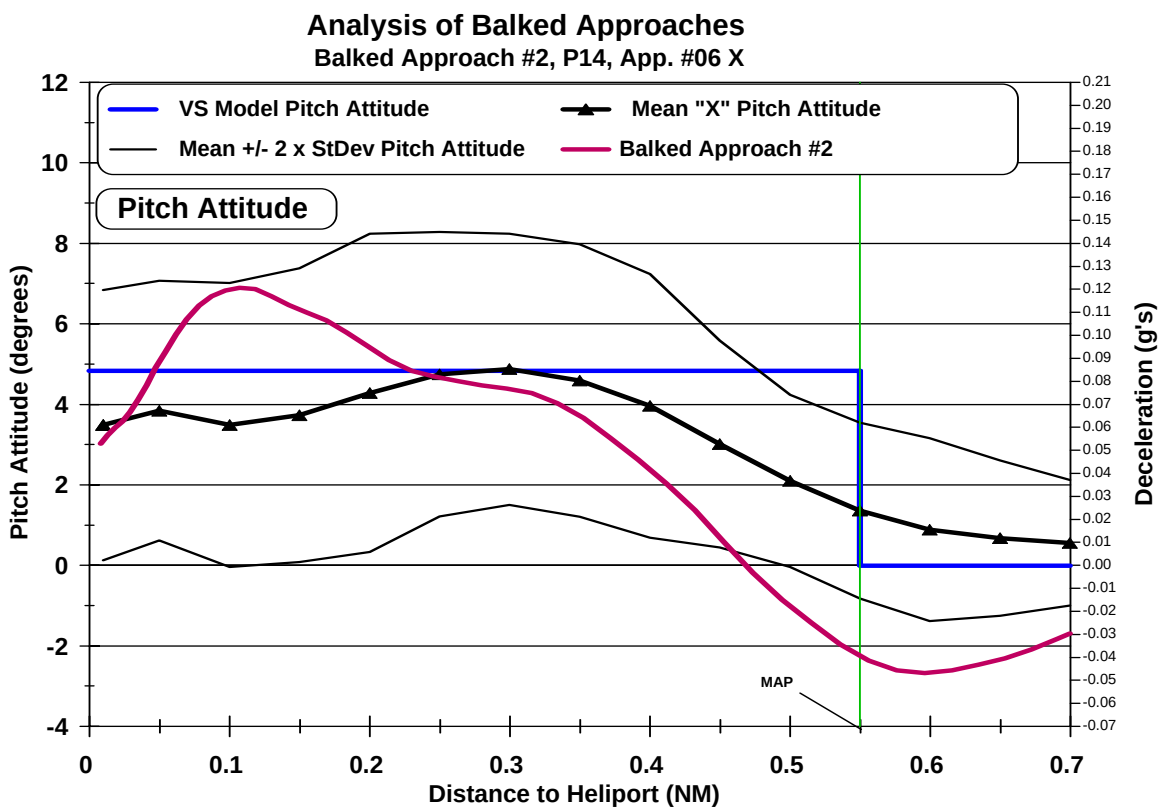

Analysis of Balked Approaches
Balked Approach #1, P05, App. #10 W
VS Model Rate of Descent
Mean "W" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Balked Approach #1
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
1600
1400
1200
1000
800
600
400
200
0
-200

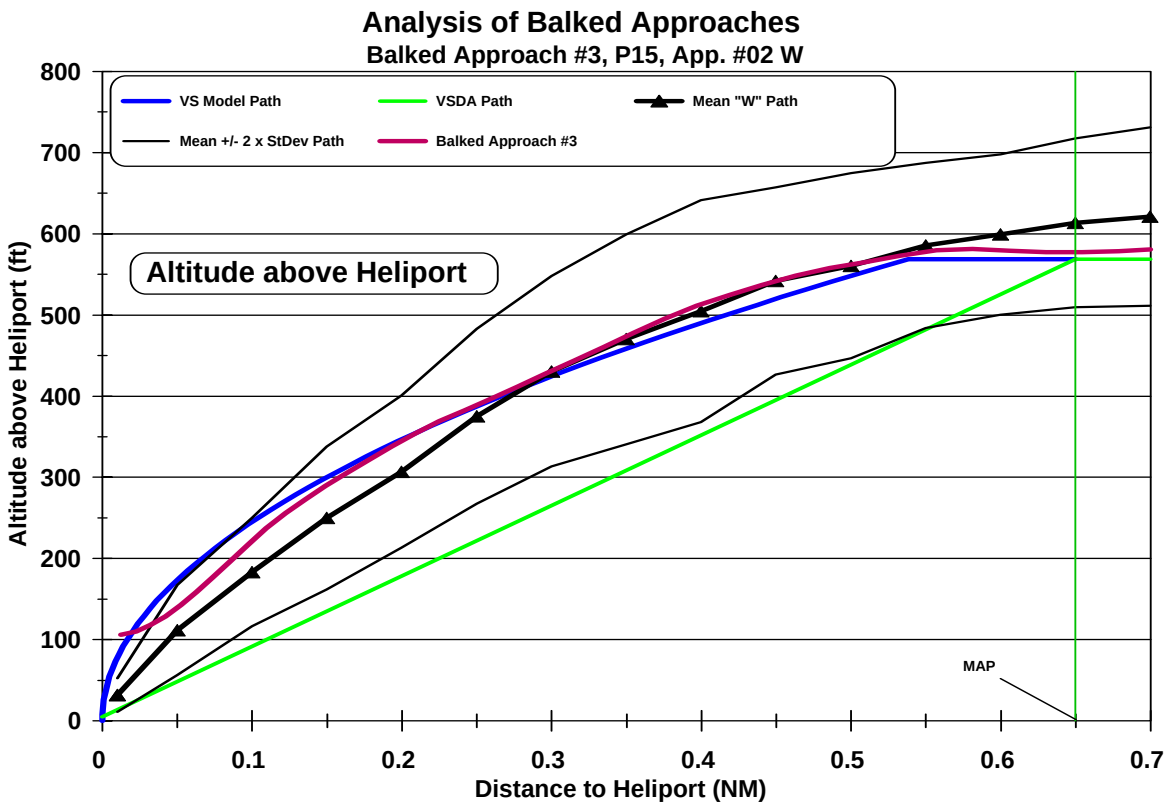

Analysis of Balked Approaches
Balked Approach #1, P05, App. #10 W
VS Model Pitch Attitude
Mean "W" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Balked Approach #1
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

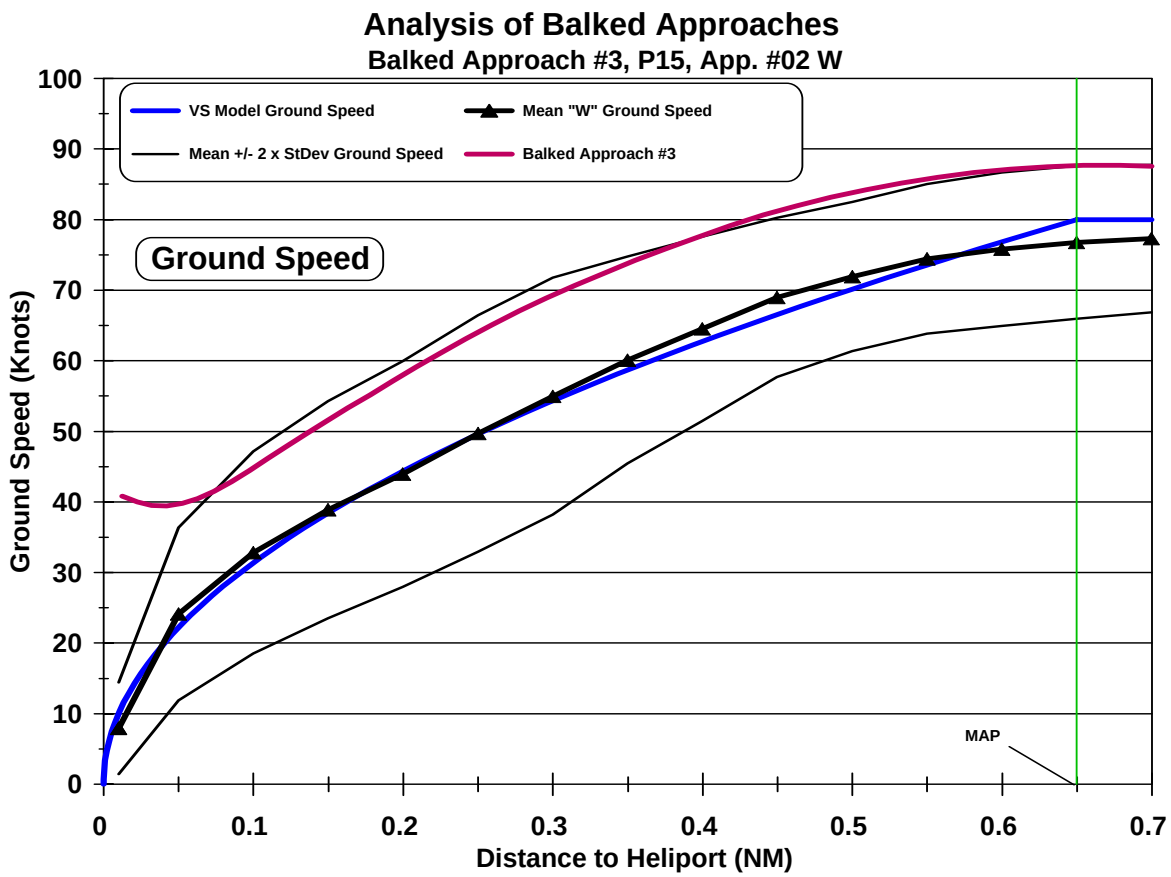

Analysis of Balked Approaches
Balked Approach #2, P14, App. # 06 X
VS Model Path
VSDA Path
Mean "X" Path
Mean +/- 2 x StDev Path
Balked Approach #2
Altitude above Heliport
MAP
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0.1
0.2
0.3
0.4
0.5
0.6
0.7

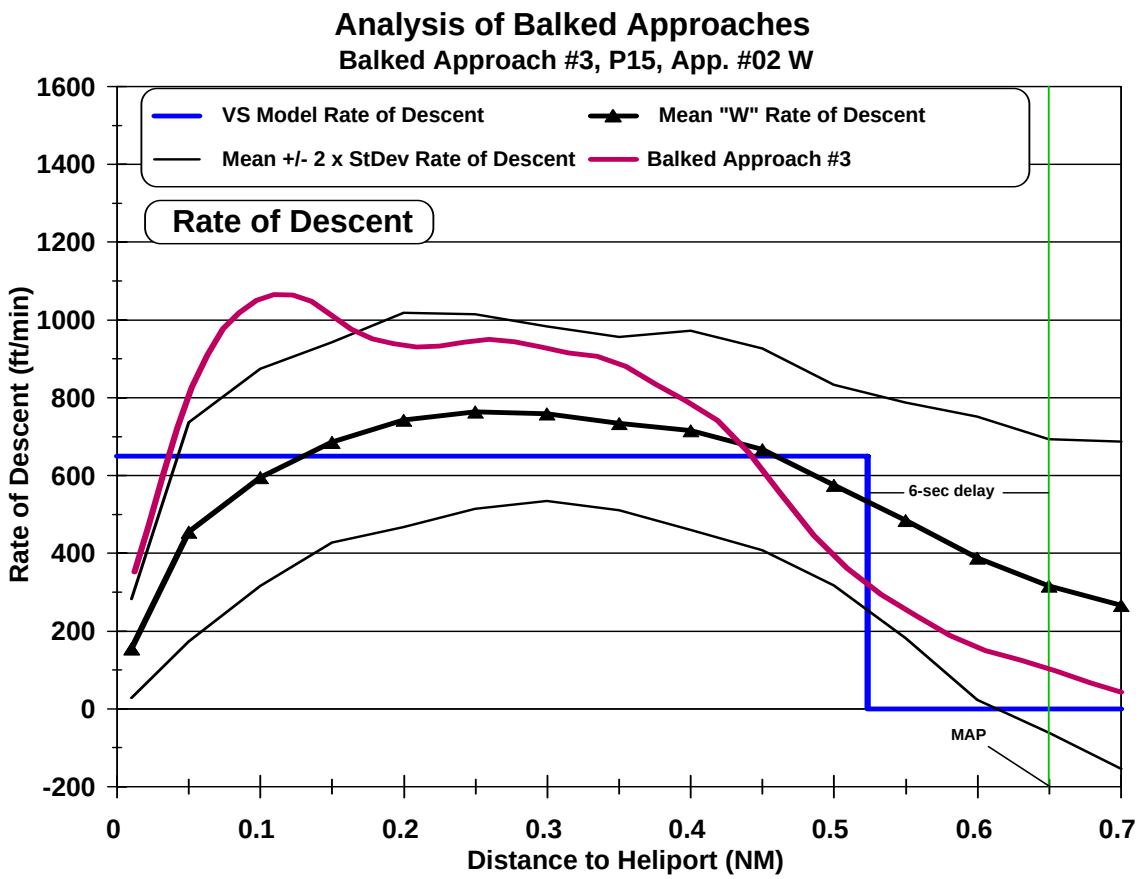

Analysis of Balked Approaches
Balked Approach #2, P14, App. #06 X
VS Model Ground Speed
Mean "X" Ground Speed
Mean +/- 2 x StDev Ground Speed
Balked Approach #2
Ground Speed
MAP
Ground Speed (knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0.1
0.2
0.3
0.4
0.5
0.6
0.7

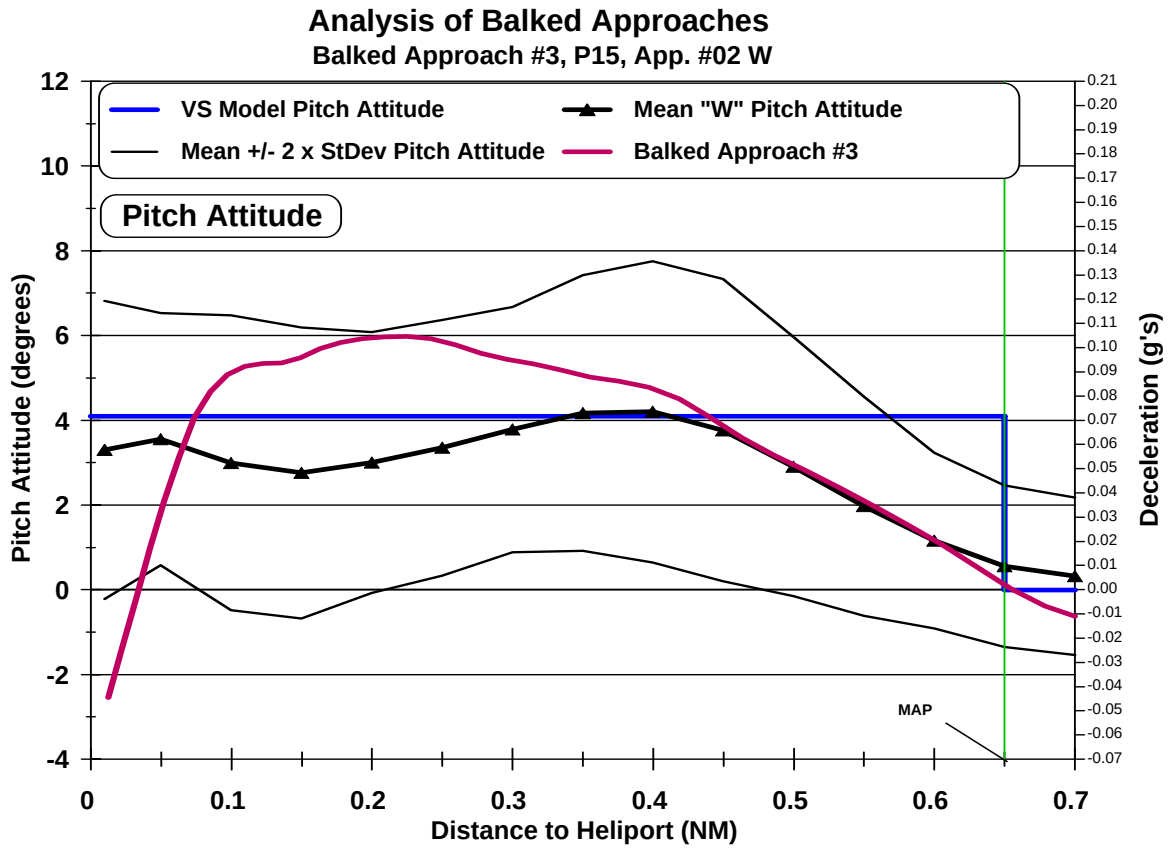

Analysis of Balked Approaches
Balked Approach #2, P14, App. #06 X
VS Model Rate of Descent
Mean "X" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Balked Approach #2
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)
1400
1200
1000
800
600
400
200
0
-200
-400
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

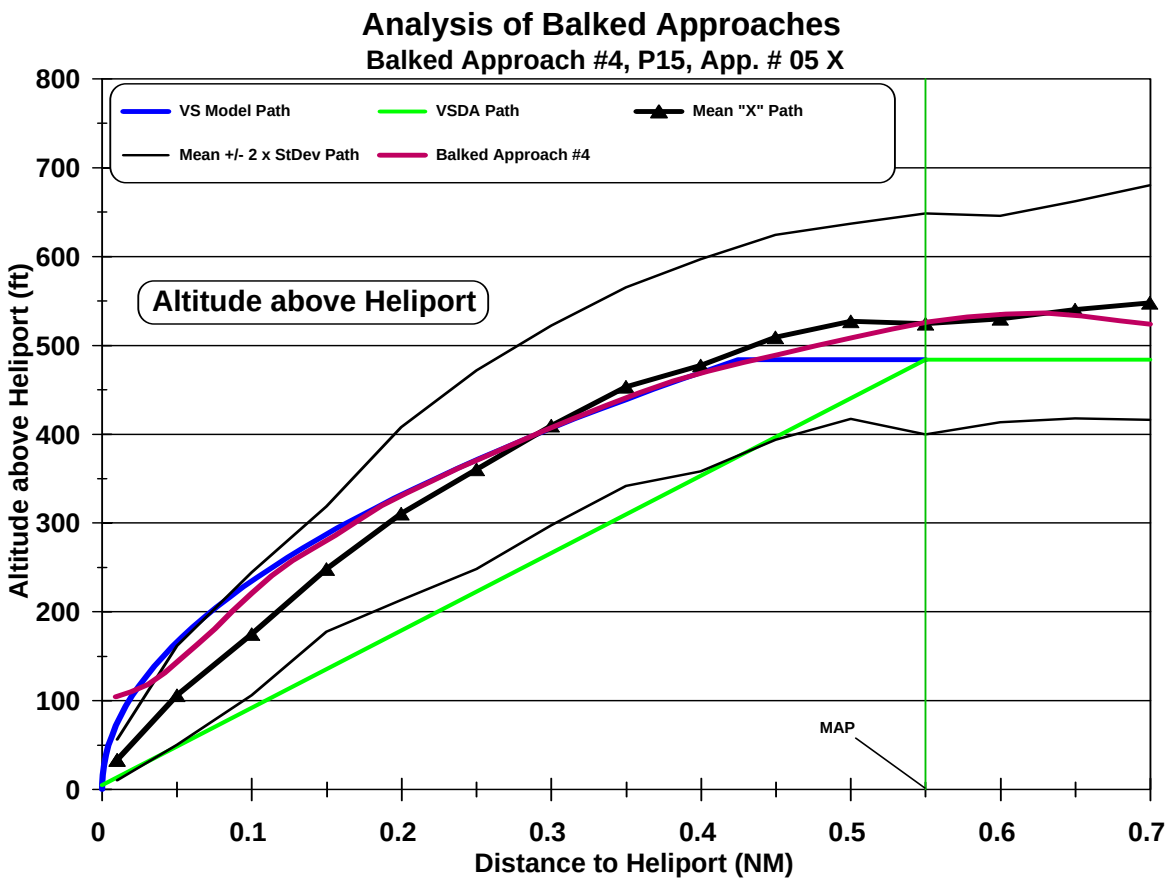

Analysis of Balked Approaches
Balked Approach #2, P14, App. #06 X
VS Model Pitch Attitude
Mean "X" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Balked Approach #2
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)
12
10
8
6
4
2
0
-2
-4
0.21
0.20
0.19
0.18
0.17
0.16
0.15
0.14
0.13
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04
-0.05
-0.06
-0.07
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

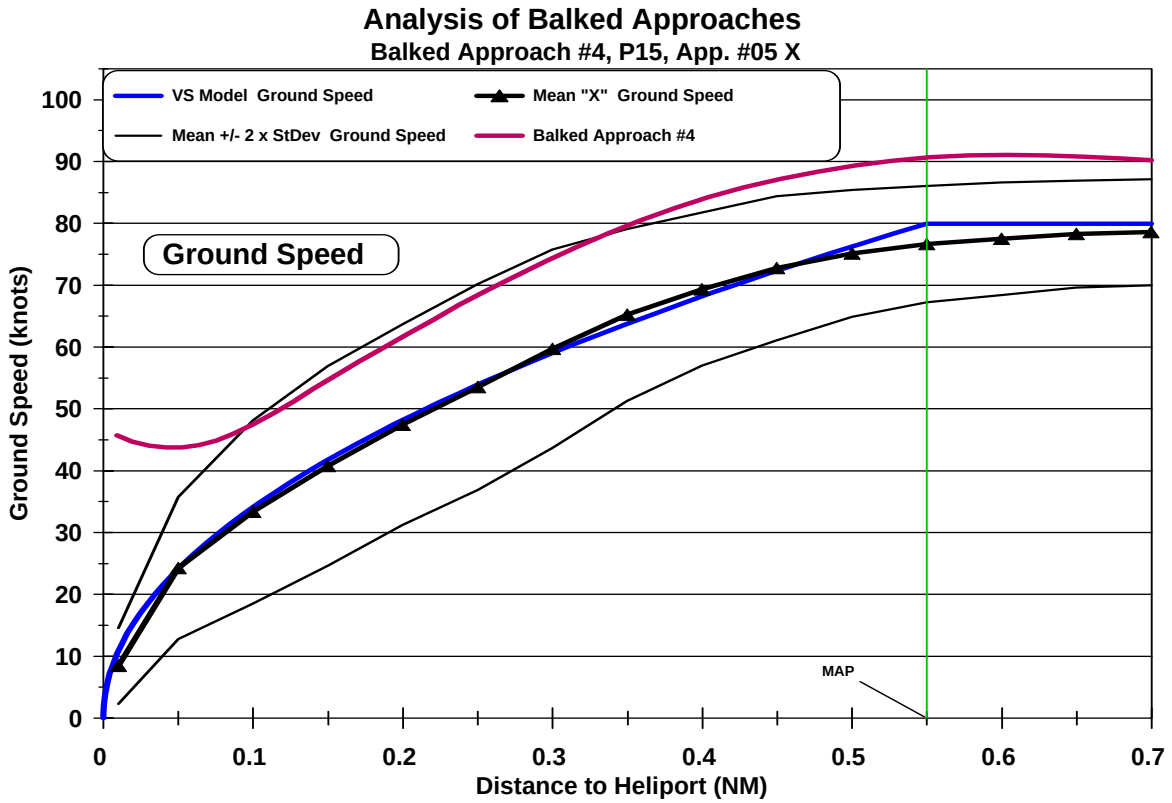

Analysis of Balked Approaches
Balked Approach #3, P15, App. #02 W
VS Model Path
VSDA Path
Mean "W" Path
Mean +/- 2 x StDev Path
Balked Approach #3
Altitude above Heliport
MAP
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

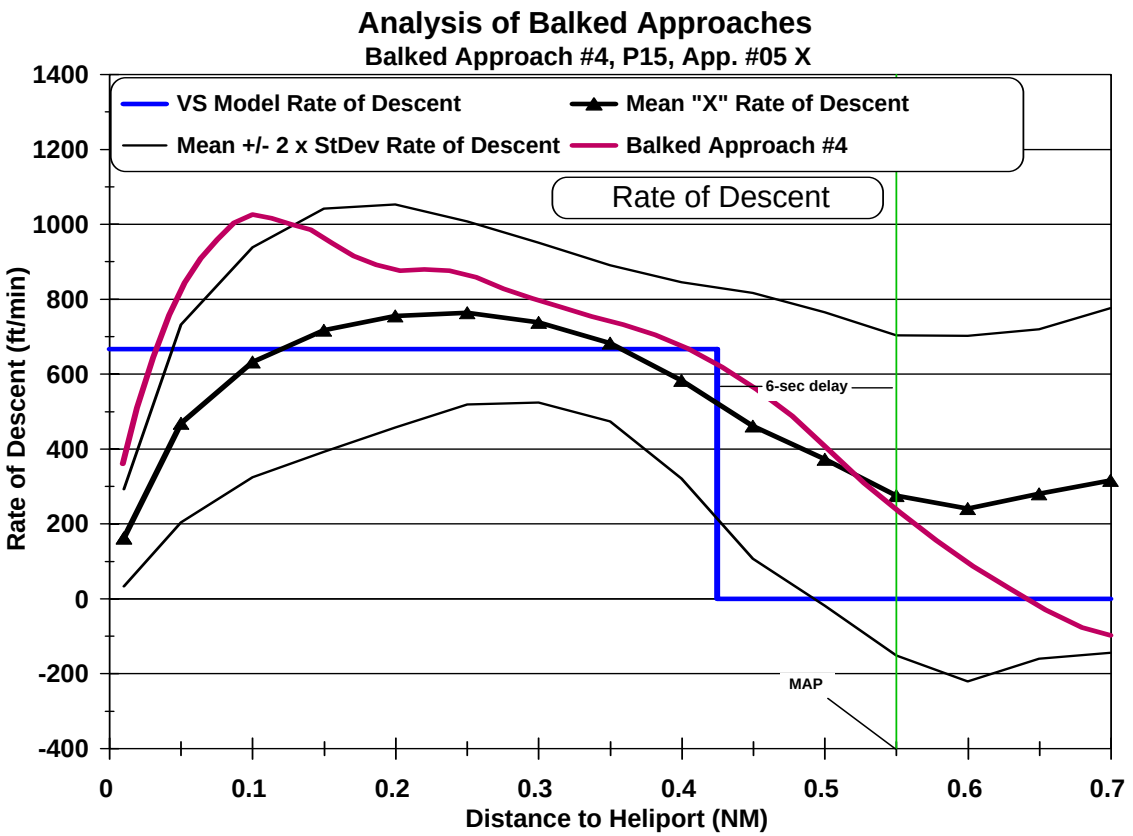

Analysis of Balked Approaches
Balked Approach #3, P15, App. #02 W
VS Model Ground Speed
Mean "W" Ground Speed
Mean +/- 2 x StDev Ground Speed
Balked Approach #3
Ground Speed
MAP
Ground Speed (Knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

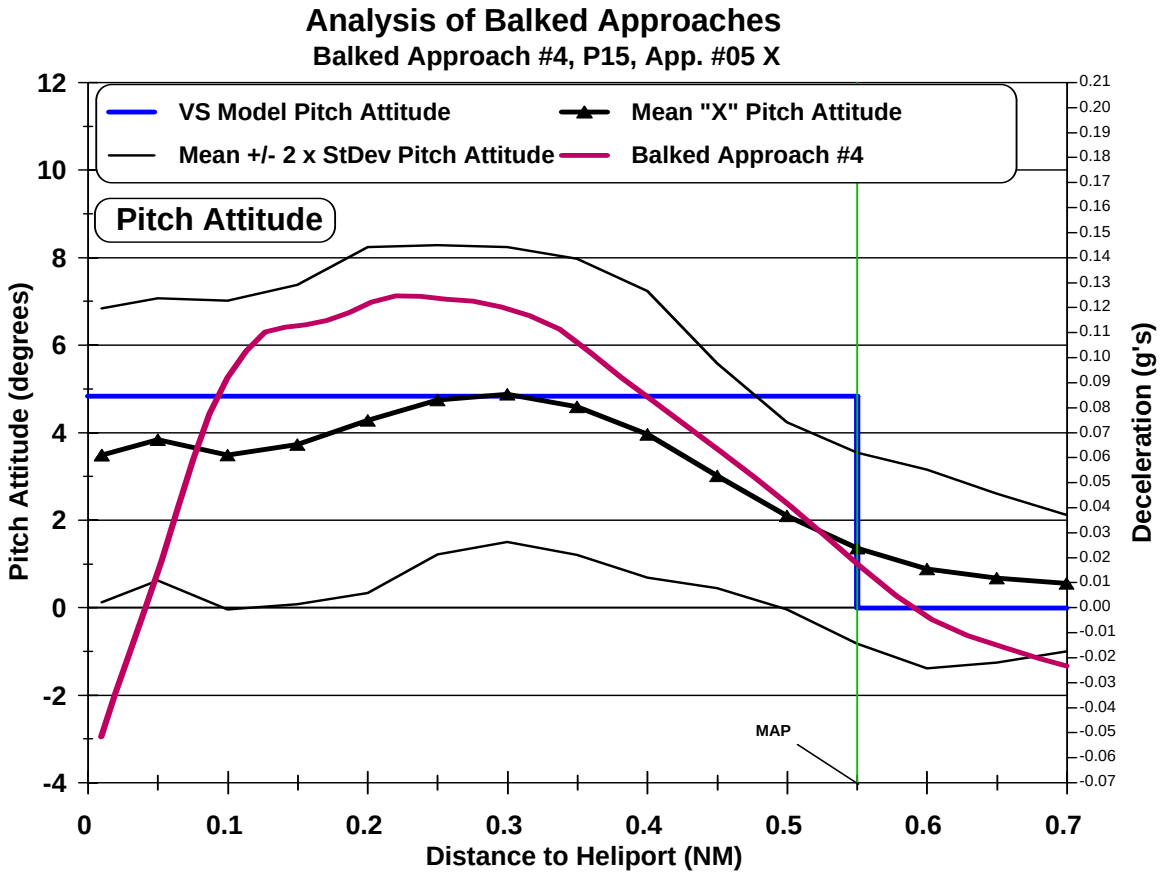

Analysis of Balked Approaches
Balked Approach #3, P15, App. #02 W
VS Model Rate of Descent
Mean "W" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Balked Approach #3
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)

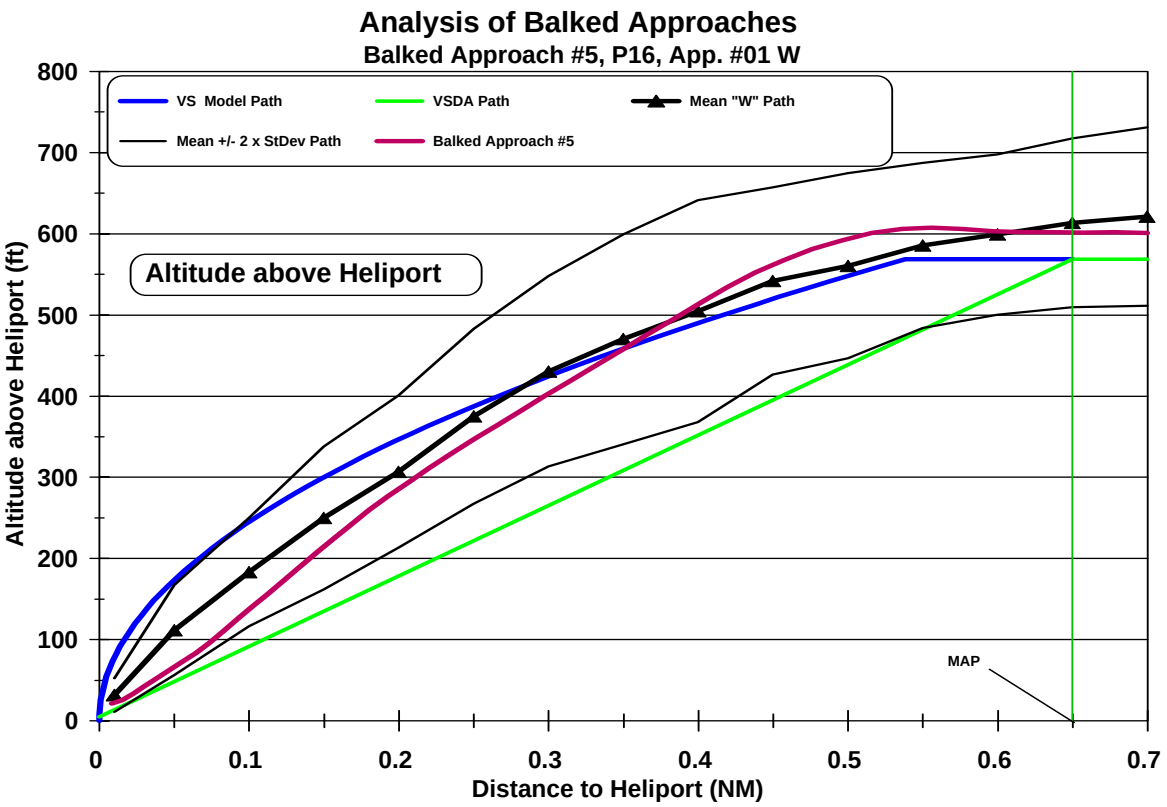

Analysis of Balked Approaches
Balked Approach #3, P15, App. #02 W
VS Model Pitch Attitude
Mean "W" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Balked Approach #3
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)

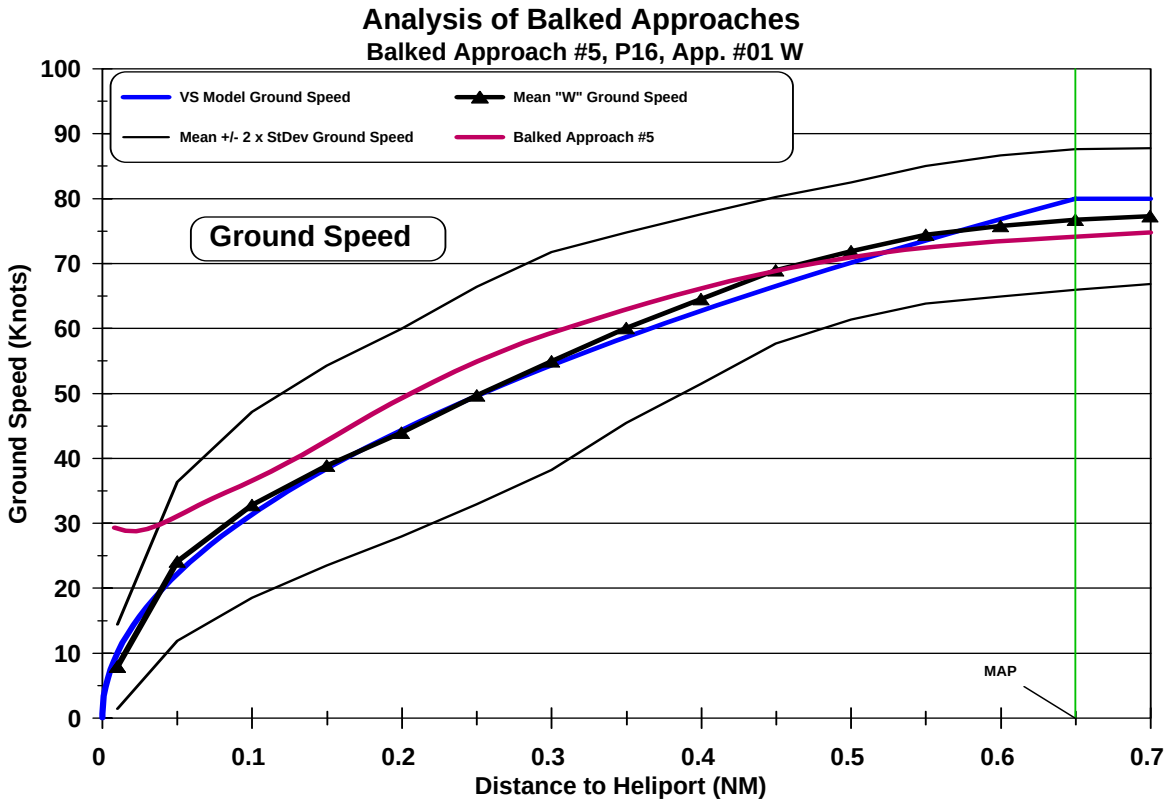

Analysis of Balked Approaches
Balked Approach #4, P15, App. # 05 X
VS Model Path
VSDA Path
Mean "X" Path
Mean +/- 2 x StDev Path
Balked Approach #4
Altitude above Heliport
MAP
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

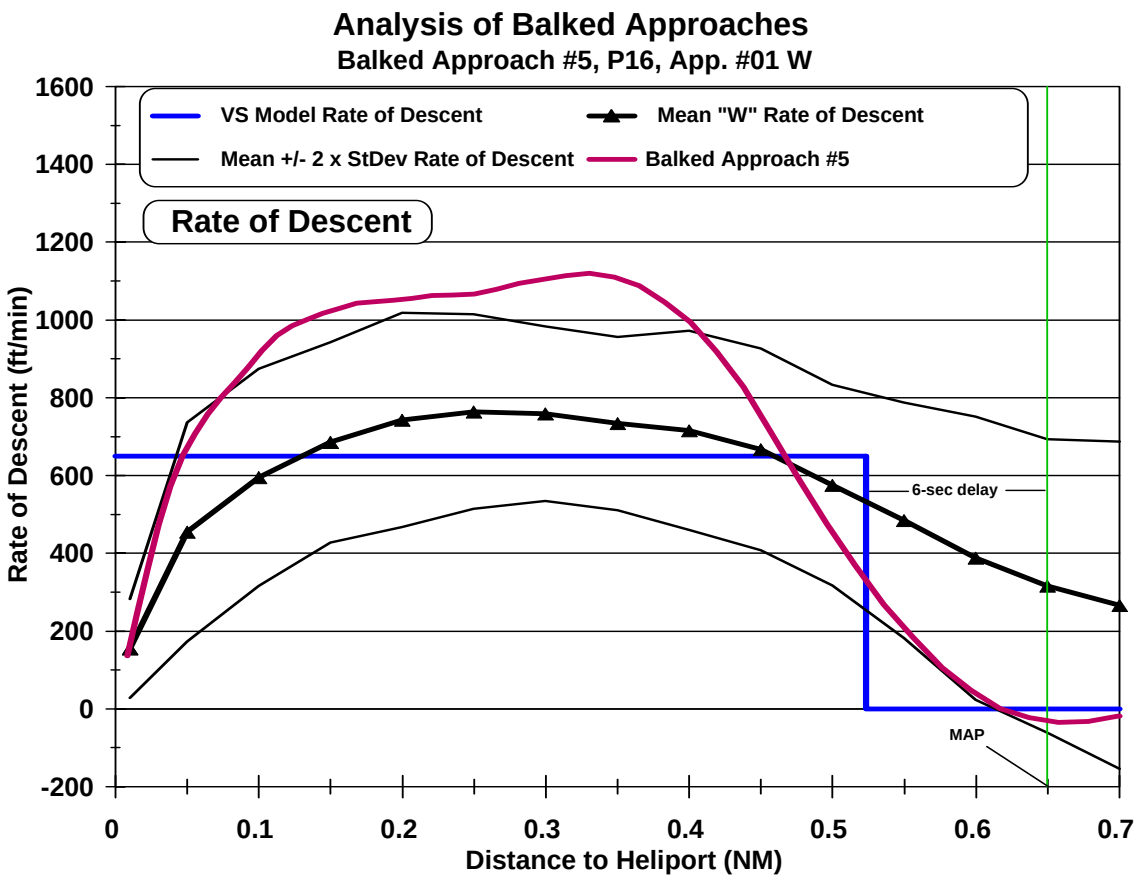

Analysis of Balked Approaches
Balked Approach #4, P15, App. #05 X
VS Model Ground Speed
Mean "X" Ground Speed
Mean +/- 2 x StDev Ground Speed
Balked Approach #4
Ground Speed
MAP
Ground Speed (knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7

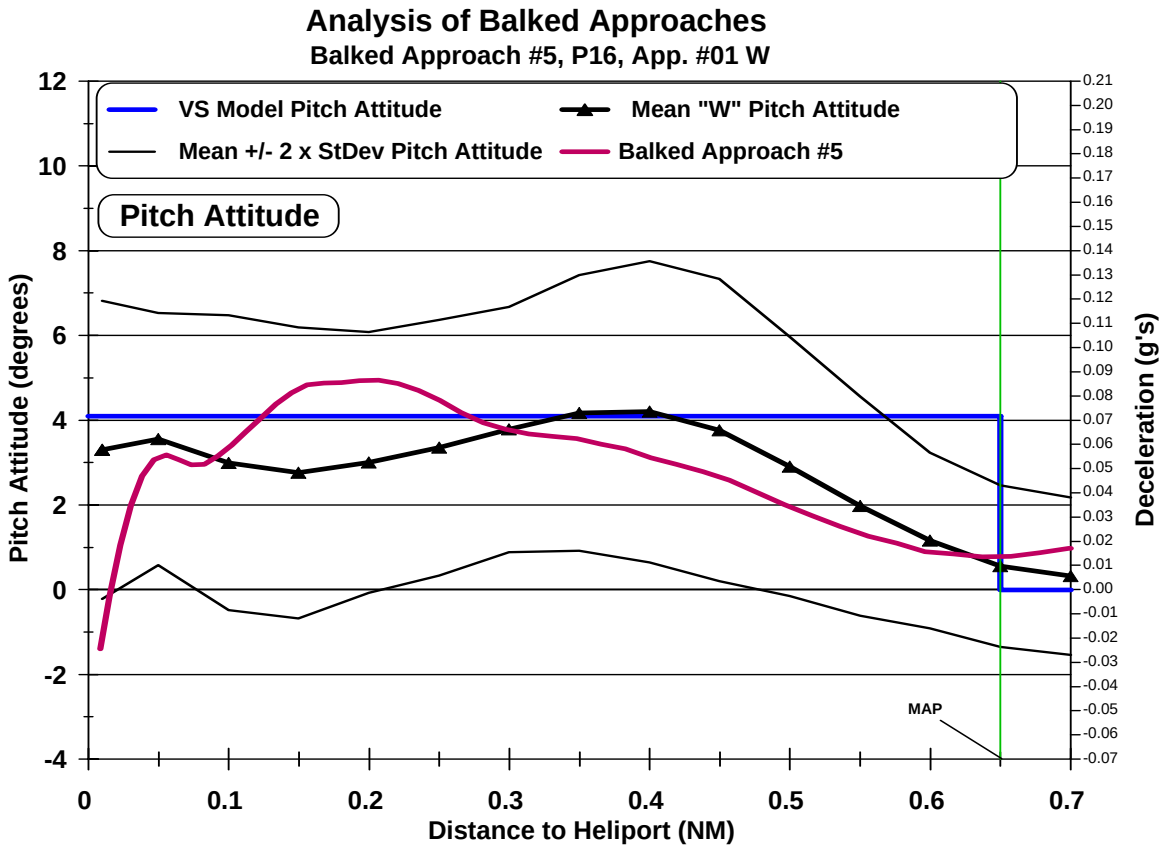

Analysis of Balked Approaches
Balked Approach #4, P15, App. #05 X
VS Model Rate of Descent
Mean "X" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Balked Approach #4
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)


Analysis of Balked Approaches
Balked Approach #4, P15, App. #05 X
VS Model Pitch Attitude
Mean "X" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Balked Approach #4
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)


Analysis of Balked Approaches
Balked Approach #5, P16, App. #01 W
VS Model Path
VSDA Path
Mean "W" Path
Mean +/- 2 x StDev Path
Balked Approach #5
Altitude above Heliport
MAP
Altitude above Heliport (ft)
Distance to Heliport (NM)
0
100
200
300
400
500
600
700
800
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7


Analysis of Balked Approaches
Balked Approach #5, P16, App. #01 W
VS Model Ground Speed
Mean "W" Ground Speed
Mean +/- 2 x StDev Ground Speed
Balked Approach #5
Ground Speed
MAP
Ground Speed (Knots)
Distance to Heliport (NM)
0
10
20
30
40
50
60
70
80
90
100
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7


Analysis of Balked Approaches
Balked Approach #5, P16, App. #01 W
VS Model Rate of Descent
Mean "W" Rate of Descent
Mean +/- 2 x StDev Rate of Descent
Balked Approach #5
Rate of Descent
6-sec delay
MAP
Rate of Descent (ft/min)
Distance to Heliport (NM)


Analysis of Balked Approaches
Balked Approach #5, P16, App. #01 W
VS Model Pitch Attitude
Mean "W" Pitch Attitude
Mean +/- 2 x StDev Pitch Attitude
Balked Approach #5
Pitch Attitude
MAP
Pitch Attitude (degrees)
Deceleration (g's)
Distance to Heliport (NM)