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Controller Response Times from the August and December 2010 Human in the Loop Data Collection Efforts

Flight Systems Laboratory
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Flight Systems Laboratory
6500 S. MacArthur Blvd.
Systems Training Building Annex, RM 217
Oklahoma City, Oklahoma 73169
Phone: (405) 954-8191

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Flight Systems Laboratory
Flight Technologies and Procedures Division
Flight Standards Service

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Reviewed by:

Harry Hodges **Date**
Manager, Flight Systems Laboratory, AFS-450

Released by:

Leslie H. Smith **Date**
Manager, Flight Technologies and Procedures Division, AFS-400

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12. Abstract In support of the Accelerating Next Generation Air Transportation System (NextGen) initiative, a Human in the Loop (HITL) data collection project was accomplished to determine Controller Response Times (CRT) for Simultaneous Parallel Independent Approaches to Closely Spaced Runways. At the direction of the Accelerating NextGen Committee, the data collection effort evaluated runway spacing dimensions that were reduced from the current standards using a standard ASR-9 surveillance radar, and a Standard Automation Replacement System (STARS) Air Traffic Control workstation with Final Monitor Aid (FMA) display. The current standards are 4,300 feet runway centerline to centerline spacing and an NTZ width of 2,000 feet. For this data collection effort, the runway spacing was reduced to 3,600 feet.		
13. Key Words Simultaneous Independent Parallel Instrument Approach (SIPIA) No Transgression Zone (NTZ) Normal Operating Zone (NOZ) Blunder Deviation Localizer Instrument Landing System (ILS) Human in the Loop (HITL) Data Collection Effort (DCE) Probability Density Function (pdf) Test Criteria Violation (TCV) Traffic Alert and Collision Avoidance System (TCAS)	**14. Distribution Statement** Controlled by AFS-450	
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EXECUTIVE SUMMARY

The Federal Aviation Administration (FAA) is evaluating standards for Closely Spaced Parallel Operations (CSPO) with the goals of increasing capacity during IMC operations, reducing delays and maintaining safety. To meet these goals, the FAA is investigating methods to conduct simultaneous, independent, parallel instrument approaches (SIPIA) at closely spaced parallel runways (CSPR).

Parallel runway spacing is one of the main parameters which affect airport capacity and that determine whether independent, dependent or single runway arrival operations can be conducted. Other parameters include radar surveillance capabilities, the air traffic automation system and runway threshold stagger. The risk of collision due to a blunder, where one aircraft unexpectedly turns toward the aircraft on the parallel final approach course, putting the non blundering aircraft at risk, is the prime concern. Controller response to a blunder must be measured to analyze this risk.

The purpose of this report is to describe the measurement and analysis of Controller Response Time (CRT) data collected during two Human in the Loop (HITL) data collection efforts (DCEs) conducted in August and December 2010. CRT data will be used in fast-time simulations. The results of these simulations will be analyzed to characterize the risk of collision due to a blunder.

Forty three active FAA controllers participated in the DCEs using two Standard Terminal Automation Replacement System (STARS) Final Monitor Aid (FMA) with a color digital display, 4:1 aspect ratio, visual and aural alerts. The surveillance radar was an Airport Surveillance Radar ASR-9 with a 4.8 second update rate. Pseudo pilots controlled computer generated aircraft executing Instrument Landing System (ILS) approaches. Controllers performed final monitor duties for dual parallel approaches as they would in actual National Airspace System (NAS) operations. Seven controllers were later determined not to be fully qualified for dual parallel operations.

Charlotte International Airport (KCLT) runways 36L and 36C and KCLT traffic data were used to generate the simulated parallel approach traffic for the August 2010 DCE. A setup based on John F. Kennedy International Airport (KJFK) runways 22L and 22R and KJFK traffic were used for the December 2010 DCE. Both DCEs utilized runways separated by 3,600 feet (centerline-to-centerline) with a 2,000 feet wide No Transgression Zone (NTZ). The flights were a mix of commercial and general aviation aircraft.

One hundred eighty six blunders were simulated. One hundred fifty six were worked by qualified controllers. Six response times were deemed to be outliers and were omitted. Analysis indicated that the times from the unqualified controllers could be pooled with the times from the qualified controllers. Analysis indicated that the times from the twenty degree blunders could not be pooled with times from the thirty degree blunders. Probability density functions (pdfs) were computed for the twenty degree blunder times and, separately, the thirty degree blunder times.

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1.0 Introduction

The Federal Aviation Administration (FAA) Next Generation Air Transportation System (NextGen) Implementation Plan (NIP) and the National Airspace System (NAS) Enterprise Architecture (EA) identify improvements to Closely Spaced Parallel Operations (CSPO) as a key future capacity enabler, with three high level goals:

- Increasing Capacity: Reduce the impact of lower visibility conditions by closing the gap in capacity between Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC).
- Reducing Delay: Reduce system wide NAS delay.
- Maintaining Safety: Ensure an acceptable level of safety exists in reduced visibility conditions with an increased number of approach operations to near that of VMC.

To meet these goals, the FAA is investigating methods to conduct closely spaced simultaneous independent parallel instrument approaches (SIPIA) to closely spaced parallel runways (CSPR).

The distance between parallel runways is one of the main parameters which affect airport capacity by determining whether independent (higher throughput) or dependent (lower throughput) parallel operations can be conducted, or single runway arrival operations must be conducted. Other factors include an airport’s radar surveillance capabilities, the air traffic automation system, and supported approach types and runway threshold stagger. A principal safety concern is the risk of collision due to a blunder, where one aircraft unexpectedly turns toward the aircraft on the parallel final approach course, putting the non blundering aircraft at risk.

To satisfy Phase 1 of the Safety Risk Management Panel’s Project Plan CSPO-001, “Simultaneous Independent Dual Straight-In ILS Approaches with Runway Centerlines at 3,000 Feet Using a 4.8 Second Surveillance Update Rate” (reference 1), two Human in the Loop (HITL) data collection efforts (DCEs) were conducted. One DCE was conducted in August and another in December 2010, using the two Air Traffic Control radar monitor controller workstations located within the Flight Operations Simulation Laboratory at the Mike Monroney Aeronautical Center, in Oklahoma City.

The purpose of the DCEs was to collect controller response time (CRT) data to be used in a fast-time, Monte Carlo computer simulation to determine the probability of a collision during closely spaced parallel approach operations due to a blunder. Controller response times were evaluated by using pseudo pilots controlling computer generated aircraft and controllers performing as they would in actual NAS operations. The flights were a mix of commercial and general aviation aircraft.

Charlotte International Airport (KCLT) runways 36L and 36C and KCLT traffic data were used to generate the simulated parallel approach traffic for the August 2010 DCE. A setup based on John F. Kennedy International Airport (KJFK) runways 22L and 22R and KJFK traffic were used for the December 2010 DCE. Both DCEs utilized runways separated by 3,600 feet (centerline-to-centerline) with a 2,000 feet wide No Transgression Zone (NTZ). The flights were a mix of commercial and general aviation aircraft.

Monitor controllers used a Standard Terminal Automation Replacement System (STARS) with Final Monitor Aid (FMA) displays, a color digital display with enhanced aspect ratios and visual and aural alerts. The navigation system used was the Instrument Landing System (ILS). The surveillance radar was an ASR-9 with a 4.8 second update rate.

The Traffic Alert and Collision Avoidance System (TCAS) provides the aircraft crew with both Traffic Advisories (TAs), an indication given to the flight crew that a certain intruder is a potential threat, and with Traffic Resolution Advisories (RAs), an indication given to the flight crew recommending a maneuver to provide separation from a threat.

Due to the close proximities of the aircraft in the July 09 DCE, TCAS RAs were issued just before controller instructions for a breakout maneuver. Crew responses to these RAs corrupted the data for determining pilot and controller response times. A follow on, Pilot Response Time (PRT) DCE was conducted with RAs inhibited to determine pilot response times (See Reference 4). Due to TCAS issues experienced with the July 09 Dual HITL test, (see reference 3) this DCE was conducted with runway spacing of 3,600 feet and an NTZ width of 2000 feet. See Figure 1. These air traffic controller HITL DCEs were conducted with just controllers to determine controller response times.

1.1 Background

In support of NextGen initiatives, a HITL data collection effort was accomplished to determine controller response times for simultaneous independent parallel instrument approaches to closely spaced runways. At the direction of the Accelerating NextGen Committee, the data collection effort evaluated runway spacing reduced from the current standards using standard surveillance radar, ASR-9, and STARS with FMA display. Those standards are 4,300 feet runway centerline to centerline spacing and an NTZ width of 2,000 feet. For this data collection effort, the runway spacing was reduced to 3,600 feet.

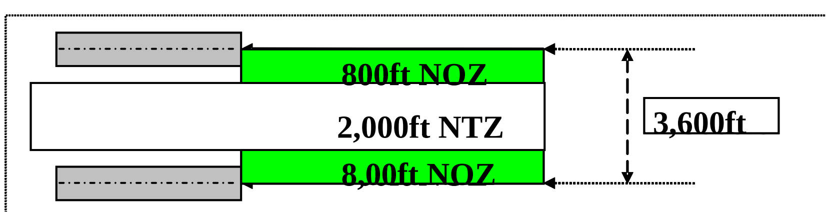

Figure 1: Runway Spacing and NTZ/NOZ Depictions

2.0 Discussion

Charlotte International Airport (KCLT) traffic data were used to generate the simulated parallel approach traffic. Monitor controllers used a Standard Terminal Automation Replacement System (STARS) with Final Monitor Aid (FMA) displays, a color digital display with enhanced aspect ratios and visual and aural alerts. The navigation system used was the Instrument Landing System (ILS). The surveillance radar was an ASR-9 with a 4.8 second update rate.

2.1 Objectives

The objectives of the test were to:

- Perform real-time data collection focused on controller response times while conducting dual simultaneous independent parallel ILS approaches using a runway spacing of 3,600 feet, no threshold stagger, ASR-9 surveillance radar with update rate of 4.8 seconds and STARS with FMA display.
- Determine controller response times during "at-risk" blunder scenarios to include a mix of responding and non-responding blundering aircraft using 20 and 30 degree angles of blunder. Blunders were simulated using computer generated aircraft (pseudo aircraft) operated by trained specialists. An at-risk blunder is a blunder in which the two aircraft are aligned in such a way that if the monitor controller and/or the endangered pilot did not react in a timely manner, the pseudo-aircraft (computer generated aircraft) and the flight simulator would pass within 500 feet center of gravity (CG) to CG causing a Test Criteria Violation (TCV).
- Determine controller response times during a breakout caused by an NTZ penetration by the opposite, parallel, blundering aircraft. No blunders were simulated during the missed approach. Instead, the pseudo aircraft deviated slightly towards the NTZ (10 to 15 degrees) during a simultaneous missed approach or balked landing.

3.0 Data Analysis

This section discusses the data collection method and the statistical analysis techniques used to analyze the data.

3.1 Data Collection

Software was developed for a computer system that operated two simulated radar displays. The radar displays emulated an ASR-9 surveillance radar with an update rate of 4.8 seconds and STARS with FMA display. In addition, the computer system coordinated the approach tracks of the pseudo aircraft approach tracks. The computer system displayed the two pseudo aircraft tracks to the controllers. The test coordinator observed the simulated traffic using a computer monitor and selected appropriate scenarios for the simulation. The test coordinator was also able to manipulate the pseudo-aircraft to align it for an at-risk blunder.

Other personnel simulated ATC tower, ground and TRACON controllers. Two additional personnel operated computer work stations that controlled the pseudo aircraft. The laboratory's two qualified flight simulators have a built in background noise that is audible to the controller through the pilot's microphone. This background noise was recorded and played at the pseudo pilot work stations during communication with the subject controllers to give more realism to the "pilots" of the pseudo aircraft.

The computer system provided a common timing system for the pseudo-aircraft, and the monitor controllers. Therefore, it was possible to record the times when blunders occurred and the monitor controllers reacted to issue an evasion command. The variables recorded by the system for this DCE included the following:

1. The blundering aircraft call sign.
2. The evading aircraft call sign.
3. Blunder start time.
4. NTZ warning time (yellow alert).
5. NTZ alert time (red alert).
6. Monitor controller communication start time.
7. Monitor controller communication stop time.
8. Blunder angle.

Other variables that were derived from the recorded variables included:

1. Monitor controller message duration.
2. Yellow alert to monitor controller message start time.
3. Red alert to monitor controller message start time.

Other variables that were derived from controller questionnaires:

1. Left monitor controller qualified?
2. Right monitor controller qualified?

3.2 Statistical Analysis

One important purpose of the simulation was to collect data that can be used to develop probability density functions (pdf). The pdfs can be used in a fast-time, Monte Carlo computer simulation to determine the probability of a collision during closely spaced parallel approach operations due to a blunder. The probability of a collision can be compared to a standard probability or risk, i.e., a target level of safety, to determine the acceptability of the operation. A mathematical algorithm is used to determine a pdf of best fit to the data in question such as controller response time. Confidence in the suitability of the derived pdf increases with increased numbers of observations in the data set. In this simulation, data such as controller response times were collected using controllers with varying experience. Some controllers were deemed inexperienced and therefore unqualified while other controllers were experienced and therefore qualified. In other cases, a controller's background led to the conclusion that the controller might be qualified. In some cases there was not enough information to reach any conclusion. Therefore the controller's status was unknown. To build an adequate data set, the analyst must determine whether the response times, based on controller qualifications, can be pooled into one data set.

Statistical tests have been devised to enable the analyst to decide whether two or more independent samples should be regarded as having come from the same population. Values from different independent samples almost always differ somewhat in means, variance, and other measures that describe properties of the data. The problem is to determine whether the observed sample differences signify differences among populations or whether they are merely the chance variations that are to be expected among random samples from the same population.

One of the most powerful and flexible statistical tests of differences in means of independent sample sets is analysis of variance (ANOVA). ANOVA is a parametric test since it is based on certain assumptions about the data. ANOVA assumes that the data were generated from normal distributions, but having the same variance. These conditions are not often completely met in practical applications and it will be shown that the curves that best fit the data sets are bounded and obviously not from a normal distribution. However, much study has been done by statisticians to ascertain the effects of violations of the assumptions. In most cases, violations of the assumptions, even fairly extreme ones, do not severely affect the outcome of the analysis of variance. ANOVA is easily performed using any statistical package and, in the case of Statistical Package for the Social Studies (SPSS), Levene's test (reference 2), a test of homogeneity of variance, is conducted concurrently with ANOVA. Levene's test is useful since it provides another measure of whether the data sets are similar enough to be pooled into one set.

3.3 Fitting Johnson Probability Density Functions

The Johnson family of empirical distributions is based on transformations of a standard normal variate. An advantage of such a transformation is that estimates of the percentiles of the fitted distribution can be obtained either from a table of areas under a standard normal distribution or from a computer program which computes areas under a standard normal distribution. Another advantage is that during a Monte Carlo simulation, variates from the distribution are readily computed from the standard normal distribution. The Johnson distributions are divided into three families as follows:

1. The S_L family is characterized by the transformation:

$$z = \gamma + \delta \ln\left(\frac{x - \varepsilon}{\lambda}\right), \; x > \varepsilon,$$

where *x* is the variable to be fitted by the Johnson distribution and *z* is a standard normal variate. Each curve in this family is bounded on the left by ε and is unbounded on the right.

2. The S_B family is characterized by the transformation:

$$z = \gamma + \delta \ln\left(\frac{x-\varepsilon}{\lambda+\varepsilon-x}\right),\ \varepsilon < x < \varepsilon + \lambda.$$

where *x* is the variable to be fitted by the Johnson distribution and *z* is a standard normal variate. Each curve in this family is bounded on the left by ε and on the right by ε + λ.

3. The S_U family is characterized by the transformation:

$$z = \gamma + \delta \sinh^{-1}\left(\frac{x-\varepsilon}{\lambda}\right),\ -\infty < x < \infty.$$

where *x* is the variable to be fitted by the Johnson distribution and *z* is a standard normal variate. Each curve in this family is unbounded and unimodal.

4.0 Findings

This section discusses the results of the statistical analysis and probability density curve fitting.

4.1 Deletion of Outliers.

Table 1 contains descriptive statistics of the entire controller response time data set. The table indicates that some entries are possible outliers. A careful inspection revealed that there were three negative entries, which occur when the controller responds prior to receiving a yellow NTZ alert. It was considered unlikely that controllers in actual practice would begin a break-out message before the yellow alert. These negative entries may be due to the simulation environment (i.e. not real world) of the DCEs. Therefore the negative entries were deleted from the final analysis.

The data inspection also revealed that there were three entries exceeding 20 seconds. Two of the three entries were times from the same controller. All three occurred during 20 degree blunders. These scenarios were examined and the audio reviewed to determine the cause of the unusual delay in response. Observer notes indicated that these controllers were overly confused due to the 4:1 AR and a lack of coordination with the opposite controller. Analysis determined this was due to an initial unfamiliarity with the FMA display used in these DCEs. Therefore these three entries were deleted from the final analysis. Table 2 contains descriptive statistics of the entire controller response time data set without outliers.

Table 1: Descriptive Statistics of All Controller Response Times

Descriptive Statistics of All Controller Response Times

	N	Minimum	Maximum	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Warning to Comm Start	186	-6.6	31.2	4.744	4.1960	2.844	.178	13.573	.355
Valid N (listwise)	186								

Table 2: Descriptive Statistics of Controller Response Times without Outliers

Descriptive Statistics of Data with Outliers Removed

	N	Minimum	Maximum	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Warning to Comm Start	180	.6	16.9	4.505	2.9034	1.419	.181	2.845	.360
Valid N (listwise)	180								

4.2 Comparison of Qualified Controller Response Times to Unqualified Controller Response Times.

The participating controllers were separated into two groups, unqualified and qualified. There were 186 blunders recorded during the two DCEs. After elimination of the outliers, there were 30 blunders worked by the unqualified controllers and 150 blunders worked by the qualified controllers. Levene's test for homogeneity of variance was not significant since the computed significance was 0.088. The ANOVA test of means was also not significant since the computed significance was 0.103. To be significant, i.e., to indicate that the two data sets are significantly different, one of the values would have to be less than 0.05. These are categorized under the "Sig." column. Therefore the two data sets were combined into one set for the comparison of response times to the two blunder angles. Table 3 contains the descriptive statistics of the two groups of controllers. Table 4 describes the results of Levene's test and table 5 describes the results of ANOVA.

Table 3: Descriptive Statistics of Qualified and Unqualified Controller Response Times

Descriptives of Controller Response Times by Qualified and Unqualified without Outliers

Warning to Comm Start

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Qualified	150	4.347	2.7130	.2215	3.910	4.785	.6	16.5
Unqualified	30	5.293	3.6664	.6694	3.924	6.662	1.2	16.9
Total	180	4.505	2.9034	.2164	4.078	4.932	.6	16.9

Table 4: Levene's Test of Controller Response Times by Qualified and Unqualified without Outliers

Test of Homogeneity of Variances of Controller Response Times by Qualified and Unqualified without Outliers

Warning to Comm Start

Levene Statistic	df1	df2	Sig.
2.936	1	178	.088

Table 5: ANOVA of Qualified and Unqualified Controller Response Times

ANOVA of Controller Response Times by Qualified and Unqualified without Outliers

Warning to Comm Start

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	22.373	1	22.373	2.679	.103
Within Groups	1486.533	178	8.351		
Total	1508.906	179			

4.3 Comparison of Controller Response Times by Blunder Angle.

Two blunder angles were used in the test, 20 degrees and 30 degrees. It is of interest to determine whether blunder angle had any effect on controller response time. ANOVA was computed to test controller response times to 20 and 30 degree blunders. The results of the ANOVA are shown in Tables 6, 7, and 8. Significant differences were observed for means.

During a 20 degree blunder, the controller has more time to recognize an impending blunder due to the reduced cross-track velocity as compared to a 30 degree blunder. Also, the 4:1 AR magnifies the apparent magnitude of the blunder angle. The increase in time available to analyze and respond to the impending blunder is demonstrated in a decrease in the mean CRT for the 20 degree blunder.

Therefore controller response times were separated into two sets, 20 degree blunders and 30 degree blunders. Johnson curves were fitted to each data set. The results are indicated in Figures 2 and 3. The specific parameters computed by the mathematical algorithm can be found in the appendix.

Table 6: Descriptive Statistics of Yellow Alert to Controller Message by Blunder Angle without Outliers

Descriptives of Controller Response Times by Blunder Angle without Outliers

Warning to Comm Start

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
20	91	4.067	2.4435	.2561	3.558	4.576	.6	11.3
30	89	4.953	3.2618	.3457	4.266	5.640	.8	16.9
Total	180	4.505	2.9034	.2164	4.078	4.932	.6	16.9

Table 7: Levene's Test of Variances of Yellow Alert to Controller Message by Blunder Angle without Outliers

Test of Homogeneity of Variances of Controller Response Times by Blunder Angle without Outliers

Warning to Comm Start

Levene Statistic	df1	df2	Sig.
2.865	1	178	.092

Table 8 ANOVA of Yellow Alert to Controller Message by Blunder Angle without Outliers

ANOVA of Controller Response Times by Blunder Angle without Outliers

Warning to Comm Start

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	35.303	1	35.303	4.264	.040
Within Groups	1473.603	178	8.279		
Total	1508.905	179			

4.4 Controller Response Time Probability Density Functions.

Based upon the results of the analysis of the effects of qualifications and blunder angles on controller response times, Johnson curves were fitted to the 20 degree blunder response time data and the 30 degree blunder response time data. The results of the curve fits are displayed in figures 2 and 3.

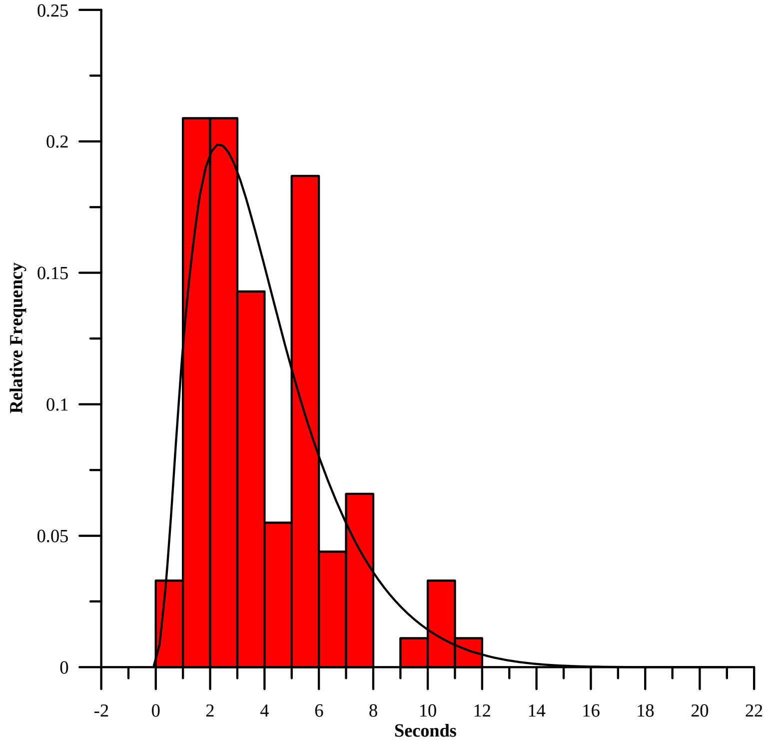

Figure 2: Controller Response Time from Yellow Alert for 20 Degree Blunder

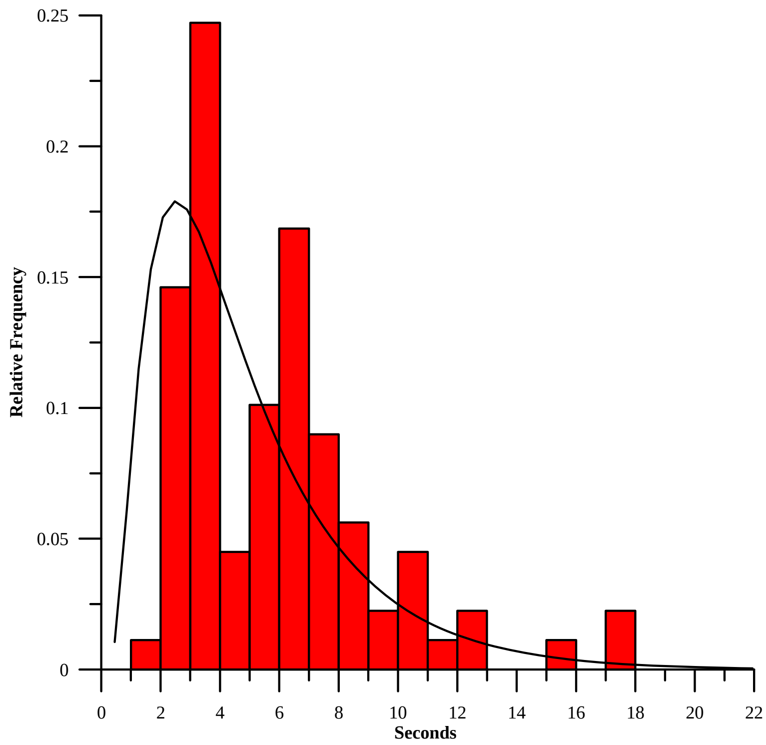

Figure 3: Controller Response Time from Yellow Alert for 30 Degree Blunder

5.0 Airspace Simulation and Analysis Tool (ASAT)

The probability density functions described above will be incorporated into ASAT to perform fast-time, Monte Carlo simulations. The ASAT model is a new-generation Monte Carlo computer simulation system. It was developed to perform complex multiple aircraft simulations in the study of obstacle clearance and airspace requirements for new standards, the re-evaluation of existing standards, and aircraft to aircraft collision risk assessment during approaches, departures, missed approaches, and operations within the terminal area.

6.0 Traffic Alert and Collision and Avoidance System (TCAS)

TCAS was not evaluated in this controller response time data collection effort.

7.0 Conclusions and Recommendations

This section summarizes the results of the data analysis and recommendations for its use.

7.1 Deletion of Outliers

The controller response times were measured from the appearance of the yellow NTZ alert until the controller pressed the push-to-talk button. Three negative response times were recorded, which occurs when the controller responds prior to receiving a yellow alert. Three response times exceeding 20 seconds were omitted due to noted initial unfamiliarity with the FMA display (4:1 AR) used in these DCEs. These six response times were omitted from the data set.

7.2 CRT based upon qualification.

The participating controllers were separated into two groups, unqualified and qualified. Levene's test for homogeneity of variance and ANOVA test for equality of means did not indicate significant differences. The sets of data were merged into one set for the remainder of the analysis.

7.2 CRT Based upon Blunder angle

Two blunder angles were used in the test, 20 degrees and 30 degrees. A Significant difference was observed for means. Therefore controller response times were separated into two sets, 20 degree blunders and 30 degree blunders. The CRT mean for the 20 degree blunder was determined to be 4.067 seconds with a standard deviation of 2.4435 seconds. The CRT mean for the 30 degree blunder was determined to be 4.953 seconds with a standard deviation of 3.2618 seconds.

7.3 Fitting Johnson Probability Density Functions to Controller Response Time Data

Johnson Probability Density Functions were fitted to the 20 degree blunder data set and the 30 degree blunder data set. Each of the functions were bounded Johnson S – B functions. The parameters for the functions are displayed in the appendix.

7.5 Use of the data from this Data Collection Effort.

It is recommended that:

1. The probability density functions described above be incorporated into the Airspace Simulation and Analysis Tool (ASAT). The ASAT is a new-generation Monte Carlo computer simulation system developed to perform complex multiple aircraft simulations in the study of obstacle clearance and airspace requirements for new standards, the re-evaluation of existing standards, and aircraft to aircraft collision risk assessment during approaches, departures, missed approaches, and operations within the terminal area.
2. Further HITL DCEs should be conducted if required due to changes in any of the NAS parameters used in this DCE that might affect pilot and controller response times.

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[3] **DOT-FAA-AFS-450-61** Pilot and Controller Response Times from the JULY, 2009 Human in the Loop Data Collection Effort

[4] **DOT-FAA-AFS-450-67** Report on Pilot Response Times from the March 2010 Human In The Loop Data Collection Effort

APPENDIX: Johnson Probability Density Function Parameters

Table A 1: 20 Degree Yellow Alert to Controller Message

Johnson Type	S - B
Gamma	0.2100034005E+01
Delta	0.1344640236E+01
Lambda	0.2159874793E+02
Epsilon	-0.2811140598E+00
Min	0.6000000000E+00
Max	0.1130000000E+02
data count	91
ks probability	0.30051

Table A 2: 30 Degree Yellow Alert to Controller Message

Johnson Type	S - B
Gamma	0.2929454032E+01
Delta	0.1306970864E+01
Lambda	0.4137074781E+02
Epsilon	0.4507064481E-01
Min	0.8000000000E+00
Max	0.1690000000E+02
data count	89
ks probability	0.31291