MEMORANDUM

REPORT

Report No. FAA AVN-500-55

Project No. AVN-500-90-34

STEEP

ANGLE

AIRCRAFT

CERTIFICATION

The Standards Development Branch
Aircraft Program Division
AVIATION SYSTEM STANDARDS (AVN)
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12. Abstract

A request was made to identify all aircraft capable of flying steep angle approaches, missed approaches, and departures. A listing of flight simulators, where available, was also requested.

This report identifies known fixed wing aircraft capable of steep angle (4° or steeper) operation.

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STEEP SLOPE AIRCRAFT CERTIFICATION

BACKGROUND: In preparation for the introduction of the microwave landing system (MLS), TERPS development activities have been underway for several years. Data collection activities have been conducted on the following FAA aircraft; B-727, CV-580, Saberliner, S-76, and UH-1H. In addition, a joint program with the Air Force provided data from a C-141. Also, a C-172 was leased by the FAA Technical Center, MLS and data collection equipment were installed, and data collected. These data sets provided the Standards Development Branch, AVN-540, with sufficient data to establish MLS TERPS criteria for straight-in approaches for Category A, B, C, and D aircraft with 900-foot minimum rate of descent as the controlling limit to maximum angle allowed.

Several years ago, the MLS Program Office, AND-30, asked AVN-540 to establish a program to develop TERPS criteria for aircraft capable of steep angle MLS approaches. Steep angle for this purpose is 4° or steeper (but up to the certification limit of the aircraft being flown). The Technical Programs Division, AFS-400, further directed AVN-540 to identify all aircraft capable of flying steep angle approaches, missed approaches and departures and include that data from flight simulators (where possible) or actual aircraft into this new TERPS steep angle data base.

The issue of concern here lies in the fact that an aircraft may attempt to execute an MLS approach which has a descent angle greater than the certified or demonstrated handling-approved approach angle. This situation is guarded against through the MLS STC installation process, whereby the installed MLS is "softwared" to exclude angles greater than the POH/AFM/FMS specifies. Steep angle approach procedures should, however, contain some type of information or safeguard against inadvertant steep angle use should MLS equipment be installed without benefit of the present STC process for MLS installation. This report attempts to identify currently known fixed wing aircraft capable of 4° or steeper approaches.

ACTION:

FAR Part 23 Aircraft. Applicants for steep angle approval of Part 23 aircraft simply must comply with the controllability and landing performance of Part 23 for the approach angle or descent rate requested. The responsible aircraft certification office (ACO) of FAA imposes this conformance via specific flight test guides for each aircraft/applicant. The verification records are maintained in Wichita, Kansas.

Aircraft	Mfg	Angle/fpm	Operator	Operation Type	Certificate Number
BE-1900	BE	4.3°/800 fpm	HZMA	G	HZMA908E
BE-1900	BE	4.3°/800 fpm	LX1A	G	LX1A985B
BE-1900C	BE	4.3°/800 fpm	BRIA	A, G	BRIA374A
BE-1900C	BE	4.3°/800 fpm	GLBA	G	GLBA031A
BE-1900C	BE	4.3°/800 fpm	GPPA	G	GPPA020A
BE-1900C	BE	4.3°/800 fpm	JJBA	G	JJBA987B
Aircraft	Mfg	Angle/fpm	Operator	Operation Type	Certificate Number
BE-1900C	BE	4.3°/800 fpm	MASA	G	MASA036A
BE-1900C	BE	4.3°/800 fpm	MLSA	G	MLSA093A
BE-1900C	BE	4.3°/800 fpm	PCAA	A, G	PCAA123A
BE-1900C	BE	4.3°/800 fpm	PLGA	A, G	PLGA925A
BE-1900C	BE	4.3°/800 fpm	SWHA	G	SWHA312A
BE-200	BE	4.4°/800 fpm 5.5°/1,00 fpm	DIRA	G	DIRA078A
BE-200	BE	4.4°/800 fpm 5.5°/1,000 fpm	MASA	G	MASA036A
BE-300	BE	4.6°/800 fpm			
BE-58	BE	4.8°/800 fpm	BQTA	E	BQTA581C
BE-58	BE	4.8°/800 fpm	SWHA	G	SWHA312A
C-90A	BE	4.5°/800 fpm	N/A	N/A	N/A
C-425	C	5.0°/900 fpm	N/A	N/A	N/A
G-4	GA	3.9°	N/A	N/A	N/A

FAR Part 25 Aircraft. Under FAR 21.16 (special conditions), airplanes certificated under FAR 25 that also have features such as high lift devices that allow them to make steep approaches and to take off and land in less than normal distances are now given credit for this capability.

In response to requests from several operators for authority to conduct steep approaches to short landing fields, the FAA has developed a set of criteria which is based upon, and quite

similar to, the special conditions imposed upon the DHC-7 for this type of operation. In essence, if airworthiness approval is desired for approach angles steeper than 4.5°, the capability of making that steep an approach is considered an "unusual or novel design feature" under FAR 21.16, and justifies the imposition of special requirements beyond those of FAR 25. Each individual aircraft submitted for this type of approval will have its own set of "special regulations," which will be based on special performance criteria, with any additions or deletions required to account for any significant differences from the DHC-7.

This guidance is described in draft of chapter 8 to Advisory Circular 25-7, Flight Test Guide for Certification of Transport Category Airplanes.

Aircraft	Mfg	Angle/fpm	Operator	Operation Type	Certificate Number
ATR-42/300	AE	*	CAIA	A, G	CAIA090B
ATR-42/300	AE	*	PAYA	A, E	PAYA165B
ATR-42/300	AE	*	RAIA	A, G	RAIA053A
ATR-42/300	AE	*	SIMA	A	SIMA069A
ATR-42/320	AE	*	BRIA	A, G	BRIA374A
ATR-72	AE	*	RAIA	A, G	RAIA0S3A
BAE-146/100A	BA	6° CAA, UK 4° ACO, FAA	WTAA	A, G	WTAA033B
BAE-146/200A	BA	6° CAA, UK 4° ACO, FAA	USAA	A	USAA105A
BAE-146/200A	BA	6° CAA, UK 4° ACO, FAA	AWAA	A	AWAA652A
BAE-146/300A	BA	6° CAA, UK 4° ACO, FAA	AWAA	A	AWAA652A
DHC-6	DH	6° MOT, CAN 7.5° CAA, UK	ERAA	A, G, E	ERAA075A
DHC-6	DH	6° MOT, CAN 7.5° CAA, UK	WCAA	G	WCAA527A
DHC-6	DH	6° MOT, CAN 7.5° CAA, UK	CROA	B, G	CROA067A

* Not specified in AFM.

Aircraft	Mfg	Angle/fpm	Operator	Operation Type	Certificate Number
DHC-6	DH	6° MOT, CAN 7.5° CAA, UK	GIVA	G	GIVA141A
DHC-6	DH	6° MOT, CAN 7.5° CAA, UK	HERA	G	HERA774A
DHC-6/100	DH	6° MOT, CAN 7.5° CAA, UK	CSAA	G	CSAA021A
DHC-6/200	DH	6° MOT, CAN 7.5° CAA, UK	SMPA	G	SMPA206I
DHC-6/300	DH	6° MOT, CAN 7.5° CAA, UK	GCNA	E	GCNA035A
DHC-6/300	DH	6° MOT, CAN 7.5° CAA, UK	KPVA	G	KPVA099A
DHC-6/300	DH	6° MOT, CAN 7.5° CAA, UK	PAWA	G	PAWA013A
DHC-6/300	DH	6° MOT, CAN 7.5° CAA, UK	ROSA	A, G	ROSA023B
DHC-6/300	DH	6° MOT, CAN 7.5° CAA, UK	SCIA	G	SCIA012A
DHC-6/300	DH	6° MOT, CAN 7.5° CAA, UK	SMPA	G	SMPA206I
DHC-7	DH	6° FAA 7.5° MOT, CAN	ASOA	A, G	ASOA029B
DHC-7/102	DH	6° FAA 7.5° MOT, CAN	BRIA	A, G	BRIA374A
DHC-7/102	DH	6° FAA 7.5° MOT, CAN	CICA	A	CICA456A
DHC-7/102	DH	6° FAA 7.5° MOT, CAN	HALA	A	HALA005A
DHC-7/102	DH	6° FAA 7.5° MOT, CAN	HNAA	A	HNAA001A
DHC-7/102	DH	6° FAA 7.5° MOT, CAN	PAYA	A, E	PAYA165B
DHC-7/102	DH	6° FAA 7.5° MOT, CAN	ROSA	A, G	ROSA023B

Aircraft	Mfg	Angle/fpm	Operator	Operation Type	Certificate Number
DHC-7/103	DH	6° FAA 7.5° MOT, CAN	MRKA	A	MRKA701A
DHC-7/103	DH	6° FAA 7.5° MOT, CAN	ROSA	A, G	ROSA023B
DHC-8	DH	6° Canada	AWXA		
DHC-8	DH	6° Canada	ERAA		
DHC-8	DH	6° Canada	PCAA		
DHC-8	DH	6° Canada	QXEA		
DHC-8/102	DH	6° Canada	FWYA		
DHC-8/102	DH	6° Canada	HNAA		
DHC-8/301	DH	4.6° Canada	MRKA		
DO-228/201	DO	7.5° Germany	PREA		
DO-228/201	DO	7.5° Germany	MIWA		
DO-228/202	DO	7.5° Germany	FFSA		
DO-328	DO	6-7° **			
EMB 110	EM	*	ASOA	A, G	ASOA029B
EMB 110	EM	*	WTAA	A, G	WTAA033B
EMB 110/P1	EM	*	CHSA	G	OHSA127A
EMB 110/P1	EM	*	COMA	A, G	COMA005B
EMB 110/P1	EM	*	EYLA	E	EYLA783D
EMB 120	EM	*	ASOA	A, G	ASOA029B
EMB 120	EM	*	BRIA	A, G	BRIA374A
EMB 120	EM	*	COMA	A, G	COMA005B
EMB 120	EM	*	MIWA	G	MIWA398B
EMB 120	EM	*	RAIA	A, G	RAIA053A

* Not specified in AFM.
** Certification in progress in Germany.

Aircraft	Mfg	Angle/fpm	Operator	Operation Type	Certificate Number
EMB 120	EM	*	WTAA	A, G	WTAA033B
EMB 120	EM	*	MASA	G	MASA036A
EMB 120	EM	*	SWIA	G	SWIA011A
EMB 120RT	EM	*	WTAA	A, G	WTAA033B

* Not specified in AFM.

FLIGHT SIMULATION. The following flight simulation systems were identified as having steep angle characteristics:

MODEL	SPONSOR	LOCATION	LEVEL
BE-1900	Flight Safety Intl	Flushing, NY	C
BE-200	Flight Safety Intl	LeBourget, FR	B
BE-200	Flight Safety Intl	Toledo, OH	B
BE-200	Flight Safety Intl	Wichita, KS	C
BE-200	SimuFlite Training	DFW, TX	C
BE-300	Flight Safety Intl	Wichita, KS	C
GA-1159IV	Flight Safety Intl	Savannah, GA	C
ATR-42/300	Flight Safety Intl	Houston, TX	C
ATR-42/300	TransWorld Express	Blagnac, FR (Pend)	C
BAE-146-200A	Air Wisconsin	Hatfield, UK	D
BAE-146-200A	U.S. Air	San Diego, CA	D
BAE-146-200A	BAE	Washington, DC	C
DHC-7-100	Flight Safety Intl	Toronto, Ontario	B
DHC-8-100	Flight Safety Intl	Toronto, Ontario	C
DHC-8-100/300	Flight Safety Intl	Seattle, WA	C
DO-328	Horizon Air	Seattle, WA	C
EMB-120	Flight Safety Intl	Houston, TX	C
EMB-120	Flight Safety Intl	Seattle, WA	C

REFERENCES.

1. FAA Small Airplane Directorate, ACE-105, Kansas City, Missouri.

2. FAA Aircraft Certification Office, Wichita, Kansas.

3. Air Carrier Aircraft Utilization and Propulsion Reliability Report, March 1991 (AVN-120).

4. FAA Transport Airplane Directorate, ANM-160S, Seattle, Washington.

5. FAA approved flight manuals for specific aircraft.

6. FAA Rotorcraft Directorate, Aircraft Certification Service, ASW-150, Fort Worth, Texas.

7. Draft of chapter 8, Advisory Circular 25-7, Flight Test Guide for Certification of Transport Category Airplanes.