This document was created to make public non-proprietary data contained in Special Conditions (including Deviations, Equivalent Safety Findings) that are part of the applicable Certification Basis as recorded in TCDS EASA.IM.A.191.

Content:

Contents

Disclaimer – This document is not exhaustive and it will be updated gradually.

CRI H-01 SC: ICA on EWIS	
APPLICABILITY:	DHC-8-401, DHC-8-402
REQUIREMENTS:	PART 21A.16(b)(3), 21A.103(a)(2)(iii), CS 25.1529 & Appendix H
ADVISORY MATERIAL:	N/A

Special Condition H-01
Appendix H Instructions for Continued Airworthiness

H25.5 Electrical Wiring Interconnection Systems Instructions for Continued Airworthiness

I. The applicant must conduct analyses if the STC requires a revision of the Instructions for Continued Airworthiness (ICA) applicable to Electrical Wiring Interconnection System (EWIS) as defined below that include the following:

Maintenance and inspection requirements for the EWIS developed with the use of an enhanced zonal analysis procedure (EZAP) that includes:

a. Identification of each zone of the aeroplane.
b. Identification of each zone that contains EWIS.
c. Identification of each zone containing EWIS that also contains combustible materials.
d. Identification of each zone in which EWIS is in close proximity to both primary and back-up hydraulic, mechanical, or electrical flight controls and lines.
e. Identification of –
    - Tasks, and the intervals for performing those tasks, that will reduce the likelihood of ignition sources and accumulation of combustible material, and
    - Procedures, and the intervals for performing those procedures, that will effectively clean the EWIS components of combustible material if there is not an effective task to reduce the likelihood of combustible material accumulation.
f. Instructions for protections and caution information that will minimize contamination and accidental damage to EWIS, as applicable, during the performance of maintenance, alteration, or repairs.

The ICA must be in the form of a document appropriate for the information to be provided, and they must be easily recognizable as EWIS ICA.

II. For the purpose of this Appendix H25.5, the following EWIS definition applies:

(a) Electrical wiring interconnection system (EWIS) means any wire, wiring device, or combination of these, including termination devices, installed in any area of the aeroplane for the purpose of transmitting electrical energy, including data and signals between two or more intended termination points. Except as provided for in subparagraph (c) of this paragraph, this includes:

(1) Wires and cables.

(2) Bus bars.

(3) The termination point on electrical devices, including those on relays, interrupters, switches, contactors, terminal blocks, and circuit breakers and other circuit protection devices.

(4) Connectors, including feed-through connectors.

(5) Connector accessories.

(6) Electrical grounding and bonding devices and their associated connections.

(7) Electrical splices.

(8) Materials used to provide additional protection for wires, including wire insulation, wire sleeving, and conduits that have electrical termination for the purpose of bonding.

(9) Shields or braids.

(10) Clamps and other devices used to route and support the wire bundle.

(11) Cable tie devices.

(12) Labels or other means of identification.

(13) Pressure seals.

(b) The definition in subparagraph (a) of this paragraph covers EWIS components inside shelves, panels, racks, junction boxes, distribution panels, and back-planes of equipment racks, including, but not limited to, circuit board back-planes, wire integration units and external wiring of equipment.

(c) Except for the equipment indicated in subparagraph (b) of this paragraph, EWIS components inside the following equipment, and the external connectors that are part of that equipment, are excluded from the definition in subparagraph (a) of this paragraph:

(1) Electrical equipment or avionics that is qualified to environmental conditions and testing procedures when those conditions and procedures are -

(i) Appropriate for the intended function and operating environment, and

(ii) Acceptable to the Agency.

(2) Portable electrical devices that are not part of the type design of the aeroplane. This includes personal entertainment devices and laptop computers.

(3) Fibre optics.

III. The following can be used as a guide to assess the impact of the STC on the EWIS ICA EZAP and re-application of EZAP to STC affected zone:

<u>Step 1:</u> Does the STC:
- Affect or modify wiring or its environment,
- Install or result in wiring being located within 5 cm (2 inches) of both primary and back-up hydraulic, mechanical, or electrical flight controls,
- Change the density of the zone or
- Change the potential effects of fire in the zone?

<u>Step 2:</u> If answer to step 1 is “NO”, no further action required

<u>Step 3:</u> If answer to step 1 is “YES”, perform EZAP analysis

Step 4: Determine if there is an existing (MRBR) EZAP task(s) that is applicable and effective
Step 5: If answer to step 4 is “YES”, no further action required because the existing EZAP derived maintenance task(s) are adequate
Step 6: If answer to step 4 is “NO”, develop appropriate task(s) and incorporate them into existing maintenance program

In case a revision to the EWIS ICA is necessary, the applicant must submit final EWIS ICA to the Agency by 7 June 2010.

FAA SC No. 25-ANM-3, Automatic Takeoff Power Control System (ATPCS)	
APPLICABILITY:	DHC-8-401, DHC-8-402
REQUIREMENTS:	PART 21.16, 27.17
ADVISORY MATERIAL:	N/A

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COMPARISON CHART—Continued

Comparison of old with new section numbers—

Old	New
(3)	221.5(c)(13) and 221.2(f)(1) (partially deleted).
221.4:	
(a)	221.8 (a) and (c).
(b)	221 8(a).
(c)	Deleted.
(d)	221.7(a).
(1)	221.7(a)(3).
(2)	221.7(a)(1).
(3)	221.7(a)(8).
(4)	221.7(a)(9).
(5)	221.7(a)(5).
(6)	221.7(a)(4).
(7)	221.7(a)(7).
(8)	221.7(a)(2).
(9)	221.7(a)(6).
(e)	221.7(b).
(1)	221.7(b)(3).
(2)	221.7(b)(1).
(3)	221.7(b)(7).
(4)	221.7(b)(4).
(5)	221.7(b)(6).
(6)	221.7(b)(2).
(7)	221.7(b)(5).
(f)	Deleted.

COMPARISON CHART

Comparison of new with old section numbers

New	Old
221.1:	
(a)	Added
(b)	221.1(a), 221.3 (r) and (f).
221.2:	
(a)(1)	Added.
(2)	Added.
(3)	Added.
(b)(1)	Added.
[illegible]	Added.
[illegible]	Added.
[illegible]	Added.
[illegible]	221.3(k)
(c)	221.3(b)(2).
(d)(1)	Added.
(2)	221.1(a) and 221.3(s).
(e)	221.3(a).
(f)(1)	221.3(n)(3) (modified).
(2)	221.3(a).
(g)(1)	221.3(c).
(2)(i)	221.3(c)(1).
(ii)	221.3(c)(2).
(iii)	221.3(c)(3).
(iv)	221.3(c)(3).
(h)(1)	221.3(v)(1).
(2)	221.3(v)(2).
(3)	221.3(v)(3) (i) and (ii).
(4)	221.3(v)(4).
(5)	221.3(v)(5).
(i)	221.4 (a), (b) and 221.3(s).
(j)	221.3(d) (1) and (2).
(k)	221.3(b)(1).
221.3:	
(a)(1)	221 1(a), 221.3(m) and 221.3(s).
(2)	221.3(t) (3) and (4) (modified).
(3)	221.3(u).
(b)	221.3(a).
(c)(i)	Added.
(ii)	Added.
(d)(1)	221.1(d) and 221.3(n)(1).
(2)	221.1(d) and 221.3(n)(1).
(3)	Added.
(4)	221.3(n)(3).
(e)	221.3(n)(1).
(f)(1)	221 1(b).
(i)	221.1(b)(1).
(ii)	221.1(b)(1).
(2)	Added.
(g)	221.3(g).
(h)	221.3(e).
(i)(1)	221.3(f)(2).
(2)	221.3(f)(1).
(3)	221.3(f)(2).
(j)	221.3(i) and 221.3(n)(4).
(k)	221.3(h).
[illegible]	
[illegible]	Added.
[illegible]	Added.
221.5:	
(a)	221.2 (first sentence).
(b)	221.2(e) (modified).

COMPARISON CHART—Continued

Comparison of new with old section numbers—

New	Old
(c)(1)	221.2(e).
(2)	221.2(f).
(3)	221.2(g).
(4)	221.2(h).
(5)	221.2(j).
(i)	221.2(j)(1).
(ii)	221.2(j)(2).
(6)	221.2(c) (modified).
(7)	221.2(k).
(8)	221.2(d).
(9)(i)	221.2(l).
(ii)	221.2(m).
(10)	221.3(o) (modified).
(11)	221.3(w) (modified).
(12)	221.3(y) (modified).
(13)	221.3(z) (modified).
221.6:	
(a)	221.2(a).
(b)	221.2(a).
(c)	221.2(i).
(d)	Added.
(e)	221.2(b).
(f)	221.2(f).
(g)	221.2(g).
(h)	221.3(n)(4).
221.7:	
(a)	221.4(d).
(1)	221.4(d)(2).
(2)	221.4(d)(8).
(3)	221.4(d)(1).
(4)	221.4(d)(6).
(5)	221.4(d)(5).
(6)	221.4(d)(9).
(7)	221.4(d)(7).
(8)	221.4(d)(3).
(9)	221.4(d)(4).
(b)	221.4(e).
(1)	221.4(e)(2).
(2)	221.4(e)(6).
(3)	221.4(e)(1).
(4)	221.4(e)(4).
(5)	221.4(e)(7).
(6)	221.4(e)(5).
(7)	221.4(e)(3).
(c)	221.4(d)(3).
(1)	221.3(d)(3)(i).
(2)	221.3(d)(3)(ii).
(d)	221.3(d)(4).
(e)	221.3(d)(5).
221.8:	
(a)	221.4 (a) and (b).
(b)	221.3(s) and 221 1(a).
(c)	221.4(a).

Board of Governors of the Federal Reserve System, October 17, 1983.

William W. Wiles,

Secretary of the Board.

[FR Doc. 83-28678 Filed 10-20-83; 8:45 am]

BILLING CODE 6210-01-M

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 21

[Docket No. NM-7; Special Conditions No. 25-ANM-3]

Special Conditions: De Havilland Aircraft of Canada Ltd., Model DHC-8 Series Airplane

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions.

SUMMARY: These special conditions are issued pursuant to §§ 21.16 and 21.17 of the Federal Aviation Regulations (FAR) to De Havilland Aircraft of Canada Ltd. for a type certificate for the DHC-8 series airplane. The DHC-8 airplane will have novel or unusual design features associated with an automatic takeoff power control system (ATPCS) for which the applicable airworthiness regulations do not contain adequate or appropriate safety standards. The ATPCS will allow the airplane to take off with less than maximum takeoff thrust approved for the airplane; and, if an engine fails, the system will automatically provide maximum takeoff thrust on the operating engine. These special conditions contain safety standards which the Administrator finds necessary to establish a level of safety equivalent to that provided by the regulations applicable to the De Havilland DHC-8 series airplane because of the novel or unusual features.

EFFECTIVE DATE: November 21, 1983.

FOR FURTHER INFORMATION CONTACT: Mr. James Walker, Regulations and Policy Office, ANM-110, FAA, Northwest Mountain Region, 17900 Pacific Highway South, C-68966, Seattle, Washington 98168; telephone (206) 431-2116.

SUPPLEMENTARY INFORMATION:

Background

On March 31, 1980, De Havilland Aircraft of Canada Ltd., Downsview, Ontario, M3K 1Y5, Canada, filed an application for a type certificate to include an ATPCS installation for approval under that type certificate covering the DHC-8 series airplane.

The DHC-8 is a high wing, twin-engine, pressurized transport category airplane having a maximum takeoff weight of 30,500 pounds. The airplane is equipped with two Pratt & Whitney PW-120 turboprop engines, each rated at 2,000 shaft horsepower with 13-foot diameter, 4-bladed, Hamilton-Standard propellers (HS 14SF-1). The airplane has a maximum permissible altitude of 25,000 feet and a passenger capacity of 36 persons.

The design covered under the type certificate is the installation of an ATPCS. Automatic takeoff power control system special conditions issued to date for other airplanes require the ATPCS be designed to permit manual decrease or increase in power up to the maximum takeoff power approved for the airplane under existing conditions through the use of power levers. The ATPCS system installed on the engines of the DHC-8 airplane contains an electronic fuel controller (EFC), which provides an automatic fixed speed increment increase in the event of an engine failure during takeoff. In the

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event of an engine failure, a signal from the ATPCS is transmitted to the EFC which up-trims the operating engine to the approved takeoff power. In the event of an ATPCS failure with engine failure, the crew would be required to advance the power lever to obtain the maximum power.

The type design of the DHC-8 series airplane with the automatic system installed contains a number of novel or unusual design features for which the applicable airworthiness requirements do not contain adequate or appropriate safety standards. Special conditions are necessary to provide a level of safety equal to that generally intended by the established certification basis and to support a finding by the Administrator that no feature or characteristics of the airplane with the automatic system installed makes it unsafe for the category in which certification is requested. These special conditions specify limits on the maximum power increment which may be applied to the operating engines by the ATPCS, prescribe system reliability and status monitoring requirements, require provisions for manual selection of the maximum takeoff power approved for the airplane under existing conditions, prohibit approval of the system if the automatic or manual application of approved maximum takeoff power would result in an engine operating limit being exceeded, and require the installation of an independent engine failure warning system if the inherent characteristics of the airplane do not provide a clear warning to the crew.

Discussion of Comments

Notice of proposed special conditions No. SC-83-4-NM was published in the **Federal Register** on June 23, 1983 (48 FR 28663). The following comments were received.

One commenter expressed the opinion that the system reliability requirements are too severe and the power setting limits are overly restrictive. As noted in the preamble of the notice of proposed special conditions, the FAA in 1977 initiated development of special conditions for the current turbine-powered transport category airplanes, coordinating the proposals world-wide with all interested groups. This effort was continued until early 1979 when a final version was completed. The same special conditions were subsequently applied to all applicants. The FAA has determined that the special conditions provide the level of safety necessary to satisfy an equivalent safety finding on the issue of trading airplane performance for a calculated ATPCS reliability and to assure a minimum safety standard intended by the applicable regulations. The FAA notes the arguments put forth by this commenter; however, it has been determined that the special conditions, as issued, are necessary for acceptance of a system that automatically increases power or thrust on operating engines when one engine fails during takeoff.

One other comment concerned wording in paragraphs D1 and E2(a) of the proposal about maximum takeoff power versus selected takeoff power as set by the ATPCS. The language in both paragraphs is meant to be the same as the purpose is to obtain the approved maximum power for the day.

Another commenter noted that the applicable amendments to Part 36 of the FAR and Special Federal Aviation Regulations (SFAR) No. 27 which were mentioned in the notice are somewhat different from those established in a meeting with the cognizant Aircraft Certification Office on June 10, 1980. This is true because the latest amendments to Part 36 and SFAR No. 27 on the date of type certification approvals must be complied with, regardless of date of application for a type certificate and/or supplemental type certificate. In this instance, Amendments 36-11 and 36-12 do not affect the applicant's airplane noise requirements. Therefore, this is not considered a burden. However, SFAR No. 27, Amendment 4, and a pending amendment may affect the manufacturer's engine installation.

On commenter questioned the accuracy of the background description of the fuel control operation as outlined in the NPRM. The preamble has been changed to reflect the proper operation of the fuel control and its function relative to the ATPCS.

One commenter pointed out what appears to be an inconsistency in the definition of Critical Time Interval and the associated graph relative to the wording "gross flight path" and § 25.115(b) of the FAR, which refers to "net takeoff flight path." The material was presented in this manner to clarify the application of § 25.115(b) since the effect of this rule is to define the gross and net flight paths. "Actual takeoff flight path" as used in § 25.115(b) is the same as the "gross flight path" defined in the special conditions.

The same commenter stated that use of the word "power" instead of "thrust" penalizes airplane performance. The FAA does not agree with this interpretation since airplane performance and gross takeoff weight allowed are a function of the thrust developed by the propellor and the thrust is affected by the characteristics of the propeller efficiency during takeoff. The takeoff thrust developed and obtained from the propellor when the ATPCS actuates is to be used to determine compliance with applicable regulations and the special conditions.

Type Certification Basis

The proposed type certification basis for the DHC-8 series airplane with the ATPCS installed is Part 25 of the Federal Aviation Regulations (FAR) effective February 1, 1965, as amended by Amendments 25-1 through 25-51; Part 36 of the FAR, including Amendments 36-1 through 36-12; SFAR No. 27 dated December 12, 1973, including Amendments 27-1 through current amendment; and the special conditions for an ATPCS contained herein.

Special conditions, as appropriate, are now issued after public notice in accordance with §§ 11.28 and 11.29(b), effective October 14, 1980, and will become part of the type certification basis in accordance with § 21.16.

List of Subjects in 14 CFR Part 21

Air transportation, Aircraft, Aviation safety.

Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued for the De Havilland DHC-8 series airplane equipped with an automatic takeoff power control system (ATPCS):

A. *General.* With the ATPCS and associated systems functioning normally as designed, all applicable requirements of Part 25, except as provided in these special conditions, must be met without requiring any action by the crew to increase power.

B. *Definitions.*

1. Automatic Takeoff Power Control System (ATPCS). An ATPCS is defined as the entire automatic system used on takeoff, including all devices, both mechanical and electrical, that sense engine failure, transmit signals, actuate fuel controls or power levers on operating engines to achieve scheduled power increase, and furnish cockpit information on system operation.

2. Critical Time Interval. When conducting an ATPCS takeoff, the critical time interval between V1 minus 1 second and a point on the minimum performance, all-engine flight path where, assuming a simultaneous engine and ATPCS failure, the resulting minimum flight path thereafter intersects the Part 25 required gross flight path at no less than 400 feet from the takeoff surface.This definition is shown in the following graph:

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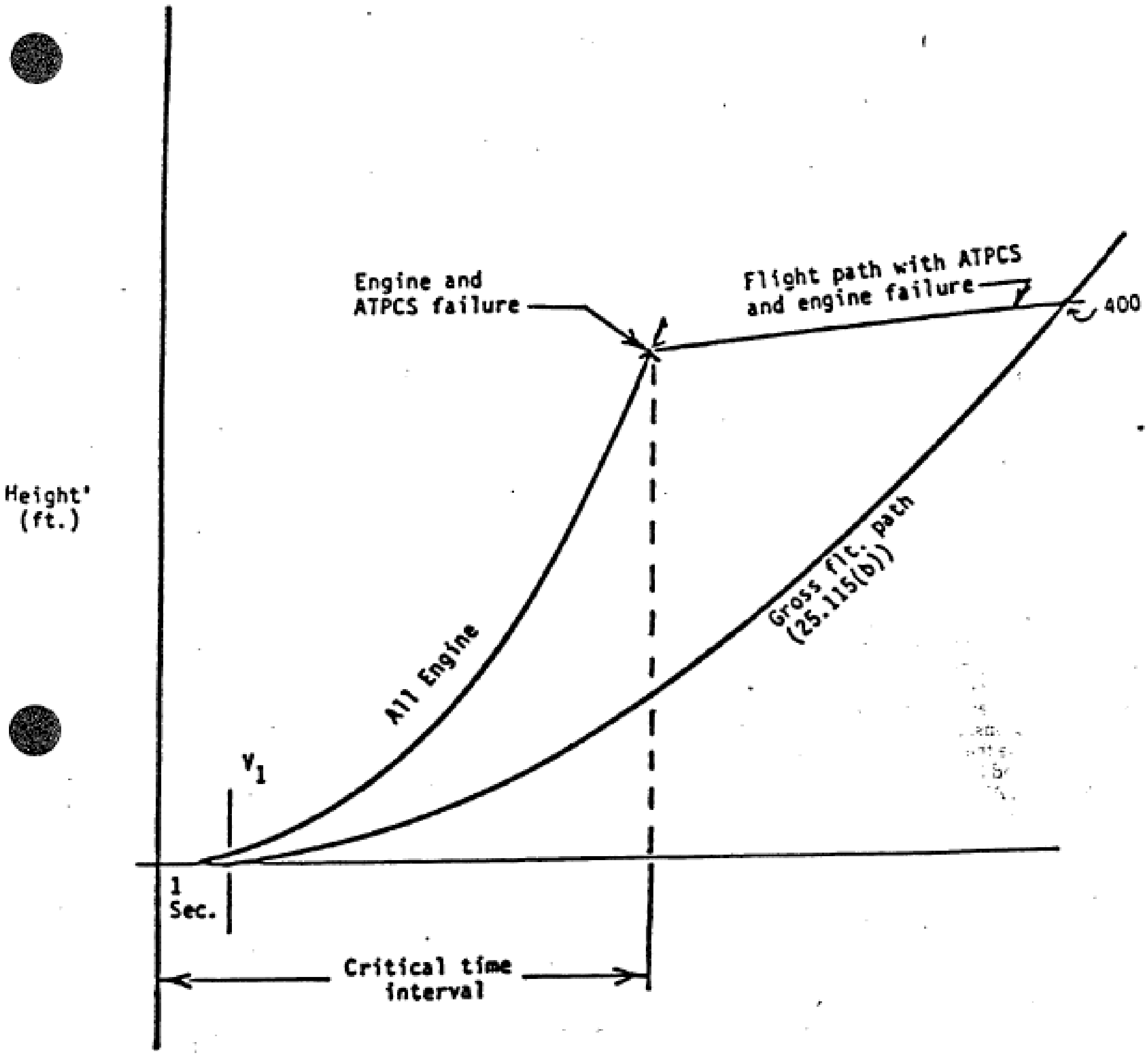

3. Takeoff Power. Notwithstanding the definition of "takeoff power" in Part 1 of the Federal Aviation Regulations (FAR), "takeoff power" means the horsepower obtained from each initial power setting approved for takeoff under these special conditions.

C. *Performance Requirements.* The applicant must comply with these performance and reliability requirements:

1. An ATPCS system failure during the critical time interval must be shown to be improbable.

2. The concurrent existence of an ATPCS failure and engine failure during the critical time interval must be shown to be extremely improbable.

3. All applicable performance requirements of Part 25 must be met with an engine failure occurring at the most critical point during takeoff with the ATPCS system functioning.

D. *Power Setting.* The initial takeoff power set on each engine at the beginning of the takeoff roll may not be less than:

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1. Ninety (90) percent of the power level set by the ATPCS (the maximum takeoff power approved for the airplane under existing conditions);

2. That required to permit normal operation of all safety-related systems and equipment dependent upon engine power or power level position; or

3. That shown to be free of hazardous engine response characteristics when power is advanced from the initial takeoff power level to the maximum approved takeoff power.

E. *Powerplant Controls.*

1. In addition to the requirements of § 25.1141, no single failure or malfunction, or probable combination thereof, of the ATPCS system, including associated systems, may cause the failure of any powerplant function necessary for safety.

2. The ATPCS must be designed to:

a. Apply power on the operating engine, following an engine failure during takeoff, to achieve the selected takeoff power without exceeding engine operating limits;

b. Permit manual decrease or increase in power up to the maximum takeoff power approved for the airplane under existing conditions through the use of the power lever, except that for aircraft equipped with limiters that automatically prevent engine operating limits from being exceeded under existing conditions, other means may be used to increase the maximum level of power controlled by the power levers in the event of an ATPCS failure, provided the means is located on or forward of the power levers, is easily identified and operated under all operating conditions by a single action of either pilot with the hand that is normally used to actuate the power levers, and meets the requirements of § 25.777, paragraphs (a), (b), and (c);

c. Provide a means to verify to the flightcrew prior to takeoff that the ATPCS is in a condition to operate; and

d. Provide a means for the flightcrew to deactivate the automatic function. This means must be designed to prevent inadvertent deactivation.

F. *Powerplant Instruments.* In addition to the requirements of § 25.1305:

1. A means must be provided to indicate when the ATPCS is in the armed or ready condition; and

2. If the inherent flight characteristics of the airplane do no provide adequate warning that an engine has failed, a warning system that is independent of the ATPCS must be provided to give the pilot a clear warning of any engine failure during takeoff.

Secs. 313(a), 601, 603, Federal Aviation Act of 1958, as amended (49 U.S.C. 1354(a), 1421, and 1423); 49 U.S.C. 106(g) (Revised, Pub. L. 97-449, January 12, 1983); and 14 CFR 11.28 and 11.29(b))

Note.—This action affects only certain unusual or novel design features on one model series of airplanes. It is not a rule of general applicability and affects only the manfacturer who applied to the FAA for approval of these features on the airplane.

Issued in Seattle, Washington, on October 6, 1983.

Frederick M. Issac,

Acting Director, Northwest Mountain Region.

[FR Doc. 83-28693 Filed 10-20-83; 8:45 am]

BILLING CODE 4910-13-M

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14 CFR Part 39

[Docket No. 80-NW-62-AD; Amdt. 39-4749]

Airworthiness Directives; Airbus Industrie Model A300 Series Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This amendment adds a new airworthiness directive (AD) applicable to Airbus Industrie Model A300 series airplanes which requires modification of the ground/flight detection circuit that supplies electrical power to the pitot probe heaters. This action is necessary to prevent the failure of pitot probe heaters which could result in a loss of all airspeed indications.

EFFECTIVE DATE: November 28, 1983.

ADDRESSES: The service bulletin specified in this AD may be obtained upon request to Airbus Industrie, Airbus Support Division, Avenue Didier Daurat, 31700 Blagnac, France or may be examined at the address shown below.

FOR FURTHER INFORMATION CONTACT: Mr. Sulmo Mariano, Foreign Aircraft Certification Branch, ANM-150S, Seattle Aircraft Certification Office, FAA, Northwest Mountain Region, 9010 East Marginal Way South, Seattle, Washington, telephone (206) 431-2979. Mailing address: FAA, Northwest Mountain Region, 17900 Pacific Highway South, C-68966, Seattle, Washington 98168.

SUPPLEMENTARY INFORMATION: The Direction Generale de l'Aviation Civile (DGAC) has declared Airbus Industrie Service Bulletin A300-30-026 as mandatory. One incident has been reported wherein a model A300 airplane experienced a complete loss of the Captain's, First Officer's, and the standby airspeed indicators. This condition lasted for approximately 15 minutes in heavy icing conditions and affected all systems dependent upon airspeed, including pitch trim and autopilot. The problem was determined to have resulted in a failure of the ground/flight detection circuit which provides electrical power to all three pitot probe heaters. In the present configuration, a single failure may result in insufficient electical power to all pitot probe heaters. The service bulletin prescribes a modification to prevent the problem from reoccurring.

A proposal to amend Part 39 of the Federal Aviation Regulations to include an airworthiness directive requiring the incorporation of a modification to ensure that the pitot probes are properly heated was published in the Federal Register on July 27, 1981 (48 FR 38376).

The comment period closed on August 28, 1981, and interested parties have been afforded an opportunity to participate in the making of this amendment. Only one comment was received and it stated no objection to the proposal.

In the interim, Airbus Industrie issued a new revision to Service Bulletin A300-30-026. The latest revision of the service bulletin introduces minor changes which do not create an additional burden to the operators. The AD will make reference to the latest revision.

The sole operator of U.S. registered Model A300 airplanes has estimated that the total cost impact of this action will be approximately $32,500. For these reasons, this rule is not considered to be a major rule under the criteria of Executive Order 12291. No small entities within the meaning of the Regulatory Flexibility Act are affected.

Therefore, the FAA has determined that air safety and the public interest require the adoption of the rule with the change mentioned above.

List of Subjects in 14 CFR Part 39

Aviation safety, Aircraft.

PART 39—[AMENDED]

Adoption of the Amendment

Accordingly, pursuant to the authority delegated to me by the Administrator, § 39.13 of Part 39 of the Federal Aviation Regulations (14 CFR 39.13) is amended by adding the following new airworthiness directive:

Airbus Industrie: Applies to all model A300 series airplanes listed in Airbus Industrie Service Bulletin A300-30-026, certificated in all categories. To prevent loss of all airspeed indications, accomplish the following within the next 1800 flight hours after the effective date of this AD, unless already accomplished:

A. Modify the pitot probe heater in accordance with Airbus Industrie Service Bulletin A300-30-026, Revision 6, dated April 9, 1982.

TCCA SC 5010-10-366, Steep Approach and Short Landing,	
APPLICABILITY:	DHC-8-401, DHC-8-402
REQUIREMENTS:	-
ADVISORY MATERIAL:	N/A

3rd DRAFT

Transport Canada June 3, 1985

General Special Conditions for Airplanes Having Steep Approach and Short Landing Capability

1. Applicability

These General Special Conditions contain airworthiness requirements which enable manufacturers of turbo-propeller airplanes to claim credit for short landing capability using an approach path angle in excess of 4.5 degrees (7.9%). The airworthiness requirements of FAR 25 are applicable except as provided herein. It is expected that specific Special Conditions based on these General Special Conditions, will be issued for each aircraft type when knowledge of its characteristics is obtained.

2. All Engines Operating Short Landing Distance

(a) The all engines operating short landing distance is the horizontal distance necessary to land and to come to a complete stop from a landing screen height of 35 ft and must be determined (for standard temperatures, at each weight, altitude and wind within the operational limits established by the applicant for the airplane) as follows: -

(1) The airplane must be in the all engines operating short landing configuration.

(2) A steady approach must be maintained down to the landing screen height at a calibrated airspeed, V_{REF}, not less than 1.3 V_S, and at the selected approach angle.

(3) Changes in configuration, power and speed must be made in accordance with the established procedures for service operation.

(4) The landing must be made without excessive vertical acceleration, tendency to bounce, nose over or ground loop. Vertical touchdown velocity should be less than 6 ft/sec.

(5) The landings must not require exceptional piloting skill or alertness.

(b) The landing distance must be determined on a level, smooth, dry, hard-surfaced runway. In addition -

(1) The pressures on the wheel-braking systems may not exceed those specified by the brake manufacturer.

(2) The brakes may not be used so as to cause excessive wear of brakes or tires.

(3) Means other than wheel brakes may be used for retardation if that means -

(i) is safe and reliable;

(ii) is used so that consistent results can be expected in service;

(iii) is such that exceptional skill is not required to control the airplane.

(c) The landing distance data must include correction factors for not more than 50% of the nominal wind components along the landing path opposite to the direction of landing, and not less than 150% of the nominal wind components along the landing path in the direction of landing.

(d) If any device is used that depends on the operation of any engine, and if the short landing distance would be noticeably increased when a landing is made with that engine assumed to fail during the final stages of the all engines operating steep approach, the short landing distance must be determined with the engine inoperative unless the use of compensating means will result in a landing distance not more than that with each engine operating.

3. All Engines Operating Baulked Landing Climb

In the short landing configuration the steady gradient of climb may not be less than 3.2%, with -

(a) the engines at the power that is available five seconds after initiation of movement of the power controls from the minimum flight idle to the take-off position; and

(b) a climb speed which is: -

(1) Not less than 1.2 V_S;

(2) Not less than V_{MCL}; and

(3) Not greater than V_{REF}.

4. One Engine Inoperative Approach Climb

In the approach configuration corresponding to the all engines operating steep approach procedure in which V_S for this configuration does not exceed 110 percent of the V_S for the related landing configuration the steady gradient of climb may not be less than 2.1 percent for two-engine airplanes, 2.4 percent for three-engine airplanes and 2.7 percent for four-engine airplanes, with -

(a) the critical engine inoperative, the remaining engine(s) at the available takeoff power;

(b) the maximum landing weight; and

(c) a climb speed which is: -

(1) not less than 1.2 V_S;

(2) not less than 1.1 V_{MCL}; and

(3) not greater than 1.3 V_S.

5. Controllability and Manoeuverability

(a) It shall be demonstrated that it is possible in calm air to complete an approach, touch down and landing roll without displaying any hazardous characteristics in the following conditions: -

(1) approach path angles of 2 degrees above and 2 degrees below the selected approach path angle, at V_{REF};

(2) V_{REF} minus 5 knots, at the selected approach path angle.

For both conditions (1) and (2): -

(i) the rate of descent should be reduced to less than 3 feet per second before touchdown;

(ii) below a height of 200 ft, no action should be taken to increase power apart from those small changes necessary to maintain an accurate approach.

(b) It shall be shown that the airplane is safely controllable in transition from the all engine short landing approach to the approach climb as established in para 4 of these Special Conditions. This must be shown after failure of the critical engine while the airplane is established on a steady landing approach at approach path angles of 2 degrees above and 2 degrees below the selected approach path angle.

(c) It shall be shown that the airplane can be landed safely after failure of the critical engine while the airplane is in the final stages of a steady landing approach at approach path angles of both 2 degrees above and 2 degrees below the selected approach path angle.

(d) A minimum manoeuvering capability shall be demonstrated in the all engine short landing configuration. At a speed of V_{REF} and symmetric power for the selected approach path angle, the load factor at stall warning onset shall not be less than 1.31 'g'. This shall be shown for the most critical weight and CG position.

6. <u>One Engine Inoperative Short Landing Distance</u> (if applicable)
If requested by the manufacturer, an one engine inoperative short landing distance may be considered for approval.

(a) The one engine inoperative short landing distance is determined as in para 2 of these Special Conditions except that the airplane must be in the one engine inoperative short landing configuration.

(b) It shall be shown that the airplane is safely controllable in transition from a one engine inoperative short landing approach to the approach climb as specified in para 4 of these Special Conditions.

7. <u>Performance Data Extrapolation</u>
The measured landing distance data may be extrapolated to a maximum of 3000 ft above the test altitude and 2000 ft below the test altitude without conducting verifying tests, provided that the performance reduction and expansion methods are approved.

8. Flight Manual

The AFM Supplement for Steep Approach and Short Landing shall include the following: -

(a) the all engines operating short landing distance and landing field lengths for destination and alternate airports. Applicable field length factors are 1/0.6 (1.67) for Destination and 1/0.7 (1.43) for Alternate. The landing distance data may also include correction factors for runway slope and temperatures other than standard, within the operational limits of the airplane;

(b) the more limiting of -

(1) the landing WAT derived in accordance with the all engines operating landing climb (para 3 of these Special Conditions); or

(2) the landing WAT derived in accordance with the one engine inoperative approach climb (para 4 of these Special Conditions);

(c) one engine inoperative short landing distance and landing field length for destination and alternate airports, if applicable;

(d) appropriate limitations, normal, abnormal and emergency procedures;

(e) a statement that the limitations, procedures and performance are predicated on the use of a guidance system suitable for visual reference or an approved steep approach instrument landing system, as applicable.

June 3, 1985

Discussion of General Special Conditions for Airplanes Having Steep Approach and Short Landing Capability (3rd draft)

1. Introduction

Transport Canada has taken part in flight evaluations of steep approach and short landing capability on a number of aircraft and has approved the operation on the DHC-7. The FAA issued Special Conditions for the DHC-7 and the CAA has proposed JAR 25 Short Landing Requirements in Flight Working Paper No.205, March 1983. Following a recent Transport Canada evaluation of a twin engined aircraft (DHC-8), the DHC-7 Special Conditions and the CAA proposal have been reviewed and as a result "General Special Conditions for Airplanes Having Steep Approach and Short Landing Capability" have been drafted. This draft contains more extensive requirements than the FAA or CAA documents and reflects Transport Canada's experience to date.

2. Detail Discussion

2.1 Applicability

Steep approach is defined as an approach path angle greater than 4.5 degrees. This permits the use of a reduced landing screen height of 35 feet without significant degradation of touchdown point dispersal.

2.2 All Engine Short Landing Distance

This differs from 25.125 in that the screen height is reduced to 35 ft, the steady approach speed is defined as V_{REF} and the maximum touchdown velocity is specified as 6 ft/sec. In addition 25.125(f), which relates to devices depending on operation of an engine, has been reworded to clarify the intent for the all engines operating short landing distance. Note that there is no 1000 ft/min limit on rate of descent (see para 2.5).

2.3 All Engines Operating Baulked Landing Climb

This requirement differs from 25.119 by requiring that the power available 5 seconds (instead of 8 seconds) after initiation of power control movement from flight idle be used to establish the climb gradient. This reflects the need for rapid power availability in the event of a go-around. The minimum and maximum values of the climb speed have also been specified to ensure adequate handling characteristics in the go-around.

2.4 One Engine Inoperative Approach Climb

This differs from 25.121(d), by specifying the minimum and maximum values of climb speed. In particular the maximum value is now 1.3 V_S (instead of 1.5 V_S). This ensures that the speed change associated with a go-around from an all engines steep approach, following an engine failure, is kept to a reasonable minimum.

2.5 Controllability and Manoeuverability

These requirements are intended to ensure adequate controllability and manoeuverability consistent with the requirements of FAR 25. In particular the requirements deal with approach angles greater than and less than the selected angle, speeds lower than V_{REF}, engine failures on approach and minimum manoeuvring capability prior to stall warning. It is considered that these requirements adequately address handling concerns associated with steep approaches and there is no need to arbitrarily impose a 1000 ft/min limit on the rate of descent.

2.6 One Engine Inoperative Short Landing Distance

This requirement is for aircraft which are capable of an one engine inoperative steep approach and compliance is optional. As well as meeting the Special Conditions the aircraft must comply with the workload aspects of the Minimum Flight Crew requirements of FAR 25.1523. It appears unlikely that a two engined aircraft similar to those evaluated by Transport Canada to date, would be capable of compliance.

In this case, following an engine failure enroute the operator will have to use the conventional one engine operative landing distance information.

2.7 Performance Data Extrapolation

The limits for performance data extrapolation are commensurate with Transport Canada experience and take into account aspects such as temperatures greater than ISA, tailwinds up to 10 knots and the flight testing at angles ± 2 degrees from the selected approach path angle.

2.8 Flight Manual

The Flight Manual requirements reflect FAR 25 and Transport Canada requirements. It should be noted that, subject to demonstrated compliance with FAR 25.1523, airworthiness approval may be granted for various types of operation, i.e.

(a) visual guidance system, VFR;

(b) instrument guidance system, manually flown approach; IFR

(c) instrument guidance system, coupled appraoch, IFR.

Special Condition SCA No. 94-12, Operation on Narrow Runways	
APPLICABILITY:	DHC-8-401, DHC-8-402
REQUIREMENTS:	FAR 25.149(e), 25.107, FAR 25.109, FAR 25.111, FAR 25.113
ADVISORY MATERIAL:	N/A

Transport Canada Safety and Security
Transports Canada Sécurité et sûreté

File: 5010-A366
5010-A408
Airworthiness Manual File: 5009-6-525
SCA: 94-12
Date: 28 December 1994

Special Conditions - Airworthiness (SCA)

This Special Condition is issued pursuant to Canadian Aviation Regulations 511 with respect to the standards of airworthiness upon which the type certificate will be granted by the Minister for:

De Havilland DHC-8 100/200/300 Series Aeroplanes

Operation On Narrow Runways

1. **General**

The basic airworthiness standards for the design type approval of the de Havilland DHC-8 100/200/300 series aeroplanes is Federal Aviation Regulations Part 25 up to and including amendment 25-66. The performance and handling characteristics requirements contained in the cited standards are not considered adequate for airworthiness approval of aeroplane operation on narrow runways.

This Special Condition contains the additional airworthiness requirements that the Minister considers necessary for the design type approval of the De Havilland DHC-8 100/200/300 series aeroplanes for operation on narrow hard surfaced runways.

Additional requirements for the approval of operation on narrow gravel surfaced runways are presented in Annex A.

According to Chapter 511 of the Canadian Airworthiness Manual, this Special Condition is part of the Type Approval Basis of the aeroplane.

2. **Background**

2.1 *Definition of a Narrow Runway.*

ICAO Annex 14, Volume 1, Aerodrome Design and Operations, Chapter 1.3 defines an aerodrome reference code depending on aeroplane performance (reference field length, which is defined as the minimum field length required for take-off at maximum take-off weight, sea level, ISA, zero wind and zero runway slope) and aeroplane physical dimensions (wing span and distance between outside edges of the main gear wheels). For the DHC-8-100/200/300 series of aeroplanes, the aerodrome reference code is Code Number 2, Code Letter C. Chapter 3.1.9 contains the recommended runway width as a function of Code Number and Code Letter. For the DHC-8-100/200/300 series, the recommended minimum width is 30 m (98 ft).

Transport Canada publication TP 312E, Aerodrome Standards and Recommended Practices, contains the same methodology as the ICAO document. The recommended minimum width for the DHC-8 100/200/300 series is 30 m (98 ft).

FAR Advisory Circular 150/5300-12, Airport Design Standards - Transport Airports, Chapter 3, paragraphs 14 and 16 relate the runway width to an Airplane Design Group classification (which depends on wingspan) and maximum take-off weight. For the DHC-8-100/200/300 series of aeroplanes, the minimum runway width is 100 ft.

All of the above standards are aerodrome design standards relating the required width of runway to the type of aeroplane which will use the runway. Although not specifically noted in the standards, it is assumed that the aeroplane performance and handling characteristics requirements contained in the basic airworthiness code are appropriate to the specified minimum width. For runways which are narrower than this minimum width, it has therefore been determined that the existing requirements are not adequate and Special Conditions are appropriate. For the DHC-8-100/200/300 series of aeroplanes, these conditions are applicable for runway widths less than 100 ft.

2.2 *Previous Requirements.*

No existing or previous airworthiness requirements or advisory material have been identified with the exception of proposed Air Navigation Orders put forward by the Australian Department of Aviation (DOA). These proposed ANOs were intended to be used to establish the minimum width of runway for each aeroplane type. The minimum width would be specified in the Aeroplane Flight Manual. The proposal was published in 1986 and was used for Australian DOA approval of some Canadian aeroplanes; however it is not known whether the proposal was ever adopted as a rule.

The Australian proposed requirements have not been adopted by the JAA, FAA or TC. That is, there are no specific requirements or test procedures in current regulations to determine the minimum width of runway for each type of aeroplane. It is considered that the existing requirements are adequate to ensure a satisfactory safety level when operating to the minimum width specified in the aerodrome design standards.

The proposed Australian DOA requirements have been used as a basis for these Special Conditions for certification on runways which are narrower than those specified in the aerodrome design standards.

3. Airworthiness Requirements.

3.1 *Minimum Runway Width*:

The minimum runway width is that which is sufficient to allow the aeroplane to be safely controllable during take-off and landing using procedures which can be consistently executed in service by crews of average skill. The width shall be sufficient to prevent any landing gear wheel leaving the runway during take-off and landing in expected operating conditions, including sudden engine failure.

3.2 *Determination of Minimum Runway Width:*

The minimum runway width W, is the greater of the following:

W = 2* ((0.5*T) + M + D take-off); or

W = 2* ((0.5*T) + D land)

where:

W = minimum runway width;

T = distance between outside edges of the main gear wheels;

M = misalignment distance of the nosewheel with the centre of the runway at start of take-off and during the take-off ground roll. It is the greater of the following:

(a) The value demonstrated during test on a representative narrow runway; or

(b) 5 ft for a 100 ft wide runway decreasing linearly to 2.5 ft for a 50 ft runway but not below 2.5 ft for runways less than 50 ft wide.

D take-off = the maximum lateral deviation distance demonstrated in take-off. It is the greater of the following:

(a) Distance "x" used during the determination of VMCG (see para 3.3).

(b) Maximum deviation determined during demonstration of rejected take-off following engine failure at any speed up to and including VMCG.

(c) Maximum ground deviation in a continued take-off or rejected take-off following any probable failure during the take-off ground roll.

(d) Maximum ground deviation determined during a take-off at the maximum crosswind limit with all engines operating.

D land = the maximum lateral deviation demonstrated during landing.

It is the greater of the following:

(a) Maximum deviation during landing at the maximum crosswind limit with all engines operating.

(b) Maximum deviation during landing following sudden engine failure at 200 ft. The nosewheel steering should be disconnected or, at the option of the applicant, the deviation can be determined on a wet runway.

(c) Maximum deviation during landing at the maximum crosswind limits with one engine inoperative if approval of one engine inoperative approaches to narrow runways is requested.

3.3 *Minimum Control Speed on the Ground, VMCG.*

FAR 25.149(e) is amended as follows:

"(e) VMCG, the minimum control speed on the ground, is the calibrated airspeed during the take-off run, at which, when the critical engine is suddenly made inoperative, it is possible to recover control of the airplane with the use of primary aerodynamic controls alone (without the use of nosewheel steering) to enable the take-off to be safely continued using normal piloting skill and rudder control forces not exceeding 150 pounds. In the determination of VMCG, assuming that the path of the airplane accelerating with all engines operating is along the centerline of the runway, its path from the point at which the critical engine is made inoperative to the point at which recovery to a direction parallel to the centerline is completed may not deviate more than a specified distance "x" feet laterally from the centerline at any point. VMCG must be established with:

(1) The airplane in each take-off configuration requested by the applicant or, at the option of the applicant, in the most critical take-off configuration;

(2) Maximum available take-off power or thrust on the operating engines;

(3) The most unfavourable center of gravity;

(4) The airplane trimmed for take-off;

(5) The most unfavourable weight in the range of take-off weights; and

(6) A value of "x" chosen by the applicant but which may not be less than 5 ft."

Note: This requirement is identical to that of FAR 25 except that the deviation of 30 ft is replaced by "x" which may not be less than 5 ft.

De Havilland DHC-8 100/200/300 Series Aeroplanes - Operation On Narrow Runways

3.4 *Directional and Lateral Control.*

It must be possible to safely land on the runway, without undue pilot skill, following a sidestep manoeuvre of 400 ft laterally initiated at a height of 400 ft during a landing approach.

This must be demonstrated with one engine inoperative if approval of one engine inoperative approaches to narrow runways is requested and must consider the most adverse crosswind to be approved for one engine inoperative approach and landing.

3.5 *Take-off Performance.*

The take-off speeds in FAR 25.107, accelerate-stop distance in FAR 25.109, and take-off path in FAR 25.111 (including the take-off distance and take-off run in FAR 25.113) must be determined using an engine failure speed VEF appropriate to VMCG established in para 3.3.

3.6 *Aeroplane Flight Manual (AFM).*

The AFM data for operation on narrow runways must contain:

(a) A statement to the effect that the airworthiness approval of operation on narrow runways does not constitute operational approval;

(b) Limitations including:

(1) Minimum runway width;

(2) Crosswind limitations;

(3) VMCG and the corresponding maximum lateral deviation "x"; and

(4) Any other appropriate limitation (e.g. Nosewheel steering must be operative);

(c) Emergency, Abnormal and Normal Procedures as appropriate; and

SCA 94-12

(d) Take-off performance predicated on a VEF appropriate to VMCG.

Maher Khouzam
Chief, Airworthiness Standards
Airworthiness Branch

Annex A

Additional Airworthiness Requirements For Operation On Narrow Gravel Surfaced Runways

A1. ***General.***

This Annex provides airworthiness requirements for the approval of De Havilland DHC-8 100/200/300 series aeroplanes for operation on narrow gravel surfaced runways.

The requirements of this Annex are in addition to the applicable standards of this Special Condition.

A2. ***Surface Definition.***

Each type of surface must be defined so that it can be recognised during in-service operations. The identification must include specification of all characteristics of the surface necessary for safe operation, such as:

(1) Surface and sub-base bearing strength, expressed as a "California Bearing Ratio" (CBR), or other accepted runway strength classification system;

(2) Aggregate size and depth of the surface material;

(3) Presence, or otherwise, of rutting; and

(4) Presence, or otherwise, of surface vegetation.

A3. ***Aeroplane Handling.***

The aeroplane's handling characteristics must meet the appropriate airworthiness requirements at each weight and c.g. and in each configuration to be approved for operation on a narrow gravel runway. Any special procedures or techniques associated with gravel runway operations such as use of propeller reverse, brakes, and nosewheel steering must be identified.

A4. Aeroplane Performance

A4.1 *General.* If special equipment (such as shields and deflectors) or special procedures are required, the effect of such equipment or procedures on aeroplane performance must be determined and accounted for in the scheduled performance.

A4.2 *Take-off, Landing and Accelerate-Stop Performance.* Take-off, landing and accelerate-stop performance must be determined for each type of runway surface for which approval is requested.

The test runways should be chosen to be representative of the worst characteristics (i.e. high rolling friction, low braking friction) of each type of runway for which approval is sought. In this regard it is not sufficient to conduct tests from a runway with low CBR. Previous work has shown that rolling friction is a function of (among other things) CBR, but that braking friction is more a function of runway surface characteristics and largely independent of CBR. Account should also be taken for other variables such as aeroplane weight and recommended tire pressure.

The take-off speeds in FAR 25.107, accelerate-stop distance in FAR 25.109, and take-off path in FAR 25.111 (including the take-off distance and take-off run in FAR 25.113) must be determined using an engine failure speed VEF appropriate to VMCG established in Section 3.3.

A4.3 *Climb Performance.* Climb performance must be scheduled to account for aeroplane configurations, and the effects of any special equipment.

A5. Systems

It shall be demonstrated that systems whose functioning may be affected by operation from unpaved runways (e.g. anti-skid, nose-wheel steering) continue to perform their intended function under all conditions for which approval is requested. It must be determined that the aeroplane can be operated on each defined surface without hazard from likely impingement or engine ingestion of gravel or other surface material. In demonstrating that there is no hazard, consideration should be given to immediate effects, such as mechanical damage and to longer term effects such as accumulations of loose runway material in areas where they could cause jamming of flight controls, prevent configuration changes or cause blockage of cooling ducts or drains.

It shall be shown that any special equipment such as gravel deflectors or low pressure tires do not adversely affect the previously established water spray and ingestion characteristics of the aeroplane.

A6. Maintenance

The instructions for Continued Airworthiness, as required by Canadian Airworthiness Manual, Chapter 525, Appendix H, should provide for any maintenance procedures such as increased frequency of inspection, or increased factors for calculating replacement life.

A7. Aeroplane Flight Manual

The AFM data for operation on narrow gravel runways must contain:

(a) A statement to the effect that the airworthiness approval of operation on narrow gravel surfaced runways does not constitute operational approval;

(b) Limitations including:

(1) Minimum runway width;

(2) Crosswind limitations;

(3) VMCG and the corresponding maximum lateral deviation "x", as established in Section 3.3;

(4) Approved aeroplane configurations including any special equipment required;

(5) Runway surfaces specified under Section A2. on which the aeroplane has been approved to operate and for which suitable performance data has been determined and scheduled according to para A4.2;

(6) Appropriate weight and c.g. limitations;

(7) Systems limitations; and

(8) Any other appropriate limitation (e.g. Nosewheel steering must be operative).

(c) Emergency, Abnormal and Normal Procedures as appropriate; and

(d) The Performance Section shall include performance determined and approved under para A4.2 and shall account for any special procedures required. Take-off performance must be predicated on a VEF appropriate to VMCG.

CRI F-17 DEV: ADS-B Out	
APPLICABILITY:	DHC-8-401, DHC-8-402
REQUIREMENTS:	CS.ACNS.D.EL.045, CS.ACNS.D.ADSB.105, Commission Implementing Regulation (EU) No. 1027/2011
ADVISORY MATERIAL:	N/A

Based on the background on the main intent of CS.ACNS, the Applicant should provide the following items to meet the intent of CS.ACNS.D.EL.045 and CS.ACNS.D.ADSB.105

- Provide a qualitative safety assessment of the transponder system which demonstrates that the “Fail Safe Design Principles” of CS 25.1309 are met with respect to the continuity of function using the “remote” definition of CS.ACNS.D.EL.045 and CS.ACSN.D.ADSB.105
- Provide a quantitative safety assessment of the transponder system which demonstrates that the values of Commission Implementing Regulation (EU) No 1027/2011 are adequately met

Acronyms and Abbreviations

TCDS	Type Certificate Data Sheet
SC	Special Condition
DEV	Deviation
ESF	Equivalent Safety Finding

– END –