



Federal Aviation Administration

Memorandum

Date: 9/25/2017

To: John S. Duncan, Executive Director, Flight Standards Service, AFX-1
Dorenda D. Baker, Executive Director, Aircraft Certification Service, AIR-1
Lorelei Peter, Assistant Chief Counsel, AGC-200

From: Leisha Bell, Chair, Regulatory Consistency Communication Board (RCCB)

Subject: RCCB Decision: DC-3 Aircraft Category and Flight Data Recorder Requirement

Action Required

Concur or non-concur with comment on the resolutions facilitated by the Regulatory Consistency Communication Board (RCCB).

This memo will serve as documentation of the resolution of the issues described below.

Summary

The FAA's Flight Standards Service (AFS) and Aircraft Certification Service (AIR) are aware of at least two requests in the last five years for clarification on whether a Boeing (Douglas) DC-3 modified with a turbine engine conversion via a Supplemental Type Certificate (STC) is subject to the Flight Data Recorder (FDR) requirements of Title 14 Code of Federal Regulations (CFR) section 125.226. On March 22, 2017, AFX-1 and AIR-1 referred this issue to the RCCB to facilitate a resolution.

In order to address this issue AFS and AIR identified key questions relevant to the resolution of the issue. These questions were:

1. Is the DC-3 a transport category aircraft?
2. Is modification of a DC-3 from piston to turbine power by STC basis for a change in the aircraft category listed on the Type Certificate (TC)?
3. Is a DC-3 modified from piston to turbine power by STC subject to the FDR requirements outlined in § 125.226?

This memo outlines the actions taken by AFS and AIR as a direct result of the questions above.

Background

A review of documents including existing guidance, exemption history, and internal memos has shown inconsistency in the agency's determination of whether the DC-3 is subject to the requirements of § 125.226.

In the most recent example, the holder of a part 125 certificate petitioned the local Flight Standards District Office (FSDO) to add a DC-3, Type Certificate Data Sheet (TCDS) 669, to its operating certificate. This DC-3 was modified by STC SA3820SW, which is a turbine engine conversion.

To support this request, the local FSDO requested clarification via memo, "on [the] applicability of 14 CFR 125.225 and 125.226 as it applies to Douglas DC-3", on January 27, 2017. This memo highlighted the inconsistent application of §125.226.

On March 3, 2017, the AFS regional office responded to the FSDO. The response memo acknowledged the original certification basis of the DC-3 as Aero Bulletin 7A. The memo further stated that because this particular aircraft's type design had been drastically altered with the incorporation of STC SA3820SW, the aircraft's category must change from Aero Bulletin 7A to transport.

The aircraft owner reached out the FAA General Aviation and Commercial Division (AFS-830) for assistance and clarification when they became aware of the response memo.

AFX-1 and AIR-1 asked that resolution of these issues be facilitated by the RCCB. Multiple telecoms were held between March 30, 2017, and May 11, 2017, with AFS, AIR, and Office of the Chief Counsel (AGC) personnel to discuss these issues. Stakeholders represented included the General Aviation and Commercial Division, AFS-800; the Aircraft Maintenance Division, AFS-300; Design, Manufacturing, and Airworthiness Division, AIR-100; Assistant Chief Counsel, Regulations, AGC-200; and AFX-1, Office of Executive Director.

The RCCB determined that the primary factor contributing to this issue was whether the DC-3 is a transport category aircraft.

Actions Taken

The RCCB addressed the following three key questions relevant to the resolution of whether the DC-3 must equip with a flight data recorder.

Question 1: Is the DC-3 a transport category aircraft?

AIR formally responded to the question of whether the DC-3 is a transport category airplane.

In a May 5, 2017, memorandum the Design, Manufacturing, and Airworthiness Division (AIR-100) stated the DC-3 series aircraft at present have three different TCs. They are the A-618, A-669, and the 6A2. The specific DC-3 aircraft category was established during the original certification project and is given on the appropriate Type Certificate Data Sheet (TCDS).

TCDS A-618 and A-669 list the certification basis as Aero Bulletin 7A. Airplanes with a certification basis of Aero Bulletin 7A are classified as normal category.

Only the DC-3 aircraft model numbers as shown on TCDS 6A2- Super DC-3, R4D-8, and R4D-8Z are classified as transport category aircraft.

All other aircraft models as shown on the Boeing (Douglas) TCDS A-618 and A-669 are classified as normal category.

The May 5, 2017, memorandum is consistent with previously issued documents from AIR identifying the DC-3 as normal category. The “Certification of Modified Douglas Model DC-3 Airplanes” article in the August 1, 1991, edition of the *Designee Newsletter, Transport Airplane Directorate* provides a good overview of the history of the DC-3.

In light of this analysis, if the owner of a DC-3 with TCDS A-618 or A-669 has an airworthiness certificate with “Transport” in the category block, they may request a replacement certificate from their local FAA office. FAA Order 8130.2H, Airworthiness Certification of Products and Articles, states “[t]he FAA may issue a replacement airworthiness certificate when a certificate is declared lost, has been mutilated, is no longer legible, or contains inaccurate and/or erroneous information[.]” See Section 2, paragraph 217, Replacement, Exchange, or Amendment of Airworthiness Certificates.

Question 2: Is modification of a DC-3 from piston to turbine power by STC a basis for a change in the aircraft category listed on the TC?

The DC-3 was originally designed and certificated on the basis of airworthiness standards in effect prior to 1940. These were contained in Bulletin 7A. Subsequently, the Civil Aeronautics Board (CAB) issued newer airworthiness requirements in parts 3, 4a, and 4b of the Civil Air Regulations, the latter two parts containing rules for transport category airplanes. When those rules were issued, the DC-3s were one of the few large airplane types in general use which retained the old standards as a basis for their certification.

Several operators started making design changes in DC-3 airplanes such as the installation of higher-powered engines and increases in maximum certificated weights. Although the basis for certification of these airplanes remained unchanged, the CAB in some instances determined that certain provisions of the newer transport aircraft standards for the design changes were necessary to maintain an adequate level of safety. The CAB adopted Special Civil Air Regulation (CAR) SR-398, to establish the certification basis for most future design changes to the DC-3, which required using the transport category standards in CAR 4b. Special CAR SR-398 was superseded by Special Federal Aviation Regulation (SFAR) No. 13 and this SFAR remains in effect. In general, the SFAR requires most modifications of DC-3s be accomplished under the transport category requirements. Because of this rule, STCs for the DC-3 may state that the certification basis for the change meets the airworthiness requirements of CAR 4b or part 25, which provides the current airworthiness standards for transport category airplanes.

Some operating and equipment requirements of 14 CFR apply based upon the category of the aircraft. For example, a restricted category aircraft may only be used to accomplish the work activity directly associated with the special purpose for which it is certificated (14 CFR 91.313); a transport category airplane must be equipped with an aural speed warning device (14 CFR 91.603).

Most DC-3s have had several STCs applied to them. Because those STCs state that the change meets the transport category airworthiness requirements, some within the FAA assume that the 14 CFR transport category operating and equipment requirements apply to the DC-3. This is incorrect. If a design change was proposed for the DC-3 that would change the certification from normal to transport, the FAA would require a model change; it would no longer be a DC-3. AIR confirmed this in their May 5, 2017, memo, which stated, “[the] classification [of the DC-3] remains the same regardless of the aircraft engine configuration (turbine) as approved by Supplement[al] Type Certification (STC) SA3820SW.” This STC allows for the installation of Pratt & Whitney Canada PT6A-65AR or PT6A-67R engines on DC-3 aircraft with a TCDS A-669.

While discussing this issue the question of how much of a DC-3 could be modified before a change to the TC would be required came up. The FAA weighs the significance of each individual change when making this decision, and considers the cumulative effect of previous relevant design changes. A product level change is a change or combination of changes that makes the product distinct from the existing product. FAA Order 8110.48, *How to Establish the Certification Basis for Changed Aeronautical Products*, typically requires a model designation change for a significant product level change. If the STCs applied to the DC-3 resulted in the airplane changing to the transport category it would no longer be a DC-3. A model designation change would be required.

Question 3: Is a DC-3 modified from piston to turbine power by STC subject to the FDR requirements outlined in § 125.226?

No.

Per the discussion above pertaining to the certification basis for the DC-3, a modification from piston to turbine power is not a basis for a change to transport category on the airworthiness certificate.

Section 125.226 requires turbine-engine-powered transport category airplanes operated under part 125 to be equipped with digital flight data recorders.¹ The requirements of § 125.226 do not apply because the DC-3 was not type certificated as a transport category aircraft. So, a DC-3 with TCDS A-669, modified by STC SA3820SW, is not subject to the requirements of

¹ Section 125.226 states, in pertinent part, “Except as provided in paragraph (l) of this section, no person may operate under this part a turbine-engine-powered transport category airplane unless it is equipped with one or more approved flight recorders that use a digital method of recording and storing data and a method of readily retrieving that data from the storage medium...”. Paragraph (l) identifies specific airplanes that do not need to comply with § 125.226. The DC-3 is not on this list.

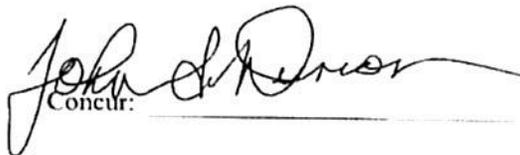
§ 125.226. Additionally, a DC-3 does not meet the applicability requirements of § 125.225, which preceded § 125.226, as the aircraft was not originally type certificated for operations above 25,000 feet or as a multiengine turbine powered airplane.

Although the agency has not taken a consistent approach with respect to the application of the requirements for a flight data recorder (e.g., the agency issued a 2010 exemption denial stating that a DC-3 with an Aero Bulletin 7A type certification basis is a transport category aircraft), as a result of the RCCB efforts and analysis, the agency took the actions described in the following paragraph to ensure a consistent approach going forward.

To support the agency and individuals that operate DC-3 aircraft, AFS and AIR are updating numerous guidance documents to clarify the FDR requirements. Specifically, AFS has amended the Flight Standards Information Management System volume 4, chapter 3, section 1, paragraph 4-487 D and 4-488 A, and volume 4, chapter 14, section 8, paragraph 4-1528 B. Additionally, AIR is reviewing AC 20-141, Airworthiness and Operational Approval of Digital Flight Data Recorder Systems, Appendix 3 for possible amendments.

Attachments:

- Memo Certification Basis for DC-3 Aircraft
- Designee Newsletter, Transport Airplane Directorate
- Supplemental Type Certificate SA3820SW

Concur: 

Concur: 

Non-Concur: _____

Non-Concur: _____

Date: 9/15/17

Date: 9/25/17

John S. Duncan
Executive Director, Flight Standards
Service

Dorenda D. Baker
Executive Director, Aircraft Certification
Service

Concur: 

Non-Concur: _____

Date: 9/1/17

Lorelei Peter
Assistant Chief Counsel



Federal Aviation Administration

Memorandum

Date: **MAY 05 2017**

To: Manager, Aircraft Maintenance Division, AFS-300
Manager, General and Commercial Aviation Division, AFS-800

From: *for* Susan J. M. Cabler, Manager, Design, Manufacturing & Airworthiness Division, AIR-100
Mark Hill

Prepared by: Dan Elgas, AIR-110

Subject: Certification Basis for DC-3 Aircraft

The Boeing (Douglas) DC-3 series of aircraft at present have three different Type Certificates (TC). These type certificates are as follows: A-618 approved its first model on September 20, 1937; A-669 approved its first model on May 1, 1939; and 6A2 approved its first model on July 24, 1950. The specific DC-3 aircraft category was established during the original certification project and is given on the appropriate Type Certificate Data Sheet (TCDS). Of historical interest, the TCDS's for the DC-3 series aircraft are called "Aircraft Specifications" not Type Certificate Data Sheets.

Aircraft Specification (TCDS), A-618, lists the certification basis as Aero Bulletin 7A. Airplanes with a certification basis of Aero Bulletin 7A are classified as "Standard Category."

Aircraft Specification (TCDS), A-669 lists the certification basis as Aero Bulletin 7A.

Aircraft Specification (TCDS), 6A2 lists the certification basis as Transport Category, CAR 4b as amended October 1, 1949.

Only the Boeing (Douglas) aircraft model numbers as shown on TCDS 6A2 - Super DC-3, R4D- 8 and R4D-8Z are classified as "Transport Category" aircraft.

All other aircraft models as shown on Boeing (Douglas) TCDS A-618 and A-669 are classified as "Standard Category." The FAA Aircraft Certification Service continues to acknowledge the non-transport category status of the DC-3's (except for the Super DC-3).

This classification remains the same regardless of the aircraft engine configuration (turbine) as approved by Supplement Type Certificate (STC) SA3820SW.

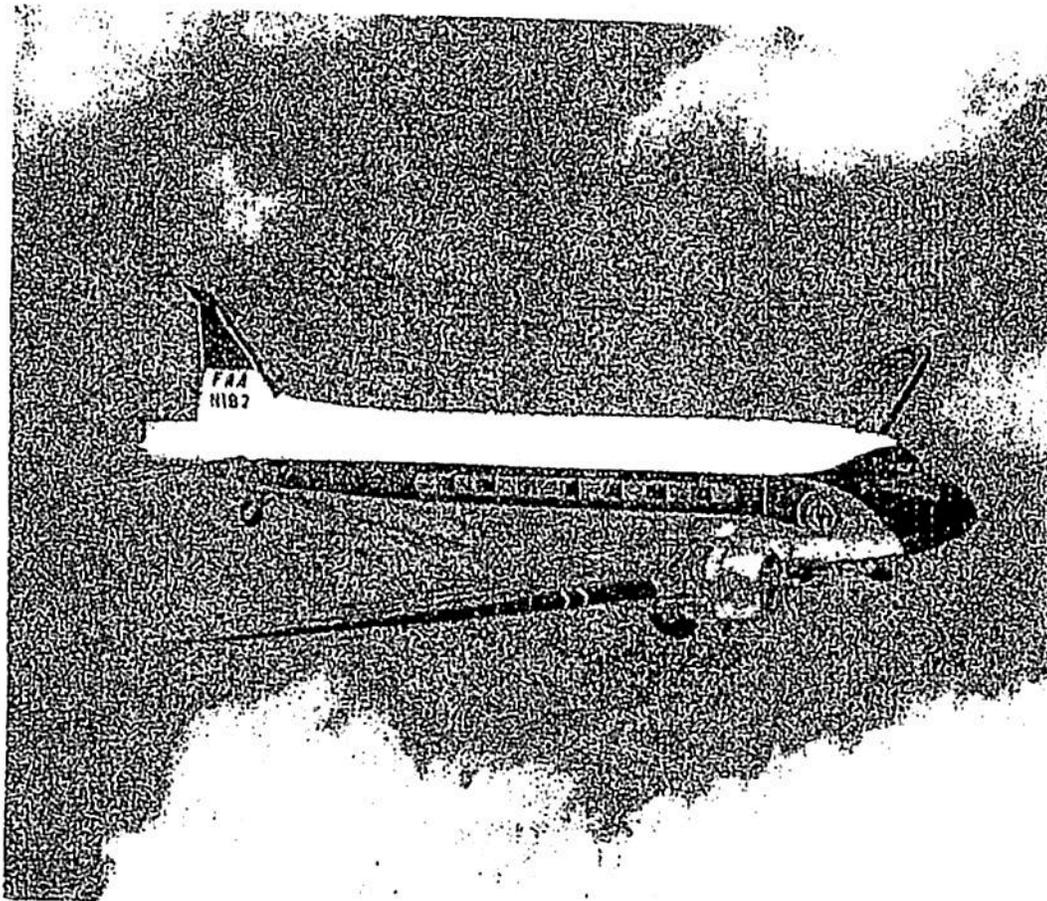


U. S. Department
of Transportation
Federal Aviation
Administration

DESIGNEE NEWSLETTER

Transport Airplane Directorate

Aircraft Certification Service; Northwest Mountain Region
Edition 12, August 1, 1991



Douglas Model DC-3

See article inside on p. 17...

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The purpose of The Designee Newsletter is to provide designees with the latest information concerning regulations, guidance material, policy and procedures changes, and personnel activities involving the certification work accomplished within the Transport Airplane Directorate's jurisdictional area. Although the information is the latest available at press time, it should not be considered "authority approved" unless specifically stated; neither does it replace any previously approved manuals, special conditions, alternative means, or other materials/documents. If you are in doubt about the status any of the information addressed, please contact your cognizant Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), or other appropriate FAA office.

- to re-establish the geographic boundaries for the SACO to make them consistent with the boundaries of the Northwest Mountain Region;
- to eliminate the confusion that continues to exist at the Salt Lake City Flight Standards District Office (FSDO); and
- in response to applicants' concerns last summer during an organizational study conducted in Denver.

In addition to this realignment of boundaries, the organizational title of the Seattle ACO's Aircraft Modification Branch (ANM-190S) will be changed to the "Special Certification Branch," and the title of the Special Certification Section (ANM-191S) will be changed to the "Aircraft Modifications Section." This change is intended to reduce the misconception that the Modification Branch only deals with modifications to small aircraft when, in fact, the Branch and the ACFO's manage type certificates and handle transport category airplane projects as well.

The Seattle Manufacturing Inspection District Office (MIDO) will continue to provide certificate management support for Production Approval Holders in the state of Colorado. Support for Production Approval Holders in the state of Utah will remain with the Phoenix Manufacturing Inspection Satellite Office (MISO).

Any questions regarding these changes may be directed to the Special Certification Branch, ANM-190S, at (206) 227-2594; the Denver Aircraft Certification Field Office, ANM-191D, at (303) 393-0839; or the Anchorage Aircraft Certification Field Office, ANM-191A, at (907) 271-2668.

Certification of Modified Douglas Model DC-3 Airplanes

There has recently been confusion concerning the type certification basis for modified Douglas Model DC-3 series airplanes. Except for the Super DC-3s, which were type certificated in 1950 under Type Certificate 6A2, none of the DC-3 series airplanes are transport category airplanes. [See cover photo.]

The DC-3 series and the corresponding DST series were first type certificated in 1936 under the prevailing airworthiness standards of Aeronautics Bulletin 7-A. (The DST series differed from their DC-3 counterparts by having sleeper interiors.) There were a number of type certificates for the various DC-3/DST series originally; however, they were later consolidated in two type certificates. The Wright-powered DC-3 series, DC-3B series and DST series are covered by Type Certificate 618, and the Pratt & Whitney-powered DC-3A series, DC-3C series, DC-3D series and DSTA series are covered by Type Certificate 669. Since this was before the time the concept of separate standards for air carrier and general aviation airplanes was adopted, the DC-3's were simply type certificated in the "standard category."

At the end of World War II, it was recognized that the standards under which the DC-3's were originally type certificated did not provide an adequate level of safety. A number of improvements were, therefore, required by airworthiness directives.

During the late 1940's, Douglas elected to make a number of modifications to the DC-3s to improve their usefulness. These included new outer wing panels, a fuselage stretch

ahead of the wing and an increase in power. Under a predecessor of Section 21.19 of the Federal Aviation Regulations (FAR), Douglas was required to apply for a new type certificate and comply with the then current provisions of Part 4b of the Civil Air Regulations (CAR). The Super DC-3's, as these modified airplanes are designated, are transport category airplanes. Surplus military R4D-8's or R4D-8Z's are also eligible for certification as transport category airplanes under this type certificate.

During this period, others were making or proposing significant modifications to DC-3 series and Lockheed 18 Lodestar airplanes. Although those modifications were not so extensive as to require applications for new type certificates, it was recognized that they were so extensive that the original certification basis would no longer provide an adequate level of safety. Accordingly, Special Civil Air Regulation SR-398 was adopted to require DC-3's and Lodestars with certain increases in power or weight to comply with portions of either Part 4a or Part 4b of the CAR. SR-398 was superseded with SR-407 which, in turn, was recodified as Special Federal Aviation Regulation (SFAR) 13.

Part 121 of the FAR, as well as predecessor regulations, makes a distinction in performance requirements for transport category reciprocating-powered airplanes (Sections 121.175 - 121.187) from those for non-transport category airplanes (Sections 121.199 - 121.205). As noted in Aircraft Specifications A-618 and A-669, DC-3's that have not been modified under SR-407 must be operated as non-transport category airplanes. Those that have been so modified are considered to be transport category airplanes insofar as the performance requirements of Part 121 are concerned.

They have never been considered to be transport category airplanes in general and, indeed, fail to meet the transport category standards of Part 4a or Part 4b in many areas. Two such areas are stability and controllability. Douglas, in fact, went through several empennage redesign efforts before the Super DC-3 was capable of meeting those transport category standards.

The FAA has acknowledged the non-transport category status of DC-3's (except of course for Super DC-3's) on numerous occasions over the past 40 years. One example in particular is the preamble to the rulemaking that requires the installation of weather radar. In that document, the FAA notes that the DC-3's do not have to comply because they are not "transport category."

Because of the areas of non-compliance with the transport category standards of Part 4a or Part 4b, DC-3's other than Super DC-3's should never be considered to be transport category airplanes.

In determining the type certification basis for modified DC-3's, the following should be considered. Under current FAA policy, as outlined in FAA Action Notice A8110.23 entitled, "Procedures for Establishing the Type Certification Basis for Derivative Aviation Products," [see article on p. 33 of this edition...] there should be a starting assumption that the airplane will be required to comply with current Part 25 of the FAR in all areas affected by the modification.

If that is determined to be inappropriate for a reason or reasons outlined in the Action Notice, the following will be considered in accordance with Section 21.101 of the FAR:

For DC-3's, other than Super DC-3's:

- The requirements of Aeronautics Bulletin 7-A.
- The superseding requirements of any Airworthiness Directives applicable to DC-3's.
- Any requirements of Part 4a or Part 4b of the CAR made applicable by SFAR 13 and the change involved.
- In the case of modifications for which the above do not provide adequate standards, e.g. the installation of turbopropeller engines, the modified airplane must also meet the standards of current Part 25 that are needed to provide an adequate level of safety in accordance with Section 21.101(b). Note that Section 21.101(c) is not applicable to DC-3's, other than Super DC-3's, because they are not transport category.

NOTE: It is not anticipated that applications will be received for approval of modified Lockheed Lodestars; however, the above criteria would apply to those airplanes as well.

For Super DC-3's, R4D-8's and R4D-8Z's:

The certification basis for modified Super DC-3's or their military surplus equivalents is more straightforward. In accordance with Section 21.101(a), it will include Part 4b. If there are modifications for which Part 4b does not provide adequate standards, the modified airplanes must also comply with the standards of current Part 25 that are needed to provide an adequate level of safety. If the change is to turbopropeller engines, the modified airplanes must also comply with the Part 25 standards specified in Section 21.101(c).

Modified Super DC-3's, R4D-8's and R4D-8Z's must also meet the noise certification requirements of Part 36 of the FAR for large transport category airplanes. Questions concerning the noise certification requirements, if any, for large, non-transport category airplanes such as the other DC-3's should be referred to your cognizant FAA office.

Software Certification's Long Journey
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When software was first introduced to the aviation community, it followed the same rocky road that non-aviation systems encountered: cost overruns, schedule overruns, and bizarre failure manifestations -- all systems didn't fail this way but some did. Analysis of successful systems and failed systems gave birth to a more organized approach to software development. This approach was labeled "*Structured Software Development*," and included extensive documentation conventions (a semi-formal definition of the software development process) and various improvements in design and coding techniques (e.g., go-to-less programming, structured system analysis, information hiding, higher order languages). When properly applied, these new techniques appeared to produce noticeably higher integrity software.

The aviation manufacturing and regulatory industry formed a Radio Technical Commission for Aeronautics (RTCA) committee to provide standards for developing and certifying software. This standard was delivered in November 1981 as RTCA Document DO-178, "*Software*

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number

SA3820SW 190-2404
PWH

This certificate, issued to

Greenwich Aircraft Corporation
7727 Airport Road
Waco, Texas 76708

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 4b of the Civil Aviation Regulations and Part 25 of the Federal Aviation Regulations

Original Product — Type Certificate Number:

A-669

Make:

McDonnell-Douglas

Model:

DC3C-SC3G, -S1C3G, -S4C4G, -R-1830-90C

Description of Type Design Change:

Installation of Pratt & Whitney Canada PT6A-65AR or PT6A-67R engines. Modified in accordance with Drawing List SA-DL1-DC3, Rev. M, dated 9/03/93, with E.O. No. B-1, dated 9/03/93 for Dwg.No. 71-70-00, and Teleflex Drawing List SK-4923-0, dated 4/9/87, or later FAA approved revisions.

Limitations and Conditions:

The following Airplane Flight Manual or later FAA Approved Revisions are required as appropriate:
FAA Approved Airplane Flight Manual (AFM) dated 8/4/87, with Change 3, dated 12/14/93, when the airplane is modified in accordance with Drawing List SA-DL1-DC3, Rev. M, dated 9/03/93.
See continuation sheet

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: July 18, 1985

Date received: 07/23/93, 9/15/93

Date of issuance: August 4, 1987

Date amended: 12/22/87, 7/27/89, 12/14/93
Rev. 3

By direction of the Administrator



for 
(Signature)

Mark R. Schilling, Manager
Special Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

United States of America
 Department of Transportation—Federal Aviation Administration
Supplemental Type Certificate
 (Continuation Sheet)

Number SA3820SW

Limitations and Conditions:

The conditions & limitations of Aircraft Specification No. A-669 apply except as follows:

This specification, which is a part of Supplemental Type Certificate No. SA3820SW, prescribes conditions and limitations under which the product for which the Supplemental Type Certificate was issued meets the airworthiness requirements of the Civil Air Regulations. A copy of this Supplemental Type Certificate Specification shall be maintained as part of the modified aircraft's permanent records.

Supplemental Type Certificate Holder	GREENWICH AIRCRAFT CORPORATION 7727 Airport Road Waco, Texas 76708
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Model: DC3C-SC3G, -S1C3G, -S4C4G, -R-1830-90C

Engine: 2 Pratt & Whitney Canada PT6A-65AR, or
2 Pratt & Whitney Canada PT6A-67R

Fuel: Pratt & Whitney of Canada Service Bulletin 13044 (See NOTE 9)

Oil: Pratt & Whitney of Canada Service Bulletin 130001 (See NOTE 10)

Engine Limits	Ratings
Takeoff (5 min)	
Shaft horsepower	1230
Maximum continuous at sea level	
Shaft horsepower	1165

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

United States of America
 Department of Transportation—Federal Aviation Administration
Supplemental Type Certificate
 (Continuation Sheet)

Number SA3820SW

Limitations and Conditions:

The engine ratings are based on static sea level conditions (No external accessory loads and no airbleed). The PT6A-65AR maximum continuous rating is available to 101 deg F Air Inlet Temperature (AIT) and takeoff rating is available to 84 deg F AIT. The PT6A-67R maximum continuous rating is available to 115 deg F AIT and takeoff rating is available to 99 deg F.

RPM Limits (See NOTE 5)

	Torque lb. ft.	Engine RPM	Ng %	Propeller RPM	Np %
Takeoff (5 min)	3800	39,000	104	1700	100
Maximum Continuous	3600	39,000	104	1700	100
Transient overspeed (See NOTE 5)	5100	39,000	104	1870	110

For propeller ground operation, See NOTE 6.

Inter-Turbine Temperature

Takeoff (5 min)	820 deg C
Max Continuous	820 deg C
Starting transient (5 sec)	1000 deg C

Fuel Pressure

Fuel: Minimum pressure at inlet to the engine fuel system shall not be less than 5 p.s.i. above true vapor pressure of the fuel. For emergency operation, with airframe boost pump inoperative, the inlet pressure must be such that vapor/liquid ratio does not exceed 0.1 for continuous operation and does not exceed 0.3 for more than 10 hours in a pump overhaul life.

Maximum pressure at inlet to fuel system:
50 p.s.i.

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

United States of America
 Department of Transportation—Federal Aviation Administration
Supplemental Type Certificate
 (Continuation Sheet)

Number SA3820SW

Limitations and Conditions:

Maximum	135 psig
Normal	90-135 psig
Minimum	60 psig

Oil Inlet Temperature (See NOTE 8)

Maximum	110 deg C
Minimum for takeoff	0 deg C
Minimum for starting	-40 deg C

Propeller (with PT6A-65AR) 2 Hartzell HC-B5MP-3C/M10876ASK
 Propeller (with PT6A-67R) 2 Hartzell HC-B5MA-3J/M10876ASK
 Propeller limits Diameter 110.7 - 111.2 inches

Pitch settings (42 in. sta.)

Low Pitch	+13 deg +/- .2 deg
Feather	+79 deg +/- .5 deg
Reverse	-11 deg +/- .5 deg

NOTE: Model M10876ASK propeller blades which acquire 48,000 hours total time in service must be retired.

Airspeed Limits

	CAS	
	kts	mph
VMO (maximum operating)	180	207
Va (maneuvering)	112	128
Vlo (landing gear operation)	144	165.5
Vle (landing gear extended)	144	165.5
Vfe (flaps extended 1/4)	135	155.5
Vfe (flaps extended 1/2)	99	114

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

United States of America
Department of Transportation—Federal Aviation Administration
Supplemental Type Certificate
(Continuation Sheet)

Number SA3820SW

Limitations and Conditions:

Gallon.

Oil capacity 1 tank integral with each engine, 2.5
U.S. Gallons

Maximum usable oil, 1.5 U.S. Gallons.

Required Equipment In addition to the pertinent required basic
equipment specified in CAR 4b and FAR 25 (for
the turbopropeller installation) refer to
"Required Equipment List" Section 6 of
Airplane Flight Manual.

This installation requires Goodrich H-2-445
main wheel brakes.

Specification Pertinent to This Model

Datum Fuselage Station "0" (40 inches aft of tip of
nose).

Leveling Means Pins on outside of fuselage at station 390.5 and
411.5 below windows (fore and aft leveling). Pins
in left and right hand center section station 222
(lateral leveling).

Control Surface Elevator up 12 +/- 1/8 inches, down 8 +/- 1/8 in.
(measured from inboard trailing edge of elevator)
Aileron up 13 +/- 1/8 in, down 8 +/- 1/2 in,
(measured from inboard trailing edge of aileron)
Rudder left 18 +/- 1/4 in., right 18 +/- 1/4 in.
(measured from lower trailing edge of rudder)
Elevator trim tab up 9/16 +/- 1/8 in, down
2 1/2 +/- 1/8 inches (measured from inboard
trailing edge of trim tab).

Certification Basis (1) FAR 21 Subpart E - 21.101b
(2) SFAR 13 effective September 10, 1954

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

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This certificate may be transferred in accordance with FAR 21.47.

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United States of America
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Supplemental Type Certificate
(Continuation Sheet)

Number SA3820SW

Limitations and Conditions:

- (3) CAR 4b effective December 31, 1953, except where superseded by FAR 25 requirements.
- (4) FAR 25 sections as amended by Amendments 25-1 through 25-54.
- (5) FAR 36 including Amendments 36-1 through 36-12.
- (6) FAR 27 Fuel Venting and Exhaust Emission requirement for Turbine Powered Airplanes.

NOTE 1

- (a) Current weight and balance report including list of equipment included in certificated weight empty, and loading instructions, must be in each aircraft at the time of original certification and at all times thereafter (except in the case of air carrier operators having an approved weight control system).
- (b) System fuel must be included in the empty weight of the airplane. System fuel is defined as the fuel required to fill the fuel system up to the fuel tank outlet plus the fuel tank unusable fuel quantity. Full oil tank and full hydraulic tank fluids must also be included in the empty weight of the airplane.
- (c) The "unusable fuel" is that amount of fuel in the tanks which is unavailable to the engine under critical flight conditions as defined in FAR 25.959 and may be obtained by taking the difference between the total fuel capacities and "usable" tank capacities shown in this specification. The "unusable fuel" must be included in the empty weight or be suitably accounted for in the airplane weight and balance report.
- (d) The engines utilize fuel only from the nacelle main

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Number SA3820SW

Limitations and Conditions:

tanks.

- (e) A crossfeed system is provided to feed fuel from an opposite nacelle tank to the engine.

NOTE 2 This airplane is approved for Day, Night, VFR, and IFR. Refer to Airplane Flight Manual for limitations and required operating procedures.

NOTE 3 All Airworthiness Directives applicable to FAA Aircraft Specification A-669 also are effective for the DC3C as modified by this STC. The following Airworthiness Directives do not apply to DC3C aircraft modified according to this STC:

43-12-02	Engine Mount Fittings
47-06-07	Fire Ext. Trigger
47-33-02	Cowl Flap Hyd Lines
47-51-12	Carburetor Airscoop
48-05-01	Oil Shutoff Valve 'O' Rings
48-17-01	Fire Prevention Modifications
50-46-01	Oil Tank Standpipe
51-02-01	Ramp Type Door Rework
52-25-01	Vacuum System Rework
56-20-05	Prop Operating Limits
58-08-03	CB Fire Extinguisher System
60-16-03	Geared Rudder Tab
77-10-02	Fire Resistance of Prop Feather

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Limitations and Conditions:

System

Ailerons permanently identified as complying with the balancing procedure of this STC are considered to comply with the aileron balancing procedures specified in AD 41-47-01. The elevator and rudder balance procedures of AD 41-47-01 are still appropriate and required.

- NOTE 4 Airworthiness Directives currently in effect or issued subsequent to the date of this STC, which involve the Pratt & Whitney PT6A-65AR engine or the Hartzell HC-B5MP-3C/M10876B propellers, are applicable to the engines or the propellers installed under this STC, and applicability statement of such Airworthiness Directives notwithstanding.
- NOTE 5 Maximum overspeed limit is as specified for transient overspeed. If these limits are exceeded, consult P&WACL Maintenance Manual No. 3028042, page 604 for disposition of engine or gear reduction box.
- NOTE 6 Ground Operation:
A. Stabilized ground operation below 900 rpm prohibited, except when propeller is feathered operation at or below 400 rpm is permissible.
B. Stabilized ground operation between 1170 and 1400 rpm is prohibited. Taxi between 900 and 1170 rpm in order to keep operation through 1170 to 1400 rpm range to a minimum in cross tail winds.
C. Advance through 1170 - 1400 rpm only after aircraft is lined up with the runway for takeoff.
- NOTE 7 Oil pressure at 75% Ng (27,000 rpm) gas generator speed and above with an oil temperature of 140 to 160 deg F: 105 - 135 p.s.i.g. Below 75% Ng (27,000 rpm) gas generator speeds: 60 p.s.i.g. (min). Extreme cold starts oil pressure may reach 200 p.s.i.

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Limitations and Conditions:

NOTE 8 Oil temperature range continuous from minus 40 deg F (-40 deg C) to 210 deg F (99 deg C).

NOTE 9 APPROVED FUELS

Fuel	Specification
Jet A	ASTM 1655
Jet A-1	ASTM 1655
Jet B	ASTM 1655
JP-4	ASTM 1655 or MIL-T-5624
JP-5	MIL-T-5624
JP-8	MIL-T-83133

The use of aviation gasoline (AVGAS) is not approved. For additional information see P&WACL Service Bulletin No. 13044.

NOTE 10 APPROVED LUBRICATING OILS

Aeroshell Turbine Oil 500	ROYCO TURBINE OIL 500
Mobil Jet Oil II	TURBONYCOIL 525-2A
Mobil Jet Oil 254	Stauffer Jet II
Castrol 5000	Esso/Exxon Turbo oil 2380

Only type II oils conforming to P & WC Service Bulletin No. 13001 are acceptable.

NOTE 11 Fuel anti-icing additives conforming to specifications MIL-I-27686D or MIL-I-27686E may be used, at a concentration not exceeding 0.15% by volume.

NOTE 12 Noise Characteristics: No acoustical change was shown under the provisions of FAR Paragraph 21.93(b). Noise measurements taken in flyover tests have demonstrated that the noise levels of the PT6A-65AR powered aircraft are no noisier than the noise levels of the R-1830 powered aircraft, at their respective maximum

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Limitations and Conditions:

takeoff and landing weights available for a sea level airport at ISA+10 deg C (ISA +18 deg F).

- NOTE 13 The aircraft is approved with the following limitations: "No passengers or cargo may be carried until an FAA approved interior is installed." See FAR 91.47 for maximum passengers when an FAA approved interior is installed, except as allowed under maximum cargo.
- NOTE 14 Engine and airframe certificated operating temperature limits; min. -40 deg C (-40 deg F) to ISA +34 deg C (ISA +61 deg F) maximum.
- NOTE 15 The location of the cockpit has not been evaluated for compatibility with the icing equipment. Any approvals for flight into known icing conditions must be coordinated with the FAA Southwest Region Special Certification Office, Fort Worth, Texas.

END

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INSTRUCTIONS: The transfer endorsement below may be used to notify the appropriate FAA Regional Office of the transfer of this Supplemental Type Certificate.

The FAA will reissue the certificate in the name of the transferee and forward it to him.

TRANSFER ENDORSEMENT

Transfer the ownership of Supplemental Type Certificate Number _____

to *(Name of transferee)* _____

(Address of transferee) _____
(Number and street)

(City, State, and ZIP code)

from *(Name of grantor) (Print or type)* _____

(Address of grantor) _____
(Number and street)

(City, State, and ZIP code)

Extent of Authority (if licensing agreement): _____

Date of Transfer: _____

Signature of grantor *(In ink)*: _____