PRATT & WHITNEY CANADA

SERVICE BULLETIN

P&WC S.B. No. 1002R29

BULLETIN INDEX LOCATOR

TURBOPROP ENGINE
ROTOR COMPONENTS - SERVICE LIFE

MODEL APPLICATION

PT6A-6, PT6A-6A, PT6A-6B, PT6A-6/C20, PT6A-20, PT6A-20A, PT6A-20B, PT6A-21, PT6A-27, PT6A-28, PT6A-34, PT6A-35, PT6A-34B, PT6A-36, PT6A-114, PT6A-114A, PT6A-135, PT6A-135A
Model(s) deleted this revision: PT6A-140

Compliance: Refer to Para. 1.E. in the Service Bulletin

Summary:

1. This service bulletin provides the service life limits for the rotor component parts which are authorized for use in the above Pratt & Whitney Canada Inc. engine models, as required by the Canadian Department of Transport regulations.
2. Compliance with the Accomplishment Instructions in step 3. of this service bulletin is necessary to maintain conformity with the approval type design and the validity of the airworthiness certification.
3. The Low Cycle Fatigue (LCF) counting process is described in detail, including the formula to use, refer to the “Remaining Life” section below, to calculate the total accumulated cycles for the various rotor components.

Dec 01/1973
Revision No. 29: Dec 05/2013

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05 December 2013

P&WC S.B. No. 1002R29

REVISION TRANSMITTAL SHEET
TURBOPROP ENGINE MODEL PT6A

SUBJECT: Pratt & Whitney Canada Service Bulletin No. PT6A-72-1002, Rev. No. 29, dated Dec 05/2013 (P&WC S.B. No. 1002R29) ROTOR COMPONENTS - SERVICE LIFE

Replace your existing copy of this service bulletin with the attached revised bulletin. Destroy the superseded copy.

Please retain this Revision Transmittal Sheet with the revised bulletin.

SUMMARY: This revision is issued to:

- remove the PT6A-140 engine since the life items are part of the AWL section of the Maintenance Manual.

EFFECT OF REVISION ON PRIOR ACCOMPLISHMENT:

None.

NOTE: A black bar in the left margin indicates a change in that line of text or figure.

REVISION HISTORY:

Original Issue: Dec 01/1973
Revision No. 1: Aug 26/1974
Revision No. 2: Jan 28/1975
Revision No. 3: Nov 10/1975
Revision No. 4: Apr 01/1976
Revision No. 5: Apr 25/1976
Revision No. 6: Oct 20/1976
Revision No. 7: Mar 30/1977
Revision No. 8: Dec 15/1977
Revision No. 9: Jun 16/1978
Revision No. 10: Jun 22/1979
Revision No. 11: Apr 22/1980
Revision No. 12: Feb 09/1982
Revision No. 13: Aug 16/1982
Revision No. 14: Aug 29/1983
Revision No. 15: Jun 01/1984
Revision No. 16: Feb 05/1985
Revision No. 17: Oct 02/1985
Revision No. 18: Oct 08/1986
Revision No. 19: Aug 08/1989
Revision No. 20: Jun 04/1990
Revision No. 21: Dec 05/1998
Revision No. 22: Apr 17/2000
Revision No. 23: Apr 12/2002
Revision No. 24: Sep 29/2004
Revision No. 25: Dec 19/2007
Revision No. 26: Jun 13/2012
Revision No. 27: Jun 15/2012
Revision No. 28: Oct 23/2012
Revision No. 29: Dec 05/2013

PRATT & WHITNEY CANADA

SERVICE BULLETIN

P&WC S.B. No. 1002R29

TURBOPROP ENGINE
ROTOR COMPONENTS - SERVICE LIFE

1. Planning Information

A. Effectivity

PT6A-6, PT6A-6A, PT6A-6B, PT6A-6/C20, PT6A-20, PT6A-20A, PT6A-20B, PT6A-21, PT6A-27, PT6A-28, PT6A-34, PT6A-34B, PT6A-35, PT6A-36, PT6A-114, PT6A-114A, PT6A-135, PT6A-135A Engines

B. Concurrent Requirements

None.

C. Reason

(1) To provide initial rotor components service life in accordance with D.O.T. regulation.

(2) To provide information covering method of marking.

D. Description

(1) Engine rotating components listed in the table below are subject to LCF due to cyclic operation of the engine. As a result, these parts must be replaced when their respective accumulated total cycle limit is reached.

(2) Operators must record all flights, starts and accumulated total cycles (which must be calculated using the formula Ref. 3.E.) in the applicable document for each component (i.e. logbook, LCF component card, etc.).

(3) The following is additional information for the Accumulated Total Cycle calculation:

- A start is defined as an engine start followed by one or more flights.
- Aircraft operation often includes abbreviated engine cycles. The definition of an abbreviated cycle is: idle - takeoff - flight - landing - idle. A normal or full cycle includes the foregoing plus an engine start and shutdown (i.e. abbreviated cycles are equivalent to the number of flights minus the number of starts). The limits specified in Paragraph 3. (Ref. Table 1) are in terms of full cycles. Accumulated abbreviated cycles are summated in terms of full cycles by means of a formula and tabulated factors.
- A full cycle is defined as an engine start followed by one flight then shutdown.
- An abbreviated cycle is less severe than a full cycle. To benefit from this, an Abbreviated Cycle Factor (ACF) is listed in the le below, and used in the formula which determines accumulated total cycles;
- A Flight Count Factor (FCF) is a multiplying factor that can be used to credit or debit life to the components listed in the Life Service to reflect the aircraft application of the engine. This factor can also be specific to an operator that diverges from the standards as missions.

1. Planning Information (Cont'd)

- When abbreviated cycles are not recorded, each flight is considered to have been preceded by one start, i.e., each flight is equivalent to a full cycle.

(4) The LCF life limits listed in the below are incorporated in the Type Approval as issued by Transport Canada. Transport Canada must approve changes to rotor component cyclic lives.

(5) The specified cyclic lives apply to engines, modules and components that contain parts listed in the approved parts list, as shown in the applicable Illustrated Parts Catalog (IPC) and SB. Operators requesting approval to incorporate parts not listed in the applicable IPC and SBs will be required to substantiate the cyclic lives of these parts to their local Airworthiness Authority.

(6) Operators having missions which include many touch-and-go flights, or a frequency of scheduled in-flight shutdowns (such as used within training missions) or which include more than 10 flights per hour, must submit their mission profiles to Pratt & Whitney Canada Inc. for life cycle analysis.

(7) Operators making scheduled or frequent use of the engine's highest allowable rated power must submit their mission profile(s) to P&WC for analysis.

(8) The same component (e.g. disk, Hub, Impeller, etc.) may be installed in different models, providing the part number is authorized to be installed in the specific engine models (Ref. applicable Service Bulletin). Operators transferring rotating components between engine models governed by different SBs must adhere to the lower of the LCF life limits published in the applicable SBs.

NOTE: 1. This applies to all PT6A engines and exclude all ST6 (industrial and marine) engines.

NOTE: 2. It is not permitted to use parts which were installed on ST6 engines for PT6 engines.

E. Compliance

The service lives quoted in the Accomplishment Instructions are incorporated by reference in the type approval as issued by the Canadian Department of Transport. Compliance with these instructions is therefore necessary to maintain conformity with the approval type design and the validity of the airworthiness certification.

1. Planning Information (Cont'd)

F. Approval

Transport Canada has reviewed and approved the technical contents of this Service Bulletin.

NOTE: This Service Bulletin is incorporated by reference in one or more Transport Canada, Aircraft Engine Type Approvals and the service lives thereby constitute limits applicable to the corresponding engines, modules and components which embody only parts listed in the Transport Canada approved parts list, as promulgated in the applicable Illustrated Parts Catalog and Service Bulletins. Operators requiring approval for incorporation of parts not listed will be required to substantiate to their local Airworthiness Authority the applicability of the lives of the substitute parts and associated parts and assemblies.

G. Manpower

Not applicable.

H. Weight and Balance

None.

I. Electrical Load Data

Not changed.

J. Software Accomplishment Summary

Not applicable.

K. References

Applicable PT6A Technical Manuals
P&WC S.B. No. 1094, 1113, 1164 and 1302

L. Publications Affected

Applicable PT6A Technical Manuals

M. Interchangeability and Intermixability of Parts

Not applicable.

2. Material Information

A. Industry Support Information

Not applicable.

2. Material Information (Cont'd)

B. Material - Cost and Availability

Not applicable.

C. Material Necessary for Each Engine

Not applicable.

D. Reidentified Parts

None.

E. Tooling - Price and Availability

Not applicable.

3. Accomplishment Instructions

A. Accumulated total cycles and all flights and starts must be recorded in the appropriate engine log book.

B. Turbine disk assemblies removed for repair must be tagged, stating the total number of flights, engine starts and/or the calculated total cycles, per Paragraph 3.E..

C. Deleted

D. Rotor components with lives greater than the limits shown in Table 1 or rotor components not supported with proper documentation, are to be removed from service.

TABLE 1, Rotor Components - Service Life Limits

Description	Detail Part No.	Engine Model	Abbr'd Cycle Factor	Flight Count Factor	Life Limits No. Of Cycles
Hub, Compressor (1st Stage)	3006911	PT6A-6, -6A, -6B, -6/C20, -20, -20B	1	1	5000
	3011420	PT6A-6, -6A, -6B, -6/C20, -20, -20B	1	1	5000
	3011711	PT6A-27	1	1	12000
	3012811	PT6A-6, -6A, -6B, -6/C20, -20, -20B	1	1	6000

3. Accomplishment Instructions (Cont'd)

TABLE 1, Rotor Components - Service Life Limits (Cont'd)

Description	Detail Part No.	Engine Model	Abbr'd Cycle Factor	Flight Count Factor	Life Limits No. Of Cycles
	3013111	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B, -21, -27, -28, -34, -35, -34B, -36, -114, -114A, -135, -135A	2	1	19000
	3013611	PT6A-6, -6A, -6B, -6/C20, -20, -20B	2	1	23000
	3014111	PT6A-27	1	1	19000
Stub Shaft Compressor Rotor	3055000-01	Deleted			
Rotor Compressor	3076420-01	Deleted			
Disk, Compressor (2nd Stage)	3006912	PT6A-6, -6A, -6B, -6/C20, -20, -20B	2	1	20000
	3013712	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B, -21, -27, -28, -34, -35, -34B, -36, -114, -114A, -135, -135A	2	1	24000
	3040312	Deleted			
Disk, Compressor (3rd Stage)	3006913	PT6A-6, -6A, -6B, -6/C20, -20, -20B	2	1	20000
	3011713	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B, -21, -27, -28, -34, -34B, -35, -36, -114, -114A, -135, -135A	2	1	25000
	3040213	Deleted			
Impeller	3008176	PT6A-6, -6A, -6B	1	1	2600

3. Accomplishment Instructions (Cont'd)

TABLE 1, Rotor Components - Service Life Limits (Cont'd)

Description	Detail Part No.	Engine Model	Abbr'd Cycle Factor	Flight Count Factor	Life Limits No. Of Cycles
	3009576	PT6A-6, -6A, -6B, -6/C20, -20, -20B	1	1	33000
	3010676	PT6A-6, -6A, -6B	1	1	2600
	3011376	PT6A-6, -6A, -6B, -6/C20, -20, -20B	2	1	33000
	3011476	PT6A-6, -6A, -6B	1	1	2600
	3013176	PT6A-21, -27, -28, -34, -34B, -36, -114, -135	2	1	19000
	3013676	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B	2	1	33000
	3032249	PT6A-21, -27, -28, -34, -34B, -36, -135	2	1	19000
	3033292	PT6A-21, -27, -28, -34,-34B, -36, -135	2	1	19000
	3027798	PT6A-35, -114A, -135, -135A,	2	1	19000
	3027798	Deleted			
	3035883	PT6A-135, -135A	2	1	19000
Disk, Compressor Turbine	3007111*	PT6A-6, -6A, -6B, -6/C20, -20, -20B	20	1	18000
	3010311*	PT6A-6, -6A, -6B, -6/C20, -20, -20B	20	1	18000
	3013411	PT6A-21, -27, -28, -34, -36	4	1	16000
	3013411	PT6A-114, -114A	5	1	16000
	3013411	PT6A-34B	20	1.35	16000

3. Accomplishment Instructions (Cont'd)

TABLE 1, Rotor Components - Service Life Limits (Cont'd)

Description	Detail Part No.	Engine Model	Abbr'd Cycle Factor	Flight Count Factor	Life Limits No. Of Cycles
	3013511*	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B	20	1	18000
	3013711	PT6A-27	3.5	1	18000
	3024211	PT6A-135, -135A	10	1	16000
	3024211	PT6A-35	1.5	3.2	16000
	3076856-01	Deleted			
Disk, Power Turbine	3006412	PT6A-6, -6A, -6B, -20	1	1	2300
	3010312	PT6A-6, -6A, -6B, -6/C20, -20, -20B	3	1	18000
	3010712	PT6A-27	3.5	1	20000
	3012712	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B	3	1	18000
	3012812	PT6A-27, -28, -34	3.5	1	20000
	3016712	PT6A-27, -28	3.5	1	20000
	3019712	PT6A-34	4	1	20000
	3022412	PT6A-20, -20A, -20B, -21, -27, -28, -34	3.5	1	20000
	3022512	PT6A-6, -6A, -6B, -6/C20, -20, -20A, -20B	3	1	18000
	3122658-01	PT6A-6, -6A, -6B	3	1	18000
	3026812	PT6A-20, -20A, -20B	3.5	1	20000
	3026812	PT6A-34, -36	4	1	20000
	3026812	PT6A-114, -114A	5	1	20000
	3026812	PT6A-34B	20	1	20000

3. Accomplishment Instructions (Cont'd)

TABLE 1, Rotor Components - Service Life Limits (Cont'd)

Description	Detail Part No.	Engine Model	Abbr'd Cycle Factor	Flight Count Factor	Life Limits No. Of Cycles
	3026812	PT6A-21, -27, -28	3.5	1	20000
	3022312	PT6A-135, -135A	10	1	30000
	3022312	PT6A-35	10	2	30000
	3076855-01	Deleted			

E. Life Determination/Calculation

(1) Remaining component life is determined by subtracting the calculated accumulated total cycles from the accumulated total cycle limits shown in the table above.

(2) The accumulated total cycles are calculated as follows, using the factors provided in the table above. Two examples are provided below using the following formula, to illustrate the difference in calculation of accumulated total cycles between an engine operated with full cycles versus an engine operated using a combination of full and abbreviated cycles.

(3) At repair and overhaul, component life is calculated in accordance with the following formula:

$$\text{Accumulated Total Cycles} = \left[\text{No. of Starts} + \left(\frac{\text{No. of Flights - No. of Starts}}{\text{Abbreviated Cycle Factor}} \right) \right] \text{X Flight Count Factor}$$

3. Accomplishment Instructions (Cont'd)

(4) Example No. 1 (Full cycles only - includes flights where starts are not recorded):

EXAMPLE:

Engine Model	PT6A-27
Part No.	3013111 (Hub, Compressor 1st Stage)
Abbreviated Cycle Factor	2
No. of Starts	9000
No. of Flights	9000
Flight Count Factor	1

$$\text{Accumulated Total Cycles} = [\ 9000 + (\ \frac{9000 - 9000}{2}\ )\ ]\ X\ 1$$

$$= [9000 + 0]\ X\ 1$$

$$= 9000$$

3. Accomplishment Instructions (Cont'd)

(5) Example No. 2 (Full and abbreviated cycles):

EXAMPLE:

Engine Model	PT6A-27
Part No.	3013111 (Hub, Compressor 1st Stage)
Abbreviated Cycle Factor	2
No. of Starts	3000
No. of Flights	9000
Flight Count Factor	1

$$\text{Accumulated Total Cycles} = [\ 3000 + (\ \frac{9000 - 3000}{2}\ )\ ]\ X\ 1$$

$$= [3000 + 3000]\ X\ 1$$

$$= 6000$$

F. Engine rotating components subject to LCF limits may be modified (i.e. reworked). The modified component is introduced by an SB, which allows rework of pre-SB components to the post-SB configuration. When a component is modified and reidentified with a new part number due to rework action, both pre-SB and post-SB cyclic lives must be taken into consideration when calculating the total accumulated cycles, as follows:

Total Accumulated Cycles = Pre-SB accumulated total cycles + Post-SB accumulated total cycles.

NOTE: The post-SB accumulated total cycle limit is to be used to determine the remaining LCF life of the modified component.

G. Accumulated total cycles must be marked using a CY prefix, as follows:

(1) The accumulated total cycles between each shop visit, rounded to the nearest 100 cycles, must be marked with the last two digits dropped and followed by a dash (-).

(2) A part having LCF cycles of 525, 1,819, and 1,972, at shop visits, would be marked as CY5-18-20- which equals approximately 4,300 accumulated total cycles.

4. Appendix

Not applicable.