5 APPENDICES

5.1 Appendix A: Electronic data recording devices

5.1.1 P&W DCU Data Readout and Analysis Report

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Pratt & Whitney Canada

18 November 2019

Transportation Safety Board of Canada
1901 Research Road, U-100
Ottawa, Ontario
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Att.: [redacted]
Accredited Representative/Air Investigations Branch

Reference: Niugini Helicopters Inc
Bell 427 registration P2-HSG
Kualakesi, West New Briton, Papua New Guinea, 11 Aug, 2019
TSB File A19F0208
P&WC File 19-123

Dear [redacted]

P&WC has extracted data, in the presence of the Transportation Safety Board (TSB) of Canada, from the PW207D engine's BF0157 and BF0158 Data Collection Unit's (DCU) on October 23, 2019.

The analysed data was obtained from the following files:

Engine #1 → PW207D S/N BF0157
Download file → DCU pn 3059185-03 sn DP06-4235 PW207D.dcu5

Engine #2 → PW207D S/N BF0158
Download file → DCU pn_3059185-03 sn_DP07-4675 PW207D.dcu5

Export Control Classification		
Contains no Technical Data: ( )		
*Data is subject to the jurisdiction of the Export and Import Controls Bureau of the Department of Foreign Affairs and International Trade of Canada, Department of Commerce of the United States and/or Department of State of the United States ** Data is not subject to the jurisdiction of the Department of Commerce of the United States or Department of State of the United States butwould become subject if exposed to any US involvement.	**Jurisdiction**	**Classification Number**
	Canadian ECL(s)*	Not required
	ECCN(s)*	
	P-ECCN(s)**	9E991
	USML(ITAR)*	
	P-USML**	
Date: 18/11/2019 Badge: 40826		

Each engine is equipped with a DCU. The purpose of this electronic device is to serve as a repository for various engine trim parameters, accumulated operation times, accumulated part cycles and specific operational exceedance excursion data. The EEC's automatically store the data in the DCU in snapshot format. A DCU recording is taken when an event is triggered. This could be a One Engine Inoperative (OEI) rating range, ultimate limit that is exceeded, a fault or an event such as a commanded auto to manual mode. A DCU recording consists of 16 standard parameters for exceedance and event recording while a fault recording consists of 4 parameters. The DCU recording's reference engine runtime (and cannot be referenced to a "time of day"). Please note that the engine running time is expressed in hours. For the ease of comprehension the engine running time was converted to hours, minutes and seconds.

The EEC has a maximum recording rate of 20ms and cannot transmit to the DCU faster than this. It is for this reason that the data may appear to be received in groups of approximately 20ms apart.

Acronyms:
NG: Gas generator speed
QLFLT: Filtered local torque
NFFLT=NPT: Filtered power turbine speed
MGT: Mean gas Temperature
CLP: Collective lever pitch
PLA: Power Lever angle
NRFLT: Filtered rotor speed
EEC: Electronic engine control

This control system does not record any remote engine parameters. The control system records OEI excursions, and high values during flight. It will also record transitions to manual mode from auto mode governing which can occur through critical faults or when pilot induced.

Summary of analysis:

[redacted]

The DCU's and EEC's were shipped back to the TSB of Canada to be desalinated and dried out and then downloaded at the Service Investigation department at Pratt and Whitney Canada.

The left-hand engine (serial number BF0157) or #1 position pilot-view had DCU 3059185-03, s/n DP06-4235. The right-hand engine (serial number BF0158) or #2 position pilot-view had DCU 3059185-03, s/n DP07-4675.

The events logged in the two DCU's will not occur at the same time, but when an event is observed on that specific engine, thus the faults from one DCU to the other may be very close during an event like this, but are not aligned.

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Engine BF0157

The relevant data deduced to be from the final flight for the left hand (#1) engine (BF0157) was tabulated in Table 1. The time is displayed in delta times, which is the difference in time from the event logged previously, to that event logged. Using the time between recorded events we can deduce that item A was a previous flight, because item B occurred approximately 35 hours after item A. Between item B and item H there was a total of approximately 20 min, so it was deduced that this could all have been from the last flight. The exceedances recorded are the peak values observed during the flight and is standard recordings for each flight. Item B is the maximum turbine speed recorded during that last flight. Item C and D occur at the same time and items E through G occur at the same recorded time. Item D is when the control system entered one engine inoperative ratings because the torque passed 68.7% (highlighted in yellow on table 1), and the DCU data revealed that the engine was in auto mode running on the NF governing. Item C shows a maximum power attained at 74.88% torque which is well within the acceptable OEI power rating. Item G is approximately 51s later and was when the OEI flag went off because the engine parameters were within the dual engine operating range again. Item H is the final event recording in the DCU and this is typically a recording of the final engine time on shutdown. From this data we can conclude that during the last 20min of flight the engine ran in OEI mode.

	Engine Serial #	Information location		Delta time	Delta time	NG	MGT	QLFLT	NFFLT	NRFLT	T1	TMSEL	PLA	CLP
				(s)	(min)	%	Deg C	%	%	%	Deg C	mA	deg	deg
A	BF0157	Man Mode Buffer	EVBLKS0102	0.0 sec.	0 min.	79.16	566.69	15.79	92.52	92.57	31.06	41.01	26.39	4.70
B	BF0157	Last Flight	Max NPt	125913.6 sec.	2099 min.				102.34					
C	BF0157	Last Flight	Max Torque	80.6 sec.	1 min.			74.88						
D	BF0157	OEI Buffer	OEIBLKS0013	0.0 sec.	0 min.	95.56	807.81	69.29	81.79	81.4	29.56	108.11	52.00	5.50
E	BF0157	Last Flight	Max NG	0.4 sec.	0 min.	97.79								
F	BF0157	Last Flight	Max T6	0.0 sec.	0 min.		834.31							
G	BF0157	OEI Buffer	OEIBLKS0013	0.0 sec.	0 min.	96.91	829.00	67.46	93.06	92.8	29.66	25.49	52.02	9.29
H	BF0157	Last Flight	Engine time	1153.1 sec.	19 min.									

Table 1: BF0157

The fault recording system on this engine model is a circular buffer which has a capacity of 100 faults maximum per flight, after which the DCU will re-write over the previous data. This results in faults recorded within an hour window and makes it impossible to determine exactly when these faults occurred (furthermore it cannot be determined if these faults occurred at the beginning or the end of the hour). A DCU fault recording, records the circular buffer time (to the hour), the fault, what triggered the fault and what NG the fault occurred at. Even though there is no time, the NG can help in determining what condition the engine was in when the fault was logged. At each new flight the Ng values from the previous flights are set to 0, which is used when determining if the faults observed where the last flight or a previous one.

Table 2 is a summary of the faults that have been recorded in the DCU from engine BF0157. It is suspected that the last two faults (G and H) are from the last flight at time 158 hours, with the engine shutdown. The three previous faults (D, E and F) were recorded an hour before at a circular buffer time of 157h and with the engine running. When looking at the faults in the sister engine BF0158 the same three faults can be seen on lines J, K and L on table 4, and they are also recorded an hour before the last series of faults, further supporting the idea that they may be from a previous flight. The final two faults G and H were the last to be recorded (which is how we know they were from the final flight) in the DCU and occurred with the engine off. A wraparound fault will occur when the EEC sends a signal and the return signal is not received (the EEC expects a confirmation through a return signal). This is indicative of a communication loss.

	Fault code	Circular Buffer Time (h)	NG (%)	Engine Condition
A	Rotor speed	157	62	Engine running
B	PLA E1	157	78	Engine running
C	PLA E2	157	76	Engine running
D	PLA	157	73	Engine running
E	Torque motor current wrap around	157	69	Engine running
F	Training discrete	157	58	Engine running
G	auto confirm wraparound	158	0	engine shutdown
H	training latch wraparound	158	0	engine shutdown

Table 2: BF0157 faults

Engine BF0158

The relevant data deduced to be from the final flight for the right hand (#2) engine (BF0158) was tabulated in Table 3. Similarly to Table 3 the time is displayed in delta times, which is the difference in time from the event logged previously, to that event logged. Using the time between recorded events we can deduce that item I was a previous flight, because item J occurred approximately 34.5 hours after item I. Between item J and item N there was a total of approximately 51min so it can either have been entirely from the last flight or last two flights (depending on the length of time of the last flight). Regardless of whether items J through N were recorded over two flights or potentially over one 51 min flight, they are only indications of maximum values captured during that flight. Item N is the final event recording in the DCU and this is typically a recording of the final engine time on shutdown. From this data we can conclude this engine did not record any indication of running in OEI mode, unlike the sister engine.

	Engine Serial #	Information location		Delta time	Delta time	NG	MGT	QLFLT	NFFLT	NRFLT	T1	TMSEL	PLA	CLP
				(s)	(min)	%	Deg C	%	%	%	Deg C	mA	deg	deg
I	BF0158	OEI Buffer	OEIBLKS0011	0.0 sec.	0 min.	96.76	820.50	67.87	100.05	100.06	33.47	66.28	58.21	49.45
J	BF0158	Last Flight	Max NG	124143.1 sec.	2069 min.	92.00								
K	BF0158	Last Flight	Max T6	0.0 sec.	0 min.		746.00							
L	BF0158	Last Flight	Max NPt	1781.3 sec.	30 min.				102.33					
M	BF0158	Last Flight	Max Torque	1231.9 sec.	21 min.			53.57						
N	BF0158	Last Flight	Engine time	2.9 sec.	0 min.									

Table 3: BF0158

As previously explained this is a circular buffer fault recording system, thus the faults will write over themselves. The faults are recorded based on this circular buffer time (with a one hour resolution) and not engine time so the faults cannot be aligned with the exceedances, nor the other engine, however the Ng is recorded which helps to determine the engine condition.

Table 4 summarizes the faults recorded on engine BF0158. It is suspected that the faults J, K and L are from a previous flight as they occur one hour prior to the last set of faults and match faults M-FQ on table 2 from engine BF0157. The faults M, N, P and Q are all wraparound faults, which indicative of an electrical communication loss. The ARINC input fault is another indication that there was a loss of communication. All of these faults occurred with the engine shutdown. To see a series of faults like these, is typical of a communication loss that can be caused by an accident.

	Fault code	Circular Buffer Time (h)	NG (%)	Engine Condition
I	Rotor Speed	160	62	Engine running
J	torque motor current wraparound	161	86	Engine running
K	PLA	161	73	Engine running
L	Training discrete	161	59	Engine running
M	auto confirm wraparound	162	17	engine shutdown
N	training latch wraparound	162	13	engine shutdown
O	ARINC Input	162	12	engine shutdown
P	EEC fail solenoid wraparound	162	12	engine shutdown
Q	ARINC Wraparound	162	11	engine shutdown

Table 4: BF0158 faults

Conclusion

P&WC believes that the DCU data captured by engines BF0157 and BF0158 shows normal peak value recordings during the last flight, while engine BF0157 showed indication of running in OEI. The faults that were captured on the engines, which are believed to be related to the event, occurred when the engines were shutdown and are all signal feedback faults with the exception of the ARINC input fault on engine BF0158 which is indicative of a problem with the ARINC being sent from the cockpit to the EEC. There were no faults observed with the engines running during the last hour of fault recordings.

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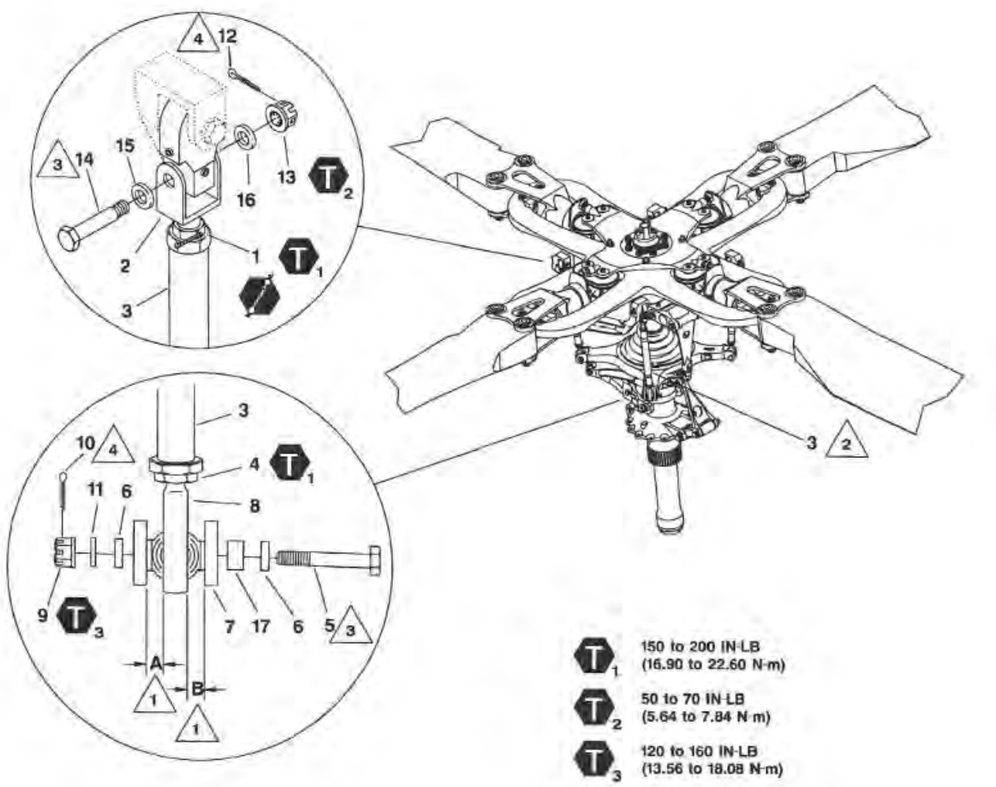
5.2 Appendix B: Maintenance

5.2.1 Pitch link adjustments

BHT-427-MM

Bell Helicopter
A Textron Company



1. Jam nut
2. Clevis
3. Pitch link
4. Jam nut
5. Bolt
6. Washer
7. Swashplate horn
8. Rod end bearing
9. Nut
10. Cotter pin
11. Washer
12. Cotter pin
13. Nut
14. Bolt
15. Washer
16. Washer
17. Bushing

NOTES:

1. After torquing jam nuts on pitch link, dimension "A" is to be equal toet dimension "B" within 0.040 with controls set at mid-collective and neutral cyclic.
2. Turn clockwise to decrease pitch, counterclockwise to increase pitch.
3. Apply corrosion preventive compound (C-104) to bolt shank before installation.
4. Apply corrosion preventive compound (C-101) to bolt head, washers, nut, and cotter pin after torquing.

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Figure 18-11. Pitch Link — Adjustment

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5.2.2 Autorotation RPM Adjustment and Verification Procedure

CAUTION

IF POSSIBLE, DO NOT MAKE ADJUSTMENTS MORE THAN ±15°. THE TRIM TAB CAN MOVE SLOWLY OUT OF POSITION AGAIN OVER TIME.

7. Bend the trim tab as necessary until the trim tab angle is approximately 2° more than the calculated angle and it puts no load on the trim tab bender. Then bend the trim tab the opposite direction until it is at the correct angle. This two bend procedure helps keep unwanted movement to a minimum.

8. Remove the trim tab bender and the trim tab gauge from the main rotor blade.

18-23. TROUBLESHOOTING

Main rotor 1/rev vibration levels of 1.0 inch-per-second (IPS) or less do not have dangerous effects such as wear or fatigue. But a sudden change in the level of the main rotor 1/rev vibrations can be a sign of problems and a full inspection of the main rotor blades, hub, and control system must be immediately performed to find the cause. If a satisfactory level of vibration cannot be obtained using the main rotor 1/rev vibration (Table 18-6) with the track and balance procedures, there can be a mechanical problem (Table 18-7).

18-24. MAIN ROTOR TRACK AND BALANCE — AFTER ADJUSTMENT

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specifications.

NUMBER	NOMENCLATURE
C-101	Corrosion Preventive Compound

1. Remove all of the RADS-AT components from the helicopter. Replace the swashplate nuts that were removed (Chapter 62).

2. Apply corrosion preventive compound (C-101) to the threads that show, and on all of the controls that you have adjusted.

3. Make a record of all of the tab positions on a main rotor track and balance adjustment log (Figure 18-9).

4. Keep a record of the data from the last test flight in the CADU or in a different computer.

18-25. Autorotation RPM — Adjustment

This section provides the procedure to determine Density Altitude. Always refer to Flight Manual (FM) for the Density Altitude (Hd) chart for calculations to perform an autorotation check, and if necessary, correct the main rotor Autorotation RPM. Refer to Table 18-8 through Table 18-10 to view examples 1 through 3 to aid in determining Density Altitude (Hd) and Autorotation RPM.

Autorotation RPM should be adjusted with consideration given to seasonal OAT and altitudes in the operating environment. Low gross weight, low temperature/low density altitude result in lower Autorotation RPM when compared to high gross weight, high temperature/high density altitude.

This chart uses seasonally adjusted density altitude (Hdmin) as a baseline to optimize Autorotation RPM throughout the gross weight range. This chart assumes that a check/adjustment of Autorotation RPM will be carried out at least when seasonal changes result in a change in average minimum OAT or when the helicopter geographical location changes.

Density altitude is the result of pressure altitude corrected for temperature. To define Hdmin, two factors must be considered:

- Determine the lowest pressure altitude (Hpmin) over which operations are likely to be carried out. The lowest geographic altitude may be used for the purpose of these calculations.
- Determine the seasonal average minimum temperature (OATmin) in the operating region. (Use the average temperature anticipated until next autorotation check/adjustment is anticipated.)

Table 18-7. Helicopter Vibration Troubleshooting

PROBLEM	PROBABLE CAUSE	SOLUTION
1/rev vibration levels change	Mast nut is loose.	Torque the mast nut.
	Worn pitch links.	Replace the pitch links.
	Damaged main rotor blade.	Repair or replace the main rotor.
	Blades are out of track or out of balance.	Do the rotor smoothing procedure.
1/rev vibrations in turns	Swashplate breakout friction is low.	Adjust the swashplate friction.
Torque sensitive 1/rev	Worn or loose drive link and attaching hardware.	Tighten or replace the drive link and/or the attaching hardware.
	Out-of-track condition because of an out-of-tab or out-of-roll condition.	Do the main rotor smoothing procedure.
1/rev vibration in a low power descent	Free play or wear between the slider and the swashplate.	Replace all of the worn parts.
4/rev vibrations	Vertical fin is not secure.	Tighten the retaining bolts.
	Horizontal stabilizer is not secure.	Tighten the retaining hardware.
	Landing gear is not secure.	Tighten, repair, or replace the landing gear attachment fittings.
	Lateral engine mount is loose or worn.	Torque the mount bolts or replace the mounts.
	Damaged or worn F/A Restraints.	Repair/replace per maintenance manual.
	Vertical Live mount(s) damaged or loss of fluid must be evident during transition, (0-40 knots).	Repair/replace as per maintenance manual.
	Frahm assembly is worn or damaged.	Replace all worn or damaged parts.
	Frahm assembly is out of adjustment.	Adjust the Frahm.

Table 18-8. Determining Hd Example #1

Determining Hdmin:	
Hpmin=	2000 ft.
OATmin=	17°C
Hdmin=	**2700 ft.** (Calculated from Density Altitude chart)
Auto Nr check:	
Hpcheck=	3000 ft.
OATcheck=	24°C
Hdcheck=	4700 ft. (Calculated from Density Altitude chart)
ΔHd=(Hdcheck-Hdmin)=	4700 – 2700 = **2000 ft. ΔHd**
Test Gross weight =	4710 lbs.
GWmin=	4310 lbs.
Delta Gross Weight=	**+400 lbs.**
Target Nr. =	**97%**

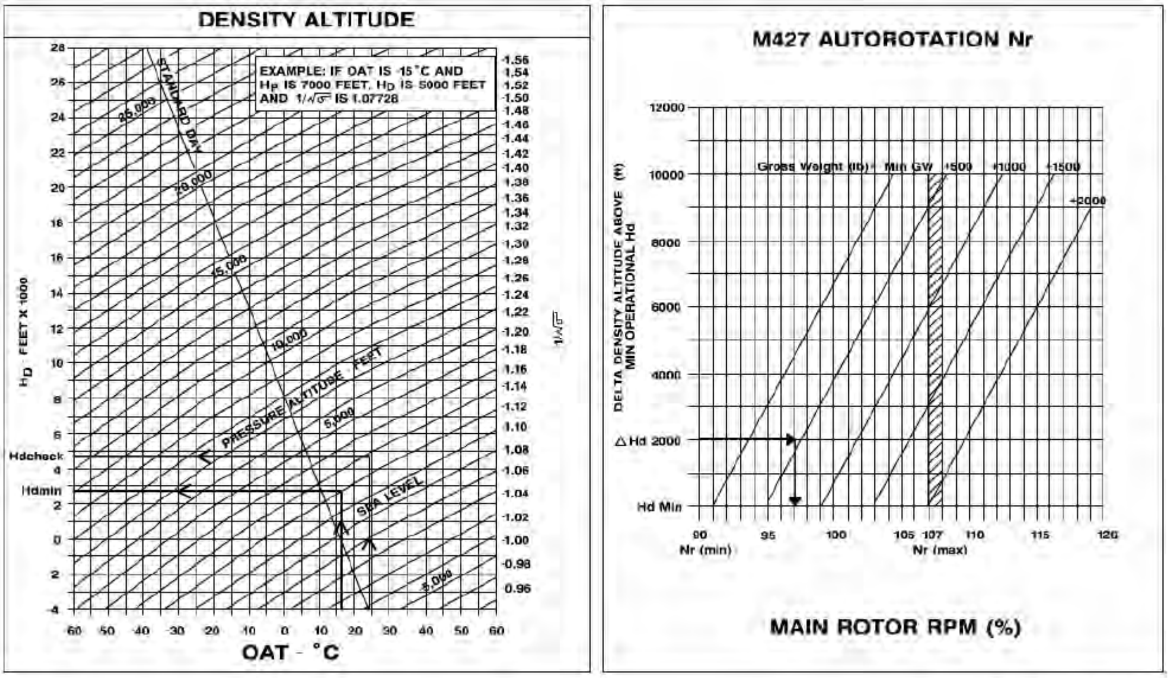

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Table 18-9. Determining Hd Example #2

Determining Hdmin:	
Hpmin=	Sea level
OATmin=	-8°C
Hdmin=	**-2900 ft.** (Calculated from Density Altitude chart)
Auto Nr check:	
Hpcheck=	2000 ft.
OATcheck=	0°C
Hdcheck=	650 ft. (Calculated from Density Altitude chart)
ΔHd=(Hdcheck-Hdmin)=	650 minus –2900 = **3550 ft. ΔHd**
Test Gross weight =	5450 lbs.
GWmin=	4230 lbs.
Delta Gross Weight=	**+1220 lbs.**
Target Nr. =	**105%**

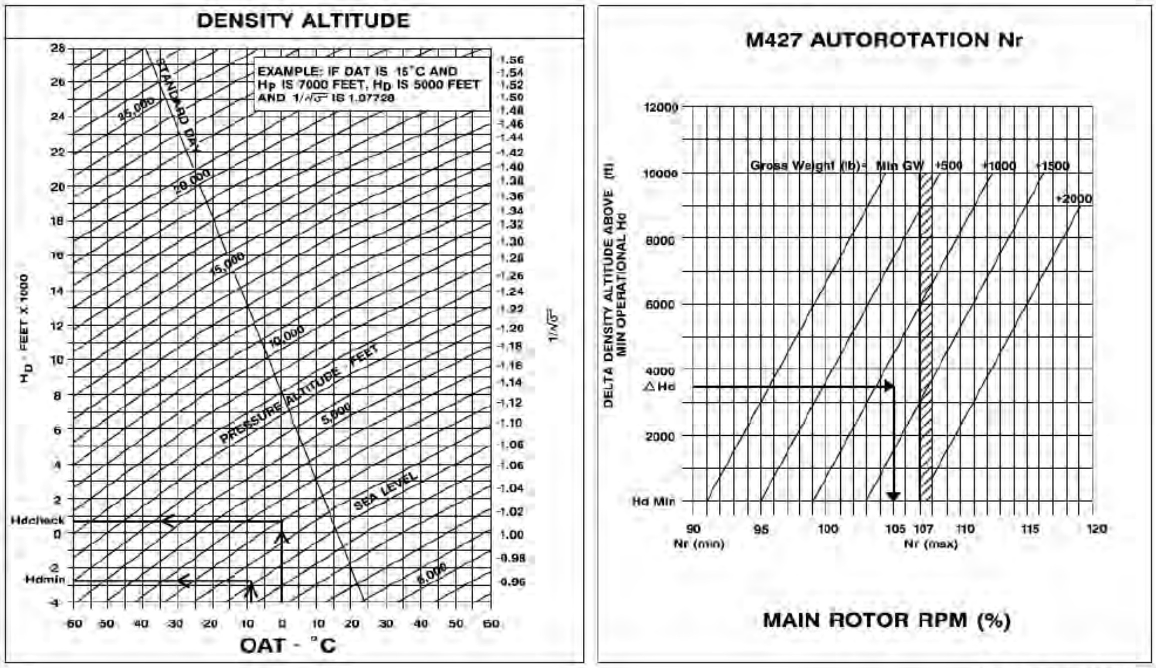

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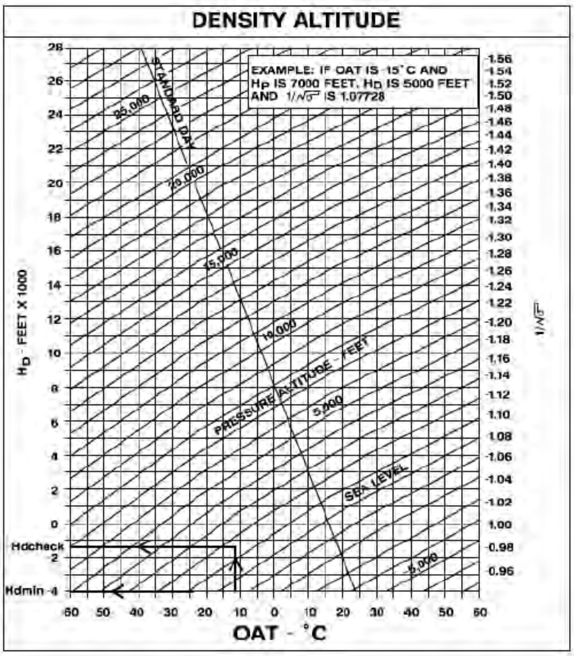
Table 18-10. Determining Hd Example #3

Determining Hdmin:	
Hpmin=	500 ft.
OATmin=	-21°C
Hdmin=	**-4000 ft.** (Calculated from Density Altitude chart)
Auto Nr check:	
Hpcheck=	1500 ft.
OATcheck=	-12°C
Hdcheck=	-1500 ft. (Calculated from Density Altitude chart)
ΔHd=(Hdcheck-Hdmin)=	-1500 minus (-4000) **= 2500 ft. ΔHd**
Test Gross weight =	5035 lbs.
GWmin=	4355 lbs.
Delta Gross Weight=	**+680 lbs.**
Target Nr. =	**100%**



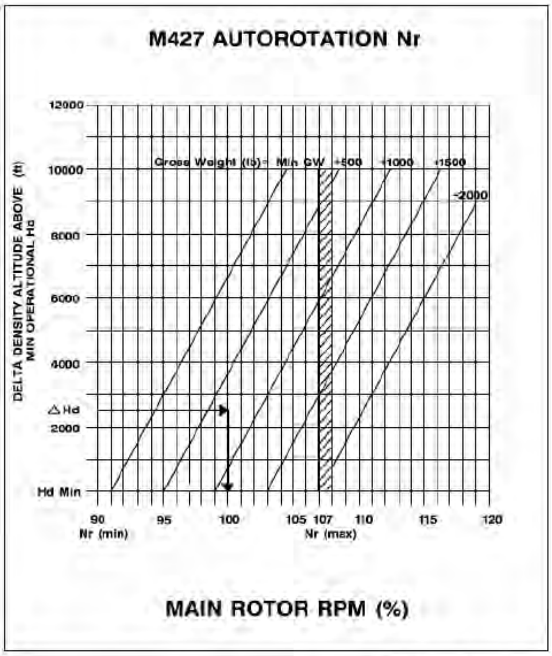


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Table 18-11. Aurorotation RPM — Adjustment Log

AUTOROTATION RPM ADJUSTMENT LOG **Date:** ______/_______/______ **Helicopter S/N:** ______________________ **Total Airframe Time:** __________________	
1.	Determine Hd_{min} (minimum density altitude): Hp_{min} (use lowest operational geographic altitude) ___________ OAT_{min} (use average seasonal minimum temperature) ___________ Hd_{min} (calculate from Density Altitude chart, BHT-427-FM-2) ___________
2.	Conduct autorotational RPM check (collective full down, both throttles at idle, stabilize at 60 KIAS): Hp_{check} (set 29.92 (1013 mb) on altimeter) ___________ OAT_{check} ___________ Main Rotor RPM ___________ Fuel Quantity ___________
3.	Calculate Hd_{check}: Apply Hp_{check} _________ and OAT_{check} __________ against Density Altitude chart (BHT-427-FM-2) to obtain Hd_{check} ___________
4.	Calculate delta density altitude (ΔHd): Hd_{check} _________ – Hd_{min} __________ = ΔHd ___________
5.	Compute Delta Gross Weight: Test Gross Weight (at time of RPM check) ___________ GWmin (Empty weight plus pilot) ___________ Delta Gross Weight ___________
6.	Apply ΔHd and Delta Gross Weight to Main Rotor Autorotation RPM chart (Figure 18-12): ΔHd ___________ Delta Gross Weight ___________ Target Main Rotor RPM ___________
7.	Adjust main rotor RPM if not within ±2% of target. Refer to paragraph 18-26.
8.	Final adjusted main rotor autorotational RPM _____________.

18-26. Autorotation RPM Pitch Links—Adjustment

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specifications.

NUMBER	NOMENCLATURE
C-101	Corrosion Preventive Compound
C-104	Corrosion Preventive Compound

1. Loosen jam nut (4, Figure 18-11).

2. Remove cotter pin (10) and discard.

3. Remove nut (9), washer (11), bolt (5), and washer (6).

4. Move pitch link (3) away from swashplate horn (7).

NOTE

Adjust all four pitch link assemblies to an equal amount. One full turn of the rod end out of the pitch link assembly decreases the Autorotation RPM approximately 3% Nr. One full turn of the rod end bearing into the pitch link assembly increases the Autorotation RPM approximately 3%.

The correct torque start point for the Autorotation RPM adjustment at flat pitch and 100% Nr is 25 to 30%.

5. Turn rod end bearing (8) to decrease or increase pitch.

6. If the autorotation is high, turn rod end bearing (8) out of pitch link assembly (3) to reduce the RPM.

7. If the Autorotation RPM is low, turn rod end bearing (8) into pitch link assembly (3) to increase the RPM.

8. Apply a coat of corrosion preventive compound (C-104) on the shank of bolt (5), on two washers (6 and 11), on the mating surface of rod end bearing (8), and on the mating surface of swashplate horn (7).

9. Place pitch link (3) in position.

10. Install washer (6), bolt (5), washer (11), nut (9)Ⓣ, and cotter pin (10).

11. Apply a coating of corrosion preventive compound (C-101) to the washer (6), bolt (5), washer (11), nut (9), and cotter pin (10).

12. Ensure that the collective control stick is in the middle position and the cyclic control stick is in the center position.

13. Adjust rod end bearing (8) in the swashplate horn to limits shown on Figure 18-11 until dimensions A and B are equal to within 0.040 inch (1.02 mm).

CAUTION

A MAXIMUM OF NINE THREADS ARE PERMITTED TO SHOW ON THE LOWER ROD END AFTER THE NUT IS TORQUED.

14. Hold the rod end in the correct position and tighten jam nut (4)Ⓣ. Secure with lockwire (C-405).

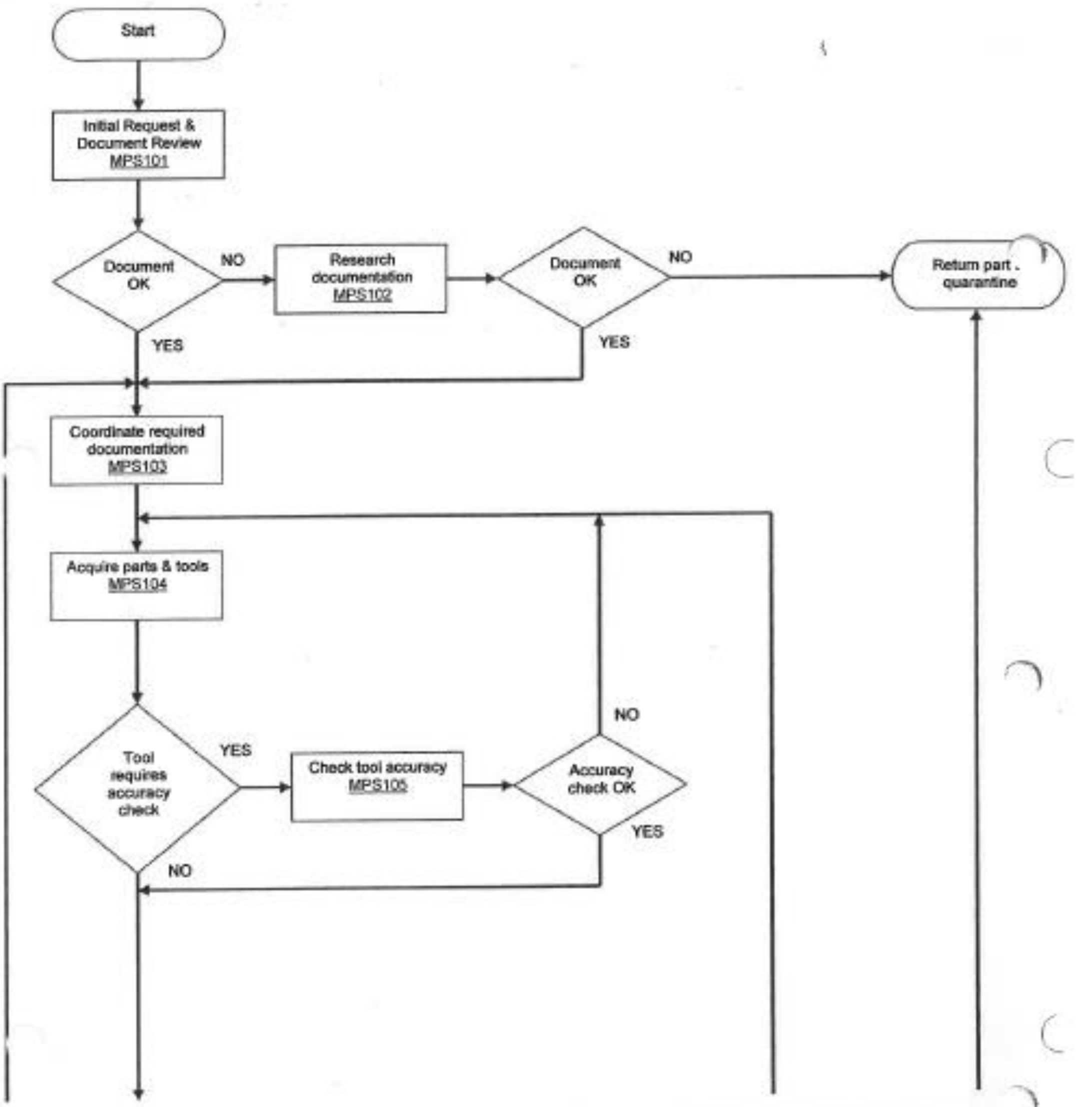
15. Apply a coating of corrosion preventive compound (C-101) to the jam nut (4) after torquing and lockwiring.

18-27. MAIN ROTOR 4/REV VIBRATION

The main rotor will normally produce vibration at its 1/rev frequency, and at other harmonics due to blade aerodynamic forces and general dynamic response. The 4/rev harmonic is always present due primarily to the variations of the aerodynamic forces acting upon each individual rotor blade as it rotates, and is the most prominent main rotor induced vibration other than 1/rev. The 4/rev is controlled by the pylon Liquid Inertial Vibration Eliminators (LIVE) mounting system and by vibration absorbing Frahms mounted in the nose of the helicopter and on the fuel cell behind the pilot's seat. This section describes the procedure to be used to measure the main rotor 4/rev vibration and verify tuning of the Frahms.

5.2.3 Maintenance Process

5.8.3 Maintenance Process - Planned Maintenance Procedures



MPS101 Initial Document Review

a) The CE, through consultation with Maintenance Controller (MC) and the Engineers will review and schedule all maintenance requests for work as described in this procedure.

b) The CE or MC will resolve all scheduling conflicts.

c) Requests for maintenance on company aircraft must;

- be within the company's scope of work, and
- have a computer generated work order issued, indicating the work to be performed

MPS102 Documentation Failing the Initial Document Review

a) Parts received from repair/overhaul not accompanied with adequate documentation will be quarantined.

b) Where additional required documents are obtained, the CE or MC will continue with the requested tasks.

MPS103 Acquiring Data Package

a) Each maintenance personnel will acquire the following items as applicable for the timely completion of each maintenance task:

- Manpower
- Inspection sheets
- Manuals
- Drawings
- Test sheets

MPS104 Parts and Tooling

a) Maintenance Personnel will acquire the required parts for the completion of each task as described in the parts procurement and distribution procedures in this manual Para. 5.6.2.

b) All parts issued from the store shall be recorded in the Stores Issue Register (Form BL020) and the following information recorded:

(1) Part Number
(2) Description
(3) Quantity
(4) Date of Issue
(5) Aircraft issued to
(6) Serial Number
(7) Received Goods Number (RGN)
(8) Work Order Number

c) Maintenance Personnel will acquire the required tools for the completion of each task as described in the tool control procedures in this manual Para. 5.5.8.

d) Prior to its use, the user of any precision tool will inspect the tool as described in the tool control procedures in this manual Para. 5.5.6.

MPS112 Final Certification Review

a) Upon completion of requested maintenance tasks, the CE or Engineer responsible for the maintenance release will perform a review of the documentation to verify that the requested task has been completed.

b) The review as described in a) will ensure;
- each required task is detailed (or reference made to other documents for the task) in the aircraft log book,
- the aircraft weight and balance report has been amended as required,
- the aircraft equipment list has been amended as required,
- parts, including tracking numbers (RGN), have been entered on the work order,
- placards associated with rectified defects are removed,
- duplicate inspections are signed as required,
- maintenance release are signed as required, and
- ground runs and test flight results are entered where required in aircraft log book release statement.

5.2.4 Aircraft Technical Record Control and Release to Service Procedures

14.	This concludes the updating of maintenance tracking for Scheduled items and you can now print a new Forecast Report to give to the MC in order to prepare and issue the new Technical Log for flight manual.

15.	Return completed work package to the CE so he can complete his Log Book entries. This will remain a function of the CE or his delegate. The engineer responsible for the coordination of the job will certify for the "Release to Service" statement.

16.	After technical log and aircraft/engine log book entries are completed and released for return to service, return to the CALM program and open the "Active Work Order" and click on the "Close Work Order" button and fill in fields accordingly and then click on the "Close" button.

TEC107 Log Book Entries and Release to Service

a) Aircraft Log Book: the following entries shall be included;

(1) The date maintenance was carried out and certified.

(2) The current Total-Time-In-Service after maintenance was carried out, transferred from the time recorded off the Aircraft Technical Log.

(3) The current total Landings/Cycles and RINS (if applicable) after maintenance was carried out, transferred from the times recorded off the Aircraft Technical Log.

(4) All maintenance details and certifications for Release to Service of any work carried out. Entries can be endorsed in this section either hand written or a loose leaf log book entry permanently attached.

(5) Record all AD's and Bulletins carried out whether applicable or not, repetitive or non-recurring, in both "Aircraft Maintenance Certification Log (DA3197)" and a signed entry in the "Aircraft Log Book Airworthiness Directives & Bulletins Records".

(6) Record only Special Inspection and Modifications in log book named "Non-recurring AD, Special Inspection and Modification Certification Log (DA3196)"

b) Engine Log Book. The following entries shall be included;

(1) The Engine Type and Serial Number of engine.

(2) The date maintenance was carried out and certified.

(3) The current Total Time Since New (TSN) and Time Since Overhaul (TSO) after maintenance was carried out, transferred from the time recorded off the Aircraft Technical Log.

(4) The current total Cycles after maintenance was carried out, transferred from the times recorded off the Aircraft Technical Log.

(5) All maintenance details and certifications for Release to Service of any work carried out. Entries can be endorsed in this section either hand written or a loose leaf log book entry permanently attached.

(6) Record all AD's and Bulletins carried out whether applicable or not, repetitive or non-recurring, in both "Engine Certification Log (Form 926)" and a signed copy in the "Aircraft Log Book Airworthiness Directives & Bulletins Records".

(7) Record only Special Inspection and Modifications in log book named "Non-recurring AD, Special Inspection and Modification Certification Log (Form 931)"

c) **Release to Service Procedures**

(1) The Certificate of Release to Service is issued following satisfactory completion of work referred to, and contains the date it was completed, the organisation authorisation reference and identification of the certifying staff.

(2) The record for components received from outside contractors, is obtained from the incoming received documentation. A certificate of release to service shall be issued at the completion of any maintenance on a component whilst off the aircraft. The authorised release certificate or serviceable tag identified as Form BL008 in Appendix 1 to this MOE, constitutes the component certificate of release to service. For extensive rework, overhaul or reconditioning, the Authorised Release Certificate must make reference to the specific work record, where full details are available. When a component is maintained internally for our own use, Form BL008 is all that is required.

(3) Any unserviceability which was permissible under an approved minimum equipment list or similar schedule, must be released to service after rectification of the unserviceability in the Aircraft Technical Log and/or transferred to the Aircraft Certification Log Book, making reference to the Aircraft Technical log.

d) **Certificate of Release to Service**

(1) Part 43 requires, that a Certificate of Release to Service be issued following maintenance. The Certificate for Release to Service only certifies, for the work that was carried out as described in the log book entry as stated. It shall be issued by an appropriately authorised certifying staff on behalf of the organisation in accordance with Part 43 and Para. 5.13 below, where it has been verified that all maintenance ordered, has been properly carried out by the organisation in accordance with the procedures specified in this MOE, taking into account the availability and use of the maintenance data that there are no non-compliances which are known that hazard seriously the flight safety.

(2) The statement shall read, ***"I hereby certify that the maintenance recorded has been carried out in accordance with the Papua New Guinea Civil Aviation Rule Part 43 and in respect of that maintenance the aircraft is release to service, pursuant to CAR Part 43.105"***