AIRCRAFT SERIOUS INCIDENT SHORT REPORT

CA18/3/2/1233: ZS-PHX, un-commanded auto feather of the left hand propeller while passing FL110 during the climb phase

Date and time	**:**	22 November 2018, 0854Z
Location	**:**	8.8 nm east of O.R. Tambo International Airport
Aircraft registration	**:**	ZS-PHX
Aircraft manufacturer and model	**:**	Beechcraft (Textron) B1900D
Last Point of departure	**:**	O.R. Tambo International Airport (FAOR), Gauteng
Next point of intended landing	**:**	Londolozi Aerodrome (FALD), Mpumalanga
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	**:**	8.8 nm east of O.R. Tambo International Airport (FAOR), overhead Petit Airfield in Bronkhorstspruit, Gauteng: S26°05'06" E028°23'24"
Meteorological Information	**:**	FAOR METAR at 0930Z: temperature: 23°C, dew point: 2°C wind: 280°/6 kts, variable between 240° and 360°, Ceiling and visibility OK, QNH: 1020 hPa
Type of operation	**:**	Commercial (Part 135)
Persons on board	**:**	2 + 9
Injuries	**:**	None
Damage to aircraft	**:**	None

All times given in this report are Coordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011), this report was compiled in the interests of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability****.*

Disclaimer:

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1. SYNOPSIS

1.1 On 22 November 2018 at 0834Z a Federal Airlines flight (FDR122) with two crewmembers and nine passengers on board departed from OR Tambo International Airport (FAOR) on a commercial flight to Londolozi Aerodrome (FALD) which is situated near Sabi in Mpumalanga.

1.2 During the climb phase passing FL110 and 8.8 nm east of FAOR the crew noticed a reduction in the left hand propeller RPM and torque indication before the propeller entered an un-commanded feather position. The crew declared a mayday and requested to return to FAOR. They did not shut down the left engine and with the propeller feathered they elected to continue back to FAOR with the left engine still operating as all the other engine parameters or indications were normal.

1.3 The aircraft was routed directly to FAOR by air traffic control and landed on runway 03L. The remainder of the flight was uneventful. The aircraft landed at FAOR approximately 20 minutes after the initial departure. None of the occupants on board sustained any injuries and the aircraft sustain no damage.

1.4 The investigation revealed that the aircraft experienced an inflight un-commanded feathering of the left engine propeller while on a climb phase due to an incorrectly rigged reverse/beta cable which caused the beta valve to open thus putting the propeller into a feathered position.

2. HISTORY OF FLIGHT

2.1 On 22 November 2018 at 0834Z a Federal Airlines flight (FDR122) with two crewmembers and nine passengers on board departed FAOR on a charter flight to FALD near Sabi in Mpumalanga. The flight was operated in accordance with South African Civil Aviation Regulations, 2011, Part 135 (Air transport operations – carriage of less than 20 passengers or cargo).

Figure 1: The aircraft during a previous operation (source: S Sowa)

2.2 During the climb phase whilst passing through flight level (FL)110 and 8.8 nm east of FAOR, the crew noticed a reduction in the left-hand propeller revolutions per minute (RPM) and torque indicators. The left-hand propeller subsequently entered an un-commanded feather position following the reduction of the RPM. The crew declared a mayday and requested to return to FAOR. Other than the propeller RPM and torque indicator for the left engine displaying abnormal parameters, the remainder of the engine parameters were all-normal. This prompted the crew to elect not to shut down the left engine.

2.3 The aircraft was routed directly to FAOR by air traffic control and landed on runway 03L. The remainder of the flight was uneventful. The crew consulted the abnormal procedure checklist for a single engine landing procedure due to the feathered engine not being able to provide any thrust. The passengers were commanded to enter the brace position prior to touch down. The aircraft landed at FAOR at 0854Z, approximately 20 minutes after the departure.

2.4 None of the occupants on board sustained any injuries, nor did the aircraft sustain any damage.

2.5 The flight was carried out in daylight and under visual meteorological conditions (VMC).

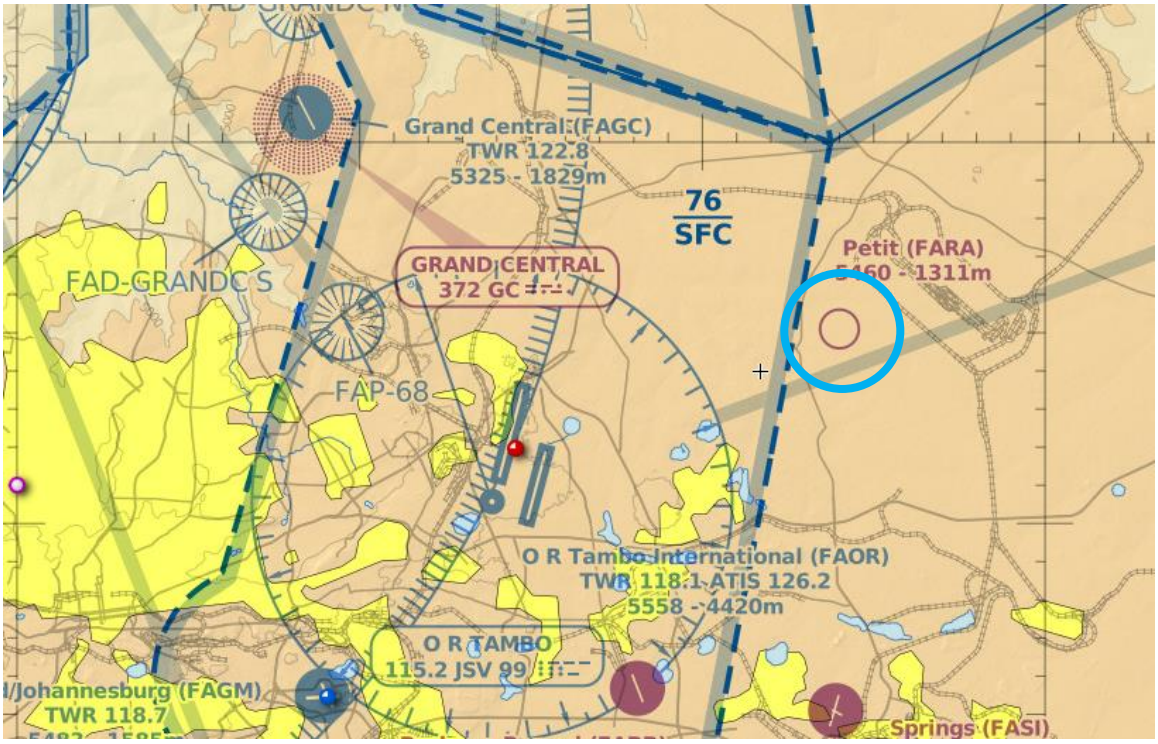

Figure 2: Shows the approximate location of the incident denoted by the blue circle (Source: SkyVector)

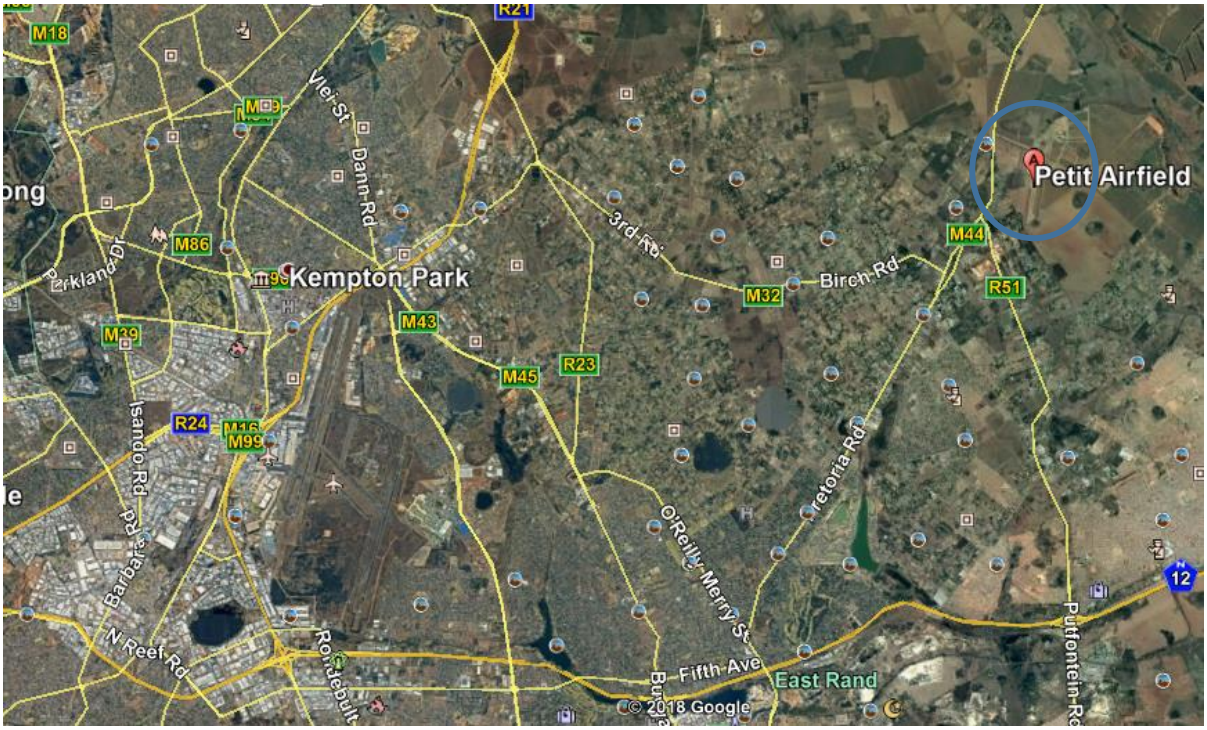

Figure 3: Shows the approximate location of the incident denoted by the blue circle (Source: Google Earth)

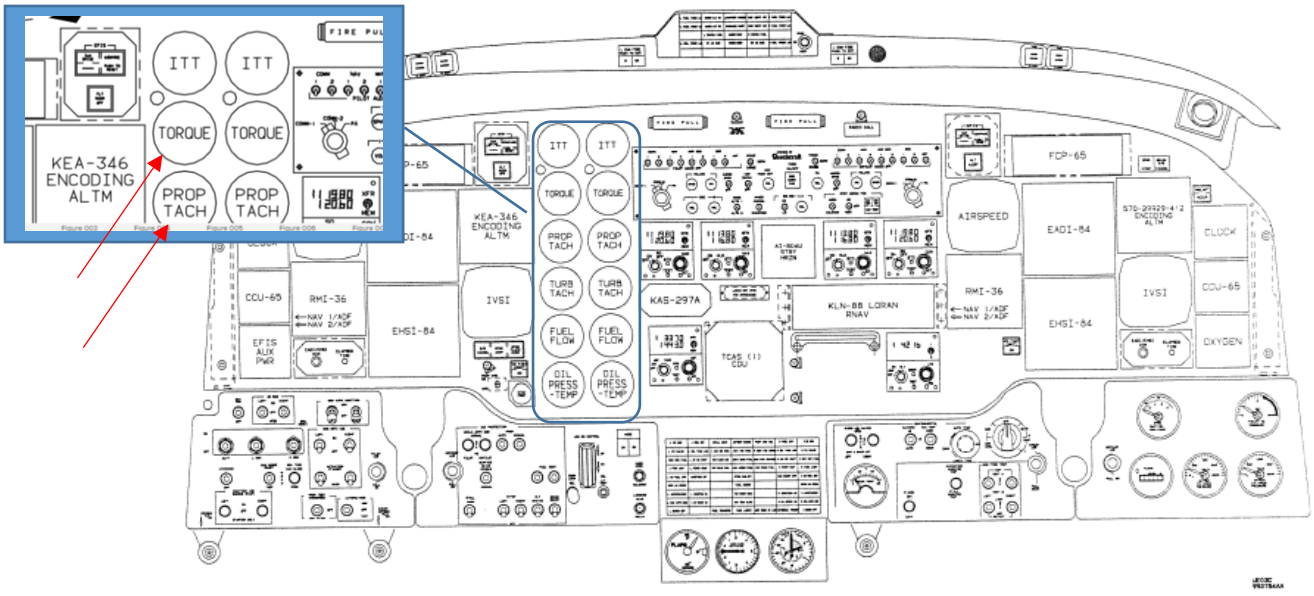

Figure 4: The location of the torque indicator and propeller RPM indicator on the flight deck of a B1900D airliner (B1900D systems description, section 3)

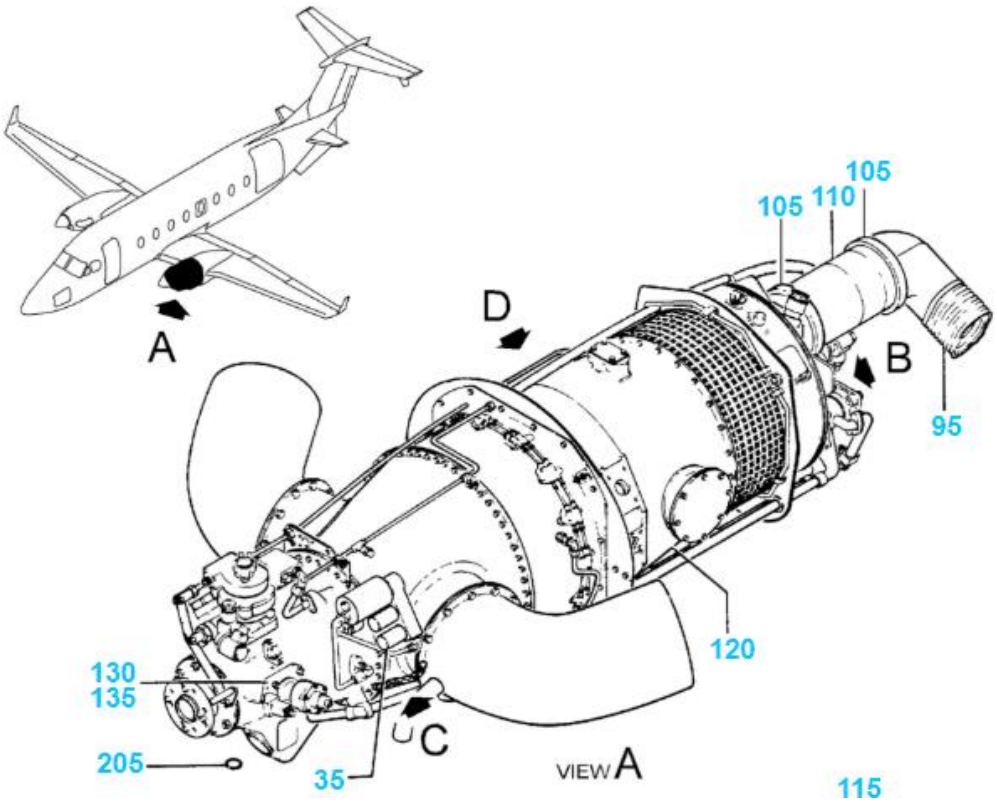

Figure 5: The B1900D is fitted with two Pratt and Whitney Canada PT6A-67D power plants (source: B1900D IPC, Figure 03: Sheet 1: POWER PLANT)

2.6 During the reverse/beta system investigation it was noted that when pulling on the beta cable towards the propeller the clearance limits were exceeded by 3-4mm. This could result in the beta valve internal piston being pulled to the open position and that will force the propeller to go into the furthering position. See appendix B bellow.

2.7 The maintenance history of this aircraft revealed that on 16 November 2018 the crew reported a left yaw caused by the left propeller on landing and the engineers adjusted the left engine solenoid (beta valve). On 17 November 2018 the crew reported aircraft pulls strongly left when closing the power lever on landing and on 18 November 2018 the engineers did another rigging of the beta system. On 21 November 2018 the crew reported aircraft yaws to the left when closing the power lever on landing and the engineers did another rigging by adjusting the reverse (beta) cable on 22 November 2018. On the day following this incident (23 November 2018) the AMO had rigged the cable and found the dimensions to be out of limits.

2.8 The Civil Aviation Regulation (CAR) 2011, Part 43.02.8 as amended, read together with South African Technical Standard (CATS), Part 43.02.8, section D, Part 1(12) as amended, state the following:

12. Duplicate inspections

(1) A duplicate inspection of all engine and flight control systems shall be carried out after initial assembly and at any time, the systems have been disturbed in any way. The purpose of the duplicate inspection is to verify that the manufacturer's specifications and requirements have been met in full.

(2) An initial inspection of the control system shall be made and certified by a person in possession of a valid Aircraft Maintenance Engineer's (AME) licence, or who has been approved by the Director as an Inspector in an organisation, or holds company certification as prescribed in Part 145 of the CAR, immediately after the maintenance is completed and before the aircraft is flown. Persons qualified to perform and certify duplicate inspections are –

(a) A type·rated AME or person holding valid company certification in terms of Part 145 of the Civil Aviation Regulations;

(b) An AME, holding a valid licence for the particular category, but not type-rated;

(c) The holder of valid company certification on a similar type; and

(d) The holder of a valid airline transport pilot licence rated on the type concerned. If the persons referred to in subparagraphs (a), (b) or (c) are not available.

3. FINDINGS

Aircrew

3.1 The pilot in command (PIC) was issued with a commercial pilot licence (CPL) on 5 September 2018 with an expiry date of 31 October 2019. The last competency check for the pilot was carried out on 5 September 2018.

3.2 The PIC had flown a total of 1070 hours on the B1900, of which 57 hours were flown in the last 90 days.

3.3 The PIC was issued with a Class 1 aviation medical certificate on 28 September 2018, which expires on 30 September 2019.

3.4 The first officer (FO) was issued with an airline transport pilot licence (ATPL) on 13 August 2018 with an expiry date of 30 September 2019. The last competency check for the pilot was carried out on 13 August 2018. The FO also held the necessary

aircraft type rating to operate the aircraft.

3.5 The FO had flown a total of 788.3 hours on the B1900 of which 98.7 hours were flown in the last 90 days.

3.6 The FO was issued with a Class 1 aviation medical certificate on 2 January 2018, which expires on 31 January 2019.

3.7 No cabin crew on board the aircraft for this flight, nor was this a requirement for the operation according to Civil Aviation Regulation 2011, Part 91.02.1 read together with the South African Civil Aviation Technical Standards (SACATS) 2011, Part *91.02.1 CREW COMPOSITION AND QUALIFICATIONS*

Aircraft

3.8 The aircraft was issued with a certificate of release to service (CoR) on 15 November 2018 with an expiry date of 14 November 2019 or at 26703.1 flying hours whichever occurs first. The last maintenance check carried out was a phase 1 check. The aircraft had flown 20.6 hours since the last maintenance check.

3.9 The aircraft was initially issued with a standard certificate of airworthiness on 29 June 2004 (initial issue) with an expiry date of 30 June 2019.

3.10 The aircraft is fitted with two Pratt and Whitney PT6A-67D turbo prop engines. Each engine drives a full range Hartzell propeller.

3.11 Prior to the incident flight, the flying crew had reported that the aircraft would yaw to the left when retarding the power prior to touchdown. Various maintenance-related investigations were carried out on multiple occasions, which included rigging of the reverse cable in the days preceding the incident.

3.12 On three occasions, where the AMO had done rigging or adjustments on the reverse/beta system there were no dual inspections recorded and this was in contravention of maintenance requirements as outlined in CAR Part 43 read together with SA Civil Aviation Technical Standards Part 43.02.8

3.13 During the reverse/beta system investigation, it was noted that when pulling on the beta cable towards the propeller the clearance limits were exceeded by 3-4mm. This could result in the beta valve internal piston being pulled to the open position and that will force the propeller to go into the feathered position. See appendix B bellow.

3.14 The aircraft experienced an inflight un-commanded feathering of the left engine propeller while on a climb phase due to an incorrect rigging of the reverse/beta cable which caused the beta valve to open resulting in the propeller entering an un-

commanded feathered position.

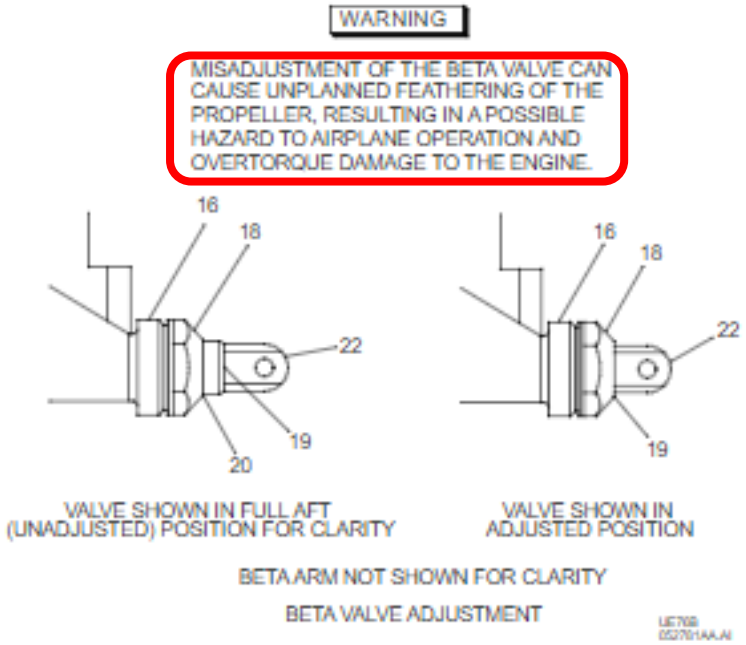

Figure 6: A warning stipulated in the B1900D AMM (Source: B1900D AMM Figure 204: Sheet 1: Fig 204 - Propeller Reversing and Beta Valve Adjustment)

Environment

3.14 The weather was not a factor in this incident.

3.15 The flight was conducted in visual meteorological conditions (VMC) by day.

4. PROBABLE CAUSE

4.1 The aircraft experienced an inflight un-commanded feathering of the left engine propeller while on a climb phase due to an incorrect rigging of the reverse/beta cable which caused the beta valve to open resulting in the propeller entering an un-commanded feathered position.

5. CONTRIBUTING FACTORS

5.1 The beta valve had an excessive clearance of 3-4mm. (see appendix B)

5.2 Beta/reverse system rigging/adjustment not properly done.

6. REFERENCES USED IN THE REPORT

6.1 Federal Airlines Maintenance report

6.2 Raytheon Aircraft Company B1900D Pilot Operating Manual

6.3 Raytheon Aircraft Company B1900D Maintenance Manual

6.4 Raytheon Aircraft Company B1900D Illustrated Parts Catalogue

7. SAFETY RECOMMENDATION

7.1 Safety Message: The Aircraft Maintenance Organisation need to ensure that maintenance performed by their personnel complies with manufacturer´s maintenance instructions and Civil Aviation Maintenance Requirements as outlined in CAR Part 43. The flight controls of the aircraft were disturbed and there was no evidence of duplicate inspection carried out by the maintenance engineers involved.

8. ORGANISATION

8.1 None

9. APPENDICES

9.1 Appendix A (Propeller reversing and beta valve adjustment diagram)

9.2 Appendix B (Technical report extract)

Appendix A

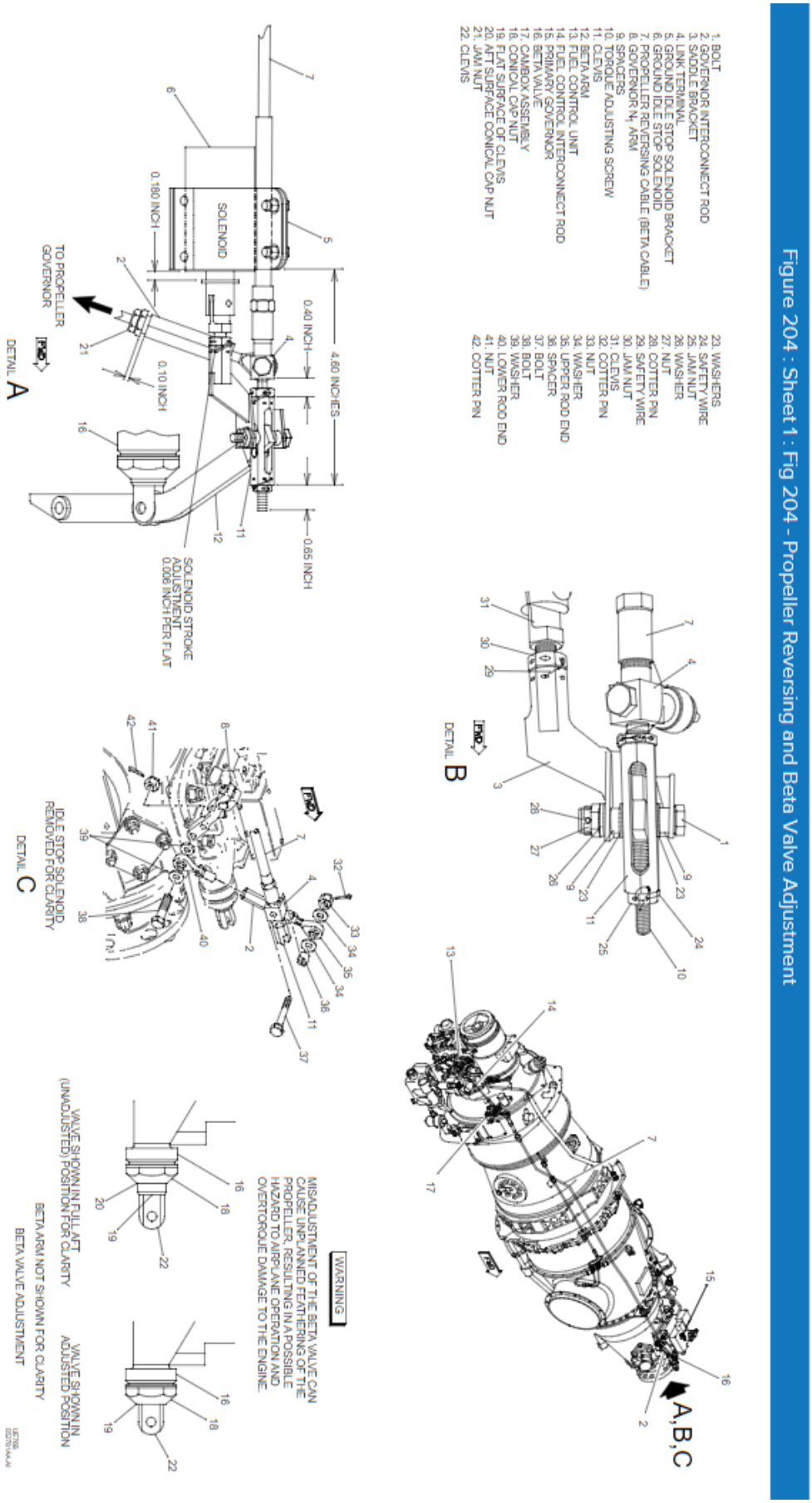

Figure 204 : Sheet 1 : Fig 204 - Propeller Reversing and Beta Valve Adjustment

(Extract from the B1900D AMM. The picture is for reference only and may not be of the

Observations

Once the aircraft landed safely, passengers disembarked.
The Engineers from Tynay OMA 1161, Opened the Left Hand Engine Cowling.

The following was observed by the R.P.A Federal Airlines, W. Heigan

1. The Components fitted to the engine were correct and correctly installed.
2. All linkages were secured with wire locking and split pined as required.
3. The Fuel topping governor had the correct clearance of 0.10 inches
4. The Solenoid was rigged and in working order at the time of the incident
5. Adjustments were in specification.
6. It was noted that when pulling forward on the reversing cable towards the propeller, that the clearance as per **Annexure A**, NOTE 1 increased to 3-4 mm. This could have pulled the internal piston of the beta valve to the open position. This action in turn would force the propeller to go into the feather position.
7. It was noted that the feather cable was stretched. The cable could be adjusted shorter by 1.5 turns at the front and 4 turns at the AFT attachment.