



National Transportation Safety Board
Washington, D.C. 20594

Safety Recommendation Report
**Preventing Incorrect Installation of the Beta Arm in
Pratt & Whitney Canada PT6A Engines**

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|-----------------------------------|---------------------------|
| Accident Number: | IAD01LA048 and ANC13WA057 |
| Operator/Flight Number: | Multiple |
| Aircraft and Registration: | Multiple |
| Location: | Multiple |
| Date: | Multiple |
| Adopted: | December 5, 2016 |

The National Transportation Safety Board (NTSB) is providing the following information to urge the Federal Aviation Administration (FAA) and Pratt & Whitney Canada to take action on the safety recommendations in this letter. These recommendations are intended to prevent the incorrect installation of the reversing lever (beta arm) and related components in PT6A engines, which can cause the propeller to transition uncommanded to feather in flight.¹ They are derived from investigations in which the beta arm or related components were found incorrectly positioned. As a result of these investigations, the NTSB is issuing one safety recommendation each to the FAA and Pratt & Whitney Canada.

Background and Analysis

As a result of a previous NTSB investigation, we became aware of a safety issue concerning the possibility of the reversing lever (beta arm) and related components in PT6A engines being incorrectly positioned.² If the beta arm is not positioned such that it is secured under its guide pin, the unsecured linkage could release oil pressure in the beta valve and cause uncommanded travel of the propeller to the feather position (figure 1 shows exemplar engines with correctly and incorrectly positioned beta arms.)

¹ The beta arm in PT6A engines provides propeller blade angle feedback to the beta valve.

² More information about this accident, NTSB case number ERA15FA129, can be found in the Aviation Accident Database at www.ntsb.gov.

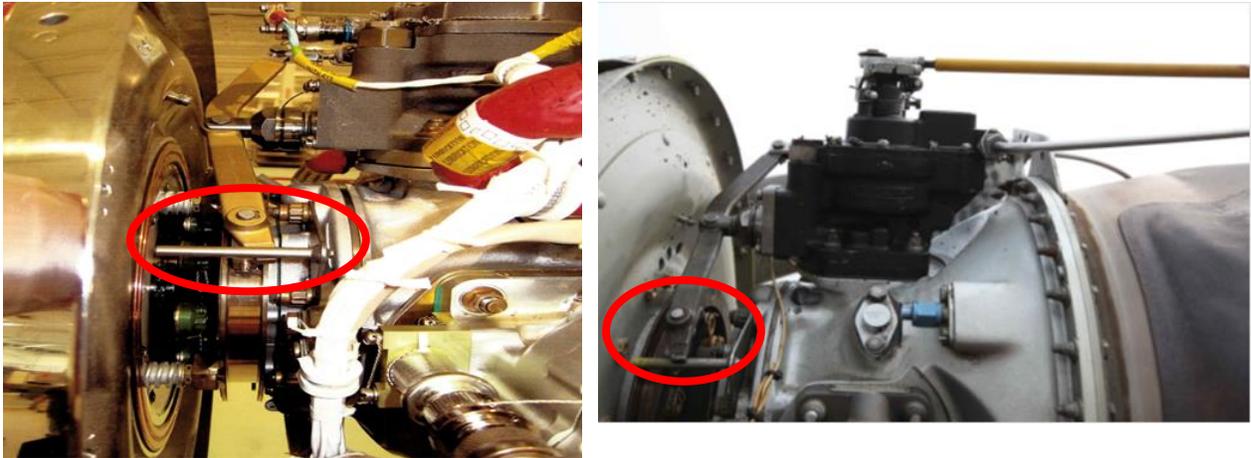


Figure 1. Photographs of exemplar engines showing correct (left) and incorrect orientation (right) of the beta arm

The NTSB notes that the critical beta arm/guide pin connection and orientation are reinstalled any time the propeller is removed from the engine for an engine inspection or propeller replacement. The airplane maintenance manual contains general warnings about improper adjustment of the beta valve but no specific warnings about the beta arm-to-guide pin connection and orientation. Out of concern that this may be a recurring safety issue, the NTSB reviewed other accident investigations in which the incorrect position of the beta arm was found.

The NTSB's review found four events in which the incorrect position of the beta arm in a PT6A engine was noted and that occurred within 100 flight hours after maintenance of the beta arm or related components.³ In a fifth event (NTSB case number ERA15FA297), the investigation found that the guide pin had been installed backward, which allowed the beta arm to be free-floating, that is, neither above nor below the guide pin (figure 2 shows the installation on the engine involved in this accident).⁴ The NTSB is aware that one operator has welded a tab to the top of guide pins to make it physically impossible to incorrectly install the beta arm over the pin but notes that this fix would not prevent an intentional reversal of the guide pin if, for example, a mechanic chose to do so to provide clearance for maintenance work.

³ Two of the events resulted in incidents (FAA ID WP27201402461 and Transportation Safety Board of Canada ID A141A0053), and two resulted in accidents (NTSB case numbers IAD01LA048 and ANC13WA057). Because it pre-dates June 1, 2009, the docket for IAD01LA048 is not available on our website; information in this docket may be obtained by using our [online contact form](#). ANC13WA057 was reported to the NTSB by the Korea Aviation and Railway Accident Investigation Board (ARAIB), which investigated the accident. Additional information about this accident may be obtained by contacting the ARAIB.

⁴ The incorrect orientation of the guide pin did not cause this accident but was cited as a finding in this investigation. More information about this accident, NTSB case number ERA15FA297, can be found in the Aviation Accident Database at www.nts.gov.

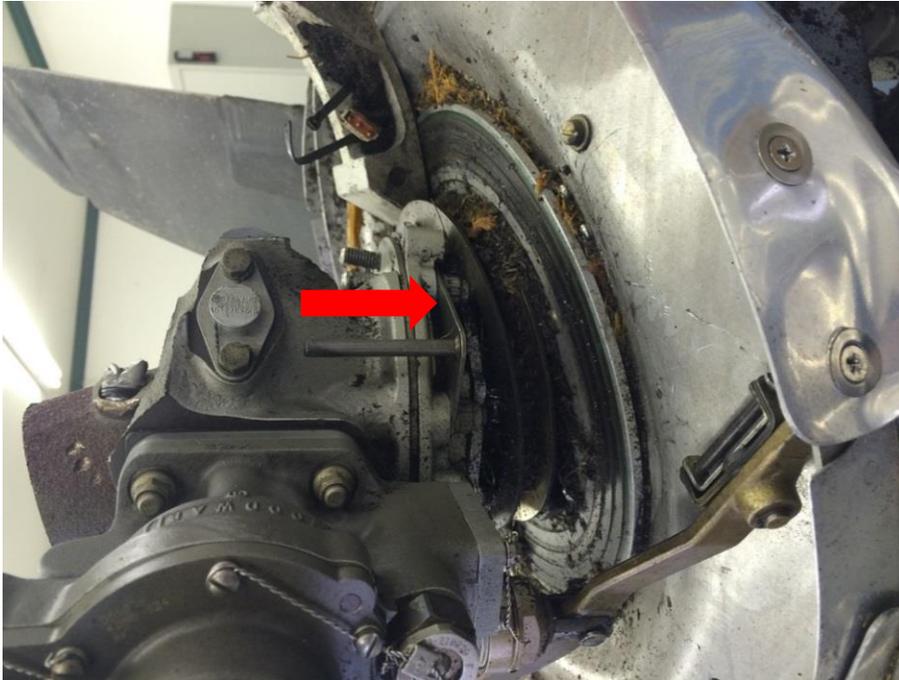


Figure 2. A photograph showing a beta arm guide pin installed incorrectly in the aft direction (the red arrow points forward, indicating the pin's correct orientation).

Depending on airplane make and model, warnings about this issue in aircraft maintenance manuals vary, ranging from a general warning about the hazards of a misadjusted beta valve assembly to no warning at all. In March 2016, Pratt & Whitney Canada issued Service Letter PT6A-239R1, "Reversing lever guide pin bracket assembly," to alert operators about the hazards of incorrectly installing the propeller beta arm. The company also revised its engine maintenance and overhaul manuals and started efforts to redesign the guide pin. However, there is no set date to complete the redesign and implementation of the new guide pin.

The NTSB is concerned that any propeller on any PT6A engine that has undergone improper maintenance to the beta valve assembly can travel uncommanded to the feather position during any phase of flight. Due to the critical function of this assembly, the NTSB believes that short- and long-term action should be taken to address this safety issue. Although Pratt & Whitney Canada has revised its engine maintenance and overhaul manuals, the NTSB believes that the design of this assembly needs to be revised to minimize the possibility of human error during maintenance.

Because the beta arm-to-guide pin connection and orientation are clearly visible between the front of the engine and the rear of its propeller spinner, minimal additional effort would be necessary to visually verify that the beta arm is positioned correctly. Therefore, the NTSB recommends as a short-term mitigation that the FAA issue a special airworthiness information bulletin that directs maintenance personnel, during routine scheduled inspections of and after propeller installation on Pratt & Whitney model PT6A engines, to visually verify that the propeller beta arm and guide pin are correctly installed and, if necessary, to fix any improper installations. Such an action would not only detect errors during inspections but also heighten awareness in the

maintenance community about the importance of properly installing the beta arm and guide pin. In the longer term, the NTSB also recommends that Pratt & Whitney Canada, as soon as practicable, complete the development and implementation of a redesigned guide pin assembly for PT6A engines to prevent the possibility of the beta arm and guide pin being incorrectly installed.

Recommendations

To the Federal Aviation Administration:

Issue a special airworthiness information bulletin that directs maintenance personnel, during routine scheduled inspections of and after propeller installation on Pratt & Whitney model PT6A engines, to visually verify that the propeller reversing lever (beta arm) and guide pin are correctly installed and, if necessary, to fix any improper installations. (A-16-53)

To Pratt & Whitney Canada:

As soon as practicable, complete the development and implementation of a redesigned guide pin assembly for PT6A engines to prevent the possibility of the reversing lever (beta arm) and guide pin being incorrectly installed. (A-16-54)