Aviation Safety Investigation Report 199201201

Partenavia Costruzioni Aeronautiche SPA
P.68B

02 January 1992

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Occurrence Number: 199201201 **Occurrence Type:** Accident
Location: Moorabbin
State: VIC **Inv Category:** 3
Date: Thursday 02 January 1992
Time: 1325 hours **Time Zone** ESuT
Highest Injury Level: None

Aircraft Manufacturer: Partenavia Costruzioni Aeronautiche SPA
Aircraft Model: P.68B
Aircraft Registration: VH-IYM **Serial Number:** 143
Type of Operation: Miscellaneous Test
Damage to Aircraft: Substantial
Departure Point: Moorabbin VIC
Departure Time: 1320 ESuT
Destination: Moorabbin VIC

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	ATPL 1st Class	50.0	4200
Other Pilot	Private	150.0	600

Approved for Release: Friday, May 27, 1994

The private pilot conducted a daily inspection, loaded five people and luggage on board the aircraft and attempted a takeoff on runway 17 right. When the aircraft failed to rotate, the pilot rejected the takeoff. He attempted a second takeoff on runway 17 right, using the extra runway distance available before the displaced threshold. Again the aircraft failed to rotate and the takeoff was rejected. He taxied back to dispersal, unloaded 75 kilograms of luggage and attempted a third unsuccessful takeoff. Next he unloaded the four passengers and attempted a fourth takeoff which was also rejected. The pilot taxied back to dispersal and acquired the services of a flying instructor in an attempt to determine why the aircraft would not rotate when he pulled the control column back.

The instructor agreed to fly a circuit with the pilot. The pilot carried out a takeoff with the instructor monitoring. Because the instructor was not flying the aircraft he was not aware that the pilot had to apply stabilator back trim to rotate the aircraft. During the crosswind leg the instructor noted that the pilot was holding an unusual control column position to achieve the climb attitude. The instructor took over the controls but realised that, although the control column pressures felt normal and ailerons performed normally, there was little or no attitude change when the column was pushed forward or pulled aft.

Using engine power variations and stabilator trim, the instructor carried out a long, shallow, landing approach for runway 17 right. The instructor was unable to reduce the rate of descent enough to prevent a hard landing. On touchdown the right main landing gear leg broke and the aircraft skidded off the runway to the left.

It was subsequently found that stabilator control was lost because the torque tube lever (drive horn) slipped on the stabilator torque tube. There was evidence of lubricant between the clamping surfaces of the drive horn and the stabilator torque tube. Lubricant had been applied to the area during recent assembly in an attempt to prevent corrosion which had occurred in the past on an unpainted torque tube. Lubricant may also find its way onto the torque tube/drive horn when the jack screw, which is located immediately above the drive horn, is lubricated.

The rigging screw/safety screw, which located the drive horn on the torque tube, had sheared progressively. It was estimated that this screw will shear with a control force of 60 pounds.
A series of tests was carried out to measure the breakaway and sliding forces of the drive horn on the torque tube with the drive horn clamp bolts properly torqued between 50 and 70 inch pounds. These tests were conducted without fitting a rigging screw. With lubricated surfaces, the maximum breakaway force was 96 pounds with the clamping bolts torqued to 70 inch pounds. The breakaway force fell to 45 pounds with clamping bolts torqued to 50 inch pounds. The highest breakaway force measured during the tests was 165 pounds with dry surfaces and 60 inch pounds torque on the clamping bolts.

These tests indicated that the current design does not comply with FAR 23.397 standards because the control system is not capable of transmitting a force of 200 pounds to the stabilator without risk of slippage of the drive horn on the torque tube.

The rigging/safety screw probably failed as a result of being subjected to repeated shearing forces during flight.

Significant Factors

The following factors were considered relevant to the development of the accident:

1. The pilot(s) conducted repetitive rejected takeoffs rather than seek qualified engineering advice.

2. Because of the current design of the attachment of the drive horn to the stabilator torque tube, the control system does not comply with FAR 23.397 standards in that it is not capable of transmitting a force of 200 pounds to the stabilator without the risk of slippage of the drive horn on the torque tube.

3. The friction grip surfaces between the drive horn and the torque tube had been lubricated during installation thereby making slippage of the drive horn more likely to occur.

4. It is possible that lubricant may find its way onto the torque tube/drive horn area because maintenance engineers periodically lubricate the screw jack located close to and above the drive horn.

Safety Action

In response to preliminary investigation advice, the Civil Aviation Authority issued Direct Mail Airworthiness Directive AD/P68/38 in March 1992. This directive required intial and repetitive integrity inspections of the stabilator drive horn to torque tube clamped joint.

AD/P68/38 Amdt 1 was issued 6/92 to reflect and require compliance with Partenavia Service bulletin P68-87. This amendment aligned the Australian AD with the country of origin AD FAI 92-077 requirements.

The current AD/P68/38 Amdt 2, issued 9/92, reflects and requires repetitive compliance with Partenavia SB P/68-87 rev 1 which introduces a more specific clamp bolt torque and a new safety screw of a different material.

The Bureau of Air SAfety Investigation engineering evaluation and testing of the stabilator horn to torque tube clamped joint, contends that the design fails to meet the FAR 23 design standards. Further comparisons, between the BASI engineering report and tests and the Partenavia engineering tests revealed that, when the joint was lubricated it failed to transmit limit loads and raises doubts whether the new NAS1105 safety screw by itself is capable of transmitting the limit load with a factor of 1.5 as suggested by Partenavia.

The Bureau of Air Safety Investigation therefore makes the following recommendation:

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(i) That the Civil Aviation Authority review the Partenavia engineering data (in comparison to the BASI engineering reports) to ascertain whether or not this friction clamped joint meets the FAR 23 design standard.

(ii) That the Civil Aviation Authority continue to negotiate with the manufacturer to produce a scheme for this primary control which positively attaches the Torque Tube Lever (Drive Horn) to the Stabilator Torque Tube.