



Interagency Aviation Lessons Learned

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Subject: Aircraft Accident Success Story

Area of Focus: Crew Resource Management

Distribution: All Aviation Operations

Discussion: On August 5, 2017, a P2V-5F aircraft sustained substantial damage shortly after takeoff. The event was classified an accident by the NTSB. The events surrounding the aircrew's successful return to the airfield is a Crew Resource Management (CRM) success story.

How could an accident be a success story you ask? The crew were able to land the aircraft safely without any injuries or further damage to the aircraft despite the odds against them. Here's the rest of the story:



The flight departed on its third mission to disperse fire retardant over a nearby wildfire. During the climb, the Pilot-In-Command (PIC) observed an uncommanded aft movement of the control yoke with a simultaneous increase in the airplane's pitch attitude. He instructed the First Officer (FO) to retract the flaps while he re-trimmed the elevator, but was not able to regain pitch control. The FO attempted to adjust his trim wheel and then re-trim the airplane using the emergency varicam, but the airplane continued to maintain a pitch up attitude. The PIC directed the FO to lower the flaps five degrees, which reduced the elevator backpressure. The PIC subsequently jettisoned the load of fire retardant over vacant farmland while the FO declared an emergency with the tower. The PIC made a shallow turn to enter a left downwind for Runway 21 while maintaining a wide traffic pattern that allowed him to make adjustments due to the lack of pitch control. During the final approach, the crew used a combination of wing flaps and engine power for pitch up adjustments, crew coordinated application of elevator for trimmed pitch, and turns to make pitch down adjustments. When the aircraft was approximately 500 feet above ground level, the FO lowered the remaining five degrees of flaps to increase the pitch attitude. With both pilots pulling back on the yoke to keep the nose up, the FO reduced power and the aircraft landed safely on the runway.

The P2V is equipped with a variable camber (varicam) horizontal stabilizer in place of an elevator trim tab. When an adjustment is made in the cockpit, the varicam drive shaft rotates to move the varicam actuators and the secondary control surfaces down or up deflection. The varicam actuators are secured to the drive shaft through universal joints located at the outboard ends, comprised of two bolts that are threaded and safety wired to the drive stop and two bolts with castellated nuts and cotter pins to secure the yoke to the drive coupling.

A post-accident examination of the varicam's left hand outboard drive stop and yoke showed that one bolt had been secured to the drive coupling but not safety wired. A bolt hole was found on the opposing side of the drive coupling, but the bolt was missing. The missing drive coupling bolt was found inside the varicam without any safety wire in the bolt head. The remaining bolt and the bolt that came out should have been safety wired to each other.

The absence of the drive coupling bolt hinders the torque capabilities of the drive shaft; thereby allowing one side of the varicam to move and the other side to remain stationary or turn incrementally.

Since the varicam is a secondary control surface that directly connects to the elevators and provides a primary structural load path for all elevator loads, the NTSB classified the damage as substantial (accident).

Crew resource management or CRM optimizes the human/machine interface and accompanying interpersonal activities that include information transfer, problem solving, decision making, maintaining situation awareness, and dealing with automated systems. (CRM) is a set of training procedures for use in environments where human error can have devastating effects.

The PIC had previously demonstrated to the FO approaches to land without making any adjustments to power or pitch to simulate a varicam failure, so they were prepared for an approach without trim or elevator control. As it turns out, both aircrew had recently completed a CRM refresher course prior to the beginning of the fire season. They were prepared. Are you?

So, what happened to the bolt? Good question. That will be the subject of another Lessons Learned in the near future. As Paul Harvey would say: "Stay tuned for the rest of the story."

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