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Date: August 7, 2024

Subject: WPR24LA134 - Excerpt from Bell Helicopter Airframe Examination
Field Notes

Contact: Bell Helicopter

The excerpt below is taken from the examination field notes.

"Cyclic control continuity was confirmed from the stick, through the servos, to the swashplate assembly in all movements of the cyclic stick. The collective stick was moved up and down freely by hand and corresponding movement was observed to the collective servo through the collective servo input arms. With collective stick movement, proper mixing of the controls through the mixing unit was observed in the cyclic control system. The collective servo exhibited two fractures at the cylinder extension (1) lower arm and (2) upper arm. The two aft located cylinder extension arm monoball bearings were manipulated by hand to feel for play. The aft bearing which connects to a horizontal boosted control tube exhibited minor axial and radial play but the forward bearing which connects the servo to the airframe aft support exhibited no discernable play in either the radial or axial directions. The forward servo actuator support bearing did not exhibit any discernable play in either the axial or radial directions. The top servo cylinder extension arm was fractured about 3/8 inch from its forward attachment surface. The bottom extension arm was fractured at its most aft surface where it attaches to the support structure for the two aft monoball bearings. The swashplate was manipulated by hand and free movement was observed through the collective lever to the horizontal boosted collective control tube just aft of the collective servo, indicating no binding was present that could have introduced loads to the aft servo cylinder extension arms. The collective input to the droop compensator (input to engine control power turbine governor on left forward side of engine) was checked for binding. A bellcrank near the aft end of the collective servo was moved by hand and free movement was observed through the droop compensator to the engine

power turbine governor, indicating no binding that could have introduced higher loads to the collective servo output support arm.

The following summary is based on Bell's material laboratory examination of one of the fatigue cracks.

"A follow-up materials laboratory examination at Bell Engineering Laboratories revealed that the collective inputs, especially during <1G maneuvers, were initially driving the crack and creating fatigue band features. Towards the end of the fatigue crack, the 2 per revolution main rotor loads were constructively contributing to the crack growth, consistent with the attributes of the individual striations. The laboratory examination group attempted to perform a fatigue band count to correlate the fatigue band striations with the 2 vibrations per blade revolution to determine if the crack initiation started after Van Horn composite blades were installed 10 days (59 flight hours) prior to the accident. However, due to the non-uniform fatigue band structure, an accurate fatigue band count could not be performed."