



Memorandum For Record

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Examination of the left Hartzell propeller, HC-E2YL-2BS, Blade Design 7663-4, SN BG768 revealed the crankshaft flange and about 70% of the starter ring gear remained attached. The propeller blades appeared to be at a low blade angle. Both blades were bent aft. The low pitch stop had 1 fresh hex shape impact mark. The propeller was on the start lock. The start lock and feather stop were unremarkable and the start lock tower was intact. The feathering spring keepers were in-place. The left propeller was not feathered at impact.

Examination of the L1 propeller blade revealed it was rotationally loose in the hub indicating internal separation of the pitch change knob. The blade bearings were ok. The pitch change knob for the L1 blade was fractured/sheared opposite low pitch. The pitch change knob was not shot peened. Preload plate came off easily and exhibited an indentation in the end of the slot consistent with forceable rotation of the blade to low pitch. The preload plate contained in-service marks. The center point of the highest knob angle was 16° forward of the plane of rotation /split line which correlated to an approximate blade angle at impact of about 31°¹ and the second knob angle of 31° forward of the plane of rotation /split line correlated to an approximate blade angle of about 16°, which was the lower limit of the start lock angle. The blade was bent aft, and exhibited some bending at the tip opposite the direction of rotation.

Examination of the L2 blade revealed the pitch change knob which was bent opposite of low pitch and was not shot peened. The preload plate had 2 marks from the L1 blade. One of the marks likely associated with impact was located at knob angle of 19° forward of the plane of rotation /split line which correlated to an approximate blade angle at impact of about 28°² and the second knob angle of 29° forward of the plane of rotation /split line correlated to an approximate blade angle of about 18°. The blade was bent aft, while about 4 inches of the tip was bent forward in the thrust direction.

¹ According to the Installation Instructions, the start lock angle is 17.5° plus or minus 1.5°. The low pitch stop is 12.0° plus or minus 0.2°.

² According to the Installation Instructions, the start lock angle is 17.5° plus or minus 1.5°. The low pitch stop is 12.0° plus or minus 0.2°.

Visual examination of the left propeller governor Hartzell F-6-3A, SN B2672 revealed the drive gear rotated freely with normal hand pressure and produced a gurgling sound. The control arm/shaft was impact separated.

Examination of the right Hartzell propeller , HC-E2YL-2BS Blade Design 7663-4, SN BG2414 revealed the zerk fitting in the propeller hub adjacent to the trailing edge of the R1 blade was impact separated. The air valve was fractured off the low pitch stop assembly. The low pitch stop was removed and some contact damage was noted to the low pitch stop indicating the propeller was at or near the low pitch blade angle. The propeller blades as first viewed were on the start lock(s). Both propeller blades were secure indicating the pitch change mechanism was intact. The pitch change mechanism was intact. The pitch change rod was noted to be bent. Following removal of the split spring keepers, both springs were removed and intact, and the spring cavity was noted to have some grease. The pitch change rod could not be unthreaded from the fork requiring the aft hub halves to be removed. Following removal of the hub halves, the aft hub cavity was partially full of oil (abnormal). The pitch change knobs on the butt ends of both propeller blades were intact but bent. Air pressure was applied to the pitch change rod where the oil enters for the piston and the opposite end of the pitch change rod was blocked. A leak was noted on the forward side of the fork. Inspection of the pitch change rod revealed bending deformation in the area of the fork. During an attempt to unthread the pitch change rod from the fork, the pitch change rod fractured completely. One area of the fracture surface had evidence of fresh engine oil, and the fresh fracture surface was dry. No oil was noted forward of the piston, and very little oil was noted in the spring cavity, which contained a light amount of grease on the inside diameter surface. The fracture surface area due to impact damage of the pitch change rod was attributed to be from bending/tension overload, and the remaining fracture caused by unthreading was overload.

There were no indications or impact signatures suggesting the right propeller was feathered at impact, and there was no evidence of preimpact failure or malfunction of the right propeller assembly that would have precluded the ability of the propeller to feather if commanded before the start lock engagement rpm.

Examination of the R1 propeller blade - Blade Design 7663-4, SN C9287 revealed it was bent aft and twisted towards low pitch at the tip. The blade was also bent opposite the direction of rotation. The blade bearings were intact. The pitch change block and nylon bumper were unremarkable. The pitch change knob was bent opposite low pitch direction. Spanwise and angular scratches were noted on the cambered side of the blade. The nylon rub strip was impact damaged on the face side. An approximate 10 inch long section of the blade tip was cut associated with recovery. Inspection of the separated section revealed a wave bend on the leading edge centered about 3 inches from the tip; the wave width was between 1.5 and 2.0 inches. The wave bend was consistent with a tree strike. The pitch change knob was not shot peened. A distinguishable, circular, impact mark on the preload plate from the R2 blade pitch change knob bumper resulted in a 29° knob angle forward of the plane of rotation /split line which correlated to an approximate blade angle at impact of about 18^{°3}.

³ According to the Installation Instructions, the start lock angle is 17.5° plus or minus 1.5°. The low pitch stop is 12.0° plus or minus 0.2°.

Examination of the R2 propeller blade – Blade Design 7663-4, SN C9524, revealed it displayed no discernable bending or twisting. At midspan of the blade on the cambered side of the blade coarse chordwise scratches were noted consistent with rotational scoring. The blade face appeared ok. The blade bearings were intact. The pitch change block and nylon bumper were unremarkable. The pitch change knob was bent opposite low pitch direction. The nylon rub strip was impact damaged on the face side. The pitch change knob was not shot peened. Two impacts marks were noted on the preload plate caused by the R1 blade pitch change knob block bumper. The highest knob angle was 29°, forward of the plane of rotation /split line which correlated to an approximate blade angle at impact of about 18°⁴ and the second knob angle of 43° forward of the plane of rotation /split line correlated to an approximate blade angle of about 4°, which was less than the lowest specified low pitch stop value of 11.8°.

Visual examination of the right propeller governor Hartzell F-6-3A, Serial Number (S/N) 7389, revealed the drive gear rotated freely with normal hand pressure and produced a gurgling sound. The control arm tower was bent. Impact damage to the control arm tower prevented rotation to the low pitch stop. The return spring was in-place and intact. The control arm was removed to facilitate further examination. The control shaft was bent and would not allow full range of motion. Following removal of the control arm, the shaft was placed back in the governor and full range of motion was achieved. The gear on the end of the shaft was satisfactory with no missing teeth. The head was removed and both flyweights remained attached and move freely and the spool valve moved freely. The head cavity was satisfactory and the speeder spring was ok. The platter moved normally with gear rotation. The contact point with the spool valve bearing was ok. There was no evidence of preimpact failure or malfunction of the governor that would have precluded normal operation. The governor was loosely assembled.

⁴ According to the Installation Instructions, the start lock angle is 17.5° plus or minus 1.5°. The low pitch stop is 12.0° plus or minus 0.2°.