

As appropriate, special conditions, as defined in § 11.19, are issued in accordance with § 11.38 and become part of the type certification basis in accordance with 14 CFR 21.101(b)(2).

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of 14 CFR 21.101(a)(1).

Novel or Unusual Design Features

The 54H60–77E will incorporate the following novel or unusual design features: dual acting digital electro-hydraulic propeller control system. Digital electronic control introduces potential failures associated with electrical power, software commands, data, and environmental effects that can result in hazardous propeller effects. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for these design features. These special conditions address the following airworthiness issues for the Hamilton Sundstrand 54H60–77E propeller:

1. Safety assessment.
2. Propeller control system.

These special conditions contain the additional safety standards necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

The existing type certified Hamilton Sundstrand 54H model propeller as described in FAA Type Certification Data Sheet P906, amendment 7, uses a mechanical governor in the propeller control system. This mechanical control system senses propeller speed and adjusts the pitch by directing hydraulic oil to the propeller actuator to increase or decrease pitch to maintain the propeller at the correct RPM and to absorb the engine power.

The Hamilton Sundstrand EPCS replaces the current mechanical control system with a digital electronic governor in the propeller control. The digital electronic governor is designed to operate a hydro-mechanical interface to direct hydraulic oil to the propeller actuator to increase or decrease pitch. The digital electronic control logic commands speed governing, synchrophasing, and failure monitoring and provides beta scheduling. Digital electronic control introduces potential

failures associated with electrical power, software commands, data, and environmental effects that can result in hazardous propeller effects.

Safety Assessment

The special conditions require the applicant to conduct a safety assessment of the propeller in conjunction with the requirements for evaluating the digital electro-hydraulic control system. A safety assessment is necessary due to the increased complexity of these propeller designs and related control systems. The ultimate objective of the safety assessment requirement is to ensure that the collective risk from all propeller failure conditions is acceptably low. The basis is the concept that an acceptable total propeller design risk is achievable by managing the individual risks to acceptable levels. This concept emphasizes reducing the risk of an event proportionally with the severity of the hazard it represents.

The special conditions are written at the propeller level for a typical aircraft. The typical aircraft may be the aircraft intended for installation of the propeller. It is advised that the propeller applicant have an understanding of the intended aircraft, not to show compliance with this requirement, but to design a propeller that will be acceptable for the intended aircraft. For example, a part 25 aircraft may require different failure effects and probability of failure than a part 23 aircraft. Showing compliance with the requirement without consideration of the intended aircraft may result in a propeller that cannot be installed on the intended aircraft.

Propeller Control System

Currently, part 35 does not adequately address propellers with combined mechanical, hydraulic, digital, and electronic control systems. Propeller mechanical control systems certified under the existing requirements incorporate a mechanical governor that senses propeller speed and adjusts the pitch to absorb the engine power to maintain the propeller at the selected rotational speed. Propellers with digital electronic control components perform the same basic function but use software, electronic circuitry, and electro-hydraulic actuators. The electronic control systems may also incorporate additional functions such as failure monitoring, synchrophasing, and beta scheduling. This addition of electronics to the control system may introduce new failure modes that can result in hazardous propeller effects.

Applicability

As discussed above, these special conditions apply to the model 54H60–77E propeller. Should Hamilton Sundstrand apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of 14 CFR § 21.101(a)(1).

Conclusion

This action affects only certain novel or unusual design features on one model of propellers. It is not a rule of general applicability, and it affects only the applicant who applied to the FAA for approval of these features on the propeller.

The substance of these special conditions has previously been subjected to the notice and comment period and has been derived without substantive change from those previously issued. The FAA has determined that prior public notice and comment are unnecessary and that good cause exists for adopting these special conditions immediately. Therefore, these special conditions are being made effective December 1, 2003. The FAA is, however, requesting comments to allow interested parties to submit views that may not have been submitted in response to the prior opportunity for comment described above.

List of Subjects in 14 CFR Part 35

Air transportation, Aircraft, Aviation safety, Safety.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701–44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Hamilton Sundstrand model 54H60–77E propeller.

In addition to the requirements of part 35, the following requirements apply to the propeller.

(a) *Definitions.* Unless otherwise approved by the Administrator and documented in the appropriate manuals and certification documents, for the purpose of these special conditions the following definitions apply to the propeller:

(1) Propeller. The propeller is defined by the components listed in the type design.

(2) Propeller system. The propeller system consists of the propeller plus all