

### **Request for Relaxed Compliance Requirements**

Three commenters request that relaxed compliance requirements be provided for engines with certain configurations that reduce the probability of an upstream failure that has been known to result in the higher severity uncontained LPT events. The commenters believe that addressing the root causes of the uncontained LPT failures will be more effective than the new shrouds for improving containment and reducing the frequency and severity of the events.

The FAA partially agrees. The FAA agrees that upstream failures that lead to uncontained LPT events must be addressed and has already mandated corrective actions for many of those known failure mechanisms. However, as stated in the proposed rule, not all such possible upstream failure modes can be predicted or anticipated. Therefore, the FAA disagrees that relaxed compliance schedules for engines configured with certain root cause fixes will achieve the necessary safety improvement that will be realized by incorporation of the improved LPT shrouds. No changes will be made to this AD.

### **Request for Equivalent Replacement Parts**

Five commenters request that any FAA-approved Parts Manufacturing Approval (PMA) or repaired configurations of the manufacturer's design be allowed as equivalent replacement parts for the GE service bulletin parts.

The FAA agrees. The final rule is revised to include all of the known FAA-approved equivalent parts for each of the engine models as acceptable configurations.

### **Service Bulletin Accepted as Compliance to Proposed Rule**

One commenter requests that GE CF6-50 SB 72-1170, Revision 1, dated November 30, 1999, be accepted as compliance for the proposed rule. The commenter notes that this revision clarifies the engines that are affected by explicitly listing all of the earlier shroud part numbers that should be replaced with the new shroud part numbers.

The FAA partially agrees. The FAA agrees that the revised SB provides additional clarification on the affected engines. However, as noted in the FAA response to the previous comment on equivalent replacement parts, there are other parts in addition to those referenced in that SB that can be used to comply with this AD. The final rule is changed to eliminate the

incorporation by reference of any version of the SB.

### **Analysis Request To Quantify Containment Improvement**

One commenter requests that an analysis be provided to quantify the containment improvement provided by the new shrouds. The commenter believes that the new design shrouds do not improve the containment capability as intended because the minimum thickness of the shear section is not changed.

The FAA disagrees. The FAA feels that the containment capability of the shrouds can not be determined based on shear section thickness alone. No changes will be made to this AD.

### **Request for Engine Containment Test**

One commenter requests that the OEM be required to perform an engine containment test to demonstrate the effectiveness of the new design shrouds. The commenter believes that other OEM's have been required to perform such tests in order to substantiate improved containment. The commenter believes that the high cost of compliance with the proposed rule warrants such a test demonstration.

The FAA does not agree. The regulations for the most part address primary blade containment. Test demonstrations for secondary failure modes, due to multiple upstream failures, as in this case, are not normally required. In addition, the regulations allow the use of analysis in lieu of a test demonstration, and a test is not always required for substantiation. No changes will be made to this AD.

### **Request To Limit the Number of Times a Shroud Can Be Repaired**

One commenter requests that the proposed rule be revised to limit the number of times a shroud can be repaired. The commenter notes, as stated in the proposal, that multiple repairs can lead to reduced backsheet thickness and result in reduced containment system capability.

The FAA partially agrees. The FAA agrees that multiple repairs can possibly result in reduced backsheet thickness. However, the FAA disagrees that the specific number of repairs that will result in this condition can be defined. Instead, the engine manufacturer has made modifications to the engine manual to require a check of the backsheet thickness in order to determine the serviceability of the shroud. Compliance with the revised manual limit will ensure that the minimum backsheet thickness required to achieve the system containment

capability is maintained. No changes will be made to this AD.

### **Request for Revision to Notice of Proposed Rulemaking (NPRM)**

One commenter requests that the proposed rule be revised to include improved stage 1 and stage 5 shrouds for the CF6-80C2. The commenter believes that a recent in-service event indicates that improved containment is necessary in stages 1 and 5 as well as stages 2, 3, and 4 that have already been proposed. The commenter recommends that an engineering analysis be performed to verify that these additional shrouds are adequate to prevent the failure mode recently demonstrated in plane 5 of the LPT.

The FAA does not agree. The most recent event referred to by this commenter exhibited an unusual variation of LPT uncontainment in which an extensive rub-through occurred in plane 5. The shrouds mandated for incorporation by this rule were redesigned primarily to address ballistic type containment events at stages where field experience and the manufacturer's analysis had shown deficiencies. In addition, the manufacturer has advised the FAA that although new part numbers for stage 1 and stage 5 LPT shrouds were introduced to the field at the same time as the stage 2 through 4 shrouds, the redesigns of those shrouds were made primarily to improve manufacturing and would have no appreciable effect on ballistic containment capability and no effect on the rub-through type of failure. Potential redesigns to address the case rub-through scenario are under consideration. Further rule making activity to address the rub-through failure scenario will be considered once redesigns are certified. No changes will be made to this AD.

### **Request for Additional Replacement Criteria**

One commenter requests that replacement be allowed on the basis of attrition only and that minimum dimensional requirements be defined or other repairs be developed for the existing shrouds to allow these shrouds to be returned to service in lieu of the new shrouds. The commenter believes that an equivalent level of safety can be achieved with properly repaired or restored versions of the current shroud design while reducing the cost burden of the proposed rule on the operators.

The FAA partially agrees. The FAA agrees that the existing shrouds may be repaired in such a way as to restore the original or achieve the latest design capability. Such repairs that have been