CTOTF Fall 2006
Aero-Derivatives Roundtable
Topics For Discussion

GE Bulletin Topics:

1. No. SL6000-06-01 R1

LM6000 PD Model Control Acoustic Sensor Logic

A Potential issue with the combustor acoustic (PX36) signal selection logic in Woodward Controls implementation of "PD Software Change S4."

2. No. SL6000-05-03 R1

Updated Periodic Inspection and Maintenance Table

Inspect Shims for proper clearance/ High Pressure Compressor Stages 3, 4, & 5 Variable Stator Vane Bushing Replacement / PCC Forward Mount Bolt Wear.

3. No SL6000-06-03

CF6-80A Uncontained High Pressure Turbine

An uncontained engine event occurred on an aircraft engine. The CF6-80A powered Boeing 767 event occurred June 2nd on the ground at Los Angeles International airport during an engine maintenance run. During an engine deceleration after stabilized takeoff power operation, the maintenance crew heard a loud bang. An aircraft fire broke out which was extinguished by airport fire station personnel. The preliminary findings suggest that the disk separation characteristics are similar to previous dovetail slot-aft slot bottom corner edge separation even on the CF6 engine.

4. No. SL6000-06-04

Procedure to Avoid Combustor Damage During Fuel Nozzle Removal

GE has received several reports, that during fuel nozzle removal, the combustor primary swirlers have become dislodged from the dome plate assembly. The main concern is for the primary swirlers in the bottom section of the engine due to the 10-degree angle of the dome plate.

5. PB-LM6000-IND-0203

Water Injection Skid Shut-off Valve

GE has received reports of failed check valves, resulting in gas fuel entering the water injection system. The existing on-base water injection skid includes a shut-off valve and check valve. The purpose of the check valve is to prevent gas fuel from entering the water injection system. If a check valve fails, gas fuel can flow past the shut-off valve and into the water injection system since the shut-off valve only holds pressure one way against the water supply side.

6. LM6000-IND-0205

Gearbox Sump Vent

This service bulletin introduces an A-sump vent system is not within engine scope of supply. The Lm6000 fleet has experienced unscheduled gas turbine removals due to oil buildup inside the

high-pressure compressor (HPC) rotor. The observed symptoms of the oil buildup in the HPC rotor have been vibration, external hardware distress, or gas path airfoil distress.

7. LM6000-IND-0206

Vibration Selection Logic

This service bulletin introduces a package control system upgrade to reduce noise-driven and transient vibration shutdown/trips on the gas turbine. The vibration system trips are major contributor to the Lm6000 forced outage rate. Many of the vibration system trips are noise-driven or transient vibration trips.

8. LM6000-IND-0207

Non-critical Vibration Indications

This service bulletin introduces a control system software upgrade to reduce the number of shutdowns/trips due to non-critical vibration system diagnostic indications. Some customers have experienced engine SML (Slow-to-Min-Load) shutdowns due to non-critical vibrations system diagnostic indications in the Bently Nevada 3300 and 3500 vibration systems.

9. LM6000-IND-0208

Introduction of Improved Combustion Chamber Assembly (PA & PC Models)

This Service Bulletin introduces two improved combustor assembly configurations. Primary swirler wear (Axial engagement of the swirler and fuel nozzle tip). Secondary swirler distress from naphtha/water (Naphtha/water attacks TBC coating more aggressively than diesel/water or gas/water to the higher density of naphtha). Secondary swirler TBC spallation (Thick-dense TBC coating application process). Splashplate burning (Splashplate cooling from the dome plate).

10. LM6000-IND-0209

Compressor Front Frame Bolt Change

The purpose of this Service Bulletin is to introduce new bolts to secure SPRINT nozzles or nozzle plugs on the compressor front frame (CFF).

Bolt head interference with the VBV system bell cranks.

11. LM6000-IND-0210

High Pressure Turbine Rotor Stage 1 Disk Rework

The Service Bulletin introduces a rework for the HPTR stage 1 disk to remove potential damage on the aft edge of the dovetail slot bottom to improve reliability and maintainability. The aft slot-bottom corner edge on the dovetail slot may contain damage resulting in stress concentrations.

12. LM6000-IND-0211

Stage 8 Low Pressure Turbine Cooling Air Tube (Aft, Right Side)

This Service Bulletin introduces an improved stage 8 LPT cooling air tube. There have been several reports of cracked/ruptured tubes on the high-pressure compressor (HPC) stage 8 tube cooling system on the Lm6000 PC models. The specific cracked/ruptured tube that has been identified in the reports is the aft stage 8 LPT cooling air tube on the right side of the engine. The tube chafing and resultant cracking was caused by offset/overlap of the support bracket relative to the wear sleeve**.**

13. LM6000-IND-0212

Low Pressure Compressor Stage 3 Bushing Replacements.

This Service Bulletin introduces bushing assemblies to replace bushing in the low-pressure compressor (LPC) stage 3 stator assembly. Field reports on the LM6000 PA update, PC and PD models have identified that the LPC stage 3 shrouds have experienced wear on the outer diameter and bushing slot.

14. LM6000-IND-0213

High Pressure Compressor Stator Stages 3 Through 5 Variables Stator Vane Bushings Replacement

This Service Bulletin introduces new multiple-piece variable stator cane bushing. The VSV system wears during operations. Severely worn VSV system components and associated components dimensional distortion can cause lever arm separations, off schedule VSV operation, stalls, and extensive field and depot maintenance.

15. LM6000-IND-0214

PB Model Enhancement

This Service Bulletin introduces a new PB up-rate configuration. The LM6000 PD model was introduced to enhance the performance and reliability of the Lm6000 DLE gas turbine. The PD gas turbine produces increased power output and improved heat rate without appreciable reduction in exhaust energy relative to the PB model. In addition, the PD model has increased reliability improvement associated with the PD model.

16. LM6000-IND-0215

High Pressure Turbine Rotor Stage 1 Blades Replacement (All LM6000 Models)

This Service Bulletin introduces an improved N5+ high-pressure turbine (HPT) rotor stage 1 blade. Field reports indicate that he N5 blade on the PB and PD models has not experienced significant oxidation distress in advance of the expected HPT rotor overhaul interval. The N5 blade, however, has experienced some oxidation distress on the suction side surfaces and tip.

17. LM6000-IND-0216

High Pressure Turbine Rotor Diffuser Vane Ring (All LM6000 Models)

This Service Bulletin introduces an improved high-pressure turbine (HPT) rotor diffuser vane ring. GE has received reports of cracking event on the HPT rotor diffuser vane ring. The cracking events typically in a seized HPT rotor, causing an unscheduled engine removal (UER). In addition, the diffuser cracking events may cause secondary damage to adjacent engine hardware, requiring significant hardware repair and replacement at a depot.

Questions for GE:

Derived From WTUI (Most Recent):

1. Water Wash Predictors

Other than the obvious of comparing MW output/heat rate verse temperature performance curves, what other indicators do you use/available for monitoring/trending/predicting need for wash. i.e. compressor pressure ratios. T25 temps?

2. Fire Protection System Upgrade

We have two LM6000PA's in Stewart & Stevenson Packages from the 1993 era. Has anyone had any experience upgrading the fire protection system? The current system provided by Wilson Fire Systems has components that are no longer supported and we are developing a plan to change it out.

3. Generator Fan Enclosure Access

We are trying to solve the safety issue of working on the turbine & generator fans with some kind of platforms to stand on. Has anyone mounted fixed or removable platform?

4. Phantom False Fired Starts Counted

Periodically, we will see an additional fired start added to our counter on a day that we only fired the unit one time. This has occurred only a few times over the course of our 3-year commercial period. We are using a GE Mark 6 system with Millennium software. Has anyone seen this occur? I am wondering if a temporary loss of one flame detector during the fired run can result in this additional click of the totalizer?

5. Clutch Seal Drain Strainer

We operate an LM6000 with a Hillard Starter: Starter: Manuf.: Hillard Start System Model# : 6601-01-019-C On the bottom case there is a 1/2" Y-strainer called a clutch seal drain strainer. Would any users have information on when this strainer should be opened & inspected? According to the manual there is a set of magnets in the strainer. Our unit has been operating since 2001 and we have never inspected this strainer under the hydraulic starter inside the engine enclosure. Is there any precaution to take if the strainer is opened & drained?

6. LPC Coupling Nut Failure

We had a failure of one LM6000 PC machine at our site due to failure of its LPC coupling nut. Has anyone else seen similar failure?

Experience Based Topics:

Users Only General Discussion Questions:

1. Have any users experienced an internal lube oil leak at the number four bearing position?

2. Have any users experienced an external oil leak that was so difficult to locate that they used milk of Magnesium and black light to locate the source of the leak. If so, where was the leak located?

3. Have any users experienced high-pressure compressor damage caused by foreign object damage, which subsequently resulted in an extensive gas turbine repair?

4. Has anyone experienced a fibrous material in their engine lube oil system, to the point where they get a low lube oil trip only to find that their gear box strainer is clogged with this fibrous material?

General:

Topics To Consider:

Inlet Air Systems

Compressors

Combustion

Turbines

Exhaust

Axillaries

Controls/Instrumentation

Generators

Environmental /C.E.M

Training

Repairs and Parts Warranty Experiences