Injector Resonator Cavity Flange

The Injector Resonator Cavity Flange provides for a bi-tuned configuration, i.e. it has two different cavity lengths. This configuration is achieved by bolting a Cavity Plate between the chamber and the photo-etched recessed cavities of the injector. This type of configuration has been used successfully since 1968 in various rocket engines. Dual tune resonator cavities have been photographically proportioned to man rated flight engines and to high production flight engines for this application. The dual tune design spans the 1st tangential to the 3rd tangential modes and allows for film coolant water along the acoustic cavity partitions.

Longitudinal Acoustic Modes can not be influenced by the bi-tuned configuration however it is believed that the Cooldown Diluent Injectors will provide significant damping for the Longitudinal Acoustic Modes.

The Injector Resonator Cavity Plate is simply bolted between the Injector and the Combustion Chamber. It will be released for fabrication at the same time the injector body drawing is released for fabrication.

Combustion Chamber

The Combustion Chamber drawings were released for fabrication during this report period and long lead items [LLI] hardware has been ordered. Reference **Figures 5 & 6.**

Cooldown Chambers (Modules)

The Cooldown Chamber drawings were released for fabrication during this report period and long lead items [LLI] hardware has been ordered. Reference **Figures 7 & 8.**

Intermediate (Diluent) Water Injectors

As described in the previous Technical Progress Report, the Diluent Injector design selected is composed of 12 radial legs as shown on the right side of **Figure 9.** Every third leg is a different length so as to provide the best possible chance of distributing the diluent water uniformly across the four-inch diameter chamber. Platelet technology will be employed for regenerative cooling and precise flow distribution of the diluent water. The configuration on the left side of Figure 9 is tentatively held in abeyance. The diluent injector uniformly injects and mixes the cooling water across the chamber cross-sectional area. Because the initial hardware check-out testing will be performed using an uncooled chamber, the diluent injectors are not required as quickly as most other components.

Consequently these hardware designs will be the last to be completed. The diluent injector drawings are approximately 80% complete.

Water Coolant Inlet Flange and Water Coolant Outlet Flange

The Water Coolant Inlet and Outlet Flanges were described in the previous Technical Progress Report. These flange drawings will be released during the next Technical Report Period.

Turbine Back Pressure Simulator

The Turbine Back Pressure Simulator is shown in **Figure 10,** A cross-sectional view is shown in **Figure 11**. This component has its own water coolant supply circuit because it will not be required during an actual power generation configuration. The Turbine Back Pressure Simulator is composed of a Zirconium Copper manifold flange from which water is injected into the convergent section of an Inconel-718 Convergent Wall. A back-pressure Orifice Plate is mounted immediately aft of the Convergent Wall. This plate is secured with 8 each 3/8" bolts which are sized to rupture at 3,000 psig and to relieve the internal pressure of the Gas Generator in the event of a unanticipated pressure surge during the start or shut down transient.

Ancillary Hardware (Closures, Support Stand & Instrumentation)

1) Support Stand

The Gas Generator Support Stand structure is currently in fabrication. It is will be completed by the middle of August.

2) Closures

The closure designs for performing leak and proof testing are 80% complete. The protective hardware closure designs are 90% complete.

3) Instrumentation

Instrumentation hardware continues to be identified and hardware drawings updated to reflect the types of instrumentation, the locations and the number of measurements needed. As an example the instrumentation requirements for the Uncooled Combustion Chamber ie.the Uncooled Combustion Chamber has a gas sample port and a chamber pressure and temperature port in addition to a Kistler port for measuring high frequency oscillations. The Uncooled Chamber also has 6 axially located thermocouples for measuring gas side wall temperatures as shown in **Figure 12**.

4] Uncooled Combustion Chamber

The Uncooled Combustion Chamber is a new piece of ancillary hardware design to be used initially only for evaluating the initial testing of the three [3] Combustion Chamber Injector Platelet Patterns designs. The Uncooled Combustion Chamber design is basically the normal Combustion Chamber configuration without all of the intricate cooling passages incorporated. It is designed for short duration testing, because of no internal cooling, and is made from chromium copper for better heat transfer properties on short duration testing without any cooling.

This initial Combustion Chamber injector testing will provide valuable information and insight into the individual pattern's performance characteristics. Evaluations will be made from this data on stability, streaking and potential hot spots for each design prior to committing the real test hardware to hot-fire testing.

The Uncooled Combustion Chamber will have a gas sample port and a chamber pressure and temperature port in addition to a Kistler port for measuring high frequency oscillations. The Uncooled Combustion Chamber will also have six [6] axially located thermocouples for measuring the gas side wall temperature as shown in **Figure 12**.

DELIVERABLES STATUS

ASSESSMENT OF OVERALL PROJECT OBJECTIVES

It appears that a conflict in the testing schedule for this program may or will occur. Aerojet has just informed CES that they have just received several high priority test program contracts from the U.S. Government for performing testing. This testing will coincide with the major portion of CES testing program on the 10Mw Gas Generator.

This slip in CES testing phase of the 10 Mw Gas Generator Testing Program may results in a 2 to 3 month delay in the 10 Mw Gas Generator Testing Program completion date.

However, if problems associated with these test programs should manifest themselves causing them to slip, then CES will have the opportunity to test the 10 Mw Gas Generator hardware sooner and complete the testing program earlier.

RESULTS & DISCUSSION

This program is completing the design phase of the 10 Mw Gas Generator Test Program and has commenced ordering materials and hardware to begin fabrication of the required Gas Generator testing hardware and ancillary

hardware. Preparations are also underway to begin planning and designing the test area systems and interfaces to perform the Gas Generator testing per the Gas Generator Test Plan. Initial testing is scheduled to begin 1 through 5 October 2001 on the Gas Generator Igniter.
Therefore, since there has been no testing results nor sub-testing results or relevant data to present for this report perod, there is no results of testing on this program to discuss in this category.

CONCLUSIONS

As was stated in the Results & Discussion category section of this report, there has been no testing or sub-testing results or relevant data to present in this report category for this report period.

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