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M/D. Brainard Holmes

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Combustion Oscillations in F-1 Engines, Monthly Report

Attached is a report describing activities relating to the combustion instability problem in the F-1 engine for the period March 20 to April 19, 1963. During the period March 20 to April 19, 1963, there were 10 F-1 engines

During the report period, and in the interim to date, <sup>good</sup> good progress was made in substantiating the design of a candidate injector for FWAT. A single injector of this design-standard H pattern, with manifolds modified to provide propellant system isolation, completed 28 runs for a total duration of 2611 seconds in two builds of engine No. 9. Injectors of this design have been released for fabrication and will be available for FWAT in September 1963 if total F-1 development program permits this schedule. Standard pattern injectors with combustion chamber baffles and full propellant system isolation have also been released as a strong backup for the flat face injector. It should be noted that engine No. 10 and 11 each experienced one case of non-dragging combustion instability. These engines were equipped with baffled injectors similar to the backup but which had not yet been modified to provide full propellant feed system isolation.

Thrust chamber testing continued to indicate that lower propellant pressure drop applied to standard pattern injectors increases the tendency of base triggered combustion instability to damp. These results provide some hope that small modifications to released hardware could provide an injector of improved dynamic stability by FWAT.

More radical injector designs originating from Rocketdyne's augmented combustion stability group, the NASA Ad Hoc Combustion Instability Committee, and consultant, Dr. Luigi Crocco, are in work. It is expected that this long range program will provide a dynamically stable injector prior to qualification test but not for the FWAT.

Original signed by  
D. B. Holmes

D. Brainard Holmes  
Director of Manned Space Flight  
...ing thrust chamber and noting  
... pressure disturbance to attend

Enclosure

cc: ...  
ED(P)/G. Low  
KLD/S. Skolensky  
ML/A. Freitag

"Bob -

Sorry that this is very late. Have requested ML to get with it.

DBH"

















