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COMBUSTOR FLAME FLASHBACK

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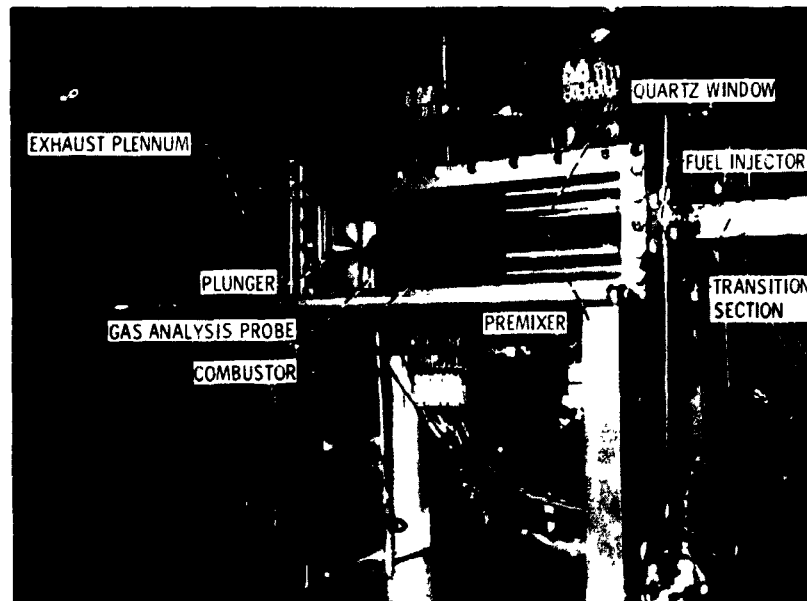
Flashback, a problem that occurs in premixed-prevaporized combustors, is the upstream propagation of the flame from the combustor into the premixing tube. Not only does flashback change the combustion process from premixed burning to diffusion burning, thus creating more pollutants, but it also inflicts considerable damage to the fuel injector, premixing tube and other equipment upstream. This study attempts to define the conditions at which flashback occurs in steady burning and the mechanism that causes flashback in both steady and transient flow.

Part of the experimental setup is shown in the attached figure. The stainless steel test section is a two-dimensional (rectangular cross-section) center dump combustor. The 4" x 1" premixing tube, 6"-long, dumps into the 4"x4" combustor, 10"-long. The combustor empties into the exhaust plenum through a 2"-diameter hole that may be partially blocked by a conical plunger. Movement of the plunger, powered by two solenoids, creates a pressure pulse for transient data. The fuel injector stationed 1½" upstream of the premixer in the transition section supplies gaseous propane to the test section. One or both sides of the test section may be fitted with ½"-thick quartz windows to view the entire combustion process.

The equivalence ratio at which flashback occurs is being measured for inlet temperatures of 600-950 K, premixer wall temperatures of 450-1050 K and premixer velocities of 40-80 ft/s. These data will be presented. It is hoped that by the time of the conference high speed film will be available to show the mechanism of flashback. Future work involves the buildup of a slightly modified Hastelloy test section that will withstand inlet temperatures of 1100 K. Transient data will also be collected.

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