

OSCILLATIONS IN GAS-TURBINE COMBUSTORS;
CONTROL OF RUMBLE, PATTERN FACTOR AND EMISSIONS

Second Interim Report

by

J H Whitelaw

United States Army, European Research Office

Contract N68171-95-C-9140

R&D 7644-AN-01

DISTRIBUTION STATEMENT A

Approved for public release
Distribution Unlimited

The experiments with kerosene fuel have been stopped temporarily and the results examined. It is evident that NO_x reductions up to 50% can be achieved with oscillation of the fuel, and that the amplitudes associated with reductions of this magnitude are difficult to achieve and may be undesirable in practice. Improvements in pattern factor can also be achieved, usually when the original pattern factor is poor, and are largest with low frequency oscillations as might be expected.

The T-vaporiser used for kerosene fuelling of the gas-turbine sector has been replaced by a double jet arrangement to allow the use of gaseous fuel and preliminary experiments show first that the pattern factors are poor as a result of the poorer mixing associated with forward injection of fuel and second that reduction in NO_x emissions are again present with magnitudes of the order of 20%. Perhaps most promising is the application of oscillations to neighbouring fuelling devices, but out of phase, so that the near field is subject to the oscillations and the far field is not. This appears to result in NO_x reductions, since thermal NO_x is produced in the near field, but without the possibly harmful effects of pressure waves throughout the combustor.

Experiments have been temporarily stopped to allow results to be assembled and analysed. The results will include those performed earlier in bluff-body stabilised, ducted flows with premixed air and fuel and with the addition of fuel to increase the degree of premixedness.

1 April 1996

DTIC

7644-AN-01

N68171-95-C-9140

Dr. J. Whitelaw

Imperial College

London, UK

DTIC QUALITY INSPECTED 1

19960520 096