Tory II-C Performance as a Function of Flight Mach Number and Inlet Pressure Recovery

J. H. Moyer

RECEIVED
JAN 21 1997
OSTI

January 15, 1963

MASTER

Lawrence
Livermore
National
Laboratory

This is an informal report intended primarily for internal or limited external distribution. The opinions and conclusions stated are those of the author and may or may not be those of the Laboratory.

Work performed under the auspices of the U.S. Department of Energy by the Lawrence Livermore National Laboratory under Contract W-7405-ENG-48.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

**Portions of this document may be illegible
in electronic image products. Images are
produced from the best available original
document.**

This document consists of 6 pagesNo. 1 of 1 copies. Series M/C.

January 15, 1963.

Naval Applications Memo No. 17.

TO: Distribution

FROM: J. H. Moyer

SUBJECT: Tory II-C Performance as a Function of Flight Mach Number and Inlet Pressure Recovery.

**DECLASSIFICATION
STAMP ON REVERSE**

In a parameter study involving thrust vs. flight Mach number, M. D. Mintz¹ has found that net jet thrust becomes a maximum at about Mach 3.66 if the Tory II-C design value of inlet pressure recovery is used at all Mach numbers. (Curve reproduced in Figure 1). This is not a realistic situation, however, because the attainable pressure recovery decreases markedly with increasing Mach number.

The effect of more realistic pressure recovery values may be seen in Figure 1. Two sets of values were employed, which differ by two percent, as shown in Table 1. Diffuser operation is always critical; i.e. we are using a "rubber" diffuser. Nozzle area has been optimized for each operating condition.

Table 1 also lists some useful reactor parameters at or near the optimum nozzle area for each operating point. Figure 2 illustrates the dependence of thrust upon nozzle area.

1. Unpublished.

CONFIDENTIAL

GROUP 1

In Figure 3 is shown the variation of several reactor parameters with nozzle area, for a flight Mach number of 3.0 and recovery of 0.76. A similar graph for the Tory II-C design point may be found in Tory II-C Memo 407, p. 75.

JM:rp

Distribution:

- 1/36A A. Lorenz
- 2/36A J. Hadley
- 3/36A H. Reynolds
- 4/36A E. Goldberg
- 5/36A T. Stubbs
- 6/36A J. Moyer
- 7/36A M. Mintz
- 8/36A A. Cole
- 9/36A E. Sheridan
- 10/36A V. Hampel
- 11/36A C. Barnett
- 12/36A J. Thomas
- 13/36A M. Jester
- 14/36A H. Reynolds/File
- 15/36A H. Reynolds/File
- 16/36A H. Reynolds/File
- 17/36A H. Reynolds/File
- 18/36A H. Reynolds/File
- 19/36A H. Reynolds/File
- 20/36A W. B. Myers
- 21/36A W. Miller
- 22/36A W. Wells
- 23/36A E. Platt
- 24/36A C. Walter
- 25/36A J. Hodges
- 26/36A J. Kane
- 27/36A A. Rothman
- 28/36A B. Rubin
- 29/36A H. McDonald
- 30/36A A. Kirschbaum
- 31/36A T. Merkle
- 32/36A P. Neal
- 33/36A J. G. Wenzel-Lockheed
- 34/36A J. Radcliffe, AEC-SAN
- 35/36A I. Hoffman, AEC-Washington
- 36/36A H. Jaffee-AGN

TABLE 1

Altitude 1000 ft.

$T_{amb} = 100^{\circ}\text{F}$

$T_{w_{max}} = 2500^{\circ}\text{F}$

Flight Mach No.	Inlet Pressure Recovery		Nozzle Area in ²	Flow Rate lb/sec	Reactor Press. Prop Psid	Fuel Element Thermal Stress Psi	Fuel Element Exit Total Temp. °F
	Set A	Set B					
2.6	.8300		725	1457	72.7	12962	2164
2.6		.8134	725	1239	71.4	12715	2167
2.8	.8000		750	1696	98.8	16187	2161
3.0	.7600		725	2165	121.3	19055	2167
3.0		.7448	728	2121	119.8	18710	2168
3.25	.7200		714	2971	162.5	23358	2184
3.25		.7056	705	2892	156.8	22765	2185
3.5	.6500		685	3799	199.9	26102	2208

FIGURE 1

Altitude 1000 ft.

 $T_{amb} = 100^{\circ}F$ $T_{wmax} = 2500^{\circ}F$

Nozzle Area Optimized

CONFIDENTIAL

Flight Mach Number

SECRET

CONFIDENTIAL

SECRET

FIGURE 2

Altitude 1000 ft.
 $T_{amb} = 100^{\circ}F$
 $T_{wmax} = 2500^{\circ}F$

1.01
1.00
.99
.98
.97
.96
.95
.94
.93
.92
.91
.84
.83

Net Jet Thrust Coefficient
Net Jet Thrust Coefficient for Tong IIC Design Point

M 3.0, Recovery .760

M 2.8, Recovery .800
From Tong IIC Memo 407

M 3.25, Recovery .720

M 3.0, Recovery .7408

M 2.6, Recovery .830

M 3.25, Recovery .7056

M 2.6, Recovery .8134

M 3.5, Recovery .650

Nozzle Throat Area, in²

KEUFFEL & ESSER CO. MADE IN U.S.A.

CONFIDENTIAL

EXCLUDED FROM AUTOMATIC DOWNGRADING AND DECLASSIFICATION

CONFIDENTIAL

FIGURE 3

Altitude 1000 ft.
 $T_{amb} = 100^\circ F$
 Flight Mach No. 3.0
 $T_{w,max} = 2500^\circ F$

CONFIDENTIAL

Nozzle Area, in²