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Reactor Thrust During Boost in a Low Altitude Trajectory

J. H. Moyer

December 14, 1962

Lawrence Livermore National Laboratory

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SUBJECT: Reactor Thrust During Boost in a Low Altitude Trajectory.

This memorandum forms a sequel to NAM No. 12. The same calculations reported there have been done for a typical low altitude trajectory, shown in Figure 1. The reader is referred to NAM No. 12 for a discussion of the method. However, a few ground rules are worth repeating to aid interpretation.

1. The assumption is made that the flow rate through the inlet exactly matches that demanded by the reactor and nozzle at all times.
2. The fuel element maximum wall temperature is assumed constant at 2500°F from time zero. This means that the values plotted in Figure 2 at any given time are true only if design temperature has been achieved by that time.
3. Values of F_{jnet} and C_{fnet} in Figure 2 are 7.3% less than the machine-computed values, to allow for losses not included in the code. They may be compared directly with the corresponding numbers in Tory II-C Memo No. 407.
4. Thrust and thrust coefficient in Figure 2 are true for an unobstructed nozzle. If the nozzle exhaust is deflected to pass the nose of a tandem booster the values plotted must be reduced.

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2. The fuel element maximum wall temperature is assumed constant at 2500°F from time zero. This means that the values plotted in Figure 2 at any given time are true only if design temperature has been achieved by that time.

3. Values of F_{net} and C_{fnet} in Figure 2 are 7.5% less than the machine-computed values, to allow for losses not included in the code. They may be compared directly with the corresponding numbers in Tory II-C Memo No. 407.

4. Thrust and thrust coefficient in Figure 2 are true for an unobstructed nozzle. If the nozzle exhaust is deflected to pass the nose of a tandem booster the values plotted must be reduced.

JM:rp

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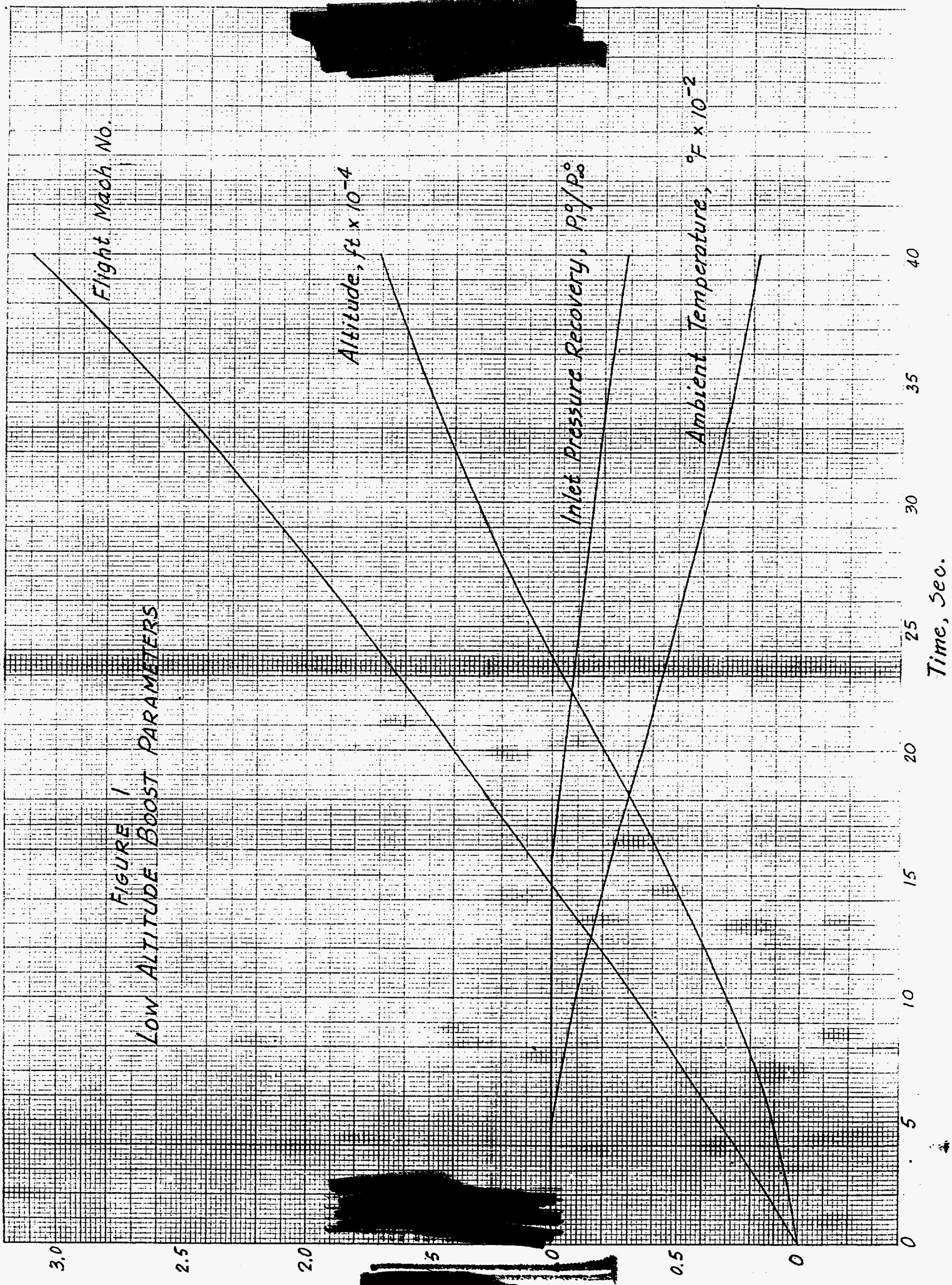

FIGURE I
LOW ALTITUDE BOOST PARAMETERS

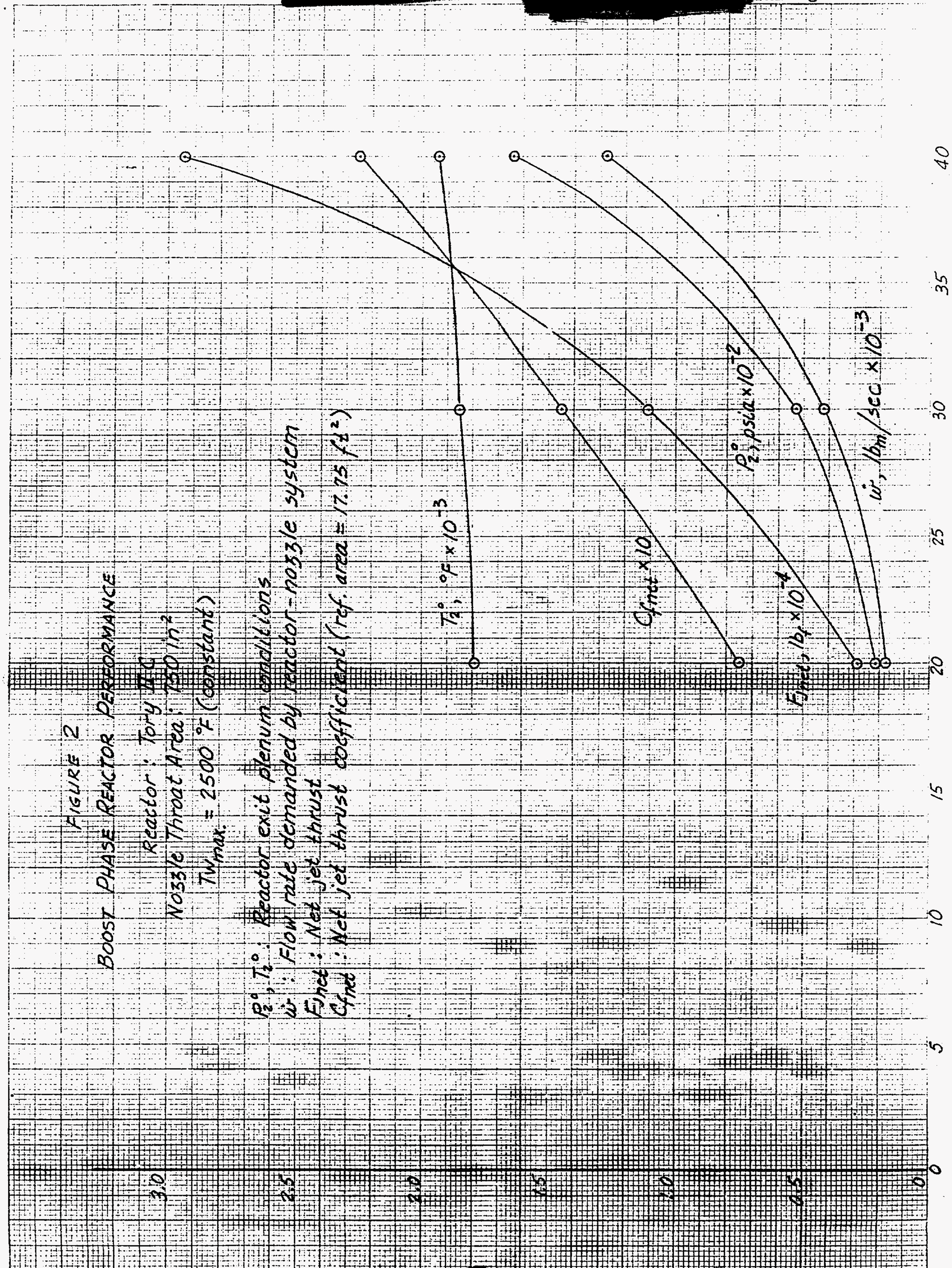
FIGURE 2
BOOST PHASE REACTOR PERFORMANCE
Reactor: Tory II C
Nozzle Throat Area: 750 in^2
TW_{max} = 2500 °F (constant)
P_2°, T_2°: Reactor exit plenum conditions
$\dot{w}$: Flow rate demanded by reactor-nozzle system
F_{jnet}: Net jet thrust
C_{fnet}: Net jet thrust coefficient (ref. area = 17.75 ft^2)
T_2°, °F × 10^{-3}
C_{fnet} × 10
F_{jnet}, lb_f × 10^{-4}
P_2°, psia × 10^{-2}
$\dot{w}$, lbm/sec × 10^{-3}
Time, Sec.
0
5
10
15
20
25
30
35
40
0
0.5
1.0
1.5
2.0
2.5
3.0

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