

Memorandum

TO : Mr. Brooksbank, R-P&VE-X
Through: ~~Mr. Cagle, R-ASTR-BU~~ ^{RLM} 8-11-66
DATE : August 10, 1966

FROM : Chief, Guidance and Control Systems
Analysis Branch, R-ASTR-NG
In reply refer to:
R-ASTR-NG-118-66
PDNicaise/vjd/876-1357

SUBJECT : Request for Thrust and Mass Data

1. The 6D simulation runs made by IBM that are necessary for LVDC flight program design and verification require mass and propulsion data for several performance perturbations as well as for the nominal. Tapes and punched cards generated by P&VE are utilized for this purpose. The propulsion tapes required are listed for the Saturn IB and Saturn V series vehicles in Tables 1 and 2 respectively. (Enclosures 1 and 2). The "early" and "late" engine mixture ratio change (EMRC) times shown in the tables refer to 3 sigma values. The tapes are listed by stage. In the Saturn V table, S-IVB stages 1, 2, and 3 refer to the first burn, the second burn, and to the abort to orbit burn cases respectively. Slight alterations may be necessary in the Saturn V requirements as the flight programs become better defined. The S-IB and S-IVB stage thrust tapes should contain the parameters listed in Table 3. (Enclosure 3) The S-IC and S-II tapes should contain comparable information. In addition, a definition of the tape format, the parameters, and the units used should be supplied as soon as possible.

2. Mass data will be required for the nominal case only for each stage listed in Tables 1 and 2. The data should be supplied either on magnetic tapes or on punched cards (preferably on magnetic tapes). The parameters needed are x, y, and z center of gravity locations, pitch (or yaw) and roll moments of inertia, and the total vehicle mass as a function of time. Again, a definition of the parameters, the format, and the units should be supplied as soon as possible.

3. Preliminary and final data should be delivered for all cases 8 1/2 and 4 1/2 months prior to a particular launch date. The data should be delivered to R. E. Poupard, Department 229, IBM Corporation.


S. M. Seltzer

3 Enc:
a/s

Approval:



F. B. Moore
Chief, Guidance and Control Division
MSFC - Form 488 (August 1960)

SATI
V

cc:

R-P&VE-PPE, Mr. McKay

R-P&VE-PPE, Mr. Igou

R-P&VE-VAW, Mr. Scott

R-ASTR-N, Mr. Moore

R-ASTR-N, Mr. Gassaway

R-ASTR-NG, Mr. Seltzer

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R-ASTR-NG, Mr. McMahan

R-ASTR-NGI, Mr. Blanton

R-ASTR-NGI, Mr. Nicaise

IBM, Dept. 229, Mr. Poupard

IBM, Dept. 229, Mr. Steele

TABLE 1
SATURN IB PROPULSION TAPES

S-IB Stage

1. Nominal
2. +5% thrust and mass flow rates
3. -5% thrust and mass flow rates

S-IVB Stage

1. Nominal
Nominal EMRC time.
2. +5% thrust and mass flow rate.
Late EMRC time.
3. -5% thrust and mass flow rate.
Early EMRC time.

TABLE 2
SATURN V PROPULSION TAPES

S-IC Stage

1. Nominal
2. +5% thrust and mass flow rates
3. -5% thrust and mass flow rates

S-II Stage

1. Nominal
Nominal EMRC time
2. +5% thrust and mass flow rates
Late EMRC time
3. -5% thrust and mass flow rates
Early EMRC time.

S-IVB Stage 1

1. Nominal
2. +5% thrust and mass flow rate
3. -5% thrust and mass flow rate

S-IVB Stage 2

1. Nominal
Nominal EMRC time
2. +5% thrust and mass flow rate
Late EMRC time
3. -5% thrust and mass flow rate
Early EMRC time

TABLE 2 (con't.)

S-IVB Stage 3

1. Nominal
Nominal EMRC time
2. +5% thrust and mass flow rate
Late EMRC time
3. -5% thrust and mass flow rate
Early EMRC time

TABLE 3

Required Parameters on S-IB and S-IVB Stage

S-IB Stage Tape

1. Time referenced to ignition.
2. Chamber pressure for each engine.
3. Vacuum thrust coefficient for each engine.
4. Turbine exhaust thrust for each engine.
5. Total mass loss due to venting, fuel and LOX consumption, and ice dumped.
6. Total mass flow rate (including ice).

S-IVB Stage Tape

1. Time referenced to ignition.
2. Total fuel ullage mass.
3. Total LOX ullage mass.
4. Total mass remaining in helium pressurized sphere.
5. Fuel mass remaining in tank.
6. LOX mass remaining in tank.
7. Vacuum thrust coefficient.
8. Chamber pressure.