NASA TECHNICAL NOTE

NASA TN D-4068

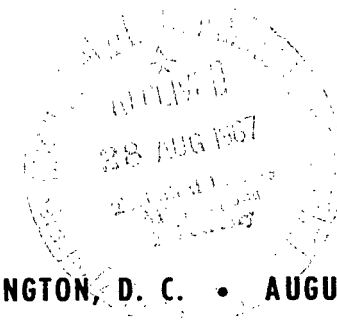



# QUALIFICATION EVALUATION OF THE PITCH CONTROL MOTOR FOR THE LAUNCH ESCAPE SYSTEM OF THE APOLLO SPACECRAFT PROGRAM

*by B. J. Lee and P. E. Cota, Jr.*

*Manned Spacecraft Center*

*Houston, Texas*



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • AUGUST 1967

NASA TN D-4068

# QUALIFICATION EVALUATION OF THE PITCH CONTROL MOTOR FOR THE LAUNCH ESCAPE SYSTEM OF THE APOLLO SPACECRAFT PROGRAM

By B. J. Lee and P. E. Cota, Jr.

Manned Spacecraft Center
Houston, Texas

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

For sale by the Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151 – CFSTI price $3.00

## ABSTRACT

This paper is a summary of the qualification test phase (consisting of environmental testing and static test firing) of the Apollo pitch control motor test program; however, the paper also supplements the contractor's work by statistically evaluating the qualification static test data with regard to the specification requirements.

The environmental testing portion of the qualification test program was conducted with a total of 14 pitch control motors divided into five environmental test groups — temperature cycling and vibration testing, temperature cycling and drop testing, accelerated aging, acceleration testing, and temperature cycle testing.

The static test firing portion of the qualification test program was conducted using a total of 17 Apollo pitch control motors (10 environmentally tested motors and 7 motors not environmentally tested). These motors were divided into three prefire propellant temperature groups: 20° F (six motors), 70° F (four motors), and 140° F (seven motors). The motors were static test fired at a nominal pressure altitude of 13.7 psia.

The results of the qualification test program investigation confirm that the pitch control motor is qualified for the Apollo Spacecraft Program.

CONTENTS

TABLES

Table | Page

FIGURES

# QUALIFICATION EVALUATION OF THE PITCH CONTROL MOTOR FOR THE LAUNCH ESCAPE SYSTEM OF THE APOLLO SPACECRAFT PROGRAM

By B. J. Lee and P. E. Cota, Jr.
Manned Spacecraft Center

## SUMMARY

A requisite of the Apollo Spacecraft Program is that the command module can be safely removed from and out of the path of the launch vehicle and service module if any system affecting crew safety should malfunction. The Apollo launch escape system will provide the capability for a successful mission abort. Primary propulsion for the launch escape system is provided by the pitch control, launch escape, and tower jettison motors. To evaluate the performance of these motors, a three-phase test program was established for each, consisting of development, qualification, and flight test phases. This paper is a summary of the qualification test phase (consisting of environmental testing and static test firing) of the pitch control motor test program; however, the paper also supplements the contractor's work by statistically evaluating the qualification static test data with regard to the specification requirements.

The environmental testing portion of the qualification test program was conducted with a total of 14 pitch control motors divided into five environmental test groups — temperature cycling and vibration testing, temperature cycling and drop testing, accelerated aging, acceleration testing, and temperature cycle testing.

The static test firing portion of the qualification test program was conducted using a total of 17 pitch control motors (10 environmentally tested motors and 7 motors not environmentally tested). These motors were divided into three prefire propellant temperature groups: 20° F (six motors), 70° F (four motors), and 140° F (seven motors). The motors were static test fired at a nominal pressure altitude of 13.7 psia.

The Apollo pitch control motor specifications require that certain performance parameters meet specific tolerance limits at particular prefire propellant temperatures (20°, 70°, and 140° F). The transformation of test data from different prefire propellant temperatures to given temperatures of interest is utilized in this report to obtain greater confidence in the statistical analysis which was performed on the test data and which consisted of calculating means, standard deviations, and one-sided and two-sided tolerance limits (for 99 percent of the population with 95-percent confidence).

The results of the qualification-test-program investigation confirm that the pitch control motor is qualified for the Apollo Spacecraft Program.

## INTRODUCTION

The Apollo Spacecraft Program launch escape system (LES) (fig. 1) will separate the command module (CM) from the service module and launch vehicle and move it out of the launch vehicle path if any system affecting crew safety should malfunction. The LES is designed to provide the capability for a successful mission abort from the earliest practicable time following crew insertion into the CM until the system is jettisoned soon after the successful completion of the launch vehicle second-stage ignition and staging.

The LES (fig. 2) consists of the following:

(1) A Q-ball assembly (located at the forward extremity of the LES) which provides aerodynamic incidence angle and dynamic pressure measurements that are required by the launch vehicle and the launch-escape emergency detection system.

(2) A canard assembly (an aerodynamic control mechanism) which reorients the jettisoned CM and LES in a heat-shield-forward attitude to allow satisfactory deployment of the earth recovery system following LES jettisoning from and out of the path of the CM.

(3) A ballast which provides aerodynamic stability for the separated CM and LES.

(4) A pitch control motor which provides a positive pitch moment that nulls the 2.75° thrust vector of the launch escape motor during the initial 0.62 second of an abort, and which orients the CM and LES to the correct flight attitude (zero angle of attack) during the initial phase of a successful escape. The pitch control motor is ignited in conjunction with the ignition of the launch escape motor.

(5) A launch escape motor which provides LES propulsion to safely remove the CM from the launch vehicle and service module and out of their path if any system affecting crew safety should malfunction. In order to provide a nominal thrust vector angle of approximately 2.75° from the motor longitudinal axis, the throat area of one of the two nozzles in the pitch plane is approximately 5 percent larger than the two nozzles in the yaw plane; and the throat area of the second nozzle in the pitch plane is approximately 5 percent smaller than the two nozzles in the yaw plane. The 2.75° thrust vector angle of the launch escape motor is required so that the CM and LES can be removed from the path of the launch vehicle and service module after the pitch control motor has burned out. During a normal flight, the launch escape motor may also be utilized to accomplish LES jettisoning should the tower jettison motor malfunction.

(6) A tower jettison motor which, during a normal flight, provides the primary propulsion for safe removal of the LES (LES jettisoning) from the CM and out of its path shortly after the successful completion of the launch vehicle second-stage ignition and staging. In order to provide a nominal thrust vector angle of 4° from the motor

longitudinal axis, the throat area of one of the two nozzles is approximately 10 percent larger than the other. The 4° thrust vector angle of the tower jettison motor is required so that the LES can be removed out of the path of the jettisoned CM. During a mission abort, the tower jettison motor is utilized to remove the LES from the CM and out of its path.

(7) A tower structure which forms the intermediate construction between the CM and the launch escape motor.

(8) A boost protective cover which shields the CM thermal coating, windows, and forward heat shield from dynamic pressure and aerodynamic heating environments imposed during booster operations and from the exhaust products of the launch escape and tower jettison motors.

The 0.62-KS-2170 and 3.23-KS-139,400 solid-propellant rocket motors were designed and developed as the pitch control and launch escape motors, respectively. The TE-380 solid-propellant rocket motor was designed and developed as the tower jettison motor (1.2-KS-33,000). To evaluate the performance of these motors, a three-phase test program, consisting of development, qualification, and flight test phases, was established. This paper is a summary of the qualification test phase (consisting of environmental testing and static test firing) of the pitch control motor; however, the contractor's work is supplemented by a statistical evaluation of the qualification static test data with regard to the specification requirements.

## SYMBOLS

| | |
|---|---|
| $A$ | area, $in^2$ |
| $C^*$ | characteristic exhaust velocity, ft/sec |
| $F$ | thrust, $lb_f$ |
| $I$ | impulse, $lb_f$-sec |
| $\bar{I}_{sp}$ | average-propellant specific impulse, $lb_f$-sec/$lb_m$ |
| $P$ | chamber pressure, psia |
| $r$ | burning rate, in/sec |
| $T$ | prefire propellant temperature, °F |
| $t$ | time, sec |
| $W_p$ | propellant weight, $lb_m$ |

Subscripts:

| | |
|---|---|
| a | action |
| b | web burn |
| d | ignition delay |
| f | force, thrust rise |
| m | weight |
| max | maximum |
| total | total |
| tail | tailoff |
| s. l. | sea level |
| vac | vacuum |

## PITCH CONTROL MOTOR DESCRIPTION

The 0. 62-KS-2170 solid-propellant rocket motor is a full-scale flight-weight motor designed and developed as the pitch control motor (fig. 3) for the Apollo LES. Nominally, based on a web burn time of 0. 62 second and at an average prefire propellant temperature of 70° F, average chamber pressure and average thrust are 1460 psia and 2450 $lb_f$, respectively.

The combustion chamber consists of a cylinder 8. 8 inches in diameter and 14. 3 inches long, with an oblate-hemispherical welded-on head-end closure and a bolt-on aft closure which are both constructed of AMS 6428 steel. The cylindrical portion of the combustion chamber consists of a forward cylindrical section 11. 3 inches long that is welded to an aft cylindrical section 3 inches long. The forward and aft cylindrical sections were constructed of AMS 6434 and AMS 6428 steel, respectively. The cylindrical portion of the combustion chamber contains approximately 0. 1 $lb_m$ (0. 03-inch thick) of a carbon-black-filled polysulfide liner (LPL-106C), and the head-end portion is lined with approximately 0. 1 $lb_m$ of silica-filled Buna N rubber (HITCO 6520 Elastomer). The aft closure incorporates an ATJ graphite nozzle insert with a conical, 15° half-angle, divergent section. The 1. 63:1 area ratio nozzle incorporates a Styrofoam nozzle closure to seal the motor chamber, thus maintaining prelaunch ambient pressure within the motor chamber until motor ignition.

The composite solid-propellant grain consists of approximately 8.9 $lb_m$ of a polysulfide-ammonium-perchlorate propellant (GCR 231A, ICC class B) (table I) which is cast directly against the combustion chamber liner. The propellant grain has a 14-point internal burning convolute perforation. The original LES mission requirements specified that the pitch control motor design be capable of modification to deliver a total impulse value anywhere within the range of 1550 to 3000 $lb_f$-sec without major redesign, redevelopment, or requalification. The contractor accomplished this design requirement by varying the propellant grain length. Current mission requirements specify a total impulse of 1750 $lb_f$-sec; therefore, the propellant grain is approximately 8.2 inches long compared with the maximum length capability of approximately 15.9 inches.

Each pitch control motor is ignited by a pellet-basket-type igniter (fig. 4(a)) mounted into a boss in the motor head end that is concentric with the motor longitudinal axis. Ignition of the igniter is accomplished by two pyrotechnic igniter cartridges (figs. 4(a) and (b)). Each igniter cartridge consists of a booster charge and the Apollo standard initiator (hot bridge-wire-type initiator) (figs. 4(b) and (c)).

## ENVIRONMENTAL TESTING

The environmental testing portion of the qualification test program was conducted with a total of 14 pitch control motors that were divided into the following five environmental test groups (table II and ref. 1):

(1) Temperature cycling and vibration testing (group F)

(2) Temperature cycling and drop testing (group G)

(3) Accelerated aging (group H)

(4) Acceleration testing (group J)

(5) Temperature cycle testing (group K)

### Temperature Cycling and Vibration Testing

Pitch control motor SN 77 (group F) was temperature cycled by successive stabilization at -20°, 140°, -20°, 140°, and -20° F. Following a visual inspection of the propellant grain, the motor was installed in the test fixture and mounted on a vibration slip-plate affixed to an electrodynamic vibration exciter. Accelerometers were also mounted on the test fixture (fig. 5). A temperature-conditioning shroud was installed over the test assembly, and the temperature within the shroud was maintained at -20° F (+0° F, -10° F) throughout the test period.

The motor was subjected to a search for resonance in the longitudinal and transverse axes throughout the frequency range of 20 to 2000 to 20 cycles per second. The input level was less than one g, and the sweep rate was slow enough for the operator to detect and note any critical resonance. A critical resonance was defined as an output-to-input ratio of 2:1 or more. The duration of the double sweep was at least 10 minutes. Results of the resonance survey are presented in table III(a). The motor was then subjected to sustained vibration for a period of 6 hours in each axis. Two hours were allotted to each frequency range, and the time was divided equally among the critical points of resonance. Input levels were as follows:

| Frequency, cps | Level, g |
|---|---|
| 20 - 60 | 3 |
| 60 - 500 | 5 |
| 500 - 2000 | 7 |

When a resonance frequency shifted during the vibration dwell period, the initial frequency of excitation was maintained. When no conditions of resonance were observed in one or more of the above frequency ranges, that frequency range was swept at a logarithmic rate of one-third of an octave per minute at the specified levels for 2 hours. Vibratory conditions employed during the sustained vibration testing are presented in table III(b).

Visual observation of the motor was maintained throughout the test to check for structural damage. In accordance with the specification requirements (refs. 2 and 3), the motor satisfactorily completed the vibration testing without damage, as was verified by visual and radiographic inspection. Throughout the vibration test, the grain temperature did not increase more than 5° F. The motor was then static test fired.

## Temperature Cycling and Drop Testing

Pitch control motors SN 37A, SN 40A, and SN 42A were assigned to test group G. Motor SN 37A was temperature cycled by successive stabilization at 140°, -20°, 140°, -20°, and 140° F. It was then stabilized at -20° F, positioned with the longitudinal axis horizontal, and dropped 4 feet onto solid reinforced concrete. Motor SN 40A was temperature cycled by successive stabilization at -20°, 140°, -20°, 140°, and -20° F. At -20° F, the motor was positioned with the longitudinal axis vertical, head-end down, and dropped 4 feet onto solid reinforced concrete. Motor SN 42A was temperature cycled by successive stabilization at -20°, 140°, -20°, 140°, and -20° F. At -20° F, the motor was positioned with the longitudinal axis vertical, nozzle-end down, and dropped 4 feet onto solid reinforced concrete.

All motors were disassembled and inspected visually for damage. Inspection of motor SN 42A showed no damage to the chamber, igniter, or propellant grain. Inspection of the nozzle hull revealed that the graphite insert had moved approximately

0.030 inch forward, breaking the sealant (LPL-13A) at the graphite-hull upstream interface (fig. 3). This failure caused excessive leakage during the postassembly pressure check, and the motor was rejected for static test firing. Motors SN 37A and SN 40A were found to be free of defect. These motors were reassembled and static test fired.

### Accelerated Aging

Pitch control motors SN 69 and SN 70 (group H) were aged for 75 days at 160° F. Both motors were then static test fired.

### Acceleration Testing

Pitch control motors SN 46, SN 68, and SN 73 were assigned to test group J. Motor SN 68, with igniter cartridges installed, was preconditioned at a temperature of 70° F for a period of 3 hours. The motor was then installed in a test fixture (with a thrust neutralization device attached) and mounted on a centrifuge boom with the exhaust nozzle straight up so that the acceleration vector was normal to the thrust axis of the motor. Figure 6 shows a typical test setup. Provisions were made to record six channels of instrumentation: two firing current pulses, two firing voltages, and two chamber pressures. The test fixture, mounted on the centrifuge, was enclosed in a temperature-conditioning box and conditioned in place. When the temperature conditioning was completed, the conditioning box and the thermocouple leads were removed; and the motor was brought up to an acceleration level of 19 ± 1g. This level was maintained for a minimum of 2 minutes. During this period, the firing circuits were armed; and all channels of instrumentation were monitored visually. Both armed firing circuits were then simultaneously energized from a common switch. The test firing was accomplished within 10 minutes after removal of the conditioning box. This procedure was repeated for motor SN 46 after conditioning to 140° F, and for motor SN 73 after conditioning to 20° F. A review of the data (chamber pressure versus time) indicated that the motors completed the test satisfactorily.

### Temperature Cycle Testing

Pitch control motors SN 38A, SN 43A, SN 45A, SN 60A, and SN 78 were assigned to test group K. Motors SN 38A, SN 45A, SN 60A, and SN 78 were temperature cycled by successive stabilization at 140°, -20°, 140°, -20°, and 140° F. Motor SN 43A was successively stabilized at -20°, 140°, -20°, 140°, and -20° F. After disassembly and visual inspection, all were found to be free of defect. They were then reassembled and static test fired.

## STATIC TEST FIRING

The static test firing portion of the qualification test program (refs. 1, 4, and 5) was conducted using a total of 17 pitch control motors (10 environmentally tested motors and 7 motors not environmentally tested).

## Installation, Instrumentation, and Calibration

Prior to static test firing, the pitch control motors were installed in a test stand, and instrumentation was provided to calibrate axial thrust and motor chamber pressure.

The pitch control motors were mounted in a test stand which contained a thrust cradle that was supported above a cradle support stand by four vertical single-flexure (thin web plate type) columns and one horizontal double-flexure column. The test stand is shown in figures 7(a) and (b). Following installation of the motors in the test stand, a portable conditioning unit was used to achieve the required grain temperature.

Instrumentation was provided to measure axial thrust and motor chamber pressure. Table IV presents instrumentation ranges, recording methods, and system accuracies for the reported measured parameters. The axial-thrust measuring system included a double bridge, strain-gage-type load cell mounted in the axial double-flexure column on the motor longitudinal axis. Axial thrust was transmitted through a buttress to the load cell. Hydraulically actuated pull rods were used to obtain prefire and postfire thrust system calibrations, and bonded strain-gage-type transducers were used to measure motor chamber pressure.

The output signal of each measuring device was filtered and then recorded on magnetic tape from a multi-input high-speed analog-to-digital converter at a scan rate of 112 times per second for reduction at a later time by an IBM 1401 computer. An independent backup for all data systems was provided by a millivolt-to-frequency converter system. The filtered analog input of this system was photographically recorded in pulse form on a galvanometer-type oscillograph. Another oscillograph provided a secondary backup in the form of a normal analog recording.

The thrust load cells and the pressure transducers were laboratory calibrated prior to use in this testing program. Following installation of the measuring devices, all instrumentation systems were calibrated before and after each individual firing.

The axial-thrust instrumentation system was calibrated with a hydraulically actuated calibration system acting through two pull rods. The hydraulically actuated pull rods exerted an axial force through the thrust cradle and flexure systems to both the axial-thrust load cell and an accurately calibrated load cell permanently mounted ahead of the forward thrust buttress. The axial-thrust load cell was calibrated by utilizing the axial load that was determined from the accurately calibrated load cell for each load applied.

The motor chamber pressure instrumentation systems were calibrated electrically through five steps by using known resistances in the transducer circuits to simulate selected pressure levels.

## Preselected Controlled Static Test Conditions

The motors to be static test fired were divided into three prefire propellant temperature groups, and each prefire propellant temperature group was further subdivided into the following ignition groups.

(1) 20° F (six motors)

(a) One motor duplicating only a failed igniter cartridge

(b) Two motors simulating only a failed nozzle closure

(c) One motor duplicating a failed igniter cartridge and simulating a failed nozzle closure

(d) Two motors duplicating normal ignition conditions

(2) 70° F (four motors)

(a) One motor duplicating only a failed igniter cartridge

(b) One motor simulating only a failed nozzle closure

(c) One motor duplicating a failed igniter cartridge and simulating a failed nozzle closure

(d) One motor duplicating normal ignition conditions

(3) 140° F (seven motors)

(a) One motor duplicating only a failed igniter cartridge

(b) One motor simulating only a failed nozzle closure

(c) Two motors duplicating a failed igniter cartridge and simulating a failed nozzle closure

(d) Three motors duplicating normal ignition conditions

## Motor Performance Data and Analysis

The static-test-firing motor performance data are summarized in table V and are presented in figures 8 to 15 with second-order least-square curve fits of the data versus prefire propellant temperature.

The specifications (refs. 2 and 3) for the Apollo pitch control motor require that certain performance parameters meet specific tolerance limits at particular prefire propellant temperatures (20°, 70°, and 140° F). Because a solid-propellant rocket motor of fixed geometry and given propellant will yield different performance with

varying prefire propellant temperatures, and because there were only 17 motors available to determine the motor performance variation and product variance, the motor performance data were transformed to the required 20°, 70°, and 140° F prefire propellant temperatures to increase the statistical confidence; a statistical analysis was then performed on these transformed data. Motor performance versus time transformed to specific prefire propellant temperatures and their two-sided tolerance limits are presented in tables VI, VII, and VIII and figures 16, 17, and 18.*

The statistical analysis consists of calculating means, standard deviations, and one-sided and two-sided tolerance limits (for 99 percent of the population with 95 percent confidence) (ref. 6). In some cases, thrust (thus, impulse and specific impulse) data were corrected to a desired pressure altitude by adding or subtracting the product of the average nozzle exit area and the delta pressure (the difference between the ambient pressure and the desired pressure altitude) to the measured data.

The method of data analysis utilized in this report is discussed in reference 6.

Ignition delay time. - Ignition delay time is defined as the time interval from the application of ignition voltage to the initiator bridge wire to the first indication that chamber pressure had increased to a value of 100 psia during the ignition transient (fig. 19(a)).

Ignition delay time for the 17 motors, independent of the prefire cavity pressure and the number of igniter cartridges used, ranged from 0.009 second (at 141° F, duplicating only a failed igniter cartridge) to 0.016 second (at 143° and 149° F, duplicating a failed igniter cartridge and simulating a failed nozzle closure) (table V and fig. 8(a)). The statistical analysis indicates a minimum and a maximum ignition delay time of 0.005 second (at 70° F) and 0.022 second (at 20° F), respectively, as the two-sided tolerance limits (table IX).

Ignition delay time for the six motors, duplicating normal ignition conditions, ranged from 0.011 second (at 146° F) to 0.015 second (at 16° and 141° F) (table V and fig. 8(e)). The statistical analysis indicates a minimum and a maximum ignition delay time of 0.004 second (at 70° and 140° F) and 0.023 second (at 20° F), respectively, as the two-sided tolerance limits (table IX).

Thrust rise time. - Thrust rise time, defined as the time interval from the application of ignition voltage to the initiator bridge wire to the first indication that axial thrust had increased to a value of 80 percent of maximum thrust (fig. 19(b)), is required by specification to be between 0.060 and 0.110 second.

Thrust rise time for the 17 motors, independent of the prefire cavity pressure and the number of igniter cartridges used, ranged from 0.068 second (at 18° F, duplicating normal ignition conditions) to 0.117 second (at 141° F, simulating a failed nozzle closure) (table V and fig. 8(f)), the 0.117-second thrust rise time not being within the above-mentioned specification requirements. The statistical analysis indicates a minimum and a maximum thrust rise time of 0.044 second (at 20° F) and 0.126 second (at

*Upper and lower two-sided tolerance limits are not maximum and minimum performance traces, but only the bounds within which these traces will lie.

140° F), respectively, as the two-sided tolerance limits (table IX), both of which are not within the above-mentioned specification requirements.

Thrust rise time for the six motors, duplicating normal ignition conditions, ranged from 0.068 second (at 18° F) to 0.091 second (at 141° F)(table V and fig. 8(j)). The statistical analysis indicates a minimum and a maximum thrust rise time of 0.042 second (at 20° F) and 0.118 second (at 140° F), respectively, as the two-sided tolerance limits (table IX), both of which are not within the above-mentioned specification requirements.

Web burn time. - Web burn time is defined as the time interval from the first indication that chamber pressure has increased to a value of 100 psia during the ignition transient to the time of web burnout (fig. 19(a)). Web burnout is defined as the time determined by the intersection of the pressure trace by the bisector of the angle formed by the tangents extended from the operating levels (one just prior to the tailoff transient and one during the initial portion of the tailoff transient). Web burn time is required by specification to be between 0.5 and 0.7 second. Web burn time ranged from 0.533 second (at 141° F) to 0.665 second (at 16° F) (table V and fig. 8(k)). The statistical analysis indicates a minimum and a maximum web burn time of 0.506 second (at 140° F) and 0.703 second (at 20° F), respectively, as the two-sided tolerance limits (table IX).

Action time. - Action time is defined as the time interval from the first indication that chamber pressure has increased to a value of 100 psia during the ignition transient to the first indication that chamber pressure has decreased to a value of 100 psia during the tailoff transient (fig. 19(a)). Action time ranged from 0.884 second (at 141° F) to 1.085 seconds (at 16° F) (table V and fig. 8(l)). The statistical analysis indicates a minimum and a maximum action time of 0.849 second (at 140° F) and 1.119 seconds (at 20° F), respectively, as the two-sided tolerance limits (table IX).

Tailoff time. - Tailoff time is defined as the time interval from web burnout to the first indication that thrust has decreased to a value of 0 $lb_f$ during the tailoff transient (fig. 19(b)). Tailoff time ranged from 0.623 second (at 141° F) to 0.740 second (at 68° and 141° F) (table V and fig. 8(m)). The statistical analysis indicates a minimum and a maximum tailoff time of 0.542 second (at 140° F) and 0.855 second (at 70° F), respectively, as the two-sided tolerance limits (table IX).

Total time. - Total time is defined as the time interval from the application of ignition voltage to the initiator bridge wire to the first indication that thrust has decreased to a value of 0 $lb_f$ during the tailoff transient (fig. 19(b)). Total time ranged from 1.171 seconds (at 141° F) to 1.381 seconds (at 18° F) (table V and fig. 8(n)). The statistical analysis indicates a minimum and a maximum total time of 1.115 seconds (at 140° F) and 1.486 seconds (at 20° F), respectively, as the two-sided tolerance limits (table IX).

Maximum thrust. - Maximum thrust is required by specification not to exceed 4000 $lb_f$. Maximum thrust, corrected to vacuum pressure altitude, ranged from 2607 $lb_f$ (at 16° F) to 3447 $lb_f$ (at 141° F) (fig. 20). The statistical analysis indicates a maximum thrust of 3636 $lb_f$ (at 140° F) as the one-sided tolerance limit at vacuum pressure altitude (table IX).

Impulse. - Impulse is defined as the time integral of thrust. Web-burn-time impulse, corrected to vacuum pressure altitude, ranged from 1470 $lb_f$-sec (at 68° F) to 1556 $lb_f$-sec (at 18° F) (fig. 21). The statistical analysis indicates a minimum and a maximum web-burn-time impulse of 1424 $lb_f$-sec (at 70° F) and 1604 $lb_f$-sec (at 20° F), respectively, as the two-sided tolerance limits at vacuum pressure altitude (table IX).

Action-time impulse, corrected to vacuum pressure altitude, ranged from 1723 $lb_f$-sec (at 68° F) to 1801 $lb_f$-sec (at 141° F) (fig. 22). The statistical analysis indicates a minimum and a maximum action-time impulse of 1679 $lb_f$-sec (at 70° F) and 1854 $lb_f$-sec (at 140° F), respectively, as the two-sided tolerance limits at vacuum pressure altitude (table IX).

Tailoff impulse is required by specification not to exceed 500 $lb_f$-sec. Tailoff impulse, corrected to vacuum pressure altitude, ranged from 236 $lb_f$-sec (at 16° F) to 315 $lb_f$-sec (at 141° F) (fig. 23). The statistical analysis indicates a maximum tail-off impulse of 348 $lb_f$-sec (at 140° F) as the one-sided tolerance limit at vacuum pressure altitude (table IX).

Total impulse is required by specification to be 1750 $lb_f$-sec ±3 percent (1697.5 to 1802.5 $lb_f$-sec) at 70° F and at sea-level pressure altitude. Total impulse, corrected to sea-level pressure altitude, ranged from 1710 $lb_f$-sec (at 68° F) to 1788 $lb_f$-sec (at 141° F) (fig. 24). The statistical analysis indicates a minimum and a maximum total impulse of 1670 and 1811 $lb_f$-sec (at 70° F), respectively, as the two-sided tolerance limits at sea-level pressure altitude (table IX), both of which are not within the above-mentioned specification requirements.

Average-propellant specific impulse. - Average-propellant specific impulse is defined as the impulse delivered per pound of propellant expended during the time interval of interest. Average-propellant specific impulse, during total time corrected to vacuum pressure altitude, ranged from 197 $lb_f$-sec/$lb_m$ (at 16° F) to 203 $lb_f$-sec/$lb_m$ (at 141° F) (fig. 25). The statistical analysis indicates a minimum and a maximum total-time specific impulse of 194 $lb_f$-sec/$lb_m$ (at 20° and 70° F) and 208 $lb_f$-sec/$lb_m$ (at 140° F), respectively, as the two-sided tolerance limits at vacuum pressure altitude (table IX).

Characteristic exhaust velocity. - Characteristic exhaust velocity is a measure of the effectiveness with which the chemical reaction is accomplished in the combustion chamber (it is frequently employed for comparing the performance of different rocket motors) and is defined by

$$C^* = \frac{gA_t \int P \, dt}{W_p}$$

Characteristic exhaust velocity ranged from 4650 ft/sec (at 18° F) to 4780 ft/sec (at 146° F) (table V and fig. 14). The statistical analysis indicates a minimum and a maximum characteristic exhaust velocity of 4570 ft/sec (at 70° F) and 4870 ft/sec (at 140° F), respectively, as the two-sided tolerance limits (table IX).

Burning rate. - Burning rate is defined as the recession of a solid-propellant burning surface perpendicular to itself per unit of time. The average burning rate during web burn time ranged from 0.702 in/sec (at 16° F) to 0.876 in/sec (at 141° F) (table V and fig. 15). The statistical analysis indicates a minimum and a maximum average burning rate during web burn time of 0.660 in/sec (at 20° F) and 0.916 in/sec (at 140° F), respectively, as the two-sided tolerance limits (table IX).

## Structural Integrity and Physical Measurements

Structural integrity. - Prefire and postfire inspection of the motors revealed that no severe nozzle or motor chamber deterioration was apparent, indicating satisfactory integrity of the motor assembly.

Burst pressure, defined as the internal chamber pressure required to cause structural failure of the motor case, is required by specification to be a minimum of 3740 psia. Three motors were burst pressure tested during development testing. The aft closure bolts failed in each case with no apparent damage to the motor. The chamber pressures required to fail these bolts were 4088, 4224, and 4507 psia. Because each motor case could not be individually burst tested, they were proof pressure tested to 2940 psia. Proof testing is defined as the internal chamber pressure to which each individual motor case is hydrostatically tested prior to propellant casting.

The maximum chamber pressure experienced ranged from 1575 psia (at 16° F) to 2026 psia (at 141° F) (table V and fig. 26). The statistical analysis indicates a maximum chamber pressure of 2117 psia (at 140° F) as the one-sided tolerance limits (table IX).

Nozzle throat measurements. - The prefire nozzle throat area ranged from 1.221 to 1.229 $in^2$ (tables X and XI) with an average of 1.224 $in^2$. The statistical analysis indicates a minimum and a maximum prefire nozzle throat area of 1.216 and 1.233 $in^2$, respectively, as the two-sided tolerance limits (table XI).

The postfire nozzle throat area ranged from 1.215 to 1.229 $in^2$ (tables X and XI) with an average of 1.222 $in^2$. The statistical analysis indicates a minimum and a maximum postfire nozzle throat area of 1.210 and 1.235 $in^2$, respectively, as the two-sided tolerance limits (table XI).

Nozzle exit measurements. - The prefire nozzle exit area ranged from 2.054 to 2.079 $in^2$ (tables X and XI) with an average of 2.069 $in^2$. The statistical analysis indicates a minimum and a maximum prefire nozzle exit area of 2.038 and 2.100 $in^2$, respectively, as the two-sided tolerance limits (table XI).

The postfire nozzle exit area ranged from 2.036 to 2.089 $in^2$ (tables X and XI) with an average of 2.057 $in^2$. The statistical analysis indicates a minimum and a maximum postfire nozzle exit area of 1.987 and 2.127 $in^2$, respectively, as the two-sided tolerance limits (table XI).

Weight. - Prefire loaded motor weight is required by specification to be a maximum of 51 $lb_m$. The prefire loaded motor weight ranged from 48.6 to 49.4 $lb_m$ (tables X and XI) with an average of 49.0 $lb_m$. The statistical analysis indicates a maximum prefire motor weight of 49.5 $lb_m$ as the one-sided tolerance limit (table XI).

The postfire motor weight is required by specification to be a minimum of 37.7 $lb_m$ and a maximum of 42.0 $lb_m$. The postfire motor weight ranged from 39.4 to 40.1 $lb_m$ (tables X and XI) with an average of 39.7 $lb_m$. The statistical analysis indicates a minimum and a maximum postfire motor weight of 39.0 and 40.5 $lb_m$, respectively, as the two-sided tolerance limits (table XI).

A comparison of the prefire and postfire motor weight indicates that the expended mass of the motor ranged from 8.9 to 9.5 $lb_m$ (tables X and XI) with an average of 9.2 $lb_m$. The statistical analysis indicates a minimum and a maximum expended mass of 8.7 and 9.8 $lb_m$, respectively, as the two-sided tolerance limits (table XI).

Propellant weight ranged from 8.81 to 9.00 $lb_m$ (tables X and XI) with an average of 8.90 $lb_m$. The statistical analysis indicates a minimum and a maximum propellant weight of 8.72 and 9.09 $lb_m$, respectively, as the two-sided tolerance limits (table XI).

## CONCLUSIONS

During the qualification phase of testing, the Apollo pitch control motor met all specified environmental and structural integrity test requirements. The motor also met all performance specification requirements except for thrust rise time. The one motor whose thrust rise time (0.117 second) did not meet the specification requirement (a minimum of 0.060 second and a maximum of 0.110 second) was static test fired simulating a failure mode (simulating a nozzle closure failure), and its thrust rise time was within the specification requirements for the launch escape motor (a minimum of 0.050 second and a maximum of 0.120 second). Because the pitch control motor is ignited in conjunction with the launch escape motor, this specification deviation does not adversely affect the launch escape system.

A statistical analysis was performed on the motor static test data. The specifications do not require that the statistical analysis meet the specification requirements, but these two points should be noted:

(1) The statistical analysis for thrust rise time of the six motors static test fired duplicating normal ignition conditions (those motors that did not duplicate and/or simulate at least one ignition failure) indicates that not all of the desired 99 percent of the population will meet the specification requirements with 95-percent confidence. However, the statistical analysis indicates that 90 percent of the population will meet the specification requirements of the launch escape motor with 95-percent confidence.

(2) The statistical analysis for total impulse of the 17 motors static test fired also indicates that not all of the desired 99 percent of the population will meet the specification requirements with 95-percent confidence. However, the statistical analysis indicates that 90 percent of the population will meet the specification requirements with 90-percent confidence.

The product variance of thrust rise time for the 17 motors static test fired will have only a negligible effect on the performance of the launch escape system, as the product variance indicates the pitch control motor will reach 80 percent of maximum thrust only 0.006 second prior to the reaching of 90-percent maximum ignition thrust by the launch escape motor. The product variance of total impulse will also have only a negligible effect on the command module and launch-escape-system flight attitude. The qualification evaluation presented found that the pitch control motor is qualified for the Apollo Spacecraft Program because the motor will adequately perform its function in the safe removal of the command module from the launch vehicle and service module and out of their path if any system affecting crew safety should malfunction.

Manned Spacecraft Center
National Aeronautics and Space Administration
Houston, Texas, March 17, 1967
914-11-10-00-72

## REFERENCES


1. Anon.: Qualification Test Report Apollo Pitch Control Motor (U). LPC Rept. No. 588-M-50, Lockheed Propulsion Co., Dec. 8, 1964.

2. Anon.: Rocket Motor, Solid Propellant, Pitch Control Motor (U). Specification, Doc. No. MC 467-0005 E, North American Aviation, Inc., Space and Information Systems Division, July 10, 1964.

3. Anon.: CSM Master End Item Specification (Block I) (U). SID 64-1237, Contract NAS9-150, North American Aviation, Inc., Space and Information Systems Division, Dec. 1, 1964.

4. Anon.: Monthly Progress Report Number 29 for Apollo Launch Escape and Pitch Control Motors (U). LPC Rept. No. 588-P-29, Lockheed Propulsion Co., Oct. 30, 1964.

5. Anon.: Pitch Control Motor Reliability Assessment Qualification Test Evaluation (U). North American Aviation, Inc., Space and Information Systems Division, Dec. 30, 1964.

6. Lee, B. J.; and Burchfield, P. B.: Solid Propellant Rocket Motor Performance Computer Programs Using the Group Transformation Method. NASA TN D-3667, 1966.

TABLE I. - PROPELLANT FORMULATION

(a) Composition

| Ingredient | Function | Weight, percent |
|---|---|---|
| Ammonium perchlorate | Oxidizer | 72.00 |
| Polysulfide polymer, LP-33 | Fuel/binder | 5.53 |
| Polysulfide polymer, LP-205 | Fuel/binder | 16.57 |
| Para-quinone dioxime, GMF | Curing agent | 1.00 |
| Sulfur | Cross-linking agent | 0.10 |
| Magnesium oxide | Stabilizer | 0.80 |
| Ferric oxide | Burning rate catalyst | 2.00 |
| Aluminum powder | Fuel/combustion stabilizer | 2.00 |

(b) Properties

| | |
|---|---|
| Exhaust gas specific heat ratio | 1.22 |
| Propellant density, $lb_m/in^3$ | 0.062 |
| Autoignition temperature, °F | |
| 1 hour | 392 |
| 100 hours | 220 |
| Flame temperature at 1000 psia, °F | 4436 |

TABLE II. - SUMMARY OF ENVIRONMENTAL TESTING

| Motor SN | Temperature cycling | Vibration testing | Drop testing | | | Accelerated aging | Acceleration testing | Environmental testing group |
|---|---|---|---|---|---|---|---|---|
| | | | Longitudinal axis horizontal | Longitudinal axis vertical | | | | |
| | | | | Head-end down | Nozzle-end down | | | |
| 37A | XX[a] | | XX (at -20° F) | | | | | G |
| 38A | XX | | | | | | | K |
| 40A | XX[a] | | | XX (at -20° F) | | | | G |
| 42A | XX[a] | | | | XX (at -20° F) | | | G |
| 43A | XX | | | | | | | K |
| 45A | XX | | | | | | | K |
| 46 | | | | | | | XX | J |
| 60A | XX | | | | | | | K |
| 68 | | | | | | | XX | J |
| 69 | | | | | | XX | | H |
| 70 | | | | | | XX | | H |
| 73 | | | | | | | XX | J |
| 77 | XX[a] | XX | | | | | | F |
| 78 | XX | | | | | | | K |

[a]The temperature cycling test was performed first.

TABLE III. - VIBRATION TESTS

(a) Results of resonance search

| Axis of vibration | Resonance frequency, cps | Output to input ratio |
|---|---|---|
| Transverse | 852 | 14.0 |
| | 1048 | 8.5 |
| | 1625 | 9.0 |
| | 1917 | 3.5 |
| Longitudinal | 790 | 6.0 |
| | 1242 | 4.0 |
| | 1367 | 3.0 |
| | 1617 | 10.0 |
| | 1910 | 4.0 |

(b) Sustained vibration test conditions

| Axis of vibration | Test | Frequency, cps | Input level, g | Duration, [a] min |
|---|---|---|---|---|
| Transverse | Resonance dwell | 852 | 7.0 | 30 |
| | | 1048 | 7.0 | 30 |
| | | 1625 | 7.0 | 30 |
| | | 1917 | 7.0 | 30 |
| | Vibration cycling | 20-60-20 | 3.0 | 120 |
| | | 60-500-60 | 5.0 | 120 |
| Longitudinal | Resonance dwell | 790 | 7.0 | 24 |
| | | 1242 | 7.0 | 24 |
| | | 1367 | 7.0 | 24 |
| | | 1617 | 7.0 | 24 |
| | | 1910 | 7.0 | 24 |
| | Vibration cycling | 20-60-20 | 3.0 | 120 |
| | | 60-500-60 | 5.0 | 120 |

[a]Total time of sustained vibration was 720 minutes.

TABLE IV. - STATIC TEST INSTRUMENTATION

| Parameter | Estimated system accuracy[a], percent | | Measuring device | Range of measuring device | Recording device | Method of system calibration |
|---|---|---|---|---|---|---|
| | Steady state at operating level | Integral | | | | |
| Axial force | ±0.445 | -- | Bonded strain-gage-type load cell | 0 to 5000 $lb_f$ | Multi-input, high-speed, analog-to-digital converter | Hydraulically actuated at nominal loads of: 0; 500; 1000; 1500; 2000; 2500; 3000; and 3500 $lb_f$ |
| Total impulse | -- | ±0.456 | | | | |
| Motor chamber pressure | ±0.643 | -- | Bonded strain-gage-type transducers (two used) | 0 to 3000 psia | Multi-input, high-speed, analog-to-digital converter | Electrical calibration at nominal levels of: 0; 500; 1000; 1500; 2000; and 2500 psi |
| Chamber pressure integral | -- | ±0.651 | | | | |
| Barometric pressure | ±0.1 | -- | Barometer | 0 to 20 psia | Visual readout | Periodic laboratory calibration |
| Time intervals | ±0.1 | -- | -- | -- | Multi-input, high-speed, analog-to-digital converter | Based on ± millisecond repeatability over normal 5-second recording time |
| Weight | ±0.14 | -- | Beam-balance scales | 0 to 400 $lb_m$ | Visual readout | Periodic dead-weight calibration |

[a] Based on root mean square value.

TABLE V. - SUMMARY OF MOTOR PERFORMANCE DATA

| Motor serial number | 38A | 60A | 78 | 43A | 45A | 37A | 44A | 50A | 58A | 59A | 64A | 65A | 74A | 40A | 69 | 70 | 77 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Static test firing date[a] | Aug. 7 | Aug. 7 | Aug. 7 | Aug. 28 | Aug. 28 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 2 | Sept. 3 | Sept. 3 | Sept. 3 | Sept. 3 |
| Prefire propellant temperature, °F | 68 | 149 | 149 | 18 | 18 | 16 | 16 | 67 | 141 | 71 | 141 | 143 | 18 | 146 | 141 | 16 | 63 |
| Ambient pressure, psia | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| Ambient temperature, °F | 92 | 100 | 98 | 82 | 80 | 76 | 78 | 71 | 74 | 74 | 72 | 78 | 80 | 87 | 86 | 84 | 93 |
| Number of igniter cartridges energized | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| Prefire cavity pressure, psia | 0.039 | 13.7 | 0.039 | 13.7 | 0.020 | 13.7 | 0.002 | 0.002 | 13.7 | 13.7 | 13.7 | 0.020 | 13.7 | 13.7 | 0.020 | 0.020 | 13.7 |
| Environmental test group | K | K | K | K | K | G | N/A[b] | N/A[b] | N/A[b] | N/A[b] | N/A[b] | N/A[b] | N/A[b] | G | H | H | F |
| Time, t, sec: | | | | | | | | | | | | | | | | | |
| Ignition delay, $t_d$ | 0.012 | 0.012 | 0.016 | 0.014 | 0.014 | 0.015 | 0.015 | 0.010 | 0.015 | 0.013 | 0.009 | 0.016 | 0.012 | 0.011 | 0.012 | 0.015 | 0.012 |
| Thrust rise, $t_f$ | .089 | .085 | .084 | .068 | .078 | .076 | .080 | .091 | .091 | .083 | .082 | .085 | .080 | .075 | .117 | .085 | .073 |
| Maximum thrust, $t_{max}$ | .260 | .248 | .220 | .200 | .200 | .175 | .220 | .262 | .258 | .246 | .180 | .210 | .250 | .180 | .260 | .280 | .200 |
| Web burn, $t_b$ | .614 | .547 | .573 | .650 | .658 | .642 | .630 | .608 | .533 | .621 | .546 | .539 | .656 | .547 | .556 | .665 | .636 |
| Action, $t_a$ | .988 | .894 | .908 | 1.049 | 1.039 | 1.026 | 1.045 | .979 | .884 | .982 | .921 | .916 | 1.048 | .899 | .920 | 1.085 | 1.038 |
| Tailoff, $t_{tail}$ | .740 | .695 | .638 | .693 | .651 | .679 | .712 | .686 | .623 | .728 | .740 | .680 | .713 | .722 | .628 | .649 | .695 |
| Total, $t_{total}$ | 1.366 | 1.254 | 1.227 | 1.357 | 1.323 | 1.336 | 1.357 | 1.304 | 1.171 | 1.362 | 1.295 | 1.235 | 1.381 | 1.280 | 1.196 | 1.329 | 1.343 |
| Chamber pressure, P, psia: | | | | | | | | | | | | | | | | | |
| Maximum, $P_{max}$ | 1703 | 1919 | 1857 | 1604 | 1604 | 1617 | 1670 | 1758 | 1975 | 1703 | 2026 | 1975 | 1635 | 1939 | 1947 | 1575 | 1616 |
| Average web burn time, $\overline{P}_b$ | 1440 | 1651 | 1586 | 1374 | 1366 | 1400 | 1430 | 1493 | 1689 | 1480 | 1680 | 1683 | 1418 | 1654 | 1602 | 1380 | 1402 |
| Average action time, $\overline{P}_a$ | 1046 | 1186 | 1153 | 990.5 | 999.0 | 1021 | 1009 | 1075 | 1213 | 1069 | 1163 | 1168 | 1011 | 1186 | 1145 | 966.8 | 1008 |
| Average tailoff time, $\overline{P}_{tail}$ | 224 | 246 | 237 | 234 | 235 | 242 | 236 | 235 | 297 | 203 | 227 | 253 | 210 | 244 | 279 | 230 | 248 |
| Average total time, $\overline{P}_{total}$ | 768.7 | 856.5 | 863.9 | 777.4 | 795.2 | 795.7 | 787.8 | 819.8 | 926.6 | 783.4 | 837.8 | 873.7 | 782.0 | 844.5 | 891.3 | 802.9 | 792.3 |
| Chamber pressure integral, $\int P\,dt$, psia-sec: | | | | | | | | | | | | | | | | | |
| Web burn time, $\int_{t_b} P\,dt$ | 884 | 903 | 909 | 893 | 899 | 899 | 901 | 908 | 900 | 919 | 917 | 907 | 930 | 905 | 891 | 918 | 892 |
| Action time, $\int_{t_a} P\,dt$ | 1033 | 1060 | 1047 | 1039 | 1038 | 1047 | 1054 | 1052 | 1072 | 1050 | 1071 | 1070 | 1060 | 1066 | 1053 | 1049 | 1046 |
| Tailoff time, $\int_{t_{tail}} P\,dt$ | 166 | 171 | 151 | 162 | 153 | 164 | 168 | 161 | 185 | 148 | 168 | 172 | 150 | 176 | 175 | 149 | 172 |
| Total time, $\int_{t_{total}} P\,dt$ | 1050 | 1074 | 1060 | 1055 | 1052 | 1063 | 1069 | 1069 | 1085 | 1067 | 1085 | 1079 | 1080 | 1081 | 1066 | 1067 | 1064 |

[a] Motors were all tested in 1964.

[b] Not applicable.

TABLE V. - SUMMARY OF MOTOR PERFORMANCE DATA - Concluded

| Motor serial number | 38A | 60A | 78 | 43A | 45A | 37A | 44A | 50A | 58A | 59A | 64A | 65A | 74A | 40A | 69 | 70 | 77 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Static test firing date[a] | Aug. 7 | Aug. 7 | Aug. 7 | Aug. 28 | Aug. 28 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 2 | Sept. 3 | Sept. 3 | Sept. 3 | Sept. 3 |
| Prefire propellant temperature, °F | 68 | 149 | 149 | 18 | 18 | 16 | 16 | 67 | 141 | 71 | 141 | 143 | 18 | 146 | 141 | 16 | 63 |
| Ambient pressure, psia | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 | 13.7 |
| Ambient temperature, °F | 92 | 100 | 98 | 82 | 80 | 76 | 78 | 71 | 74 | 74 | 72 | 78 | 80 | 87 | 86 | 84 | 93 |
| Number of igniter cartridges energized | 1 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 |
| Prefire cavity pressure, psia | 0.039 | 13.7 | 0.039 | 13.7 | 0.020 | 13.7 | 0.002 | 0.002 | 13.7 | 13.7 | 13.7 | 0.020 | 13.7 | 13.7 | 0.020 | 0.020 | 13.7 |
| Environmental test group | K | K | K | K | K | G | N/A[b] | N/A[b] | N/A[b] | N/A[b] | N/A[b] | N/A[b] | N/A[b] | G | H | H | F |
| Thrust, F, $lb_f$: | | | | | | | | | | | | | | | | | |
| Maximum, $F_{max}$ | 2826 | 3185 | 3076 | 2721 | 2694 | 2709 | 2840 | 2951 | 3306 | 2853 | 3419 | 3331 | 2726 | 3264 | 3235 | 2579 | 2734 |
| Average web burn time, $\overline{F}_b$ | 2366 | 2720 | 2613 | 2318 | 2306 | 2324 | 2351 | 2492 | 2801 | 2459 | 2788 | 2794 | 2344 | 2724 | 2644 | 2251 | 2326 |
| Average action time, $\overline{F}_a$ | 1716 | 1950 | 1896 | 1661 | 1678 | 1683 | 1654 | 1781 | 2009 | 1770 | 1923 | 1932 | 1659 | 1946 | 1880 | 1565 | 1662 |
| Average tailoff time, $\overline{F}_{tail}$ | 351 | 390 | 378 | 365 | 372 | 371 | 367 | 357 | 477 | 305 | 354 | 398 | 306 | 380 | 438 | 336 | 378 |
| Average total time, $\overline{F}_{total}$ | 1254 | 1403 | 1416 | 1297 | 1330 | 1305 | 1284 | 1350 | 1529 | 1284 | 1378 | 1439 | 1272 | 1378 | 1459 | 1290 | 1297 |
| Impulse, I, $lb_f$-sec: | | | | | | | | | | | | | | | | | |
| Web burn time, $I_b$ | 1453 | 1488 | 1497 | 1507 | 1517 | 1492 | 1481 | 1515 | 1493 | 1527 | 1522 | 1506 | 1538 | 1490 | 1470 | 1497 | 1479 |
| Action time, $I_a$ | 1695 | 1743 | 1722 | 1742 | 1743 | 1727 | 1728 | 1744 | 1776 | 1738 | 1771 | 1770 | 1739 | 1749 | 1730 | 1698 | 1725 |
| Tailoff time, $I_{tail}$ | 260 | 271 | 241 | 253 | 242 | 252 | 261 | 245 | 297 | 222 | 262 | 271 | 218 | 274 | 275 | 218 | 263 |
| Total time, $I_{total}$ | 1713 | 1759 | 1738 | 1760 | 1759 | 1744 | 1742 | 1760 | 1790 | 1749 | 1784 | 1777 | 1756 | 1764 | 1745 | 1715 | 1742 |
| Average-propellant specific impulse, $\overline{I}_{sp}$, $lb_f$-sec/$lb_m$: | | | | | | | | | | | | | | | | | |
| Web burn time, $\overline{I}_{sp_b}$ | 196 | 197 | 197 | 200 | 199 | 198 | 197 | 201 | 201 | 199 | 201 | 200 | 198 | 200 | 198 | 196 | 199 |
| Action time, $\overline{I}_{sp_a}$ | 196 | 197 | 197 | 199 | 198 | 197 | 197 | 199 | 200 | 199 | 200 | 199 | 197 | 200 | 197 | 194 | 198 |
| Total time, $\overline{I}_{sp_{total}}$ | 194 | 196 | 196 | 198 | 197 | 196 | 195 | 198 | 200 | 197 | 199 | 198 | 195 | 199 | 197 | 193 | 197 |
| Characteristic exhaust velocity, C*, ft/sec: | 4680 | 4710 | 4700 | 4650 | 4650 | 4690 | 4720 | 4740 | 4750 | 4720 | 4760 | 4730 | 4700 | 4780 | 4730 | 4710 | 4740 |
| Average burning rate, $\overline{r}_b$, in/sec (based on $t_b$) | 0.761 | 0.854 | 0.815 | 0.718 | 0.710 | 0.727 | 0.741 | 0.768 | 0.876 | 0.752 | 0.855 | 0.866 | 0.712 | 0.854 | 0.840 | 0.702 | 0.734 |

[a]Motors were all tested in 1964.

[b]Not applicable.

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS

(a) Chamber pressure

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO SIDED TOLERANCE LIMITS MEAN | MIN. | MAX. | TRANSFORMED CHAMBER PRESSURE MEAN | MIN. | MAX. |
|---|---|---|---|---|---|---|
| .00 | .0000 | -.0000 | .0000 | 100.0714 | 96.2193 | 103.9236 |
| .81 | .0052 | .0048 | .0057 | 213.8349 | 54.5948 | 373.0750 |
| 1.61 | .0105 | .0096 | .0113 | 335.7164 | 89.0437 | 582.3892 |
| 2.42 | .0157 | .0144 | .0170 | 465.3385 | 179.3090 | 751.3680 |
| 3.23 | .0209 | .0192 | .0227 | 590.8907 | 279.2386 | 902.5428 |
| 4.03 | .0262 | .0240 | .0284 | 708.8691 | 382.7620 | 1034.9762 |
| 4.84 | .0314 | .0288 | .0340 | 828.3971 | 499.7772 | 1157.0170 |
| 5.65 | .0366 | .0336 | .0397 | 934.0646 | 611.4156 | 1256.7136 |
| 6.45 | .0419 | .0384 | .0454 | 1026.4213 | 714.7385 | 1338.1040 |
| 7.26 | .0471 | .0432 | .0510 | 1104.5699 | 799.6650 | 1409.4748 |
| 8.06 | .0523 | .0480 | .0567 | 1171.7233 | 869.7382 | 1473.7085 |
| 8.87 | .0576 | .0528 | .0624 | 1229.6081 | 928.2947 | 1530.9215 |
| 9.68 | .0628 | .0576 | .0681 | 1280.0663 | 978.7018 | 1581.4308 |
| 10.48 | .0680 | .0624 | .0737 | 1324.1921 | 1021.0016 | 1627.3826 |
| 11.29 | .0733 | .0671 | .0794 | 1362.5600 | 1057.3860 | 1667.7342 |
| 12.10 | .0785 | .0719 | .0851 | 1396.1897 | 1090.4425 | 1701.9369 |
| 12.90 | .0837 | .0767 | .0908 | 1425.6958 | 1120.3378 | 1731.0537 |
| 13.71 | .0890 | .0815 | .0964 | 1451.3522 | 1148.1769 | 1754.5275 |
| 14.52 | .0942 | .0863 | .1021 | 1473.8226 | 1174.7032 | 1772.9419 |
| 15.32 | .0994 | .0911 | .1078 | 1493.0480 | 1198.8329 | 1787.2630 |
| 16.13 | .1047 | .0959 | .1134 | 1509.5475 | 1221.1618 | 1797.9333 |
| 16.94 | .1099 | .1007 | .1191 | 1523.7892 | 1242.2250 | 1805.3533 |
| 17.74 | .1152 | .1055 | .1248 | 1536.2387 | 1261.7476 | 1810.7297 |
| 18.55 | .1204 | .1103 | .1305 | 1546.7279 | 1279.1497 | 1814.3062 |
| 19.35 | .1256 | .1151 | .1361 | 1555.8264 | 1294.7260 | 1816.9270 |
| 20.16 | .1309 | .1199 | .1418 | 1563.3684 | 1308.6955 | 1818.0412 |
| 20.97 | .1361 | .1247 | .1475 | 1569.7407 | 1321.6619 | 1817.8195 |
| 21.77 | .1413 | .1295 | .1531 | 1574.9504 | 1333.1924 | 1816.7083 |
| 22.58 | .1466 | .1343 | .1588 | 1579.1103 | 1343.6818 | 1814.5389 |
| 23.39 | .1518 | .1391 | .1645 | 1583.0784 | 1354.3683 | 1811.7885 |
| 24.19 | .1570 | .1439 | .1702 | 1586.3305 | 1362.9621 | 1809.6989 |
| 25.00 | .1623 | .1487 | .1758 | 1589.2084 | 1370.6274 | 1807.7894 |
| 25.81 | .1675 | .1535 | .1815 | 1591.6612 | 1378.0879 | 1805.2344 |
| 26.61 | .1727 | .1583 | .1872 | 1593.6973 | 1384.6878 | 1802.7067 |
| 27.42 | .1780 | .1631 | .1928 | 1595.4076 | 1390.4323 | 1800.3831 |
| 28.23 | .1832 | .1679 | .1985 | 1596.6162 | 1396.1042 | 1797.1282 |
| 29.03 | .1884 | .1727 | .2042 | 1597.6438 | 1400.1522 | 1795.1354 |
| 29.84 | .1937 | .1775 | .2099 | 1598.2410 | 1403.1813 | 1793.3007 |
| 30.65 | .1989 | .1823 | .2155 | 1598.7331 | 1406.2769 | 1791.1893 |
| 31.45 | .2041 | .1871 | .2212 | 1598.9628 | 1407.3943 | 1790.5314 |
| 32.26 | .2094 | .1919 | .2269 | 1599.2030 | 1408.8378 | 1789.5681 |
| 33.06 | .2146 | .1967 | .2326 | 1599.5789 | 1409.8395 | 1789.3182 |
| 33.87 | .2198 | .2014 | .2382 | 1599.6443 | 1409.6880 | 1789.6006 |
| 34.68 | .2251 | .2062 | .2439 | 1599.6377 | 1410.6137 | 1788.6616 |
| 35.48 | .2303 | .2110 | .2496 | 1598.9819 | 1411.0050 | 1786.9589 |
| 36.29 | .2355 | .2158 | .2552 | 1598.2427 | 1411.0935 | 1785.3918 |
| 37.10 | .2408 | .2206 | .2609 | 1597.5285 | 1410.9863 | 1784.0707 |
| 37.90 | .2460 | .2254 | .2666 | 1596.5313 | 1410.7330 | 1782.3297 |
| 38.71 | .2512 | .2302 | .2723 | 1595.7498 | 1410.7119 | 1780.7876 |
| 39.52 | .2565 | .2350 | .2779 | 1594.5645 | 1409.4036 | 1779.7254 |
| 40.32 | .2617 | .2398 | .2836 | 1593.5700 | 1408.1335 | 1779.0065 |
| 41.13 | .2669 | .2446 | .2893 | 1592.2225 | 1405.8061 | 1778.6388 |
| 41.94 | .2722 | .2494 | .2949 | 1590.6072 | 1403.5503 | 1777.6641 |
| 42.74 | .2774 | .2542 | .3006 | 1588.9823 | 1401.5016 | 1776.4629 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20 ° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2826 | .2590 | .3063 | 1587.3942 | 1399.4784 | 1775.3099 |
| 44.35 | .2879 | .2638 | .3120 | 1585.8664 | 1397.5788 | 1774.1539 |
| 45.16 | .2931 | .2686 | .3176 | 1583.9648 | 1395.3440 | 1772.5855 |
| 45.97 | .2983 | .2734 | .3233 | 1582.0700 | 1392.9718 | 1771.1682 |
| 46.77 | .3036 | .2782 | .3290 | 1579.8756 | 1391.0440 | 1768.7073 |
| 47.58 | .3088 | .2830 | .3347 | 1577.7623 | 1389.0708 | 1766.4538 |
| 48.39 | .3141 | .2878 | .3403 | 1575.6299 | 1386.4417 | 1764.8181 |
| 49.19 | .3193 | .2926 | .3460 | 1573.0845 | 1383.7505 | 1762.4186 |
| 50.00 | .3245 | .2974 | .3517 | 1570.6252 | 1381.0483 | 1760.2020 |
| 50.81 | .3298 | .3022 | .3573 | 1567.8602 | 1377.5809 | 1758.1396 |
| 51.61 | .3350 | .3070 | .3630 | 1565.0925 | 1373.6778 | 1756.5072 |
| 52.42 | .3402 | .3118 | .3687 | 1562.4043 | 1370.0605 | 1754.7482 |
| 53.23 | .3455 | .3166 | .3744 | 1559.0815 | 1366.8909 | 1751.2722 |
| 54.03 | .3507 | .3214 | .3800 | 1555.5950 | 1364.1562 | 1747.0338 |
| 54.84 | .3559 | .3262 | .3857 | 1551.7946 | 1360.1396 | 1743.4495 |
| 55.65 | .3612 | .3309 | .3914 | 1547.5185 | 1355.9633 | 1739.0738 |
| 56.45 | .3664 | .3357 | .3970 | 1542.8380 | 1352.1541 | 1733.5219 |
| 57.26 | .3716 | .3405 | .4027 | 1537.6469 | 1346.8485 | 1728.4454 |
| 58.06 | .3769 | .3453 | .4084 | 1532.1330 | 1341.1526 | 1723.1134 |
| 58.87 | .3821 | .3501 | .4141 | 1526.1579 | 1334.8309 | 1717.4848 |
| 59.68 | .3873 | .3549 | .4197 | 1519.9064 | 1328.5951 | 1711.2178 |
| 60.48 | .3926 | .3597 | .4254 | 1513.2283 | 1322.3118 | 1704.1449 |
| 61.29 | .3978 | .3645 | .4311 | 1506.0175 | 1314.7362 | 1697.2988 |
| 62.10 | .4030 | .3693 | .4367 | 1498.8714 | 1307.2513 | 1690.4916 |
| 62.90 | .4083 | .3741 | .4424 | 1492.5089 | 1302.6302 | 1682.3877 |
| 63.71 | .4135 | .3789 | .4481 | 1484.9178 | 1296.1338 | 1673.7019 |
| 64.52 | .4187 | .3837 | .4538 | 1477.7021 | 1289.9235 | 1665.4807 |
| 65.32 | .4240 | .3885 | .4594 | 1470.0101 | 1281.6077 | 1658.4124 |
| 66.13 | .4292 | .3933 | .4651 | 1461.6917 | 1272.9283 | 1650.4551 |
| 66.94 | .4344 | .3981 | .4708 | 1453.4784 | 1265.4599 | 1641.4969 |
| 67.74 | .4397 | .4029 | .4765 | 1444.0797 | 1254.8525 | 1633.3067 |
| 68.55 | .4449 | .4077 | .4821 | 1435.8973 | 1247.9094 | 1623.8853 |
| 69.35 | .4501 | .4125 | .4878 | 1427.5436 | 1240.8239 | 1614.2633 |
| 70.16 | .4554 | .4173 | .4935 | 1418.9342 | 1233.1915 | 1604.6768 |
| 70.97 | .4606 | .4221 | .4991 | 1410.4780 | 1225.9019 | 1595.0540 |
| 71.77 | .4658 | .4269 | .5048 | 1402.2067 | 1219.1147 | 1585.2988 |
| 72.58 | .4711 | .4317 | .5105 | 1393.8542 | 1212.4041 | 1575.3044 |
| 73.39 | .4763 | .4365 | .5162 | 1385.5311 | 1205.1439 | 1565.9183 |
| 74.19 | .4815 | .4413 | .5218 | 1377.1307 | 1198.4720 | 1555.7894 |
| 75.00 | .4868 | .4461 | .5275 | 1368.7865 | 1191.9356 | 1545.6373 |
| 75.81 | .4920 | .4509 | .5332 | 1360.4972 | 1184.6069 | 1536.3875 |
| 76.61 | .4972 | .4557 | .5388 | 1352.0903 | 1176.6387 | 1527.5420 |
| 77.42 | .5025 | .4605 | .5445 | 1343.5397 | 1168.8226 | 1518.2569 |
| 78.23 | .5077 | .4652 | .5502 | 1335.1933 | 1162.5821 | 1507.8044 |
| 79.03 | .5130 | .4700 | .5559 | 1327.0901 | 1156.1368 | 1498.0435 |
| 79.84 | .5182 | .4748 | .5615 | 1318.6514 | 1149.0435 | 1488.2593 |
| 80.65 | .5234 | .4796 | .5672 | 1310.2201 | 1141.9220 | 1478.5182 |
| 81.45 | .5287 | .4844 | .5729 | 1301.9214 | 1134.8524 | 1468.9903 |
| 82.26 | .5339 | .4892 | .5785 | 1293.5787 | 1127.3386 | 1459.8188 |
| 83.06 | .5391 | .4940 | .5842 | 1285.3677 | 1120.1840 | 1450.5515 |
| 83.87 | .5444 | .4988 | .5899 | 1276.9474 | 1112.7952 | 1441.0995 |
| 84.68 | .5496 | .5036 | .5956 | 1268.7697 | 1105.6063 | 1431.9330 |
| 85.48 | .5548 | .5084 | .6012 | 1260.6680 | 1098.5208 | 1422.8152 |
| 86.29 | .5601 | .5132 | .6069 | 1252.2826 | 1090.6285 | 1413.9368 |
| 87.10 | .5653 | .5180 | .6126 | 1243.7638 | 1082.5192 | 1405.0083 |
| 87.90 | .5705 | .5228 | .6183 | 1235.2642 | 1074.3146 | 1396.2139 |
| 88.71 | .5758 | .5276 | .6239 | 1226.4974 | 1065.7187 | 1387.2763 |
| 89.52 | .5810 | .5324 | .6296 | 1217.6802 | 1057.6025 | 1377.7579 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20 ° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5862 | .5372 | .6353 | 1208.5138 | 1048.8310 | 1368.1965 |
| 91.13 | .5915 | .5420 | .6409 | 1198.8129 | 1039.6113 | 1358.0145 |
| 91.94 | .5967 | .5468 | .6466 | 1188.8809 | 1029.9236 | 1347.8380 |
| 92.74 | .6019 | .5516 | .6523 | 1178.7023 | 1019.3715 | 1338.0332 |
| 93.55 | .6072 | .5564 | .6580 | 1168.0823 | 1008.7963 | 1327.3684 |
| 94.35 | .6124 | .5612 | .6636 | 1157.5004 | 997.6449 | 1317.3559 |
| 95.16 | .6176 | .5660 | .6693 | 1146.7292 | 985.8747 | 1307.5838 |
| 95.97 | .6229 | .5708 | .6750 | 1135.7049 | 973.8090 | 1297.6008 |
| 96.77 | .6281 | .5756 | .6806 | 1124.2118 | 960.9675 | 1287.4562 |
| 97.58 | .6333 | .5804 | .6863 | 1111.5654 | 946.6339 | 1276.4969 |
| 98.39 | .6386 | .5852 | .6920 | 1096.7509 | 928.6238 | 1264.8781 |
| 99.19 | .6438 | .5900 | .6977 | 1079.0874 | 906.8218 | 1251.3530 |
| 100.00 | .6490 | .5948 | .7033 | 1056.8563 | 878.7670 | 1234.9457 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .6540 | .5998 | .7082 | 1032.2713 | 852.7668 | 1211.7758 |
| 2.67 | .6589 | .6048 | .7130 | 1003.1181 | 824.2574 | 1181.9788 |
| 4.00 | .6639 | .6099 | .7179 | 970.3492 | 791.7588 | 1148.9397 |
| 5.33 | .6688 | .6148 | .7228 | 935.2910 | 759.9216 | 1110.6603 |
| 6.67 | .6738 | .6198 | .7277 | 898.8756 | 727.9694 | 1069.7819 |
| 8.00 | .6787 | .6247 | .7327 | 862.6937 | 697.5113 | 1027.8760 |
| 9.33 | .6837 | .6296 | .7377 | 826.8861 | 669.1065 | 984.6656 |
| 10.67 | .6886 | .6345 | .7427 | 792.6620 | 642.6421 | 942.6820 |
| 12.00 | .6936 | .6394 | .7478 | 759.8852 | 617.4075 | 902.3629 |
| 13.33 | .6985 | .6442 | .7528 | 728.5773 | 593.4793 | 863.6754 |
| 14.67 | .7034 | .6490 | .7579 | 699.0406 | 571.2465 | 826.8346 |
| 16.00 | .7084 | .6537 | .7630 | 671.1488 | 550.3462 | 791.9514 |
| 17.33 | .7133 | .6585 | .7682 | 644.7417 | 530.4744 | 759.0090 |
| 18.67 | .7183 | .6632 | .7734 | 619.9496 | 511.5419 | 728.3572 |
| 20.00 | .7232 | .6679 | .7786 | 596.3925 | 493.3357 | 699.4493 |
| 21.33 | .7282 | .6726 | .7838 | 574.1122 | 476.6174 | 671.6070 |
| 22.67 | .7331 | .6772 | .7890 | 552.7246 | 461.0527 | 644.3965 |
| 24.00 | .7381 | .6818 | .7943 | 531.9488 | 445.6569 | 618.2408 |
| 25.33 | .7430 | .6864 | .7996 | 512.4038 | 431.0381 | 593.7695 |
| 26.67 | .7480 | .6910 | .8049 | 493.9447 | 417.1057 | 570.7837 |
| 28.00 | .7529 | .6956 | .8103 | 476.4854 | 403.8100 | 549.1608 |
| 29.33 | .7579 | .7001 | .8156 | 460.2538 | 391.5291 | 528.9785 |
| 30.67 | .7628 | .7046 | .8210 | 444.4433 | 379.0685 | 509.8181 |
| 32.00 | .7677 | .7091 | .8264 | 429.7775 | 367.4447 | 492.1102 |
| 33.33 | .7727 | .7135 | .8318 | 415.7541 | 355.9896 | 475.5185 |
| 34.67 | .7776 | .7180 | .8373 | 401.9778 | 345.0758 | 458.8798 |
| 36.00 | .7826 | .7224 | .8428 | 388.8519 | 334.9616 | 442.7421 |
| 37.33 | .7875 | .7268 | .8482 | 376.3846 | 325.0894 | 427.6798 |
| 38.67 | .7925 | .7312 | .8537 | 364.4428 | 315.6475 | 413.2381 |
| 40.00 | .7974 | .7356 | .8593 | 353.1843 | 306.5691 | 399.7995 |
| 41.33 | .8024 | .7399 | .8648 | 342.3302 | 297.9516 | 386.7088 |
| 42.67 | .8073 | .7442 | .8704 | 331.6260 | 289.2051 | 374.0470 |
| 44.00 | .8123 | .7486 | .8760 | 321.3928 | 280.5450 | 362.2405 |
| 45.33 | .8172 | .7529 | .8815 | 311.5581 | 272.5222 | 350.5941 |
| 46.67 | .8221 | .7571 | .8872 | 302.1570 | 265.1946 | 339.1194 |
| 48.00 | .8271 | .7614 | .8928 | 293.2250 | 257.5245 | 328.9254 |
| 49.33 | .8320 | .7657 | .8984 | 284.6579 | 250.0853 | 319.2304 |
| 50.67 | .8370 | .7699 | .9041 | 276.5535 | 243.7694 | 309.3376 |
| 52.00 | .8419 | .7741 | .9097 | 268.5807 | 237.4411 | 299.7203 |
| 53.33 | .8469 | .7783 | .9154 | 260.9368 | 231.3340 | 290.5397 |
| 54.67 | .8518 | .7825 | .9211 | 253.5844 | 225.4292 | 281.7395 |
| 56.00 | .8568 | .7867 | .9268 | 246.4786 | 219.5272 | 273.4299 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .8617 | .7909 | .9325 | 239.5633 | 213.7229 | 265.4037 |
| 58.67 | .8667 | .7951 | .9383 | 232.7971 | 208.1392 | 257.4550 |
| 60.00 | .8716 | .7992 | .9440 | 226.1628 | 202.2861 | 250.0394 |
| 61.33 | .8766 | .8033 | .9498 | 219.7901 | 196.6421 | 242.9382 |
| 62.67 | .8815 | .8075 | .9555 | 213.5769 | 191.6331 | 235.5207 |
| 64.00 | .8864 | .8116 | .9613 | 207.4409 | 186.5906 | 228.2912 |
| 65.33 | .8914 | .8157 | .9671 | 201.7754 | 181.6452 | 221.9057 |
| 66.67 | .8963 | .8198 | .9729 | 196.3818 | 177.5513 | 215.2124 |
| 68.00 | .9013 | .8239 | .9787 | 191.0075 | 173.2533 | 208.7617 |
| 69.33 | .9062 | .8280 | .9845 | 185.8156 | 168.8138 | 202.8174 |
| 70.67 | .9112 | .8320 | .9903 | 180.7992 | 164.7534 | 196.8450 |
| 72.00 | .9161 | .8361 | .9961 | 175.9733 | 160.7999 | 191.1466 |
| 73.33 | .9211 | .8401 | 1.0020 | 171.4188 | 157.1707 | 185.6669 |
| 74.67 | .9260 | .8442 | 1.0078 | 166.9881 | 153.1190 | 180.8572 |
| 76.00 | .9310 | .8482 | 1.0137 | 162.4860 | 149.0995 | 175.8724 |
| 77.33 | .9359 | .8523 | 1.0195 | 158.0791 | 145.1313 | 171.0268 |
| 78.67 | .9408 | .8563 | 1.0254 | 153.8985 | 141.4037 | 166.3932 |
| 80.00 | .9458 | .8603 | 1.0313 | 149.5532 | 137.5573 | 161.5491 |
| 81.33 | .9507 | .8643 | 1.0372 | 145.5742 | 134.6793 | 156.4691 |
| 82.67 | .9557 | .8683 | 1.0431 | 141.7739 | 131.7489 | 151.7990 |
| 84.00 | .9606 | .8723 | 1.0490 | 137.9330 | 128.8742 | 146.9919 |
| 85.33 | .9656 | .8763 | 1.0549 | 134.1222 | 126.9237 | 141.3206 |
| 86.67 | .9705 | .8803 | 1.0608 | 130.3526 | 123.4812 | 137.2241 |
| 88.00 | .9755 | .8843 | 1.0667 | 126.8564 | 120.2822 | 133.4306 |
| 89.33 | .9804 | .8882 | 1.0726 | 123.4752 | 117.0991 | 129.8512 |
| 90.67 | .9854 | .8922 | 1.0785 | 120.3135 | 113.7727 | 126.8543 |
| 92.00 | .9903 | .8962 | 1.0844 | 117.3708 | 110.4913 | 124.2502 |
| 93.33 | .9953 | .9001 | 1.0904 | 114.6546 | 108.0097 | 121.2995 |
| 94.67 | 1.0002 | .9041 | 1.0963 | 111.5618 | 105.4503 | 117.6734 |
| 96.00 | 1.0051 | .9080 | 1.1023 | 108.5566 | 102.9840 | 114.1292 |
| 97.33 | 1.0101 | .9120 | 1.1082 | 105.4761 | 100.4156 | 110.5366 |
| 98.67 | 1.0150 | .9159 | 1.1142 | 102.6403 | 97.6519 | 107.6288 |
| 100.00 | 1.0200 | .9198 | 1.1201 | 99.9929 | 95.1848 | 104.8010 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO SIDED TOLERANCE LIMITS MEAN | MIN. | MAX. | TRANSFORMED THRUST AT PA = 14.70 MEANS WITH TWO SIDED TOLERANCE LIMITS MEAN | MIN. | MAX. |
|---|---|---|---|---|---|---|
| .00 | .0000 | -.0000 | .0000 | -.4183 | -.4183 | -.4183 |
| .81 | .0052 | .0048 | .0057 | 117.4167 | -124.1618 | 358.9953 |
| 1.61 | .0105 | .0096 | .0113 | 297.7856 | -28.7303 | 624.3015 |
| 2.42 | .0157 | .0144 | .0170 | 518.1978 | 132.6962 | 903.6994 |
| 3.23 | .0209 | .0192 | .0227 | 767.1356 | 337.4325 | 1196.8387 |
| 4.03 | .0262 | .0240 | .0284 | 1019.9699 | 588.7108 | 1451.2289 |
| 4.84 | .0314 | .0288 | .0340 | 1257.8371 | 797.2113 | 1718.4631 |
| 5.65 | .0366 | .0336 | .0397 | 1461.2556 | 968.4250 | 1954.0861 |
| 6.45 | .0419 | .0384 | .0454 | 1637.8061 | 1133.8637 | 2141.7484 |
| 7.26 | .0471 | .0432 | .0510 | 1786.4178 | 1279.9393 | 2292.8963 |
| 8.06 | .0523 | .0480 | .0567 | 1915.6399 | 1408.3613 | 2422.9185 |
| 8.87 | .0576 | .0528 | .0624 | 2021.8742 | 1516.6567 | 2527.0917 |
| 9.68 | .0628 | .0576 | .0681 | 2109.6754 | 1598.8217 | 2620.5292 |
| 10.48 | .0680 | .0624 | .0737 | 2186.8088 | 1667.6943 | 2705.9233 |
| 11.29 | .0733 | .0671 | .0794 | 2254.9528 | 1738.0212 | 2771.8844 |
| 12.10 | .0785 | .0719 | .0851 | 2314.5200 | 1793.8764 | 2835.1637 |
| 12.90 | .0837 | .0767 | .0908 | 2366.4276 | 1835.5469 | 2897.3083 |
| 13.71 | .0890 | .0815 | .0964 | 2411.4972 | 1881.3727 | 2941.6217 |
| 14.52 | .0942 | .0863 | .1021 | 2452.2599 | 1929.9849 | 2974.5349 |
| 15.32 | .0994 | .0911 | .1078 | 2488.8317 | 1971.2242 | 3006.4391 |
| 16.13 | .1047 | .0959 | .1134 | 2519.0923 | 2009.2735 | 3028.9111 |
| 16.94 | .1099 | .1007 | .1191 | 2542.5706 | 2044.3357 | 3040.8055 |
| 17.74 | .1152 | .1055 | .1248 | 2564.8442 | 2077.3297 | 3052.3587 |
| 18.55 | .1204 | .1103 | .1305 | 2584.4521 | 2110.2071 | 3058.6972 |
| 19.35 | .1256 | .1151 | .1361 | 2600.0115 | 2139.6589 | 3060.3642 |
| 20.16 | .1309 | .1199 | .1418 | 2613.8236 | 2160.9723 | 3066.6748 |
| 20.97 | .1361 | .1247 | .1475 | 2624.9407 | 2180.4297 | 3069.4517 |
| 21.77 | .1413 | .1295 | .1531 | 2633.6294 | 2205.9706 | 3061.2882 |
| 22.58 | .1466 | .1343 | .1588 | 2641.5291 | 2226.2497 | 3056.8086 |
| 23.39 | .1518 | .1391 | .1645 | 2648.7728 | 2242.1811 | 3055.3646 |
| 24.19 | .1570 | .1439 | .1702 | 2654.8687 | 2256.0395 | 3053.6977 |
| 25.00 | .1623 | .1487 | .1758 | 2659.4611 | 2270.9736 | 3047.9486 |
| 25.81 | .1675 | .1535 | .1815 | 2663.6210 | 2284.8898 | 3042.3523 |
| 26.61 | .1727 | .1583 | .1872 | 2667.7089 | 2293.4918 | 3041.9260 |
| 27.42 | .1780 | .1631 | .1928 | 2670.1017 | 2303.0982 | 3037.1054 |
| 28.23 | .1832 | .1679 | .1985 | 2671.7900 | 2311.1533 | 3032.4266 |
| 29.03 | .1884 | .1727 | .2042 | 2672.7846 | 2316.2510 | 3029.3184 |
| 29.84 | .1937 | .1775 | .2099 | 2674.0865 | 2321.4308 | 3026.7422 |
| 30.65 | .1989 | .1823 | .2155 | 2674.9501 | 2328.2054 | 3021.6949 |
| 31.45 | .2041 | .1871 | .2212 | 2675.2512 | 2331.7832 | 3018.7193 |
| 32.26 | .2094 | .1919 | .2269 | 2676.1062 | 2332.1603 | 3020.0521 |
| 33.06 | .2146 | .1967 | .2326 | 2676.3609 | 2335.4096 | 3017.3123 |
| 33.87 | .2198 | .2014 | .2382 | 2676.2982 | 2340.8068 | 3011.7895 |
| 34.68 | .2251 | .2062 | .2439 | 2676.0098 | 2345.0219 | 3006.9979 |
| 35.48 | .2303 | .2110 | .2496 | 2674.7049 | 2346.2101 | 3003.1995 |
| 36.29 | .2355 | .2158 | .2552 | 2673.3632 | 2346.1974 | 3000.5290 |
| 37.10 | .2408 | .2206 | .2609 | 2672.1016 | 2345.7397 | 2998.4634 |
| 37.90 | .2460 | .2254 | .2666 | 2670.6039 | 2344.8925 | 2996.3152 |
| 38.71 | .2512 | .2302 | .2723 | 2668.8331 | 2341.4733 | 2996.1929 |
| 39.52 | .2565 | .2350 | .2779 | 2666.7808 | 2339.7824 | 2993.7792 |
| 40.32 | .2617 | .2398 | .2836 | 2665.4220 | 2338.5630 | 2992.2811 |
| 41.13 | .2669 | .2446 | .2893 | 2663.5599 | 2338.7751 | 2988.3448 |
| 41.94 | .2722 | .2494 | .2949 | 2660.8125 | 2337.5569 | 2984.0682 |
| 42.74 | .2774 | .2542 | .3006 | 2657.8439 | 2335.5717 | 2980.1161 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2826 | .2590 | .3063 | 2654.9631 | 2333.4498 | 2976.4763 |
| 44.35 | .2879 | .2638 | .3120 | 2651.9313 | 2330.9221 | 2972.9404 |
| 45.16 | .2931 | .2686 | .3176 | 2648.5963 | 2327.4080 | 2969.7845 |
| 45.97 | .2983 | .2734 | .3233 | 2645.2971 | 2322.5699 | 2968.0244 |
| 46.77 | .3036 | .2782 | .3290 | 2641.4066 | 2319.5373 | 2963.2759 |
| 47.58 | .3088 | .2830 | .3347 | 2637.6428 | 2315.8464 | 2959.4393 |
| 48.39 | .3141 | .2878 | .3403 | 2634.2242 | 2312.0078 | 2956.4407 |
| 49.19 | .3193 | .2926 | .3460 | 2630.5541 | 2309.4060 | 2951.7023 |
| 50.00 | .3245 | .2974 | .3517 | 2626.5164 | 2304.6184 | 2948.4143 |
| 50.81 | .3298 | .3022 | .3573 | 2621.0743 | 2300.4222 | 2941.7264 |
| 51.61 | .3350 | .3070 | .3630 | 2615.7724 | 2296.9867 | 2934.5582 |
| 52.42 | .3402 | .3118 | .3687 | 2611.3222 | 2293.7249 | 2928.9195 |
| 53.23 | .3455 | .3166 | .3744 | 2605.6913 | 2288.0404 | 2923.3422 |
| 54.03 | .3507 | .3214 | .3800 | 2599.3901 | 2281.1444 | 2917.6357 |
| 54.84 | .3559 | .3262 | .3857 | 2593.2302 | 2275.4186 | 2911.0419 |
| 55.65 | .3612 | .3309 | .3914 | 2586.9238 | 2269.1818 | 2904.6660 |
| 56.45 | .3664 | .3357 | .3970 | 2579.4387 | 2261.1699 | 2897.7074 |
| 57.26 | .3716 | .3405 | .4027 | 2570.6574 | 2248.9482 | 2892.3667 |
| 58.06 | .3769 | .3453 | .4084 | 2561.1927 | 2237.1452 | 2885.2401 |
| 58.87 | .3821 | .3501 | .4141 | 2551.3231 | 2228.7142 | 2873.9320 |
| 59.68 | .3873 | .3549 | .4197 | 2540.8580 | 2217.1146 | 2864.6015 |
| 60.48 | .3926 | .3597 | .4254 | 2529.3691 | 2203.6380 | 2855.1002 |
| 61.29 | .3978 | .3645 | .4311 | 2518.1343 | 2194.8972 | 2841.3715 |
| 62.10 | .4030 | .3693 | .4367 | 2506.6707 | 2186.1994 | 2827.1420 |
| 62.90 | .4083 | .3741 | .4424 | 2495.6019 | 2177.4373 | 2813.7666 |
| 63.71 | .4135 | .3789 | .4481 | 2483.0034 | 2163.6250 | 2802.3817 |
| 64.52 | .4187 | .3837 | .4538 | 2470.3058 | 2150.0614 | 2790.5501 |
| 65.32 | .4240 | .3885 | .4594 | 2456.7580 | 2137.0744 | 2776.4416 |
| 66.13 | .4292 | .3933 | .4651 | 2443.2499 | 2125.9453 | 2760.5545 |
| 66.94 | .4344 | .3981 | .4708 | 2430.3632 | 2116.7718 | 2743.9546 |
| 67.74 | .4397 | .4029 | .4765 | 2416.5290 | 2113.9917 | 2719.0663 |
| 68.55 | .4449 | .4077 | .4821 | 2403.2214 | 2108.2654 | 2698.1775 |
| 69.35 | .4501 | .4125 | .4878 | 2389.3010 | 2094.9648 | 2683.6372 |
| 70.16 | .4554 | .4173 | .4935 | 2375.7353 | 2086.2962 | 2665.1744 |
| 70.97 | .4606 | .4221 | .4991 | 2360.4744 | 2067.2233 | 2653.7254 |
| 71.77 | .4658 | .4269 | .5048 | 2345.2378 | 2049.1282 | 2641.3474 |
| 72.58 | .4711 | .4317 | .5105 | 2329.6209 | 2029.9822 | 2629.2597 |
| 73.39 | .4763 | .4365 | .5162 | 2314.5501 | 2011.1548 | 2617.9454 |
| 74.19 | .4815 | .4413 | .5218 | 2299.8101 | 2001.1649 | 2598.4554 |
| 75.00 | .4868 | .4461 | .5275 | 2285.8560 | 1991.2229 | 2580.4890 |
| 75.81 | .4920 | .4509 | .5332 | 2271.8629 | 1976.0129 | 2567.7130 |
| 76.61 | .4972 | .4557 | .5388 | 2257.5029 | 1959.9009 | 2555.1049 |
| 77.42 | .5025 | .4605 | .5445 | 2243.3090 | 1945.3023 | 2541.3159 |
| 78.23 | .5077 | .4652 | .5502 | 2230.1079 | 1936.1971 | 2524.0187 |
| 79.03 | .5130 | .4700 | .5559 | 2216.6738 | 1925.5690 | 2507.7786 |
| 79.84 | .5182 | .4748 | .5615 | 2202.5194 | 1914.3036 | 2490.7352 |
| 80.65 | .5234 | .4796 | .5672 | 2188.8383 | 1905.0736 | 2472.6029 |
| 81.45 | .5287 | .4844 | .5729 | 2175.0270 | 1893.6393 | 2456.4146 |
| 82.26 | .5339 | .4892 | .5785 | 2160.5632 | 1881.5679 | 2439.5586 |
| 83.06 | .5391 | .4940 | .5842 | 2145.8988 | 1871.3851 | 2420.4125 |
| 83.87 | .5444 | .4988 | .5899 | 2131.7976 | 1859.8720 | 2403.7232 |
| 84.68 | .5496 | .5036 | .5956 | 2118.1078 | 1847.5017 | 2388.7139 |
| 85.48 | .5548 | .5084 | .6012 | 2104.2210 | 1835.6147 | 2372.8272 |
| 86.29 | .5601 | .5132 | .6069 | 2089.8832 | 1825.0406 | 2354.7258 |
| 87.10 | .5653 | .5180 | .6126 | 2075.5847 | 1813.3467 | 2337.8227 |
| 87.90 | .5705 | .5228 | .6183 | 2061.0807 | 1798.6849 | 2323.4766 |
| 88.71 | .5758 | .5276 | .6239 | 2045.6638 | 1783.5961 | 2307.7316 |
| 89.52 | .5810 | .5324 | .6296 | 2030.5426 | 1770.5262 | 2290.5590 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5862 | .5372 | .6353 | 2014.5962 | 1756.4016 | 2272.7909 |
| 91.13 | .5915 | .5420 | .6409 | 1998.2513 | 1739.6988 | 2256.8039 |
| 91.94 | .5967 | .5468 | .6466 | 1982.1700 | 1722.1465 | 2242.1934 |
| 92.74 | .6019 | .5516 | .6523 | 1965.3594 | 1705.3395 | 2225.3793 |
| 93.55 | .6072 | .5564 | .6580 | 1947.8362 | 1688.1261 | 2207.5462 |
| 94.35 | .6124 | .5612 | .6636 | 1929.7291 | 1669.6137 | 2189.8445 |
| 95.16 | .6176 | .5660 | .6693 | 1911.2112 | 1650.4202 | 2172.0023 |
| 95.97 | .6229 | .5708 | .6750 | 1892.6275 | 1630.4921 | 2154.7628 |
| 96.77 | .6281 | .5756 | .6806 | 1873.3548 | 1611.7165 | 2134.9929 |
| 97.58 | .6333 | .5804 | .6863 | 1852.9215 | 1590.6879 | 2115.1551 |
| 98.39 | .6386 | .5852 | .6920 | 1829.0353 | 1559.6415 | 2098.4291 |
| 99.19 | .6438 | .5900 | .6977 | 1801.3611 | 1523.5738 | 2079.1484 |
| 100.00 | .6490 | .5948 | .7033 | 1766.1675 | 1481.3647 | 2050.9703 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .6540 | .5998 | .7082 | 1726.5541 | 1436.6361 | 2016.4720 |
| 2.67 | .6589 | .6048 | .7130 | 1679.3400 | 1388.3600 | 1970.3200 |
| 4.00 | .6639 | .6099 | .7179 | 1626.0569 | 1332.4969 | 1919.6168 |
| 5.33 | .6688 | .6148 | .7228 | 1566.8859 | 1278.3431 | 1855.4288 |
| 6.67 | .6738 | .6198 | .7277 | 1504.8715 | 1227.8280 | 1781.9150 |
| 8.00 | .6787 | .6247 | .7327 | 1442.9217 | 1174.3437 | 1711.4996 |
| 9.33 | .6837 | .6296 | .7377 | 1380.8358 | 1120.9558 | 1640.7160 |
| 10.67 | .6886 | .6345 | .7427 | 1322.4112 | 1071.1785 | 1573.6439 |
| 12.00 | .6936 | .6394 | .7478 | 1267.0980 | 1028.2839 | 1505.9122 |
| 13.33 | .6985 | .6442 | .7528 | 1214.1191 | 988.1323 | 1440.1060 |
| 14.67 | .7034 | .6490 | .7579 | 1165.2797 | 943.7920 | 1386.7676 |
| 16.00 | .7084 | .6537 | .7630 | 1117.5957 | 903.6604 | 1331.5310 |
| 17.33 | .7133 | .6585 | .7682 | 1072.3679 | 866.8841 | 1277.8516 |
| 18.67 | .7183 | .6632 | .7734 | 1029.7519 | 832.9131 | 1226.5907 |
| 20.00 | .7232 | .6679 | .7786 | 989.5133 | 801.1880 | 1177.8387 |
| 21.33 | .7282 | .6726 | .7838 | 951.4220 | 768.6861 | 1134.1578 |
| 22.67 | .7331 | .6772 | .7890 | 914.7409 | 738.9879 | 1090.4937 |
| 24.00 | .7381 | .6818 | .7943 | 879.3076 | 712.7733 | 1045.8418 |
| 25.33 | .7430 | .6864 | .7996 | 846.0730 | 687.0471 | 1005.0989 |
| 26.67 | .7480 | .6910 | .8049 | 814.9632 | 660.6873 | 969.2392 |
| 28.00 | .7529 | .6956 | .8103 | 785.5657 | 635.4316 | 935.6999 |
| 29.33 | .7579 | .7001 | .8156 | 757.7663 | 612.7276 | 902.8050 |
| 30.67 | .7628 | .7046 | .8210 | 730.1077 | 589.3174 | 870.8979 |
| 32.00 | .7677 | .7091 | .8264 | 704.6833 | 567.2167 | 842.1498 |
| 33.33 | .7727 | .7135 | .8318 | 680.6411 | 546.1143 | 815.1680 |
| 34.67 | .7776 | .7180 | .8373 | 657.2415 | 526.1543 | 788.3287 |
| 36.00 | .7826 | .7224 | .8428 | 635.1462 | 508.8769 | 761.4155 |
| 37.33 | .7875 | .7268 | .8482 | 613.6446 | 489.9081 | 737.3811 |
| 38.67 | .7925 | .7312 | .8537 | 593.3366 | 470.1892 | 716.4840 |
| 40.00 | .7974 | .7356 | .8593 | 574.2928 | 453.2859 | 695.2997 |
| 41.33 | .8024 | .7399 | .8648 | 555.6133 | 437.7611 | 673.4655 |
| 42.67 | .8073 | .7442 | .8704 | 537.5683 | 422.0624 | 653.0742 |
| 44.00 | .8123 | .7486 | .8760 | 520.4550 | 406.9999 | 633.9101 |
| 45.33 | .8172 | .7529 | .8815 | 503.8071 | 392.2321 | 615.3821 |
| 46.67 | .8221 | .7571 | .8872 | 488.0967 | 379.1778 | 597.0156 |
| 48.00 | .8271 | .7614 | .8928 | 472.8517 | 366.9686 | 578.7349 |
| 49.33 | .8320 | .7657 | .8984 | 457.9898 | 354.4863 | 561.4933 |
| 50.67 | .8370 | .7699 | .9041 | 444.2640 | 341.1989 | 547.3290 |
| 52.00 | .8419 | .7741 | .9097 | 430.9844 | 330.0762 | 531.8926 |
| 53.33 | .8469 | .7783 | .9154 | 416.9440 | 318.3501 | 515.5380 |
| 54.67 | .8518 | .7825 | .9211 | 403.7241 | 304.7269 | 502.7214 |
| 56.00 | .8568 | .7867 | .9268 | 391.4178 | 293.9473 | 488.8882 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .8617 | .7909 | .9325 | 379.0305 | 282.1491 | 475.9118 |
| 58.67 | .8667 | .7951 | .9383 | 367.9944 | 272.8567 | 463.1321 |
| 60.00 | .8716 | .7992 | .9440 | 357.4842 | 266.1890 | 448.7794 |
| 61.33 | .8766 | .8033 | .9498 | 346.7217 | 257.6376 | 435.8057 |
| 62.67 | .8815 | .8075 | .9555 | 337.2520 | 250.5188 | 423.9852 |
| 64.00 | .8864 | .8116 | .9613 | 327.4797 | 239.2297 | 415.7298 |
| 65.33 | .8914 | .8157 | .9671 | 317.7240 | 226.3884 | 409.0597 |
| 66.67 | .8963 | .8198 | .9729 | 307.9804 | 215.3817 | 400.5791 |
| 68.00 | .9013 | .8239 | .9787 | 297.6124 | 204.8424 | 390.3823 |
| 69.33 | .9062 | .8280 | .9845 | 288.9416 | 197.4690 | 380.4143 |
| 70.67 | .9112 | .8320 | .9903 | 280.4251 | 190.7502 | 370.0999 |
| 72.00 | .9161 | .8361 | .9961 | 271.7376 | 183.4569 | 360.0183 |
| 73.33 | .9211 | .8401 | 1.0020 | 263.7214 | 176.0189 | 351.4238 |
| 74.67 | .9260 | .8442 | 1.0078 | 256.2778 | 169.8337 | 342.7218 |
| 76.00 | .9310 | .8482 | 1.0137 | 248.7336 | 162.3830 | 335.0843 |
| 77.33 | .9359 | .8523 | 1.0195 | 241.7867 | 155.5935 | 327.9799 |
| 78.67 | .9408 | .8563 | 1.0254 | 234.6826 | 149.6584 | 319.7068 |
| 80.00 | .9458 | .8603 | 1.0313 | 227.3640 | 143.9120 | 310.8160 |
| 81.33 | .9507 | .8643 | 1.0372 | 221.0747 | 140.2719 | 301.8774 |
| 82.67 | .9557 | .8683 | 1.0431 | 214.6689 | 133.6928 | 295.6450 |
| 84.00 | .9606 | .8723 | 1.0490 | 207.9675 | 127.0177 | 288.9174 |
| 85.33 | .9656 | .8763 | 1.0549 | 201.4206 | 123.1064 | 279.7348 |
| 86.67 | .9705 | .8803 | 1.0608 | 194.9883 | 118.1879 | 271.7887 |
| 88.00 | .9755 | .8843 | 1.0667 | 189.1844 | 114.1201 | 264.2486 |
| 89.33 | .9804 | .8882 | 1.0726 | 183.9233 | 109.1880 | 258.6587 |
| 90.67 | .9854 | .8922 | 1.0785 | 178.9857 | 105.0042 | 252.9671 |
| 92.00 | .9903 | .8962 | 1.0844 | 173.9075 | 99.6091 | 248.2059 |
| 93.33 | .9953 | .9001 | 1.0904 | 168.7252 | 92.8077 | 244.6428 |
| 94.67 | 1.0002 | .9041 | 1.0963 | 163.6662 | 86.3627 | 240.9697 |
| 96.00 | 1.0051 | .9080 | 1.1023 | 159.1370 | 82.3347 | 235.9394 |
| 97.33 | 1.0101 | .9120 | 1.1082 | 154.3074 | 79.7986 | 228.8163 |
| 98.67 | 1.0150 | .9159 | 1.1142 | 149.1629 | 77.5785 | 220.7473 |
| 100.00 | 1.0200 | .9198 | 1.1201 | 144.3696 | 74.7319 | 214.0073 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO SIDED TOLERANCE LIMITS MEAN | MIN. | MAX. | TRANSFORMED THRUST AT PA = .00 MEAN | MIN. | MAX. |
|---|---|---|---|---|---|---|
| .00 | .0000 | -.0000 | .0000 | 29.9096 | -85.4209 | 145.2400 |
| .81 | .0052 | .0048 | .0057 | 147.7445 | -93.8494 | 389.3385 |
| 1.61 | .0105 | .0096 | .0113 | 328.1134 | 1.5266 | 654.7002 |
| 2.42 | .0157 | .0144 | .0170 | 548.5256 | 162.8961 | 934.1552 |
| 3.23 | .0209 | .0192 | .0227 | 797.4634 | 367.6001 | 1227.3267 |
| 4.03 | .0262 | .0240 | .0284 | 1050.2976 | 618.8467 | 1481.7487 |
| 4.84 | .0314 | .0288 | .0340 | 1288.1649 | 827.3306 | 1748.9994 |
| 5.65 | .0366 | .0336 | .0397 | 1491.5834 | 998.5368 | 1984.6301 |
| 6.45 | .0419 | .0384 | .0454 | 1668.1339 | 1164.0044 | 2172.2634 |
| 7.26 | .0471 | .0432 | .0510 | 1816.7456 | 1310.1050 | 2323.3862 |
| 8.06 | .0523 | .0480 | .0567 | 1945.9677 | 1438.5369 | 2453.3986 |
| 8.87 | .0576 | .0528 | .0624 | 2052.2020 | 1546.8461 | 2557.5579 |
| 9.68 | .0628 | .0576 | .0681 | 2140.0032 | 1629.0306 | 2650.9758 |
| 10.48 | .0680 | .0624 | .0737 | 2217.1366 | 1697.9150 | 2736.3583 |
| 11.29 | .0733 | .0671 | .0794 | 2285.2806 | 1768.2565 | 2802.3047 |
| 12.10 | .0785 | .0719 | .0851 | 2344.8478 | 1824.1264 | 2865.5693 |
| 12.90 | .0837 | .0767 | .0908 | 2396.7554 | 1865.8062 | 2927.7045 |
| 13.71 | .0890 | .0815 | .0964 | 2441.8250 | 1911.6424 | 2972.0076 |
| 14.52 | .0942 | .0863 | .1021 | 2482.5878 | 1960.2776 | 3004.8980 |
| 15.32 | .0994 | .0911 | .1078 | 2519.1595 | 2001.5289 | 3036.7900 |
| 16.13 | .1047 | .0959 | .1134 | 2549.4201 | 2039.5968 | 3059.2435 |
| 16.94 | .1099 | .1007 | .1191 | 2572.8984 | 2074.6709 | 3071.1259 |
| 17.74 | .1152 | .1055 | .1248 | 2595.1720 | 2107.6707 | 3082.6733 |
| 18.55 | .1204 | .1103 | .1305 | 2614.7800 | 2140.5631 | 3088.9969 |
| 19.35 | .1256 | .1151 | .1361 | 2630.3393 | 2170.0196 | 3090.6590 |
| 20.16 | .1309 | .1199 | .1418 | 2644.1513 | 2191.3407 | 3096.9620 |
| 20.97 | .1361 | .1247 | .1475 | 2655.2685 | 2210.8041 | 3099.7330 |
| 21.77 | .1413 | .1295 | .1531 | 2663.9573 | 2236.3608 | 3091.5537 |
| 22.58 | .1466 | .1343 | .1588 | 2671.8569 | 2256.6539 | 3087.0599 |
| 23.39 | .1518 | .1391 | .1645 | 2679.1006 | 2272.5903 | 3085.6109 |
| 24.19 | .1570 | .1439 | .1702 | 2685.1965 | 2286.4504 | 3083.9425 |
| 25.00 | .1623 | .1487 | .1758 | 2689.7889 | 2301.4046 | 3078.1734 |
| 25.81 | .1675 | .1535 | .1815 | 2693.9488 | 2315.3269 | 3072.5707 |
| 26.61 | .1727 | .1583 | .1872 | 2698.0367 | 2323.9364 | 3072.1370 |
| 27.42 | .1780 | .1631 | .1928 | 2700.4296 | 2333.5414 | 3067.3178 |
| 28.23 | .1832 | .1679 | .1985 | 2702.1177 | 2341.5997 | 3062.6357 |
| 29.03 | .1884 | .1727 | .2042 | 2703.1124 | 2346.7104 | 3059.5145 |
| 29.84 | .1937 | .1775 | .2099 | 2704.4143 | 2351.8956 | 3056.9330 |
| 30.65 | .1989 | .1823 | .2155 | 2705.2780 | 2358.6805 | 3051.8755 |
| 31.45 | .2041 | .1871 | .2212 | 2705.5790 | 2362.2637 | 3048.8943 |
| 32.26 | .2094 | .1919 | .2269 | 2706.4341 | 2362.6460 | 3050.2221 |
| 33.06 | .2146 | .1967 | .2326 | 2706.6887 | 2365.8872 | 3047.4903 |
| 33.87 | .2198 | .2014 | .2382 | 2706.6260 | 2371.2855 | 3041.9665 |
| 34.68 | .2251 | .2062 | .2439 | 2706.3377 | 2375.5068 | 3037.1686 |
| 35.48 | .2303 | .2110 | .2496 | 2705.0327 | 2376.7004 | 3033.3649 |
| 36.29 | .2355 | .2158 | .2552 | 2703.6910 | 2376.6799 | 3030.7020 |
| 37.10 | .2408 | .2206 | .2609 | 2702.4294 | 2376.2354 | 3028.6235 |
| 37.90 | .2460 | .2254 | .2666 | 2700.9317 | 2375.3856 | 3026.4777 |
| 38.71 | .2512 | .2302 | .2723 | 2699.1609 | 2371.9713 | 3026.3507 |
| 39.52 | .2565 | .2350 | .2779 | 2697.1086 | 2370.2820 | 3023.9353 |
| 40.32 | .2617 | .2398 | .2836 | 2695.7498 | 2369.0569 | 3022.4428 |
| 41.13 | .2669 | .2446 | .2893 | 2693.8877 | 2369.2715 | 3018.5040 |
| 41.94 | .2722 | .2494 | .2949 | 2691.1403 | 2368.0469 | 3014.2337 |
| 42.74 | .2774 | .2542 | .3006 | 2688.1717 | 2366.0580 | 3010.2854 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2826 | .2590 | .3063 | 2685.2909 | 2363.9379 | 3006.6438 |
| 44.35 | .2879 | .2638 | .3120 | 2682.2592 | 2361.4120 | 3003.1063 |
| 45.16 | .2931 | .2686 | .3176 | 2678.9241 | 2357.8863 | 2999.9620 |
| 45.97 | .2983 | .2734 | .3233 | 2675.6249 | 2353.0518 | 2998.1982 |
| 46.77 | .3036 | .2782 | .3290 | 2671.7344 | 2350.0194 | 2993.4493 |
| 47.58 | .3088 | .2830 | .3347 | 2667.9707 | 2346.3301 | 2989.6113 |
| 48.39 | .3141 | .2878 | .3403 | 2664.5521 | 2342.4856 | 2986.6187 |
| 49.19 | .3193 | .2926 | .3460 | 2660.8820 | 2339.8842 | 2981.8796 |
| 50.00 | .3245 | .2974 | .3517 | 2656.8442 | 2335.0863 | 2978.6021 |
| 50.81 | .3298 | .3022 | .3573 | 2651.4021 | 2330.8921 | 2971.9122 |
| 51.61 | .3350 | .3070 | .3630 | 2646.1002 | 2327.4631 | 2964.7373 |
| 52.42 | .3402 | .3118 | .3687 | 2641.6500 | 2324.1903 | 2959.1096 |
| 53.23 | .3455 | .3166 | .3744 | 2636.0191 | 2318.5029 | 2953.5352 |
| 54.03 | .3507 | .3214 | .3800 | 2629.7178 | 2311.6038 | 2947.8318 |
| 54.84 | .3559 | .3262 | .3857 | 2623.5580 | 2305.8739 | 2941.2422 |
| 55.65 | .3612 | .3309 | .3914 | 2617.2517 | 2299.6414 | 2934.8621 |
| 56.45 | .3664 | .3357 | .3970 | 2609.7666 | 2291.6222 | 2927.9110 |
| 57.26 | .3716 | .3405 | .4027 | 2600.9852 | 2279.3819 | 2922.5887 |
| 58.06 | .3769 | .3453 | .4084 | 2591.5205 | 2267.5838 | 2915.4572 |
| 58.87 | .3821 | .3501 | .4141 | 2581.6509 | 2259.1533 | 2904.1485 |
| 59.68 | .3873 | .3549 | .4197 | 2571.1859 | 2247.5476 | 2894.8242 |
| 60.48 | .3926 | .3597 | .4254 | 2559.6968 | 2234.0589 | 2885.3347 |
| 61.29 | .3978 | .3645 | .4311 | 2548.4622 | 2225.3317 | 2871.5925 |
| 62.10 | .4030 | .3693 | .4367 | 2536.9985 | 2216.6335 | 2857.3635 |
| 62.90 | .4083 | .3741 | .4424 | 2525.9297 | 2207.8764 | 2843.9830 |
| 63.71 | .4135 | .3789 | .4481 | 2513.3312 | 2194.0609 | 2832.6015 |
| 64.52 | .4187 | .3837 | .4538 | 2500.6336 | 2180.4970 | 2820.7702 |
| 65.32 | .4240 | .3885 | .4594 | 2487.0858 | 2167.5058 | 2806.6657 |
| 66.13 | .4292 | .3933 | .4651 | 2473.5777 | 2156.3834 | 2790.7721 |
| 66.94 | .4344 | .3981 | .4708 | 2460.6910 | 2147.2155 | 2774.1665 |
| 67.74 | .4397 | .4029 | .4765 | 2446.8569 | 2144.4503 | 2749.2634 |
| 68.55 | .4449 | .4077 | .4821 | 2433.5493 | 2138.7211 | 2728.3774 |
| 69.35 | .4501 | .4125 | .4878 | 2419.6289 | 2125.4209 | 2713.8369 |
| 70.16 | .4554 | .4173 | .4935 | 2406.0632 | 2116.7480 | 2695.3782 |
| 70.97 | .4606 | .4221 | .4991 | 2390.8022 | 2097.6720 | 2683.9324 |
| 71.77 | .4658 | .4269 | .5048 | 2375.5656 | 2079.5710 | 2671.5602 |
| 72.58 | .4711 | .4317 | .5105 | 2359.9488 | 2060.4251 | 2659.4723 |
| 73.39 | .4763 | .4365 | .5162 | 2344.8779 | 2041.5918 | 2648.1640 |
| 74.19 | .4815 | .4413 | .5218 | 2330.1380 | 2031.6207 | 2628.6554 |
| 75.00 | .4868 | .4461 | .5275 | 2316.1838 | 2021.6726 | 2610.6951 |
| 75.81 | .4920 | .4509 | .5332 | 2302.1907 | 2006.4589 | 2597.9225 |
| 76.61 | .4972 | .4557 | .5388 | 2287.8307 | 1990.3415 | 2585.3199 |
| 77.42 | .5025 | .4605 | .5445 | 2273.6368 | 1975.7490 | 2571.5248 |
| 78.23 | .5077 | .4652 | .5502 | 2260.4357 | 1966.6377 | 2554.2337 |
| 79.03 | .5130 | .4700 | .5559 | 2247.0015 | 1956.0152 | 2537.9878 |
| 79.84 | .5182 | .4748 | .5615 | 2232.8472 | 1944.7576 | 2520.9369 |
| 80.65 | .5234 | .4796 | .5672 | 2219.1661 | 1935.5247 | 2502.8075 |
| 81.45 | .5287 | .4844 | .5729 | 2205.3548 | 1924.0915 | 2486.6182 |
| 82.26 | .5339 | .4892 | .5785 | 2190.8911 | 1912.0195 | 2469.7627 |
| 83.06 | .5391 | .4940 | .5842 | 2176.2266 | 1901.8336 | 2450.6196 |
| 83.87 | .5444 | .4988 | .5899 | 2162.1255 | 1890.3268 | 2433.9242 |
| 84.68 | .5496 | .5036 | .5956 | 2148.4356 | 1877.9604 | 2418.9108 |
| 85.48 | .5548 | .5084 | .6012 | 2134.5488 | 1866.0796 | 2403.0180 |
| 86.29 | .5601 | .5132 | .6069 | 2120.2110 | 1855.5057 | 2384.9163 |
| 87.10 | .5653 | .5180 | .6126 | 2105.9125 | 1843.8219 | 2368.0031 |
| 87.90 | .5705 | .5228 | .6183 | 2091.4085 | 1829.1652 | 2353.6518 |
| 88.71 | .5758 | .5276 | .6239 | 2075.9916 | 1814.0820 | 2337.9014 |
| 89.52 | .5810 | .5324 | .6296 | 2060.8704 | 1801.0045 | 2320.7363 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5862 | .5372 | .6353 | 2044.9241 | 1786.8792 | 2302.9689 |
| 91.13 | .5915 | .5420 | .6409 | 2028.5791 | 1770.1814 | 2286.9768 |
| 91.94 | .5967 | .5468 | .6466 | 2012.4978 | 1752.6318 | 2272.3637 |
| 92.74 | .6019 | .5516 | .6523 | 1995.6872 | 1735.8284 | 2255.5461 |
| 93.55 | .6072 | .5564 | .6580 | 1978.1640 | 1718.6240 | 2237.7039 |
| 94.35 | .6124 | .5612 | .6636 | 1960.0569 | 1700.1167 | 2219.9972 |
| 95.16 | .6176 | .5660 | .6693 | 1941.5390 | 1680.9324 | 2202.1458 |
| 95.97 | .6229 | .5708 | .6750 | 1922.9554 | 1661.0017 | 2184.9090 |
| 96.77 | .6281 | .5756 | .6806 | 1903.6826 | 1642.2246 | 2165.1404 |
| 97.58 | .6333 | .5804 | .6863 | 1883.2493 | 1621.1999 | 2145.2986 |
| 98.39 | .6386 | .5852 | .6920 | 1859.3631 | 1590.1496 | 2128.5766 |
| 99.19 | .6438 | .5900 | .6977 | 1831.6890 | 1554.0740 | 2109.3039 |
| 100.00 | .6490 | .5948 | .7033 | 1796.4953 | 1511.8646 | 2081.1260 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .6540 | .5998 | .7082 | 1756.8819 | 1467.1251 | 2046.6388 |
| 2.67 | .6589 | .6048 | .7130 | 1709.6678 | 1418.8286 | 2000.5070 |
| 4.00 | .6639 | .6099 | .7179 | 1656.3847 | 1362.9454 | 1949.8239 |
| 5.33 | .6688 | .6148 | .7228 | 1597.2137 | 1308.7698 | 1885.6578 |
| 6.67 | .6738 | .6198 | .7277 | 1535.1993 | 1258.2405 | 1812.1581 |
| 8.00 | .6787 | .6247 | .7327 | 1473.2496 | 1204.7452 | 1741.7538 |
| 9.33 | .6837 | .6296 | .7377 | 1411.1637 | 1151.3456 | 1670.9819 |
| 10.67 | .6886 | .6345 | .7427 | 1352.7390 | 1101.5572 | 1603.9209 |
| 12.00 | .6936 | .6394 | .7478 | 1297.4259 | 1058.6575 | 1536.1942 |
| 13.33 | .6985 | .6442 | .7528 | 1244.4469 | 1018.5059 | 1470.3880 |
| 14.67 | .7034 | .6490 | .7579 | 1195.6076 | 974.1666 | 1417.0486 |
| 16.00 | .7084 | .6537 | .7630 | 1147.9235 | 934.0371 | 1361.8099 |
| 17.33 | .7133 | .6585 | .7682 | 1102.6957 | 897.2651 | 1308.1262 |
| 18.67 | .7183 | .6632 | .7734 | 1060.0797 | 863.2988 | 1256.8606 |
| 20.00 | .7232 | .6679 | .7786 | 1019.8412 | 831.5805 | 1208.1018 |
| 21.33 | .7282 | .6726 | .7838 | 981.7498 | 799.0734 | 1164.4261 |
| 22.67 | .7331 | .6772 | .7890 | 945.0687 | 769.3740 | 1120.7633 |
| 24.00 | .7381 | .6818 | .7943 | 909.6354 | 743.1650 | 1076.1057 |
| 25.33 | .7430 | .6864 | .7996 | 876.4008 | 717.4422 | 1035.3594 |
| 26.67 | .7480 | .6910 | .8049 | 845.2911 | 691.0796 | 999.5025 |
| 28.00 | .7529 | .6956 | .8103 | 815.8936 | 665.8180 | 965.9691 |
| 29.33 | .7579 | .7001 | .8156 | 788.0941 | 643.1054 | 933.0829 |
| 30.67 | .7628 | .7046 | .8210 | 760.4355 | 619.6914 | 901.1796 |
| 32.00 | .7677 | .7091 | .8264 | 735.0111 | 597.5864 | 872.4358 |
| 33.33 | .7727 | .7135 | .8318 | 710.9690 | 576.4763 | 845.4616 |
| 34.67 | .7776 | .7180 | .8373 | 687.5694 | 556.5157 | 818.6230 |
| 36.00 | .7826 | .7224 | .8428 | 665.4741 | 539.2448 | 791.7033 |
| 37.33 | .7875 | .7268 | .8482 | 643.9725 | 520.2769 | 767.6681 |
| 38.67 | .7925 | .7312 | .8537 | 623.6644 | 500.5485 | 746.7803 |
| 40.00 | .7974 | .7356 | .8593 | 604.6206 | 483.6335 | 725.6077 |
| 41.33 | .8024 | .7399 | .8648 | 585.9411 | 468.1063 | 703.7760 |
| 42.67 | .8073 | .7442 | .8704 | 567.8961 | 452.4119 | 683.3804 |
| 44.00 | .8123 | .7486 | .8760 | 550.7828 | 437.3505 | 664.2151 |
| 45.33 | .8172 | .7529 | .8815 | 534.1349 | 422.5878 | 645.6821 |
| 46.67 | .8221 | .7571 | .8872 | 518.4245 | 409.5344 | 627.3146 |
| 48.00 | .8271 | .7614 | .8928 | 503.1796 | 397.3200 | 609.0391 |
| 49.33 | .8320 | .7657 | .8984 | 488.3176 | 384.8254 | 591.8099 |
| 50.67 | .8370 | .7699 | .9041 | 474.5918 | 371.5259 | 577.6577 |
| 52.00 | .8419 | .7741 | .9097 | 461.3122 | 360.4050 | 562.2194 |
| 53.33 | .8469 | .7783 | .9154 | 447.2718 | 348.6843 | 545.8594 |
| 54.67 | .8518 | .7825 | .9211 | 434.0520 | 335.0683 | 533.0357 |
| 56.00 | .8568 | .7867 | .9268 | 421.7456 | 324.3005 | 519.1907 |

TABLE VI. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 20° F AND THE TWO-SIDED TOLERANCE LIMITS - Concluded

(c) Thrust corrected to vacuum pressure altitude - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .8617 | .7909 | .9325 | 409.3583 | 312.5184 | 506.1982 |
| 58.67 | .8667 | .7951 | .9383 | 398.3222 | 303.2289 | 493.4155 |
| 60.00 | .8716 | .7992 | .9440 | 387.8121 | 296.5597 | 479.0644 |
| 61.33 | .8766 | .8033 | .9498 | 377.0495 | 288.0145 | 466.0845 |
| 62.67 | .8815 | .8075 | .9555 | 367.5798 | 280.8925 | 454.2672 |
| 64.00 | .8864 | .8116 | .9613 | 357.8076 | 269.5952 | 446.0199 |
| 65.33 | .8914 | .8157 | .9671 | 348.0519 | 256.7420 | 439.3617 |
| 66.67 | .8963 | .8198 | .9729 | 338.3082 | 245.7298 | 430.8866 |
| 68.00 | .9013 | .8239 | .9787 | 327.9402 | 235.2017 | 420.6787 |
| 69.33 | .9062 | .8280 | .9845 | 319.2695 | 227.8302 | 410.7087 |
| 70.67 | .9112 | .8320 | .9903 | 310.7529 | 221.1025 | 400.4033 |
| 72.00 | .9161 | .8361 | .9961 | 302.0654 | 213.7950 | 390.3357 |
| 73.33 | .9211 | .8401 | 1.0020 | 294.0492 | 206.3574 | 381.7410 |
| 74.67 | .9260 | .8442 | 1.0078 | 286.6056 | 200.1791 | 373.0321 |
| 76.00 | .9310 | .8482 | 1.0137 | 279.0615 | 192.7148 | 365.4082 |
| 77.33 | .9359 | .8523 | 1.0195 | 272.1145 | 185.9219 | 358.3072 |
| 78.67 | .9408 | .8563 | 1.0254 | 265.0104 | 179.9943 | 350.0266 |
| 80.00 | .9458 | .8603 | 1.0313 | 257.6918 | 174.2559 | 341.1277 |
| 81.33 | .9507 | .8643 | 1.0372 | 251.4025 | 170.6201 | 332.1849 |
| 82.67 | .9557 | .8683 | 1.0431 | 244.9968 | 164.0373 | 325.9563 |
| 84.00 | .9606 | .8723 | 1.0490 | 238.2954 | 157.3441 | 319.2467 |
| 85.33 | .9656 | .8763 | 1.0549 | 231.7484 | 153.4261 | 310.0707 |
| 86.67 | .9705 | .8803 | 1.0608 | 225.3162 | 148.5173 | 302.1151 |
| 88.00 | .9755 | .8843 | 1.0667 | 219.5122 | 144.4480 | 294.5764 |
| 89.33 | .9804 | .8882 | 1.0726 | 214.2512 | 139.5066 | 288.9957 |
| 90.67 | .9854 | .8922 | 1.0785 | 209.3135 | 135.3271 | 283.2999 |
| 92.00 | .9903 | .8962 | 1.0844 | 204.2353 | 129.9335 | 278.5372 |
| 93.33 | .9953 | .9001 | 1.0904 | 199.0530 | 123.1331 | 274.9730 |
| 94.67 | 1.0002 | .9041 | 1.0963 | 193.9940 | 116.6835 | 271.3045 |
| 96.00 | 1.0051 | .9080 | 1.1023 | 189.4649 | 112.6423 | 266.2874 |
| 97.33 | 1.0101 | .9120 | 1.1082 | 184.6353 | 110.1046 | 259.1660 |
| 98.67 | 1.0150 | .9159 | 1.1142 | 179.4907 | 107.9000 | 251.0814 |
| 100.00 | 1.0200 | .9198 | 1.1201 | 174.6974 | 105.0664 | 244.3285 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS

(a) Chamber pressure

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO SIDED TOLERANCE LIMITS MEAN | MIN. | MAX. | TRANSFORMED CHAMBER PRESSURE MEAN | MIN. | MAX. |
|---|---|---|---|---|---|---|
| .00 | .0000 | -.0000 | .0000 | 100.0727 | 96.2117 | 103.9337 |
| .81 | .0050 | .0045 | .0054 | 186.2759 | 47.4130 | 325.1388 |
| 1.61 | .0099 | .0091 | .0108 | 288.4526 | 76.4223 | 500.4828 |
| 2.42 | .0149 | .0136 | .0162 | 400.0431 | 154.3467 | 645.7395 |
| 3.23 | .0199 | .0182 | .0215 | 514.5706 | 243.7581 | 785.3831 |
| 4.03 | .0248 | .0227 | .0269 | 624.0311 | 338.0396 | 910.0225 |
| 4.84 | .0298 | .0273 | .0323 | 731.4412 | 443.1322 | 1019.7502 |
| 5.65 | .0348 | .0318 | .0377 | 834.9045 | 548.8521 | 1120.9568 |
| 6.45 | .0397 | .0364 | .0431 | 928.8627 | 649.3971 | 1208.3282 |
| 7.26 | .0447 | .0409 | .0485 | 1011.5578 | 735.0849 | 1288.0307 |
| 8.06 | .0497 | .0455 | .0538 | 1084.9299 | 807.9524 | 1361.9073 |
| 8.87 | .0546 | .0500 | .0592 | 1150.4757 | 871.0561 | 1429.8953 |
| 9.68 | .0596 | .0545 | .0646 | 1208.8554 | 926.5884 | 1491.1225 |
| 10.48 | .0645 | .0591 | .0700 | 1261.3881 | 974.6762 | 1548.0998 |
| 11.29 | .0695 | .0636 | .0754 | 1308.2346 | 1017.1144 | 1599.3549 |
| 12.10 | .0745 | .0682 | .0808 | 1350.0422 | 1056.0642 | 1644.0203 |
| 12.90 | .0794 | .0727 | .0862 | 1387.5762 | 1091.8444 | 1683.3080 |
| 13.71 | .0844 | .0773 | .0915 | 1421.3233 | 1125.6662 | 1716.9805 |
| 14.52 | .0894 | .0818 | .0969 | 1451.6023 | 1157.9969 | 1745.2076 |
| 15.32 | .0943 | .0864 | .1023 | 1478.7972 | 1188.1652 | 1769.4291 |
| 16.13 | .0993 | .0909 | .1077 | 1503.5798 | 1216.8781 | 1790.2816 |
| 16.94 | .1043 | .0955 | .1131 | 1526.5542 | 1244.7761 | 1808.3324 |
| 17.74 | .1092 | .1000 | .1185 | 1546.9323 | 1270.6313 | 1823.2334 |
| 18.55 | .1142 | .1045 | .1238 | 1564.9614 | 1294.1378 | 1835.7851 |
| 19.35 | .1192 | .1091 | .1292 | 1581.5182 | 1315.8552 | 1847.1812 |
| 20.16 | .1241 | .1136 | .1346 | 1596.2879 | 1335.8879 | 1856.6880 |
| 20.97 | .1291 | .1182 | .1400 | 1609.3506 | 1354.5360 | 1864.1652 |
| 21.77 | .1341 | .1227 | .1454 | 1620.4328 | 1371.0981 | 1869.7676 |
| 22.58 | .1390 | .1273 | .1508 | 1630.3001 | 1386.5419 | 1874.0583 |
| 23.39 | .1440 | .1318 | .1562 | 1639.5942 | 1401.9310 | 1877.2574 |
| 24.19 | .1490 | .1364 | .1615 | 1647.5151 | 1414.6645 | 1880.3656 |
| 25.00 | .1539 | .1409 | .1669 | 1654.6235 | 1426.0915 | 1883.1555 |
| 25.81 | .1589 | .1455 | .1723 | 1661.2788 | 1437.3437 | 1885.2139 |
| 26.61 | .1638 | .1500 | .1777 | 1666.9022 | 1447.2263 | 1886.5780 |
| 27.42 | .1688 | .1545 | .1831 | 1672.2225 | 1456.2725 | 1888.1725 |
| 28.23 | .1738 | .1591 | .1885 | 1676.4756 | 1464.7989 | 1888.1524 |
| 29.03 | .1787 | .1636 | .1938 | 1680.2541 | 1471.3614 | 1889.1469 |
| 29.84 | .1837 | .1682 | .1992 | 1683.6993 | 1476.9883 | 1890.4102 |
| 30.65 | .1887 | .1727 | .2046 | 1686.7656 | 1482.4679 | 1891.0632 |
| 31.45 | .1936 | .1773 | .2100 | 1689.6254 | 1485.9445 | 1893.3062 |
| 32.26 | .1986 | .1818 | .2154 | 1691.9939 | 1489.3389 | 1894.6489 |
| 33.06 | .2036 | .1864 | .2208 | 1694.2330 | 1492.0268 | 1896.4392 |
| 33.87 | .2085 | .1909 | .2261 | 1696.0794 | 1493.4425 | 1898.7162 |
| 34.68 | .2135 | .1955 | .2315 | 1697.3031 | 1495.5069 | 1899.0993 |
| 35.48 | .2185 | .2000 | .2369 | 1698.3392 | 1497.4662 | 1899.2123 |
| 36.29 | .2234 | .2045 | .2423 | 1698.8275 | 1498.6623 | 1898.9928 |
| 37.10 | .2284 | .2091 | .2477 | 1699.3327 | 1499.6715 | 1898.9940 |
| 37.90 | .2334 | .2136 | .2531 | 1699.4336 | 1500.4301 | 1898.4371 |
| 38.71 | .2383 | .2182 | .2585 | 1699.4032 | 1501.1038 | 1897.7027 |
| 39.52 | .2433 | .2227 | .2638 | 1699.6042 | 1501.0358 | 1898.1726 |
| 40.32 | .2483 | .2273 | .2692 | 1699.4354 | 1500.4852 | 1898.3857 |
| 41.13 | .2532 | .2318 | .2746 | 1698.9325 | 1498.8431 | 1899.0219 |
| 41.94 | .2582 | .2364 | .2800 | 1698.1861 | 1497.3153 | 1899.0568 |
| 42.74 | .2631 | .2409 | .2854 | 1697.0608 | 1495.6663 | 1898.4554 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2681 | .2455 | .2908 | 1695.5937 | 1493.6824 | 1897.5050 |
| 44.35 | .2731 | .2500 | .2961 | 1694.0745 | 1491.7364 | 1896.4126 |
| 45.16 | .2780 | .2545 | .3015 | 1692.4855 | 1489.7363 | 1895.2347 |
| 45.97 | .2830 | .2591 | .3069 | 1690.9648 | 1487.6661 | 1894.2635 |
| 46.77 | .2880 | .2636 | .3123 | 1689.2429 | 1486.1593 | 1892.3265 |
| 47.58 | .2929 | .2682 | .3177 | 1687.9059 | 1484.8948 | 1890.9170 |
| 48.39 | .2979 | .2727 | .3231 | 1686.0139 | 1482.4461 | 1889.5818 |
| 49.19 | .3029 | .2773 | .3285 | 1683.7669 | 1480.0048 | 1887.5290 |
| 50.00 | .3078 | .2818 | .3338 | 1681.6899 | 1477.6165 | 1885.7634 |
| 50.81 | .3128 | .2864 | .3392 | 1679.0422 | 1474.1835 | 1883.9009 |
| 51.61 | .3178 | .2909 | .3446 | 1676.3945 | 1470.2831 | 1882.5059 |
| 52.42 | .3227 | .2955 | .3500 | 1673.4878 | 1466.3678 | 1880.6078 |
| 53.23 | .3277 | .3000 | .3554 | 1670.3387 | 1463.3387 | 1877.3388 |
| 54.03 | .3327 | .3045 | .3608 | 1667.2517 | 1460.9975 | 1873.5059 |
| 54.84 | .3376 | .3091 | .3661 | 1663.6708 | 1457.1346 | 1870.2070 |
| 55.65 | .3426 | .3136 | .3715 | 1659.7595 | 1453.2724 | 1866.2467 |
| 56.45 | .3476 | .3182 | .3769 | 1655.1865 | 1449.5914 | 1860.7816 |
| 57.26 | .3525 | .3227 | .3823 | 1650.3546 | 1444.5683 | 1856.1410 |
| 58.06 | .3575 | .3273 | .3877 | 1645.4045 | 1439.3457 | 1851.4635 |
| 58.87 | .3624 | .3318 | .3931 | 1639.4879 | 1433.0053 | 1845.9706 |
| 59.68 | .3674 | .3364 | .3985 | 1633.2585 | 1426.7380 | 1839.7791 |
| 60.48 | .3724 | .3409 | .4038 | 1626.4598 | 1420.3194 | 1832.6002 |
| 61.29 | .3773 | .3455 | .4092 | 1619.3300 | 1412.7360 | 1825.9241 |
| 62.10 | .3823 | .3500 | .4146 | 1612.2121 | 1405.1977 | 1819.2267 |
| 62.90 | .3873 | .3545 | .4200 | 1604.6806 | 1399.5986 | 1809.7626 |
| 63.71 | .3922 | .3591 | .4254 | 1596.7055 | 1392.7685 | 1800.6425 |
| 64.52 | .3972 | .3636 | .4308 | 1588.9195 | 1386.0671 | 1791.7719 |
| 65.32 | .4022 | .3682 | .4361 | 1581.3076 | 1377.7398 | 1784.8755 |
| 66.13 | .4071 | .3727 | .4415 | 1573.1360 | 1369.0930 | 1777.1790 |
| 66.94 | .4121 | .3773 | .4469 | 1564.8889 | 1361.5914 | 1768.1865 |
| 67.74 | .4171 | .3818 | .4523 | 1556.3409 | 1351.5890 | 1761.0929 |
| 68.55 | .4220 | .3864 | .4577 | 1547.9214 | 1344.4722 | 1751.3705 |
| 69.35 | .4270 | .3909 | .4631 | 1538.9636 | 1336.8781 | 1741.0492 |
| 70.16 | .4320 | .3955 | .4685 | 1529.6991 | 1328.6521 | 1730.7462 |
| 70.97 | .4369 | .4000 | .4738 | 1520.4931 | 1320.7040 | 1720.2822 |
| 71.77 | .4419 | .4046 | .4792 | 1511.7381 | 1313.5326 | 1709.9436 |
| 72.58 | .4469 | .4091 | .4846 | 1503.2595 | 1306.7792 | 1699.7398 |
| 73.39 | .4518 | .4136 | .4900 | 1494.4600 | 1299.1186 | 1689.8014 |
| 74.19 | .4568 | .4182 | .4954 | 1485.9684 | 1292.4371 | 1679.4997 |
| 75.00 | .4617 | .4227 | .5008 | 1477.3739 | 1285.7598 | 1668.9881 |
| 75.81 | .4667 | .4273 | .5061 | 1467.8084 | 1277.2995 | 1658.3173 |
| 76.61 | .4717 | .4318 | .5115 | 1457.9984 | 1268.0385 | 1647.9583 |
| 77.42 | .4766 | .4364 | .5169 | 1447.9451 | 1258.8627 | 1637.0274 |
| 78.23 | .4816 | .4409 | .5223 | 1438.8756 | 1252.0673 | 1625.6840 |
| 79.03 | .4866 | .4455 | .5277 | 1430.2524 | 1245.2208 | 1615.2841 |
| 79.84 | .4915 | .4500 | .5331 | 1421.2985 | 1237.7059 | 1604.8912 |
| 80.65 | .4965 | .4546 | .5384 | 1411.9651 | 1229.8191 | 1594.1112 |
| 81.45 | .5015 | .4591 | .5438 | 1402.8683 | 1222.0734 | 1583.6631 |
| 82.26 | .5064 | .4636 | .5492 | 1393.4044 | 1213.5523 | 1573.2565 |
| 83.06 | .5114 | .4682 | .5546 | 1384.1218 | 1205.4579 | 1562.7856 |
| 83.87 | .5164 | .4727 | .5600 | 1374.9182 | 1197.3819 | 1552.4545 |
| 84.68 | .5213 | .4773 | .5654 | 1365.6267 | 1189.2108 | 1542.0426 |
| 85.48 | .5263 | .4818 | .5708 | 1356.5140 | 1181.2270 | 1531.8011 |
| 86.29 | .5313 | .4864 | .5761 | 1347.2283 | 1172.4927 | 1521.9639 |
| 87.10 | .5362 | .4909 | .5815 | 1337.7622 | 1163.4899 | 1512.0345 |
| 87.90 | .5412 | .4955 | .5869 | 1328.4356 | 1154.5029 | 1502.3684 |
| 88.71 | .5462 | .5000 | .5923 | 1318.8686 | 1145.1311 | 1492.6062 |
| 89.52 | .5511 | .5046 | .5977 | 1308.9783 | 1136.0403 | 1481.9163 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5561 | .5091 | .6031 | 1299.0389 | 1126.5444 | 1471.5334 |
| 91.13 | .5610 | .5136 | .6084 | 1288.9000 | 1116.8996 | 1460.9004 |
| 91.94 | .5660 | .5182 | .6138 | 1278.3531 | 1106.6177 | 1450.0885 |
| 92.74 | .5710 | .5227 | .6192 | 1267.3961 | 1095.2660 | 1439.5262 |
| 93.55 | .5759 | .5273 | .6246 | 1256.3310 | 1084.2116 | 1428.4503 |
| 94.35 | .5809 | .5318 | .6300 | 1245.2392 | 1072.4862 | 1417.9923 |
| 95.16 | .5859 | .5364 | .6354 | 1234.1475 | 1060.2894 | 1408.0054 |
| 95.97 | .5908 | .5409 | .6408 | 1223.1327 | 1048.0887 | 1398.1768 |
| 96.77 | .5958 | .5455 | .6461 | 1212.0997 | 1035.5067 | 1388.6929 |
| 97.58 | .6008 | .5500 | .6515 | 1200.4740 | 1021.8971 | 1379.0508 |
| 98.39 | .6057 | .5546 | .6569 | 1185.8283 | 1003.6930 | 1367.9636 |
| 99.19 | .6107 | .5591 | .6623 | 1168.4571 | 981.6796 | 1355.2347 |
| 100.00 | .6157 | .5636 | .6677 | 1145.7223 | 952.4611 | 1338.9837 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .6206 | .5686 | .6725 | 1118.7697 | 924.0121 | 1313.5273 |
| 2.67 | .6254 | .5736 | .6773 | 1086.7690 | 892.7339 | 1280.8042 |
| 4.00 | .6303 | .5785 | .6821 | 1050.3857 | 856.7386 | 1244.0328 |
| 5.33 | .6352 | .5835 | .6870 | 1011.7241 | 821.6552 | 1201.7930 |
| 6.67 | .6401 | .5883 | .6919 | 971.5473 | 786.4144 | 1156.6802 |
| 8.00 | .6450 | .5932 | .6968 | 931.6782 | 752.8625 | 1110.4938 |
| 9.33 | .6499 | .5980 | .7017 | 892.6076 | 721.8643 | 1063.3509 |
| 10.67 | .6548 | .6029 | .7067 | 855.3248 | 693.0366 | 1017.6131 |
| 12.00 | .6597 | .6077 | .7117 | 819.4540 | 665.4108 | 973.4971 |
| 13.33 | .6646 | .6124 | .7167 | 785.5828 | 639.5456 | 931.6200 |
| 14.67 | .6694 | .6171 | .7217 | 753.2597 | 615.1995 | 891.3198 |
| 16.00 | .6743 | .6219 | .7268 | 722.6703 | 592.2510 | 853.0896 |
| 17.33 | .6792 | .6265 | .7319 | 693.6676 | 570.4025 | 816.9326 |
| 18.67 | .6841 | .6312 | .7370 | 666.1639 | 549.3537 | 782.9741 |
| 20.00 | .6890 | .6359 | .7422 | 640.3914 | 529.4356 | 751.3472 |
| 21.33 | .6939 | .6405 | .7473 | 615.8021 | 510.9543 | 720.6499 |
| 22.67 | .6988 | .6451 | .7525 | 592.5075 | 493.9920 | 691.0230 |
| 24.00 | .7037 | .6496 | .7577 | 570.0886 | 477.3924 | 662.7849 |
| 25.33 | .7086 | .6542 | .7629 | 548.8185 | 461.4724 | 636.1645 |
| 26.67 | .7134 | .6587 | .7682 | 528.5498 | 446.1409 | 610.9587 |
| 28.00 | .7183 | .6632 | .7735 | 509.2877 | 431.4305 | 587.1449 |
| 29.33 | .7232 | .6677 | .7788 | 491.0974 | 417.5962 | 564.5985 |
| 30.67 | .7281 | .6721 | .7841 | 473.4347 | 403.6292 | 543.2402 |
| 32.00 | .7330 | .6766 | .7894 | 456.6112 | 390.2160 | 523.0063 |
| 33.33 | .7379 | .6810 | .7948 | 440.9169 | 377.3766 | 504.4572 |
| 34.67 | .7428 | .6854 | .8002 | 425.7773 | 365.3657 | 486.1889 |
| 36.00 | .7477 | .6898 | .8056 | 411.5136 | 354.3595 | 468.6677 |
| 37.33 | .7526 | .6942 | .8110 | 398.0980 | 343.7363 | 452.4596 |
| 38.67 | .7575 | .6985 | .8164 | 384.9482 | 333.3091 | 436.5872 |
| 40.00 | .7623 | .7028 | .8219 | 372.6211 | 323.3540 | 421.8882 |
| 41.33 | .7672 | .7071 | .8273 | 360.9189 | 314.0585 | 407.7792 |
| 42.67 | .7721 | .7114 | .8328 | 349.3216 | 304.5711 | 394.0722 |
| 44.00 | .7770 | .7157 | .8383 | 338.4454 | 295.3758 | 381.5149 |
| 45.33 | .7819 | .7200 | .8438 | 327.8011 | 286.6873 | 368.9149 |
| 46.67 | .7868 | .7242 | .8494 | 317.3519 | 278.4996 | 356.2041 |
| 48.00 | .7917 | .7285 | .8549 | 307.4221 | 269.9771 | 344.8672 |
| 49.33 | .7966 | .7327 | .8605 | 297.9488 | 261.7621 | 334.1354 |
| 50.67 | .8015 | .7369 | .8660 | 288.7212 | 254.5062 | 322.9362 |
| 52.00 | .8063 | .7411 | .8716 | 279.9151 | 247.4768 | 312.3534 |
| 53.33 | .8112 | .7453 | .8772 | 271.7372 | 240.9243 | 302.5501 |
| 54.67 | .8161 | .7494 | .8828 | 263.6080 | 234.3644 | 292.8517 |
| 56.00 | .8210 | .7536 | .8884 | 255.9788 | 228.0174 | 283.9402 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .8259 | .7577 | .8941 | 248.3934 | 221.6398 | 275.1469 |
| 58.67 | .8308 | .7619 | .8997 | 241.0648 | 215.5795 | 266.5502 |
| 60.00 | .8357 | .7660 | .9054 | 234.3061 | 209.6224 | 258.9898 |
| 61.33 | .8406 | .7701 | .9110 | 227.6651 | 203.7331 | 251.5970 |
| 62.67 | .8455 | .7742 | .9167 | 221.2060 | 198.5070 | 243.9050 |
| 64.00 | .8503 | .7783 | .9224 | 214.8457 | 193.2729 | 236.4185 |
| 65.33 | .8552 | .7824 | .9281 | 208.5310 | 187.7487 | 229.3132 |
| 66.67 | .8601 | .7865 | .9338 | 202.1990 | 182.8354 | 221.5626 |
| 68.00 | .8650 | .7905 | .9395 | 196.4787 | 178.2372 | 214.7202 |
| 69.33 | .8699 | .7946 | .9452 | 191.1092 | 173.6381 | 208.5804 |
| 70.67 | .8748 | .7986 | .9510 | 185.6251 | 169.1642 | 202.0860 |
| 72.00 | .8797 | .8027 | .9567 | 180.2799 | 164.7641 | 195.7957 |
| 73.33 | .8846 | .8067 | .9625 | 175.4276 | 160.8767 | 189.9785 |
| 74.67 | .8895 | .8107 | .9682 | 170.6171 | 156.4750 | 184.7591 |
| 76.00 | .8944 | .8147 | .9740 | 165.6604 | 152.0464 | 179.2745 |
| 77.33 | .8992 | .8187 | .9797 | 160.6167 | 147.5117 | 173.7218 |
| 78.67 | .9041 | .8227 | .9855 | 156.2894 | 143.6445 | 168.9342 |
| 80.00 | .9090 | .8267 | .9913 | 152.1756 | 139.9957 | 164.3556 |
| 81.33 | .9139 | .8307 | .9971 | 147.9813 | 136.9321 | 159.0305 |
| 82.67 | .9188 | .8347 | 1.0029 | 144.0087 | 133.8443 | 154.1731 |
| 84.00 | .9237 | .8387 | 1.0087 | 139.9193 | 130.7487 | 149.0900 |
| 85.33 | .9286 | .8427 | 1.0145 | 136.0162 | 128.7390 | 143.2933 |
| 86.67 | .9335 | .8466 | 1.0203 | 132.1325 | 125.1921 | 139.0730 |
| 88.00 | .9384 | .8506 | 1.0261 | 128.4227 | 121.7876 | 135.0579 |
| 89.33 | .9432 | .8545 | 1.0320 | 124.8258 | 118.3964 | 131.2551 |
| 90.67 | .9481 | .8585 | 1.0378 | 121.6686 | 115.0492 | 128.2881 |
| 92.00 | .9530 | .8624 | 1.0436 | 118.5244 | 111.5678 | 125.4810 |
| 93.33 | .9579 | .8664 | 1.0495 | 115.4463 | 108.7479 | 122.1447 |
| 94.67 | .9628 | .8703 | 1.0553 | 112.2210 | 106.0667 | 118.3753 |
| 96.00 | .9677 | .8742 | 1.0611 | 108.9699 | 103.3730 | 114.5669 |
| 97.33 | .9726 | .8782 | 1.0670 | 106.0028 | 100.9064 | 111.0992 |
| 98.67 | .9775 | .8821 | 1.0728 | 103.1398 | 98.1133 | 108.1662 |
| 100.00 | .9824 | .8860 | 1.0787 | 100.3185 | 95.4782 | 105.1589 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude

| | TRANSFORMED TIMES | | | TRANSFORMED THRUST AT PA = 14.70 | | |
|---|---|---|---|---|---|---|
| PCT. | MEANS WITH TWO SIDED TOLERANCE LIMITS | | | | | |
| WEB TIME | MEAN | MIN. | MAX. | MEAN | MIN. | MAX. |
| .00 | .0000 | -.0000 | .0000 | -.4179 | -.4179 | -.4179 |
| .81 | .0050 | .0045 | .0054 | 98.3668 | -111.9791 | 308.7128 |
| 1.61 | .0099 | .0091 | .0108 | 251.5811 | -28.5347 | 531.6970 |
| 2.42 | .0149 | .0136 | .0162 | 441.2329 | 110.2316 | 772.2341 |
| 3.23 | .0199 | .0182 | .0215 | 664.1237 | 291.3397 | 1036.9077 |
| 4.03 | .0248 | .0227 | .0269 | 894.2589 | 517.1364 | 1271.3815 |
| 4.84 | .0298 | .0273 | .0323 | 1107.0869 | 702.8180 | 1511.3559 |
| 5.65 | .0348 | .0318 | .0377 | 1302.9075 | 866.5632 | 1739.2517 |
| 6.45 | .0397 | .0364 | .0431 | 1479.2413 | 1028.2841 | 1930.1986 |
| 7.26 | .0447 | .0409 | .0485 | 1633.4302 | 1174.5369 | 2092.3235 |
| 8.06 | .0497 | .0455 | .0538 | 1771.5004 | 1305.8729 | 2237.1280 |
| 8.87 | .0546 | .0500 | .0592 | 1889.8077 | 1420.9824 | 2358.6329 |
| 9.68 | .0596 | .0545 | .0646 | 1990.6247 | 1512.1073 | 2469.1422 |
| 10.48 | .0645 | .0591 | .0700 | 2081.6555 | 1590.4725 | 2572.8385 |
| 11.29 | .0695 | .0636 | .0754 | 2163.8448 | 1670.1841 | 2657.5055 |
| 12.10 | .0745 | .0682 | .0808 | 2237.0246 | 1735.7629 | 2738.2863 |
| 12.90 | .0794 | .0727 | .0862 | 2302.3481 | 1787.7097 | 2816.9864 |
| 13.71 | .0844 | .0773 | .0915 | 2360.9774 | 1843.6366 | 2878.3181 |
| 14.52 | .0894 | .0818 | .0969 | 2414.8345 | 1901.7585 | 2927.9105 |
| 15.32 | .0943 | .0864 | .1023 | 2464.7892 | 1953.1544 | 2976.4240 |
| 16.13 | .0993 | .0909 | .1077 | 2509.0148 | 2001.9757 | 3016.0539 |
| 16.94 | .1043 | .0955 | .1131 | 2547.2397 | 2048.5397 | 3045.9397 |
| 17.74 | .1092 | .1000 | .1185 | 2582.9099 | 2092.0549 | 3073.7650 |
| 18.55 | .1142 | .1045 | .1238 | 2615.2778 | 2135.1565 | 3095.3991 |
| 19.35 | .1192 | .1091 | .1292 | 2643.4485 | 2174.9394 | 3111.9577 |
| 20.16 | .1241 | .1136 | .1346 | 2669.5027 | 2206.3693 | 3132.6362 |
| 20.97 | .1291 | .1182 | .1400 | 2691.9435 | 2235.3277 | 3148.5594 |
| 21.77 | .1341 | .1227 | .1454 | 2710.5619 | 2269.5212 | 3151.6025 |
| 22.58 | .1390 | .1273 | .1508 | 2728.1426 | 2298.2541 | 3158.0310 |
| 23.39 | .1440 | .1318 | .1562 | 2744.4170 | 2322.0187 | 3166.8152 |
| 24.19 | .1490 | .1364 | .1615 | 2758.4365 | 2342.8237 | 3174.0493 |
| 25.00 | .1539 | .1409 | .1669 | 2770.1785 | 2364.1971 | 3176.1599 |
| 25.81 | .1589 | .1455 | .1723 | 2781.4513 | 2384.5603 | 3178.3424 |
| 26.61 | .1638 | .1500 | .1777 | 2791.6400 | 2398.5974 | 3184.6827 |
| 27.42 | .1688 | .1545 | .1831 | 2800.1201 | 2413.7594 | 3186.4808 |
| 28.23 | .1736 | .1591 | .1885 | 2806.9441 | 2426.4749 | 3187.4133 |
| 29.03 | .1787 | .1636 | .1938 | 2812.5563 | 2435.7321 | 3189.3805 |
| 29.84 | .1837 | .1682 | .1992 | 2818.6920 | 2445.2921 | 3192.0918 |
| 30.65 | .1887 | .1727 | .2046 | 2823.9139 | 2456.0602 | 3191.7677 |
| 31.45 | .1936 | .1773 | .2100 | 2828.6610 | 2463.6270 | 3193.6949 |
| 32.26 | .1986 | .1818 | .2154 | 2833.1434 | 2467.1453 | 3199.1415 |
| 33.06 | .2036 | .1864 | .2208 | 2836.5287 | 2473.3192 | 3199.7383 |
| 33.87 | .2085 | .1909 | .2261 | 2839.4688 | 2481.6933 | 3197.2443 |
| 34.68 | .2135 | .1955 | .2315 | 2841.2452 | 2487.9652 | 3194.5253 |
| 35.48 | .2185 | .2000 | .2369 | 2842.7906 | 2491.7839 | 3193.7975 |
| 36.29 | .2234 | .2045 | .2423 | 2843.5196 | 2493.6812 | 3193.3580 |
| 37.10 | .2284 | .2091 | .2477 | 2844.3170 | 2495.1395 | 3193.4946 |
| 37.90 | .2334 | .2136 | .2531 | 2844.6890 | 2495.9861 | 3193.3919 |
| 38.71 | .2383 | .2182 | .2585 | 2844.1598 | 2493.5543 | 3194.7652 |
| 39.52 | .2433 | .2227 | .2638 | 2844.4491 | 2493.9644 | 3194.9338 |
| 40.32 | .2483 | .2273 | .2692 | 2844.5084 | 2494.0289 | 3194.9879 |
| 41.13 | .2532 | .2318 | .2746 | 2844.1030 | 2495.6350 | 3192.5710 |
| 41.94 | .2582 | .2364 | .2800 | 2842.8248 | 2495.7723 | 3189.8773 |
| 42.74 | .2631 | .2409 | .2854 | 2840.6867 | 2494.5369 | 3186.8366 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2681 | .2455 | .2908 | 2837.9970 | 2492.6242 | 3183.3699 |
| 44.35 | .2731 | .2500 | .2961 | 2834.9492 | 2490.0802 | 3179.8181 |
| 45.16 | .2780 | .2545 | .3015 | 2832.1352 | 2486.9435 | 3177.3268 |
| 45.97 | .2830 | .2591 | .3069 | 2829.4622 | 2482.5158 | 3176.4086 |
| 46.77 | .2880 | .2636 | .3123 | 2826.3584 | 2480.2032 | 3172.5135 |
| 47.58 | .2929 | .2682 | .3177 | 2823.8942 | 2477.7125 | 3170.0760 |
| 48.39 | .2979 | .2727 | .3231 | 2820.8955 | 2474.2223 | 3167.5686 |
| 49.19 | .3029 | .2773 | .3285 | 2817.7744 | 2472.1353 | 3163.4136 |
| 50.00 | .3078 | .2818 | .3338 | 2814.3920 | 2467.8940 | 3160.8899 |
| 50.81 | .3128 | .2864 | .3392 | 2809.0935 | 2463.8913 | 3154.2958 |
| 51.61 | .3178 | .2909 | .3446 | 2803.9500 | 2460.7097 | 3147.1903 |
| 52.42 | .3227 | .2955 | .3500 | 2799.1369 | 2457.1481 | 3141.1257 |
| 53.23 | .3277 | .3000 | .3554 | 2793.7993 | 2451.6276 | 3135.9710 |
| 54.03 | .3327 | .3045 | .3608 | 2788.1442 | 2445.2794 | 3131.0090 |
| 54.84 | .3376 | .3091 | .3661 | 2782.3742 | 2439.9283 | 3124.8200 |
| 55.65 | .3426 | .3136 | .3715 | 2776.7517 | 2434.2763 | 3119.2271 |
| 56.45 | .3476 | .3182 | .3769 | 2769.4800 | 2426.3309 | 3112.6291 |
| 57.26 | .3525 | .3227 | .3823 | 2761.3064 | 2414.3573 | 3108.2554 |
| 58.06 | .3575 | .3273 | .3877 | 2752.7852 | 2403.1968 | 3102.3736 |
| 58.87 | .3624 | .3318 | .3931 | 2743.0321 | 2394.9154 | 3091.1487 |
| 59.68 | .3674 | .3364 | .3985 | 2732.6124 | 2383.2083 | 3082.0166 |
| 60.48 | .3724 | .3409 | .4038 | 2720.9051 | 2369.2488 | 3072.5614 |
| 61.29 | .3773 | .3455 | .4092 | 2709.8799 | 2360.7920 | 3058.9679 |
| 62.10 | .3823 | .3500 | .4146 | 2698.5116 | 2352.3272 | 3044.6960 |
| 62.90 | .3873 | .3545 | .4200 | 2685.4416 | 2341.7888 | 3029.0945 |
| 63.71 | .3922 | .3591 | .4254 | 2672.2120 | 2327.2137 | 3017.2104 |
| 64.52 | .3972 | .3636 | .4308 | 2658.5126 | 2312.6047 | 3004.4205 |
| 65.32 | .4022 | .3682 | .4361 | 2645.0599 | 2299.7137 | 2990.4061 |
| 66.13 | .4071 | .3727 | .4415 | 2631.8435 | 2288.8969 | 2974.7900 |
| 66.94 | .4121 | .3773 | .4469 | 2618.9777 | 2279.8460 | 2958.1093 |
| 67.74 | .4171 | .3818 | .4523 | 2606.7462 | 2279.1307 | 2934.3616 |
| 68.55 | .4220 | .3864 | .4577 | 2593.0810 | 2273.4406 | 2912.7215 |
| 69.35 | .4270 | .3909 | .4631 | 2578.1552 | 2259.1891 | 2897.1214 |
| 70.16 | .4320 | .3955 | .4685 | 2563.5594 | 2249.8536 | 2877.2652 |
| 70.97 | .4369 | .4000 | .4738 | 2546.9542 | 2229.2512 | 2864.6573 |
| 71.77 | .4419 | .4046 | .4792 | 2530.8021 | 2210.0854 | 2851.5188 |
| 72.58 | .4469 | .4091 | .4846 | 2514.8558 | 2190.3855 | 2839.3260 |
| 73.39 | .4518 | .4136 | .4900 | 2498.9010 | 2170.4356 | 2827.3664 |
| 74.19 | .4568 | .4182 | .4954 | 2483.9655 | 2160.4964 | 2807.4346 |
| 75.00 | .4617 | .4227 | .5008 | 2469.6015 | 2150.3686 | 2788.8343 |
| 75.81 | .4667 | .4273 | .5061 | 2453.4516 | 2133.0004 | 2773.9028 |
| 76.61 | .4717 | .4318 | .5115 | 2436.7068 | 2114.4789 | 2758.9347 |
| 77.42 | .4766 | .4364 | .5169 | 2419.9915 | 2097.4995 | 2742.4834 |
| 78.23 | .4816 | .4409 | .5223 | 2405.6384 | 2087.5823 | 2723.6946 |
| 79.03 | .4866 | .4455 | .5277 | 2391.3459 | 2076.3230 | 2706.3689 |
| 79.84 | .4915 | .4500 | .5331 | 2376.3295 | 2064.3988 | 2688.2601 |
| 80.65 | .4965 | .4546 | .5384 | 2361.1671 | 2054.0971 | 2668.2370 |
| 81.45 | .5015 | .4591 | .5438 | 2346.0229 | 2041.5619 | 2650.4838 |
| 82.26 | .5064 | .4636 | .5492 | 2329.6342 | 2027.8505 | 2631.4178 |
| 83.06 | .5114 | .4682 | .5546 | 2313.0962 | 2016.2217 | 2609.9708 |
| 83.87 | .5164 | .4727 | .5600 | 2297.6810 | 2003.6059 | 2591.7561 |
| 84.68 | .5213 | .4773 | .5654 | 2282.1174 | 1989.5465 | 2574.6883 |
| 85.48 | .5263 | .4818 | .5708 | 2266.5059 | 1976.1463 | 2556.8654 |
| 86.29 | .5313 | .4864 | .5761 | 2250.6328 | 1964.3598 | 2536.9058 |
| 87.10 | .5362 | .4909 | .5815 | 2234.7401 | 1951.2869 | 2518.1933 |
| 87.90 | .5412 | .4955 | .5869 | 2218.8273 | 1935.2346 | 2502.4201 |
| 88.71 | .5462 | .5000 | .5923 | 2202.0122 | 1918.8140 | 2485.2104 |
| 89.52 | .5511 | .5046 | .5977 | 2185.0601 | 1904.1158 | 2466.0043 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5561 | .5091 | .6031 | 2167.7731 | 1888.8009 | 2446.7453 |
| 91.13 | .5610 | .5136 | .6084 | 2150.6923 | 1871.3278 | 2430.0567 |
| 91.94 | .5660 | .5182 | .6138 | 2133.6250 | 1852.6840 | 2414.5659 |
| 92.74 | .5710 | .5227 | .6192 | 2115.5283 | 1834.5825 | 2396.4742 |
| 93.55 | .5759 | .5273 | .6246 | 2097.2861 | 1816.6008 | 2377.9715 |
| 94.35 | .5809 | .5318 | .6300 | 2078.3016 | 1797.1560 | 2359.4471 |
| 95.16 | .5859 | .5364 | .6354 | 2059.2197 | 1777.2783 | 2341.1611 |
| 95.97 | .5908 | .5409 | .6408 | 2040.6584 | 1757.1760 | 2324.1408 |
| 96.77 | .5958 | .5455 | .6461 | 2022.1791 | 1739.1010 | 2305.2570 |
| 97.58 | .6008 | .5500 | .6515 | 2003.5529 | 1719.5775 | 2287.5282 |
| 98.39 | .6057 | .5546 | .6569 | 1980.0510 | 1688.1917 | 2271.9103 |
| 99.19 | .6107 | .5591 | .6623 | 1953.0609 | 1651.8738 | 2254.2478 |
| 100.00 | .6157 | .5636 | .6677 | 1917.2261 | 1608.1617 | 2226.2904 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .6206 | .5686 | .6725 | 1873.7704 | 1559.2305 | 2188.3103 |
| 2.67 | .6254 | .5736 | .6773 | 1821.9103 | 1506.2513 | 2137.5693 |
| 4.00 | .6303 | .5785 | .6821 | 1762.6786 | 1444.3780 | 2080.9791 |
| 5.33 | .6352 | .5835 | .6870 | 1697.4118 | 1384.6812 | 2010.1423 |
| 6.67 | .6401 | .5883 | .6919 | 1628.9879 | 1328.8300 | 1929.1460 |
| 8.00 | .6450 | .5932 | .6968 | 1560.7285 | 1269.9272 | 1851.5298 |
| 9.33 | .6499 | .5980 | .7017 | 1492.9963 | 1211.7035 | 1774.2891 |
| 10.67 | .6548 | .6029 | .7067 | 1429.3499 | 1157.5630 | 1701.1367 |
| 12.00 | .6597 | .6077 | .7117 | 1368.8049 | 1110.6299 | 1626.9799 |
| 13.33 | .6646 | .6124 | .7167 | 1311.4866 | 1067.2316 | 1555.7417 |
| 14.67 | .6694 | .6171 | .7217 | 1258.0129 | 1018.8248 | 1497.2009 |
| 16.00 | .6743 | .6219 | .7268 | 1205.7164 | 974.8640 | 1436.5688 |
| 17.33 | .6792 | .6265 | .7319 | 1156.0444 | 934.5177 | 1377.5712 |
| 18.67 | .6841 | .6312 | .7370 | 1108.7749 | 896.8294 | 1320.7204 |
| 20.00 | .6890 | .6359 | .7422 | 1064.7514 | 862.1384 | 1267.3644 |
| 21.33 | .6939 | .6405 | .7473 | 1022.7122 | 826.3578 | 1219.0666 |
| 22.67 | .6988 | .6451 | .7525 | 982.7623 | 794.0556 | 1171.4689 |
| 24.00 | .7037 | .6496 | .7577 | 944.5262 | 765.7832 | 1123.2691 |
| 25.33 | .7086 | .6542 | .7629 | 908.3551 | 737.7809 | 1078.9292 |
| 26.67 | .7134 | .6587 | .7682 | 874.1827 | 708.8722 | 1039.4930 |
| 28.00 | .7183 | .6632 | .7735 | 841.7332 | 681.0617 | 1002.4046 |
| 29.33 | .7232 | .6677 | .7788 | 810.5794 | 655.6284 | 965.5304 |
| 30.67 | .7281 | .6721 | .7841 | 779.7107 | 629.5792 | 929.8422 |
| 32.00 | .7330 | .6766 | .7894 | 750.5736 | 604.3865 | 896.7608 |
| 33.33 | .7379 | .6810 | .7948 | 723.6704 | 580.8834 | 866.4573 |
| 34.67 | .7428 | .6854 | .8002 | 697.9487 | 559.0136 | 836.8837 |
| 36.00 | .7477 | .6898 | .8056 | 673.9281 | 540.2368 | 807.6194 |
| 37.33 | .7526 | .6942 | .8110 | 650.7941 | 519.8712 | 781.7169 |
| 38.67 | .7575 | .6985 | .8164 | 628.4261 | 498.3227 | 758.5296 |
| 40.00 | .7623 | .7028 | .8219 | 607.5658 | 479.8954 | 735.2362 |
| 41.33 | .7672 | .7071 | .8273 | 587.4290 | 463.1883 | 711.6697 |
| 42.67 | .7721 | .7114 | .8328 | 567.8703 | 446.2162 | 689.5244 |
| 44.00 | .7770 | .7157 | .8383 | 549.6776 | 430.2270 | 669.1283 |
| 45.33 | .7819 | .7200 | .8438 | 531.6530 | 414.2947 | 649.0113 |
| 46.67 | .7868 | .7242 | .8494 | 514.1662 | 399.8224 | 628.5099 |
| 48.00 | .7917 | .7285 | .8549 | 497.2133 | 386.2725 | 608.1541 |
| 49.33 | .7966 | .7327 | .8605 | 480.7887 | 372.5347 | 589.0427 |
| 50.67 | .8015 | .7369 | .8660 | 465.1438 | 357.6345 | 572.6531 |
| 52.00 | .8063 | .7411 | .8716 | 450.4512 | 345.3761 | 555.5264 |
| 53.33 | .8112 | .7453 | .8772 | 435.4558 | 332.8760 | 538.0357 |
| 54.67 | .8161 | .7494 | .8828 | 420.8805 | 318.0548 | 523.7062 |
| 56.00 | .8210 | .7536 | .8884 | 407.6729 | 306.5143 | 508.8316 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .8259 | .7577 | .8941 | 394.1186 | 293.7352 | 494.5020 |
| 58.67 | .8308 | .7619 | .8997 | 382.1404 | 283.6966 | 480.5842 |
| 60.00 | .8357 | .7660 | .9054 | 371.4477 | 276.9355 | 465.9600 |
| 61.33 | .8406 | .7701 | .9110 | 360.2308 | 268.0219 | 452.4397 |
| 62.67 | .8455 | .7742 | .9167 | 350.3817 | 260.6127 | 440.1506 |
| 64.00 | .8503 | .7783 | .9224 | 340.2515 | 248.9122 | 431.5907 |
| 65.33 | .8552 | .7824 | .9281 | 329.3761 | 235.0523 | 423.7000 |
| 66.67 | .8601 | .7865 | .9338 | 318.0004 | 222.7487 | 413.2522 |
| 68.00 | .8650 | .7905 | .9395 | 307.0046 | 211.6667 | 402.3425 |
| 69.33 | .8699 | .7946 | .9452 | 298.0363 | 204.0308 | 392.0417 |
| 70.67 | .8748 | .7986 | .9510 | 288.7185 | 196.7310 | 380.7060 |
| 72.00 | .8797 | .8027 | .9567 | 279.1287 | 188.7799 | 369.4775 |
| 73.33 | .8846 | .8067 | .9625 | 270.5969 | 180.9230 | 360.2708 |
| 74.67 | .8895 | .8107 | .9682 | 262.5053 | 174.2476 | 350.7631 |
| 76.00 | .8944 | .8147 | .9740 | 254.1848 | 166.2090 | 342.1606 |
| 77.33 | .8992 | .8187 | .9797 | 246.1540 | 158.6591 | 333.6488 |
| 78.67 | .9041 | .8227 | .9855 | 238.7988 | 152.5234 | 325.0742 |
| 80.00 | .9090 | .8267 | .9913 | 231.8822 | 147.0066 | 316.7577 |
| 81.33 | .9139 | .8307 | .9971 | 225.2312 | 143.1314 | 307.3310 |
| 82.67 | .9188 | .8347 | 1.0029 | 218.5303 | 136.3109 | 300.7497 |
| 84.00 | .9237 | .8387 | 1.0087 | 211.3985 | 129.3184 | 293.4786 |
| 85.33 | .9286 | .8427 | 1.0145 | 204.6928 | 125.3046 | 284.0810 |
| 86.67 | .9335 | .8466 | 1.0203 | 198.0646 | 120.2412 | 275.8880 |
| 88.00 | .9384 | .8506 | 1.0261 | 191.8944 | 115.9242 | 267.8647 |
| 89.33 | .9432 | .8545 | 1.0320 | 186.2666 | 110.7321 | 261.8010 |
| 90.67 | .9481 | .8585 | 1.0378 | 181.3433 | 106.5240 | 256.1626 |
| 92.00 | .9530 | .8624 | 1.0436 | 175.9151 | 100.8736 | 250.9566 |
| 93.33 | .9579 | .8664 | 1.0495 | 170.0999 | 93.6477 | 246.5521 |
| 94.67 | .9628 | .8703 | 1.0553 | 164.8127 | 87.0378 | 242.5875 |
| 96.00 | .9677 | .8742 | 1.0611 | 159.8586 | 82.7566 | 236.9606 |
| 97.33 | .9726 | .8782 | 1.0670 | 155.2298 | 80.3305 | 230.1291 |
| 98.67 | .9775 | .8821 | 1.0728 | 150.0369 | 78.0727 | 222.0011 |
| 100.00 | .9824 | .8860 | 1.0787 | 144.9392 | 75.0412 | 214.8371 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO SIDED TOLERANCE LIMITS | | | TRANSFORMED THRUST AT PA = .00 MEANS WITH TWO SIDED TOLERANCE LIMITS | | |
|---|---|---|---|---|---|---|
| | MEAN | MIN. | MAX. | MEAN | MIN. | MAX. |
| .00 | .0000 | -.0000 | .0000 | 29.9100 | -85.4260 | 145.2459 |
| .81 | .0050 | .0045 | .0054 | 128.6946 | -81.6653 | 339.0546 |
| 1.61 | .0099 | .0091 | .0108 | 281.9090 | 1.7245 | 562.0935 |
| 2.42 | .0149 | .0136 | .0162 | 471.5607 | 140.4345 | 802.6869 |
| 3.23 | .0199 | .0182 | .0215 | 694.4515 | 321.5112 | 1067.3919 |
| 4.03 | .0248 | .0227 | .0269 | 924.5868 | 547.2773 | 1301.8962 |
| 4.84 | .0298 | .0273 | .0323 | 1137.4147 | 732.9413 | 1541.8882 |
| 5.65 | .0348 | .0318 | .0377 | 1333.2352 | 896.6773 | 1769.7933 |
| 6.45 | .0397 | .0364 | .0431 | 1509.5691 | 1058.4309 | 1960.7075 |
| 7.26 | .0447 | .0409 | .0485 | 1663.7580 | 1204.7103 | 2122.8056 |
| 8.06 | .0497 | .0455 | .0538 | 1801.8282 | 1336.0550 | 2267.6016 |
| 8.87 | .0546 | .0500 | .0592 | 1920.1355 | 1451.1768 | 2389.0942 |
| 9.68 | .0596 | .0545 | .0646 | 2020.9526 | 1542.3207 | 2499.5845 |
| 10.48 | .0645 | .0591 | .0700 | 2111.9834 | 1620.7030 | 2603.2638 |
| 11.29 | .0695 | .0636 | .0754 | 2194.1727 | 1700.4281 | 2687.9172 |
| 12.10 | .0745 | .0682 | .0808 | 2267.3524 | 1766.0181 | 2768.6867 |
| 12.90 | .0794 | .0727 | .0862 | 2332.6759 | 1817.9741 | 2847.3777 |
| 13.71 | .0844 | .0773 | .0915 | 2391.3051 | 1873.9083 | 2908.7020 |
| 14.52 | .0894 | .0818 | .0969 | 2445.1623 | 1932.0522 | 2958.2724 |
| 15.32 | .0943 | .0864 | .1023 | 2495.1170 | 1983.4714 | 3006.7626 |
| 16.13 | .0993 | .0909 | .1077 | 2539.3426 | 2032.2972 | 3046.3880 |
| 16.94 | .1043 | .0955 | .1131 | 2577.5675 | 2078.8729 | 3076.2620 |
| 17.74 | .1092 | .1000 | .1185 | 2613.2377 | 2122.4005 | 3104.0750 |
| 18.55 | .1142 | .1045 | .1238 | 2645.6056 | 2165.5149 | 3125.6963 |
| 19.35 | .1192 | .1091 | .1292 | 2673.7763 | 2205.3074 | 3142.2453 |
| 20.16 | .1241 | .1136 | .1346 | 2699.8305 | 2236.7407 | 3162.9203 |
| 20.97 | .1291 | .1182 | .1400 | 2722.2712 | 2265.7028 | 3178.8398 |
| 21.77 | .1341 | .1227 | .1454 | 2740.8897 | 2299.9138 | 3181.8657 |
| 22.58 | .1390 | .1273 | .1508 | 2758.4704 | 2328.6655 | 3188.2754 |
| 23.39 | .1440 | .1318 | .1562 | 2774.7448 | 2352.4293 | 3197.0602 |
| 24.19 | .1490 | .1364 | .1615 | 2788.7643 | 2373.2424 | 3204.2862 |
| 25.00 | .1539 | .1409 | .1669 | 2800.5063 | 2394.6269 | 3206.3857 |
| 25.81 | .1589 | .1455 | .1723 | 2811.7792 | 2415.0017 | 3208.5566 |
| 26.61 | .1638 | .1500 | .1777 | 2821.9678 | 2429.0447 | 3214.8910 |
| 27.42 | .1688 | .1545 | .1831 | 2830.4479 | 2444.2039 | 3216.6918 |
| 28.23 | .1738 | .1591 | .1885 | 2837.2719 | 2456.9333 | 3217.6106 |
| 29.03 | .1787 | .1636 | .1938 | 2842.8841 | 2466.1893 | 3219.5789 |
| 29.84 | .1837 | .1682 | .1992 | 2849.0198 | 2475.7554 | 3222.2841 |
| 30.65 | .1887 | .1727 | .2046 | 2854.2417 | 2486.5305 | 3221.9529 |
| 31.45 | .1936 | .1773 | .2100 | 2858.9887 | 2494.0985 | 3223.8790 |
| 32.26 | .1986 | .1818 | .2154 | 2863.4712 | 2497.6341 | 3229.3084 |
| 33.06 | .2036 | .1864 | .2208 | 2866.8565 | 2503.7991 | 3229.9140 |
| 33.87 | .2085 | .1909 | .2261 | 2869.7965 | 2512.1626 | 3227.4305 |
| 34.68 | .2135 | .1955 | .2315 | 2871.5731 | 2518.4520 | 3224.6942 |
| 35.48 | .2185 | .2000 | .2369 | 2873.1184 | 2522.2716 | 3223.9653 |
| 36.29 | .2234 | .2045 | .2423 | 2873.8475 | 2524.1828 | 3223.5122 |
| 37.10 | .2284 | .2091 | .2477 | 2874.6448 | 2525.6334 | 3223.6563 |
| 37.90 | .2334 | .2136 | .2531 | 2875.0168 | 2526.4722 | 3223.5613 |
| 38.71 | .2383 | .2182 | .2585 | 2874.4876 | 2524.0527 | 3224.9225 |
| 39.52 | .2433 | .2227 | .2638 | 2874.7769 | 2524.4575 | 3225.0962 |
| 40.32 | .2483 | .2273 | .2692 | 2874.8362 | 2524.5221 | 3225.1503 |
| 41.13 | .2532 | .2318 | .2746 | 2874.4308 | 2526.1292 | 3222.7324 |
| 41.94 | .2582 | .2364 | .2800 | 2873.1526 | 2526.2619 | 3220.0433 |
| 42.74 | .2631 | .2409 | .2854 | 2871.0146 | 2525.0269 | 3217.0023 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2681 | .2455 | .2908 | 2868.3248 | 2523.1066 | 3213.5431 |
| 44.35 | .2731 | .2500 | .2961 | 2865.2769 | 2520.5601 | 3209.9938 |
| 45.16 | .2780 | .2545 | .3015 | 2862.4629 | 2517.4233 | 3207.5026 |
| 45.97 | .2830 | .2591 | .3069 | 2859.7900 | 2513.0028 | 3206.5773 |
| 46.77 | .2880 | .2636 | .3123 | 2856.6862 | 2510.6798 | 3202.6925 |
| 47.58 | .2929 | .2682 | .3177 | 2854.2220 | 2508.1865 | 3200.2576 |
| 48.39 | .2979 | .2727 | .3231 | 2851.2232 | 2504.6908 | 3197.7557 |
| 49.19 | .3029 | .2773 | .3285 | 2848.1022 | 2502.6069 | 3193.5976 |
| 50.00 | .3078 | .2818 | .3338 | 2844.7198 | 2498.3733 | 3191.0663 |
| 50.81 | .3128 | .2864 | .3392 | 2839.4213 | 2494.3550 | 3184.4877 |
| 51.61 | .3178 | .2909 | .3446 | 2834.2778 | 2491.1850 | 3177.3707 |
| 52.42 | .3227 | .2955 | .3500 | 2829.4647 | 2487.6159 | 3171.3136 |
| 53.23 | .3277 | .3000 | .3554 | 2824.1272 | 2482.0980 | 3166.1563 |
| 54.03 | .3327 | .3045 | .3608 | 2818.4720 | 2475.7414 | 3161.2025 |
| 54.84 | .3376 | .3091 | .3661 | 2812.7021 | 2470.3959 | 3155.0082 |
| 55.65 | .3426 | .3136 | .3715 | 2807.0796 | 2464.7331 | 3149.4260 |
| 56.45 | .3476 | .3182 | .3769 | 2799.8079 | 2456.7768 | 3142.8389 |
| 57.26 | .3525 | .3227 | .3823 | 2791.6342 | 2444.7939 | 3138.4745 |
| 58.06 | .3575 | .3273 | .3877 | 2783.1130 | 2433.6220 | 3132.6041 |
| 58.87 | .3624 | .3318 | .3931 | 2773.3599 | 2425.3489 | 3121.3707 |
| 59.68 | .3674 | .3364 | .3985 | 2762.9403 | 2413.6415 | 3112.2390 |
| 60.48 | .3724 | .3409 | .4038 | 2751.2329 | 2399.6761 | 3102.7897 |
| 61.29 | .3773 | .3455 | .4092 | 2740.2078 | 2391.2279 | 3089.1877 |
| 62.10 | .3823 | .3500 | .4146 | 2728.8394 | 2382.7666 | 3074.9121 |
| 62.90 | .3873 | .3545 | .4200 | 2715.7695 | 2372.2278 | 3059.3112 |
| 63.71 | .3922 | .3591 | .4254 | 2702.5398 | 2357.6389 | 3047.4407 |
| 64.52 | .3972 | .3636 | .4308 | 2688.8404 | 2343.0470 | 3034.6339 |
| 65.32 | .4022 | .3682 | .4361 | 2675.3877 | 2330.1481 | 3020.6273 |
| 66.13 | .4071 | .3727 | .4415 | 2662.1713 | 2319.3293 | 3005.0132 |
| 66.94 | .4121 | .3773 | .4469 | 2649.3055 | 2310.2878 | 2988.3231 |
| 67.74 | .4171 | .3818 | .4523 | 2637.0740 | 2309.5849 | 2964.5630 |
| 68.55 | .4220 | .3864 | .4577 | 2623.4088 | 2303.8965 | 2942.9211 |
| 69.35 | .4270 | .3909 | .4631 | 2608.4831 | 2289.6410 | 2927.3251 |
| 70.16 | .4320 | .3955 | .4685 | 2593.8872 | 2280.3134 | 2907.4610 |
| 70.97 | .4369 | .4000 | .4738 | 2577.2821 | 2259.7080 | 2894.8563 |
| 71.77 | .4419 | .4046 | .4792 | 2561.1299 | 2240.5366 | 2881.7232 |
| 72.58 | .4469 | .4091 | .4846 | 2545.1835 | 2220.8183 | 2869.5489 |
| 73.39 | .4518 | .4136 | .4900 | 2529.2288 | 2200.8713 | 2857.5862 |
| 74.19 | .4568 | .4182 | .4954 | 2514.2934 | 2190.9509 | 2837.6359 |
| 75.00 | .4617 | .4227 | .5008 | 2499.9293 | 2180.8189 | 2819.0397 |
| 75.81 | .4667 | .4273 | .5061 | 2483.7794 | 2163.4445 | 2804.1142 |
| 76.61 | .4717 | .4318 | .5115 | 2467.0346 | 2144.9338 | 2789.1355 |
| 77.42 | .4766 | .4364 | .5169 | 2450.3193 | 2127.9415 | 2772.6971 |
| 78.23 | .4816 | .4409 | .5223 | 2435.9662 | 2118.0287 | 2753.9037 |
| 79.03 | .4866 | .4455 | .5277 | 2421.6738 | 2106.7662 | 2736.5813 |
| 79.84 | .4915 | .4500 | .5331 | 2406.6572 | 2094.8505 | 2718.4640 |
| 80.65 | .4965 | .4546 | .5384 | 2391.4948 | 2084.5418 | 2698.4479 |
| 81.45 | .5015 | .4591 | .5438 | 2376.3506 | 2072.0121 | 2680.6892 |
| 82.26 | .5064 | .4636 | .5492 | 2359.9619 | 2058.2972 | 2661.6267 |
| 83.06 | .5114 | .4682 | .5546 | 2343.4240 | 2046.6704 | 2640.1778 |
| 83.87 | .5164 | .4727 | .5600 | 2328.0088 | 2034.0621 | 2621.9555 |
| 84.68 | .5213 | .4773 | .5654 | 2312.4452 | 2020.0016 | 2604.8888 |
| 85.48 | .5263 | .4818 | .5708 | 2296.8338 | 2006.6184 | 2587.0491 |
| 86.29 | .5313 | .4864 | .5761 | 2280.9606 | 1994.8274 | 2567.0937 |
| 87.10 | .5362 | .4909 | .5815 | 2265.0679 | 1981.7576 | 2548.3783 |
| 87.90 | .5412 | .4955 | .5869 | 2249.1552 | 1965.7215 | 2532.5889 |
| 88.71 | .5462 | .5000 | .5923 | 2232.3401 | 1949.2994 | 2515.3807 |
| 89.52 | .5511 | .5046 | .5977 | 2215.3879 | 1934.6026 | 2496.1732 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5561 | .5091 | .6031 | 2198.1009 | 1919.2804 | 2476.9214 |
| 91.13 | .5610 | .5136 | .6084 | 2181.0201 | 1901.8137 | 2460.2263 |
| 91.94 | .5660 | .5182 | .6138 | 2163.9528 | 1883.1708 | 2444.7348 |
| 92.74 | .5710 | .5227 | .6192 | 2145.8561 | 1865.0740 | 2426.6382 |
| 93.55 | .5759 | .5273 | .6246 | 2127.6139 | 1847.1024 | 2408.1255 |
| 94.35 | .5809 | .5318 | .6300 | 2108.6294 | 1827.6688 | 2389.5900 |
| 95.16 | .5859 | .5364 | .6354 | 2089.5475 | 1807.7857 | 2371.3093 |
| 95.97 | .5908 | .5409 | .6408 | 2070.9862 | 1787.6872 | 2354.2851 |
| 96.77 | .5958 | .5455 | .6461 | 2052.5068 | 1769.6109 | 2335.4027 |
| 97.58 | .6008 | .5500 | .6515 | 2033.8807 | 1750.0885 | 2317.6729 |
| 98.39 | .6057 | .5546 | .6569 | 2010.3788 | 1718.7040 | 2302.0537 |
| 99.19 | .6107 | .5591 | .6623 | 1983.3887 | 1682.3773 | 2284.3999 |
| 100.00 | .6157 | .5636 | .6677 | 1947.5539 | 1638.6585 | 2256.4492 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .6206 | .5686 | .6725 | 1904.0982 | 1589.7141 | 2218.4823 |
| 2.67 | .6254 | .5736 | .6773 | 1852.2381 | 1536.7176 | 2167.7586 |
| 4.00 | .6303 | .5785 | .6821 | 1793.0064 | 1474.8251 | 2111.1877 |
| 5.33 | .6352 | .5835 | .6870 | 1727.7396 | 1415.1121 | 2040.3671 |
| 6.67 | .6401 | .5883 | .6919 | 1659.3158 | 1359.2429 | 1959.3887 |
| 8.00 | .6450 | .5932 | .6968 | 1591.0564 | 1300.3271 | 1881.7856 |
| 9.33 | .6499 | .5980 | .7017 | 1523.3241 | 1242.0927 | 1804.5556 |
| 10.67 | .6548 | .6029 | .7067 | 1459.6777 | 1187.9408 | 1731.4146 |
| 12.00 | .6597 | .6077 | .7117 | 1399.1327 | 1141.0040 | 1657.2614 |
| 13.33 | .6646 | .6124 | .7167 | 1341.8144 | 1097.6074 | 1586.0214 |
| 14.67 | .6694 | .6171 | .7217 | 1288.3407 | 1049.1997 | 1527.4816 |
| 16.00 | .6743 | .6219 | .7268 | 1236.0442 | 1005.2416 | 1466.8468 |
| 17.33 | .6792 | .6265 | .7319 | 1186.3722 | 964.8985 | 1407.8460 |
| 18.67 | .6841 | .6312 | .7370 | 1139.1027 | 927.2142 | 1350.9913 |
| 20.00 | .6890 | .6359 | .7422 | 1095.0792 | 892.5298 | 1297.6286 |
| 21.33 | .6939 | .6405 | .7473 | 1053.0400 | 856.7447 | 1249.3352 |
| 22.67 | .6988 | .6451 | .7525 | 1013.0901 | 824.4401 | 1201.7401 |
| 24.00 | .7037 | .6496 | .7577 | 974.8540 | 796.1760 | 1153.5320 |
| 25.33 | .7086 | .6542 | .7629 | 938.6829 | 768.1775 | 1109.1883 |
| 26.67 | .7134 | .6587 | .7682 | 904.5105 | 739.2651 | 1069.7559 |
| 28.00 | .7183 | .6632 | .7735 | 872.0610 | 711.4493 | 1032.6727 |
| 29.33 | .7232 | .6677 | .7788 | 840.9072 | 686.0063 | 995.8081 |
| 30.67 | .7281 | .6721 | .7841 | 810.0386 | 659.9553 | 960.1218 |
| 32.00 | .7330 | .6766 | .7894 | 780.9014 | 634.7568 | 927.0461 |
| 33.33 | .7379 | .6810 | .7948 | 753.9982 | 611.2459 | 896.7505 |
| 34.67 | .7428 | .6854 | .8002 | 728.2765 | 589.3771 | 867.1760 |
| 36.00 | .7477 | .6898 | .8056 | 704.2560 | 570.6066 | 837.9053 |
| 37.33 | .7526 | .6942 | .8110 | 681.1219 | 550.2386 | 812.0052 |
| 38.67 | .7575 | .6985 | .8164 | 658.7540 | 528.6794 | 788.8285 |
| 40.00 | .7623 | .7028 | .8219 | 637.8936 | 510.2441 | 765.5431 |
| 41.33 | .7672 | .7071 | .8273 | 617.7568 | 493.5347 | 741.9790 |
| 42.67 | .7721 | .7114 | .8328 | 598.1981 | 476.5672 | 719.8290 |
| 44.00 | .7770 | .7157 | .8383 | 580.0054 | 460.5784 | 699.4325 |
| 45.33 | .7819 | .7200 | .8438 | 561.9808 | 444.6524 | 679.3093 |
| 46.67 | .7868 | .7242 | .8494 | 544.4940 | 430.1807 | 658.8073 |
| 48.00 | .7917 | .7285 | .8549 | 527.5411 | 416.6257 | 638.4565 |
| 49.33 | .7966 | .7327 | .8605 | 511.1165 | 402.8734 | 619.3596 |
| 50.67 | .8015 | .7369 | .8660 | 495.4716 | 387.9626 | 602.9807 |
| 52.00 | .8063 | .7411 | .8716 | 480.7791 | 375.7061 | 585.8521 |
| 53.33 | .8112 | .7453 | .8772 | 465.7836 | 363.2112 | 568.3561 |
| 54.67 | .8161 | .7494 | .8828 | 451.2083 | 348.3974 | 554.0193 |
| 56.00 | .8210 | .7536 | .8884 | 438.0007 | 336.8681 | 539.1334 |

TABLE VII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 70° F AND THE TWO-SIDED TOLERANCE LIMITS - Concluded

(c) Thrust corrected to vacuum pressure altitude - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .8259 | .7577 | .8941 | 424.4465 | 324.1052 | 524.7877 |
| 58.67 | .8308 | .7619 | .8997 | 412.4682 | 314.0708 | 510.8655 |
| 60.00 | .8357 | .7660 | .9054 | 401.7756 | 307.3071 | 496.2441 |
| 61.33 | .8406 | .7701 | .9110 | 390.5586 | 298.3997 | 482.7176 |
| 62.67 | .8455 | .7742 | .9167 | 380.7095 | 290.9875 | 470.4315 |
| 64.00 | .8503 | .7783 | .9224 | 370.5793 | 279.2780 | 461.8806 |
| 65.33 | .8552 | .7824 | .9281 | 359.7040 | 265.4061 | 454.0018 |
| 66.67 | .8601 | .7865 | .9338 | 348.3283 | 253.0975 | 443.5590 |
| 68.00 | .8650 | .7905 | .9395 | 337.3324 | 242.0264 | 432.6385 |
| 69.33 | .8699 | .7946 | .9452 | 328.3641 | 234.3927 | 422.3355 |
| 70.67 | .8748 | .7986 | .9510 | 319.0463 | 227.0833 | 411.0094 |
| 72.00 | .8797 | .8027 | .9567 | 309.4565 | 219.1186 | 399.7944 |
| 73.33 | .8846 | .8067 | .9625 | 300.9247 | 211.2617 | 390.5877 |
| 74.67 | .8895 | .8107 | .9682 | 292.8332 | 204.5929 | 381.0734 |
| 76.00 | .8944 | .8147 | .9740 | 284.5126 | 196.5410 | 372.4843 |
| 77.33 | .8992 | .8187 | .9797 | 276.4818 | 188.9881 | 363.9755 |
| 78.67 | .9041 | .8227 | .9855 | 269.1266 | 182.8596 | 355.3936 |
| 80.00 | .9090 | .8267 | .9913 | 262.2100 | 177.3512 | 347.0687 |
| 81.33 | .9139 | .8307 | .9971 | 255.5590 | 173.4801 | 337.6380 |
| 82.67 | .9188 | .8347 | 1.0029 | 248.8581 | 166.6553 | 331.0609 |
| 84.00 | .9237 | .8387 | 1.0087 | 241.7264 | 159.6450 | 323.8078 |
| 85.33 | .9286 | .8427 | 1.0145 | 235.0206 | 155.6245 | 314.4167 |
| 86.67 | .9335 | .8466 | 1.0203 | 228.3924 | 150.5706 | 306.2142 |
| 88.00 | .9384 | .8506 | 1.0261 | 222.2223 | 146.2521 | 298.1924 |
| 89.33 | .9432 | .8545 | 1.0320 | 216.5944 | 141.0506 | 292.1381 |
| 90.67 | .9481 | .8585 | 1.0378 | 211.6711 | 136.8468 | 286.4954 |
| 92.00 | .9530 | .8624 | 1.0436 | 206.2429 | 131.1978 | 281.2881 |
| 93.33 | .9579 | .8664 | 1.0495 | 200.4277 | 123.9730 | 276.8824 |
| 94.67 | .9628 | .8703 | 1.0553 | 195.1405 | 117.3585 | 272.9225 |
| 96.00 | .9677 | .8742 | 1.0611 | 190.1864 | 113.0641 | 267.3087 |
| 97.33 | .9726 | .8782 | 1.0670 | 185.5576 | 110.6363 | 260.4790 |
| 98.67 | .9775 | .8821 | 1.0728 | 180.3647 | 108.3940 | 252.3354 |
| 100.00 | .9824 | .8860 | 1.0787 | 175.2670 | 105.3755 | 245.1585 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS

(a) Chamber pressure

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO-SIDED TOLERANCE LIMITS MEAN | MIN. | MAX. | TRANSFORMED CHAMBER PRESSURE MEAN | MIN. | MAX. |
|---|---|---|---|---|---|---|
| .00 | .0000 | -.0000 | .0000 | 100.4714 | 96.5831 | 104.3597 |
| .81 | .0045 | .0041 | .0048 | 182.2445 | 46.1364 | 318.3526 |
| 1.61 | .0089 | .0082 | .0097 | 280.9791 | 74.2267 | 487.7316 |
| 2.42 | .0134 | .0122 | .0145 | 390.7089 | 150.8435 | 630.5743 |
| 3.23 | .0179 | .0163 | .0194 | 509.6899 | 242.0068 | 777.3729 |
| 4.03 | .0223 | .0204 | .0242 | 629.2284 | 342.0253 | 916.4315 |
| 4.84 | .0268 | .0245 | .0291 | 748.9143 | 455.8182 | 1042.0103 |
| 5.65 | .0313 | .0286 | .0339 | 865.8748 | 571.9367 | 1159.8130 |
| 6.45 | .0357 | .0327 | .0388 | 971.4636 | 682.1950 | 1260.7321 |
| 7.26 | .0402 | .0367 | .0436 | 1067.3973 | 778.8780 | 1355.9166 |
| 8.06 | .0446 | .0408 | .0485 | 1155.7943 | 863.7377 | 1447.8511 |
| 8.87 | .0491 | .0449 | .0533 | 1235.5085 | 938.2390 | 1532.7780 |
| 9.68 | .0536 | .0490 | .0582 | 1306.3743 | 1003.8936 | 1608.8550 |
| 10.48 | .0580 | .0531 | .0630 | 1370.4126 | 1061.1570 | 1679.6682 |
| 11.29 | .0625 | .0571 | .0679 | 1428.1159 | 1112.2638 | 1743.9680 |
| 12.10 | .0670 | .0612 | .0727 | 1480.0157 | 1159.3715 | 1800.6600 |
| 12.90 | .0714 | .0653 | .0776 | 1526.7368 | 1202.7085 | 1850.7650 |
| 13.71 | .0759 | .0694 | .0824 | 1568.6574 | 1243.4224 | 1893.8924 |
| 14.52 | .0804 | .0735 | .0873 | 1606.4622 | 1282.2600 | 1930.6643 |
| 15.32 | .0848 | .0776 | .0921 | 1640.8203 | 1318.7459 | 1962.8946 |
| 16.13 | .0893 | .0816 | .0970 | 1671.7324 | 1353.0563 | 1990.4085 |
| 16.94 | .0938 | .0857 | .1018 | 1699.6355 | 1385.6725 | 2013.5987 |
| 17.74 | .0982 | .0898 | .1066 | 1724.9109 | 1416.3120 | 2033.5097 |
| 18.55 | .1027 | .0939 | .1115 | 1747.3967 | 1444.2479 | 2050.5454 |
| 19.35 | .1072 | .0980 | .1163 | 1767.6257 | 1469.7494 | 2065.5020 |
| 20.16 | .1116 | .1020 | .1212 | 1785.7855 | 1493.3883 | 2078.1825 |
| 20.97 | .1161 | .1061 | .1260 | 1801.8133 | 1515.3066 | 2088.3201 |
| 21.77 | .1205 | .1102 | .1309 | 1816.1481 | 1535.3300 | 2096.9662 |
| 22.58 | .1250 | .1143 | .1357 | 1829.1330 | 1554.1429 | 2104.1230 |
| 23.39 | .1295 | .1184 | .1406 | 1840.6910 | 1572.2544 | 2109.1276 |
| 24.19 | .1339 | .1225 | .1454 | 1850.8470 | 1587.5462 | 2114.1478 |
| 25.00 | .1384 | .1265 | .1503 | 1859.7029 | 1601.0294 | 2118.3764 |
| 25.81 | .1429 | .1306 | .1551 | 1867.6655 | 1614.0126 | 2121.3184 |
| 26.61 | .1473 | .1347 | .1600 | 1874.8149 | 1625.7839 | 2123.8460 |
| 27.42 | .1518 | .1388 | .1648 | 1881.3154 | 1636.3720 | 2126.2588 |
| 28.23 | .1563 | .1429 | .1697 | 1887.1240 | 1646.8072 | 2127.4409 |
| 29.03 | .1607 | .1470 | .1745 | 1892.2191 | 1654.8697 | 2129.5685 |
| 29.84 | .1652 | .1510 | .1794 | 1896.8153 | 1661.8142 | 2131.8164 |
| 30.65 | .1697 | .1551 | .1842 | 1900.8095 | 1668.4355 | 2133.1834 |
| 31.45 | .1741 | .1592 | .1891 | 1903.8680 | 1672.2199 | 2135.5162 |
| 32.26 | .1786 | .1633 | .1939 | 1906.2636 | 1675.8242 | 2136.7031 |
| 33.06 | .1831 | .1674 | .1988 | 1908.3840 | 1678.5312 | 2138.2369 |
| 33.87 | .1875 | .1714 | .2036 | 1910.3903 | 1680.0735 | 2140.7069 |
| 34.68 | .1920 | .1755 | .2084 | 1912.0164 | 1682.6203 | 2141.4123 |
| 35.48 | .1965 | .1796 | .2133 | 1913.3392 | 1684.9965 | 2141.6819 |
| 36.29 | .2009 | .1837 | .2181 | 1914.4245 | 1686.7992 | 2142.0498 |
| 37.10 | .2054 | .1878 | .2230 | 1915.2498 | 1688.1790 | 2142.3206 |
| 37.90 | .2098 | .1919 | .2278 | 1915.7499 | 1689.3781 | 2142.1217 |
| 38.71 | .2143 | .1959 | .2327 | 1916.0703 | 1690.4313 | 2141.7093 |
| 39.52 | .2188 | .2000 | .2375 | 1916.0879 | 1690.2298 | 2141.9459 |
| 40.32 | .2232 | .2041 | .2424 | 1915.6025 | 1689.3751 | 2141.8300 |
| 41.13 | .2277 | .2082 | .2472 | 1915.0998 | 1687.6080 | 2142.5918 |
| 41.94 | .2322 | .2123 | .2521 | 1914.4263 | 1686.0725 | 2142.7801 |
| 42.74 | .2366 | .2163 | .2569 | 1913.3520 | 1684.3856 | 2142.3184 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2411 | .2204 | .2618 | 1912.2616 | 1682.6060 | 2141.9172 |
| 44.35 | .2456 | .2245 | .2666 | 1910.9936 | 1680.7668 | 2141.2204 |
| 45.16 | .2500 | .2286 | .2715 | 1909.4622 | 1678.7653 | 2140.1591 |
| 45.97 | .2545 | .2327 | .2763 | 1908.0029 | 1676.6676 | 2139.3380 |
| 46.77 | .2590 | .2368 | .2812 | 1906.6269 | 1675.4777 | 2137.7760 |
| 47.58 | .2634 | .2408 | .2860 | 1905.0857 | 1674.0888 | 2136.0825 |
| 48.39 | .2679 | .2449 | .2909 | 1903.1827 | 1671.5613 | 2134.8041 |
| 49.19 | .2724 | .2490 | .2957 | 1901.0399 | 1669.1794 | 2132.9005 |
| 50.00 | .2768 | .2531 | .3006 | 1898.6057 | 1666.4378 | 2130.7737 |
| 50.81 | .2813 | .2572 | .3054 | 1895.9756 | 1662.8703 | 2129.0810 |
| 51.61 | .2857 | .2612 | .3102 | 1893.2877 | 1658.7314 | 2127.8440 |
| 52.42 | .2902 | .2653 | .3151 | 1890.2352 | 1654.4894 | 2125.9811 |
| 53.23 | .2947 | .2694 | .3199 | 1886.8864 | 1651.2674 | 2122.5053 |
| 54.03 | .2991 | .2735 | .3248 | 1883.5084 | 1648.7432 | 2118.2735 |
| 54.84 | .3036 | .2776 | .3296 | 1879.7989 | 1644.6950 | 2114.9028 |
| 55.65 | .3081 | .2817 | .3345 | 1875.5825 | 1640.5627 | 2110.6022 |
| 56.45 | .3125 | .2857 | .3393 | 1870.9878 | 1636.9194 | 2105.0563 |
| 57.26 | .3170 | .2898 | .3442 | 1865.8720 | 1631.5777 | 2100.1664 |
| 58.06 | .3215 | .2939 | .3490 | 1860.2297 | 1625.7067 | 2094.7527 |
| 58.87 | .3259 | .2980 | .3539 | 1854.2940 | 1619.2146 | 2089.3735 |
| 59.68 | .3304 | .3021 | .3587 | 1847.9689 | 1612.7583 | 2083.1794 |
| 60.48 | .3349 | .3061 | .3636 | 1840.9671 | 1606.1040 | 2075.8302 |
| 61.29 | .3393 | .3102 | .3684 | 1833.5947 | 1598.1584 | 2069.0310 |
| 62.10 | .3438 | .3143 | .3733 | 1825.8696 | 1589.9482 | 2061.7910 |
| 62.90 | .3483 | .3184 | .3781 | 1817.6738 | 1583.8482 | 2051.4993 |
| 63.71 | .3527 | .3225 | .3830 | 1809.3245 | 1576.6963 | 2041.9528 |
| 64.52 | .3572 | .3266 | .3878 | 1800.6179 | 1569.1992 | 2032.0366 |
| 65.32 | .3616 | .3306 | .3927 | 1791.7094 | 1559.5742 | 2023.8446 |
| 66.13 | .3661 | .3347 | .3975 | 1782.9257 | 1550.2313 | 2015.6201 |
| 66.94 | .3706 | .3388 | .4024 | 1774.0112 | 1542.1318 | 2005.8906 |
| 67.74 | .3750 | .3429 | .4072 | 1764.7804 | 1531.2748 | 1998.2860 |
| 68.55 | .3795 | .3470 | .4120 | 1755.2588 | 1523.2743 | 1987.2434 |
| 69.35 | .3840 | .3510 | .4169 | 1745.5979 | 1515.0935 | 1976.1023 |
| 70.16 | .3884 | .3551 | .4217 | 1735.8259 | 1506.3888 | 1965.2630 |
| 70.97 | .3929 | .3592 | .4266 | 1726.1623 | 1498.0252 | 1954.2994 |
| 71.77 | .3974 | .3633 | .4314 | 1716.4847 | 1490.1087 | 1942.8605 |
| 72.58 | .4018 | .3674 | .4363 | 1706.4633 | 1482.1341 | 1930.7926 |
| 73.39 | .4063 | .3715 | .4411 | 1696.3241 | 1473.3257 | 1919.3225 |
| 74.19 | .4108 | .3755 | .4460 | 1686.4576 | 1465.5871 | 1907.3281 |
| 75.00 | .4152 | .3796 | .4508 | 1676.4577 | 1457.8325 | 1895.0829 |
| 75.81 | .4197 | .3837 | .4557 | 1666.0716 | 1448.6143 | 1883.5289 |
| 76.61 | .4242 | .3878 | .4605 | 1655.6826 | 1438.7135 | 1872.6517 |
| 77.42 | .4286 | .3919 | .4654 | 1645.3455 | 1429.1900 | 1861.5010 |
| 78.23 | .4331 | .3960 | .4702 | 1635.2811 | 1421.6691 | 1848.8931 |
| 79.03 | .4376 | .4000 | .4751 | 1625.3223 | 1413.7705 | 1836.8740 |
| 79.84 | .4420 | .4041 | .4799 | 1615.0891 | 1405.1846 | 1824.9936 |
| 80.65 | .4465 | .4082 | .4848 | 1604.6821 | 1396.3947 | 1812.9694 |
| 81.45 | .4509 | .4123 | .4896 | 1594.3355 | 1387.5946 | 1801.0765 |
| 82.26 | .4554 | .4164 | .4945 | 1583.8389 | 1378.1130 | 1789.5649 |
| 83.06 | .4599 | .4204 | .4993 | 1573.5652 | 1369.1404 | 1777.9900 |
| 83.87 | .4643 | .4245 | .5042 | 1563.2199 | 1360.0695 | 1766.3704 |
| 84.68 | .4688 | .4286 | .5090 | 1552.6427 | 1350.7530 | 1754.5323 |
| 85.48 | .4733 | .4327 | .5138 | 1542.3444 | 1341.7073 | 1742.9814 |
| 86.29 | .4777 | .4368 | .5187 | 1531.8699 | 1331.8196 | 1731.9202 |
| 87.10 | .4822 | .4409 | .5235 | 1521.0579 | 1321.5268 | 1720.5889 |
| 87.90 | .4867 | .4449 | .5284 | 1510.1767 | 1311.0554 | 1709.2980 |
| 88.71 | .4911 | .4490 | .5332 | 1498.9956 | 1300.1355 | 1697.8557 |
| 89.52 | .4956 | .4531 | .5381 | 1487.5139 | 1289.5790 | 1685.4488 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5001 | .4572 | .5429 | 1475.8703 | 1278.4965 | 1673.2442 |
| 91.13 | .5045 | .4613 | .5478 | 1463.9547 | 1267.2345 | 1660.6749 |
| 91.94 | .5090 | .4653 | .5526 | 1451.8318 | 1255.4546 | 1648.2091 |
| 92.74 | .5135 | .4694 | .5575 | 1439.3891 | 1242.5684 | 1636.2098 |
| 93.55 | .5179 | .4735 | .5623 | 1426.9048 | 1230.1133 | 1623.6962 |
| 94.35 | .5224 | .4776 | .5672 | 1413.9602 | 1216.5268 | 1611.3935 |
| 95.16 | .5268 | .4817 | .5720 | 1400.5734 | 1202.0630 | 1599.0838 |
| 95.97 | .5313 | .4858 | .5769 | 1386.7538 | 1187.1801 | 1586.3274 |
| 96.77 | .5358 | .4898 | .5817 | 1372.1615 | 1171.2918 | 1573.0311 |
| 97.58 | .5402 | .4939 | .5866 | 1356.1343 | 1153.6758 | 1558.5928 |
| 98.39 | .5447 | .4980 | .5914 | 1337.7424 | 1131.7142 | 1543.7706 |
| 99.19 | .5492 | .5021 | .5963 | 1316.7122 | 1105.8488 | 1527.5756 |
| 100.00 | .5536 | .5062 | .6011 | 1291.4120 | 1073.2629 | 1509.5610 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .5582 | .5108 | .6056 | 1261.7300 | 1041.7465 | 1481.7135 |
| 2.67 | .5628 | .5154 | .6101 | 1227.6062 | 1008.0115 | 1447.2008 |
| 4.00 | .5673 | .5200 | .6146 | 1188.8811 | 969.1849 | 1408.5774 |
| 5.33 | .5719 | .5246 | .6191 | 1147.2421 | 931.1207 | 1363.3635 |
| 6.67 | .5764 | .5291 | .6237 | 1103.5695 | 892.6140 | 1314.5251 |
| 8.00 | .5810 | .5337 | .6283 | 1058.8852 | 854.9628 | 1262.8075 |
| 9.33 | .5855 | .5382 | .6329 | 1014.8648 | 820.0482 | 1209.6815 |
| 10.67 | .5901 | .5427 | .6375 | 971.9146 | 786.8413 | 1156.9878 |
| 12.00 | .5947 | .5471 | .6422 | 930.5580 | 754.9838 | 1106.1321 |
| 13.33 | .5992 | .5516 | .6469 | 891.3381 | 725.0423 | 1057.6338 |
| 14.67 | .6038 | .5560 | .6516 | 854.0251 | 696.9205 | 1011.1297 |
| 16.00 | .6083 | .5604 | .6563 | 818.7983 | 670.4726 | 967.1240 |
| 17.33 | .6129 | .5647 | .6611 | 785.1069 | 645.0645 | 925.1493 |
| 18.67 | .6175 | .5691 | .6658 | 753.3328 | 620.7171 | 885.9485 |
| 20.00 | .6220 | .5734 | .6706 | 723.1350 | 597.3621 | 848.9078 |
| 21.33 | .6266 | .5777 | .6754 | 694.2886 | 575.6328 | 812.9444 |
| 22.67 | .6311 | .5820 | .6803 | 667.0936 | 555.7815 | 778.4057 |
| 24.00 | .6357 | .5863 | .6851 | 641.2545 | 536.6338 | 745.8753 |
| 25.33 | .6402 | .5905 | .6900 | 616.6462 | 518.1824 | 715.1100 |
| 26.67 | .6448 | .5947 | .6949 | 593.3169 | 500.5056 | 686.1281 |
| 28.00 | .6494 | .5989 | .6998 | 571.1113 | 483.5105 | 658.7122 |
| 29.33 | .6539 | .6031 | .7047 | 549.8807 | 467.3035 | 632.4580 |
| 30.67 | .6585 | .6073 | .7097 | 529.5728 | 451.2156 | 607.9299 |
| 32.00 | .6630 | .6114 | .7147 | 510.2908 | 435.8057 | 584.7759 |
| 33.33 | .6676 | .6156 | .7196 | 491.9678 | 420.8056 | 563.1299 |
| 34.67 | .6722 | .6197 | .7246 | 474.3339 | 406.7953 | 541.8725 |
| 36.00 | .6767 | .6238 | .7297 | 457.6683 | 393.8961 | 521.4406 |
| 37.33 | .6813 | .6278 | .7347 | 441.8237 | 381.3096 | 502.3378 |
| 38.67 | .6858 | .6319 | .7398 | 426.5810 | 369.1916 | 483.9703 |
| 40.00 | .6904 | .6360 | .7448 | 412.0638 | 357.4349 | 466.6928 |
| 41.33 | .6950 | .6400 | .7499 | 398.1252 | 346.3096 | 449.9407 |
| 42.67 | .6995 | .6440 | .7550 | 384.6662 | 335.2747 | 434.0577 |
| 44.00 | .7041 | .6480 | .7601 | 371.9054 | 324.4820 | 419.3287 |
| 45.33 | .7086 | .6520 | .7652 | 359.6258 | 314.4436 | 404.8080 |
| 46.67 | .7132 | .6560 | .7704 | 347.7552 | 305.1221 | 390.3883 |
| 48.00 | .7177 | .6599 | .7755 | 336.3741 | 295.3685 | 377.3797 |
| 49.33 | .7223 | .6639 | .7807 | 325.3834 | 285.8547 | 364.9121 |
| 50.67 | .7269 | .6678 | .7859 | 314.7610 | 277.4658 | 352.0562 |
| 52.00 | .7314 | .6718 | .7911 | 304.6064 | 269.3169 | 339.8960 |
| 53.33 | .7360 | .6757 | .7963 | 295.0519 | 261.6063 | 328.4974 |
| 54.67 | .7405 | .6796 | .8015 | 285.8176 | 254.1344 | 317.5007 |
| 56.00 | .7451 | .6835 | .8067 | 277.0101 | 246.7832 | 307.2369 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(a) Chamber pressure - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .7497 | .6874 | .8119 | 268.4653 | 239.5977 | 297.3329 |
| 58.67 | .7542 | .6912 | .8172 | 259.9622 | 232.5423 | 287.3821 |
| 60.00 | .7588 | .6951 | .8224 | 251.8873 | 225.4231 | 278.3515 |
| 61.33 | .7633 | .6990 | .8277 | 243.9868 | 218.4006 | 269.5729 |
| 62.67 | .7679 | .7028 | .8330 | 236.2043 | 212.0061 | 260.4026 |
| 64.00 | .7724 | .7066 | .8383 | 228.9180 | 205.9605 | 251.8755 |
| 65.33 | .7770 | .7105 | .8435 | 221.8911 | 199.8072 | 243.9750 |
| 66.67 | .7816 | .7143 | .8489 | 215.0819 | 194.5140 | 235.6498 |
| 68.00 | .7861 | .7181 | .8542 | 208.6892 | 189.3391 | 228.0392 |
| 69.33 | .7907 | .7219 | .8595 | 202.3983 | 183.9136 | 220.8831 |
| 70.67 | .7952 | .7257 | .8648 | 196.2759 | 178.8853 | 213.6665 |
| 72.00 | .7998 | .7295 | .8701 | 190.4181 | 174.0656 | 206.7705 |
| 73.33 | .8044 | .7333 | .8755 | 184.5726 | 169.3038 | 199.8414 |
| 74.67 | .8089 | .7370 | .8808 | 178.6908 | 163.9185 | 193.4630 |
| 76.00 | .8135 | .7408 | .8861 | 172.9741 | 158.8051 | 187.1430 |
| 77.33 | .8180 | .7446 | .8915 | 167.4887 | 153.8919 | 181.0855 |
| 78.67 | .8226 | .7483 | .8969 | 162.3381 | 149.2658 | 175.4103 |
| 80.00 | .8272 | .7521 | .9022 | 157.4458 | 144.8815 | 170.0101 |
| 81.33 | .8317 | .7558 | .9076 | 152.7962 | 141.4247 | 164.1678 |
| 82.67 | .8363 | .7596 | .9130 | 148.3298 | 137.8864 | 158.7731 |
| 84.00 | .8408 | .7633 | .9184 | 143.9113 | 134.5067 | 153.3159 |
| 85.33 | .8454 | .7670 | .9238 | 139.7917 | 132.3456 | 147.2378 |
| 86.67 | .8499 | .7707 | .9291 | 135.6312 | 128.5409 | 142.7215 |
| 88.00 | .8545 | .7745 | .9345 | 131.4109 | 124.6502 | 138.1717 |
| 89.33 | .8591 | .7782 | .9400 | 127.3799 | 120.8429 | 133.9168 |
| 90.67 | .8636 | .7819 | .9454 | 123.4328 | 116.7120 | 130.1535 |
| 92.00 | .8682 | .7856 | .9508 | 119.7225 | 112.6816 | 126.7635 |
| 93.33 | .8727 | .7893 | .9562 | 116.1767 | 109.4255 | 122.9279 |
| 94.67 | .8773 | .7930 | .9616 | 112.6251 | 106.4384 | 118.8117 |
| 96.00 | .8819 | .7967 | .9670 | 109.3187 | 103.6987 | 114.9387 |
| 97.33 | .8864 | .8004 | .9725 | 106.1427 | 101.0248 | 111.2606 |
| 98.67 | .8910 | .8040 | .9779 | 102.9483 | 97.9111 | 107.9855 |
| 100.00 | .8955 | .8077 | .9833 | 99.8463 | 95.0047 | 104.6879 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO-SIDED TOLERANCE LIMITS | | | TRANSFORMED THRUST AT PA = 14.70 MEANS WITH TWO-SIDED TOLERANCE LIMITS | | |
|---|---|---|---|---|---|---|
| | MEAN | MIN. | MAX. | MEAN | MIN. | MAX. |
| .00 | .0000 | -.0000 | .0000 | -.2987 | -.2987 | -.2987 |
| .81 | .0045 | .0041 | .0048 | 95.5699 | -110.1105 | 301.2504 |
| 1.61 | .0089 | .0082 | .0097 | 244.2624 | -28.0994 | 516.6243 |
| 2.42 | .0134 | .0122 | .0145 | 430.2345 | 107.3004 | 753.1686 |
| 3.23 | .0179 | .0163 | .0194 | 657.5222 | 289.8585 | 1025.1859 |
| 4.03 | .0223 | .0204 | .0242 | 901.9449 | 524.5925 | 1279.2973 |
| 4.84 | .0268 | .0245 | .0291 | 1134.2828 | 722.8256 | 1545.7401 |
| 5.65 | .0313 | .0286 | .0339 | 1352.3602 | 904.6855 | 1800.0351 |
| 6.45 | .0357 | .0327 | .0388 | 1548.4564 | 1082.9919 | 2013.9209 |
| 7.26 | .0402 | .0367 | .0436 | 1725.2637 | 1246.9486 | 2203.5787 |
| 8.06 | .0446 | .0408 | .0485 | 1889.1978 | 1397.7040 | 2380.6917 |
| 8.87 | .0491 | .0449 | .0533 | 2031.7335 | 1532.4894 | 2530.9775 |
| 9.68 | .0536 | .0490 | .0582 | 2153.6542 | 1640.8788 | 2666.4298 |
| 10.48 | .0580 | .0531 | .0630 | 2264.2010 | 1734.0436 | 2794.3584 |
| 11.29 | .0625 | .0571 | .0679 | 2364.9195 | 1828.5427 | 2901.2963 |
| 12.10 | .0670 | .0612 | .0727 | 2455.3224 | 1907.6349 | 3003.0099 |
| 12.90 | .0714 | .0653 | .0776 | 2536.2986 | 1971.7684 | 3100.8287 |
| 13.71 | .0759 | .0694 | .0824 | 2608.8626 | 2039.3264 | 3178.3987 |
| 14.52 | .0804 | .0735 | .0873 | 2675.6950 | 2108.5987 | 3242.7912 |
| 15.32 | .0848 | .0776 | .0921 | 2738.1679 | 2170.8138 | 3305.5221 |
| 16.13 | .0893 | .0816 | .0970 | 2793.0031 | 2229.2379 | 3356.7683 |
| 16.94 | .0938 | .0857 | .1018 | 2839.4857 | 2283.8084 | 3395.1630 |
| 17.74 | .0982 | .0898 | .1066 | 2883.5712 | 2335.2852 | 3431.8573 |
| 18.55 | .1027 | .0939 | .1115 | 2923.6915 | 2386.1811 | 3461.2018 |
| 19.35 | .1072 | .0980 | .1163 | 2958.0916 | 2432.6937 | 3483.4897 |
| 20.16 | .1116 | .1020 | .1212 | 2990.0059 | 2469.9060 | 3510.1058 |
| 20.97 | .1161 | .1061 | .1260 | 3017.5029 | 2504.1392 | 3530.8667 |
| 21.77 | .1205 | .1102 | .1309 | 3041.6068 | 2544.9821 | 3538.2315 |
| 22.58 | .1250 | .1143 | .1357 | 3064.5688 | 2579.7968 | 3549.3408 |
| 23.39 | .1295 | .1184 | .1406 | 3084.7410 | 2607.9129 | 3561.5692 |
| 24.19 | .1339 | .1225 | .1454 | 3102.6187 | 2632.9610 | 3572.2763 |
| 25.00 | .1384 | .1265 | .1503 | 3117.2823 | 2658.0954 | 3576.4693 |
| 25.81 | .1429 | .1306 | .1551 | 3130.7685 | 2681.5996 | 3579.9373 |
| 26.61 | .1473 | .1347 | .1600 | 3143.6235 | 2698.5436 | 3588.7033 |
| 27.42 | .1518 | .1388 | .1648 | 3154.0354 | 2716.3119 | 3591.7589 |
| 28.23 | .1563 | .1429 | .1697 | 3163.4461 | 2731.9916 | 3594.9006 |
| 29.03 | .1607 | .1470 | .1745 | 3171.1876 | 2743.5353 | 3598.8400 |
| 29.84 | .1652 | .1510 | .1794 | 3179.3094 | 2755.3543 | 3603.2645 |
| 30.65 | .1697 | .1551 | .1842 | 3186.1068 | 2768.0857 | 3604.1279 |
| 31.45 | .1741 | .1592 | .1891 | 3191.1792 | 2776.2777 | 3606.0806 |
| 32.26 | .1786 | .1633 | .1939 | 3195.7678 | 2779.8850 | 3611.6505 |
| 33.06 | .1831 | .1674 | .1988 | 3198.9010 | 2786.2633 | 3611.5387 |
| 33.87 | .1875 | .1714 | .2036 | 3202.0877 | 2795.6397 | 3608.5358 |
| 34.68 | .1920 | .1755 | .2084 | 3204.5080 | 2803.0529 | 3605.9631 |
| 35.48 | .1965 | .1796 | .2133 | 3206.5125 | 2807.5842 | 3605.4407 |
| 36.29 | .2009 | .1837 | .2181 | 3208.2384 | 2810.5714 | 3605.9053 |
| 37.10 | .2054 | .1878 | .2230 | 3209.5695 | 2812.6692 | 3606.4699 |
| 37.90 | .2098 | .1919 | .2278 | 3210.6423 | 2814.2245 | 3607.0602 |
| 38.71 | .2143 | .1959 | .2327 | 3210.6453 | 2812.0515 | 3609.2390 |
| 39.52 | .2188 | .2000 | .2375 | 3210.6181 | 2812.2807 | 3608.9555 |
| 40.32 | .2232 | .2041 | .2424 | 3210.1855 | 2811.9845 | 3608.3867 |
| 41.13 | .2277 | .2082 | .2472 | 3209.8375 | 2813.8817 | 3605.7931 |
| 41.94 | .2322 | .2123 | .2521 | 3208.6808 | 2814.2852 | 3603.0765 |
| 42.74 | .2366 | .2163 | .2569 | 3206.5993 | 2813.1519 | 3600.0466 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2411 | .2204 | .2618 | 3204.5197 | 2811.8284 | 3597.2109 |
| 44.35 | .2456 | .2245 | .2666 | 3201.8354 | 2809.5872 | 3594.0836 |
| 45.16 | .2500 | .2286 | .2715 | 3199.1030 | 2806.3813 | 3591.8247 |
| 45.97 | .2545 | .2327 | .2763 | 3196.5213 | 2801.7665 | 3591.2762 |
| 46.77 | .2590 | .2368 | .2812 | 3193.9779 | 2799.9930 | 3587.9628 |
| 47.58 | .2634 | .2408 | .2860 | 3191.1420 | 2797.2762 | 3585.0078 |
| 48.39 | .2679 | .2449 | .2909 | 3188.1505 | 2793.7175 | 3582.5835 |
| 49.19 | .2724 | .2490 | .2957 | 3185.2937 | 2791.9493 | 3578.6382 |
| 50.00 | .2768 | .2531 | .3006 | 3181.3234 | 2787.1448 | 3575.5021 |
| 50.81 | .2813 | .2572 | .3054 | 3175.9484 | 2783.1892 | 3568.7076 |
| 51.61 | .2857 | .2612 | .3102 | 3170.6502 | 2780.0923 | 3561.2081 |
| 52.42 | .2902 | .2653 | .3151 | 3165.6037 | 2776.3744 | 3554.8330 |
| 53.23 | .2947 | .2694 | .3199 | 3159.9271 | 2770.3907 | 3549.4636 |
| 54.03 | .2991 | .2735 | .3248 | 3153.7232 | 2763.4693 | 3543.9771 |
| 54.84 | .3036 | .2776 | .3296 | 3147.7722 | 2758.0373 | 3537.5070 |
| 55.65 | .3081 | .2817 | .3345 | 3141.7628 | 2752.0066 | 3531.5189 |
| 56.45 | .3125 | .2857 | .3393 | 3134.5153 | 2743.8442 | 3525.1863 |
| 57.26 | .3170 | .2898 | .3442 | 3125.8611 | 2730.9036 | 3520.8187 |
| 58.06 | .3215 | .2939 | .3490 | 3116.1501 | 2718.3374 | 3513.9628 |
| 58.87 | .3259 | .2980 | .3539 | 3106.3976 | 2710.1237 | 3502.6716 |
| 59.68 | .3304 | .3021 | .3587 | 3095.8314 | 2698.0025 | 3493.6603 |
| 60.48 | .3349 | .3061 | .3636 | 3083.7539 | 2683.2051 | 3484.3026 |
| 61.29 | .3393 | .3102 | .3684 | 3072.4555 | 2674.6868 | 3470.2243 |
| 62.10 | .3438 | .3143 | .3733 | 3060.1487 | 2665.6597 | 3454.6378 |
| 62.90 | .3483 | .3184 | .3781 | 3045.9123 | 2654.0866 | 3437.7380 |
| 63.71 | .3527 | .3225 | .3830 | 3032.0853 | 2638.5608 | 3425.6098 |
| 64.52 | .3572 | .3266 | .3878 | 3016.7578 | 2622.2339 | 3411.2819 |
| 65.32 | .3616 | .3306 | .3927 | 3001.0343 | 2607.3649 | 3394.7038 |
| 66.13 | .3661 | .3347 | .3975 | 2986.8637 | 2595.8090 | 3377.9185 |
| 66.94 | .3706 | .3388 | .4024 | 2973.0151 | 2586.1142 | 3359.9160 |
| 67.74 | .3750 | .3429 | .4072 | 2959.9289 | 2585.9085 | 3333.9492 |
| 68.55 | .3795 | .3470 | .4120 | 2944.4785 | 2579.3160 | 3309.6410 |
| 69.35 | .3840 | .3510 | .4169 | 2928.3951 | 2563.9414 | 3292.8489 |
| 70.16 | .3884 | .3551 | .4217 | 2913.0880 | 2554.4110 | 3271.7650 |
| 70.97 | .3929 | .3592 | .4266 | 2895.5713 | 2532.3390 | 3258.8036 |
| 71.77 | .3974 | .3633 | .4314 | 2877.6766 | 2511.1309 | 3244.2223 |
| 72.58 | .4018 | .3674 | .4363 | 2858.9015 | 2488.4208 | 3229.3823 |
| 73.39 | .4063 | .3715 | .4411 | 2840.5353 | 2465.7113 | 3215.3592 |
| 74.19 | .4108 | .3755 | .4460 | 2823.1972 | 2454.0924 | 3192.3020 |
| 75.00 | .4152 | .3796 | .4508 | 2806.4795 | 2442.2430 | 3170.7161 |
| 75.81 | .4197 | .3837 | .4557 | 2788.9463 | 2423.1468 | 3154.7457 |
| 76.61 | .4242 | .3878 | .4605 | 2771.2025 | 2403.1613 | 3139.2439 |
| 77.42 | .4286 | .3919 | .4654 | 2754.0471 | 2385.4338 | 3122.6605 |
| 78.23 | .4331 | .3960 | .4702 | 2738.1460 | 2374.5187 | 3101.7732 |
| 79.03 | .4376 | .4000 | .4751 | 2721.6338 | 2361.5193 | 3081.7484 |
| 79.84 | .4420 | .4041 | .4799 | 2704.4711 | 2347.9270 | 3061.0151 |
| 80.65 | .4465 | .4082 | .4848 | 2687.5780 | 2336.5096 | 3038.6464 |
| 81.45 | .4509 | .4123 | .4896 | 2670.3529 | 2322.2812 | 3018.4246 |
| 82.26 | .4554 | .4164 | .4945 | 2652.1658 | 2307.0528 | 2997.2788 |
| 83.06 | .4599 | .4204 | .4993 | 2633.8375 | 2294.2273 | 2973.4477 |
| 83.87 | .4643 | .4245 | .5042 | 2616.5121 | 2280.0498 | 2952.9744 |
| 84.68 | .4688 | .4286 | .5090 | 2598.7949 | 2263.9898 | 2933.5999 |
| 85.48 | .4733 | .4327 | .5138 | 2581.1508 | 2248.8227 | 2913.4788 |
| 86.29 | .4777 | .4368 | .5187 | 2563.2441 | 2235.5121 | 2890.9761 |
| 87.10 | .4822 | .4409 | .5235 | 2545.0913 | 2220.4863 | 2869.6962 |
| 87.90 | .4867 | .4449 | .5284 | 2526.5297 | 2201.8228 | 2851.2367 |
| 88.71 | .4911 | .4490 | .5332 | 2506.8970 | 2182.7318 | 2831.0622 |
| 89.52 | .4956 | .4531 | .5381 | 2487.2228 | 2165.6122 | 2808.8333 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5001 | .4572 | .5429 | 2466.9883 | 2147.6834 | 2786.2933 |
| 91.13 | .5045 | .4613 | .5478 | 2446.9112 | 2127.3355 | 2766.4869 |
| 91.94 | .5090 | .4653 | .5526 | 2427.2829 | 2106.0144 | 2748.5514 |
| 92.74 | .5135 | .4694 | .5575 | 2406.7328 | 2085.4328 | 2728.0328 |
| 93.55 | .5179 | .4735 | .5623 | 2386.1548 | 2065.1571 | 2707.1524 |
| 94.35 | .5224 | .4776 | .5672 | 2364.0050 | 2042.6249 | 2685.3852 |
| 95.16 | .5268 | .4817 | .5720 | 2340.9967 | 2018.9602 | 2663.0332 |
| 95.97 | .5313 | .4858 | .5769 | 2317.6982 | 1994.4012 | 2640.9951 |
| 96.77 | .5358 | .4898 | .5817 | 2293.2184 | 1971.1662 | 2615.2707 |
| 97.58 | .5402 | .4939 | .5866 | 2267.2769 | 1945.2461 | 2589.3078 |
| 98.39 | .5447 | .4980 | .5914 | 2237.5961 | 1907.4265 | 2567.7659 |
| 99.19 | .5492 | .5021 | .5963 | 2204.7148 | 1864.6849 | 2544.7447 |
| 100.00 | .5536 | .5062 | .6011 | 2164.8758 | 1816.0119 | 2513.7396 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .5582 | .5108 | .6056 | 2117.0821 | 1761.8152 | 2472.3490 |
| 2.67 | .5628 | .5154 | .6101 | 2061.9458 | 1704.7134 | 2419.1782 |
| 4.00 | .5673 | .5200 | .6146 | 1999.0893 | 1637.9784 | 2360.2003 |
| 5.33 | .5719 | .5246 | .6191 | 1928.8376 | 1573.2393 | 2284.4359 |
| 6.67 | .5764 | .5291 | .6237 | 1854.4698 | 1512.3633 | 2196.5763 |
| 8.00 | .5810 | .5337 | .6283 | 1777.9636 | 1446.2412 | 2109.6861 |
| 9.33 | .5855 | .5382 | .6329 | 1701.6404 | 1380.5897 | 2022.6911 |
| 10.67 | .5901 | .5427 | .6375 | 1628.3188 | 1318.3589 | 1938.2787 |
| 12.00 | .5947 | .5471 | .6422 | 1558.5025 | 1264.2867 | 1852.7184 |
| 13.33 | .5992 | .5516 | .6469 | 1492.1209 | 1214.0299 | 1770.2120 |
| 14.67 | .6038 | .5560 | .6516 | 1430.3560 | 1158.3196 | 1702.3923 |
| 16.00 | .6083 | .5604 | .6563 | 1370.1309 | 1107.7727 | 1632.4890 |
| 17.33 | .6129 | .5647 | .6611 | 1312.4306 | 1060.9677 | 1563.8935 |
| 18.67 | .6175 | .5691 | .6658 | 1257.8274 | 1017.4340 | 1498.2208 |
| 20.00 | .6220 | .5734 | .6706 | 1206.2427 | 976.8062 | 1435.6793 |
| 21.33 | .6266 | .5777 | .6754 | 1156.9251 | 934.9741 | 1378.8761 |
| 22.67 | .6311 | .5820 | .6803 | 1110.2910 | 897.3321 | 1323.2499 |
| 24.00 | .6357 | .5863 | .6851 | 1066.2191 | 864.7242 | 1267.7142 |
| 25.33 | .6402 | .5905 | .6900 | 1024.3648 | 832.3059 | 1216.4238 |
| 26.67 | .6448 | .5947 | .6949 | 985.0182 | 799.0831 | 1170.9533 |
| 28.00 | .6494 | .5989 | .6998 | 947.5938 | 767.0886 | 1128.0989 |
| 29.33 | .6539 | .6031 | .7047 | 911.2335 | 737.4168 | 1085.0500 |
| 30.67 | .6585 | .6073 | .7097 | 875.7607 | 707.5675 | 1043.9538 |
| 32.00 | .6630 | .6114 | .7147 | 842.3755 | 678.7648 | 1005.9862 |
| 33.33 | .6676 | .6156 | .7196 | 810.9693 | 651.4466 | 970.4921 |
| 34.67 | .6722 | .6197 | .7246 | 781.0013 | 626.0707 | 935.9319 |
| 36.00 | .6767 | .6238 | .7297 | 752.9148 | 604.1130 | 901.7166 |
| 37.33 | .6813 | .6278 | .7347 | 725.6048 | 580.2097 | 870.9999 |
| 38.67 | .6858 | .6319 | .7398 | 699.6699 | 555.4336 | 843.9062 |
| 40.00 | .6904 | .6360 | .7448 | 675.0864 | 533.8809 | 816.2918 |
| 41.33 | .6950 | .6400 | .7499 | 651.1105 | 514.0679 | 788.1530 |
| 42.67 | .6995 | .6440 | .7550 | 628.3946 | 494.4440 | 762.3453 |
| 44.00 | .7041 | .6480 | .7601 | 607.0176 | 475.7863 | 738.2488 |
| 45.33 | .7086 | .6520 | .7652 | 586.2117 | 457.5031 | 714.9202 |
| 46.67 | .7132 | .6560 | .7704 | 566.3288 | 441.1025 | 691.5552 |
| 48.00 | .7177 | .6599 | .7755 | 546.8937 | 425.6027 | 668.1847 |
| 49.33 | .7223 | .6639 | .7807 | 527.8498 | 409.7434 | 645.9562 |
| 50.67 | .7269 | .6678 | .7859 | 509.8289 | 392.7507 | 626.9071 |
| 52.00 | .7314 | .6718 | .7911 | 492.8592 | 378.6435 | 607.0748 |
| 53.33 | .7360 | .6757 | .7963 | 475.4177 | 364.1724 | 586.6630 |
| 54.67 | .7405 | .6796 | .8015 | 458.8945 | 347.5241 | 570.2650 |
| 56.00 | .7451 | .6835 | .8067 | 443.6583 | 334.2840 | 553.0325 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(b) Thrust corrected to sea-level pressure altitude - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .7497 | .6874 | .8119 | 428.4162 | 320.0157 | 536.8167 |
| 58.67 | .7542 | .6912 | .8172 | 414.4736 | 308.4150 | 520.5322 |
| 60.00 | .7588 | .6951 | .8224 | 401.5946 | 300.0903 | 503.0989 |
| 61.33 | .7633 | .6990 | .8277 | 388.2300 | 289.5081 | 486.9519 |
| 62.67 | .7679 | .7028 | .8330 | 376.1939 | 280.4300 | 471.9579 |
| 64.00 | .7724 | .7066 | .8383 | 364.5233 | 267.2903 | 461.7563 |
| 65.33 | .7770 | .7105 | .8435 | 352.4203 | 252.1539 | 452.6868 |
| 66.67 | .7816 | .7143 | .8489 | 340.1921 | 239.0024 | 441.3819 |
| 68.00 | .7861 | .7181 | .8542 | 327.9669 | 226.8336 | 429.1002 |
| 69.33 | .7907 | .7219 | .8595 | 317.4317 | 217.9797 | 416.8836 |
| 70.67 | .7952 | .7257 | .8648 | 307.0229 | 209.8744 | 404.1714 |
| 72.00 | .7998 | .7295 | .8701 | 296.5293 | 201.2332 | 391.8255 |
| 73.33 | .8044 | .7333 | .8755 | 286.2824 | 192.0487 | 380.5162 |
| 74.67 | .8089 | .7370 | .8808 | 276.3611 | 184.0197 | 368.7026 |
| 76.00 | .8135 | .7408 | .8861 | 266.7444 | 174.9730 | 358.5157 |
| 77.33 | .8180 | .7446 | .8915 | 257.9817 | 166.8608 | 349.1025 |
| 78.67 | .8226 | .7483 | .8969 | 249.2131 | 159.6991 | 338.7271 |
| 80.00 | .8272 | .7521 | .9022 | 240.9623 | 153.2052 | 328.7194 |
| 81.33 | .8317 | .7558 | .9076 | 233.5457 | 148.8310 | 318.2604 |
| 82.67 | .8363 | .7596 | .9130 | 225.9967 | 141.3582 | 310.6352 |
| 84.00 | .8408 | .7633 | .9184 | 218.2944 | 133.9235 | 302.6653 |
| 85.33 | .8454 | .7670 | .9238 | 211.2157 | 129.6694 | 292.7620 |
| 86.67 | .8499 | .7707 | .9291 | 204.1115 | 124.2640 | 283.9591 |
| 88.00 | .8545 | .7745 | .9345 | 197.0648 | 119.3559 | 274.7737 |
| 89.33 | .8591 | .7782 | .9400 | 190.6980 | 113.6443 | 267.7518 |
| 90.67 | .8636 | .7819 | .9454 | 184.4126 | 108.5019 | 260.3233 |
| 92.00 | .8682 | .7856 | .9508 | 178.0003 | 102.1820 | 253.8185 |
| 93.33 | .8727 | .7893 | .9562 | 171.3682 | 94.4177 | 248.3186 |
| 94.67 | .8773 | .7930 | .9616 | 165.5157 | 87.4402 | 243.5912 |
| 96.00 | .8819 | .7967 | .9670 | 160.4675 | 83.1085 | 237.8265 |
| 97.33 | .8864 | .8004 | .9725 | 155.4753 | 80.4514 | 230.4991 |
| 98.67 | .8910 | .8040 | .9779 | 149.7029 | 77.8282 | 221.5777 |
| 100.00 | .8955 | .8077 | .9833 | 144.1150 | 74.4993 | 213.7308 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude

| PCT. WEB TIME | TRANSFORMED TIMES MEANS WITH TWO-SIDED TOLERANCE LIMITS | | | TRANSFORMED THRUST AT PA = .00 MEANS WITH TWO-SIDED TOLERANCE LIMITS | | |
|---|---|---|---|---|---|---|
| | MEAN | MIN. | MAX. | MEAN | MIN. | MAX. |
| .00 | .0000 | -.0000 | .0000 | 30.0291 | -85.7719 | 145.8302 |
| .81 | .0045 | .0041 | .0048 | 125.8977 | -79.7951 | 331.5905 |
| 1.61 | .0089 | .0082 | .0097 | 274.5902 | 2.1628 | 547.0177 |
| 2.42 | .0134 | .0122 | .0145 | 460.5623 | 137.5074 | 783.6172 |
| 3.23 | .0179 | .0163 | .0194 | 687.8500 | 320.0347 | 1055.6653 |
| 4.03 | .0223 | .0204 | .0242 | 932.2728 | 554.7389 | 1309.8066 |
| 4.84 | .0268 | .0245 | .0291 | 1164.6106 | 752.9572 | 1576.2641 |
| 5.65 | .0313 | .0286 | .0339 | 1382.6881 | 934.8075 | 1830.5686 |
| 6.45 | .0357 | .0327 | .0388 | 1578.7842 | 1113.1462 | 2044.4221 |
| 7.26 | .0402 | .0367 | .0436 | 1755.5915 | 1277.1302 | 2234.0528 |
| 8.06 | .0446 | .0408 | .0485 | 1919.5256 | 1427.8937 | 2411.1576 |
| 8.87 | .0491 | .0449 | .0533 | 2062.0614 | 1562.6975 | 2561.4252 |
| 9.68 | .0536 | .0490 | .0582 | 2183.9821 | 1671.0971 | 2696.8671 |
| 10.48 | .0580 | .0531 | .0630 | 2294.5288 | 1764.2776 | 2824.7800 |
| 11.29 | .0625 | .0571 | .0679 | 2395.2473 | 1858.7899 | 2931.7047 |
| 12.10 | .0670 | .0612 | .0727 | 2485.6502 | 1937.8971 | 3033.4032 |
| 12.90 | .0714 | .0653 | .0776 | 2566.6264 | 2002.0425 | 3131.2103 |
| 13.71 | .0759 | .0694 | .0824 | 2639.1903 | 2069.6074 | 3208.7734 |
| 14.52 | .0804 | .0735 | .0873 | 2706.0229 | 2138.9039 | 3273.1418 |
| 15.32 | .0848 | .0776 | .0921 | 2768.4958 | 2201.1352 | 3335.8564 |
| 16.13 | .0893 | .0816 | .0970 | 2823.3310 | 2259.5772 | 3387.0848 |
| 16.94 | .0938 | .0857 | .1018 | 2869.8134 | 2314.1478 | 3425.4792 |
| 17.74 | .0982 | .0898 | .1066 | 2913.8991 | 2365.6432 | 3462.1549 |
| 18.55 | .1027 | .0939 | .1115 | 2954.0193 | 2416.5466 | 3491.4920 |
| 19.35 | .1072 | .0980 | .1163 | 2988.4195 | 2463.0670 | 3513.7720 |
| 20.16 | .1116 | .1020 | .1212 | 3020.3338 | 2500.2886 | 3540.3789 |
| 20.97 | .1161 | .1061 | .1260 | 3047.8307 | 2534.5243 | 3561.1371 |
| 21.77 | .1205 | .1102 | .1309 | 3071.9346 | 2575.3822 | 3568.4870 |
| 22.58 | .1250 | .1143 | .1357 | 3094.8966 | 2610.2157 | 3579.5776 |
| 23.39 | .1295 | .1184 | .1406 | 3115.0688 | 2638.3294 | 3591.8082 |
| 24.19 | .1339 | .1225 | .1454 | 3132.9465 | 2663.3829 | 3602.5101 |
| 25.00 | .1384 | .1265 | .1503 | 3147.6102 | 2688.5355 | 3606.6849 |
| 25.81 | .1429 | .1306 | .1551 | 3161.0962 | 2712.0379 | 3610.1544 |
| 26.61 | .1473 | .1347 | .1600 | 3173.9513 | 2728.9975 | 3618.9050 |
| 27.42 | .1518 | .1388 | .1648 | 3184.3632 | 2746.7553 | 3621.9711 |
| 28.23 | .1563 | .1429 | .1697 | 3193.7739 | 2762.4474 | 3625.1004 |
| 29.03 | .1607 | .1470 | .1745 | 3201.5155 | 2774.0030 | 3629.0280 |
| 29.84 | .1652 | .1510 | .1794 | 3209.6373 | 2785.8320 | 3633.4425 |
| 30.65 | .1697 | .1551 | .1842 | 3216.4346 | 2798.5588 | 3634.3104 |
| 31.45 | .1741 | .1592 | .1891 | 3221.5071 | 2806.7608 | 3636.2533 |
| 32.26 | .1786 | .1633 | .1939 | 3226.0956 | 2810.3632 | 3641.8279 |
| 33.06 | .1831 | .1674 | .1988 | 3229.2289 | 2816.7517 | 3641.7060 |
| 33.87 | .1875 | .1714 | .2036 | 3232.4155 | 2826.1146 | 3638.7163 |
| 34.68 | .1920 | .1755 | .2084 | 3234.8358 | 2833.5389 | 3636.1327 |
| 35.48 | .1965 | .1796 | .2133 | 3236.8403 | 2838.0781 | 3635.6025 |
| 36.29 | .2009 | .1837 | .2181 | 3238.5661 | 2841.0589 | 3636.0735 |
| 37.10 | .2054 | .1878 | .2230 | 3239.8974 | 2843.1732 | 3636.6215 |
| 37.90 | .2098 | .1919 | .2278 | 3240.9702 | 2844.7358 | 3637.2047 |
| 38.71 | .2143 | .1959 | .2327 | 3240.9731 | 2842.5572 | 3639.3891 |
| 39.52 | .2188 | .2000 | .2375 | 3240.9460 | 2842.7888 | 3639.1032 |
| 40.32 | .2232 | .2041 | .2424 | 3240.5134 | 2842.4787 | 3638.5480 |
| 41.13 | .2277 | .2082 | .2472 | 3240.1653 | 2844.3746 | 3635.9559 |
| 41.94 | .2322 | .2123 | .2521 | 3239.0086 | 2844.7786 | 3633.2386 |
| 42.74 | .2366 | .2163 | .2569 | 3236.9272 | 2843.6482 | 3630.2061 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 43.55 | .2411 | .2204 | .2618 | 3234.8475 | 2842.3156 | 3627.3794 |
| 44.35 | .2456 | .2245 | .2666 | 3232.1631 | 2840.0745 | 3624.2518 |
| 45.16 | .2500 | .2286 | .2715 | 3229.4308 | 2836.8590 | 3622.0025 |
| 45.97 | .2545 | .2327 | .2763 | 3226.8491 | 2832.2435 | 3621.4547 |
| 46.77 | .2590 | .2368 | .2812 | 3224.3058 | 2830.4867 | 3618.1248 |
| 47.58 | .2634 | .2408 | .2860 | 3221.4697 | 2827.7536 | 3615.1860 |
| 48.39 | .2679 | .2449 | .2909 | 3218.4783 | 2824.1900 | 3612.7666 |
| 49.19 | .2724 | .2490 | .2957 | 3215.6215 | 2822.4245 | 3608.8186 |
| 50.00 | .2768 | .2531 | .3006 | 3211.6512 | 2817.6220 | 3605.6805 |
| 50.81 | .2813 | .2572 | .3054 | 3206.2762 | 2813.6576 | 3598.8948 |
| 51.61 | .2857 | .2612 | .3102 | 3200.9780 | 2810.5756 | 3591.3804 |
| 52.42 | .2902 | .2653 | .3151 | 3195.9315 | 2806.8441 | 3585.0190 |
| 53.23 | .2947 | .2694 | .3199 | 3190.2549 | 2800.8602 | 3579.6496 |
| 54.03 | .2991 | .2735 | .3248 | 3184.0510 | 2793.9386 | 3574.1634 |
| 54.84 | .3036 | .2776 | .3296 | 3178.1000 | 2788.5021 | 3567.6979 |
| 55.65 | .3081 | .2817 | .3345 | 3172.0906 | 2782.4643 | 3561.7168 |
| 56.45 | .3125 | .2857 | .3393 | 3164.8430 | 2774.2898 | 3555.3963 |
| 57.26 | .3170 | .2898 | .3442 | 3156.1889 | 2761.3456 | 3551.0323 |
| 58.06 | .3215 | .2939 | .3490 | 3146.4779 | 2748.7739 | 3544.1819 |
| 58.87 | .3259 | .2980 | .3539 | 3136.7255 | 2740.5724 | 3532.8787 |
| 59.68 | .3304 | .3021 | .3587 | 3126.1592 | 2728.4391 | 3523.8794 |
| 60.48 | .3349 | .3061 | .3636 | 3114.0816 | 2713.6248 | 3514.5385 |
| 61.29 | .3393 | .3102 | .3684 | 3102.7833 | 2705.1163 | 3500.4503 |
| 62.10 | .3438 | .3143 | .3733 | 3090.4765 | 2696.1018 | 3484.8512 |
| 62.90 | .3483 | .3184 | .3781 | 3076.2401 | 2684.5248 | 3467.9554 |
| 63.71 | .3527 | .3225 | .3830 | 3062.4130 | 2668.9938 | 3455.8323 |
| 64.52 | .3572 | .3266 | .3878 | 3047.0856 | 2652.6713 | 3441.5001 |
| 65.32 | .3616 | .3306 | .3927 | 3031.3621 | 2637.8002 | 3424.9241 |
| 66.13 | .3661 | .3347 | .3975 | 3017.1915 | 2626.2474 | 3408.1356 |
| 66.94 | .3706 | .3388 | .4024 | 3003.3428 | 2616.5490 | 3390.1367 |
| 67.74 | .3750 | .3429 | .4072 | 2990.2567 | 2616.3643 | 3364.1491 |
| 68.55 | .3795 | .3470 | .4120 | 2974.8063 | 2609.7672 | 3339.8452 |
| 69.35 | .3840 | .3510 | .4169 | 2958.7229 | 2594.3930 | 3323.0530 |
| 70.16 | .3884 | .3551 | .4217 | 2943.4158 | 2584.8567 | 3301.9748 |
| 70.97 | .3929 | .3592 | .4266 | 2925.8991 | 2562.7859 | 3289.0123 |
| 71.77 | .3974 | .3633 | .4314 | 2908.0044 | 2541.5741 | 3274.4347 |
| 72.58 | .4018 | .3674 | .4363 | 2889.2294 | 2518.8654 | 3259.5934 |
| 73.39 | .4063 | .3715 | .4411 | 2870.8631 | 2496.1496 | 3245.5765 |
| 74.19 | .4108 | .3755 | .4460 | 2853.5250 | 2484.5424 | 3222.5076 |
| 75.00 | .4152 | .3796 | .4508 | 2836.8073 | 2472.6920 | 3200.9226 |
| 75.81 | .4197 | .3837 | .4557 | 2819.2741 | 2453.5955 | 3184.9528 |
| 76.61 | .4242 | .3878 | .4605 | 2801.5304 | 2433.6065 | 3169.4542 |
| 77.42 | .4286 | .3919 | .4654 | 2784.3749 | 2415.8739 | 3152.8760 |
| 78.23 | .4331 | .3960 | .4702 | 2768.4738 | 2404.9705 | 3131.9770 |
| 79.03 | .4376 | .4000 | .4751 | 2751.9617 | 2391.9737 | 3111.9498 |
| 79.84 | .4420 | .4041 | .4799 | 2734.7988 | 2378.3761 | 3091.2215 |
| 80.65 | .4465 | .4082 | .4848 | 2717.9058 | 2366.9646 | 3068.8471 |
| 81.45 | .4509 | .4123 | .4896 | 2700.6807 | 2352.7346 | 3048.6268 |
| 82.26 | .4554 | .4164 | .4945 | 2682.4936 | 2337.5060 | 3027.4813 |
| 83.06 | .4599 | .4204 | .4993 | 2664.1653 | 2324.6757 | 3003.6549 |
| 83.87 | .4643 | .4245 | .5042 | 2646.8398 | 2310.5021 | 2983.1777 |
| 84.68 | .4688 | .4286 | .5090 | 2629.1227 | 2294.4523 | 2963.7931 |
| 85.48 | .4733 | .4327 | .5138 | 2611.4786 | 2279.2947 | 2943.6626 |
| 86.29 | .4777 | .4368 | .5187 | 2593.5719 | 2265.9803 | 2921.1635 |
| 87.10 | .4822 | .4409 | .5235 | 2575.4191 | 2250.9644 | 2899.8738 |
| 87.90 | .4867 | .4449 | .5284 | 2556.8575 | 2232.3079 | 2881.4072 |
| 88.71 | .4911 | .4490 | .5332 | 2537.2248 | 2213.2171 | 2861.2325 |
| 89.52 | .4956 | .4531 | .5381 | 2517.5506 | 2196.0946 | 2839.0066 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Continued

(c) Thrust corrected to vacuum pressure altitude - Continued

| | | | | | | |
|---|---|---|---|---|---|---|
| 90.32 | .5001 | .4572 | .5429 | 2497.3162 | 2178.1698 | 2816.4625 |
| 91.13 | .5045 | .4613 | .5478 | 2477.2390 | 2157.8231 | 2796.6549 |
| 91.94 | .5090 | .4653 | .5526 | 2457.6107 | 2136.4983 | 2778.7230 |
| 92.74 | .5135 | .4694 | .5575 | 2437.0605 | 2115.9239 | 2758.1973 |
| 93.55 | .5179 | .4735 | .5623 | 2416.4826 | 2095.6569 | 2737.3083 |
| 94.35 | .5224 | .4776 | .5672 | 2394.3329 | 2073.1346 | 2715.5311 |
| 95.16 | .5268 | .4817 | .5720 | 2371.3246 | 2049.4767 | 2693.1725 |
| 95.97 | .5313 | .4858 | .5769 | 2348.0259 | 2024.9069 | 2671.1449 |
| 96.77 | .5358 | .4898 | .5817 | 2323.5463 | 2001.6798 | 2645.4128 |
| 97.58 | .5402 | .4939 | .5866 | 2297.6048 | 1975.7554 | 2619.4540 |
| 98.39 | .5447 | .4980 | .5914 | 2267.9240 | 1937.9285 | 2597.9194 |
| 99.19 | .5492 | .5021 | .5963 | 2235.0426 | 1895.1886 | 2574.8965 |
| 100.00 | .5536 | .5062 | .6011 | 2195.2036 | 1846.5073 | 2543.8999 |
| PCT. TAILOFF TIME | | | | | | |
| 1.33 | .5582 | .5108 | .6056 | 2147.4099 | 1792.2971 | 2502.5226 |
| 2.67 | .5628 | .5154 | .6101 | 2092.2737 | 1735.1855 | 2449.3618 |
| 4.00 | .5673 | .5200 | .6146 | 2029.4172 | 1668.4247 | 2390.4096 |
| 5.33 | .5719 | .5246 | .6191 | 1959.1655 | 1603.6720 | 2314.6589 |
| 6.67 | .5764 | .5291 | .6237 | 1884.7976 | 1542.7759 | 2226.8193 |
| 8.00 | .5810 | .5337 | .6283 | 1808.2915 | 1476.6447 | 2139.9384 |
| 9.33 | .5855 | .5382 | .6329 | 1731.9682 | 1410.9784 | 2052.9581 |
| 10.67 | .5901 | .5427 | .6375 | 1658.6466 | 1348.7349 | 1968.5583 |
| 12.00 | .5947 | .5471 | .6422 | 1588.8304 | 1294.6630 | 1882.9978 |
| 13.33 | .5992 | .5516 | .6469 | 1522.4487 | 1244.4074 | 1800.4902 |
| 14.67 | .6038 | .5560 | .6516 | 1460.6838 | 1188.6948 | 1732.6728 |
| 16.00 | .6083 | .5604 | .6563 | 1400.4587 | 1138.1532 | 1662.7643 |
| 17.33 | .6129 | .5647 | .6611 | 1342.7585 | 1091.3500 | 1594.1669 |
| 18.67 | .6175 | .5691 | .6658 | 1288.1552 | 1047.8220 | 1528.4883 |
| 20.00 | .6220 | .5734 | .6706 | 1236.5706 | 1007.1976 | 1465.9435 |
| 21.33 | .6266 | .5777 | .6754 | 1187.2528 | 965.3641 | 1409.1417 |
| 22.67 | .6311 | .5820 | .6803 | 1140.6188 | 927.7188 | 1353.5190 |
| 24.00 | .6357 | .5863 | .6851 | 1096.5469 | 895.1182 | 1297.9758 |
| 25.33 | .6402 | .5905 | .6900 | 1054.6926 | 862.7038 | 1246.6816 |
| 26.67 | .6448 | .5947 | .6949 | 1015.3460 | 829.4740 | 1201.2180 |
| 28.00 | .6494 | .5989 | .6998 | 977.9216 | 797.4770 | 1158.3661 |
| 29.33 | .6539 | .6031 | .7047 | 941.5613 | 767.7959 | 1115.3266 |
| 30.67 | .6585 | .6073 | .7097 | 906.0885 | 737.9432 | 1074.2338 |
| 32.00 | .6630 | .6114 | .7147 | 872.7033 | 709.1369 | 1036.2697 |
| 33.33 | .6676 | .6156 | .7196 | 841.2971 | 681.8086 | 1000.7856 |
| 34.67 | .6722 | .6197 | .7246 | 811.3292 | 656.4335 | 966.2249 |
| 36.00 | .6767 | .6238 | .7297 | 783.2426 | 634.4837 | 932.0015 |
| 37.33 | .6813 | .6278 | .7347 | 755.9327 | 610.5791 | 901.2862 |
| 38.67 | .6858 | .6319 | .7398 | 729.9977 | 585.7945 | 874.2010 |
| 40.00 | .6904 | .6360 | .7448 | 705.4142 | 564.2324 | 846.5960 |
| 41.33 | .6950 | .6400 | .7499 | 681.4383 | 544.4154 | 818.4611 |
| 42.67 | .6995 | .6440 | .7550 | 658.7225 | 524.7954 | 792.6495 |
| 44.00 | .7041 | .6480 | .7601 | 637.3454 | 506.1382 | 768.5525 |
| 45.33 | .7086 | .6520 | .7652 | 616.5395 | 487.8614 | 745.2176 |
| 46.67 | .7132 | .6560 | .7704 | 596.6566 | 471.4603 | 721.8529 |
| 48.00 | .7177 | .6599 | .7755 | 577.2215 | 455.9559 | 698.4871 |
| 49.33 | .7223 | .6639 | .7807 | 558.1776 | 440.0839 | 676.2714 |
| 50.67 | .7269 | .6678 | .7859 | 540.1567 | 423.0800 | 657.2334 |
| 52.00 | .7314 | .6718 | .7911 | 523.1870 | 408.9748 | 637.3991 |
| 53.33 | .7360 | .6757 | .7963 | 505.7455 | 394.5086 | 616.9824 |
| 54.67 | .7405 | .6796 | .8015 | 489.2223 | 377.8679 | 600.5768 |
| 56.00 | .7451 | .6835 | .8067 | 473.9861 | 364.6393 | 583.3329 |

TABLE VIII. - VARIATION OF MOTOR PERFORMANCE VERSUS MOTOR OPERATING TIME TRANSFORMED TO A PREFIRE PROPELLANT TEMPERATURE OF 140° F AND THE TWO-SIDED TOLERANCE LIMITS - Concluded

(c) Thrust corrected to vacuum pressure altitude - Concluded

| | | | | | | |
|---|---|---|---|---|---|---|
| 57.33 | .7497 | .6874 | .8119 | 458.7440 | 350.3872 | 567.1009 |
| 58.67 | .7542 | .6912 | .8172 | 444.8014 | 338.7904 | 550.8125 |
| 60.00 | .7588 | .6951 | .8224 | 431.9224 | 330.4629 | 533.3819 |
| 61.33 | .7633 | .6990 | .8277 | 418.5578 | 319.8865 | 517.2292 |
| 62.67 | .7679 | .7028 | .8330 | 406.5218 | 310.8051 | 502.2385 |
| 64.00 | .7724 | .7066 | .8383 | 394.8511 | 297.6566 | 492.0457 |
| 65.33 | .7770 | .7105 | .8435 | 382.7482 | 282.5095 | 482.9868 |
| 66.67 | .7816 | .7143 | .8489 | 370.5200 | 269.3521 | 471.6879 |
| 68.00 | .7861 | .7181 | .8542 | 358.2947 | 257.1948 | 459.3947 |
| 69.33 | .7907 | .7219 | .8595 | 347.7595 | 248.3426 | 447.1764 |
| 70.67 | .7952 | .7257 | .8648 | 337.3507 | 240.2280 | 434.4735 |
| 72.00 | .7998 | .7295 | .8701 | 326.8572 | 231.5729 | 422.1414 |
| 73.33 | .8044 | .7333 | .8755 | 316.6102 | 222.3883 | 410.8322 |
| 74.67 | .8089 | .7370 | .8808 | 306.6890 | 214.3664 | 399.0115 |
| 76.00 | .8135 | .7408 | .8861 | 297.0722 | 205.3057 | 388.8387 |
| 77.33 | .8180 | .7446 | .8915 | 288.3095 | 197.1905 | 379.4284 |
| 78.67 | .8226 | .7483 | .8969 | 279.5409 | 190.0361 | 369.0458 |
| 80.00 | .8272 | .7521 | .9022 | 271.2901 | 183.5502 | 359.0300 |
| 81.33 | .8317 | .7558 | .9076 | 263.8735 | 179.1798 | 348.5672 |
| 82.67 | .8363 | .7596 | .9130 | 256.3245 | 171.7028 | 340.9463 |
| 84.00 | .8408 | .7633 | .9184 | 248.6222 | 164.2504 | 332.9940 |
| 85.33 | .8454 | .7670 | .9238 | 241.5435 | 159.9896 | 323.0974 |
| 86.67 | .8499 | .7707 | .9291 | 234.4394 | 154.5938 | 314.2849 |
| 88.00 | .8545 | .7745 | .9345 | 227.3926 | 149.6840 | 305.1013 |
| 89.33 | .8591 | .7782 | .9400 | 221.0259 | 143.9630 | 298.0887 |
| 90.67 | .8636 | .7819 | .9454 | 214.7404 | 138.8244 | 290.6564 |
| 92.00 | .8682 | .7856 | .9508 | 208.3281 | 132.5060 | 284.1502 |
| 93.33 | .8727 | .7893 | .9562 | 201.6960 | 124.7428 | 278.6492 |
| 94.67 | .8773 | .7930 | .9616 | 195.8435 | 117.7606 | 273.9264 |
| 96.00 | .8819 | .7967 | .9670 | 190.7953 | 113.4158 | 268.1747 |
| 97.33 | .8864 | .8004 | .9725 | 185.8031 | 110.7568 | 260.8494 |
| 98.67 | .8910 | .8040 | .9779 | 180.0308 | 108.1492 | 251.9124 |
| 100.00 | .8955 | .8077 | .9833 | 174.4429 | 104.8332 | 244.0525 |

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS

(a) Transformed to 20° F

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Time, t, sec: | | | | | | | |
| Ignition delay, $t_d$ | | | | | | | |
| All 17 motors | 0.014 | 0.010 | 0.018 | 0.007 | 0.021 | 0.006 | 0.022 |
| Duplicating only a failed igniter cartridge (3 motors) | .012 | .012 | .012 | .012 | .012 | .012 | .012 |
| Simulating only a failed nozzle closure (4 motors) | .014 | .014 | .014 | .014 | .014 | .014 | .014 |
| Duplicating a failed igniter cartridge and simulating a failed nozzle closure (4 motors) | .014 | .014 | .014 | .013 | .014 | .013 | .014 |
| Duplicating normal ignition conditions (6 motors) | .014 | .013 | .017 | .007 | .022 | .006 | .023 |
| Thrust rise, $t_f$ | | | | | | | |
| All 17 motors | .079 | .067 | .105 | .047 | .110 | .044 | .113 |
| Duplicating only a failed igniter cartridge (3 motors) | .080 | .080 | .080 | .080 | .080 | .080 | .080 |
| Simulating only a failed nozzle closure (4 motors) | .083 | .080 | .086 | .068 | .097 | .066 | .100 |
| Duplicating a failed igniter cartridge and simulating a failed nozzle closure (4 motors) | .079 | .079 | .079 | .075 | .082 | .074 | .083 |
| Duplicating normal ignition conditions (6 motors)[a] | .072 | .065 | .079 | .046 | .098 | .042 | .102 |
| Maximum thrust, $t_{max}$ | .222 | .177 | .284 | .107 | .338 | .095 | .349 |
| Web burn, $t_b$[b] | .649 | .627 | .681 | .600 | .698 | .595 | .703 |
| Action, $t_a$ | 1.046 | 1.017 | 1.085 | .980 | 1.112 | .974 | 1.119 |
| Tailoff, $t_{tail}$ | .686 | .633 | .751 | .561 | .811 | .548 | .823 |
| Total, $t_{total}$ | 1.349 | 1.273 | 1.408 | 1.224 | 1.473 | 1.212 | 1.486 |

[a]Specification requirements were a minimum of 0.060 and a maximum of 0.110.

[b]Specification requirements were a minimum of 0.5 and a maximum of 0.7.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(a) Transformed to 20° F - Continued

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Chamber pressure, P, psia: | | | | | | | |
| Maximum, $P_{max}$ | 1600 | 1536 | 1695 | 1464 | 1774 | 1411 | 1818 |
| Average web burn time, $\overline{P}_b$ | 1396 | 1336 | 1437 | 1283 | 1510 | 1271 | 1521 |
| Average action time, $\overline{P}_a$ | 1001 | 964.5 | 1040 | 929.4 | 1073 | 922.0 | 1081 |
| Average tailoff time, $\overline{P}_{tail}$ | 231 | 205 | 271 | 169 | 293 | 163 | 299 |
| Average total time, $\overline{P}_{total}$ | 789.2 | 762.7 | 843.5 | 715.2 | 863.2 | 707.5 | 870.9 |
| Chamber pressure integral, $\int P\,dt$, psia-sec: | | | | | | | |
| Web burn time, $\int_{t_b} P\,dt$ | 906 | 889 | 930 | 864 | 948 | 860 | 952 |
| Action time, $\int_{t_a} P\,dt$ | 1047 | 1032 | 1060 | 1017 | 1078 | 1014 | 1081 |
| Tailoff time, $\int_{t_{tail}} P\,dt$ | 158 | 139 | 172 | 127 | 189 | 123 | 193 |
| Total time, $\int_{t_{total}} P\,dt$ | 1064 | 1048 | 1080 | 1032 | 1096 | 1028 | 1100 |
| Thrust, F, $lb_f$: | | | | | | | |
| Maximum, $F_{max}$ | | | | | | | |
| Sea level | 2676 | 2536 | 2854 | 2398 | 3018 | 2346 | 3069 |
| Vacuum[c] | 2707 | 2567 | 2884 | 2428 | 3048 | 2377 | 3100 |
| Average web burn time, $\overline{F}_b$ | | | | | | | |
| Sea level | 2309 | 2194 | 2383 | 2106 | 2512 | 2086 | 2533 |
| Vacuum | 2340 | 2224 | 2413 | 2137 | 2542 | 2116 | 2563 |
| Average action time, $\overline{F}_a$ | | | | | | | |
| Sea level | 1648 | 1568 | 1716 | 1507 | 1789 | 1493 | 1803 |
| Vacuum | 1678 | 1599 | 1747 | 1537 | 1819 | 1523 | 1834 |
| Average tailoff time, $\overline{F}_{tail}$ | | | | | | | |
| Sea level | 355 | 303 | 431 | 241 | 468 | 230 | 480 |
| Vacuum | 385 | 333 | 462 | 272 | 498 | 260 | 510 |
| Average total time, $\overline{F}_{total}$ | | | | | | | |
| Sea level | 1291 | 1244 | 1387 | 1158 | 1424 | 1145 | 1438 |
| Vacuum | 1322 | 1275 | 1418 | 1189 | 1455 | 1175 | 1469 |

[c]Specification requirement was a maximum of 4000.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(a) Transformed to 20° F - Concluded

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Impulse, I, $lb_f$-sec: | | | | | | | |
| Web burn time, $I_b$ | | | | | | | |
| Sea level | 1498 | 1459 | 1536 | 1420 | 1576 | 1412 | 1584 |
| Vacuum | 1518 | 1479 | 1556 | 1440 | 1596 | 1432 | 1604 |
| Action time, $I_a$ | | | | | | | |
| Sea level | 1723 | 1690 | 1745 | 1655 | 1792 | 1648 | 1799 |
| Vacuum | 1755 | 1722 | 1776 | 1688 | 1823 | 1681 | 1830 |
| Tailoff time, $I_{tail}$ | | | | | | | |
| Sea level | 243 | 214 | 273 | 182 | 303 | 176 | 309 |
| Vacuum[d] | 263 | 235 | 292 | 203 | 324 | 197 | 330 |
| Total time, $I_{total}$ | | | | | | | |
| Sea level | 1741 | 1711 | 1766 | 1677 | 1805 | 1670 | 1811 |
| Vacuum | 1782 | 1752 | 1805 | 1718 | 1845 | 1712 | 1832 |
| Average-propellant specific impulse, $\bar{I}_{sp}$, $lb_f$-sec/$lb_m$: | | | | | | | |
| Web burn time, $\bar{I}_{sp_b}$ | | | | | | | |
| Sea level | 197 | 195 | 200 | 191 | 204 | 190 | 205 |
| Vacuum | 200 | 197 | 203 | 194 | 206 | 193 | 207 |
| Action time, $\bar{I}_{sp_a}$ | | | | | | | |
| Sea level | 196 | 194 | 199 | 191 | 202 | 190 | 203 |
| Vacuum | 200 | 198 | 203 | 194 | 206 | 194 | 206 |
| Total time, $\bar{I}_{sp_{total}}$ | | | | | | | |
| Sea level | 195 | 192 | 198 | 190 | 201 | 189 | 201 |
| Vacuum | 200 | 197 | 202 | 195 | 205 | 194 | 206 |
| Characteristic velocity, C*, ft/sec | 4700 | 4650 | 4740 | 4590 | 4800 | 4580 | 4820 |
| Average burning rate, $\bar{r}_b$, in/sec (based on $t_b$) | 0.720 | 0.686 | 0.745 | 0.666 | 0.774 | 0.660 | 0.780 |

[d]Specification requirement was a maximum of 500.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(b) Transformed to 70° F

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Time, t, sec: | | | | | | | |
| Ignition delay, $t_d$ | | | | | | | |
| All 17 motors | 0.012 | 0.008 | 0.014 | 0.006 | 0.018 | 0.005 | 0.018 |
| Duplicating only a failed igniter cartridge (3 motors) | .013 | .013 | .013 | .013 | .013 | .013 | .013 |
| Simulating only a failed nozzle closure (4 motors) | .010 | .010 | .010 | .010 | .010 | .010 | .010 |
| Duplicating a failed igniter cartridge and simulating a failed nozzle closure (4 motors) | .012 | .012 | .012 | .011 | .013 | .011 | .013 |
| Duplicating normal ignition conditions (6 motors) | .012 | .011 | .015 | .006 | .019 | .004 | .020 |
| Thrust rise, $t_f$ | | | | | | | |
| All 17 motors | .085 | .073 | .114 | .051 | .119 | .048 | .123 |
| Duplicating only a failed igniter cartridge (3 motors) | .083 | .083 | .083 | .083 | .083 | .083 | .083 |
| Simulating only a failed nozzle closure (4 motors) | .092 | .089 | .094 | .076 | .108 | .073 | .111 |
| Duplicating a failed igniter cartridge and simulating a failed nozzle closure (4 motors) | .089 | .089 | .090 | .087 | .091 | .087 | .092 |
| Duplicating normal ignition conditions (6 motors)[e] | .074 | .067 | .082 | .047 | .102 | .043 | .106 |
| Maximum thrust, $t_{max}$ | .243 | .194 | .310 | .117 | .370 | .104 | .383 |
| Web burn, $t_b$[f] | .616 | .594 | .647 | .568 | .663 | .564 | .668 |
| Action, $t_a$ | .993 | .965 | 1.030 | .931 | 1.055 | .924 | 1.062 |
| Tailoff, $t_{tail}$ | .712 | .655 | .778 | .582 | .842 | .568 | .855 |
| Total, $t_{total}$ | 1.339 | 1.262 | 1.396 | 1.214 | 1.464 | 1.201 | 1.477 |

[e]Specification requirements were a minimum of 0.060 and a maximum of 0.110.

[f]Specification requirements were a minimum of 0.5 and a maximum of 0.7.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(b) Transformed to 70° F - Continued

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Chamber pressure, P, psia: | | | | | | | |
| Maximum, $P_{max}$ | 1699 | 1621 | 1793 | 1545 | 1876 | 1501 | 1899 |
| Average web burn time, $\overline{P}_b$ | 1463 | 1399 | 1508 | 1344 | 1583 | 1331 | 1596 |
| Average action time, $\overline{P}_a$ | 1054 | 1016 | 1095 | 978.6 | 1130 | 970.8 | 1138 |
| Average tailoff time, $\overline{P}_{tail}$ | 229 | 203 | 270 | 167 | 292 | 161 | 298 |
| Average total time, $\overline{P}_{total}$ | 795.0 | 769.4 | 850.9 | 718.8 | 871.2 | 711.0 | 879.0 |
| Chamber pressure integral, $\int P\,dt$, psia-sec: | | | | | | | |
| Web burn time, $\int_{t_b} P\,dt$ | 901 | 884 | 924 | 859 | 942 | 855 | 946 |
| Action time, $\int_{t_a} P\,dt$ | 1046 | 1031 | 1059 | 1016 | 1077 | 1012 | 1081 |
| Tailoff time, $\int_{t_{tail}} P\,dt$ | 163 | 144 | 177 | 131 | 195 | 127 | 198 |
| Total time, $\int_{t_{total}} P\,dt$ | 1064 | 1048 | 1080 | 1031 | 1096 | 1028 | 1100 |
| Thrust, F, $lb_f$: | | | | | | | |
| Maximum, $F_{max}$ | | | | | | | |
| Sea level | 2845 | 2678 | 3020 | 2532 | 3193 | 2496 | 3200 |
| Vacuum[g] | 2875 | 2709 | 3050 | 2563 | 3223 | 2526 | 3230 |
| Average web burn time, $\overline{F}_b$ | | | | | | | |
| Sea level | 2422 | 2298 | 2499 | 2208 | 2636 | 2186 | 2658 |
| Vacuum | 2452 | 2328 | 2529 | 2238 | 2666 | 2216 | 2688 |
| Average action time, $\overline{F}_a$ | | | | | | | |
| Sea level | 1736 | 1653 | 1809 | 1588 | 1884 | 1573 | 1900 |
| Vacuum | 1767 | 1683 | 1840 | 1619 | 1915 | 1603 | 1930 |
| Average tailoff time, $\overline{F}_{tail}$ | | | | | | | |
| Sea level | 352 | 301 | 429 | 238 | 466 | 227 | 478 |
| Vacuum | 382 | 331 | 460 | 269 | 496 | 257 | 508 |
| Average total time, $\overline{F}_{total}$ | | | | | | | |
| Sea level | 1301 | 1253 | 1399 | 1165 | 1438 | 1151 | 1452 |
| Vacuum | 1331 | 1284 | 1430 | 1195 | 1468 | 1181 | 1482 |

[g]Specification requirement was a maximum of 4000.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(b) Transformed to 70° F - Concluded

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Impulse, I, $lb_f$-sec: | | | | | | | |
| Web burn time, $I_b$ | | | | | | | |
| Sea level | 1490 | 1452 | 1528 | 1413 | 1567 | 1405 | 1575 |
| Vacuum | 1509 | 1470 | 1547 | 1432 | 1586 | 1424 | 1594 |
| Action time, $I_a$ | | | | | | | |
| Sea level | 1724 | 1690 | 1746 | 1655 | 1792 | 1648 | 1800 |
| Vacuum | 1754 | 1720 | 1776 | 1686 | 1822 | 1679 | 1829 |
| Tailoff time, $I_{tail}$ | | | | | | | |
| Sea level | 250 | 220 | 281 | 188 | 312 | 181 | 319 |
| Vacuum[h] | 272 | 243 | 301 | 210 | 334 | 203 | 340 |
| Total time, $I_{total}$ | | | | | | | |
| Sea level[i] | 1741 | 1710 | 1766 | 1676 | 1805 | 1670 | 1811 |
| Vacuum | 1781 | 1752 | 1804 | 1717 | 1845 | 1711 | 1852 |
| Average-propellant specific impulse, $\bar{I}_{sp}$, $lb_f$-sec/$lb_m$: | | | | | | | |
| Web burn time, $\bar{I}_{sp_b}$ | | | | | | | |
| Sea level | 198 | 195 | 201 | 191 | 204 | 190 | 205 |
| Vacuum | 200 | 197 | 203 | 194 | 206 | 193 | 207 |
| Action time, $\bar{I}_{sp_a}$ | | | | | | | |
| Sea level | 197 | 194 | 199 | 191 | 202 | 190 | 203 |
| Vacuum | 200 | 197 | 203 | 194 | 206 | 194 | 206 |
| Total time, $\bar{I}_{sp_{total}}$ | | | | | | | |
| Sea level | 195 | 192 | 198 | 190 | 201 | 189 | 201 |
| Vacuum | 200 | 197 | 202 | 195 | 205 | 194 | 206 |
| Characteristic velocity, C*, ft/sec | 4700 | 4650 | 4740 | 4580 | 4800 | 4570 | 4810 |
| Average burning rate, $\bar{r}_b$, in/sec (based on $t_b$) | 0.759 | 0.722 | 0.786 | 0.701 | 0.817 | 0.695 | 0.822 |

[h] Specification requirement was a maximum of 500.

[i] Specification requirements were a minimum of 1697.5 and a maximum of 1802.5.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(c) Transformed to 140° F

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Time, t, sec: | | | | | | | |
| Ignition delay, $t_d$ | | | | | | | |
| All 17 motors | 0.013 | 0.009 | 0.016 | 0.006 | 0.019 | 0.006 | 0.020 |
| Duplicating only a failed igniter cartridge (3 motors) | .009 | .009 | .009 | .009 | .009 | .009 | .009 |
| Simulating only a failed nozzle closure (4 motors) | .012 | .012 | .012 | .012 | .012 | .012 | .012 |
| Duplicating a failed igniter cartridge and simulating a failed nozzle closure (4 motors) | .015 | .015 | .016 | .013 | .017 | .013 | .018 |
| Duplicating normal ignition conditions (6 motors) | .012 | .011 | .015 | .005 | .020 | .004 | .021 |
| Thrust rise, $t_f$ | | | | | | | |
| All 17 motors | .088 | .075 | .117 | .053 | .123 | .050 | .126 |
| Duplicating only a failed igniter cartridge (3 motors) | .082 | .082 | .082 | .082 | .082 | .082 | .082 |
| Simulating only a failed nozzle closure (4 motors) | .116 | .113 | .120 | .096 | .137 | .093 | .141 |
| Duplicating a failed igniter cartridge and simulating a failed nozzle closure (4 motors) | .086 | .086 | .086 | .085 | .087 | .085 | .087 |
| Duplicating normal ignition conditions (6 motors)[j] | .082 | .074 | .091 | .052 | .113 | .047 | .118 |
| Maximum thrust, $t_{max}$ | .225 | .179 | .287 | .108 | .342 | .096 | .354 |
| Web burn, $t_b$[k] | .554 | .534 | .582 | .511 | .597 | .506 | .601 |
| Action, $t_a$ | .911 | .885 | .945 | .854 | .968 | .849 | .974 |
| Tailoff, $t_{tail}$ | .680 | .624 | .741 | .554 | .805 | .542 | .818 |
| Total, $t_{total}$ | 1.246 | 1.173 | 1.297 | 1.128 | 1.365 | 1.115 | 1.378 |

[j]Specification requirements were a minimum of 0.060 and a maximum of 0.110.

[k]Specification requirements were a minimum of 0.5 and a maximum of 0.7.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Continued

(c) Transformed to 140° F - Continued

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Chamber pressure, P, psia: | | | | | | | |
| Maximum, $P_{max}$ | 1916 | 1823 | 2022 | 1738 | 2117 | 1690 | 2142 |
| Average web burn time, $\overline{P}_b$ | 1634 | 1559 | 1685 | 1498 | 1769 | 1484 | 1783 |
| Average action time, $\overline{P}_a$ | 1165 | 1124 | 1211 | 1081 | 1248 | 1072 | 1257 |
| Average tailoff time, $\overline{P}_{tail}$ | 251 | 222 | 296 | 181 | 321 | 174 | 328 |
| Average total time, $\overline{P}_{total}$ | 862.5 | 834.4 | 924.9 | 777.3 | 947.7 | 768.5 | 956.5 |
| Chamber pressure integral, $\int P\,dt$, psia-sec: | | | | | | | |
| Web burn time, $\int_{t_b} P\,dt$ | 904 | 887 | 928 | 863 | 945 | 858 | 950 |
| Action time, $\int_{t_a} P\,dt$ | 1061 | 1044 | 1073 | 1029 | 1093 | 1026 | 1096 |
| Tailoff time, $\int_{t_{tail}} P\,dt$ | 170 | 150 | 185 | 136 | 204 | 133 | 207 |
| Total time, $\int_{t_{total}} P\,dt$ | 1074 | 1058 | 1090 | 1041 | 1107 | 1038 | 1111 |
| Thrust, F, $lb_f$: | | | | | | | |
| Maximum, $F_{max}$ | | | | | | | |
| Sea level | 3211 | 3016 | 3410 | 2852 | 3606 | 2814 | 3609 |
| Vacuum[1] | 3241 | 3047 | 3440 | 2882 | 3636 | 2845 | 3642 |
| Average web burn time, $\overline{F}_b$ | | | | | | | |
| Sea level | 2707 | 2564 | 2794 | 2465 | 2948 | 2441 | 2973 |
| Vacuum | 2737 | 2595 | 2824 | 2496 | 2979 | 2471 | 3004 |
| Average action time, $\overline{F}_a$ | | | | | | | |
| Sea level | 1921 | 1830 | 2004 | 1758 | 2085 | 1741 | 2102 |
| Vacuum | 1952 | 1860 | 2034 | 1788 | 2115 | 1772 | 2132 |
| Average tailoff time, $\overline{F}_{tail}$ | | | | | | | |
| Sea level | 388 | 332 | 474 | 262 | 514 | 249 | 528 |
| Vacuum | 418 | 362 | 504 | 292 | 545 | 279 | 558 |
| Average total time, $\overline{F}_{total}$ | | | | | | | |
| Sea level | 1414 | 1361 | 1524 | 1262 | 1566 | 1246 | 1582 |
| Vacuum | 1444 | 1391 | 1554 | 1292 | 1596 | 1277 | 1612 |

[1]Specification requirement was a maximum of 4000.

TABLE IX. - SUMMARY OF MOTOR PERFORMANCE DATA TRANSFORMED TO SPECIFIC PREFIRE PROPELLANT TEMPERATURES AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS - Concluded

(c) Transformed to 140° F - Concluded

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Impulse, I, $lb_f$-sec: | | | | | | | |
| Web burn time, $I_b$ | | | | | | | |
| Sea level | 1498 | 1459 | 1536 | 1421 | 1575 | 1413 | 1583 |
| Vacuum | 1515 | 1476 | 1552 | 1438 | 1592 | 1430 | 1600 |
| Action time, $I_a$ | | | | | | | |
| Sea level | 1750 | 1715 | 1774 | 1680 | 1820 | 1673 | 1828 |
| Vacuum | 1778 | 1743 | 1801 | 1708 | 1847 | 1701 | 1854 |
| Tailoff time, $I_{tail}$ | | | | | | | |
| Sea level | 263 | 232 | 295 | 198 | 328 | 191 | 335 |
| Vacuum[m] | 284 | 253 | 315 | 219 | 348 | 212 | 355 |
| Total time, $I_{total}$ | | | | | | | |
| Sea level | 1761 | 1731 | 1787 | 1696 | 1826 | 1689 | 1833 |
| Vacuum | 1799 | 1769 | 1823 | 1734 | 1864 | 1728 | 1871 |
| Average-propellant specific impulse, $\bar{I}_{sp}$, $lb_f$-sec/$lb_m$: | | | | | | | |
| Web burn time, $\bar{I}_{sp_b}$ | | | | | | | |
| Sea level | 200 | 197 | 203 | 193 | 206 | 193 | 207 |
| Vacuum | 202 | 199 | 205 | 196 | 208 | 195 | 209 |
| Action time, $\bar{I}_{sp_a}$ | | | | | | | |
| Sea level | 199 | 196 | 202 | 193 | 205 | 192 | 205 |
| Vacuum | 202 | 199 | 205 | 196 | 208 | 196 | 209 |
| Total time, $\bar{I}_{sp_{total}}$ | | | | | | | |
| Sea level | 198 | 195 | 200 | 192 | 203 | 192 | 204 |
| Vacuum | 202 | 199 | 204 | 196 | 207 | 196 | 208 |
| Characteristic velocity, C*, ft/sec | 4740 | 4690 | 4790 | 4630 | 4850 | 4620 | 4870 |
| Average burning rate, $\bar{r}_b$, in/sec (based on $t_b$) | 0.844 | 0.802 | 0.875 | 0.779 | 0.909 | 0.772 | 0.916 |

[m]Specification requirement was a maximum of 500.

TABLE X. - SUMMARY OF MOTOR PHYSICAL MEASUREMENTS

| Motor serial number | 38A | 60A | 78 | 43A | 45A | 37A | 44A | 50A | 58A | 59A | 64A | 65A | 74A | 40A | 69 | 70 | 77 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Static test firing data[a] | Aug. 7 | Aug. 7 | Aug. 7 | Aug. 28 | Aug. 28 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 1 | Sept. 2 | Sept. 3 | Sept. 3 | Sept. 3 | Sept. 3 |
| Weight, $lb_m$ | | | | | | | | | | | | | | | | | |
| Prefire motor | 48.9 | 48.9 | 48.9 | 49.4 | 48.9 | 49.0 | 49.1 | 48.8 | 48.9 | 49.1 | 48.9 | 49.2 | 49.1 | 49.0 | 48.8 | 48.8 | 49.0 |
| Postfire motor | 40.0 | 39.5 | 39.7 | 40.1 | 39.4 | 39.7 | 39.7 | 39.6 | 39.4 | 39.8 | 39.6 | 40.0 | 39.9 | 39.8 | 39.6 | 39.6 | 39.8 |
| Expended mass | 8.87 | 9.42 | 9.16 | 9.31 | 9.48 | 9.34 | 9.40 | 9.17 | 9.46 | 9.31 | 9.30 | 9.16 | 9.20 | 9.20 | 9.17 | 9.22 | 9.23 |
| Propellant | 8.81 | 8.97 | 8.85 | 8.91 | 8.93 | 8.91 | 8.92 | 8.89 | 8.97 | 8.89 | 8.97 | 8.97 | 9.00 | 8.88 | 8.87 | 8.90 | 8.86 |
| Nozzle throat area, $in^2$ | | | | | | | | | | | | | | | | | |
| Prefire | 1.222 | 1.224 | 1.221 | 1.225 | 1.229 | 1.225 | 1.225 | 1.227 | 1.222 | 1.223 | 1.223 | 1.225 | 1.223 | 1.222 | 1.224 | 1.225 | 1.229 |
| Postfire | 1.219 | 1.224 | 1.220 | 1.221 | 1.229 | 1.223 | 1.225 | 1.227 | 1.221 | 1.222 | 1.222 | 1.221 | 1.215 | 1.221 | 1.225 | 1.219 | 1.225 |
| Nozzle exit area, $in^2$ | | | | | | | | | | | | | | | | | |
| Prefire | 2.074 | 2.071 | 2.074 | 2.066 | 2.054 | 2.071 | 2.054 | 2.079 | 2.076 | 2.076 | 2.069 | 2.069 | 2.054 | 2.074 | 2.066 | 2.071 | 2.079 |
| Postfire | 2.087 | 2.061 | 2.089 | 2.061 | 2.036 | 2.036 | 2.036 | 2.061 | 2.087 | 2.061 | 2.061 | 2.061 | 2.061 | 2.036 | 2.036 | 2.061 | 2.036 |
| Nozzle area ratio | | | | | | | | | | | | | | | | | |
| Prefire | 1.697 | 1.692 | 1.699 | 1.687 | 1.671 | 1.691 | 1.677 | 1.694 | 1.699 | 1.697 | 1.692 | 1.689 | 1.679 | 1.697 | 1.688 | 1.691 | 1.692 |
| Postfire | 1.712 | 1.684 | 1.712 | 1.688 | 1.657 | 1.665 | 1.662 | 1.680 | 1.709 | 1.687 | 1.687 | 1.688 | 1.696 | 1.667 | 1.662 | 1.690 | 1.662 |

[a]Motors were all tested in 1964.

TABLE XI. - SUMMARY OF MOTOR PHYSICAL MEASUREMENTS AND THE ONE-SIDED AND TWO-SIDED TOLERANCE LIMITS

| Parameter | Mean | Minimum | Maximum | Tolerance limits | | | |
|---|---|---|---|---|---|---|---|
| | | | | One-sided | | Two-sided | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Weight, $lb_m$: | | | | | | | |
| Prefire motor[a] | 49.0 | 48.6 | 49.4 | 48.4 | 49.5 | 48.3 | 49.6 |
| Postfire motor[b] | 39.7 | 39.4 | 40.1 | 39.1 | 40.4 | 39.0 | 40.5 |
| Expended mass | 9.2 | 8.9 | 9.5 | 8.7 | 9.8 | 8.7 | 9.8 |
| Propellant | 8.90 | 8.81 | 9.00 | 8.73 | 9.07 | 8.72 | 9.09 |
| Nozzle throat area, $in^2$: | | | | | | | |
| Prefire | 1.224 | 1.221 | 1.229 | 1.216 | 1.232 | 1.216 | 1.233 |
| Postfire | 1.222 | 1.215 | 1.229 | 1.211 | 1.234 | 1.210 | 1.235 |
| Nozzle exit area, $in^2$: | | | | | | | |
| Prefire | 2.069 | 2.054 | 2.079 | 2.041 | 2.097 | 2.038 | 2.100 |
| Postfire | 2.057 | 2.036 | 2.089 | 1.993 | 2.121 | 1.987 | 2.127 |
| Nozzle area ratio: | | | | | | | |
| Prefire | 1.690 | 1.671 | 1.699 | 1.663 | 1.717 | 1.660 | 1.720 |
| Postfire | 1.683 | 1.657 | 1.712 | 1.621 | 1.745 | 1.615 | 1.751 |

[a]Specification requirement was a maximum of 51.0.

[b]Specification requirements were a minimum of 37.7 and a maximum of 42.0.

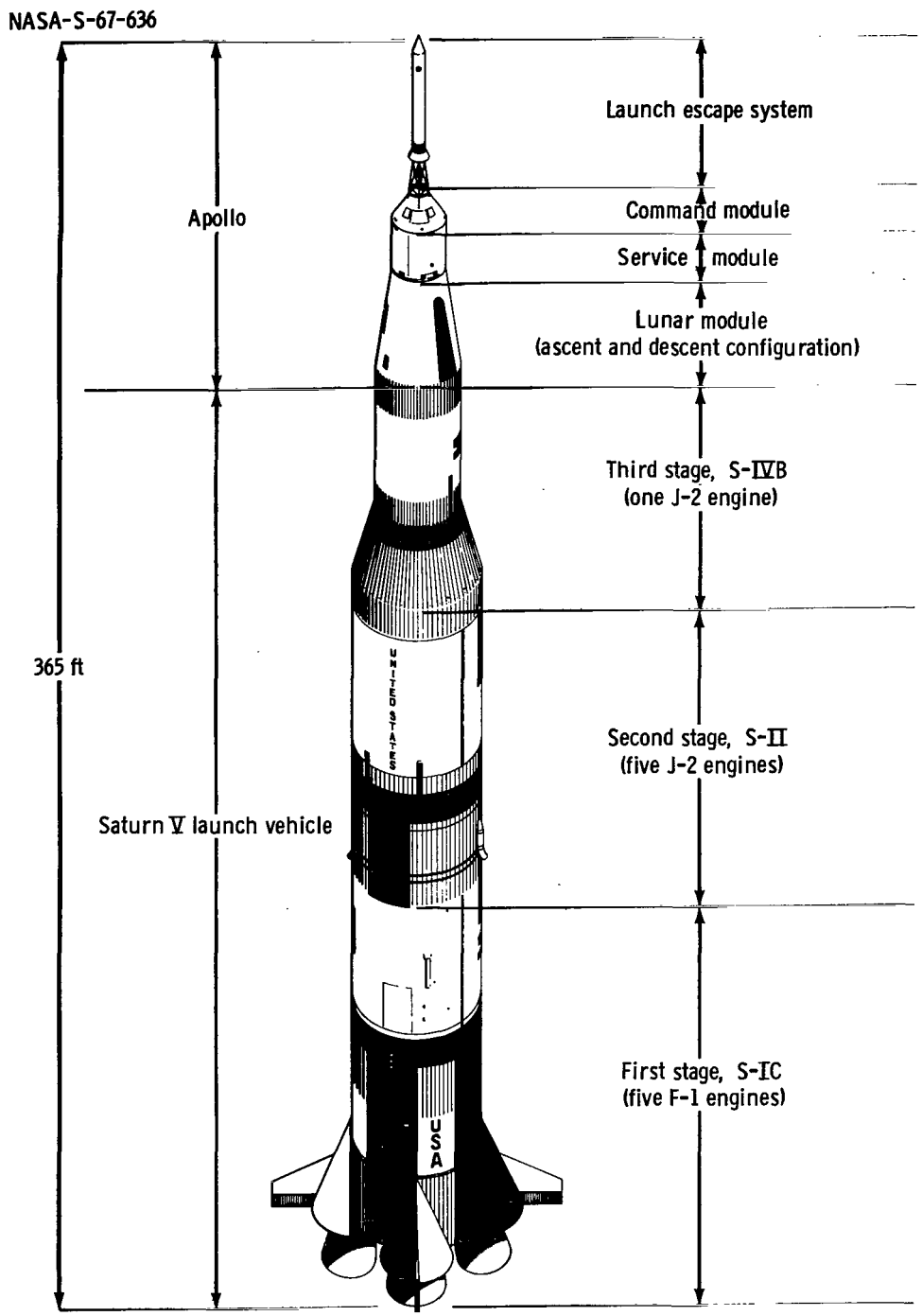



Figure 1.- Saturn V launch vehicle and Apollo spacecraft.

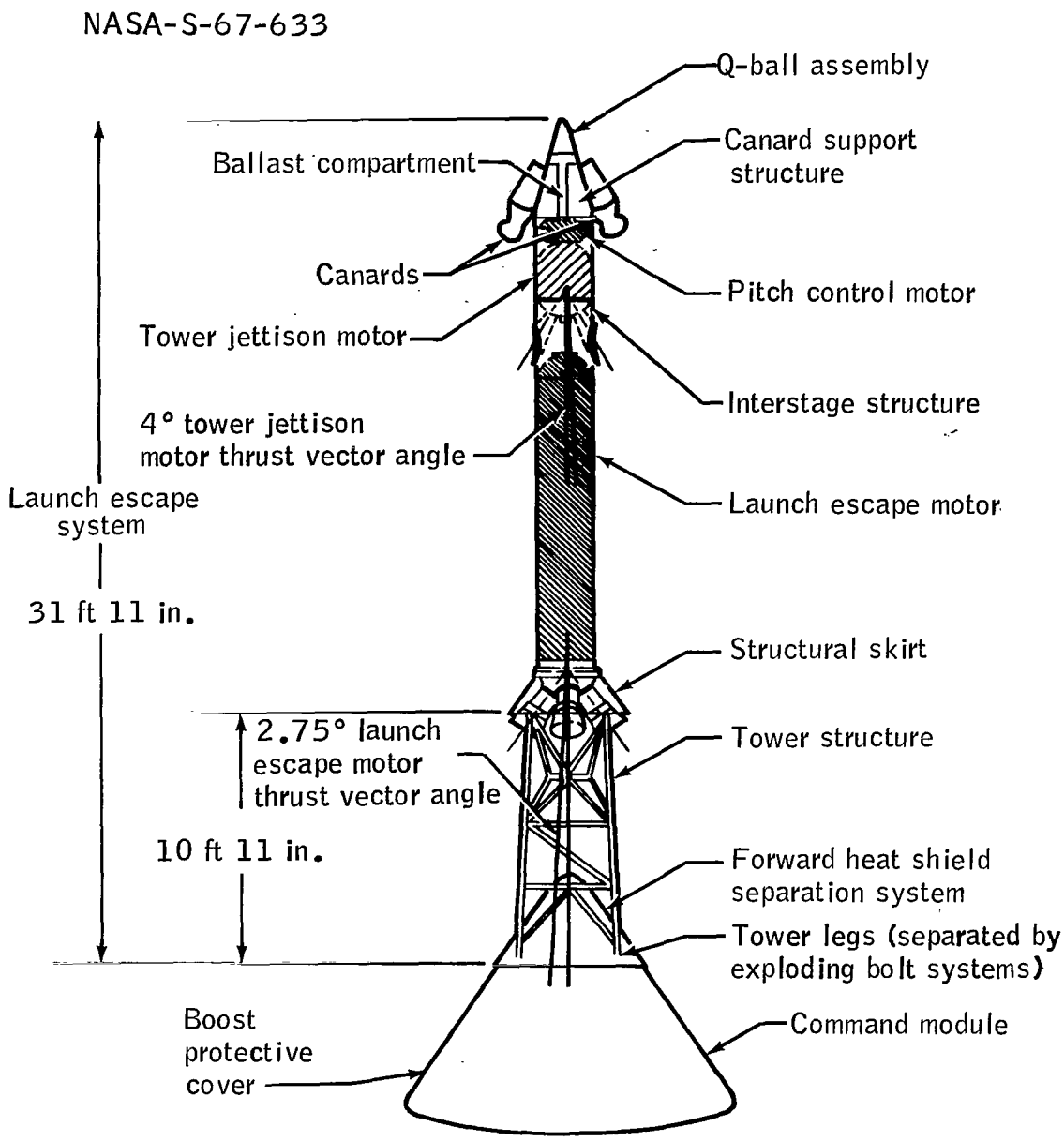
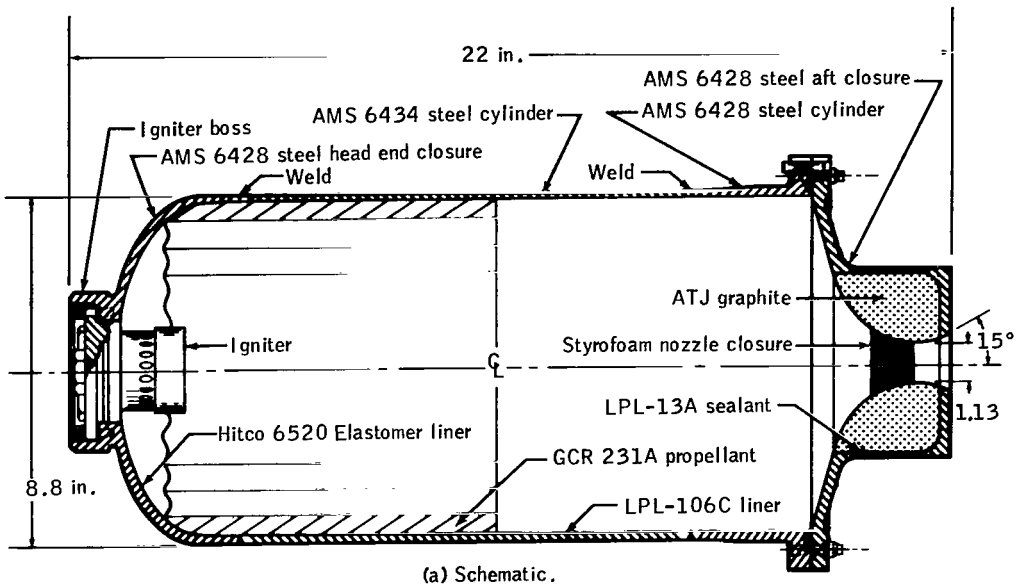


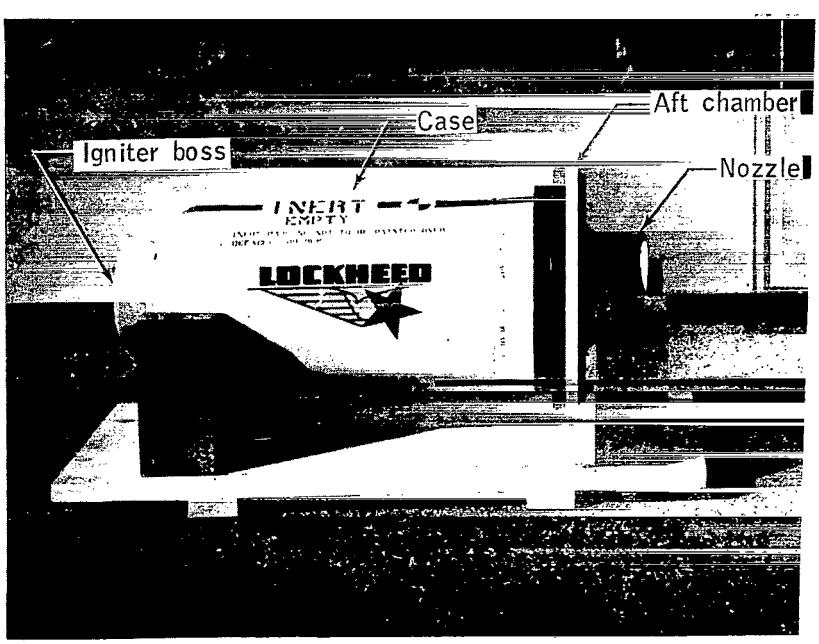

Figure 2.- Apollo launch escape system and command module.

NASA-S-67-1145




(a) Schematic.

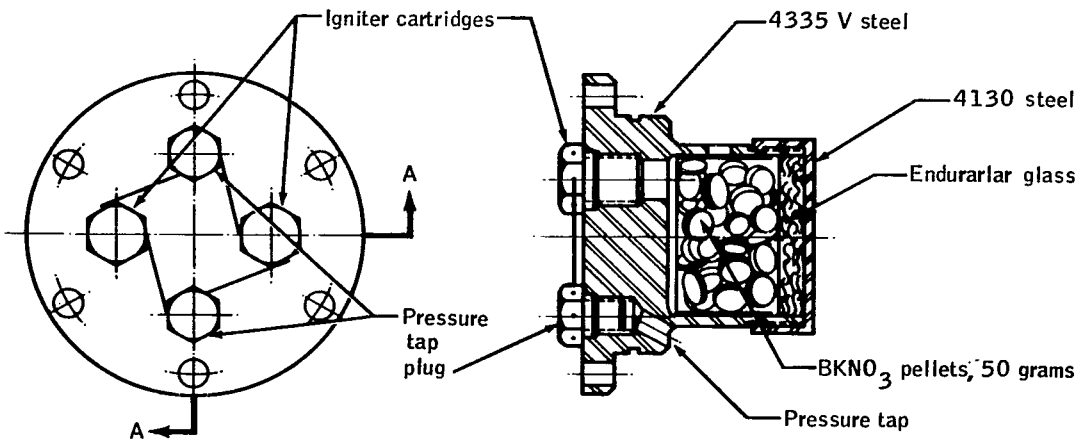
NASA-S-67-1143




(b) Photograph.

Figure 3.- The pitch control motor for the Apollo launch escape system.

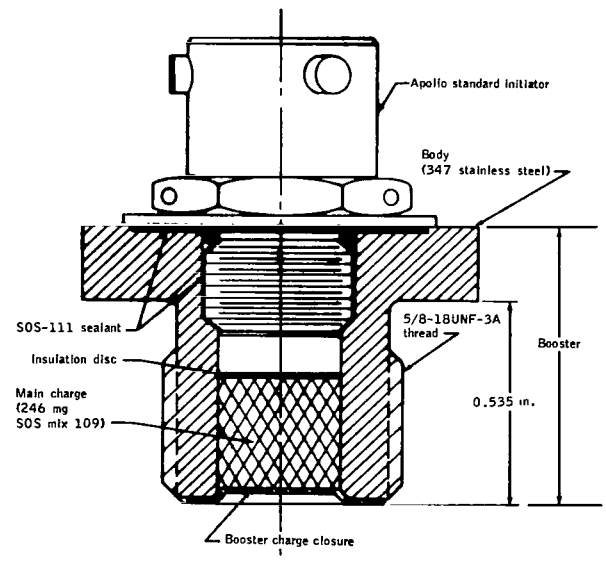
NASA-S-67-1144




Section A - A

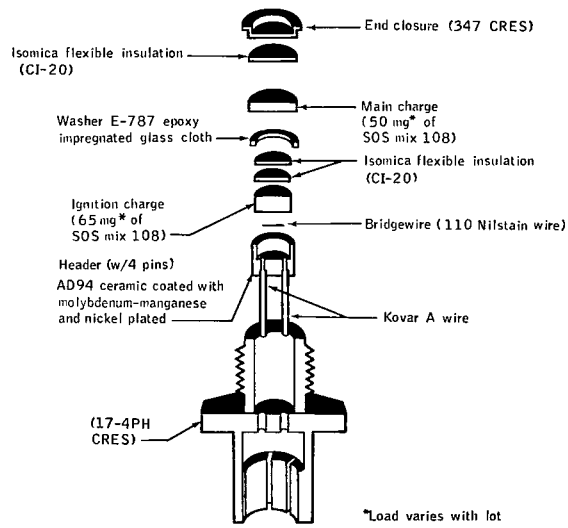
(a) Igniter.

NASA-S-67-1142




(b) Pyrotechnic igniter cartridge.

NASA-S-67-1141




(c) Apollo standard initiator.

Figure 4.- Schematic of motor ignition system.

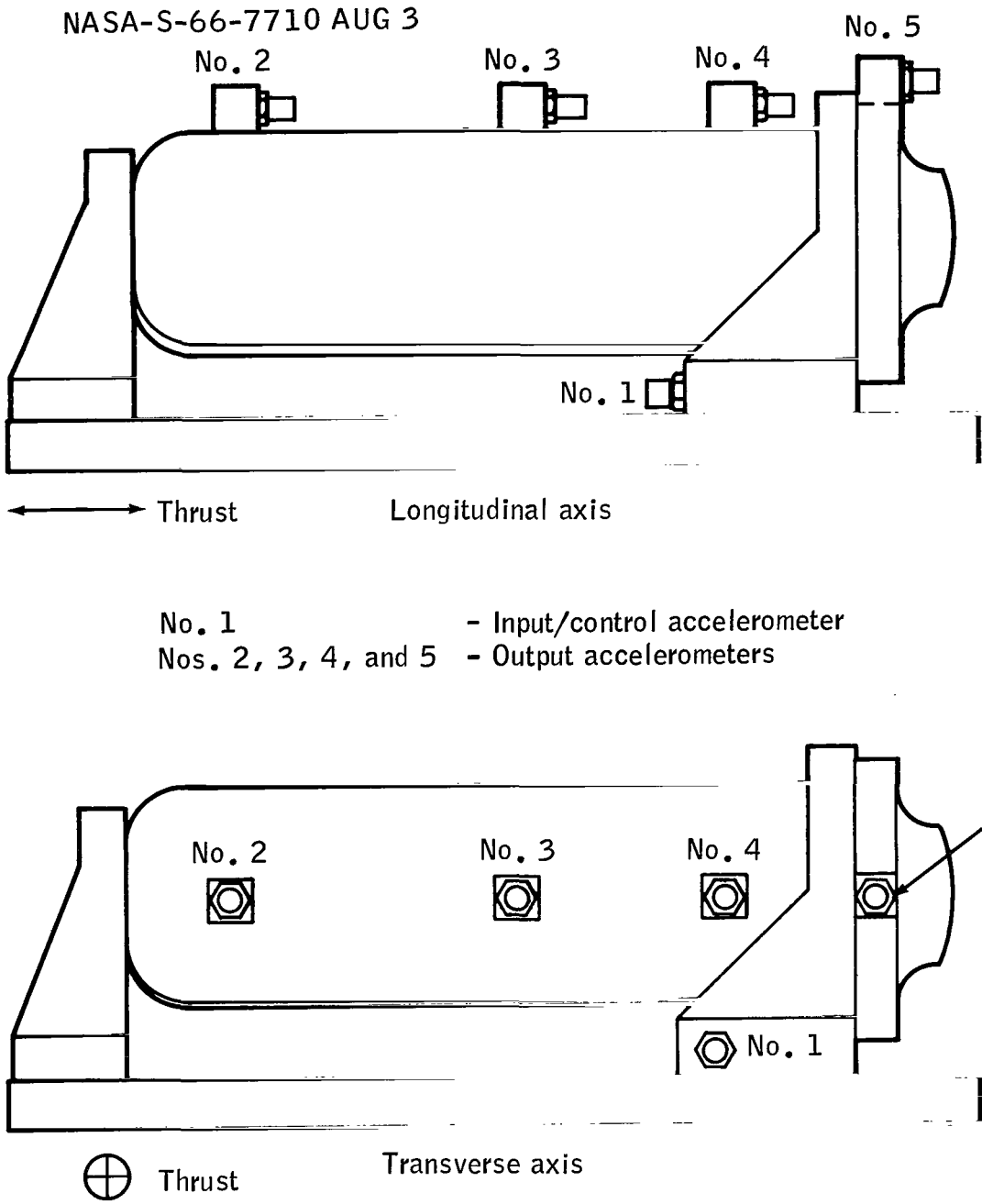
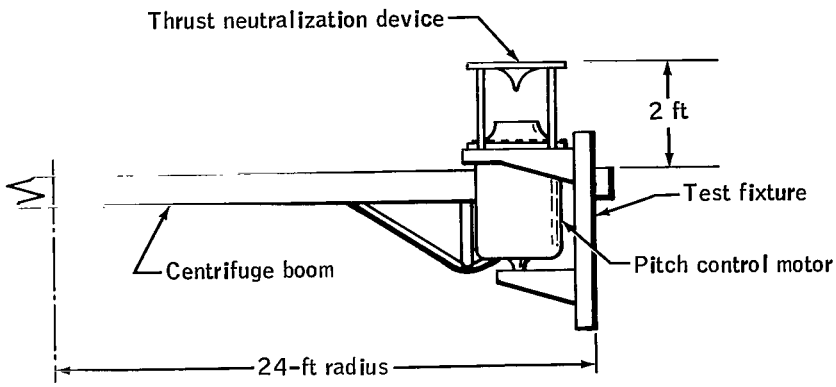
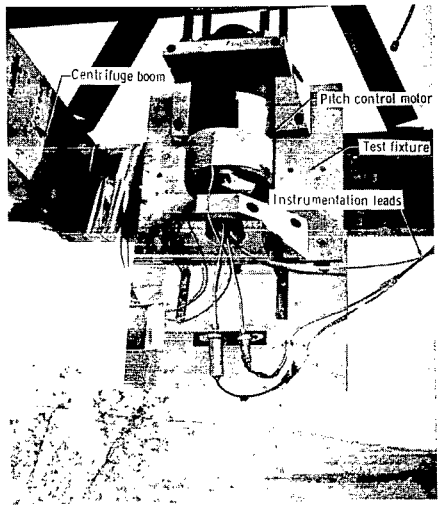



Figure 5.- Location of accelerometers and definition of axes.

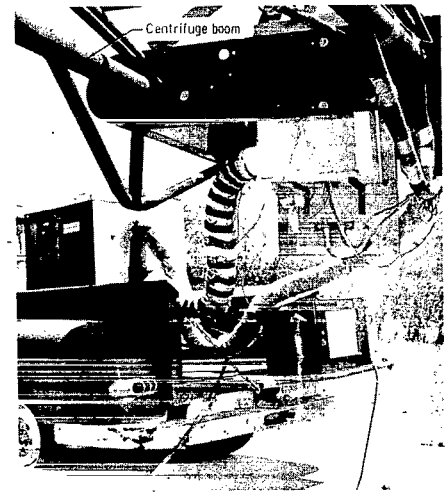
NASA-S-67-631




(a) Schematic.



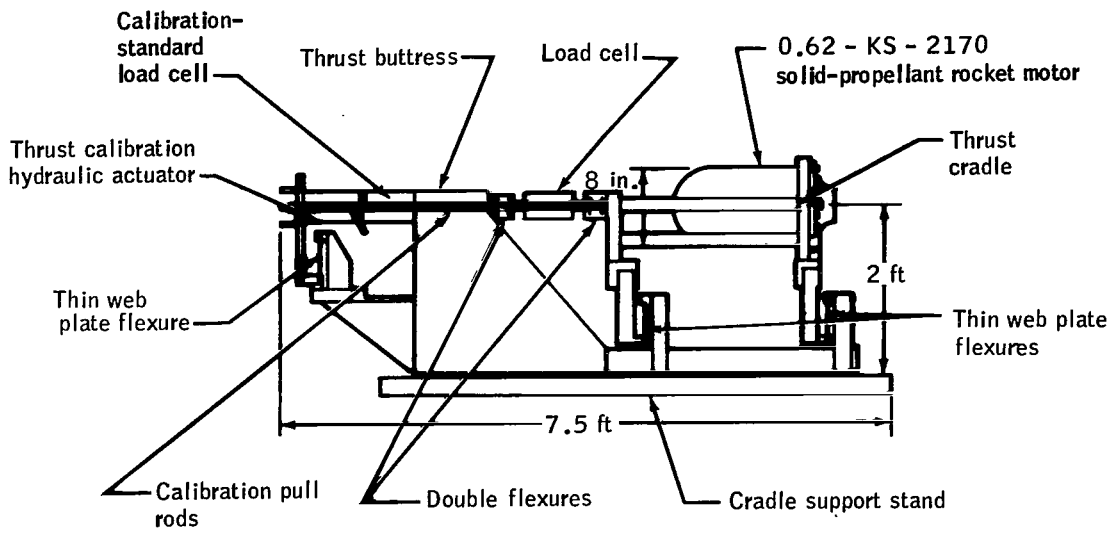

(b) Instrumented unit mounted on centrifuge boom.




(c) Typical temperature-conditioning setup prior to acceleration testing.

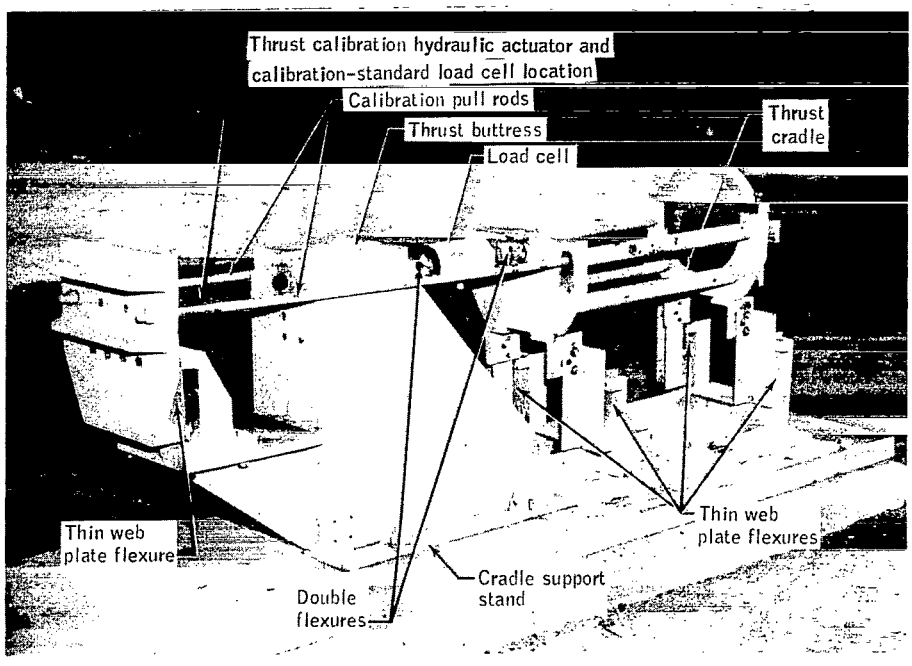
Figure 6.- Acceleration test setup.

NASA-S-67-632



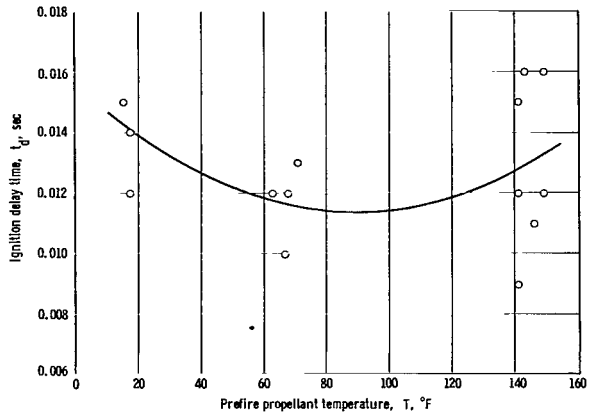

(a) Schematic.

NASA-S-67-634

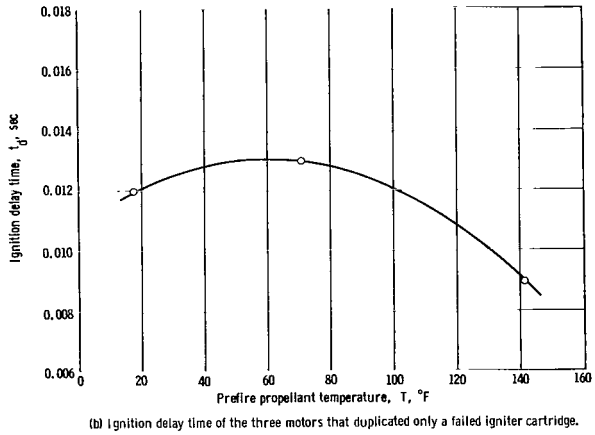



(b) Photograph.

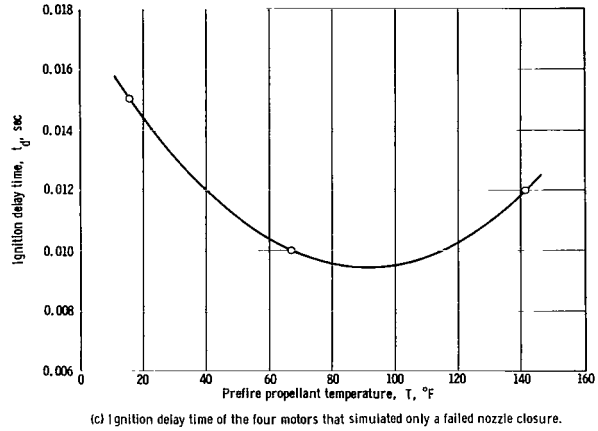
Figure 7.- Static test stand.



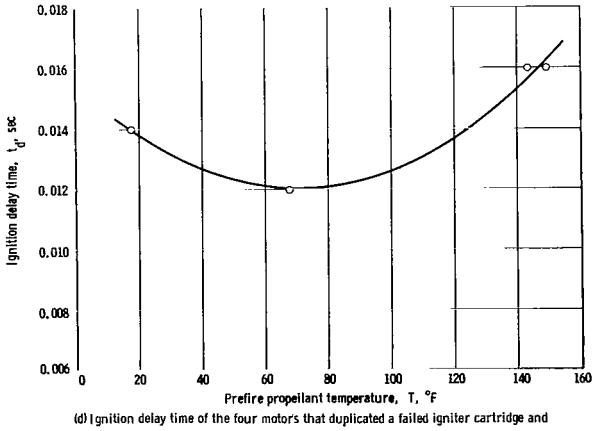

(a) Ignition delay time independent of prefire cavity pressure and the number of igniter cartridges used.



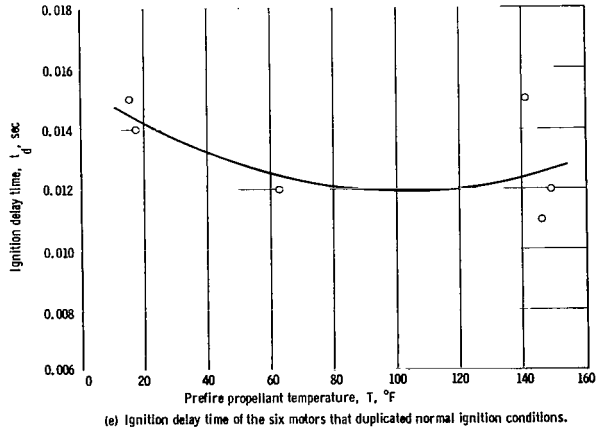

(b) Ignition delay time of the three motors that duplicated only a failed igniter cartridge.




(c) Ignition delay time of the four motors that simulated only a failed nozzle closure.

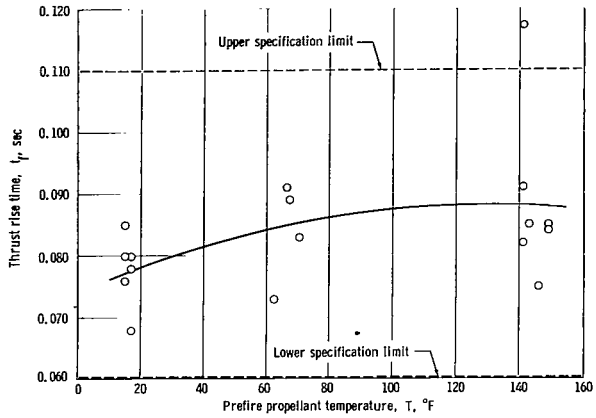



(d) Ignition delay time of the four motors that duplicated a failed igniter cartridge and simulated a failed nozzle closure.

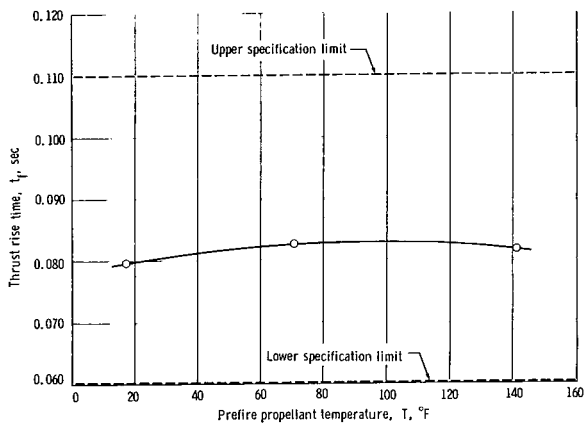



(e) Ignition delay time of the six motors that duplicated normal ignition conditions.

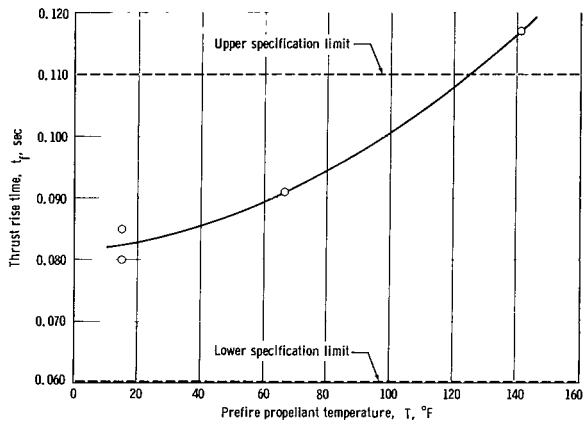
Figure 8.- Variation of motor time characteristics versus prefire propellant temperature.



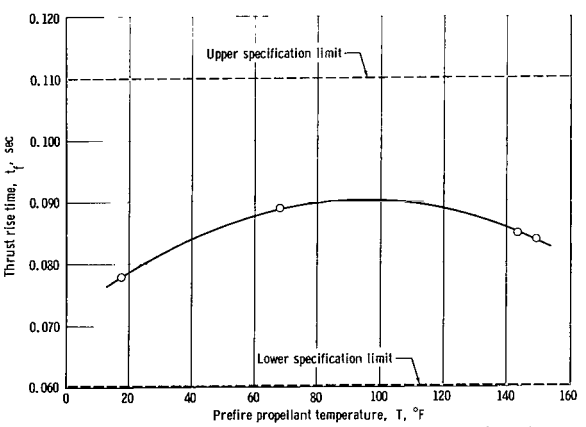

(f) Thrust rise time independent of prefire cavity pressure and the number of igniter cartridges used.



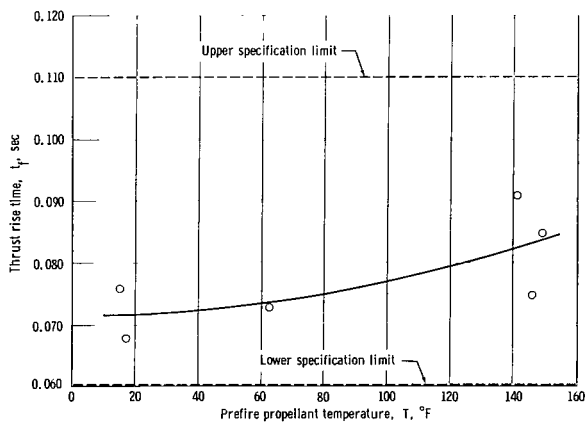

(g) Thrust rise time of the three motors that duplicated only a failed igniter cartridge.




(h) Thrust rise time of the four motors that simulated only a failed nozzle closure.

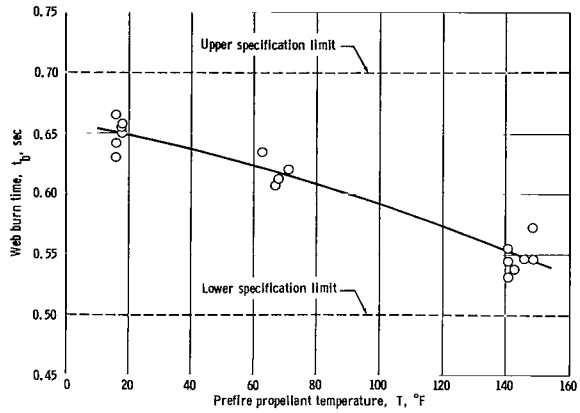



(i) Thrust rise time of the four motors that duplicated a failed igniter cartridge and simulated a failed nozzle closure.

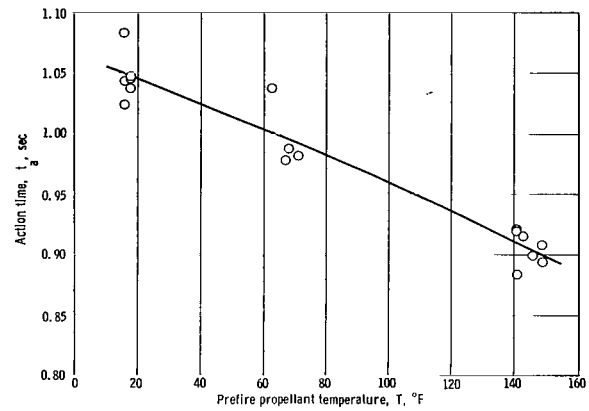



(j) Thrust rise time of the six motors that duplicated normal ignition conditions.

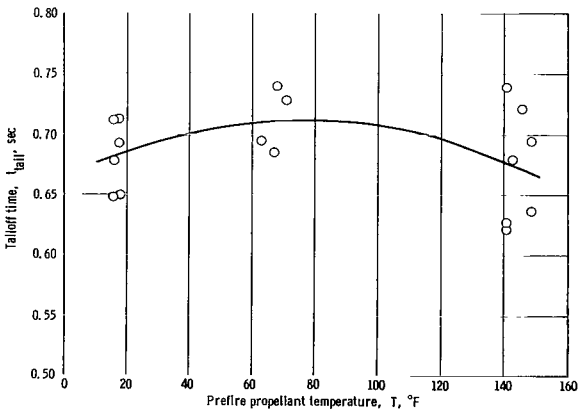
Figure 8.- Continued.



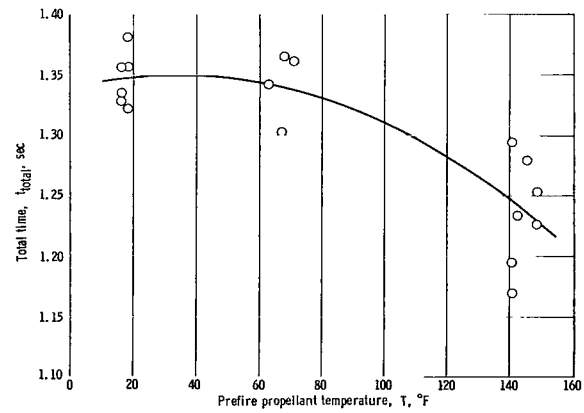

(k) Web burn time.




(l) Action time.

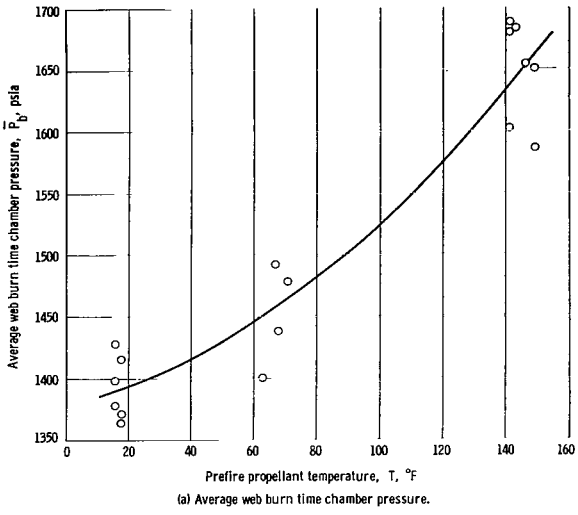



(m) Tailoff time.

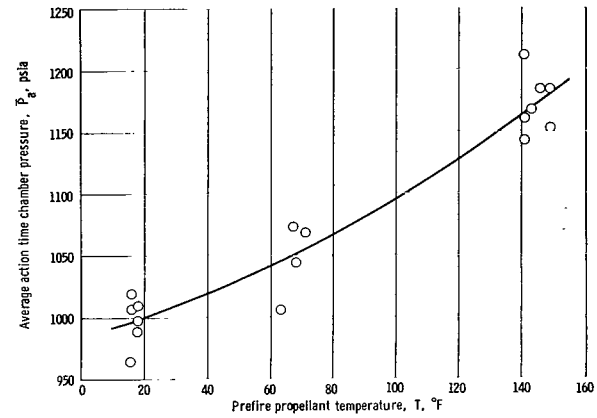



(n) Total time.

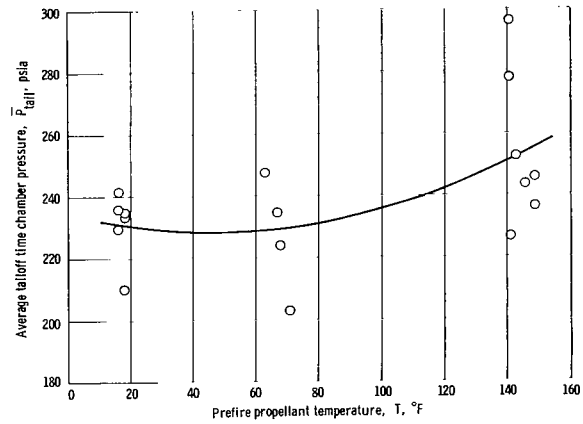
Figure 8.- Concluded.



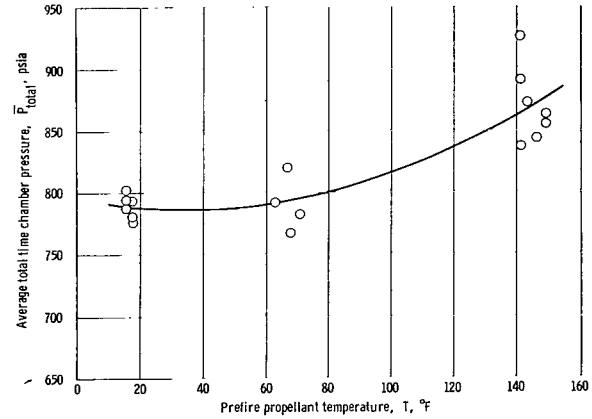

(a) Average web burn time chamber pressure.




(b) Average action time chamber pressure.

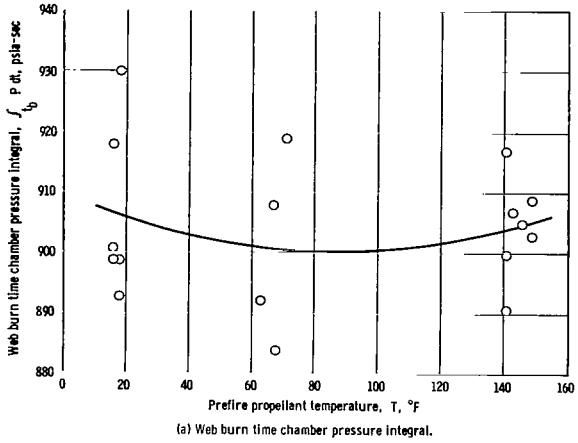



(c) Average tailoff time chamber pressure.

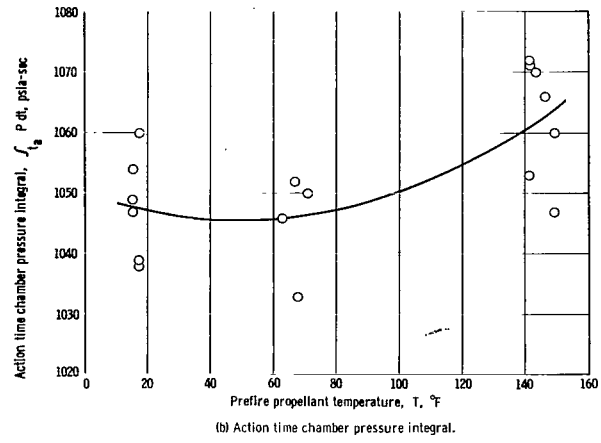



(d) Average total time chamber pressure.

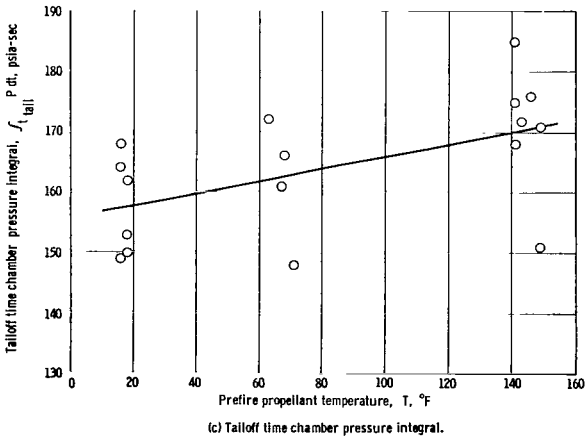
Figure 9.- Variation of motor average chamber pressure characteristics versus prefire propellant temperature.



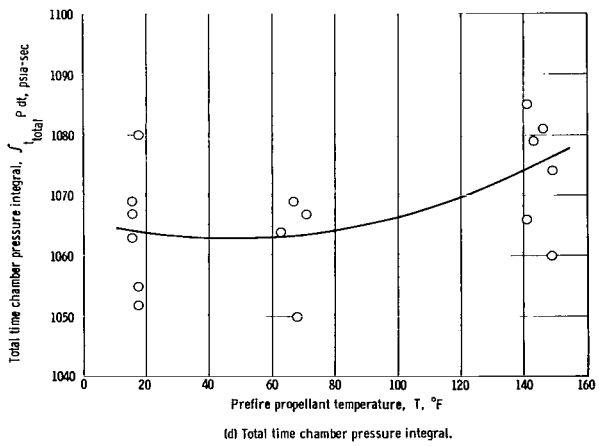

(a) Web burn time chamber pressure integral.




(b) Action time chamber pressure integral.




(c) Tailoff time chamber pressure integral.




(d) Total time chamber pressure integral.

Figure 10.- Variation of motor chamber pressure integral characteristics versus prefire propellant temperature.

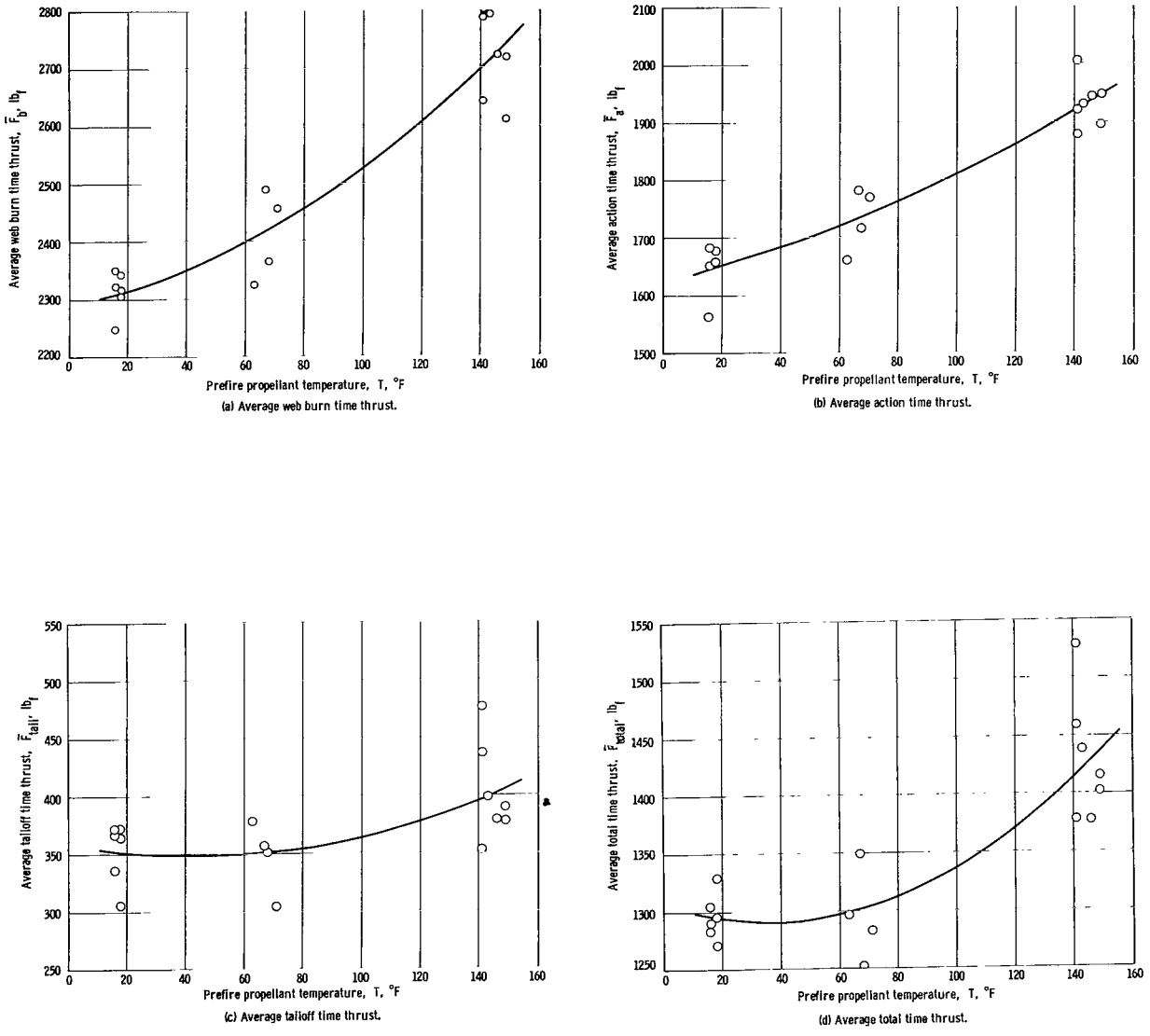
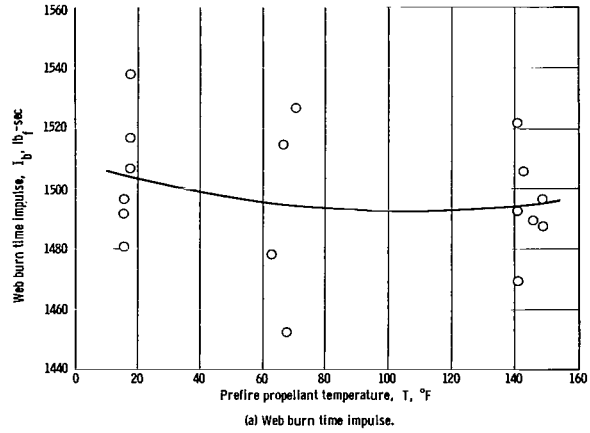
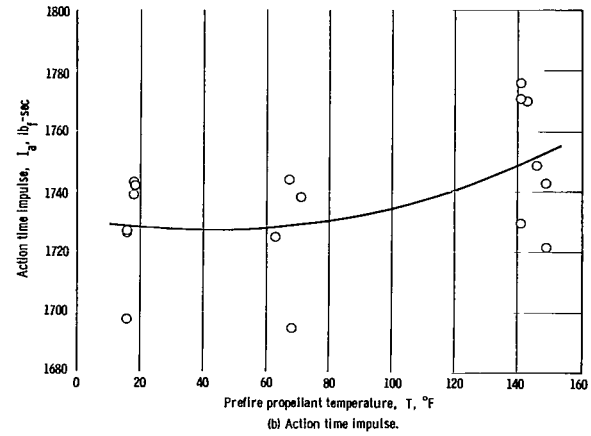


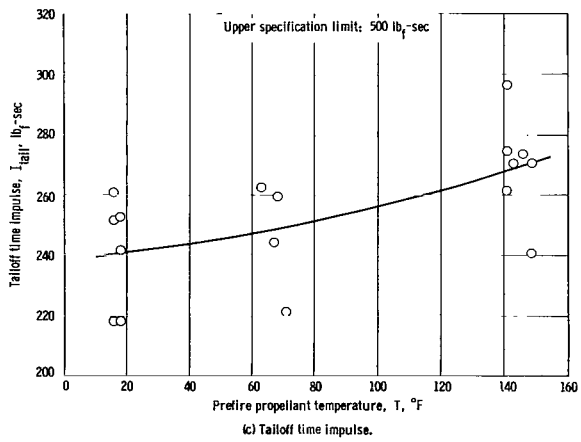

Figure 11.- Variation of motor average thrust characteristics versus prefire propellant temperature.



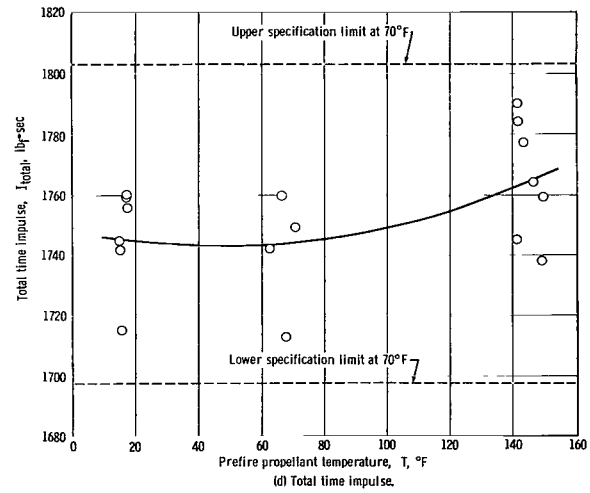

(a) Web burn time impulse.




(b) Action time impulse.

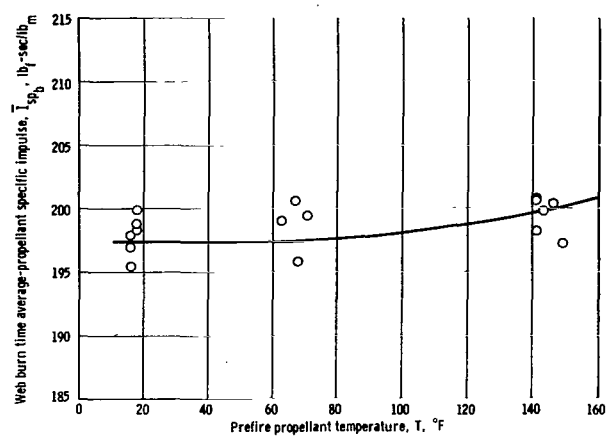



(c) Tailoff time impulse.

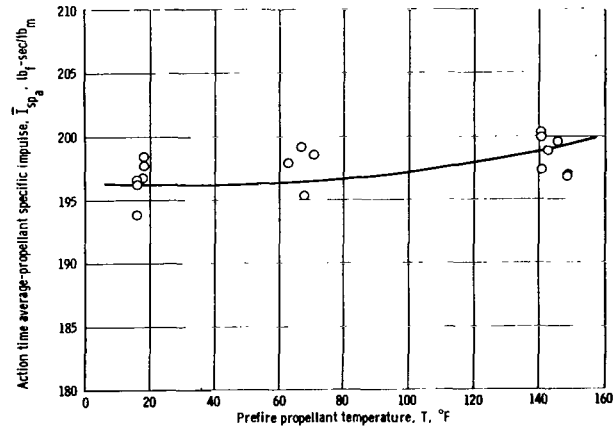



(d) Total time impulse.

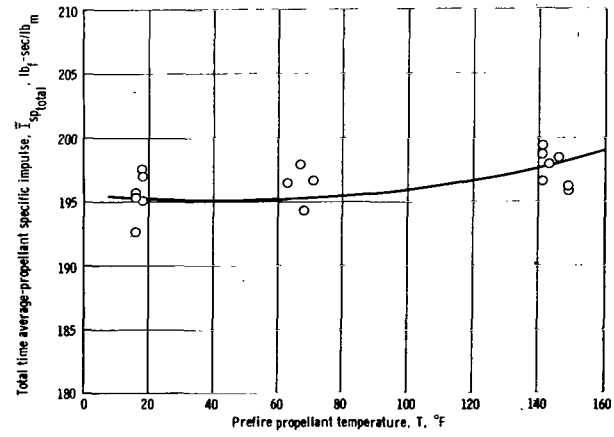
Figure 12.- Variation of motor impulse characteristics versus prefire propellant temperature.




(a) Web burn time average-propellant specific impulse.




(b) Action time average-propellant specific impulse.




(c) Total time average-propellant specific impulse.

Figure 13.- Variation of motor average-propellant specific impulse characteristics versus prefire propellant temperature.

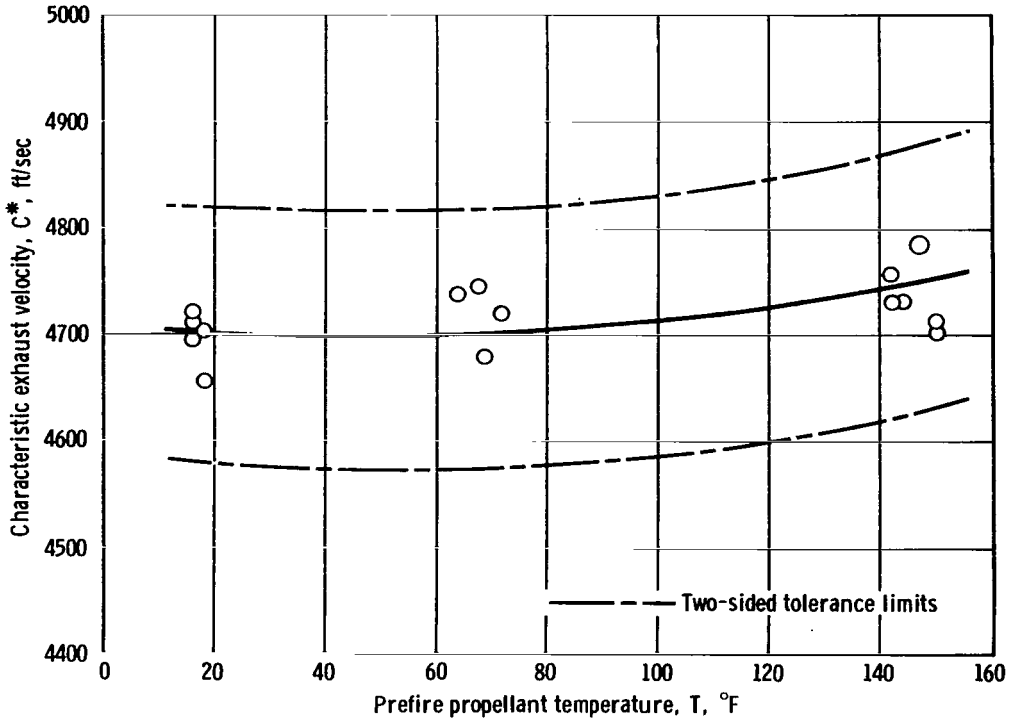



Figure 14. - Variation of motor characteristic exhaust velocity versus prefire propellant temperature.

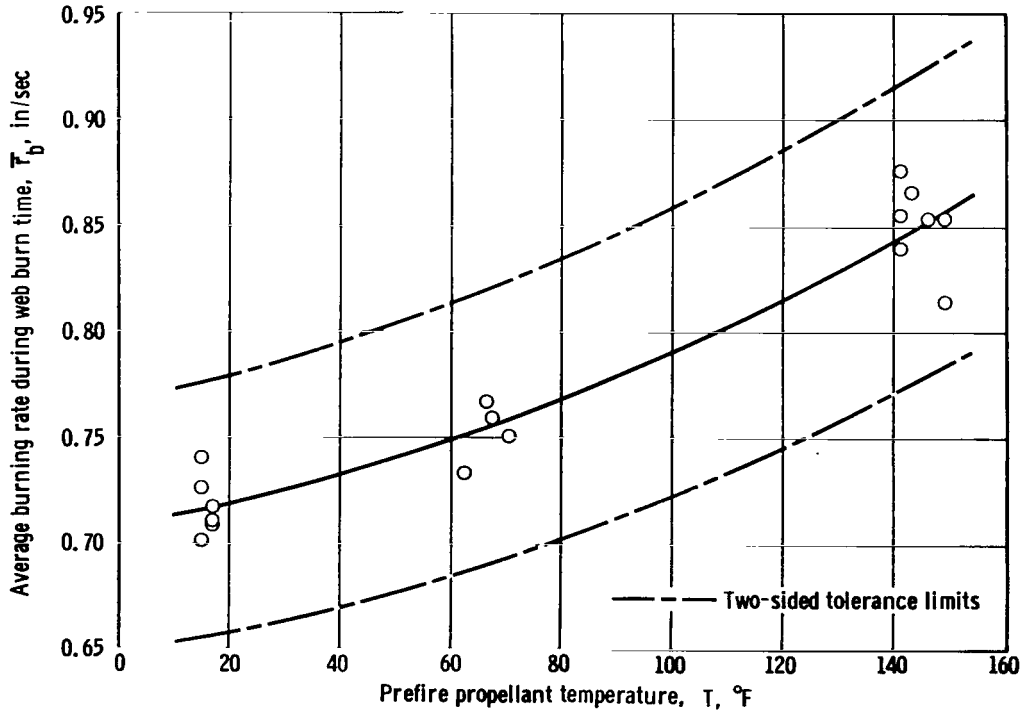
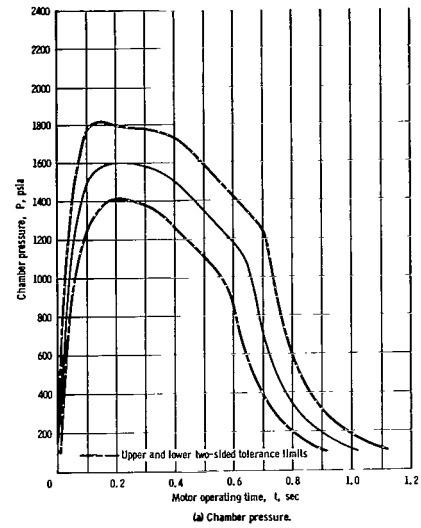
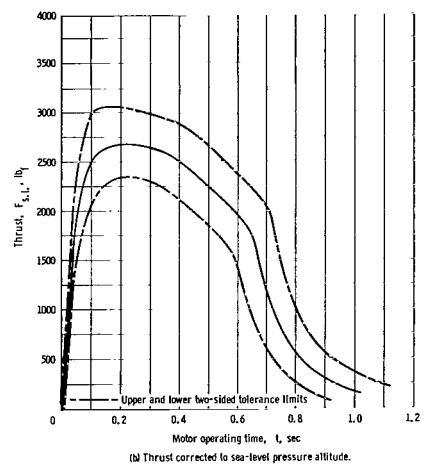


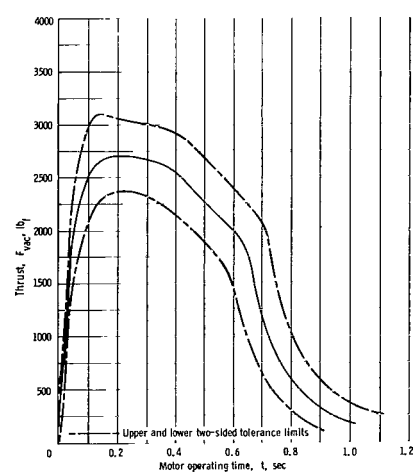

Figure 15. - Variation of motor average burning rate during web burn time versus prefire propellant temperature.




(a) Chamber pressure.

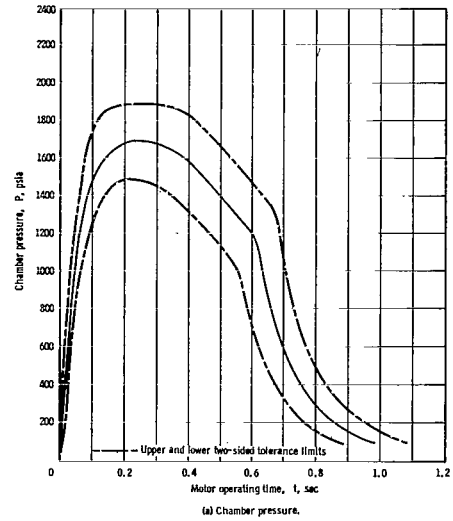



(b) Thrust corrected to sea-level pressure altitude.

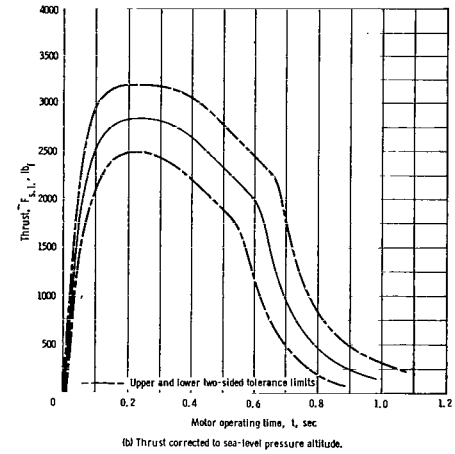



(c) Thrust corrected to vacuum pressure altitude

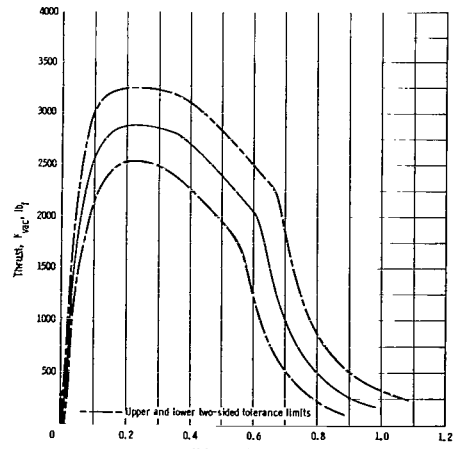
Figure 16. - Nominal motor performance versus operating time and the calculated statistical limits (two-sided tolerance limits) at 20° F.




(a) Chamber pressure.

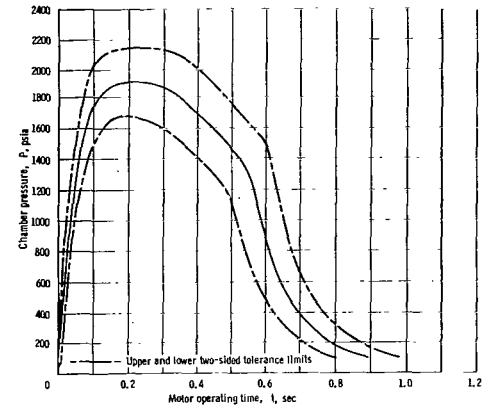



(b) Thrust corrected to sea-level pressure altitude.

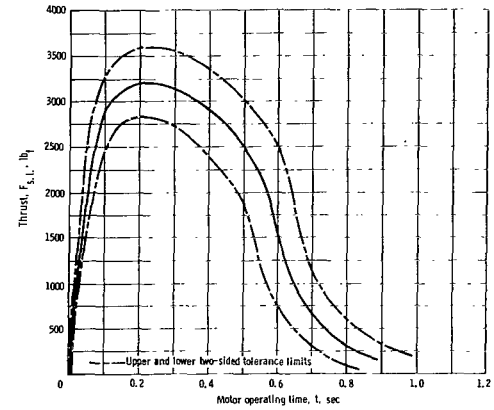



(c) Thrust corrected to vacuum pressure altitude.

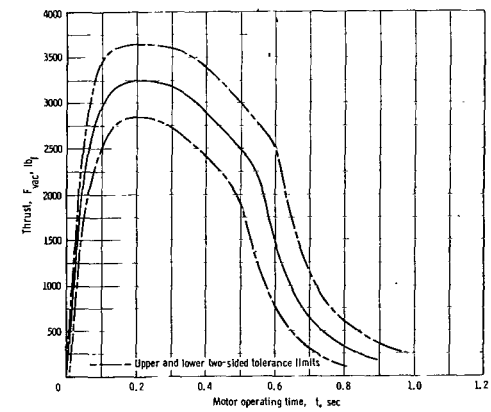
Figure 17. - Nominal motor performance versus operating time and the calculated statistical limits (two-sided tolerance limits) at 70° F.




(a) Chamber pressure.



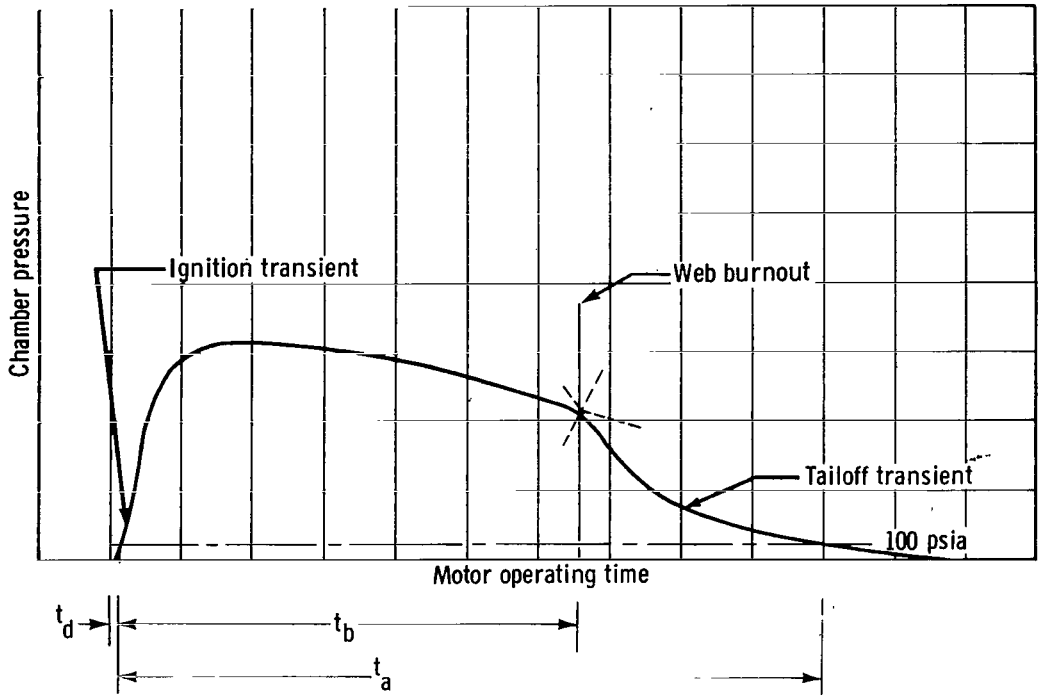

(b) Thrust corrected to sea-level pressure altitude.



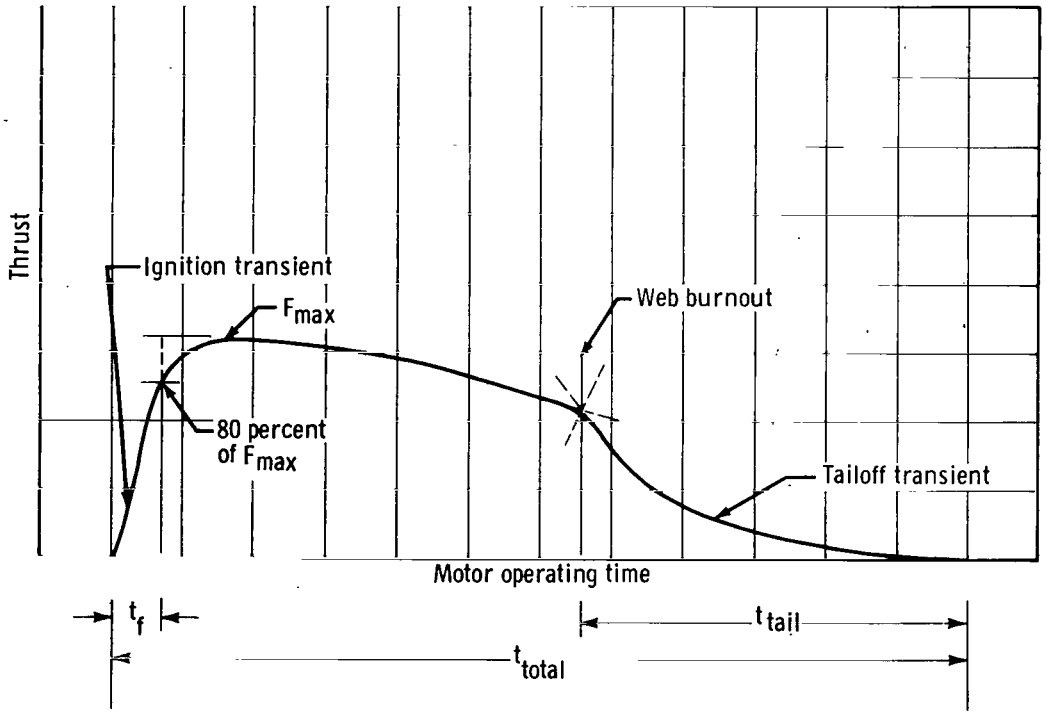

(c) Thrust corrected to vacuum pressure altitude.

Figure 18. - Nominal motor performance versus operating time and the calculated statistical limits (two-sided tolerance limits) at 140° F.

NASA-S-67-635




(a) Based on chamber pressure.




(b) Based on thrust.

Figure 19.- Time characteristics definition.

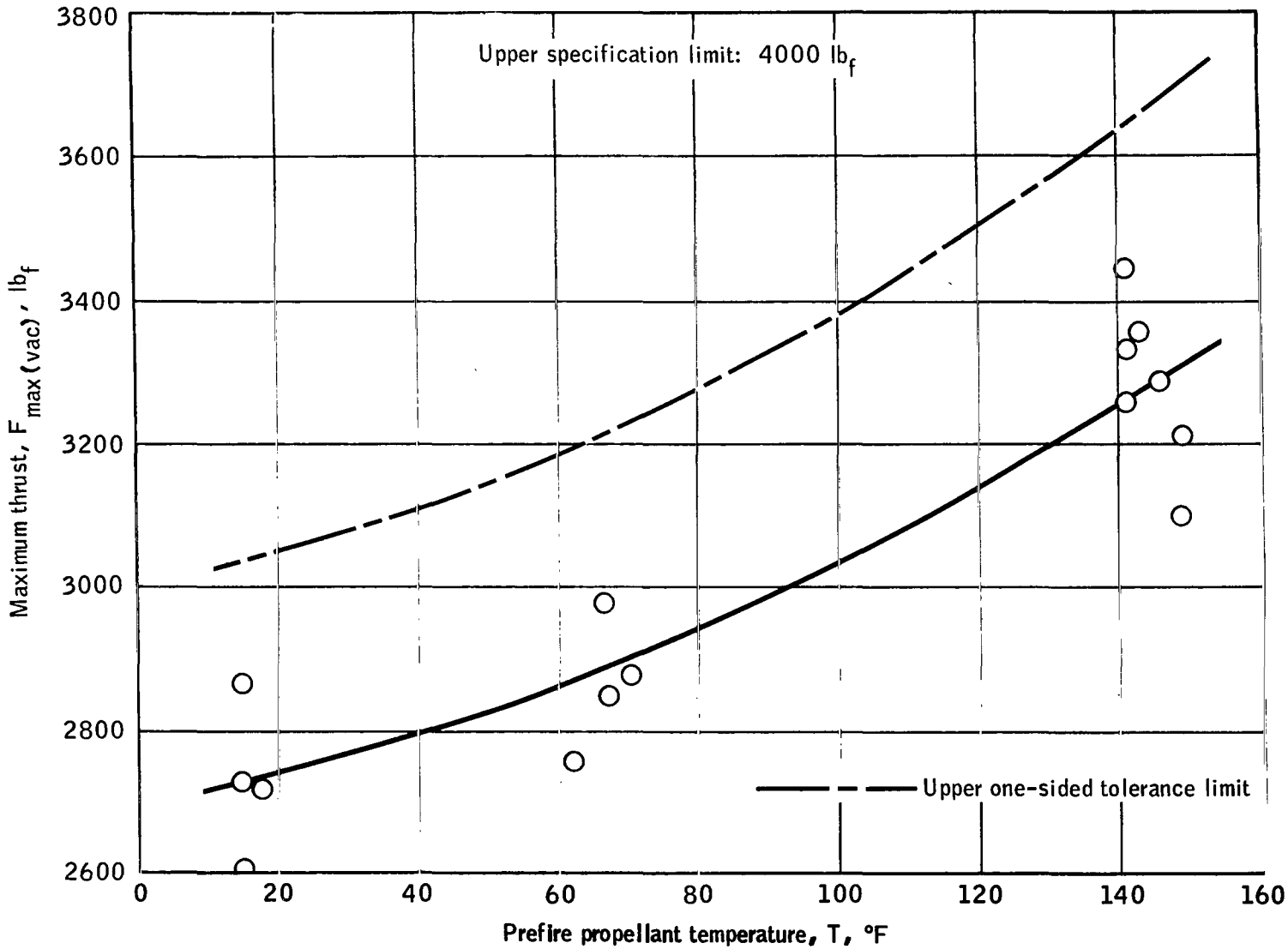



Figure 20. - Calculated variation of motor maximum thrust corrected to vacuum pressure altitude versus prefire propellant temperature.

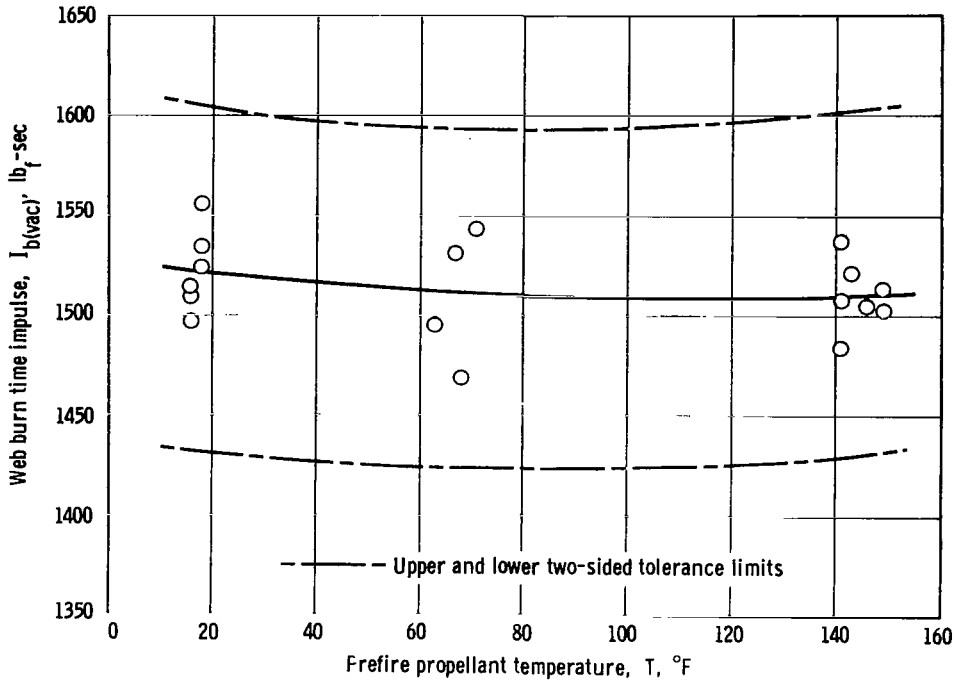



Figure 21. - Calculated variation of motor web burn time impulse corrected to vacuum pressure altitude versus prefire propellant temperature.

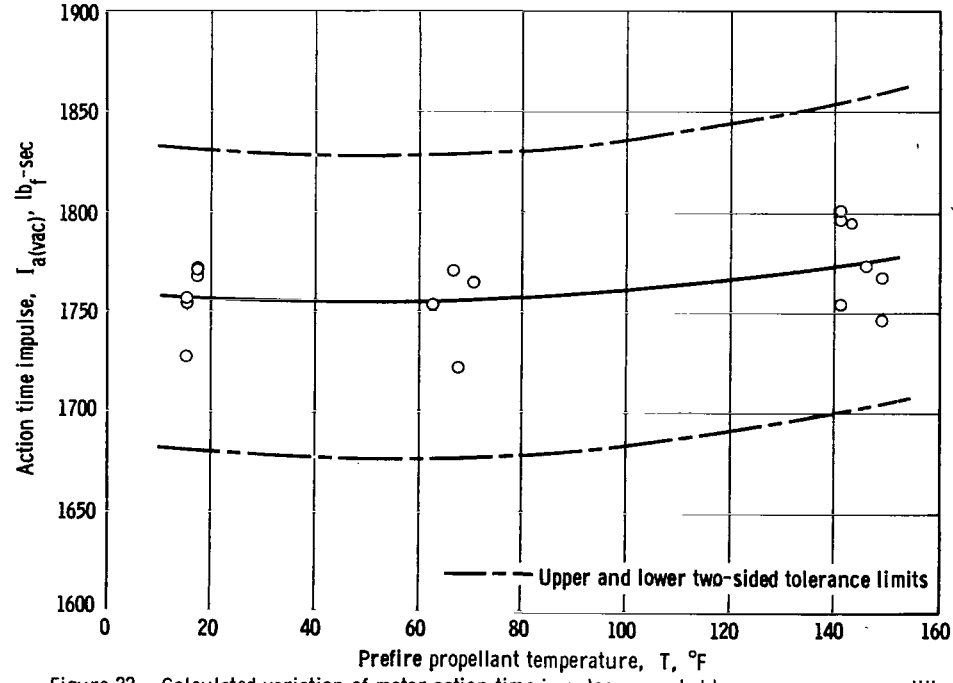



Figure 22. - Calculated variation of motor action time impulse corrected to vacuum pressure altitude versus prefire propellant temperature.

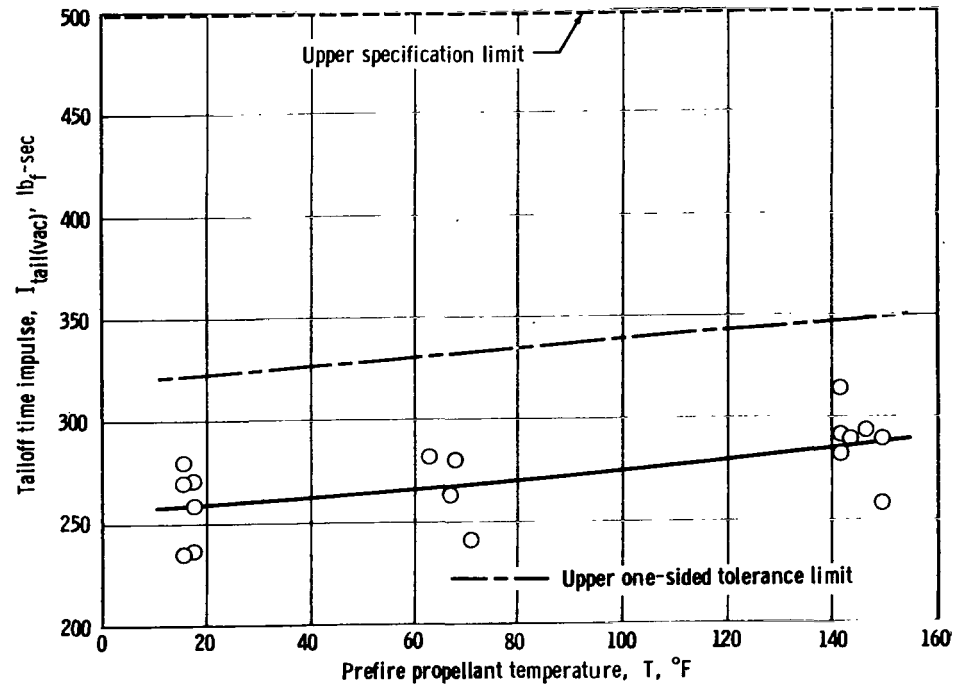



Figure 23. - Calculated variation of motor tailoff time impulse corrected to vacuum pressure altitude versus prefire propellant temperature.

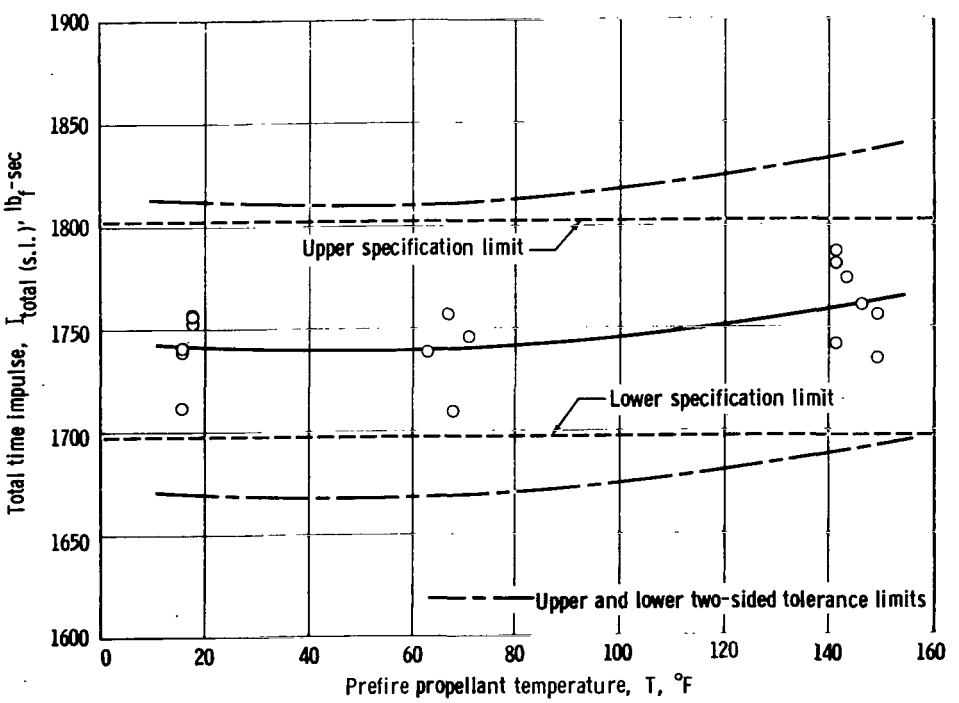



Figure 24. - Calculated variation of motor total time impulse corrected to sea-level pressure altitude versus prefire propellant temperature.

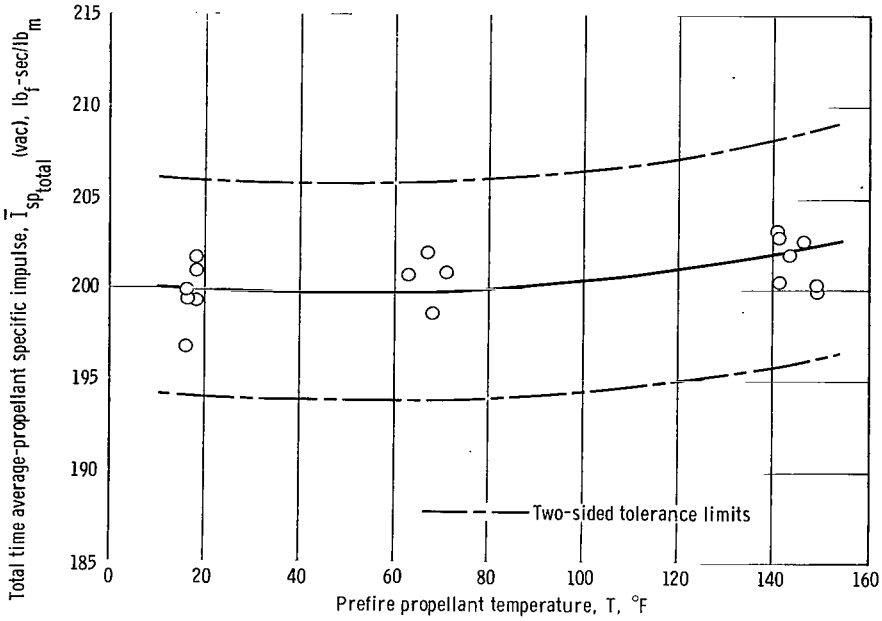



Figure 25. - Calculated variation of motor total time average-propellant specific impulse corrected to vacuum pressure altitude versus prefire propellant temperature.

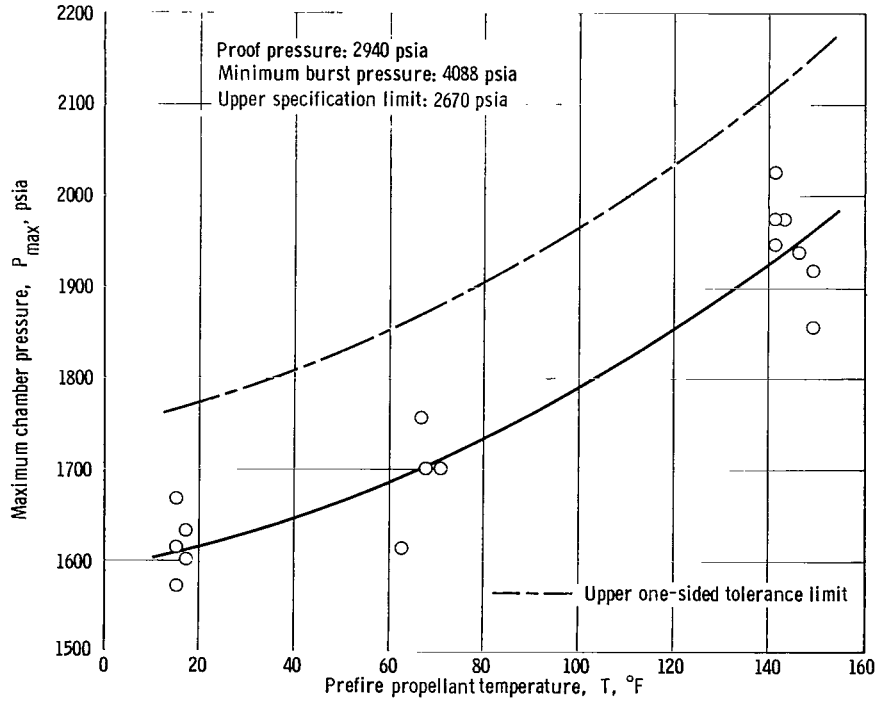



Figure 26. - Calculated variation of motor maximum chamber pressure versus prefire propellant temperature.

*"The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."*

—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

# NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDUMS: Information receiving limited distribution because of preliminary data, security classification, or other reasons.

CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit NASA distribution in English.

SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Notes, and Technology Surveys.

*Details on the availability of these publications may be obtained from:*

SCIENTIFIC AND TECHNICAL INFORMATION DIVISION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546