1
00:00:20,470 --> 00:00:26,250
Highlighting this report period on November
16 was the successful launching form Complex

2
00:00:26,250 --> 00:01:14,420
34 at Cape Canaveral of the third Saturn C-I
flight vehicle, SA-3.

3
00:01:14,420 --> 00:01:20,329
Similar in major aspects to the previously
successful SA-1 and SA-2 flights, SA-3 performed

4
00:01:20,329 --> 00:01:25,070
several additional missions contributing to
development of the Block II SA-5 and beyond

5
00:01:25,070 --> 00:01:26,340
version of the vehicle.

6
00:01:26,340 --> 00:01:33,130
For example, an engineering model of the ST-124
stabilized platform was carried as a functional

7
00:01:33,130 --> 00:01:35,630
passenger, though not in control.

8
00:01:35,630 --> 00:01:40,990
Though no stage separation was attempted,
Block II retrorockets were successfully test

9
00:01:40,990 --> 00:01:42,130
fired.

10
00:01:42,130 --> 00:01:48,979
The booster carried a full load of propellant,
some 750,000 pounds instead of the 620,000

11
00:01:48,979 --> 00:01:50,260
pounds carried earlier.

12
00:01:50,260 --> 00:01:55,520
SA-3’s weight was almost as great as that
of later vehicles, which will have 188,000

13
00:01:55,520 --> 00:02:03,020
pound thrust engines, although SA-3’s eight
H-1 engines were rated at 165,000 pounds thrust

14
00:02:03,020 --> 00:02:04,020
each.

15
00:02:04,020 --> 00:02:09,960
SA-3 was the most heavily instrumented rocket
ever launched by the United States, transmitting

16
00:02:09,960 --> 00:02:13,030
716 measurements to ground stations.

17
00:02:13,030 --> 00:02:18,440
Analysis of telemetry data indicated that
the vehicle performed precisely as expected.

18
00:02:18,440 --> 00:02:27,230
SA-3 reached maximum altitude of 104 miles,
range was 270 miles, and velocity 4,000 miles

19
00:02:27,230 --> 00:02:28,230
per hour.

20
00:02:28,230 --> 00:02:33,470
Flight time to impact was slightly over eight
minutes.

21
00:02:33,470 --> 00:02:39,510
SA-3’s two inert upper stages, laden with
ninety-five tons of water simulating fuel,

22
00:02:39,510 --> 00:02:46,410

were deliberately exploded on schedule at
104 miles altitude, 292 seconds after liftoff,

23
00:02:46,410 --> 00:02:49,140
in a study of the basic physics of the ionosphere.

24
00:02:49,140 --> 00:02:53,810
Satisfactory data on this experiment, known
as Project Highwater, were recorded.

25
00:02:53,810 --> 00:02:59,989
A similar experiment had been conducted on
the SA-2 flight.

26
00:02:59,989 --> 00:03:04,900
More damage was done to ground support equipment
by SA-3 than on previous launches because

27
00:03:04,900 --> 00:03:10,670
of lower liftoff acceleration resulting from
the additional 160,000 pounds of propellant.

28
00:03:10,670 --> 00:03:16,670
However, damage was not considered excessive.

29
00:03:16,670 --> 00:03:21,280
Half a mile north of SA-3’s launch site,
construction progress is on schedule at Launch

30
00:03:21,280 --> 00:03:29,980
Complex 37, being built to handle launching
of Block II vehicles.

31
00:03:29,980 --> 00:03:35,120
Pad B it expected to be operational in March.

32
00:03:35,120 --> 00:03:39,520
Beneficial occupancy and final inspection
of the launch control center was accomplished

33
00:03:39,520 --> 00:03:42,349
in early November.

34
00:03:42,349 --> 00:03:46,140
Work on the launch site service structure
is progressing with hydraulic lines being

35
00:03:46,140 --> 00:03:52,410
installed and work on pneumatic lines underway.

36
00:03:52,410 --> 00:03:58,849
Pad A is scheduled to be operational about
three months after Pad B.

37
00:03:58,849 --> 00:04:03,629
Erection of primary structural steel for the
umbilical tower is complete, and delivery

38
00:04:03,629 --> 00:04:09,920
of structural steel for the launch pedestal
has begun.

39
00:04:09,920 --> 00:04:14,700
At the automatic ground control station, concrete
is being finished, and drains and electrical

40
00:04:14,700 --> 00:04:19,150
conduit installed.

41
00:04:19,150 --> 00:04:23,550
The new combination support and hold down
arms for Block II launch pedestals were delivered

42
00:04:23,550 --> 00:04:28,090
by the manufacturer, Hayes International of
Birmingham, to the Marshall Space Flight Center

43
00:04:28,090 --> 00:04:30,280
this quarter for testing.

44
00:04:30,280 --> 00:04:37,380
Afterwards, they'll be shipped to the Cape
for installation at Launch Complex 37.

45
00:04:37,380 --> 00:04:42,190
The arms will support and hold down the Saturn
vehicle after ignition until proper thrust

46
00:04:42,190 --> 00:04:46,840
condition for liftoff.

47
00:04:46,840 --> 00:04:54,919
The fourth Saturn flight vehicle, SA-4, was
removed from Marshall's Static Test Stand

48
00:04:54,919 --> 00:05:00,140
on October 1, having completed its static
testing with a full duration firing the previous

49
00:05:00,140 --> 00:05:04,560
week.

50
00:05:04,560 --> 00:05:10,360
After undergoing post-static rework and modification,
the SA-4 booster was transferred to final

51
00:05:10,360 --> 00:05:13,229
checkout on October 22.

52
00:05:13,229 --> 00:05:19,140
A micrometeorite detector device designed
to measure the density of small, high speed

53
00:05:19,140 --> 00:05:24,990
particles encountered at high altitudes, will
be initially flown aboard SA-4 as an inactive

54
00:05:24,990 --> 00:05:28,400

passenger to see how it withstands environmental
conditions.

55
00:05:28,400 --> 00:05:40,490
If telemetered results are satisfactory, the
device may be operative on later Saturn flights.

56
00:05:40,490 --> 00:05:53,460
Three static firings of the test booster,
SA-T4.5, were held during this report period,

57
00:05:53,460 --> 00:05:58,190
with engines developing one and half million
pounds thrust.

58
00:05:58,190 --> 00:06:03,790
Test objectives were to check integrity of
the propulsion system and effect of the 188k

59
00:06:03,790 --> 00:06:05,720
engines on the flame deflector.

60
00:06:05,720 --> 00:06:17,010
The test booster was removed from the stand
on November 15.

61
00:06:17,010 --> 00:06:22,130
The final engine was installed on the booster
for the fifth Saturn flight vehicle, SA-5,

62
00:06:22,130 --> 00:06:27,550
on October 11, and the stage was later release
for pre-static checkout expected to be completed

63
00:06:27,550 --> 00:06:28,550
in mid-January.

64
00:06:28,550 --> 00:06:39,039
A decision has been had to fly a Jupiter-type
payload body on SA-5 rather than the Apollo

65
00:06:39,039 --> 00:06:46,310
boilerplate configuration as originally proposed.

66
00:06:46,310 --> 00:06:51,950
Assembly of the booster for the sixth Saturn
flight vehicle, SA-6, begun on September 24,

67
00:06:51,950 --> 00:06:56,660
proceeded this quarter with clustering of
tanks completed and installation of engines

68
00:06:56,660 --> 00:07:00,890
underway.

69
00:07:00,890 --> 00:07:05,430
Fabrication of the tail section of the booster
for the seventh flight vehicle, SA-7, was

70
00:07:05,430 --> 00:07:10,880
finished in December.

71
00:07:10,880 --> 00:07:14,530
The vehicle's interstage adapter was also
completed.

72
00:07:14,530 --> 00:07:19,880
SA-7 booster assembly is scheduled to begin
in January.

73
00:07:19,880 --> 00:07:23,830
Modification of Marshall's Dynamic Test
Stand to accept the dynamic test vehicle,

74
00:07:23,830 --> 00:07:29,150
SA-D5 was finished in October.

75
00:07:29,150 --> 00:07:33,210
Major alterations included cutting away of

a portion of the grillage in order to accommodate

76
00:07:33,210 --> 00:07:38,509
the longer Block II-type vehicle,

77
00:07:38,509 --> 00:07:47,380
plus installation of new support pedestals
at the base of the stand.

78
00:07:47,380 --> 00:07:51,780
Assembly of the Block II dynamic test booster
was completed early this quarter and the stage

79
00:07:51,780 --> 00:08:03,460
was erected in the Dynamic Test Tower on November
13 after weighing and center of gravity determination.

80
00:08:03,460 --> 00:08:08,630
The S-IV hydrostatic dynamic stage, which
forms the upper stage of the SA-D5 dynamic

81
00:08:08,630 --> 00:08:14,380
test vehicle, was completed this quarter by
Douglas Aircraft Company, S-IV prime contractor

82
00:08:14,380 --> 00:08:20,740
at Santa Monica, and was prepared for shipment.

83
00:08:20,740 --> 00:08:26,669
On October 26, the stage was moved from the
Douglas plant to the docks at nearby San Pedro.

84
00:08:26,669 --> 00:08:30,889
Cradled in a specially built twenty-five ton
transporter, the S-IV was loaded aboard a

85
00:08:30,889 --> 00:08:42,510
steam ship to begin its 3,500 mile journey
to the Marshall Space Flight Center.

86
00:08:42,510 --> 00:08:46,370
This marked the first time a Saturn stage
has been shipped by water from a west coast

87
00:08:46,370 --> 00:08:51,389
manufacturing site through the Panama Canal
to a test or launch site in the east.

88
00:08:51,389 --> 00:08:56,389
Other stages will follow.

89
00:08:56,389 --> 00:09:01,230
The S-IV stage arrived at Marshall on November
16 after a twenty-three day journey.

90
00:09:01,230 --> 00:09:06,040
It had been transferred to the Saturn barge,
Promise, at New Orleans for the river portion

91
00:09:06,040 --> 00:09:12,089
of the trip.

92
00:09:12,089 --> 00:09:16,290
At Marshall, the S-IV stage was installed
atop the SA-D5 booster.

93
00:09:16,290 --> 00:09:20,269
The stage is scheduled to remain at Marshall
for several months.

94
00:09:20,269 --> 00:09:25,779
Its external configuration, weight, and other
characteristics are the same as those of the

95
00:09:25,779 --> 00:09:33,759
flight stage, which will be a part of SA-5.

96
00:09:33,759 --> 00:09:37,930
After installation of the instrument unit,

payload adapter, and payload to complete the

97
00:09:37,930 --> 00:09:48,989
vehicle, SA-D5 was made ready for dynamic
testing, scheduled to begin in January.

98
00:09:48,989 --> 00:09:53,480
Modification of Marshall's C-I Static Test
Stand to accommodate two boosters continued

99
00:09:53,480 --> 00:09:54,480
this quarter.

100
00:09:54,480 --> 00:10:01,610
Steel superstructure and basic plumbing now
stands at the fourth level.

101
00:10:01,610 --> 00:10:05,819
Adjacent to the stand is the annex, which
will house office and shop personnel.

102
00:10:05,819 --> 00:10:15,009
Units such as the elevator, air conditioners,
and heating ducts are being installed.

103
00:10:15,009 --> 00:10:19,860
Using a scale model of the Saturn booster
tank assembly, a series of liquid oxygen boil

104
00:10:19,860 --> 00:10:28,470
off tests were run at Marshall to determine
system flow under simulated flight conditions.

105
00:10:28,470 --> 00:10:32,089
For safety, liquid nitrogen was used to simulate
LOX.

106
00:10:32,089 --> 00:10:37,480
Purpose of the test is to find out how much
boil off occurs in a given time and to verify

107
00:10:37,480 --> 00:10:46,009
the tanks empty simultaneously.

108
00:10:46,009 --> 00:10:50,569
Discharge tubes carry the liquid nitrogen
from the test stand to the point of discharge.

109
00:10:50,569 --> 00:10:57,850
Liquid nitrogen vapors hold close to the ground
and are highly toxic.

110
00:10:57,850 --> 00:11:02,410
Line flow is monitored by movie cameras to
study vortexing conditions in the suction

111
00:11:02,410 --> 00:11:10,899
line and undesirable gassing in the system.

112
00:11:10,899 --> 00:11:15,579
Using scale model tanks to represent Saturn
boosters, tests are being run at Marshall

113
00:11:15,579 --> 00:11:19,870
to determine the most desirable method of
controlling propellant dispersion in even

114
00:11:19,870 --> 00:11:24,310
of rain safety destruct or accidental explosion.

115
00:11:24,310 --> 00:11:31,019
An external destruct system has proven most
effective using Primacord and flexible linear

116
00:11:31,019 --> 00:11:36,190
shaped charges installed longitudinally on
the cylindrical portions of all tanks.

117
00:11:36,190 --> 00:11:41,800

Upon ignition, these charges rupture the containers
and internal tank pressure causes an outward

118
00:11:41,800 --> 00:11:47,489
dispersion of the LOX and RP-1 propellants,
greatly reducing their mixture and the resulting

119
00:11:47,489 --> 00:11:48,489
explosion.

120
00:11:48,489 --> 00:11:52,230
[Sound of Explosion] After engineering refinement,
the external destruct system will be employed

121
00:11:52,230 --> 00:11:55,749
on SA-5 and subsequent vehicles.

122
00:11:55,749 --> 00:12:01,170
The first two production models of the ST-124
stabilized platform were delivered to Marshall

123
00:12:01,170 --> 00:12:04,850
this quarter by the manufacturer, Bendix Corporation.

124
00:12:04,850 --> 00:12:12,050
ST-124 units will be flown as functional passenger,
though not in command, aboard SA-5 and SA-6.

125
00:12:12,050 --> 00:12:20,079
Beginning with SA-7, the ST-124 will be the
command unit.

126
00:12:20,079 --> 00:12:25,269
One of the ST-124s was later shipped to Holloman
Air Force Base, New Mexico, for a series of

127
00:12:25,269 --> 00:12:27,149
rocket sled tests.

128

00:12:27,149 --> 00:12:30,970
Four telemetry lengths provide forty-eight
channels of information to measure performance

129
00:12:30,970 --> 00:12:35,839
during the seven second, five mile trip along
the sled track, where the unit sustains a

130
00:12:35,839 --> 00:12:41,130
maximum of 8gs for three seconds.

131
00:12:41,130 --> 00:12:47,739
The sled reached maximum speed [Sound of Test]
of approximately 1,000 miles per hour.

132
00:12:47,739 --> 00:12:54,410
Test results were satisfactory, indicating
the ST-124 will stabilize as desired.

133
00:12:54,410 --> 00:13:01,240
A prototype of the Saturn Block II instrument
unit, which will house the ST-124 stabilized

134
00:13:01,240 --> 00:13:06,489
platform, together with other components necessary
to perform the functions of guidance, navigation,

135
00:13:06,489 --> 00:13:11,029
instrumentation, measurement, and telemetry
began undergoing checkout this quarter in

136
00:13:11,029 --> 00:13:19,269
a recently completed automatic checkout facility
at the Marshall Center’s Astrionics Division.

137
00:13:19,269 --> 00:13:24,579
The facility, which will also simulate Saturn
C-I vehicle checkout at the launch site, consists

138
00:13:24,579 --> 00:13:31,269

of a launch controlled computer, signal conditioning,
countdown clock, digital data acquisition

139
00:13:31,269 --> 00:13:37,689
ground station, automatic instrumentation
stimulus, instrument unit electrical support

140
00:13:37,689 --> 00:13:47,329
equipment, manual electrical support equipment,
S-I stage substitute, power distribution,

141
00:13:47,329 --> 00:13:57,649
systems interface, facility recorders, propellant
tank system, and instrumentation unit interface.

142
00:13:57,649 --> 00:14:01,629
The automatic checkout facility has the prime
objective of assuring compatibility of the

143
00:14:01,629 --> 00:14:06,629
entire Saturn vehicle with each unit of its
electrical support equipment and confirming

144
00:14:06,629 --> 00:14:10,419
design of such equipment prior to its installation
at Cape Canaveral.

145
00:14:10,419 --> 00:14:16,279
The vehicle is simulated for checkout purposes
by utilizing flight-type distributors, sequencers,

146
00:14:16,279 --> 00:14:22,509
and other electrical flight hardware.

147
00:14:22,509 --> 00:14:27,250
At Marshall’s Quality Assurance Division,
an automated checkout concept for Saturn stages

148
00:14:27,250 --> 00:14:32,350
was used in part for the first time this quarter

in connection with the SA-4 booster and will

149
00:14:32,350 --> 00:14:42,249
be used in its entirety next quarter on the
SA-5 booster.

150
00:14:42,249 --> 00:14:48,139
The checkout concept includes ten widely separated
remote stations, each assigned specific test

151
00:14:48,139 --> 00:14:53,560
missions, serving as satellites to the central
computer complex, the heart of the entire

152
00:14:53,560 --> 00:14:54,709
system.

153
00:14:54,709 --> 00:15:00,509
The computer complex consists of three Packard-Bell
250 general purpose computers communicating

154
00:15:00,509 --> 00:15:04,609
with each other by sharing common memory elements
under a master slave structure.

155
00:15:04,609 --> 00:15:10,970
The Saturn hardware forms a closed loop system
which provides stimuli generation, switching,

156
00:15:10,970 --> 00:15:14,679
and response retrieval, all under computer
control.

157
00:15:14,679 --> 00:15:18,619
Transmissions between the computer and test
stations are digital, permitting location

158
00:15:18,619 --> 00:15:22,529
of the test stations at a considerable distance
from the computer complex.

159
00:15:22,529 --> 00:15:27,059
The test stations include instrumentation
and telemetry systems and components, guidance

160
00:15:27,059 --> 00:15:33,439
and control systems, radio frequency systems,
network systems, electrical components and

161
00:15:33,439 --> 00:15:41,220
mechanical systems, assemblies, and components.

162
00:15:41,220 --> 00:15:45,249
At Marshall’s Michoud Operations in New
Orleans being readied for Chrysler’s production

163
00:15:45,249 --> 00:15:50,939
of C-I, C-IB boosters, renovation and construction
work this quarter included buildup of the

164
00:15:50,939 --> 00:15:56,529
shipping and receiving ramps from which the
huge plant is serviced by rail and truck.

165
00:15:56,529 --> 00:16:02,089
A new forty foot vertical lift door is also
being installed at one end of the building

166
00:16:02,089 --> 00:16:05,839
to permit movement of boosters.

167
00:16:05,839 --> 00:16:10,199
All construction work is being done under
direction of Michoud services contractor,

168
00:16:10,199 --> 00:16:18,089
the Mason-Rust Company.

169
00:16:18,089 --> 00:16:22,319

Installation of Saturn booster assembly fixtures
at Michoud by Chrysler was well underway this

170
00:16:22,319 --> 00:16:23,319
quarter.

171
00:16:23,319 --> 00:16:28,019
Early in November, the barrel assembly fixture
was emplaced in the tail assembly area.

172
00:16:28,019 --> 00:16:33,049
Here the booster’s upper and lower thrust
rings, skin assembly, and sheer web assembly

173
00:16:33,049 --> 00:16:40,809
will be constructed.

174
00:16:40,809 --> 00:16:44,660
The thrust structure fixture was also installed
on its foundation.

175
00:16:44,660 --> 00:16:49,459
Optical alignment to precisely level the large
fixture was accomplished by the vendor and

176
00:16:49,459 --> 00:16:52,209
checked by Chrysler tool engineering personnel.

177
00:16:52,209 --> 00:16:57,179
This fixture will be used to tie together
the barrel assembly, the eight outriggers,

178
00:16:57,179 --> 00:17:02,889
and their connecting structure.

179
00:17:02,889 --> 00:17:06,690
Installation of rails, control cabs, hoists,
and electrical circuits for the overhead crane

180

00:17:06,690 --> 00:17:09,740
systems and the tail assembly area continued.

181
00:17:09,740 --> 00:17:14,179
These cranes will be used to move the upper
and lower thrust rings, barrel assembly, thrust

182
00:17:14,179 --> 00:17:26,380
structure, and other components from one work
station to another in the tail assembly area.

183
00:17:26,380 --> 00:17:31,130
Work on the surface treating pit is progressing
with laying of form and pouring of concrete

184
00:17:31,130 --> 00:17:32,130
accomplished.

185
00:17:32,130 --> 00:17:36,240
The sub pump area and flooring and side walls
for the area to contain the large treating

186
00:17:36,240 --> 00:17:41,990
tanks have also been finished.

187
00:17:41,990 --> 00:17:45,700
At Douglas Aircraft Company’s Sacramento
test facility, [Sound of Engines Firing] a

188
00:17:45,700 --> 00:17:50,340
highlight of this report period occurred on
October 4, the first successful full duration

189
00:17:50,340 --> 00:17:54,530
static firing of the six engine S-IV stage
battleship configuration.

190
00:17:54,530 --> 00:18:01,299
All RL-10 engines ignited properly under simulated
altitude conditions and fired for seven minutes

191
00:18:01,299 --> 00:18:10,080
at full thrust of 90,000 pounds.

192
00:18:10,080 --> 00:18:15,490
The bottom sections of all diffusers of test
stand Number 2 exhibited extreme erosion and

193
00:18:15,490 --> 00:18:20,080
required replacement with diffuser caps taken
from test stand Number 1.

194
00:18:20,080 --> 00:18:24,100
Certain modifications were made to allow greater
cooling of these caps by increased water flow

195
00:18:24,100 --> 00:18:30,429
through them.

196
00:18:30,429 --> 00:18:35,690
The S-IV all-systems vehicle, after tank cleaning
in Douglas' hydrostatic tower, has been

197
00:18:35,690 --> 00:18:40,509
moved into a plant area where installation
of its electrical systems will take place

198
00:18:40,509 --> 00:18:49,010
and the stage made ready for its static firings
at Sacramento in 1963.

199
00:18:49,010 --> 00:18:53,549
In the vehicle checkout area, the first set
of ground support equipment has been installed.

200
00:18:53,549 --> 00:18:59,590
This is the Phase 1 set of GSE, which had
previously been systems tested in Douglas'

201

00:18:59,590 --> 00:19:06,809
Culver City facility system integration area.

202
00:19:06,809 --> 00:19:11,440
All available articles of Phase 2 GSE have
now been installed in the systems integration

203
00:19:11,440 --> 00:19:19,899
area, and GSE system tests have begun with
the GSE test set and the S-IV stage mockup.

204
00:19:19,899 --> 00:19:27,000
A telemetry test and evaluation console is
used to monitor the various instrumentation

205
00:19:27,000 --> 00:19:28,000
circuits.

206
00:19:28,000 --> 00:19:33,850
During these operations, checkout and calibration
procedures are also developed.

207
00:19:33,850 --> 00:19:39,360
In an adjacent testing bay, vehicle and GSE
end items and subsystems, which require individual

208
00:19:39,360 --> 00:19:45,100
checking, are acceptance tested against specialized
consoles.

209
00:19:45,100 --> 00:19:50,679
Phase 2 equipment will be shipped to Sacramento
for use on the all-systems vehicle in January.

210
00:19:50,679 --> 00:20:02,730
Other sets will later be checked out for delivery
to the Saturn launch site at Cape Canaveral.

211
00:20:02,730 --> 00:20:08,630
Douglas has also begun studies on application

of the S-IVB stage, third stage of the advance,

212
00:20:08,630 --> 00:20:13,789
or C-V, Saturn to the C-IB vehicle.

213
00:20:13,789 --> 00:20:18,889
The work includes investigation of minimum
changes to the C-V-type stage for C-IB missions,

214
00:20:18,889 --> 00:20:26,950
plus S-I, S-IVB interface and stage separation.

215
00:20:26,950 --> 00:20:31,909
The S-IVB structural layout drawings being
prepared by Douglas are nearing completion,

216
00:20:31,909 --> 00:20:36,809
and work had begun on detail stage structural
drawings.

217
00:20:36,809 --> 00:20:41,260
Plans for a facility for ground testing of
S-IVB stage at Douglas Aircraft Sacramento

218
00:20:41,260 --> 00:20:45,929
area were outlined in late November.

219
00:20:45,929 --> 00:20:51,039
The test complex will include static test
stands, blockhouse, propellant and high pressure

220
00:20:51,039 --> 00:20:56,760
gas systems, and supporting utilities.

221
00:20:56,760 --> 00:21:01,750
At Rocketdyne Division of North American Aviation,
contractor for the J-2 engine, which will

222
00:21:01,750 --> 00:21:09,000

power the S-IVB stage, a major milestone was
reached this quarter when, on October 4, the

223
00:21:09,000 --> 00:21:13,940
first full duration static test of the liquid
hydrogen fueled engine was held.

224
00:21:13,940 --> 00:21:18,610
Coming eight months and five days from the
time of the J-2’s initial static test, the