



1

00:00:32,509 --> 00:00:41,260

This is the beginning of a voyage only fantasied
when most of us were born, a voyage of exploration

2

00:00:41,260 --> 00:00:43,510

into space.

3

00:00:43,510 --> 00:00:51,969

Saturn, sailing down river to a Florida cape,
a chapter of a legend in the making even now,

4

00:00:51,969 --> 00:00:58,920

a legend being made by many dedicated Americans
in all businesses and professions by the National

5

00:00:58,920 --> 00:01:05,360

Aeronautics and Space Administration, the
Marshall Space Flight Center, other NASA centers,

6

00:01:05,360 --> 00:01:11,950

and American industry, such as the Chrysler
Corporation, manufacturer of the Saturn I

7

00:01:11,950 --> 00:01:18,220

first stage, and the Douglas Aircraft Company,
who developed and built the second stage.

8

00:01:18,220 --> 00:01:26,080

This structure, the vertical assembly building,
stands on an island off a Florida cape once

9

00:01:26,080 --> 00:01:31,430

called Canaveral, but since renamed for John
Fitzgerald Kennedy.

10

00:01:31,430 --> 00:01:38,759

"I believe that this nation should commit
itself to achieving the goal before this decade

11

00:01:38,759 --> 00:01:46,460

is out of landing a man on the Moon and returning him safely to the Earth.”

12

00:01:46,460 --> 00:01:52,759

Launch Complex 39 at Kennedy Space Center is one of many launch sites developed, built,

13

00:01:52,759 --> 00:01:59,800

and used by NASA to launch manned and unmanned peaceful explorations of space, a complicated

14

00:01:59,800 --> 00:02:08,379

business which presents scientific and engineering problems unheard of a few years ago.

15

00:02:08,379 --> 00:02:14,569

The liftoff of Saturn V and later rocket-launched journeys into space from this launch pad will

16

00:02:14,569 --> 00:02:22,130

one day seem almost commonplace events to some who are living even now.

17

00:02:22,130 --> 00:02:26,690

This seems strange, considering how little time has passed since we began the rocket

18

00:02:26,690 --> 00:02:34,050

research and development program that will make these journeys possible.

19

00:02:34,050 --> 00:02:40,519

On launch Complex 34 at Cape Kennedy, not far from the Apollo Saturn V spaceport, the

20

00:02:40,519 --> 00:02:49,159

first Saturn I countdown began not too long ago on October 27, 1961.

21

00:02:49,159 --> 00:02:57,909

Ten unmanned flights have been made by Saturn I launch vehicles.

22

00:02:57,909 --> 00:03:03,549

Each of Saturn I's ten missions took another cautious, necessary step toward extensive

23

00:03:03,549 --> 00:03:11,940

manned space exploration, not just to the Moon, but even deeper into space.

24

00:03:11,940 --> 00:03:17,099

Only sixteen years before, the research and development program responsible for Saturn

25

00:03:17,099 --> 00:03:23,909

I's success was just beginning in this country.

26

00:03:23,909 --> 00:03:29,200

And so before the drama of the first Saturn launch begins, it might be well to understand

27

00:03:29,200 --> 00:03:35,370

its full significance, to see how deeply the roots of Saturn lie in the history of rocket

28

00:03:35,370 --> 00:03:36,920

flight.

29

00:03:36,920 --> 00:03:42,999

In these early years, there were several groups doing research to develop useful rocket vehicles.

30

00:03:42,999 --> 00:03:48,520

Even as today, the information gained was freely exchanged, rapidly expanding the base

31

00:03:48,520 --> 00:03:53,590

of our knowledge, developing new technology,

creating experience and skills from which

32

00:03:53,590 --> 00:03:57,590

we might ultimately move to space flight.

33

00:03:57,590 --> 00:04:02,609

From one of these groups came the first true spaceflight in the world.

34

00:04:02,609 --> 00:04:12,010

On February 24, 1949, a WAC corporal placed a payload outside of the Earth's atmosphere.

35

00:04:12,010 --> 00:04:18,060

As these groups continued to expend this country's rocket technology, more room was required

36

00:04:18,060 --> 00:04:22,580

and rocket researchers began to spread over the United States.

37

00:04:22,580 --> 00:04:29,900

In 1950, the Army research group moved to Redstone Arsenal, Huntsville, Alabama.

38

00:04:29,900 --> 00:04:35,600

Here, the successful Redstone and Jupiter missiles were developed by the United States

39

00:04:35,600 --> 00:04:36,600

Army.

40

00:04:36,600 --> 00:04:43,040

The Redstone and Jupiter, the grandfather and father of the Saturn, for during their

41

00:04:43,040 --> 00:05:01,390

development, the scientific base a technological knowhow necessary for Saturn I were obtained.

42
00:05:01,390 --> 00:05:07,950
In 1957, this knowledge was already being used as men were sketching a vehicle, designed

43
00:05:07,950 --> 00:05:15,790
from the ground up, for lifting the tons of payload required for scientific space exploration.

44
00:05:15,790 --> 00:05:21,010
Predicting the need for a booster with a million and a half pounds of thrust, these rocket

45
00:05:21,010 --> 00:05:26,600
scientists said this need could be met with a cluster of existing Redstone and Jupiter

46
00:05:26,600 --> 00:05:35,370
tanks and Jupiter rocket engines, plus many hours of engineering work to tie them together.

47
00:05:35,370 --> 00:05:41,390
In the fall of that year, the Soviets launched Sputniks I and II.

48
00:05:41,390 --> 00:05:44,350
Long-range projects were temporarily shelved.

49
00:05:44,350 --> 00:05:51,950
On January 31, 1958, only six weeks after Sputnik II, the first American satellite,

50
00:05:51,950 --> 00:05:58,420
Explorer I, was placed in orbit by Juno I, a modified Redstone with a thrust of 83,000

51
00:05:58,420 --> 00:05:59,510
pounds.

52
00:05:59,510 --> 00:06:05,560

Its payload discovered the van Allen Radiation Belt.

53

00:06:05,560 --> 00:06:12,800

With our own capability in space, an established fact, on July 26, 1958, ARPA, the Advanced

54

00:06:12,800 --> 00:06:19,580

Research Projects Agency, approved the program for a clustered engine booster with 1.5 million

55

00:06:19,580 --> 00:06:23,250

pounds of thrust.

56

00:06:23,250 --> 00:06:28,060

A single engine powerful enough to produce this thrust was under development by American

57

00:06:28,060 --> 00:06:35,250

industry in 1958, but neither this engine nor its tanks would be available in time.

58

00:06:35,250 --> 00:06:40,660

Besides, with eight well-proven, properly clustered smaller engines, the failure of

59

00:06:40,660 --> 00:06:45,300

one would not mean the failure of the booster to lift its heavy load.

60

00:06:45,300 --> 00:06:50,620

The clustering of already designed Jupiter and Redstone hardware would save both time

61

00:06:50,620 --> 00:06:53,580

and money as we moved ahead.

62

00:06:53,580 --> 00:07:02,210

On August 15, 1958, the Saturn Project was assigned to the experienced group that had

63
00:07:02,210 --> 00:07:09,480
developed Redstone, Jupiter-C, Juno I, and
launched the Explorer satellites.

64
00:07:09,480 --> 00:07:14,330
It was a team geared to conduct its own research,
development, and production.

65
00:07:14,330 --> 00:07:19,290
Its highly successful products were literally
custom-made in its own laboratories, shops,

66
00:07:19,290 --> 00:07:25,980
and offices, or produced to specification
by a relatively few major industrial contractors.

67
00:07:25,980 --> 00:07:32,050
What were only pounds had been lifted before,
tons of weight would be blasted into orbit

68
00:07:32,050 --> 00:07:36,600
to explore space, in which we had only begun
to pioneer.

69
00:07:36,600 --> 00:07:39,700
The lightweights were having their day.

70
00:07:39,700 --> 00:07:44,140
Soon, it would be time for the heavyweights.

71
00:07:44,140 --> 00:07:50,340
It was time for Saturn I, and in July 1958,
NASA was born.

72
00:07:50,340 --> 00:07:55,620
Six months later, the Saturn Project, along
with other Army space-related missions became

73

00:07:55,620 --> 00:07:58,400
part of the NASA program.

74
00:07:58,400 --> 00:08:04,180
The size and complexity of Saturn I, the size of the booster alone, and the complexity of

75
00:08:04,180 --> 00:08:11,430
its components presented an enormous technical and scientific challenge.

76
00:08:11,430 --> 00:08:16,290
Another challenge would be presented by the larger complexity of the management and organization

77
00:08:16,290 --> 00:08:23,210
required to sustain a number of other space projects already underway in 1958, and yet,

78
00:08:23,210 --> 00:08:27,300
move on beyond the frontiers of science and engineering.

79
00:08:27,300 --> 00:08:33,320
To produce a series of huge Saturn I rocket boosters in a mere handful of years and to

80
00:08:33,320 --> 00:08:42,130
ensure success would create a revolution in both management and engineering development.

81
00:08:42,130 --> 00:08:48,770
Early in 1959, it was decided to use the liquid propellant H-1 engine, an improved version

82
00:08:48,770 --> 00:08:54,870
of the S-III Jupiter and Thor engine developed by Rocketdyne as the basic element in the

83
00:08:54,870 --> 00:08:58,050

Saturn engine cluster.

84

00:08:58,050 --> 00:09:03,130

Fabrication and assembly of a ground test first stage to prove out the cluster tank

85

00:09:03,130 --> 00:09:09,690

and engine concept was started in mid-1959.

86

00:09:09,690 --> 00:09:15,779

Translating this concept into a working vehicle required proving out new ideas, for there

87

00:09:15,779 --> 00:09:20,820

were many engineers and scientists who had doubts that eight rocket engines could be

88

00:09:20,820 --> 00:09:26,529

fired at the same time in close proximity or that nine propellant tanks could be fastened

89

00:09:26,529 --> 00:09:31,500

together so they would not shake apart during flight.

90

00:09:31,500 --> 00:09:36,020

The second stage, designed and developed by the Douglas Aircraft Company, would be powered

91

00:09:36,020 --> 00:09:41,330

by six liquid hydrogen-oxygen engines.

92

00:09:41,330 --> 00:09:46,590

Selected for its greater thrust per pound of fuel, the super cold liquid hydrogen would

93

00:09:46,590 --> 00:09:52,820

require NASA and industry to develop a new technology.

94
00:09:52,820 --> 00:09:58,880
Much is always made of space technology, the hardware is glamorous, but little is known

95
00:09:58,880 --> 00:10:06,330
of the management program that makes a number of complex projects simultaneously possible.

96
00:10:06,330 --> 00:10:11,900
Three main projects ran like nerves through the Saturn Program, development of the launch

97
00:10:11,900 --> 00:10:18,580
vehicle, development of ground support equipment, and the development of launch facilities.

98
00:10:18,580 --> 00:10:21,640
Each demanded sustained and intensive effort.

99
00:10:21,640 --> 00:10:28,200
Each was a separate project, yet interrelated with the other two.

100
00:10:28,200 --> 00:10:35,110
Through 1960 and into 1961, the Saturn Program continued, developing not only the first flight

101
00:10:35,110 --> 00:10:41,400
vehicle, its engines, equipment and instrumentation, its plumbing, and its circuitry, but also

102
00:10:41,400 --> 00:10:46,230
providing for support and launch facilities.

103
00:10:46,230 --> 00:10:51,139
While the booster was being developed, modification began to a static test stand at Huntsville,

104
00:10:51,139 --> 00:10:54,680

Alabama to captive fire the first stage.

105

00:10:54,680 --> 00:11:00,839

It took a year to convert the 177 foot high structure.

106

00:11:00,839 --> 00:11:05,650

When it was finished, a mockup was installed to check the fit and test out methods for

107

00:11:05,650 --> 00:11:10,500

servicing the booster during static tests.

108

00:11:10,500 --> 00:11:17,170

These static tests began in March 1960, first with two,

109

00:11:17,170 --> 00:11:22,540

then with four,

110

00:11:22,540 --> 00:11:31,170

finally, many weeks later, with all eight engines running.

111

00:11:31,170 --> 00:11:37,360

Then came another change in the management of the Saturn I Program.

112

00:11:37,360 --> 00:11:43,730

In September 1960, that part of Redstone Arsenal transferred to NASA was formally dedicated

113

00:11:43,730 --> 00:11:47,490

as the George C. Marshall Space Flight Center.

114

00:11:47,490 --> 00:11:52,339

President Eisenhower had long ago stated his belief that outer space should be used for

115

00:11:52,339 --> 00:11:54,920
peaceful purposes.

116
00:11:54,920 --> 00:11:59,830
Aeronautical and space scientific activities
sponsored by the United States should be,

117
00:11:59,830 --> 00:12:03,980
he said, under the direction of a civilian
agency.

118
00:12:03,980 --> 00:12:10,880
Now this was an accomplished fact, and the
president had this to say, "We are propelled

119
00:12:10,880 --> 00:12:17,850
in these efforts by ingenuity and industry,
by courage to overcome disappointment and

120
00:12:17,850 --> 00:12:22,900
failure, by free-ranging imagination, by insistence
upon excellence.

121
00:12:22,900 --> 00:12:32,770
In this fact is proof again that hard work,
toughness of spirit, and self-reliant enterprise

122
00:12:32,770 --> 00:12:38,690
are not mere catchwords in an era dead and
gone.

123
00:12:38,690 --> 00:12:47,370
They remain the imperatives for the fulfillment
of America's dream, not pushbuttons, nor

124
00:12:47,370 --> 00:12:55,480
electronic devices, but superlative human
qualities have brought success and fame to

125
00:12:55,480 --> 00:12:58,630

this place.”

126

00:12:58,630 --> 00:13:04,980

In that fall of 1960, the planning and construction continued, new test stands at Marshall and

127

00:13:04,980 --> 00:13:11,030

at contractor's facilities, launch and ground support construction at the Cape.

128

00:13:11,030 --> 00:13:17,250

Meanwhile, transporters to haul the bulky boosters from place to place, aircraft to

129

00:13:17,250 --> 00:13:24,520

ferry the bulging second stage and other cargo from coast to coast, barges to float the first

130

00:13:24,520 --> 00:13:30,710

stage down the river and through the Gulf, these and thousands of other items large and

131

00:13:30,710 --> 00:13:38,280

small had to be provided for Saturn I. With so much happening, new information flowed

132

00:13:38,280 --> 00:13:41,290

almost constantly into the Saturn project.

133

00:13:41,290 --> 00:13:47,170

New technical fields were explored, new techniques devised for assembly, fabrication, and other

134

00:13:47,170 --> 00:13:49,830

processes, new decisions were made.

135

00:13:49,830 --> 00:13:55,800

In early 1961, the Saturn I prime mission was changed from launching scientific satellites

136

00:13:55,800 --> 00:13:59,580

to supporting the growing manned spaceflight program.

137

00:13:59,580 --> 00:14:04,880

The first stage, therefore, had to be redesigned to include fins for additional stability,

138

00:14:04,880 --> 00:14:10,440

larger propellant tanks and uprated engines for heavier payloads, payloads of about ten

139

00:14:10,440 --> 00:14:17,529

tons as compared to the twenty pounds of Explorer I. Guidance and control instrumentation was

140

00:14:17,529 --> 00:14:22,360

also moved at this time from the separate stages and combined into a single instrument

141

00:14:22,360 --> 00:14:25,330

unit.

142

00:14:25,330 --> 00:14:31,200

As new technology advancements were made and as scientific breakthroughs were achieved,

143

00:14:31,200 --> 00:14:38,100

change was a constant factor all through the years of Saturn I development and flight,

144

00:14:38,100 --> 00:14:45,990

for these were the years in which valves, pumps, tubing, turbines, tanks, engines, gyroscopes,

145

00:14:45,990 --> 00:14:50,810

accelerometers, and computers all adapted to the rocket environments were developed

146

00:14:50,810 --> 00:14:53,350
and produced.

147

00:14:53,350 --> 00:14:59,660
This created a vast array of instruments,
pressure and strain gauges, transducers, telemeters,

148

00:14:59,660 --> 00:15:02,890
beacons and recorders.

149

00:15:02,890 --> 00:15:08,000
The combination of high stress, heat, and
vibration demanded creating new alloys of

150

00:15:08,000 --> 00:15:14,870
steel and aluminum, increased the use of other
metals, beryllium, titanium, molybdenum, and

151

00:15:14,870 --> 00:15:16,970
tungsten.

152

00:15:16,970 --> 00:15:22,380
The same physical properties making these
metal suitable for Saturn also required development

153

00:15:22,380 --> 00:15:25,000
of new methods of working them.

154

00:15:25,000 --> 00:15:33,089
So, new tools based on the latest engineering
theory and scientific discoveries were developed.

155

00:15:33,089 --> 00:15:35,760
Magnetic forming,

156

00:15:35,760 --> 00:15:38,540
chemical milling,

157

00:15:38,540 --> 00:15:43,070

electron beam welding, to name a few.

158

00:15:43,070 --> 00:15:47,240

Ground service equipment was developed and produced for test stands and launch sites

159

00:15:47,240 --> 00:15:51,370

springing up like wild cat wails.

160

00:15:51,370 --> 00:15:56,720

Liquid fuel, some commonplace, but others once considered rare and exotic chemicals,

161

00:15:56,720 --> 00:16:02,470

were produced by tons, kerosene, liquid oxygen and hydrogen.

162

00:16:02,470 --> 00:16:07,170

Liquid hydrogen technology, the development of techniques for the manufacturer, delivery,

163

00:16:07,170 --> 00:16:12,890

storage, and use of the super cold liquid hydrogen, with its minus 423 degree boiling

164

00:16:12,890 --> 00:16:16,480

point, reached a scale never attempted before.

165

00:16:16,480 --> 00:16:21,960

The engineering and research lay on the edge of the state of the art throughout the program,

166

00:16:21,960 --> 00:16:27,310

and the skills involved were more diversified than usual.

167

00:16:27,310 --> 00:16:32,650

No single government agency, or even the entire government, could command all the knowledge

168

00:16:32,650 --> 00:16:33,940

and skills needed.

169

00:16:33,940 --> 00:16:41,209

Rather, a combination of government, educational institutions, and private industry was needed.

170

00:16:41,209 --> 00:16:46,959

This led to increasing industrial support for the Saturn I program.

171

00:16:46,959 --> 00:16:52,331

More and more corporate names began to appear on tools and equipment, on containers, on

172

00:16:52,331 --> 00:16:59,649

small parts and components developed in industrial plants scattered across the United States.

173

00:16:59,649 --> 00:17:04,760

More and more names appeared on office doors and building walls, on the smocks of engineers

174

00:17:04,760 --> 00:17:07,709

and technicians.

175

00:17:07,709 --> 00:17:12,579

At the same time, there was another shift in Marshall's philosophy of vehicle development.

176

00:17:12,579 --> 00:17:18,740

A shift in the basic concept of testing vehicles in flight to the idea of testing not only

177

00:17:18,740 --> 00:17:24,579

all components, but the vehicles themselves in ground test facilities, even though these

178

00:17:24,579 --> 00:17:28,209

also had to be designed and built.

179

00:17:28,209 --> 00:17:33,320

The reasons for the shift from flight to ground testing were mainly economic.

180

00:17:33,320 --> 00:17:37,520

Flight testing required a large number of expendable flight vehicles.

181

00:17:37,520 --> 00:17:42,330

The Jupiter Program alone had involved almost fifty flight test vehicles.

182

00:17:42,330 --> 00:17:47,390

The high cost of each Saturn I set a definite limit on the number of these that could be

183

00:17:47,390 --> 00:17:52,010

launched simply for test purposes.

184

00:17:52,010 --> 00:17:54,550

Everything happened everywhere at once.

185

00:17:54,550 --> 00:18:00,450

In Florida, machinists formed parts for a liquid hydrogen rocket engine,

186

00:18:00,450 --> 00:18:07,170

While in Tennessee, wind tunnel blasts roared past a scale model of the Saturn vehicle,

187

00:18:07,170 --> 00:18:15,450

While in California, the dome of a Saturn fuel tank turned on a welding fixture,

188

00:18:15,450 --> 00:18:21,800

And in Huntsville, at the same time, a full-sized Saturn first stage shook in its test stand.

189

00:18:21,800 --> 00:18:27,030

The use of mockups, special stages, flight stages, computers, special test stands, and

190

00:18:27,030 --> 00:18:31,799

other ground test facilities reached the point in the Saturn I program where the success

191

00:18:31,799 --> 00:18:35,910

factor for any given vehicle was exceptionally high.

192

00:18:35,910 --> 00:18:40,920

Success in flight was almost guaranteed, in fact, by the continuous growing and cumulative

193

00:18:40,920 --> 00:18:45,440

effect of testing on the ground.

194

00:18:45,440 --> 00:18:58,960

Research, design, develop, and test, assemble and test and modify, test, reassembled and

195

00:18:58,960 --> 00:19:05,830

test, and mate and test and modify and test again, this was the pattern resulting in Saturn's

196

00:19:05,830 --> 00:19:11,090

reliability, a pattern that flowed through months and even years of constant change and

197

00:19:11,090 --> 00:19:16,240

growth and new research that often began the cycle over again.

198

00:19:16,240 --> 00:19:24,220

Finally, now somehow, but as the result of management grounded in science and technical

199

00:19:24,220 --> 00:19:32,430
competence, the reliable parts, systems, and stages of Saturn I were joined.

200

00:19:32,430 --> 00:19:38,880
In August 1961, the first Saturn flight vehicle was ready for shipment from Marshall to the

201

00:19:38,880 --> 00:19:39,890
Cape.

202

00:19:39,890 --> 00:19:45,120
Its stages and payload body moved from Marshall shops to docking facilities on the Tennessee

203

00:19:45,120 --> 00:19:50,130
River for loads aboard the barge, Palaemon.

204

00:19:50,130 --> 00:19:56,610
On August 5, the barge began its slow trip down river, through the Gulf of Mexico, and

205

00:19:56,610 --> 00:19:59,840
around the Florida peninsula to the Cape.

206

00:19:59,840 --> 00:20:05,280
There, the stages were unloaded.

207

00:20:05,280 --> 00:20:10,679
Assembly of the first flight vehicle began in the middle of August, towering 162 feet

208

00:20:10,679 --> 00:20:14,280
on its launch pedestal at Launch Complex 34.

209

00:20:14,280 --> 00:20:20,780
Loaded with propellants, its weight on liftoff totaled 460 tons.

210

00:20:20,780 --> 00:20:24,800

Before that happened, however, other matters were attended to.

211

00:20:24,800 --> 00:20:31,050

On September 13, 1961, contracts were let for the Army Corps of Engineers to build Launch

212

00:20:31,050 --> 00:20:37,179

Complex 37, an additional Saturn I launch complex.

213

00:20:37,179 --> 00:20:42,510

At Marshall, designs were being drawn of bigger and more advanced Saturn vehicles to launch

214

00:20:42,510 --> 00:20:47,929

manned explorations of the Moon and deeper space.

215

00:20:47,929 --> 00:20:51,630

In October, NASA acquired Michoud Ordnance Plant at New Orleans.

216

00:20:51,630 --> 00:20:56,960

Here in this manufacturing facility, Chrysler would build the last two Saturn I first stages,

217

00:20:56,960 --> 00:21:01,670

and Chrysler and other NASA stage contractors would build first stages for more advanced

218

00:21:01,670 --> 00:21:02,990

Saturn vehicles.

219

00:21:02,990 --> 00:21:10,000

Out west, an upper stage manufacturing and assembly site for advanced Saturn vehicles

220

00:21:10,000 --> 00:21:15,150

was planned for Huntington Beach, California
by Douglas Aircraft Corporation.

221

00:21:15,150 --> 00:21:19,980

Such planning extended into the years ahead.

222

00:21:19,980 --> 00:21:26,600

For the launch of the first Saturn vehicle
from Launch Complex 34 on October 27, 1961,

223

00:21:26,600 --> 00:21:40,650

the Saturn I and advanced Saturn flight programs
were only beginning.

224

00:21:40,650 --> 00:21:53,380

The first Saturn launch was almost flawless.

225

00:21:53,380 --> 00:21:56,850

None of the ten flights presented significant
problems.

226

00:21:56,850 --> 00:22:02,230

The prime mission of the first four Saturn
flights was to verify first stage design and

227

00:22:02,230 --> 00:22:04,840

prove out launch facilities.

228

00:22:04,840 --> 00:22:10,430

There was some distinctive differences, however,
between these early flights.

229

00:22:10,430 --> 00:22:16,370

A secondary mission was assigned to SA-2 and
-3, Project Highwater.

230

00:22:16,370 --> 00:22:21,380

Ninety-five tons of water ballasting the dummy
second stage was deliberately exploded in

231

00:22:21,380 --> 00:22:25,310

space to see what effect this would have on the ionosphere.

232

00:22:25,310 --> 00:22:28,559

The explosion caused only a temporary disturbance.

233

00:22:28,559 --> 00:22:35,780

SA-3 also carried the first full propellant load of 750,000 pounds.

234

00:22:35,780 --> 00:22:42,179

A secondary mission for SA-4 was the testing of its engine-out capability.

235

00:22:42,179 --> 00:22:46,280

One engine was cut off in flight to see if the vehicle would operate on the remaining

236

00:22:46,280 --> 00:22:47,580

seven.

237

00:22:47,580 --> 00:22:53,530

This it did, scoring the fourth Saturn I success.

238

00:22:53,530 --> 00:22:58,590

On January 29, 1964, NASA launched the fifth Saturn I.

239

00:22:58,590 --> 00:23:04,040

The liquid hydrogen fueled second stage, flight tested for the first time functioned perfectly.

240

00:23:04,040 --> 00:23:07,610

First stage engines shut off as planned.

241

00:23:07,610 --> 00:23:12,030

Onboard cameras recorded second stage separation and ignition.

242

00:23:12,030 --> 00:23:16,700

The stages' engines burned for eight minutes with attached instrument unit and sand-filled

243

00:23:16,700 --> 00:23:20,419

nosecone attained orbit as an Earth satellite.

244

00:23:20,419 --> 00:23:26,710

This almost nineteen ton satellite was the heaviest ever orbited by the free world.

245

00:23:26,710 --> 00:23:34,500

SA-6, launched five months later on May 28, 1964, was the first to put into orbit an Apollo

246

00:23:34,500 --> 00:23:37,540

boilerplate command and propulsion module.

247

00:23:37,540 --> 00:23:45,410

The Apollo spacecraft is being developed by the Manned Spacecraft Center, Houston, Texas.

248

00:23:45,410 --> 00:23:51,169

There was another first for SA-6, activation of a new guidance system This system, developed

249

00:23:51,169 --> 00:23:56,220

at Marshall, was unique and complex, fully exploiting the state of the art.

250

00:23:56,220 --> 00:24:01,240

It was designed to constantly monitor the flight path and compute completely new trajectories

251

00:24:01,240 --> 00:24:03,490

as the flight progresses.

252

00:24:03,490 --> 00:24:08,240

This guidance system, active for the first time on the sixth flight, successfully corrected

253

00:24:08,240 --> 00:24:14,920

an unexpected deviation from the planned trajectory caused by the premature shutdown of one engine.

254

00:24:14,920 --> 00:24:20,710

As a result of this kind of excellent performance, SA-6 was the last Saturn I R&D vehicle instead

255

00:24:20,710 --> 00:24:23,539

of SA-10, as originally scheduled.

256

00:24:23,539 --> 00:24:26,400

The rest will be operational vehicles.

257

00:24:26,400 --> 00:24:33,260

On September 8, 1964, SA-7 launched the second Apollo boilerplate spacecraft into orbit,

258

00:24:33,260 --> 00:24:38,610

testing its structure and design and demonstrating its compatibility with the launch vehicle.

259

00:24:38,610 --> 00:24:43,230

All other major test objectives of this flight were also met.

260

00:24:43,230 --> 00:24:49,290

SA-9 placed in orbit the first Pegasus, a meteoroid technology satellite, on February

261

00:24:49,290 --> 00:24:51,390

16, 1965.

262

00:24:51,390 --> 00:24:56,429

Pegasus, developed for NASA's Office of Advanced Research and Technology by Fairchild-Hiller

263

00:24:56,429 --> 00:25:01,740

Corporation under the management of Marshall,
was shrouded by the Apollo boilerplate command

264

00:25:01,740 --> 00:25:05,169

and propulsion modules.

265

00:25:05,169 --> 00:25:09,390

Onboard television recorded shroud ejection
after second stage shutdown.

266

00:25:09,390 --> 00:25:15,590

Then, Pegasus extended its 100 foot aluminum-plated
electronic wings and, like a moth emerged

267

00:25:15,590 --> 00:25:22,150

from its cocoon, moved on, its wings spread
to measure the hazards of meteoroids in space.

268

00:25:22,150 --> 00:25:28,130

Data from Pegasus conferment that the Apollo
spacecraft design is adequate to protect astronauts

269

00:25:28,130 --> 00:25:29,990

from meteoroids.

270

00:25:29,990 --> 00:25:34,419

SA-8 launched at night, orbited the second
Pegasus satellite.

271

00:25:34,419 --> 00:25:39,990

SA-10, the final Saturn I flight vehicle,
launched Pegasus 3.

272

00:25:39,990 --> 00:25:55,330

The ten vehicle Saturn I Program was without
precedent in the history of spaceflight.

273

00:25:55,330 --> 00:26:00,740

Each vehicle of the program established new levels of rocket reliability far above those

274

00:26:00,740 --> 00:26:07,390
of sixteen years earlier.

275

00:26:07,390 --> 00:26:17,830
A program providing the foundation for the follow-on advanced Saturn programs.

276

00:26:17,830 --> 00:26:32,890
The updated Saturn I

277

00:26:32,890 --> 00:27:03,800
and Saturn V.

278

00:27:03,800 --> 00:27:25,250
That's the story of the first ten lives of Saturn I, each one an essential step in

279

00:27:25,250 --> 00:27:31,770
the development of large launch vehicle science and technology, each flight a vital step toward