
AMERICAN

1
00:00:03,360 --> 00:00:07,419
[Music]

2
00:00:15,310 --> 00:00:10,400
to the nation were the mightiest rocket

3
00:00:27,690 --> 00:00:15,320
power belongs the conquest of space

4
00:00:31,000 --> 00:00:27,700
[Music]

5
00:00:33,700 --> 00:00:31,010
shortly after its establishment in 1958

6
00:00:36,490 --> 00:00:33,710
NASA the National Aeronautics and Space

7
00:00:38,860 --> 00:00:36,500
Administration began the job of creating

8
00:00:42,750 --> 00:00:38,870
rocket power capable of thrusting

9
00:00:47,380 --> 00:00:42,760
skyward a spaceship weighing 3,000 tons

10
00:00:51,280 --> 00:00:47,390
how much is three thousand tons as much

11
00:00:53,110 --> 00:00:51,290
as this nuclear submarine or two dozen

12
00:00:57,400 --> 00:00:53,120
jet airliners fully loaded with

13
00:01:00,160 --> 00:00:57,410

passengers cargo and cruise but such

14
00:01:03,040 --> 00:01:00,170
gargantuan power must also be as humanly

15
00:01:07,210 --> 00:01:03,050
reliable as possible four men will ride

16
00:01:08,859 --> 00:01:07,220
the ship to the moon under the technical

17
00:01:11,170 --> 00:01:08,869
direction of the Marshall Space Flight

18
00:01:13,690 --> 00:01:11,180
Center the task was assigned to

19
00:01:15,080 --> 00:01:13,700
Rocketdyne a division of north american

20
00:01:21,690 --> 00:01:15,090
aviation incorporated

21
00:01:26,370 --> 00:01:24,300
in California's Santa Susana mountains

22
00:01:29,370 --> 00:01:26,380
where Butterfield stages once rolled

23
00:01:31,950 --> 00:01:29,380
down rugged trails Rocketdyne engineers

24
00:01:34,770 --> 00:01:31,960
had created America's largest propulsion

25
00:01:36,600 --> 00:01:34,780
field laboratory on the ashes of

26
00:01:39,510 --> 00:01:36,610
campfires built here by the outlaw

27
00:01:42,230 --> 00:01:39,520
Joaquin Murrieta other rocket engines

28
00:01:45,539 --> 00:01:42,240
had already begun their trials by fire

29
00:01:52,889 --> 00:01:45,549
anchored to test stands engines poured

30
00:01:56,160 --> 00:01:52,899
forth their pillars of flame work on the

31
00:01:58,020 --> 00:01:56,170
giant engine christened the f1 began

32
00:02:00,749 --> 00:01:58,030
with studies of other Rocketdyne

33
00:02:02,880 --> 00:02:00,759
accomplishments in rocket power from

34
00:02:06,660 --> 00:02:02,890
investigations made for the Air Force as

35
00:02:10,050 --> 00:02:06,670
far back as 1955 to space shots of the

36
00:02:13,890 --> 00:02:10,060
60s experts examined and evaluated

37
00:02:16,020 --> 00:02:13,900
results information from 20,000 engine

38
00:02:23,940 --> 00:02:16,030

and component tests was thoroughly

39
00:02:25,590 --> 00:02:23,950
reviewed analyzed checked to the f1 the

40
00:02:27,960 --> 00:02:25,600
Marshall Space Flight Center had

41
00:02:30,090 --> 00:02:27,970
assigned the mammoth task of lifting the

42
00:02:33,990 --> 00:02:30,100
mightiest rocket ship ever from launch

43
00:02:35,819 --> 00:02:34,000
pad into space for this reason NASA had

44
00:02:39,509 --> 00:02:35,829
placed the highest priority on the

45
00:02:41,729 --> 00:02:39,519
project to achieve the tremendous push

46
00:02:45,920 --> 00:02:41,739
or thrust needed for this immense engine

47
00:02:48,509 --> 00:02:45,930
data and design were precisely plotted

48
00:02:51,300 --> 00:02:48,519
steadily systematically designed

49
00:02:53,220 --> 00:02:51,310
developed into a prototype harnessed

50
00:02:56,220 --> 00:02:53,230
here within the metal and might of this

51
00:02:59,759 --> 00:02:56,230
engine lay the outer space prestige of

52
00:03:02,310 --> 00:02:59,769
the United States this new f1 must

53
00:03:05,370 --> 00:03:02,320
perform perfectly for more than just

54
00:03:06,840 --> 00:03:05,380
time and money are involved men's lives

55
00:03:10,530 --> 00:03:06,850
will depend on

56
00:03:15,569 --> 00:03:13,199
since there is no air in outer space for

57
00:03:19,170 --> 00:03:15,579
a rocket engine to breathe it must carry

58
00:03:22,170 --> 00:03:19,180
along its own liquid oxygen at 300

59
00:03:24,619 --> 00:03:22,180
degrees below zero at the same instant

60
00:03:27,089 --> 00:03:24,629
this frigid oxygen is flowing however an

61
00:03:29,670 --> 00:03:27,099
inferno of five thousand degrees

62
00:03:35,759 --> 00:03:29,680
Fahrenheit is created inside the engine

63
00:03:37,770 --> 00:03:35,769

a new generation of production

64
00:03:42,509 --> 00:03:37,780
techniques and tools had to be devised

65
00:03:48,180 --> 00:03:42,519
new methods of manufacture new

66
00:03:50,009 --> 00:03:48,190
adjustments new ideas advanced

67
00:03:56,099 --> 00:03:50,019
metallurgy had to produce superior

68
00:03:58,319 --> 00:03:56,109
metals of great strength the latest

69
00:04:06,809 --> 00:03:58,329
instruments and inventions were prepared

70
00:04:08,970 --> 00:04:06,819
and put to their purposes essential

71
00:04:20,490 --> 00:04:08,980
details were pictured in black and white

72
00:04:22,350 --> 00:04:20,500
a myriad of matters were pinned down the

73
00:04:23,480 --> 00:04:22,360
best talent and technologies were

74
00:04:36,659 --> 00:04:23,490
assembled

75
00:04:42,840 --> 00:04:39,460
tests were run for withstanding the

76
00:04:48,350 --> 00:04:42,850
tremendous acceleration of launch

77
00:04:50,490 --> 00:04:48,360
intense vibration prodigious pressures

78
00:04:57,430 --> 00:04:50,500
[Music]

79
00:05:11,020 --> 00:04:57,440
the vacuum of outer space extremes of

80
00:05:12,850 --> 00:05:11,030
cold and heat yet all of these were

81
00:05:15,550 --> 00:05:12,860
merely samplings of the countless

82
00:05:22,300 --> 00:05:15,560
complexities to be solved there was more

83
00:05:24,580 --> 00:05:22,310
much more to fathom to feed the f1 with

84
00:05:27,100 --> 00:05:24,590
liquid oxygen and kerosene pumps were

85
00:05:28,990 --> 00:05:27,110
needed capable of forcing three tonnes

86
00:05:31,570 --> 00:05:29,000
of propellant into the engine in a

87
00:05:33,960 --> 00:05:31,580
single second that's as much fuel as

88
00:05:36,790 --> 00:05:33,970

your automobile uses in an entire year

89
00:05:39,130 --> 00:05:36,800
the combined power of these pumps would

90
00:05:47,050 --> 00:05:39,140
equal 30 diesel locomotives working

91
00:05:50,020 --> 00:05:47,060
together there was more for the

92
00:05:52,690 --> 00:05:50,030
engineers to ponder because wait in a

93
00:05:55,500 --> 00:05:52,700
rocket is at a premium each pump must be

94
00:05:58,350 --> 00:05:55,510
confined to a small compact package

95
00:06:00,850 --> 00:05:58,360
[Music]

96
00:06:02,770 --> 00:06:00,860
entering the combustion chamber fuel

97
00:06:05,200 --> 00:06:02,780
would have to burn with volcanic force

98
00:06:09,250 --> 00:06:05,210
to produce a thrust of 1 million five

99
00:06:15,529 --> 00:06:09,260
hundred thousand pounds the equivalent

100
00:06:20,219 --> 00:06:18,390
once Unleashed however this Titanic

101
00:06:24,740 --> 00:06:20,229
force must still be under absolute

102
00:06:27,270 --> 00:06:24,750
control thrust precisely delivered

103
00:06:29,879 --> 00:06:27,280
duration regulated to the fraction of a

104
00:06:32,010 --> 00:06:29,889
second the engine must be instantly

105
00:06:35,879 --> 00:06:32,020
stopped when necessary by the push of a

106
00:06:37,830 --> 00:06:35,889
single button to these formidable

107
00:06:40,170 --> 00:06:37,840
demands the Marshall Space Flight Center

108
00:06:42,360 --> 00:06:40,180
had added the requisites of reliable

109
00:06:44,730 --> 00:06:42,370
simplest in drugs to provide the utmost

110
00:06:48,959 --> 00:06:44,740
safety for the men who will ride a tough

111
00:06:51,689 --> 00:06:48,969
the f1 engines and the f1 must be

112
00:06:53,999 --> 00:06:51,699
adaptable to fit such giant spaceships

113
00:07:00,119 --> 00:06:54,009

as the advanced Saturn moon rocket now

114
00:07:03,059 --> 00:07:00,129
being planned by NASA this Saturn the c5

115
00:07:06,830 --> 00:07:03,069
will carry the Apollo spacecraft and its

116
00:07:09,570 --> 00:07:06,840
crew on the first expedition to the moon

117
00:07:14,330 --> 00:07:09,580
riding with the astronauts will be food

118
00:07:17,010 --> 00:07:14,340
water oxygen power air-conditioning

119
00:07:20,959 --> 00:07:17,020
communications equipment scientific

120
00:07:23,550 --> 00:07:20,969
instruments and a means for return home

121
00:07:25,550 --> 00:07:23,560
heavy shielding will protect them from

122
00:07:28,830 --> 00:07:25,560
deadly radiation

123
00:07:31,310 --> 00:07:28,840
in addition thousands of gallons of fuel

124
00:07:34,339 --> 00:07:31,320
will be contained within these tanks

125
00:07:37,469 --> 00:07:34,349
[Music]

126
00:07:40,680 --> 00:07:37,479
such a tremendous amount of weight will

127
00:07:44,100 --> 00:07:40,690
call for the advanced Saturn to be 350

128
00:07:48,059 --> 00:07:44,110
feet high tall as a 30-story building it

129
00:07:51,119 --> 00:07:48,069
will weigh 3,000 tons six million pounds

130
00:07:52,800 --> 00:07:51,129
of takeoff weight the heaviest load ever

131
00:07:57,809 --> 00:07:52,810
to lift off the earth by its own

132
00:08:02,640 --> 00:07:57,819
bootstraps how will such a stupendous

133
00:08:05,159 --> 00:08:02,650
task be performed by clustering 5f1

134
00:08:08,070 --> 00:08:05,169
engines together for the Saturn's first

135
00:08:10,150 --> 00:08:08,080
stage creating seven and a half million

136
00:08:17,560 --> 00:08:10,160
pounds of thrust

137
00:08:19,720 --> 00:08:17,570
power equal to 85 Hoover dams the

138
00:08:22,420 --> 00:08:19,730

intricacies of such a dynamic endeavor

139
00:08:30,010 --> 00:08:22,430
demand machines able to affect economies

140
00:08:31,930 --> 00:08:30,020
in money minutes and material and shape

141
00:08:39,909 --> 00:08:31,940
high-strength metal to exacting

142
00:09:06,640 --> 00:08:39,919
requirements and also men skilled men to

143
00:09:09,160 --> 00:09:06,650
manipulate the machines and men with

144
00:09:16,480 --> 00:09:09,170
trained minds to probe deeply into

145
00:09:19,120 --> 00:09:16,490
problems never known before hundreds of

146
00:09:20,830 --> 00:09:19,130
scientists and engineers and more

147
00:09:23,260 --> 00:09:20,840
hundreds in manufacturing and

148
00:09:25,060 --> 00:09:23,270
administration all directing their

149
00:09:27,210 --> 00:09:25,070
efforts and energies toward bringing

150
00:09:37,500 --> 00:09:27,220
into reality the f1

151
00:09:43,240 --> 00:09:40,329
from the mastery of a thousand things

152
00:09:45,460 --> 00:09:43,250
never thought of before from a multitude

153
00:09:48,540 --> 00:09:45,470
of materials newly discovered vented or

154
00:09:52,300 --> 00:09:48,550
edited from thought to tangible reality

155
00:10:07,660 --> 00:09:52,310
the f1 is no longer a drawing for dream

156
00:10:10,840 --> 00:10:07,670
it exists now the f1 is a mighty metal

157
00:10:12,880 --> 00:10:10,850
fact the result of four earnest years of

158
00:10:17,530 --> 00:10:12,890
work by the nation's most experienced

159
00:10:20,319 --> 00:10:17,540
rocket engine experts in May 1962 the f1

160
00:10:23,440 --> 00:10:20,329
was successfully run at full thrust for

161
00:10:25,389 --> 00:10:23,450
full duration captive runs continued at

162
00:10:28,240 --> 00:10:25,399
the NASA high thrust test area at

163
00:10:31,480 --> 00:10:28,250

Edwards California they will continue

164
00:10:38,110 --> 00:10:31,490
night and day perfecting the f1 for

165
00:10:40,720 --> 00:10:38,120
flight into a new dimension with the f1

166
00:10:44,590 --> 00:10:40,730
engine we will be ready to send our men

167
00:10:47,590 --> 00:10:44,600
to the moon and beyond there is no end

168
00:10:50,829 --> 00:10:47,600
to space and the moon is not our final

169
00:10:52,540 --> 00:10:50,839
target long before that landing has

170
00:10:55,410 --> 00:10:52,550
taken place routes will have been

171
00:10:58,480 --> 00:10:55,420
plotted for expeditions far beyond it as

172
00:10:58,960 --> 00:10:58,490
long as man seeks after knowledge and

173
00:11:02,170 --> 00:10:58,970
wisdom

174
00:11:04,960 --> 00:11:02,180
there will be no ultimate goal there

175
00:11:07,720 --> 00:11:04,970
will only be a series of steps each

176
00:11:14,830 --> 00:11:07,730
reaching out a little farther into the