

1  
00:00:25,019 --> 00:00:29,820  
as the Sun rises over the Guiana Space

2  
00:00:27,210 --> 00:00:31,469  
Center the team conducts final checks on

3  
00:00:29,820 --> 00:00:36,840  
the health and status of the Aryan 5

4  
00:00:31,469 --> 00:00:38,179  
rocket and its payload the James Webb

5  
00:00:36,840 --> 00:00:43,040  
Space Telescope

6  
00:00:38,179 --> 00:00:43,039  
NASA's number one science priority

7  
00:00:56,109 --> 00:01:00,338  
the Webb telescope is designed to look

8  
00:00:58,268 --> 00:01:02,920  
back to a time when stars and galaxies

9  
00:01:00,338 --> 00:01:05,798  
were first forming over thirteen point

10  
00:01:02,920 --> 00:01:07,990  
five billion years ago with its

11  
00:01:05,799 --> 00:01:10,509  
revolutionary design and capabilities

12  
00:01:07,989 --> 00:01:14,099  
the Webb telescope is about to unleash a

13  
00:01:10,509 --> 00:01:14,099  
new dawn of discovery

14  
00:01:16,950 --> 00:01:22,200  
the video at also Pollyanna

15  
00:01:22,530 --> 00:01:24,799  
this

16  
00:01:24,969 --> 00:01:31,289  
seconds before liftoff the Aryan fives

17  
00:01:27,700 --> 00:01:33,430  
liquid-fueled engine comes to full power

18  
00:01:31,290 --> 00:01:35,790  
followed by the ignition or the tim

19  
00:01:33,430 --> 00:01:38,450  
solid rockets

20  
00:01:35,790 --> 00:01:38,450  
have lift-off

21  
00:01:48,299 --> 00:01:53,520  
the Webb telescope is finally on its way

22  
00:01:51,060 --> 00:01:55,530  
the result of years of study and

23  
00:01:53,519 --> 00:01:59,328  
development by thousands of team members

24  
00:01:55,530 --> 00:02:01,769  
in the United States Canada in Europe

25  
00:01:59,328 --> 00:02:03,209  
Webb spacecraft ascends nearly

26  
00:02:01,769 --> 00:02:06,199  
vertically through the heavy lower

27  
00:02:03,209 --> 00:02:06,199  
atmosphere of Earth

28  
00:02:09,050 --> 00:02:13,850  
as the rocket reaches maximum

29

00:02:10,939 --> 00:02:15,800  
acceleration spent solid rocket motors

30  
00:02:13,849 --> 00:02:18,259  
or jettison safely into the Atlantic

31  
00:02:15,800 --> 00:02:20,860  
Ocean reaching the upper atmosphere

32  
00:02:18,259 --> 00:02:22,780  
where protection is no longer needed

33  
00:02:20,860 --> 00:02:25,110  
the payload fairing is jettisoned

34  
00:02:22,780 --> 00:02:25,110  
away

35  
00:02:27,968 --> 00:02:32,389  
accelerating through the atmosphere the

36  
00:02:29,989 --> 00:02:38,060  
Aryan five rockets four-stage expended

37  
00:02:32,389 --> 00:02:39,828  
its fuel and shuts down the empty first

38  
00:02:38,060 --> 00:02:45,259  
stage then separates from the upper

39  
00:02:39,829 --> 00:02:47,810  
stage after first stage separation and

40  
00:02:45,259 --> 00:02:49,639  
before second stage ignition the Webb

41  
00:02:47,810 --> 00:02:52,039  
telescope has a slightly downward

42  
00:02:49,639 --> 00:02:54,768  
trajectory as it speeds over the

43  
00:02:52,039 --> 00:02:57,429

Atlantic Ocean the upper stage motor

44

00:02:54,769 --> 00:03:01,688

ignites and the ascent to L tune resumes

45

00:02:57,430 --> 00:03:01,689

never again to be interrupted

46

00:03:03,300 --> 00:03:07,830

the exposed telescope is delicate and

47

00:03:05,669 --> 00:03:11,339

must be protected from the sun's fierce

48

00:03:07,830 --> 00:03:13,140

heat to avoid overheating and damage a

49

00:03:11,340 --> 00:03:15,030

carefully designed series of

50

00:03:13,139 --> 00:03:19,349

oscillations are performed that provide

51

00:03:15,030 --> 00:03:21,300

the necessary protection near the end of

52

00:03:19,349 --> 00:03:23,099

powered flight the Roll program stops

53

00:03:21,300 --> 00:03:26,360

and the launcher then assumes the proper

54

00:03:23,099 --> 00:03:26,359

attitude for separation

55

00:03:32,229 --> 00:03:37,459

after separation from the Aryan upper

56

00:03:34,848 --> 00:03:40,459

stage the Webb telescope continues its

57

00:03:37,459 --> 00:03:42,199

journey to I2 under its own power taking

58  
00:03:40,459 --> 00:03:46,390  
the next step to its final orbital

59  
00:03:42,199 --> 00:03:46,389  
station 1 million miles from Earth

60  
00:03:50,750 --> 00:03:56,530  
the Webb telescope is about to unleash

61  
00:03:53,030 --> 00:03:56,530  
an dawn of discovery

62  
00:04:12,959 --> 00:04:17,918  
the Webb telescope separates from the

63  
00:04:15,430 --> 00:04:19,989  
launcher second stage the white ring

64  
00:04:17,918 --> 00:04:22,599  
close to the earth represents the Hubble

65  
00:04:19,988 --> 00:04:24,519  
Space Telescope's orbit and the larger

66  
00:04:22,600 --> 00:04:26,350  
orbit is the geosynchronous orbit where

67  
00:04:24,519 --> 00:04:28,839  
most telecommunications satellites are

68  
00:04:26,350 --> 00:04:31,509  
located the solar array is Webb's first

69  
00:04:28,839 --> 00:04:33,489  
deployment when completed all of Webb's

70  
00:04:31,509 --> 00:04:35,379  
electrical power needs are satisfied by

71  
00:04:33,490 --> 00:04:38,199  
the solar array for the remainder of the

72  
00:04:35,379 --> 00:04:39,850  
mission the onboard control system

73  
00:04:38,199 --> 00:04:41,829  
continually monitors and updates the

74  
00:04:39,850 --> 00:04:44,770  
attitude to ensure power generation and

75  
00:04:41,829 --> 00:04:47,259  
thermal safety to preserve the

76  
00:04:44,769 --> 00:04:49,329  
cleanliness of the mirrors thrusters are

77  
00:04:47,259 --> 00:04:52,120  
located only on the sunlit side of the

78  
00:04:49,329 --> 00:04:54,399  
observatory the trajectory is designed

79  
00:04:52,120 --> 00:04:56,019  
without employing a retro fire which

80  
00:04:54,399 --> 00:05:00,189  
necessitates pointing the delicate

81  
00:04:56,019 --> 00:05:02,829  
telescope with the Sun if course

82  
00:05:00,189 --> 00:05:04,478  
corrections are needed these velocity

83  
00:05:02,829 --> 00:05:06,519  
additions must be done early in the

84  
00:05:04,478 --> 00:05:10,168  
flight to most efficiently use the

85  
00:05:06,519 --> 00:05:10,168  
missions limited precious fuel

86

00:05:12,759 --> 00:05:17,778  
after completing mid-course Corrections

87  
00:05:15,288 --> 00:05:19,959  
the Webb telescope passes the orbit of

88  
00:05:17,778 --> 00:05:19,959  
the moon

89  
00:05:34,949 --> 00:05:41,479  
Webb's initial transformation is the

90  
00:05:37,740 --> 00:05:41,480  
deployment of the sunshield pallets

91  
00:06:04,209 --> 00:06:07,569  
the tower separating the telescope and

92  
00:06:06,189 --> 00:06:10,620  
instruments from the spacecraft and

93  
00:06:07,569 --> 00:06:10,620  
sunshield is next

94  
00:06:15,379 --> 00:06:21,170  
next the aft flap deploys this is key to

95  
00:06:19,339 --> 00:06:24,139  
managing momentum build-up in fluid

96  
00:06:21,170 --> 00:06:25,550  
consumption this structure helps to

97  
00:06:24,139 --> 00:06:27,469  
balance the pressure from the sun's

98  
00:06:25,550 --> 00:06:30,189  
light on the Webb telescope around its

99  
00:06:27,470 --> 00:06:30,190  
center of mass

100  
00:06:31,100 --> 00:06:35,300

after the sunshield pallets reach their

101

00:06:33,139 --> 00:06:37,849

final positions the membrane launch

102

00:06:35,300 --> 00:06:39,920

restraints are released these have kept

103

00:06:37,850 --> 00:06:42,200

the sunshield membrane safely in place

104

00:06:39,920 --> 00:06:44,330

from final stowage at the Northrop

105

00:06:42,199 --> 00:06:47,039

Grumman facility in California through

106

00:06:44,329 --> 00:06:49,099

shipment and launch

107

00:06:47,040 --> 00:06:49,100

you

108

00:06:49,379 --> 00:07:02,399

the sunshield protective covers roll

109

00:06:51,569 --> 00:07:04,110

back permitting membrane deployment the

110

00:07:02,399 --> 00:07:06,529

covers over the core region released

111

00:07:04,110 --> 00:07:06,530

next

112

00:07:08,939 --> 00:07:13,769

then the mid booms extend and the

113

00:07:11,399 --> 00:07:16,849

sunshield assumes it's hexagonal tennis

114

00:07:13,769 --> 00:07:16,849

court size shape



115  
00:07:37,829 --> 00:07:43,128  
it is now time to tension the sunshield

116  
00:07:40,110 --> 00:07:45,840  
membranes each thinner than a human hair

117  
00:07:43,129 --> 00:07:48,110  
pulling each of the uniquely sized and

118  
00:07:45,839 --> 00:07:51,329  
shaped layers to their optimal position

119  
00:07:48,110 --> 00:07:53,639  
when deployed the Sun shield allows the

120  
00:07:51,329 --> 00:07:56,339  
telescope to cool the 385 degrees

121  
00:07:53,639 --> 00:07:59,430  
Fahrenheit below zero cold enough to

122  
00:07:56,339 --> 00:08:01,560  
liquefy air while the layer closest to

123  
00:07:59,430 --> 00:08:04,168  
the Sun is almost 190 degrees Fahrenheit

124  
00:08:01,560 --> 00:08:04,728  
above zero nearly the boiling point of

125  
00:08:04,168 --> 00:08:08,629  
the water

126  
00:08:04,728 --> 00:08:11,360  
of almost 600 degrees

127  
00:08:08,629 --> 00:08:13,639  
truth fire nice

128  
00:08:11,360 --> 00:08:15,348  
once in the shadow of the deployed Sun

129  
00:08:13,639 --> 00:08:17,240  
shield the telescope and instruments

130  
00:08:15,348 --> 00:08:20,529  
continue cooling down to their final

131  
00:08:17,240 --> 00:08:23,300  
operational cryogenic temperatures at

132  
00:08:20,529 --> 00:08:25,818  
the completion of membrane tensioning

133  
00:08:23,300 --> 00:08:30,530  
the secondary mirror deploys in the

134  
00:08:25,819 --> 00:08:32,719  
position as latch rigidly in place the

135  
00:08:30,529 --> 00:08:35,000  
aft deployable radiator releases and

136  
00:08:32,719 --> 00:08:36,829  
springs into position allowing the

137  
00:08:35,000 --> 00:08:38,538  
instruments to radiate their waste heat

138  
00:08:36,828 --> 00:08:41,538  
directly into space and away from the

139  
00:08:38,538 --> 00:08:43,639  
telescope disposing of excess heat is

140  
00:08:41,538 --> 00:08:46,159  
crucial to the mission so that it does

141  
00:08:43,639 --> 00:08:49,909  
not overwhelm the faint infrared signals

142  
00:08:46,159 --> 00:08:52,569  
to be collected from the cosmos the cord

143

00:08:49,909 --> 00:08:54,919  
fold wings deploy and latch in place

144  
00:08:52,570 --> 00:08:58,209  
completing the major deployments of the

145  
00:08:54,919 --> 00:08:58,208  
largest telescope in space

146  
00:09:06,509 --> 00:09:11,250  
as the Webb telescope continues out to

147  
00:09:09,480 --> 00:09:14,159  
its operational orbit around the Sun or

148  
00:09:11,250 --> 00:09:16,049  
though to the observatory continues to

149  
00:09:14,159 --> 00:09:21,179  
cool down to its final cryogenic

150  
00:09:16,049 --> 00:09:24,169  
temperature state a trajectory

151  
00:09:21,179 --> 00:09:26,699  
correction applied 29 days after launch

152  
00:09:24,169 --> 00:09:30,500  
puts the Webb telescope into its halo

153  
00:09:26,700 --> 00:09:33,900  
orbit a key part of the mission design

154  
00:09:30,500 --> 00:09:35,789  
the Sun Earth L2 point is where Webb's

155  
00:09:33,899 --> 00:09:39,449  
orbit around the Sun is synchronized

156  
00:09:35,789 --> 00:09:42,000  
with Earth's at this point 1 million

157  
00:09:39,450 --> 00:09:43,920

miles from Earth Webb is free from the

158

00:09:42,000 --> 00:09:48,210

thermal influences of the earth and all

159

00:09:43,919 --> 00:09:50,549

eclipses additionally the Sun Earth and

160

00:09:48,210 --> 00:09:52,670

Moon the brightest objects in the sky

161

00:09:50,549 --> 00:09:56,009

are hidden by the deployed Sun shield

162

00:09:52,669 --> 00:09:58,379

giving where the dark cold and stable

163

00:09:56,009 --> 00:10:00,620

environment to carry out its mission of

164

00:09:58,379 --> 00:10:00,620

discovery

165

00:10:01,309 --> 00:10:06,799

once the mirrors and detectors are

166

00:10:03,799 --> 00:10:09,740

sufficiently cold the wavefront sensing

167

00:10:06,799 --> 00:10:12,139

and control operations can begin this

168

00:10:09,740 --> 00:10:14,990

sophisticated multi-step operations

169

00:10:12,139 --> 00:10:17,120

ultimate goal is to position each of the

170

00:10:14,990 --> 00:10:18,919

web telescopes moveable mirrors into

171

00:10:17,120 --> 00:10:22,759

their correct final positions and

172  
00:10:18,919 --> 00:10:24,799  
orientations once the mirrors are

173  
00:10:22,759 --> 00:10:26,808  
aligned the mission team will continue

174  
00:10:24,799 --> 00:10:29,588  
checking out the science instruments

175  
00:10:26,808 --> 00:10:31,429  
preparing them for operations

176  
00:10:29,589 --> 00:10:34,220  
commissioning is completed about a

177  
00:10:31,429 --> 00:10:37,859  
hundred sixty days after launch and the

178  
00:10:34,220 --> 00:10:40,290  
science mission is ready to begin

179  
00:10:37,860 --> 00:10:42,240  
this brings to fruition the work of the

180  
00:10:40,289 --> 00:10:45,659  
thousands of members of the web team

181  
00:10:42,240 --> 00:10:49,500  
from the United States of America Canada

182  
00:10:45,659 --> 00:10:52,559  
and Europe astronomers from all over the

183  
00:10:49,500 --> 00:10:55,100  
world can now use this facility to study

184  
00:10:52,559 --> 00:10:55,099  
the universe

185  
00:10:57,080 --> 00:11:03,500  
NASA's James Webb Space Telescope is a

186  
00:11:00,500 --> 00:11:05,589  
game-changer discoveries made by this

187  
00:11:03,500 --> 00:11:07,970  
Observatory will rewrite textbooks

188  
00:11:05,589 --> 00:11:13,190  
inspiring the next generation of future

189  
00:11:07,970 --> 00:11:15,560  
engineers and scientists this

190  
00:11:13,190 --> 00:11:18,140  
revolutionary tool will provide an

191  
00:11:15,559 --> 00:11:21,379  
unprecedented view into the birth of the

192  
00:11:18,139 --> 00:11:24,879  
first stars and galaxies unleashing a

193  
00:11:21,379 --> 00:11:24,879  
new dawn of discovery

194  
00:11:39,600 --> 00:11:41,659  
you