



1
00:00:25,359 --> 00:00:49,750
my

2
00:00:54,790 --> 00:00:52,229
believe me it has been a beginning it is

3
00:00:58,549 --> 00:00:56,470
i don't think there ever will be an end

4
00:01:41,670 --> 00:00:58,559
not as long as man is alive

5
00:01:45,429 --> 00:01:43,270
constellation is

6
00:01:47,270 --> 00:01:45,439
nasa's program to

7
00:01:49,749 --> 00:01:47,280
to return humans

8
00:01:52,469 --> 00:01:49,759
uh to exploring beyond low earth orbit

9
00:01:55,510 --> 00:01:52,479
we've begun with the end in mind of of

10
00:01:57,830 --> 00:01:55,520
exploring mars and understanding what is

11
00:01:59,510 --> 00:01:57,840
it that we need to learn between now and

12
00:02:01,590 --> 00:01:59,520
then in order to be able to do that

13
00:02:03,670 --> 00:02:01,600

safely and effectively

14

00:02:05,749 --> 00:02:03,680

we have three different what we refer to

15

00:02:07,270 --> 00:02:05,759

as design reference missions the first

16

00:02:09,430 --> 00:02:07,280

one is servicing the international space

17

00:02:10,630 --> 00:02:09,440

station insert into orbit rendezvous and

18

00:02:13,910 --> 00:02:10,640

dock with the international space

19

00:02:15,350 --> 00:02:13,920

station stay up to 180 days or more at

20

00:02:16,390 --> 00:02:15,360

the international space station and then

21

00:02:19,589 --> 00:02:16,400

return

22

00:02:21,110 --> 00:02:19,599

that crew to to the surface of the earth

23

00:02:23,110 --> 00:02:21,120

design reference mission number two

24

00:02:24,229 --> 00:02:23,120

would be to do a seven-day mission to

25

00:02:25,750 --> 00:02:24,239

the moon

26
00:02:27,830 --> 00:02:25,760
design versus mission number three is

27
00:02:29,750 --> 00:02:27,840
sort of a combination of those first two

28
00:02:31,670 --> 00:02:29,760
because we're doing

29
00:02:33,990 --> 00:02:31,680
essentially the same functions that are

30
00:02:36,790 --> 00:02:34,000
in the space station mission and in the

31
00:02:38,390 --> 00:02:36,800
lunar seven day mission but now we're

32
00:02:41,910 --> 00:02:38,400
having crews stay on the lunar surface

33
00:02:44,470 --> 00:02:41,920
for up to six months at a lunar outpost

34
00:02:46,630 --> 00:02:44,480
we have a very rich heritage of human

35
00:02:48,550 --> 00:02:46,640
and robotic exploration of the solar

36
00:02:50,869 --> 00:02:48,560
system the extent of our reach who is

37
00:02:54,070 --> 00:02:50,879
the moon and generations past with

38
00:03:06,390 --> 00:02:54,080

humans constellation is about reaching

39

00:03:10,710 --> 00:03:08,550

the orion system is basically the

40

00:03:13,110 --> 00:03:10,720

capsule in the supporting system that

41

00:03:14,790 --> 00:03:13,120

will get the crew into space into

42

00:03:17,030 --> 00:03:14,800

docking with the iss and eventually onto

43

00:03:19,110 --> 00:03:17,040

the moon so that's where the crew sits

44

00:03:21,030 --> 00:03:19,120

that's where the crew does this job on

45

00:03:22,470 --> 00:03:21,040

apollo we had a capsule shape and in

46

00:03:23,990 --> 00:03:22,480

that mission also we were going to the

47

00:03:25,750 --> 00:03:24,000

moon this is different now because the

48

00:03:27,190 --> 00:03:25,760

mission on the moon is different

49

00:03:28,869 --> 00:03:27,200

we're now going

50

00:03:30,229 --> 00:03:28,879

global access on the moon meaning we

51
00:03:31,750 --> 00:03:30,239
want to be able to go to the poles where

52
00:03:33,270 --> 00:03:31,760
we might find the ice and those kind of

53
00:03:35,190 --> 00:03:33,280
things which will help us sustain

54
00:03:36,949 --> 00:03:35,200
ourselves there longer to do that

55
00:03:38,869 --> 00:03:36,959
requires a different vehicle right more

56
00:03:40,309 --> 00:03:38,879
propellant than we had on a problem we

57
00:03:41,990 --> 00:03:40,319
also want to be able when we're on the

58
00:03:44,309 --> 00:03:42,000
moon to have a sufficient crew to

59
00:03:45,750 --> 00:03:44,319
actually do a lot more evas to get out

60
00:03:47,910 --> 00:03:45,760
there and actually do work so that's why

61
00:03:50,229 --> 00:03:47,920
we're sending four people to the surface

62
00:03:52,070 --> 00:03:50,239
so given those two changes this

63
00:03:53,270 --> 00:03:52,080

orion system is is much different than

64

00:03:54,630 --> 00:03:53,280

apollo

65

00:03:56,789 --> 00:03:54,640

as far as the size and the other

66

00:03:59,110 --> 00:03:56,799

capabilities now to get orion in orbit

67

00:04:07,270 --> 00:03:59,120

you need a booster so that's are areas

68

00:04:14,949 --> 00:04:10,070

ares one is what we call the crew launch

69

00:04:19,189 --> 00:04:17,670

it's made up of a first stage which is

70

00:04:21,110 --> 00:04:19,199

derived from the space shuttle solid

71

00:04:22,870 --> 00:04:21,120

rocket booster except it uses an extra

72

00:04:24,950 --> 00:04:22,880

fifth segment with a liquid oxygen

73

00:04:27,350 --> 00:04:24,960

liquid hydrogen upper stage powered by a

74

00:04:31,030 --> 00:04:27,360

j2 engine which is a derivative of the

75

00:04:35,990 --> 00:04:31,040

old j2 engine that flew on the saturn v

76

00:04:40,310 --> 00:04:37,749

this vehicle can lift

77

00:04:43,110 --> 00:04:40,320

six times the cargo anything on this

78

00:04:45,749 --> 00:04:43,120

planet can lift today

79

00:04:47,430 --> 00:04:45,759

it's got the same solid rocket booster

80

00:04:49,350 --> 00:04:47,440

surrounding a liquid oxygen liquid

81

00:04:51,670 --> 00:04:49,360

hydrogen core stage which is double the

82

00:04:53,430 --> 00:04:51,680

size of the external tank today and it

83

00:04:55,430 --> 00:04:53,440

has an upper stage as well we call it an

84

00:04:57,270 --> 00:04:55,440

earth departure stage that does two

85

00:04:59,590 --> 00:04:57,280

things one it takes the lander in the

86

00:05:01,270 --> 00:04:59,600

lower orbit then after that docks with

87

00:05:03,670 --> 00:05:01,280

the orion which is what the aries one

88

00:05:05,189 --> 00:05:03,680

takes to orbit it does one final burn

89

00:05:23,110 --> 00:05:05,199

and injects the stack on its way to the

90

00:05:27,670 --> 00:05:25,110

the lunar lander is part of the

91

00:05:29,590 --> 00:05:27,680

constellation program it has a mission

92

00:05:31,590 --> 00:05:29,600

of taking four people back to the

93

00:05:33,189 --> 00:05:31,600

surface of the moon

94

00:05:35,029 --> 00:05:33,199

in this architecture the crew is

95

00:05:37,990 --> 00:05:35,039

actually launched separately from the

96

00:05:40,070 --> 00:05:38,000

lander he launched the crew in the orion

97

00:05:42,629 --> 00:05:40,080

vehicle on ares 1

98

00:05:44,950 --> 00:05:42,639

and you launch separately the earth

99

00:05:45,990 --> 00:05:44,960

departure stage and the lander on aries

100

00:05:48,710 --> 00:05:46,000

5.

101
00:05:51,189 --> 00:05:48,720
both of those go into low earth orbit

102
00:05:53,270 --> 00:05:51,199
the earth departure stage and the lander

103
00:05:54,629 --> 00:05:53,280
rendezvous with the orion vehicle in low

104
00:05:56,629 --> 00:05:54,639
earth orbit

105
00:05:59,749 --> 00:05:56,639
at that point the earth departure stage

106
00:06:02,629 --> 00:05:59,759
does a translunar initiation burn

107
00:06:04,790 --> 00:06:02,639
and we go to lunar orbit you drop the

108
00:06:07,110 --> 00:06:04,800
eds stage along the way

109
00:06:09,189 --> 00:06:07,120
and you end up in lunar orbit with the

110
00:06:11,110 --> 00:06:09,199
lander and the orion vehicle

111
00:06:13,270 --> 00:06:11,120
at that point they separate the lander

112
00:06:15,189 --> 00:06:13,280
goes down to the surface of the moon we

113
00:06:17,270 --> 00:06:15,199

leave the descent stage on the surface

114

00:06:20,070 --> 00:06:17,280

of the moon when our mission is done and

115

00:06:22,469 --> 00:06:20,080

only the ascent stage returns to orbit

116

00:06:24,950 --> 00:06:22,479

we re-rendezvous with the orion vehicle

117

00:06:27,189 --> 00:06:24,960

and then we expand the ascent stage

118

00:06:29,830 --> 00:06:27,199

we have three different missions we have

119

00:06:31,909 --> 00:06:29,840

one mission which is a sorting mission

120

00:06:33,830 --> 00:06:31,919

and it takes four people to the surface

121

00:06:35,590 --> 00:06:33,840

of the moon for seven days

122

00:06:38,469 --> 00:06:35,600

they actually live out of the land or in

123

00:06:40,790 --> 00:06:38,479

that mission we have a second reference

124

00:06:43,830 --> 00:06:40,800

mission which is an outpost mission

125

00:06:45,909 --> 00:06:43,840

and in that mission the lander takes the

126
00:06:48,629 --> 00:06:45,919
crew to the surface of the moon but the

127
00:06:50,790 --> 00:06:48,639
crew then lives out of the outpost

128
00:06:53,909 --> 00:06:50,800
in that mission the lander actually sits

129
00:06:56,550 --> 00:06:53,919
dormant for approximately six months the

130
00:06:59,350 --> 00:06:56,560
third mission is cargo mission that is

131
00:07:01,350 --> 00:06:59,360
an uncrewed mission it's an automated

132
00:07:03,270 --> 00:07:01,360
lander and that's what you would use to

133
00:07:11,189 --> 00:07:03,280
bring heavy cargo to the surface of the

134
00:07:13,749 --> 00:07:12,790
you look at some of the choices we've

135
00:07:16,309 --> 00:07:13,759
made

136
00:07:18,710 --> 00:07:16,319
in the systems we've chosen the solid

137
00:07:20,950 --> 00:07:18,720
motor from the shuttle the upper stage

138
00:07:22,790 --> 00:07:20,960

engine from apollo

139

00:07:24,390 --> 00:07:22,800

has starting points

140

00:07:27,189 --> 00:07:24,400

for what we are going to build that

141

00:07:29,029 --> 00:07:27,199

gives us a great advantage

142

00:07:30,950 --> 00:07:29,039

so what we see going on here in the

143

00:07:32,309 --> 00:07:30,960

early part of the program with the test

144

00:07:35,189 --> 00:07:32,319

firings and the different things that

145

00:07:37,830 --> 00:07:35,199

we're doing much of that is to anchor

146

00:07:40,790 --> 00:07:37,840

our analytical models and the design

147

00:07:42,830 --> 00:07:40,800

tools we use to then go and improve the

148

00:07:46,150 --> 00:07:42,840

design in key

149

00:07:48,869 --> 00:07:46,160

areas we have every center of nasa's

150

00:07:50,790 --> 00:07:48,879

team engaged in this program at nearly

151

00:07:53,110 --> 00:07:50,800

every level i've been incredibly

152

00:07:54,550 --> 00:07:53,120

impressed with the depth of talent this

153

00:07:56,629 --> 00:07:54,560

agency has to

154

00:07:59,270 --> 00:07:56,639

to offer and we're taking that and we're

155

00:08:01,909 --> 00:07:59,280

applying it to the really tough problems

156

00:08:03,510 --> 00:08:01,919

of constellation of exploration

157

00:08:29,110 --> 00:08:03,520

of being able to actually push out to