



1
00:03:50,170 --> 00:03:51,170

>>
[MUSIC]

2
00:03:51,170 --> 00:03:52,170
>> GOOD MORNING.

3
00:03:52,170 --> 00:03:57,530
WELCOME TO GOODARD SPACE FLIGHT CENTER
IN MARYLAND.

4
00:03:57,530 --> 00:04:00,280
WE'RE LIVE FROM THE ROBOTIC
OPERATION CENTER WHERE NASA IS

5
00:04:00,280 --> 00:04:03,420
DEVELOPING SOME THE TECHNOLOGIST
NEEDED FOR THE ASTEROID REDIRECT

6
00:04:03,420 --> 00:04:05,820
MISSION AM OR ARM.

7
00:04:05,820 --> 00:04:08,460
YOU JUST SAW A SHORT MISSION
HIGHLIGHTING THE MISSION AND WE

8
00:04:08,460 --> 00:04:12,210
HAVE SOME SPECIAL GUESTS TO TELL
US WHAT ARM IS, HOW IT WILL

9
00:04:12,210 --> 00:04:15,330
ENABLE OUR JOURNEY TO MARS AND
HOW TO PROTECT OUR PLANET.

10
00:04:15,330 --> 00:04:19,850
OUR FIRST GUEST IS THE PRESIDENT
SCIENCE ADVISER DR. †JOHN P.

11
00:04:19,850 --> 00:04:22,170

HOLGREN.

12

00:04:22,170 --> 00:04:26,550
NASA ADMINISTRATOR CHARLES
BOLDEN AND ARMED PROGRAM

13

00:04:26,550 --> 00:04:29,100
DIRECTOR, MICHELLE GATES.

14

00:04:29,100 --> 00:04:31,099
FIRST WE WILL HEAR SOME REMARKS
FROM MR. †BOLDEN.

15

00:04:31,099 --> 00:04:39,389
>> I WANTED TO PUT THE ARM
MISSION IN CONTEXT OF THE

16

00:04:39,389 --> 00:04:42,440
PRESIDENT'S AND NASA'S VISION
FOR EXPANDING THE HUMAN

17

00:04:42,440 --> 00:04:43,810
EXPLORATION OF SPACE.

18

00:04:43,810 --> 00:04:48,280
THE VISION IS AMBITIOUS,
COHERENT, SYSTEMATIC AND HAS

19

00:04:48,280 --> 00:04:50,200
FOUR MAJOR PIECES.

20

00:04:50,200 --> 00:04:54,840
THE FIRST PIECE OF THAT STRATEGY
IS WORKING WITH THE PRIVATE

21

00:04:54,840 --> 00:04:59,320
SECTOR, WORKING WITH INDUSTRY TO
DEVELOP THE MOST COST-EFFECTIVE

22

00:04:59,320 --> 00:05:02,910
CAPACITIES TO EXPAND OUR
PRESENCE IN SPACE THAT WE

23

00:05:02,910 --> 00:05:04,190
POSSIBLY CAN.

24

00:05:04,190 --> 00:05:07,940
THE SECOND COMPONENT IS
DEVELOPING THE NEW INNOVATIVE

25

00:05:07,940 --> 00:05:11,540
ADVANCE TECHNOLOGIST THAT WILL BE
NEEDED TO TAKE US ALL THE WAY TO

26

00:05:11,540 --> 00:05:13,710
MARS AND BEYOND.

27

00:05:13,710 --> 00:05:17,070
THAT INVOLVES IN SPACE
REFUELLING, IT INVOLVES HABITAT

28

00:05:17,070 --> 00:05:20,340
DEVELOPMENT, IT INVOLVES HOW TO
PROTECT ASTRONAUTS ON THE LONG

29

00:05:20,340 --> 00:05:21,340
MISSIONS.

30

00:05:21,340 --> 00:05:24,370
IT INVOLVES THE ADVANCE
PROPULSION AND MUCH MORE.

31

00:05:24,370 --> 00:05:29,400
THE THIRD ELEMENT OF THE
STRATEGY IS EXTENDING THE USE OF

32

00:05:29,400 --> 00:05:33,000
THE INTERNATIONAL SPACE STATION
INTO THE MID 2020 SO IT COULD

33

00:05:33,000 --> 00:05:36,590

CONTINUE TO SERVE AS A TEST BED
FOR SOME OF THE ADVANCED

34

00:05:36,590 --> 00:05:40,560

TECHNOLOGIES AND JUMPING ON
POINT AS WELL AS THE SCIENTIFIC

35

00:05:40,560 --> 00:05:44,590

PLATFORM AND EDUCATIONAL
PLATFORM AND EVEN A DIPLOMATIC

36

00:05:44,590 --> 00:05:45,850

PLATFORM.

37

00:05:45,850 --> 00:05:51,210

THE FOURTH COMPONENT IS A SET OF
MISSIONS OF INCREASING AMBITION

38

00:05:51,210 --> 00:05:55,220

TAKING HUMANS FURTHER AND
FURTHER INTO SPACE BEYOND, WAY

39

00:05:55,220 --> 00:05:57,180

BEYOND LOWER EARTH ORBIT.

40

00:05:57,180 --> 00:06:00,580

WHAT WE WILL BE DOING NEXT IS
SETTING OPERATIONS IN A STABLE

41

00:06:00,580 --> 00:06:04,599

ORBIT AROUND THE MOON WHICH IS
THE MOST CENTRAL JUMPING OFF

42

00:06:04,599 --> 00:06:08,180

POINT FOR A MARS MISSION AS
OPPOSE TO THE SURFACE OF THE

43

00:06:08,180 --> 00:06:12,710
MOON, YOU DON'T IS TO SPEND THE
ENERGY TO LIFT THE PAYLOAD BACK

44
00:06:12,710 --> 00:06:14,040
TO EARTH'S GRAVITY.

45
00:06:14,040 --> 00:06:19,530
THIS IS A CONCLUSION THAT HAS
LOOKED CAREFULLY AT THE DYNAMICS

46
00:06:19,530 --> 00:06:21,730
OF GETTING TO MARS.

47
00:06:21,730 --> 00:06:24,620
YOU DO IT FROM A JUMPING OUT
POINT IN STABLE AND AROUND THE

48
00:06:24,620 --> 00:06:25,620
MOON.

49
00:06:25,620 --> 00:06:30,560
THE ARM MISSION EXPLOIT AND WILL
EXPLOIT A WHOLE VARIETY OF

50
00:06:30,560 --> 00:06:35,630
TECHNOLOGIES THAT COME TOGETHER
TO ADVANCE OUR PROGRESS TOWARDS

51
00:06:40,110 --> 00:06:36,630
THE MOON.

52
00:06:40,110 --> 00:06:43,840
ANOTHER IS THE COMBINATION OF
ROBOTIC CAPABILITIES THAT WILL

53
00:06:43,840 --> 00:06:47,490
PULL A BOLDER FROM AN ASTEROID
AND BRING IT TO THE ORBIT AND

54

00:06:47,490 --> 00:06:50,910

THE HUMAN CAPABILITIES, THE
JUDGMENT, ON THE SPOT DECISION

55

00:06:50,910 --> 00:06:55,270

MAKING ONLY HUMANS COULD
DELIVER.

56

00:06:55,270 --> 00:06:58,470

THE DEMONSTRATION OF THE
ADVANCED ELECTRIC PROPULSION

57

00:06:58,470 --> 00:07:05,000

CAPABILITIES THAT WILL BE ABLE
TO REACH THE ASTEROID AND BRING

58

00:07:05,000 --> 00:07:07,039

A BOLDER BACK FROM IT.

59

00:07:07,039 --> 00:07:10,159

AND THE OTHER BENEFITS OF THE
MISSION WHICH IS JUST

60

00:07:10,159 --> 00:07:14,080

EXTRAORDINARY INCLUDES
DEMONSTRATING CAPABILITIES THAT

61

00:07:14,080 --> 00:07:18,380

ULTIMATELY WE NEED TO DEFLECT AN
ASTEROID IN A COLLISION COURSE

62

00:07:18,380 --> 00:07:19,470

ON THE EARTH.

63

00:07:19,470 --> 00:07:24,520

THIS IS A HAZARD, 65 MILLION
YEARS AGO THE DINOSAURS

64

00:07:24,520 --> 00:07:26,260

SUCCUMBED TO.

65

00:07:26,260 --> 00:07:28,560

WE HAVE TO BE SMARTER THAN THE
DINOSAURS

66

00:07:28,560 --> 00:07:33,210

THEY WENT EXTENT WHEN THE LARGE
DINOSAUR HIT THE YUCATAN

67

00:07:33,210 --> 00:07:35,030

PENINSULA.

68

00:07:35,030 --> 00:07:43,580

WE WILL GET BETTER IN
IDENTIFYING DANGEROUS ASTEROID,

69

00:07:43,580 --> 00:07:48,310

LEARNING HOW TO DEFLECT THEM AND
WE'LL LEARN IN ADDITION HOW TO

70

00:07:48,310 --> 00:07:54,150

EXPLOIT HOW TO EXPLOIT ASTEROIDS
COMMERCIALY.

71

00:07:54,150 --> 00:07:59,380

THEY WILL ULTIMATELY BE VALUABLE
SOURCES OF MATERIALS FOR

72

00:07:59,380 --> 00:08:03,469

LONG-TERM EXISTENCE OF HUMANS IN
SPACE.

73

00:08:03,469 --> 00:08:07,680

PRESIDENT OBAMA SAID WE'RE GOING
TO SPACE NOT ONLY TO VISIT BUT

74

00:08:07,680 --> 00:08:08,800

TO STAY.

75

00:08:08,800 --> 00:08:12,380

AND THE ASTEROID MISSION IS THE
NEXT IMPORTANT STEP ON THAT

76

00:08:12,380 --> 00:08:13,380

TRAJECTORY.

77

00:08:13,380 --> 00:08:14,380

>> EXCELLENT.

78

00:08:14,380 --> 00:08:15,380

THANK YOU, SIR.

79

00:08:15,380 --> 00:08:17,110

WE WILL NOW HEAR FROM
ADMINISTRATOR BOLDEN.

80

00:08:17,110 --> 00:08:22,479

>> THANK YOU FOR COMING OUT ON
THIS SPECIAL DAY.

81

00:08:22,479 --> 00:08:23,479

IT'S A FULL DAY.

82

00:08:23,479 --> 00:08:26,870

I WANT TO THANK MICHELLE GATES
FOR THE ASTEROID REDIRECT

83

00:08:26,870 --> 00:08:28,370

MISSION.

84

00:08:28,370 --> 00:08:32,260

AS I SAID, WE WILL TALK A LITTLE
BIT BRIEFLY ABOUT THE OVERVIEW

85

00:08:32,260 --> 00:08:33,950

OF THE MISSION, A LITTLE
DETAILS.

86

00:08:33,950 --> 00:08:36,469

THEN THE BIG PART OF THE DAY IS
THIS AFTERNOON, WHEN THE

87

00:08:36,469 --> 00:08:41,020

INDUSTRY IS ALLOWED TO COME IN
AND SPEND A LITTLE TIME WITH US.

88

00:08:41,020 --> 00:08:43,479

THEY HAVE BEEN WORKING WITH US
FOR A NUMBER OF YEARS.

89

00:08:43,479 --> 00:08:47,330

THIS IS THE PIECE OF RESISTANCE
WHEN WE BRING AND ACTUALLY LOOK

90

00:08:47,330 --> 00:08:48,330

UP THE MARKUPS.

91

00:08:48,330 --> 00:08:56,180

AND I WANT TO THANK CHRIS TELLIS
FOR NOT ONLY HOSTING OR

92

00:08:56,180 --> 00:09:03,110

ESTABLISHING, BUT HOSTING THIS
PARTICULAR PROGRAM.

93

00:09:03,110 --> 00:09:05,780

ENGINEERS AND SCIENTISTS
ACTUALLY AROUND THE WORLD HAVE

94

00:09:05,780 --> 00:09:09,350

BEEN INVOLVED IN THINKING ABOUT
THIS FOR A NUMBER OF YEARS.

95

00:09:09,350 --> 00:09:13,830

DR. †HOLDEN SAID WE WANT TO BE
SMARTER THAN THE DINOSAUR.

96

00:09:13,830 --> 00:09:19,410
IN NASA WE TRY TO TAKE A STEP BY
STEP INCREMENTAL APPROACH TO BE

97
00:09:19,410 --> 00:09:21,550
ABLE TO GET HUMANS TO MARS.

98
00:09:21,550 --> 00:09:25,670
IF YOU LOOK AT HOW WE'VE
ARRANGED IT, WE HAVE†-- I

99
00:09:25,670 --> 00:09:28,520
CONSIDER THEM ZONES IN THE SOLAR
SYSTEM.

100
00:09:28,520 --> 00:09:33,300
AND THOSE ZONES ARE ACTUALLY,
YOU KNOW, WHERE WE LIVE TODAY.

101
00:09:33,300 --> 00:09:35,399
WE LIVE AND WORK INTO NEAR
ORBIT.

102
00:09:35,399 --> 00:09:39,279
WE'VE BEEN IN THE INTERNATIONAL
SPACE STATION FOR ALMOST 16

103
00:09:39,279 --> 00:09:40,279
YEARS.

104
00:09:40,279 --> 00:09:43,060
WE'VE LEARNED A LOT AND THERE'S
A LOT TO BE LEARNED AS

105
00:09:43,060 --> 00:09:44,710
DR. †HOLDEN MENTIONED.

106
00:09:44,710 --> 00:09:49,399
THE OTHER THING, THE NEXT AREA
WE WANT TO GO IS BACK TO THE

107

00:09:49,399 --> 00:09:51,720

LUNAR VICINITY.

108

00:09:51,720 --> 00:09:55,070

WHEN WE'RE WORKING ON THE
INTERNATIONAL SPACE STATION, WE

109

00:09:55,070 --> 00:09:57,600

JUST CALL THAT THE EARTH-RELIANT
PHASE.

110

00:09:57,600 --> 00:09:59,280

WE RELY ON OUR HOME PLANET.

111

00:09:59,280 --> 00:10:03,790

WE'RE HOURS AWAY SO WE CAN GET
SUPPLIES, WE CAN RESCUE CREWS,

112

00:10:03,790 --> 00:10:05,080

WE CAN DO LOTS OF THINGS.

113

00:10:05,080 --> 00:10:07,779

WE WANT TO NEXT MOVE WHERE WE'RE
A LITTLE MORE DISTANT.

114

00:10:07,779 --> 00:10:13,720

IN THAT PARTICULAR CASE, WHAT WE
CALL THE VICINITY AROUND THE

115

00:10:13,720 --> 00:10:15,680

MOON, WE'RE GOING TO BE A COUPLE
OF DAYS AWAY.

116

00:10:15,680 --> 00:10:18,029

THAT WILL STRETCH OUR
CAPABILITIES.

117

00:10:18,029 --> 00:10:23,100

WE WILL HAVE TO FIGURE OUT NEW
WAYS TO SUPPLY OURSELVES, TO

118

00:10:23,100 --> 00:10:26,630

TEST THE TECHNOLOGIES THAT ARE
NECESSARY WHEN WE FINALLY TAKE

119

00:10:26,630 --> 00:10:30,190

THE BIG STEP TO GO WITH HUMANS
OUT TO MARS.

120

00:10:30,190 --> 00:10:34,220

SO TIMEWISE, WE'VE BEEN WORKING
ON THIS EARTH-RELIANT PHASE FOR

121

00:10:34,220 --> 00:10:37,420

ABOUT 50 YEARS, WHEN YOU REALLY
GET DOWN TO IT.

122

00:10:37,420 --> 00:10:41,519

WHEN WE MOVE TO THE LUNAR SPACE,
THAT'S THE PERIOD OF THE 20.

123

00:10:41,519 --> 00:10:46,830

WHEN YOU GET TO THE 30S, THEN
NOW WE'RE GOING TO BE EARTH INT

124

00:10:46,830 --> 00:10:48,900

DEPENDENT.

125

00:10:48,900 --> 00:10:52,300

HUMANS HAVE BEEN DREAMING ABOUT
GOING TO MARS AS LONG AS WE'RE

126

00:10:52,300 --> 00:10:54,930

LOOKING AT THE SKY.

127

00:10:54,930 --> 00:10:56,910

WE'RE FINALLY ALMOST THERE.

128

00:10:56,910 --> 00:10:59,160

SOME OF US COULD TASTE IT.

129

00:10:59,160 --> 00:11:02,550

WHEN WE MOVE TO MARS, THAT'S
WHAT WE CALL THE HEALTH

130

00:11:02,550 --> 00:11:03,700

INDEPENDENCE STAGE.

131

00:11:03,700 --> 00:11:08,980

WE WILL HAVE TO TAKE STUFF, MAKE
IT ON THE WAY OR MAKE IT WHEN WE

132

00:11:08,980 --> 00:11:11,310

GET TO THE MARS SURFACE.

133

00:11:11,310 --> 00:11:14,390

THOSE ARE THE TECHNOLOGIES THAT
DR. HOLDEN WAS TALKING ABOUT.

134

00:11:14,390 --> 00:11:18,490

WE'RE HE CAN SIGHTED TO--
EXCITED TO FAULK ABOUT THE

135

00:11:18,490 --> 00:11:20,210

ASTEROID REDIRECT MISSION.

136

00:11:20,210 --> 00:11:25,709

FOR US, HAVING BEEN AN ASTRONAUT
BEFORE AND HAVING FOUND OUT THAT

137

00:11:25,709 --> 00:11:28,610

FLYING IN SPACE IS NOT LYING
FLYING AN AIRPLANE.

138

00:11:28,610 --> 00:11:35,440

THINGS YOU DO IN AN AIRPLANE, IS
DIFFERENT IN SPACE.

139

00:11:35,440 --> 00:11:39,500

WHEN WE GO TO LOW GRAVITY AND NO
GRAVITY ENVIRONMENTS, THE WAY

140

00:11:39,500 --> 00:11:43,010

WE'RE GOING TO BE AROUND MOON
AND MARS AND OTHER PLACES, WE

141

00:11:43,010 --> 00:11:46,880

HAVE TO TEACH OURSELVES NEW
TECHNICIAN.

142

00:11:46,880 --> 00:11:50,060

IN TRYING TO BRING THIS UP TO
BRING THE COMMERCIAL ENTERIES,

143

00:11:50,060 --> 00:11:53,870

WE WANT TO DEVELOP TECHNOLOGIST
AND TECHNIQUES SO WE CAN HAND

144

00:11:53,870 --> 00:11:58,600

OFF TO PRIVATE ENTERPRISES,
WHETHER ENTREPRENEUR, ECONOMICS

145

00:11:58,600 --> 00:12:02,630

INDUSTRIES.

146

00:12:02,630 --> 00:12:08,360

THAT'S AN IMPORTANT STEP FOR US
TO THE JOURNEY TO MARS.

147

00:12:08,360 --> 00:12:12,320

IT WILL GIVE US AN OPPORTUNITY
TO SIT OUT IN THE PROVING GROUND

148

00:12:12,320 --> 00:12:15,290

AND MAKE SURE THAT WE UNDERSTAND
THE KINDS OF THINGS THAT WE NEED

149

00:12:15,290 --> 00:12:18,589

TO DO WHEN WE FINALLY SEND OUR
ASTRONAUTS BACK TO MARS.

150

00:12:18,589 --> 00:12:20,290

IT IS AN EXCITING TIME.

151

00:12:20,290 --> 00:12:24,459

YOU KNOW, WE HAVE TO HAVE OUR
ACT TOGETHER WHEN WE GO THERE.

152

00:12:24,459 --> 00:12:27,000

HOPEFULLY YOU ALL WILL LEARN
WHAT YOU KNEW THAN WHEN YOU

153

00:12:27,000 --> 00:12:30,670

STARTED THIS PROGRAM TODAY AND
I'M GOING TO LET YOU TURN IT

154

00:12:30,670 --> 00:12:33,540

OVER TO MICHELLE BECAUSE SHE'S
THE EXPERT WITH US AND SHE WILL

155

00:12:33,540 --> 00:12:35,479

GIVE US A LITTLE MORE DETAIL.

156

00:12:35,479 --> 00:12:36,479

>> THANK YOU VERY MUCH.

157

00:12:36,479 --> 00:12:41,040

IT'S AN HONOR TO BE HERE WITH
BOTH OF YOU, DR. †HOLDEN.

158

00:12:41,040 --> 00:12:45,010

AND ASTEROID REDIRECT MISSION IS
A VITAL STEP IN THE JOURNEY TO

159

00:12:45,010 --> 00:12:46,010

MARS.

160

00:12:46,010 --> 00:12:48,750

IT'S THE PROVING GROUND OF THE
LUNAR SPACE.

161

00:12:48,750 --> 00:12:53,149

AS WE MOVE TO THE EARTH RELIANT
OPERATION AND LOW EARTH ORBIT TO

162

00:12:53,149 --> 00:12:56,389

THE PROVING GROUND WHERE WE CAN
GET OUR ASTRONAUT CREWS WITHIN A

163

00:12:56,389 --> 00:12:58,600

MATTER OF DAYS, IF WE NEED TO.

164

00:12:58,600 --> 00:13:02,810

AND TO EARTH RELIANT STAGE, FOR
EXAMPLE, MISSION TO MARS ON THE

165

00:13:02,810 --> 00:13:04,120

SCALE OF YEARS AND DURATION.

166

00:13:04,120 --> 00:13:09,220

THAT'S WHERE THE REDIRECT
MISSION REALLY PROVIDES THE

167

00:13:09,220 --> 00:13:14,959

DEMONSTRATION AND AN IMPORTANT
INGRATED MISSION OPPORTUNITY AND

168

00:13:14,959 --> 00:13:15,959

LUNAR SPACE.

169

00:13:15,959 --> 00:13:18,610

THERE'S A ROBOTIC MISSION
COMPONENT AND CRUDE MISSION

170

00:13:18,610 --> 00:13:19,649

COMPONENT.

171

00:13:19,649 --> 00:13:25,990

THE ROBOTIC HAS A FIRST EVER
DEMONSTRATION OF ADVANCE SOLAR

172

00:13:25,990 --> 00:13:30,950

PROPULSION IN MOVING MULTI-TON
MASSES TO INTERPLANETARY SPACE.

173

00:13:30,950 --> 00:13:38,529

AND IN ADDITION, WE WILL USE IT
TO TRANSIT COUPLE OF YEARS TO A

174

00:13:38,529 --> 00:13:42,910

NEAR EARTH ASTEROID AND ACQUIRE
MULTIBOLDER AS YOU MENTIONED,

175

00:13:42,910 --> 00:13:46,029

DR.†HOLDEN, FROM THE SURFACE OF
THE ASTEROID.

176

00:13:46,029 --> 00:13:49,720

WE WILL THEN ACTUALLY USE THE
GRAVTATIONAL MASS OF THE

177

00:13:49,720 --> 00:13:54,019

MULTI-TON BOLDER AND SPACECRAFT
TO ALTER THE TRAJECTORY OF THE

178

00:13:54,019 --> 00:13:55,459

APPARENT ASTEROID.

179

00:13:55,459 --> 00:13:59,740

IN A DEFLECTION FOR THE
PLANETARY DEFENSE PURPOSES AS

180

00:13:59,740 --> 00:14:00,999

YOU MENTIONED.

181

00:14:00,999 --> 00:14:06,649

WE'LL USE THE SPACE FLIGHT
MISSION TO FERRY THE ASTEROID

182

00:14:06,649 --> 00:14:12,850

MASS BACK TO GRAVITATIONARY POINT
TO A LUNAR VICINITY AS YOU

183

00:14:12,850 --> 00:14:14,050

MENTIONED AS WELL.

184

00:14:14,050 --> 00:14:19,959

ABOUT 10 YEARS FROM NOW, OUR
ASTEROIDS WILL LAUNCH AN OWE

185

00:14:19,959 --> 00:14:23,300

RYAN CREW CAPSULE, THE NEXT
GENERATION SYSTEM UNDER

186

00:14:23,300 --> 00:14:26,740

DEVELOPMENT NOW BY THE AGENCY
THAT WE'LL BE TESTING WITH OUR

187

00:14:26,740 --> 00:14:31,870

CREWS 5-7 YEARS, IF MY MEMORY
SERVES.

188

00:14:31,870 --> 00:14:36,450

10 YEARS FROM NOW, OUR CREW WILL
TRANSIT THE SEVERAL DAY TRIP TO

189

00:14:36,450 --> 00:14:41,370

THE ASTEROID BOWL BOLDER,
MULTITON MASS, RENDEZVOUS WITH

190

00:14:41,370 --> 00:14:46,700

IT AND SELECT, EXTRACT AND
RETURN SAMPLES IN THE O RYAN

191

00:14:46,700 --> 00:14:51,240
CAPSULES BACK TO EARTH
>> GREAT, THANK YOU ALL.

192
00:14:51,240 --> 00:14:57,339
YOU DID A GREAT JOB TORE
DESCRIBING TO US WHY THE

193
00:14:57,339 --> 00:15:07,610
ASTEROID
>> AND IT LANDS AS AN EARLY

194
00:15:07,610 --> 00:15:10,269
MISSION, INSIST LUNAR SPACE.

195
00:15:10,269 --> 00:15:14,149
IT'S ABOUT 25 DAYS TO A MONTH IN
DURATION.

196
00:15:14,149 --> 00:15:18,410
IT'S A SIGNIFICANT DURATION FOR
OUR ASTRONAUT CREWS IN THE MID

197
00:15:18,410 --> 00:15:19,410
2020'S.

198
00:15:19,410 --> 00:15:22,320
THE ROBOTIC MISSION JUST
RECEIVED APPROVAL FOR PHASE B,

199
00:15:22,320 --> 00:15:29,130
THE PHASE DEVELOPMENT IN WHICH
WE BASELINE A MISSION DESIGN,

200
00:15:29,130 --> 00:15:32,259
INCLUDING SPACECRAFT DESIGN,
TRAJECTORY DESIGN, ORBITAL

201
00:15:32,259 --> 00:15:37,240
MECHANICS, MISSION DURATION AND

ALL THE TECHNICAL PARAMETERS

202

00:15:37,240 --> 00:15:40,870

THAT DEFINE THE SPACECRAFT
MISSION.

203

00:15:40,870 --> 00:15:46,690

THE PRELIMINARY DESIGN REVIEW
AND BASELINE IS PLANNED FOR LATE

204

00:15:46,690 --> 00:15:51,860

IN 2017 AND THEN A FOLLOW ON
APPROVAL AT THE AGENCY LEVEL FOR

205

00:15:51,860 --> 00:15:53,639

MARCH OF 2018.

206

00:15:53,639 --> 00:15:56,199

THERE ARE MANY SYSTEMS UNDER
PROTO TYPES INCLUDING THE ONE

207

00:15:56,199 --> 00:15:59,330

YOU SEE BEHIND US, THE ROBOTIC
SYSTEMS FORECAPTURE.

208

00:15:59,330 --> 00:16:05,199

THE SPACECRAFT DEVELOPMENT IS
WITH ONGOING INDUSTRY TO A LEVER

209

00:16:05,199 --> 00:16:08,100

RAJ COMMERCIAL CAPABILITIES THAT
THE INDUSTRY COULD PROVIDE AS

210

00:16:08,100 --> 00:16:12,839

WELL AS THE PATH FOR INDUSTRIES
OF ADVANCED SOLAR PROPULSION IN

211

00:16:12,839 --> 00:16:13,839

THE FUTURE.

212

00:16:13,839 --> 00:16:14,839

>> THANK YOU, MICHELLE.

213

00:16:14,839 --> 00:16:18,899

>>> DOCTOR HOLDEN YOU TOUCHED ON
A LITTLE BIT IN PLANS OF

214

00:16:18,899 --> 00:16:19,899

DEFENSE.

215

00:16:19,899 --> 00:16:22,069

IF YOU THINK ABOUT ASTEROID
HEADING TO EARTH, IT SOUNDS LIKE

216

00:16:22,069 --> 00:16:25,899

OUT OF THE MOVIES, ARE WE AS A
NATION PREPARED FOR THAT?

217

00:16:25,899 --> 00:16:27,009

>> WE ARE NOT PREPARED.

218

00:16:27,009 --> 00:16:31,079

BUT WE ARE IN A TRAJECTORY TO
GET MORE SO.

219

00:16:31,079 --> 00:16:36,369

WE HAVE DEVELOP ADVANCED
RESOURCES, TO DETECTING, THAT

220

00:16:36,369 --> 00:16:39,180

COULD BE ON A COLLISION COURSE
WITH THE EARTH.

221

00:16:39,180 --> 00:16:42,540

WE HAVE HAD SOME RECENT
EXPERIENCES THAT INDICATE HOW

222

00:16:42,540 --> 00:16:44,959

CHALLENGING THAT IS.

223

00:16:44,959 --> 00:16:50,449

IN 2013, A SMALLER ASTEROID
EXPLODED OVER SIBERIA WITH THE

224

00:16:50,449 --> 00:16:54,809

FORCE OF ABOUT 400 KILOTONS OR
500 KILOTONS OF TNT.

225

00:16:54,809 --> 00:16:58,170

IT DID A LOT OF DAMAGE ON THE
GROUND.

226

00:16:58,170 --> 00:17:02,130

SOMETHING LIKE A THOUSAND PEOPLE
WERE INJURED BY FLYING GLASS AND

227

00:17:02,130 --> 00:17:03,130

SO ON.

228

00:17:03,130 --> 00:17:07,589

THAT EXPLOSION WAS IN THE RANGE
OF 30 TIMES BIGGER THAN THE

229

00:17:07,589 --> 00:17:10,880

HIROSHIMA NUCLEAR BOMB.

230

00:17:10,880 --> 00:17:17,189

WE HAD IN 1908, A MUCH LARGER
ASTEROID EXPLOSION AGAIN OVER A

231

00:17:17,189 --> 00:17:18,189

PART OF SIBERIA.

232

00:17:18,189 --> 00:17:22,540

FORTUNATELY, IT DIDN'T OCCUR
OVER A HEAVILY POPULATED AREA,

233

00:17:22,540 --> 00:17:26,780

BUT IT EXPLODED WITH THE
EQUIVALENT OF MULTIPLE MEGATONS

234

00:17:26,780 --> 00:17:28,960
OF EXPLOSIVE FORCE.

235

00:17:28,960 --> 00:17:30,720
WE KNOW THIS HAPPENS.

236

00:17:30,720 --> 00:17:32,320
IT'S RARE.

237

00:17:32,320 --> 00:17:36,350
THE IMPACT THAT IT OCCURRED IN
2013 IS ESTIMATED TO BE A ONE IN

238

00:17:36,350 --> 00:17:37,740
A 100 YEAR EVENT.

239

00:17:37,740 --> 00:17:40,910
THE IMPACT THAT OCCURRED IN
1908, IS ESTIMATED TO HAVE

240

00:17:40,910 --> 00:17:42,990
OCCURRED IN ONE IN A THOUSAND
EVENT.

241

00:17:42,990 --> 00:17:48,270
AGAIN, IF WE ARE GOING TO BE A
CAPABLE CIVILIZATION AS OUR

242

00:17:48,270 --> 00:17:53,170
TECHNOLOGY ALLOWS, WE NEED TO BE
PREPARED FOR EVEN THOSE RARE

243

00:17:53,170 --> 00:17:57,250
EVENTS BECAUSE THEY CAN DO A LOT
OF DAMAGE TO THE EARTH.

244

00:17:57,250 --> 00:18:01,090
AND AS PART OF THE PREPARATION,
WE HAVE THE PLANETARY DEFENSE

245
00:18:01,090 --> 00:18:03,910
ASPECT OF THE ASTEROID RETREEFL
MISSION.

246
00:18:03,910 --> 00:18:06,990
AND I WOULD EMPHASIZE THE AS
STROITD RETREVAL SYSTEM MAKES

247
00:18:06,990 --> 00:18:09,170
SENSE IN FIVE DIFFERENT WAYS.

248
00:18:09,170 --> 00:18:13,670
IT MAKES SENSE FOR SCIENCE, FOR
BETTER UNDERSTANDING OF THE

249
00:18:13,670 --> 00:18:17,470
COMPOSITION OF THE ASTEROID AND
WHAT THEY CAN TELL US ABOUT THE

250
00:18:17,470 --> 00:18:20,720
ORIGINS OF THE SOLAR SYSTEM, IT
MAKES SENSE OF THE STANDPOINT OF

251
00:18:20,720 --> 00:18:23,570
TECHNOLOGY DEMONSTRATION,
DEMONSTRATING TECHNOLOGYIES THAT

252
00:18:23,570 --> 00:18:27,210
WE WILL NEED FOR THE MISSION TO
MARS, IT MAKES SENSE IN TERMS OF

253
00:18:27,210 --> 00:18:32,100
HUMAN OPERATION, IN LUNAR SPACE
AND AGAIN THE MOST APPROPRIATE

254
00:18:32,100 --> 00:18:36,360

STEPPING OFF POINT FOR MARS, AND
IT MAKES SENSE FOR THE

255

00:18:36,360 --> 00:18:41,520

POSSIBILITIES OF USING ASTEROIDS
AS SOURCES OF MATERIALS, SOURCES

256

00:18:41,520 --> 00:18:44,620

OF FUEL, SOURCES OF WATER, TO
RESUPPLY SPACE MISSIONS AND

257

00:18:44,620 --> 00:18:47,030

ULTIMATELY MEET THE NEEDS ON
EARTH.

258

00:18:47,030 --> 00:18:52,580

THIS IS ONE IMPORTANT ASPECT OF
IT.

259

00:18:52,580 --> 00:18:54,740

>> UNDERSTOOD, THANK YOU.

260

00:18:54,740 --> 00:18:56,270

>>> ADMINISTRATOR BOLDEN.

261

00:18:56,270 --> 00:18:58,700

THE SECOND PART OF THE MISSION
IS TO SEND A CREW TO THE

262

00:18:58,700 --> 00:18:59,700

ASTEROID BOLDER.

263

00:18:59,700 --> 00:19:03,640

YOU COULD TELL US WHERE WE ARE
WITH THE SYSTEMS WE'RE SENDING

264

00:19:03,640 --> 00:19:04,640

THERE?

265

00:19:04,640 --> 00:19:07,240
>> WE HAVE AN OPPORTUNITY TO
TALK ABOUT SOME OF THEM THIS

266
00:19:07,240 --> 00:19:08,240
AFTERNOON.

267
00:19:08,240 --> 00:19:13,460
ONE OF THE THINGS THAT WE ARE
VERY PROUD OF IS THE FAC THAT WE

268
00:19:13,460 --> 00:19:14,990
HAVE THE S.O.S.

269
00:19:14,990 --> 00:19:20,120
AND THE O RYAN
MODULE THAT'S OFF THE CUTTING

270
00:19:20,120 --> 00:19:21,120
BOARD.

271
00:19:21,120 --> 00:19:27,120
WE ACTUALLY FLEW ORYAN BACK IN
DECEMBER OF 2014.

272
00:19:27,120 --> 00:19:32,090
A VERY SUCCESSFUL MISSION
FURTHER AWAY FROM ETHAN ANY

273
00:19:32,090 --> 00:19:36,200
VEHICLE INTENDED TO CARRY HUMANS
IN MORE THAN 40 YEARS.

274
00:19:36,200 --> 00:19:40,730
I LOVE TO TELL PEOPLE COME WITH
ME TO OUTSIDE OF NEW ORLEANS,

275
00:19:40,730 --> 00:19:44,570
WHERE YOU COULD SEE THE BARREL
SECTIONS OF THE MASSIVE SPACE

276

00:19:44,570 --> 00:19:48,280

LAUNCH SYSTEM THAT ARE NOW BEING
WIELDED AND ASSEMBLES.

277

00:19:48,280 --> 00:19:50,300

WE WILL FLY THE TEST FLIGHT OF
S.O.S.

278

00:19:50,300 --> 00:19:53,710

OF ORYAN IN 2018.

279

00:19:53,710 --> 00:19:58,300

THAT WILL BE AN OUTMISSION AND
ORBIT.

280

00:19:58,300 --> 00:20:02,540

AND IN THE EARLY 2020'S, WE WILL
PUT A CREW ON BOARD AND FLY THAT

281

00:20:02,540 --> 00:20:03,770

PARTICULAR MISSION.

282

00:20:03,770 --> 00:20:07,880

IN THE MID-20s, WHEN I SAY,
MICHELLE AND HER TEAM ARE

283

00:20:07,880 --> 00:20:13,040

SUCCESSFUL IN MOVING THE
ASTEROID OR MASS TO LUNAR SPACE

284

00:20:13,040 --> 00:20:17,790

AND A STABLE ORBIT AROUND THE
MOON, WE WILL ALLOW A CREW TO

285

00:20:17,790 --> 00:20:20,780

ATTACH THEMSELVES TO THE DEVICE
THAT SOME OF YOU COULD SEE

286

00:20:20,780 --> 00:20:21,860
BEHIND ME.

287
00:20:21,860 --> 00:20:26,570
THEY WILL ACTUALLY USE THAT AS
AN EXIT WAY ON TO ORYAN TO THE

288
00:20:26,570 --> 00:20:30,940
MASS WHERE THEY CAN DO
EXPERIMENTATION ON TECHNOLOGY

289
00:20:30,940 --> 00:20:36,030
DEVELOPMENT AND PROCEDURAL
DEVELOPMENT.

290
00:20:36,030 --> 00:20:38,510
I TALK ABOUT STEP BY STEP THINGS
ALL THE TIME.

291
00:20:38,510 --> 00:20:41,380
WE HAVE ACTUALLY BEEN DOING
SIMULATIONS AT THE JOHNSON'S

292
00:20:41,380 --> 00:20:46,140
SPACE CENTER, SIMULATION HERE.

293
00:20:46,140 --> 00:20:50,510
WE ALSO SPENT THE LAST THREE
YEARS IN THE UNDERWATER

294
00:20:50,510 --> 00:20:52,600
APPROVING GROUND CALLED NEMO.

295
00:20:52,600 --> 00:20:57,470
THAT'S DEDICATED TO ASTEROID
RESEARCH, IF YOU WILL.

296
00:20:57,470 --> 00:21:03,020
HOW DO HUMANS ATTACH THEMSELVES
TO AN ASTEROID, WHICH WOULD BE

297

00:21:03,020 --> 00:21:04,630

NO GRAVITY OR VERY LITTLE
GRAVITY.

298

00:21:04,630 --> 00:21:08,820

WE HAVE BEEN COMING AROUND AND
UP UNTIL NOW THE MID 2020'S,

299

00:21:08,820 --> 00:21:13,690

THEY WILL SEND A CREW OUT TO DO
SOME OF THE THINGS THAT WE THINK

300

00:21:13,690 --> 00:21:17,340

YOU NEED TO DO WHEN YOU GET OUT
TO THE MARTIAL ENVIRONMENT,

301

00:21:17,340 --> 00:21:24,870

WHERE OUR CREWS WILL BE MUCH
BETTER PREPARED TO DO THE

302

00:21:24,870 --> 00:21:26,430

OPERATIONS THEY NEED TO DO.

303

00:21:26,430 --> 00:21:29,740

IT'S AN INCREMENTAL STEP BY STEP
APPROACH WE USE.

304

00:21:29,740 --> 00:21:34,570

>> DOCTOR GATES, YOU COULD TELL
US MORE OF THE TARGET ASTEROID

305

00:21:34,570 --> 00:21:36,799

THAT WE PLAN TO VISIT?

306

00:21:36,799 --> 00:21:38,680

>> SURE, ABSOLUTELY.

307

00:21:38,680 --> 00:21:44,000

THE SCIENCE COMMUNITY REFERENCE
OUR TARGET.

308

00:21:44,000 --> 00:21:46,480
IT IS 2000 BB 5.

309

00:21:46,480 --> 00:21:50,750
IT'S BELIEVED TO BE ONE OF
POTENTIALLY FOUR TYPES.

310

00:21:50,750 --> 00:21:55,660
IT'S ANTICIPATED TO BE
POTENTIALLY 20 PERCENT WATER.

311

00:21:55,660 --> 00:22:01,670
IT HAS VOLATILE RICH, AND
CONTAINS THE COMPOUNDS FROM

312

00:22:01,670 --> 00:22:04,511
EARLY FORMATION OF THE SOLAR
SYSTEM THAT THE RECORDS THAT IS

313

00:22:04,511 --> 00:22:09,430
ONLY AVAILABLE THROUGH CERTAIN
CLASSES OF ASTEROIDS.

314

00:22:09,430 --> 00:22:13,350
THE ASTEROID HAS NEVER BEEN
VISITED BEFORE WHICH IS THE

315

00:22:13,350 --> 00:22:15,360
DESIRE OF THE SCIENCE COMMUNITY.

316

00:22:15,360 --> 00:22:19,030
THE RESOURCES COMMUNITY, IN
PARTICULAR, FOLKS WHO ARE

317

00:22:19,030 --> 00:22:25,500
INTERESTED IN USING ASTEROIDAL
RESOURCES, ARE VERY INTERESTED

318

00:22:25,500 --> 00:22:27,950
IN THE TARGET AS WELL.

319

00:22:27,950 --> 00:22:30,660
AND SO OUR MISSION DESIGN WORK
IS ALL BEING DONE AROUND THE

320

00:22:30,660 --> 00:22:31,770
TARGET.

321

00:22:31,770 --> 00:22:37,860
OUR CAPTURE CAPABILITY PROTO
TYPING IS DONE WITH THE

322

00:22:37,860 --> 00:22:41,340
ASSUMPTIONS OF THE TARGET.

323

00:22:41,340 --> 00:22:45,580
WE HAVE VERY LENGTHY REPORT FROM
THE EXTERNAL COMMUNITY,

324

00:22:45,580 --> 00:22:46,580
ACTUALLY.

325

00:22:46,580 --> 00:22:54,920
RECENTLY OUT IN FEBRUARY OF THIS
YEAR, AVAILABLE IN OUR WEBSITE,

326

00:22:54,920 --> 00:22:55,970
WWW.NASA.ED.GOV.

327

00:22:55,970 --> 00:23:03,730
IT IS A FAST REPORT, IN CASE
ANYONE IS INTERESTED.

328

00:23:03,730 --> 00:23:07,570
>> I CAN'T BELIEVE I GOT THIS
BUT LAST WEEK WE HAD AN

329

00:23:07,570 --> 00:23:10,990

INCREDIBLE MISSION THAT WAS
LAUNCHED.

330

00:23:10,990 --> 00:23:15,120

AS I TALK ABOUT THE INCREMENTAL
APPROACH THAT WE'RE DOING, A LOT

331

00:23:15,120 --> 00:23:19,320

OF FOLKS WHO ARE HERE AT GODARD
BECAUSE THEY WERE THE KEY

332

00:23:19,320 --> 00:23:22,830

MEMBERS OF THE TEAM.

333

00:23:22,830 --> 00:23:26,331

WE LAUNCHED A SATELLITE THAT
WILL MAKE A COUPLE OF YEAR

334

00:23:26,331 --> 00:23:31,770

TRANSIT TO ANOTHER ASTEROID THAT
IS PRETTY WELL STUDIED.

335

00:23:31,770 --> 00:23:34,500

WHEN IT GETS THERE, WE WILL
STUDY THAT ASTEROID FOR ABOUT

336

00:23:34,500 --> 00:23:35,620

TWO YEARS.

337

00:23:35,620 --> 00:23:36,750

WE WILL PICK LANDING SIGHTS.

338

00:23:36,750 --> 00:23:39,360

WE WILL DO A CHARACTERIZATION.

339

00:23:39,360 --> 00:23:42,600

FINALLY, WHEN WE'RE CONFIDENT

WHERE WE ARE GOING TO LAND AND

340

00:23:42,600 --> 00:23:48,730

HOW TO DO IT, IT'S ACTUALLY
GOING TO TAKE ITSELF DOWN TO

341

00:23:48,730 --> 00:23:51,950

VERY CLOSE PROXIMITY TO THE
SURFACE OF THE NEW AND USE A

342

00:23:51,950 --> 00:23:57,480

LONG ARM THAT WILL GO DOWN,
PENETRATE THE SURFACE IN DUST

343

00:23:57,480 --> 00:24:01,800

AND DEBRIS AND†-- WHATEVER YOU
WANT TO CALL IT FROM AN ASTEROID

344

00:24:01,800 --> 00:24:07,450

TO BE CAPTURED IN A CANNISTER
THAT WE WILL THEN BRING BACK TO

345

00:24:07,450 --> 00:24:08,640

EARTH FOR SUBSEQUENT STUDY.

346

00:24:08,640 --> 00:24:12,751

IT WILL GO TO WHAT WE CALL THE
LUNAR REPOSITORY TO THE JOHNSON

347

00:24:12,751 --> 00:24:13,850

SPACE CENTER.

348

00:24:13,850 --> 00:24:23,210

WE WILL TAKE REAL SAMPLES AND
THAT WILL FEED TO THE ASTEROID

349

00:24:23,210 --> 00:24:24,650

REDIRECT MISSION.

350

00:24:24,650 --> 00:24:27,470
EVERYTHING WE DO IS
INCREMENTALLY PLANNED TO SUPPORT

351
00:24:27,470 --> 00:24:28,470
EACH OTHER.

352
00:24:28,470 --> 00:24:29,990
I DIDN'T WANT TO FORGET ABOUT
OSARRIS.

353
00:24:29,990 --> 00:24:32,289
>> THING TO WRAP UP.

354
00:24:32,289 --> 00:24:42,830
>> AND I WANT TO LOOK AT THE
PROGRESS, INCLUDING THE

355
00:24:42,830 --> 00:24:48,230
SPACECRAFT BOX, ANNOUNCEMENT FOR
PARTNERSHIP, THE PROTO TYPING

356
00:24:48,230 --> 00:24:53,330
INFORMATION, AND ALL THE
BENEFITS THE MISSION SPOKE OF.

357
00:24:53,330 --> 00:24:57,050
>> I'M JUST HAPPY TO BE HERE,
HAVE DR. †HOLDEN HERE.

358
00:24:57,050 --> 00:25:00,480
IT'S NOT EVERY DAY WE GET THE
PRESIDENT'S SCIENCE ADVISER TO

359
00:25:00,480 --> 00:25:03,730
COME OUT.

360
00:25:03,730 --> 00:25:05,450
EXCITED ABOUT THE MISSION.

361

00:25:05,450 --> 00:25:08,050

EXCITED ABOUT THE FACT THAT WE
ARE GOING TO EXPOSE INDUSTRY TO

362

00:25:08,050 --> 00:25:12,740

IT TODAY AND LET THEM GIVE US
SOME INPUT.

363

00:25:12,740 --> 00:25:15,730

>> I WANT TO ADD THE PRESIDENT
IS EXCITED ABOUT THE MISSION AS

364

00:25:15,730 --> 00:25:16,730

WELL.

365

00:25:16,730 --> 00:25:20,830

HE SPOKE ABOUT THE ASTEROID
MISSION IN 2010, WHEN HE TALKED

366

00:25:20,830 --> 00:25:26,210

ABOUT THE WAY WE WERE BUILDING A
SYSTEMATIC VISIONARY APPROACH TO

367

00:25:26,210 --> 00:25:30,060

MOVING DEEPER INTO SPACE AND
CONDUCTING A MORE EVOLVING

368

00:25:30,060 --> 00:25:31,440

OPERATION IN SPACE.

369

00:25:31,440 --> 00:25:34,690

AND WE THINK THIS MISSION IS A
GREAT EXAMPLE THAT PULLS

370

00:25:34,690 --> 00:25:41,490

TOGETHER SO MANY THREADS WE NEED
TO BE DOING ON THE WAY TO MARS.

371

00:25:41,490 --> 00:25:42,490

>> GREAT
WELL, THANK YOU ALL.

372
00:25:42,490 --> 00:25:44,190
WE APPRECIATE YOU BEING HERE
TODAY.

373
00:25:44,190 --> 00:25:45,890
WE'RE EXCITED ABOUT THE MISSION
AS WELL.

374
00:25:45,890 --> 00:25:48,590
IF YOU ARE INTERESTED IN
LEARNING MORE ABOUT THE ASTEROID

375
00:25:48,590 --> 00:25:51,740
REDIRECT MISSION, CHECK OUT
WWW.NASA.GOV/ARM.

376
00:25:51,740 --> 00:25:59,870
IF YOU COULD TUNE TO OUR UPDATE.

377
00:25:59,870 --> 00:26:04,880
IMMEDIATELY AFTER THAT, 4:00
P.M., WE WILL HAVE MORE STAFF TO

378
00:26:04,880 --> 00:26:07,870
TALK ABOUT THE ASTEROID REDIRECT
MISSION.