
PURDUE
UNIVERSITY

1
00:00:11,089 --> 00:00:08,089
good evening welcome to the 2010 william

2
00:00:13,190 --> 00:00:11,099
ii Boeing a distinguished lecture I am

3
00:00:16,189 --> 00:00:13,200
Tom she I'm head of the school of

4
00:00:19,070 --> 00:00:16,199
Aeronautics and Astronautics it is my

5
00:00:22,460 --> 00:00:19,080
distinct pleasure to have all of you

6
00:00:25,900 --> 00:00:22,470
here tonight either here in powder hall

7
00:00:28,400 --> 00:00:25,910
or watching at home it is now my

8
00:00:31,580 --> 00:00:28,410
distinct privilege to introduce the

9
00:00:35,569 --> 00:00:31,590
leader of our great University she is a

10
00:00:37,690 --> 00:00:35,579
scientist and educator she is a

11
00:00:41,720 --> 00:00:37,700
supporter of all things Purdue a

12
00:00:44,660 --> 00:00:41,730
cheerleader for the Boilermakers in the

13
00:00:47,690 --> 00:00:44,670

classroom in the lab in our community

14
00:00:49,190 --> 00:00:47,700
and on the playing field ladies and

15
00:00:55,459 --> 00:00:49,200
gentlemen and the president of Purdue

16
00:01:02,229 --> 00:00:55,469
University dr. France córdova thank you

17
00:01:05,060 --> 00:01:02,239
good evening good evening Boilermakers

18
00:01:07,760 --> 00:01:05,070
boilermaker community members thank you

19
00:01:09,859 --> 00:01:07,770
for being here and thanks to the College

20
00:01:13,100 --> 00:01:09,869
of Engineering and its school of

21
00:01:15,440 --> 00:01:13,110
Aeronautics and Astronautics and to the

22
00:01:18,830 --> 00:01:15,450
Indiana Space Grant consortium for

23
00:01:21,590 --> 00:01:18,840
making this evening possible as you know

24
00:01:25,690 --> 00:01:21,600
Purdue has a long history in aerospace

25
00:01:29,120 --> 00:01:25,700
and a very close relationship with NASA

26
00:01:32,289 --> 00:01:29,130
the school has produced more aerospace

27
00:01:36,520 --> 00:01:32,299
engineering degrees than any other US

28
00:01:41,680 --> 00:01:36,530
University during the past decade the

29
00:01:48,380 --> 00:01:45,980
and I'll ask the students here how many

30
00:01:56,170 --> 00:01:48,390
Purdue graduates have been selected as

31
00:01:59,510 --> 00:01:56,180
astronauts 23 that's right well

32
00:02:02,240 --> 00:01:59,520
including of course Neil Armstrong the

33
00:02:05,570 --> 00:02:02,250
first person on the moon and Gene Cernan

34
00:02:09,380 --> 00:02:05,580
who prefers to be called the most recent

35
00:02:12,560 --> 00:02:09,390
person on the Moon Neil and gene are

36
00:02:15,830 --> 00:02:12,570
very close to produce still and they're

37
00:02:19,009 --> 00:02:15,840
quick to say that they were only two of

38
00:02:21,860 --> 00:02:19,019

thousands of engineers and scientists

39
00:02:26,150 --> 00:02:21,870
many of them Purdue graduates who helped

40
00:02:29,440 --> 00:02:26,160
us to get to the moon our association

41
00:02:32,690 --> 00:02:29,450
with NASA goes back to its earliest days

42
00:02:35,120 --> 00:02:32,700
Purdue graduate Virgil Gus Grissom

43
00:02:37,630 --> 00:02:35,130
remember Grissom building on our campus

44
00:02:41,270 --> 00:02:37,640
was one of the original mercury 7

45
00:02:44,750 --> 00:02:41,280
astronauts and the second American to

46
00:02:47,810 --> 00:02:44,760
fly in space we have research

47
00:02:49,640 --> 00:02:47,820
partnerships with NASA and our students

48
00:02:51,979 --> 00:02:49,650
are looking to the skies through an

49
00:02:54,610 --> 00:02:51,989
organization called the students for the

50
00:02:57,860 --> 00:02:54,620
exploration and development of space

51
00:03:01,490 --> 00:02:57,870
open to all majors how many of you here

52
00:03:04,789 --> 00:03:01,500
are members of that organization great

53
00:03:07,550 --> 00:03:04,799
well welcome here tonight the space

54
00:03:11,740 --> 00:03:07,560
travelers engineers and scientists of

55
00:03:14,979 --> 00:03:11,750
tomorrow are studying at Purdue today

56
00:03:18,680 --> 00:03:14,989
tonight I'm honored to welcome to Purdue

57
00:03:23,110 --> 00:03:18,690
NASA Administrator in retired Marine

58
00:03:26,360 --> 00:03:23,120
Corps Major General Charles Bolden jr.

59
00:03:29,090 --> 00:03:26,370
before arriving at NASA general Bolden

60
00:03:33,380 --> 00:03:29,100
had a long and successful career in the

61
00:03:36,319 --> 00:03:33,390
military and in science doreen is

62
00:03:39,380 --> 00:03:36,329
distinguished 34 years service with the

63
00:03:43,449 --> 00:03:39,390

Marine Corps he flew more than 100

64
00:03:46,460 --> 00:03:43,459
combat missions his many military

65
00:03:48,949 --> 00:03:46,470
decorations include the defense superior

66
00:03:51,000 --> 00:03:48,959
service medal and the Distinguished

67
00:03:54,360 --> 00:03:51,010
Flying Cross

68
00:03:57,170 --> 00:03:54,370
he's also a veteran of for shuttle

69
00:04:00,210 --> 00:03:57,180
missions and commanded two of them

70
00:04:05,250 --> 00:04:00,220
logging more than six hundred and eighty

71
00:04:07,220 --> 00:04:05,260
hours in space his flights included

72
00:04:10,649 --> 00:04:07,230
deployment of the Hubble Space Telescope

73
00:04:13,589 --> 00:04:10,659
I believe that was launched before the

74
00:04:18,240 --> 00:04:13,599
most of the freshman on our campus this

75
00:04:21,779 --> 00:04:18,250
month were born and the first us-russian

76
00:04:24,290 --> 00:04:21,789
shuttle mission he was inducted into the

77
00:04:28,409 --> 00:04:24,300
u.s. astronaut hall of fame in May of

78
00:04:30,150 --> 00:04:28,419
2006 he graduated from the u.s. Naval

79
00:04:32,279 --> 00:04:30,160
Academy with the degree in electrical

80
00:04:36,409 --> 00:04:32,289
science and earned a Master of Science

81
00:04:39,360 --> 00:04:36,419
degree in systems management from USC

82
00:04:42,270 --> 00:04:39,370
general Bolden is only the second

83
00:04:46,140 --> 00:04:42,280
astronaut to lead NASA in its 50-year

84
00:04:49,170 --> 00:04:46,150
history hearing from the leader of our

85
00:04:53,340 --> 00:04:49,180
space program is a rare opportunity for

86
00:04:56,850 --> 00:04:53,350
the campus and the community nASA has

87
00:04:59,310 --> 00:04:56,860
been the doorway to our universe in one

88
00:05:03,240 --> 00:04:59,320

of the principal agencies for

89
00:05:06,420 --> 00:05:03,250
exploration and research and as you know

90
00:05:10,200 --> 00:05:06,430
this is a critical time in the agency's

91
00:05:13,500 --> 00:05:10,210
history we all at Purdue have a great

92
00:05:16,200 --> 00:05:13,510
vision for space exploration and I know

93
00:05:20,610 --> 00:05:16,210
some of our students are eager to get

94
00:05:23,040 --> 00:05:20,620
out there and to keep on exploring so I

95
00:05:26,070 --> 00:05:23,050
know that you will give general Bolden

96
00:05:28,560 --> 00:05:26,080
are really warm welcome a round of

97
00:05:32,070 --> 00:05:28,570
applause this evening as he gives his

98
00:05:35,580 --> 00:05:32,080
talk titled our nation's future in space

99
00:05:44,730 --> 00:05:35,590
it's my distinct honor to introduce NASA

100
00:05:44,740 --> 00:05:49,279
thank you all very much

101
00:05:58,670 --> 00:05:56,869
okay dr. Cordova thank you so very much

102
00:06:01,219 --> 00:05:58,680
for those very kind words and thanks to

103
00:06:02,809 --> 00:06:01,229
all of you for for coming out tonight I

104
00:06:04,850 --> 00:06:02,819
want to thank the College of Engineering

105
00:06:06,799 --> 00:06:04,860
and the Indiana Space Grant consortium

106
00:06:09,469 --> 00:06:06,809
for inviting me to speak to you tonight

107
00:06:11,149 --> 00:06:09,479
and I want you to know it's quite a

108
00:06:13,670 --> 00:06:11,159
pleasure for me to be back here on the

109
00:06:16,579 --> 00:06:13,680
Purdue campus i have i have been here

110
00:06:18,829 --> 00:06:16,589
before on on selected occasions but it's

111
00:06:20,689 --> 00:06:18,839
been quite a while since i came back and

112
00:06:22,760 --> 00:06:20,699
as I was explaining to people who came

113
00:06:24,439 --> 00:06:22,770

in with me from Washington this is

114
00:06:27,129 --> 00:06:24,449
actually the first time that I have done

115
00:06:31,159 --> 00:06:27,139
more than fly a t-38 into the airport

116
00:06:32,809 --> 00:06:31,169
here on campus come see somebody get

117
00:06:35,420 --> 00:06:32,819
back in my t-38 and go back to houston

118
00:06:37,219 --> 00:06:35,430
so we actually spent most of the day

119
00:06:39,230 --> 00:06:37,229
here and it's it's been an incredible

120
00:06:41,420 --> 00:06:39,240
experience for me and I I really want to

121
00:06:43,699 --> 00:06:41,430
thank all of you students faculty

122
00:06:46,219 --> 00:06:43,709
everybody who really made us feel at

123
00:06:50,480 --> 00:06:46,229
home and from whom I've learned quite a

124
00:06:52,489 --> 00:06:50,490
bit today I really you know it's it's

125
00:06:54,679 --> 00:06:52,499
just a pleasure to be here at one of our

126
00:06:56,829 --> 00:06:54,689
nation's great universities and I I want

127
00:07:01,549 --> 00:06:56,839
to again express my appreciation to you

128
00:07:04,369 --> 00:07:01,559
dr. France córdova for being produced

129
00:07:06,350 --> 00:07:04,379
president which I'm not sure how many of

130
00:07:10,249 --> 00:07:06,360
you understand the significance of

131
00:07:12,949 --> 00:07:10,259
having a woman of such a steam as your

132
00:07:14,689 --> 00:07:12,959
president having a woman as the

133
00:07:17,230 --> 00:07:14,699
president of such a prestigious

134
00:07:21,559 --> 00:07:17,240
university they are few and far between

135
00:07:24,170 --> 00:07:21,569
when you look at places like this I am

136
00:07:27,799 --> 00:07:24,180
very proud to say that the dr cordova

137
00:07:29,719 --> 00:07:27,809
and I are both alums of NASA this is I

138
00:07:31,879 --> 00:07:29,729

am returning for my second time and

139
00:07:35,059 --> 00:07:31,889
she's actually the former NASA chief

140
00:07:39,049 --> 00:07:35,069
scientist and I commend her for the

141
00:07:40,730 --> 00:07:39,059
shining example that that she said for

142
00:07:42,469 --> 00:07:40,740
what can be accomplished in science

143
00:07:45,709 --> 00:07:42,479
technology engineering and math or stem

144
00:07:46,999 --> 00:07:45,719
as we call it dr. Cordova for those of

145
00:07:49,219 --> 00:07:47,009
you who may not know was the first woman

146
00:07:51,009 --> 00:07:49,229
and the youngest person ever to hold the

147
00:07:55,040 --> 00:07:51,019
position of chief scientist at NASA

148
00:07:59,360 --> 00:07:55,050
another NASA alum here tonight is a dear

149
00:08:00,920 --> 00:07:59,370
friend of mine dr. LDS who was the in

150
00:08:03,350 --> 00:08:00,930
fact when I was at NASA

151
00:08:04,670 --> 00:08:03,360
so was kind of running the science

152
00:08:06,800 --> 00:08:04,680
Mission Directorate I don't even know

153
00:08:08,689 --> 00:08:06,810
what we called it back then I didn't

154
00:08:10,310 --> 00:08:08,699
call it that but we called it something

155
00:08:11,390 --> 00:08:10,320
and then he went over to become the

156
00:08:14,480 --> 00:08:11,400
director of the Goddard Space Flight

157
00:08:16,610 --> 00:08:14,490
Center so it is it's very special for me

158
00:08:17,900 --> 00:08:16,620
to be here with him he's now produced

159
00:08:20,749 --> 00:08:17,910
executive vice president for business

160
00:08:22,520 --> 00:08:20,759
and finance I think many of you know

161
00:08:24,950 --> 00:08:22,530
that many of the astronauts count Purdue

162
00:08:26,900 --> 00:08:24,960
as their alma mater from our first

163
00:08:30,040 --> 00:08:26,910

moonwalker Neil Armstrong to mark

164
00:08:35,480 --> 00:08:30,050
polanski commander of last year's SGS

165
00:08:38,570 --> 00:08:35,490
21-27 space mission I count 22 plus one

166
00:08:39,800 --> 00:08:38,580
I have learned tonight astronauts among

167
00:08:42,170 --> 00:08:39,810
the ranks of the Boilermakers and it's

168
00:08:44,300 --> 00:08:42,180
plus 1 because 1 is still an astronaut

169
00:08:46,430 --> 00:08:44,310
candidate I understand so we have this

170
00:08:47,870 --> 00:08:46,440
funky thing you know about you're not an

171
00:08:50,240 --> 00:08:47,880
astronaut until you finish your first

172
00:08:51,740 --> 00:08:50,250
year or whatever it is and don't ask me

173
00:08:57,920 --> 00:08:51,750
but that's just the way it is so you

174
00:08:59,690 --> 00:08:57,930
have 22 plus 1 this place these halls on

175
00:09:02,320 --> 00:08:59,700
this campus have contributed an awful

176
00:09:05,570 --> 00:09:02,330
lot to the space program and through

177
00:09:08,570 --> 00:09:05,580
that the economic well-being of this

178
00:09:10,880 --> 00:09:08,580
nation our national security and yes the

179
00:09:14,079 --> 00:09:10,890
spirit of our country through the vast

180
00:09:16,250 --> 00:09:14,089
inspiration that exploration provides I

181
00:09:19,820 --> 00:09:16,260
love that you have a college of

182
00:09:22,579 --> 00:09:19,830
engineering a college of science and a

183
00:09:25,640 --> 00:09:22,589
college of technology this is really my

184
00:09:27,380 --> 00:09:25,650
kind of place earlier today I spoke to

185
00:09:30,230 --> 00:09:27,390
the interns from Purdue who spent their

186
00:09:32,060 --> 00:09:30,240
summer at NASA speaking to such students

187
00:09:34,310 --> 00:09:32,070
is one of the most rewarding things that

188
00:09:36,560 --> 00:09:34,320

I have an opportunity to do as the NASA

189
00:09:38,690 --> 00:09:36,570
Administrator students who are just

190
00:09:40,130 --> 00:09:38,700
starting their college careers are

191
00:09:42,560 --> 00:09:40,140
generally excited about the future

192
00:09:45,019 --> 00:09:42,570
they're fired up about what lies ahead

193
00:09:47,150 --> 00:09:45,029
for the space program and the chance to

194
00:09:49,819 --> 00:09:47,160
create capabilities that we don't have

195
00:09:51,680 --> 00:09:49,829
today they want to be part of something

196
00:09:54,620 --> 00:09:51,690
larger and they want to contribute to

197
00:09:56,630 --> 00:09:54,630
national goals we're often asked to

198
00:09:58,910 --> 00:09:56,640
justify the space program which by the

199
00:10:02,569 --> 00:09:58,920
way for those of you interested in

200
00:10:05,569 --> 00:10:02,579
trivia is only about six percent of the

201
00:10:08,090 --> 00:10:05,579
entire federal budget six tenths of one

202
00:10:09,769 --> 00:10:08,100
percent in light of so many of the

203
00:10:12,130 --> 00:10:09,779
pressing world problems here on the

204
00:10:15,110 --> 00:10:12,140
ground from poverty to disease and war

205
00:10:17,690 --> 00:10:15,120
but the fact is that space

206
00:10:20,920 --> 00:10:17,700
has made huge contributions to all of

207
00:10:23,300 --> 00:10:20,930
the problems we face as a planet

208
00:10:25,190 --> 00:10:23,310
technology like we use in our water

209
00:10:27,350 --> 00:10:25,200
processing systems on the International

210
00:10:29,990 --> 00:10:27,360
Space Station or ISS for instance is

211
00:10:33,380 --> 00:10:30,000
helping people in remote areas get

212
00:10:35,840 --> 00:10:33,390
access to water ISS research has helped

213
00:10:37,730 --> 00:10:35,850

us learn more about salmonella and has

214
00:10:40,760 --> 00:10:37,740
led to a candidate vaccine and we're

215
00:10:43,010 --> 00:10:40,770
also studying other pathogens many of

216
00:10:45,590 --> 00:10:43,020
the tools and technologies we take for

217
00:10:49,130 --> 00:10:45,600
granted came about as a result of

218
00:10:51,620 --> 00:10:49,140
exploration it's an impressive list that

219
00:10:54,680 --> 00:10:51,630
you can peruse if you care to go to our

220
00:10:56,570 --> 00:10:54,690
NASA website but i want to emphasize how

221
00:10:59,630 --> 00:10:56,580
exploration improves life for people

222
00:11:02,840 --> 00:10:59,640
everywhere on Earth and helps us solve a

223
00:11:04,460 --> 00:11:02,850
lot of problems that are universal you

224
00:11:07,760 --> 00:11:04,470
need only to look at the partnership

225
00:11:10,700 --> 00:11:07,770
between 15 nations including a former

226
00:11:12,680 --> 00:11:10,710
Cold War rival Russia that created the

227
00:11:15,610 --> 00:11:12,690
International Space Station to see how

228
00:11:18,650 --> 00:11:15,620
exploration brings our world together

229
00:11:20,720 --> 00:11:18,660
I'm one of the still too small group of

230
00:11:23,180 --> 00:11:20,730
people who have witnessed our home

231
00:11:25,760 --> 00:11:23,190
planet from above where we see no

232
00:11:27,949 --> 00:11:25,770
visible borders I had the privilege of

233
00:11:30,320 --> 00:11:27,959
working with international cruise all

234
00:11:33,440 --> 00:11:30,330
focused on the same big goals and

235
00:11:36,920 --> 00:11:33,450
sharing our triumphs and successes as a

236
00:11:39,140 --> 00:11:36,930
team I hope many more people have the

237
00:11:42,290 --> 00:11:39,150
chance to experience that in the years

238
00:11:44,840 --> 00:11:42,300

to come I want that world for my

239
00:11:47,030 --> 00:11:44,850
grandchildren let me get back down to

240
00:11:48,470 --> 00:11:47,040
earth though I also spoke today to some

241
00:11:50,930 --> 00:11:48,480
fourth through sixth grade for through

242
00:11:53,220 --> 00:11:50,940
fifth-graders actually the sixth graders

243
00:11:55,110 --> 00:11:53,230
didn't show up

244
00:11:58,560 --> 00:11:55,120
that's not true I don't think they were

245
00:11:59,670 --> 00:11:58,570
invited but in speaking to the fourth

246
00:12:03,390 --> 00:11:59,680
and fifth graders who were participating

247
00:12:05,190 --> 00:12:03,400
in the FIRST Robotics Competition you

248
00:12:07,590 --> 00:12:05,200
know they were about real-world

249
00:12:09,300 --> 00:12:07,600
challenges and they were asking some of

250
00:12:11,550 --> 00:12:09,310
the same questions our scientists and

251
00:12:14,390 --> 00:12:11,560
engineers do when they build a robot to

252
00:12:16,980 --> 00:12:14,400
send to space or to another planet I

253
00:12:19,710 --> 00:12:16,990
think we really have to grab kids at

254
00:12:21,300 --> 00:12:19,720
this age they have to be engaged at the

255
00:12:23,760 --> 00:12:21,310
earliest grades and make science

256
00:12:26,340 --> 00:12:23,770
technology engineering and math studies

257
00:12:29,040 --> 00:12:26,350
a regular part of their curriculum so

258
00:12:32,610 --> 00:12:29,050
they don't seem alien so they don't seem

259
00:12:35,160 --> 00:12:32,620
like huge scary subjects first makes

260
00:12:36,900 --> 00:12:35,170
that tangible it demonstrates a

261
00:12:38,450 --> 00:12:36,910
connection between the subjects they've

262
00:12:41,490 --> 00:12:38,460
been studying and real-world

263
00:12:43,320 --> 00:12:41,500

applications at the high school level in

264
00:12:45,120 --> 00:12:43,330
the first program when students are

265
00:12:47,160 --> 00:12:45,130
building real robots out of metal and

266
00:12:49,080 --> 00:12:47,170
gears and controllers they basically

267
00:12:51,660 --> 00:12:49,090
have to do a complete mission turn

268
00:12:53,100 --> 00:12:51,670
around in a very brief period including

269
00:12:55,590 --> 00:12:53,110
completing a full engineering

270
00:12:58,140 --> 00:12:55,600
requirements analysis brainstorming

271
00:13:00,300 --> 00:12:58,150
developing a concept then designing it

272
00:13:02,670 --> 00:13:00,310
and building it developing the software

273
00:13:05,190 --> 00:13:02,680
and integrating everything documenting

274
00:13:07,920 --> 00:13:05,200
their work testing and debugging and

275
00:13:10,980 --> 00:13:07,930
then their robot actually competes

276
00:13:13,590 --> 00:13:10,990
against others from around the world the

277
00:13:15,510 --> 00:13:13,600
goal isn't simply to build a robot but

278
00:13:18,210 --> 00:13:15,520
to provide a vehicle for learning much

279
00:13:20,700 --> 00:13:18,220
more with an ultimate goal of building a

280
00:13:23,370 --> 00:13:20,710
collaborative team a supportive

281
00:13:26,060 --> 00:13:23,380
community and a solid strategy for

282
00:13:29,490 --> 00:13:26,070
problem-solving during the competition

283
00:13:31,710 --> 00:13:29,500
here at Purdue yuasa you successfully

284
00:13:34,440 --> 00:13:31,720
have supported I think three or four

285
00:13:36,990 --> 00:13:34,450
teams in the first robotics program NASA

286
00:13:39,390 --> 00:13:37,000
sponsored nearly 300 of the 1800 teams

287
00:13:41,340 --> 00:13:39,400
have participated in the 2010 FIRST

288
00:13:44,220 --> 00:13:41,350

Robotics international competition held

289
00:13:46,710 --> 00:13:44,230
this summer in Atlanta Georgia Boeing

290
00:13:49,200 --> 00:13:46,720
and several other major corporations are

291
00:13:51,770 --> 00:13:49,210
also big sponsors we plan to continue

292
00:13:54,150 --> 00:13:51,780
our involvement with this great program

293
00:13:56,250 --> 00:13:54,160
but you know I was asked to speak to you

294
00:13:58,860 --> 00:13:56,260
tonight about NASA's vision for the

295
00:14:00,390 --> 00:13:58,870
future of exploration our nation's

296
00:14:02,910 --> 00:14:00,400
leadership is still working out the

297
00:14:04,590 --> 00:14:02,920
details of the budget for next year but

298
00:14:06,240 --> 00:14:04,600
a few things are clear for those of you

299
00:14:06,960 --> 00:14:06,250
that don't understand that means

300
00:14:10,530 --> 00:14:06,970
Congress

301
00:14:13,019 --> 00:14:10,540
still working on the budget okay so when

302
00:14:16,619 --> 00:14:13,029
we finish I'll come tell you again but

303
00:14:19,800 --> 00:14:16,629
but we're optimistic the nation has

304
00:14:21,840 --> 00:14:19,810
established exploration as a priority it

305
00:14:24,689 --> 00:14:21,850
wasn't that long ago that we had to

306
00:14:27,900 --> 00:14:24,699
justify why we were even pursuing human

307
00:14:30,420 --> 00:14:27,910
spaceflight at all as a nation that's no

308
00:14:33,300 --> 00:14:30,430
longer in question we will be doing

309
00:14:35,280 --> 00:14:33,310
human exploration and we plan to develop

310
00:14:37,470 --> 00:14:35,290
the capabilities needed to go beyond

311
00:14:40,379 --> 00:14:37,480
low-earth orbit father into our solar

312
00:14:42,540 --> 00:14:40,389
system the discussion underway now will

313
00:14:45,600 --> 00:14:42,550

determine the path we take to achieve

314
00:14:48,840 --> 00:14:45,610
this future of new capabilities and a

315
00:14:50,910 --> 00:14:48,850
new way of looking at space we're no

316
00:14:52,710 --> 00:14:50,920
longer discussing whether or not we

317
00:14:55,499 --> 00:14:52,720
should be pursuing exploration at all

318
00:14:57,480 --> 00:14:55,509
that's a positive shift in the dialogue

319
00:14:59,670 --> 00:14:57,490
and a real testament to the

320
00:15:02,179 --> 00:14:59,680
accomplishments of NASA and the entire

321
00:15:04,710 --> 00:15:02,189
aerospace industry over the past decades

322
00:15:07,439 --> 00:15:04,720
the president released his National

323
00:15:09,900 --> 00:15:07,449
Space policy in June it's part of a

324
00:15:12,900 --> 00:15:09,910
national focus involving many agencies a

325
00:15:14,699 --> 00:15:12,910
major goal is to enlarge and

326
00:15:17,460 --> 00:15:14,709
reinvigorate American research and

327
00:15:19,379 --> 00:15:17,470
development the policy brings focus to

328
00:15:22,290 --> 00:15:19,389
efforts needed today to enable a bright

329
00:15:25,170 --> 00:15:22,300
future with space as an even larger part

330
00:15:26,910 --> 00:15:25,180
of the nation's efforts this policy will

331
00:15:29,999 --> 00:15:26,920
ensure the US remains at the forefront

332
00:15:32,100 --> 00:15:30,009
of innovation we're going to develop the

333
00:15:36,179 --> 00:15:32,110
capabilities that help our nation both

334
00:15:38,369 --> 00:15:36,189
in space and here on earth in doing so

335
00:15:41,429 --> 00:15:38,379
will inspire these young and not so

336
00:15:44,670 --> 00:15:41,439
young and active actively encouraged

337
00:15:47,269 --> 00:15:44,680
students to dream and build and become

338
00:15:50,150 --> 00:15:47,279

the engineers and scientists of tomorrow

339
00:15:53,400 --> 00:15:50,160
we've achieved amazing things already

340
00:15:55,619 --> 00:15:53,410
we've landed robots on Mars for instance

341
00:15:58,100 --> 00:15:55,629
and they've roamed the Martian surface

342
00:16:00,480 --> 00:15:58,110
and sent amazing high defination

343
00:16:03,179 --> 00:16:00,490
high-resolution images of the red planet

344
00:16:04,829 --> 00:16:03,189
back to earth we've created and

345
00:16:07,679 --> 00:16:04,839
successfully launched the world's

346
00:16:09,629 --> 00:16:07,689
largest fleet of Earth observing

347
00:16:12,090 --> 00:16:09,639
satellites that have provided insightful

348
00:16:15,120 --> 00:16:12,100
data about our plank climate planet's

349
00:16:19,410 --> 00:16:15,130
climate water levels ice coverage and so

350
00:16:21,900 --> 00:16:19,420
much more we've launched today 356

351
00:16:25,200 --> 00:16:21,910
men and women into space on the space

352
00:16:27,180 --> 00:16:25,210
shuttle but President Obama now wants us

353
00:16:29,340 --> 00:16:27,190
to focus on new and emerging

354
00:16:33,030 --> 00:16:29,350
capabilities will need to make huge

355
00:16:36,240 --> 00:16:33,040
leaps in the decades ahead to take the

356
00:16:39,720 --> 00:16:36,250
necessary steps to develop and flight

357
00:16:41,850 --> 00:16:39,730
test new exploration systems several

358
00:16:44,280 --> 00:16:41,860
examples are propulsion systems that

359
00:16:46,860 --> 00:16:44,290
allow us to reach Mars much quicker than

360
00:16:48,840 --> 00:16:46,870
the current eight month trip closed-loop

361
00:16:51,420 --> 00:16:48,850
life support to make it feasible to live

362
00:16:53,760 --> 00:16:51,430
on another planetary body or just get

363
00:16:55,590 --> 00:16:53,770

there in the first place precision

364
00:16:58,080 --> 00:16:55,600
Landers that can scout future

365
00:16:59,730 --> 00:16:58,090
destinations at the same time as they

366
00:17:03,000 --> 00:16:59,740
test technologies and make scientific

367
00:17:05,190 --> 00:17:03,010
discoveries strong research universities

368
00:17:08,790 --> 00:17:05,200
like Purdue will no doubt play a

369
00:17:10,440 --> 00:17:08,800
critical role in all of this work there

370
00:17:13,440 --> 00:17:10,450
are many things in the plan for fiscal

371
00:17:15,030 --> 00:17:13,450
year 11 that seem to be certain like

372
00:17:17,360 --> 00:17:15,040
extending the International Space

373
00:17:19,560 --> 00:17:17,370
Station to at least twenty twenty

374
00:17:21,740 --> 00:17:19,570
increasing support for many science

375
00:17:23,910 --> 00:17:21,750
missions especially in earth science

376
00:17:25,590 --> 00:17:23,920
ramping up funding for the next

377
00:17:28,290 --> 00:17:25,600
generation of science and Aeronautics

378
00:17:30,780 --> 00:17:28,300
research and expanding our education

379
00:17:34,320 --> 00:17:30,790
activities to help us widen the pipeline

380
00:17:37,110 --> 00:17:34,330
for future leaders one of the key things

381
00:17:39,780 --> 00:17:37,120
that is that is that next generation of

382
00:17:41,910 --> 00:17:39,790
technology there are technology

383
00:17:44,070 --> 00:17:41,920
capabilities experts in the field have

384
00:17:47,340 --> 00:17:44,080
agreed for years we need for

385
00:17:49,710 --> 00:17:47,350
long-duration deep-space missions a new

386
00:17:52,500 --> 00:17:49,720
heavy-lift rocket that can get us out

387
00:17:55,500 --> 00:17:52,510
into deep space seems likely to be one

388
00:17:57,900 --> 00:17:55,510

of our priorities as well as some mix of

389
00:17:59,970 --> 00:17:57,910
the systems I mentioned earlier we now

390
00:18:02,580 --> 00:17:59,980
have a new chief science technologist

391
00:18:05,250 --> 00:18:02,590
dr. Bobby Braun one of our youngest NASA

392
00:18:06,870 --> 00:18:05,260
leaders at the age of 44 and he's

393
00:18:09,120 --> 00:18:06,880
helping guide our planning for

394
00:18:11,330 --> 00:18:09,130
technology development when the when the

395
00:18:13,830 --> 00:18:11,340
fiscal year 11 budget is approved

396
00:18:17,100 --> 00:18:13,840
there's an open letter to students from

397
00:18:18,600 --> 00:18:17,110
Bobby on the AI double a website he

398
00:18:20,730 --> 00:18:18,610
makes a lot of good points and

399
00:18:23,130 --> 00:18:20,740
challenges today's students to become

400
00:18:25,050 --> 00:18:23,140
tomorrow's innovators one of our

401
00:18:27,480 --> 00:18:25,060
immediate needs is to inspire the next

402
00:18:29,520 --> 00:18:27,490
generation and give them the hands-on

403
00:18:33,450 --> 00:18:29,530
opportunities to develop hardware and

404
00:18:36,000 --> 00:18:33,460
flight test it when you think about it

405
00:18:37,620 --> 00:18:36,010
it's not a long time line for the

406
00:18:39,720 --> 00:18:37,630
students many of you sitting in this

407
00:18:42,090 --> 00:18:39,730
auditorium that we're attempting to

408
00:18:45,419 --> 00:18:42,100
inspire to be the scientists and

409
00:18:47,850 --> 00:18:45,429
engineers conducting these missions some

410
00:18:50,250 --> 00:18:47,860
of you who are sophomores today will

411
00:18:53,039 --> 00:18:50,260
only be 35 years of age by the time we

412
00:18:56,039 --> 00:18:53,049
reach an asteroid in 20-25 as the

413
00:18:58,639 --> 00:18:56,049

president has proposed believe it or not

414
00:19:01,919 --> 00:18:58,649
that's still pretty early in your career

415
00:19:04,159 --> 00:19:01,929
you'll be in your mid 40s by the time a

416
00:19:06,860 --> 00:19:04,169
manned mission to Mars takes place I

417
00:19:09,779 --> 00:19:06,870
want you to have a chance to excel and

418
00:19:12,389 --> 00:19:09,789
create the world of tomorrow with it's

419
00:19:15,630 --> 00:19:12,399
stunning possibilities as was done by

420
00:19:18,269 --> 00:19:15,640
the Mercury Gemini and Apollo generation

421
00:19:19,740 --> 00:19:18,279
and the scientists and engineers who

422
00:19:22,620 --> 00:19:19,750
constructed and launched the Hubble

423
00:19:24,750 --> 00:19:22,630
Space Telescope NASA's do the new

424
00:19:27,480 --> 00:19:24,760
direction has been widely reported as a

425
00:19:29,580 --> 00:19:27,490
cut but it's not it's a six billion

426
00:19:32,190 --> 00:19:29,590
dollar increase over the next five years

427
00:19:34,230 --> 00:19:32,200
that's a huge vote of confidence by the

428
00:19:37,230 --> 00:19:34,240
President and Congress in these tough

429
00:19:39,060 --> 00:19:37,240
economic times we are working to enable

430
00:19:41,580 --> 00:19:39,070
commercial access to low-earth orbit

431
00:19:44,549 --> 00:19:41,590
that area that extends to where Hubble

432
00:19:46,740 --> 00:19:44,559
and the space station are 250 to 400

433
00:19:48,810 --> 00:19:46,750
miles above us with congressional

434
00:19:51,210 --> 00:19:48,820
approval we're going to keep working

435
00:19:53,220 --> 00:19:51,220
with companies both large and small to

436
00:19:55,860 --> 00:19:53,230
open up this entirely new segment of the

437
00:19:58,169 --> 00:19:55,870
economy companies that can launch the

438
00:20:00,180 --> 00:19:58,179

space and the many businesses that

439
00:20:03,180 --> 00:20:00,190
provide things like communications and

440
00:20:05,610 --> 00:20:03,190
supporting equipment that we think will

441
00:20:09,000 --> 00:20:05,620
spur jobs and innovation for decades to

442
00:20:12,169 --> 00:20:09,010
come those are jobs that the students of

443
00:20:14,789 --> 00:20:12,179
today that you will be able to pursue

444
00:20:16,620 --> 00:20:14,799
the international space station that has

445
00:20:18,930 --> 00:20:16,630
been our focus for much of the past two

446
00:20:22,169 --> 00:20:18,940
decades is an absolute engineering

447
00:20:24,529 --> 00:20:22,179
marvel I could truly never have imagined

448
00:20:27,060 --> 00:20:24,539
when I was a child that in my lifetime

449
00:20:29,130 --> 00:20:27,070
we would have an orbiting facility the

450
00:20:33,000 --> 00:20:29,140
size of a football field with an

451
00:20:38,070 --> 00:20:33,010
international crew on it 24 7 365

452
00:20:39,630 --> 00:20:38,080
sometimes 364 days you know and we're

453
00:20:41,850 --> 00:20:39,640
going to have it for at least another

454
00:20:43,909 --> 00:20:41,860
decade so there will be many

455
00:20:46,010 --> 00:20:43,919
opportunities for students and educators

456
00:20:48,140 --> 00:20:46,020
researchers and in

457
00:20:50,780 --> 00:20:48,150
three to put experiments on it and

458
00:20:54,020 --> 00:20:50,790
outside of it and gather information in

459
00:20:55,910 --> 00:20:54,030
a way that's possible nowhere else we're

460
00:20:57,890 --> 00:20:55,920
really thinking hard about where we want

461
00:21:00,770 --> 00:20:57,900
to be in a generation not just in the

462
00:21:03,050 --> 00:21:00,780
next five years to move beyond that

463
00:21:05,300 --> 00:21:03,060

vehicle driven approach to think in

464
00:21:07,880 --> 00:21:05,310
broader terms about the capabilities we

465
00:21:10,400 --> 00:21:07,890
need in order to do a wider range of

466
00:21:13,700 --> 00:21:10,410
things and serve a wider range of people

467
00:21:16,070 --> 00:21:13,710
from other government users of space to

468
00:21:20,120 --> 00:21:16,080
our international partners industry

469
00:21:23,450 --> 00:21:20,130
academia and you the private citizen you

470
00:21:25,670 --> 00:21:23,460
asked about vision so please allow me to

471
00:21:28,280 --> 00:21:25,680
tell you what I envision for the future

472
00:21:32,090 --> 00:21:28,290
of space exploration in years to come as

473
00:21:33,560 --> 00:21:32,100
we pursue NASA's exciting goals let me

474
00:21:36,440 --> 00:21:33,570
talk just a little bit about human

475
00:21:38,630 --> 00:21:36,450
exploration but also exploration by our

476
00:21:41,240 --> 00:21:38,640
amazing science missions that go out

477
00:21:44,750 --> 00:21:41,250
into the universe and also help us

478
00:21:46,760 --> 00:21:44,760
better understand our own planet we also

479
00:21:49,190 --> 00:21:46,770
have an incredibly robust Aeronautics

480
00:21:52,010 --> 00:21:49,200
program that will greatly improve the

481
00:21:55,100 --> 00:21:52,020
future of air travel over the coming

482
00:21:57,530 --> 00:21:55,110
decades NASA is determined to work with

483
00:22:00,620 --> 00:21:57,540
people everywhere to achieve continued

484
00:22:02,840 --> 00:22:00,630
and expanded exploration of space with

485
00:22:04,730 --> 00:22:02,850
humans that will drive prosperity here

486
00:22:07,270 --> 00:22:04,740
on earth through innovations and

487
00:22:09,890 --> 00:22:07,280
technologies not even imagine today

488
00:22:13,160 --> 00:22:09,900

through our exploration endeavors we

489
00:22:15,590 --> 00:22:13,170
will expand our economic sphere expand

490
00:22:18,830 --> 00:22:15,600
our minds through exciting scientific

491
00:22:21,350 --> 00:22:18,840
discoveries and expand our imaginations

492
00:22:25,040 --> 00:22:21,360
by going to incredible new places in the

493
00:22:27,020 --> 00:22:25,050
solar system in the upcoming decades we

494
00:22:29,450 --> 00:22:27,030
truly hope to witness the first boots on

495
00:22:32,930 --> 00:22:29,460
Mars fulfilling the dreams of

496
00:22:35,060 --> 00:22:32,940
generations who have come before as our

497
00:22:37,640 --> 00:22:35,070
first astronauts shake the red soil from

498
00:22:40,010 --> 00:22:37,650
their boots they will prove once and for

499
00:22:43,130 --> 00:22:40,020
all that humans are truly meant to

500
00:22:45,530 --> 00:22:43,140
explore we may be able to detect the

501
00:22:47,810 --> 00:22:45,540
earliest forms of matter galaxies and

502
00:22:50,720 --> 00:22:47,820
stars in the universe with the James

503
00:22:53,480 --> 00:22:50,730
Webb Space Telescope will be able to

504
00:22:55,370 --> 00:22:53,490
pros probe the event horizon of a

505
00:22:57,740 --> 00:22:55,380
supermassive black hole and another

506
00:22:59,800 --> 00:22:57,750
galaxy with the International x-ray

507
00:23:02,170 --> 00:22:59,810
Observatory through

508
00:23:04,150 --> 00:23:02,180
our astrophysics missions we may be able

509
00:23:07,510 --> 00:23:04,160
to peer back to the very beginnings of

510
00:23:09,910 --> 00:23:07,520
our universe in earth science NASA with

511
00:23:12,130 --> 00:23:09,920
our international partners has deployed

512
00:23:14,740 --> 00:23:12,140
and are maturing a global Earth

513
00:23:17,440 --> 00:23:14,750

observation system of systems in the

514
00:23:19,330 --> 00:23:17,450
future this system will enable routine

515
00:23:21,520 --> 00:23:19,340
extended weather forecasting and

516
00:23:25,030 --> 00:23:21,530
multi-year climate predictions on a

517
00:23:27,400 --> 00:23:25,040
regional basis future airplanes will be

518
00:23:30,190 --> 00:23:27,410
more efficient less polluting and

519
00:23:31,870 --> 00:23:30,200
quieter they will use much lighter

520
00:23:34,420 --> 00:23:31,880
high-temperature materials and

521
00:23:37,060 --> 00:23:34,430
structures and potentially hybrid

522
00:23:39,250 --> 00:23:37,070
electric propulsion systems we're

523
00:23:41,160 --> 00:23:39,260
constantly working on ways for young

524
00:23:43,690 --> 00:23:41,170
people to get involved with NASA and

525
00:23:46,690 --> 00:23:43,700
hopefully pursue careers in our

526
00:23:49,000 --> 00:23:46,700
wonderful world we recently announced a

527
00:23:51,070 --> 00:23:49,010
competition for high school students to

528
00:23:53,890 --> 00:23:51,080
participate in a program called spheres

529
00:23:56,380 --> 00:23:53,900
in which they design software to program

530
00:23:59,010 --> 00:23:56,390
small soccer ball-sized satellites

531
00:24:02,110 --> 00:23:59,020
aboard the International Space Station

532
00:24:04,570 --> 00:24:02,120
these little satellites are used to test

533
00:24:07,510 --> 00:24:04,580
maneuvers for spacecraft performing

534
00:24:10,000 --> 00:24:07,520
autonomous rendezvous and docking three

535
00:24:12,790 --> 00:24:10,010
of them fly today inside the station's

536
00:24:16,150 --> 00:24:12,800
cabin and they're each self-contained

537
00:24:18,760 --> 00:24:16,160
with power propulsion computing and

538
00:24:20,920 --> 00:24:18,770

navigation equipment how exciting to

539
00:24:23,800 --> 00:24:20,930
have worked on one of these when I was

540
00:24:26,350 --> 00:24:23,810
in school our minority innovations

541
00:24:28,150 --> 00:24:26,360
challenges Institute is working to

542
00:24:30,340 --> 00:24:28,160
create a virtual training ground where

543
00:24:32,290 --> 00:24:30,350
minority undergraduate students learn

544
00:24:35,140 --> 00:24:32,300
how to compete in NASA technical

545
00:24:38,320 --> 00:24:35,150
challenges sometimes for significant

546
00:24:41,080 --> 00:24:38,330
cash prizes these activities will focus

547
00:24:43,390 --> 00:24:41,090
on competitions found within NASA's

548
00:24:46,600 --> 00:24:43,400
Centennial Challenges program which

549
00:24:48,250 --> 00:24:46,610
provides cash prizes from 50,000 to two

550
00:24:50,740 --> 00:24:48,260
million dollars to individuals or teams

551
00:24:53,470 --> 00:24:50,750
it can achieve specific technical

552
00:24:55,810 --> 00:24:53,480
accomplishments we're kicking off a

553
00:24:57,730 --> 00:24:55,820
one-stop-shopping initiative where

554
00:24:59,740 --> 00:24:57,740
undergraduate and graduate students who

555
00:25:02,740 --> 00:24:59,750
want to apply for an answer internship

556
00:25:05,140 --> 00:25:02,750
or fellowship soon will have access to

557
00:25:08,410 --> 00:25:05,150
all of NASA's opportunities on a single

558
00:25:10,450 --> 00:25:08,420
website at an education summit next week

559
00:25:11,770 --> 00:25:10,460
we're going to iron out some of the

560
00:25:13,130 --> 00:25:11,780
kinks and bring together people

561
00:25:15,530 --> 00:25:13,140
interested in

562
00:25:18,530 --> 00:25:15,540
pating and creating creating even more

563
00:25:20,480 --> 00:25:18,540

opportunities and we're also we also

564
00:25:22,880 --> 00:25:20,490
want to develop ways to maintain the

565
00:25:25,510 --> 00:25:22,890
connection with these passionate young

566
00:25:28,810 --> 00:25:25,520
people who come to work for us and

567
00:25:32,210 --> 00:25:28,820
experience great learning opportunities

568
00:25:34,730 --> 00:25:32,220
we want to stay in touch see where their

569
00:25:37,550 --> 00:25:34,740
careers take them and help them open

570
00:25:40,820 --> 00:25:37,560
doors at NASA if that's where they want

571
00:25:45,500 --> 00:25:40,830
to go among our current exciting science

572
00:25:47,870 --> 00:25:45,510
missions epoxy the repurpose deep impact

573
00:25:49,610 --> 00:25:47,880
spacecraft some of you will remember the

574
00:25:52,130 --> 00:25:49,620
one that carried the impactor that hit a

575
00:25:54,470 --> 00:25:52,140
comment a couple of years ago well it

576
00:25:56,810 --> 00:25:54,480
reaches the comet Hartley 2 in November

577
00:26:00,350 --> 00:25:56,820
for extended examination of this

578
00:26:02,030 --> 00:26:00,360
mysterious object also in November will

579
00:26:05,030 --> 00:26:02,040
launch a space shuttle with a robotic

580
00:26:07,520 --> 00:26:05,040
crew member Robonaut 2 or r2 as we like

581
00:26:09,650 --> 00:26:07,530
to call him r2 was developed through a

582
00:26:11,870 --> 00:26:09,660
space act agreement between General

583
00:26:14,330 --> 00:26:11,880
Motors and NASA to work in the auto

584
00:26:17,570 --> 00:26:14,340
industry and will now be tested for

585
00:26:20,210 --> 00:26:17,580
applications in space in March next year

586
00:26:23,570 --> 00:26:20,220
miss messenger will become the first

587
00:26:26,110 --> 00:26:23,580
spacecraft ever to orbit mercury the

588
00:26:29,600 --> 00:26:26,120

Mars Science Laboratory dubbed curiosity

589
00:26:31,610 --> 00:26:29,610
launches in November 2011 it will be the

590
00:26:34,520 --> 00:26:31,620
largest Rover we've ever sent to the red

591
00:26:37,220 --> 00:26:34,530
planet about the size of a small car and

592
00:26:40,190 --> 00:26:37,230
it will carry its own laboratory as its

593
00:26:42,140 --> 00:26:40,200
name suggests one of its prime goals

594
00:26:44,600 --> 00:26:42,150
will be to help us learn more about

595
00:26:48,440 --> 00:26:44,610
whether an art Mars has ever been

596
00:26:51,050 --> 00:26:48,450
hospitable to life in 2014 we plan to

597
00:26:54,020 --> 00:26:51,060
launch the James Webb Space Telescope to

598
00:26:56,630 --> 00:26:54,030
appoint a million miles away it's hard

599
00:26:58,100 --> 00:26:56,640
to imagine that distance but Webb is

600
00:27:00,740 --> 00:26:58,110
going to be the most advanced

601
00:27:02,300 --> 00:27:00,750
Observatory we have and it will peer

602
00:27:04,640 --> 00:27:02,310
back to the very beginnings of the

603
00:27:07,940 --> 00:27:04,650
universe the new horizons spacecraft

604
00:27:10,310 --> 00:27:07,950
reaches Pluto in 2015 and that

605
00:27:13,040 --> 00:27:10,320
mysterious dwarf planet will get its

606
00:27:15,320 --> 00:27:13,050
first thorough examination in earth

607
00:27:18,170 --> 00:27:15,330
science new missions to study ice sheets

608
00:27:20,630 --> 00:27:18,180
and carbon cycles and climate change and

609
00:27:24,380 --> 00:27:20,640
many other processes of our planet are

610
00:27:26,820 --> 00:27:24,390
in development as I mentioned earlier we

611
00:27:30,369 --> 00:27:26,830
have many plans in aeronautics

612
00:27:32,769 --> 00:27:30,379
today or tomorrow I actually speak at a

613
00:27:35,409 --> 00:27:32,779

green aviation summit in California

614
00:27:37,210 --> 00:27:35,419
we're actively working with the FAA and

615
00:27:39,489 --> 00:27:37,220
others to develop the air transportation

616
00:27:42,940 --> 00:27:39,499
system of tomorrow the next generation

617
00:27:45,399 --> 00:27:42,950
air transportation system or next-gen if

618
00:27:47,349 --> 00:27:45,409
you go to our website you'll see some of

619
00:27:50,169 --> 00:27:47,359
the prototype vehicles that we're we've

620
00:27:52,720 --> 00:27:50,179
solicited as a base for starting to

621
00:27:55,869 --> 00:27:52,730
develop some new aircraft on which we

622
00:27:58,840 --> 00:27:55,879
may all be traveling in the future to do

623
00:28:00,970 --> 00:27:58,850
all this as I've already said we need

624
00:28:03,549 --> 00:28:00,980
the brightest American minds pursuing

625
00:28:07,629 --> 00:28:03,559
science technology engineering and math

626
00:28:10,119 --> 00:28:07,639
we need you how we recruit you and other

627
00:28:13,570 --> 00:28:10,129
students around the country how we get

628
00:28:16,450 --> 00:28:13,580
you and them interested and keep you and

629
00:28:19,210 --> 00:28:16,460
them interested at a young age is a huge

630
00:28:20,609 --> 00:28:19,220
challenge for us we're going to need

631
00:28:23,399 --> 00:28:20,619
smart people in all disciplines

632
00:28:26,109 --> 00:28:23,409
biologists medical professionals

633
00:28:28,720 --> 00:28:26,119
psychologists geologists material

634
00:28:30,639 --> 00:28:28,730
scientists you name it in engineering

635
00:28:33,279 --> 00:28:30,649
and science and we're going to have a

636
00:28:34,930 --> 00:28:33,289
need for it as we move out on the space

637
00:28:38,320 --> 00:28:34,940
missions for which we are laying the

638
00:28:41,739 --> 00:28:38,330

groundwork today that 30-year grid is

639
00:28:43,180 --> 00:28:41,749
filling up fast I know Purdue and our

640
00:28:45,460 --> 00:28:43,190
nation's other universities will

641
00:28:47,889 --> 00:28:45,470
continue to turn out graduates with

642
00:28:50,349 --> 00:28:47,899
skills and knowledge that you can apply

643
00:28:54,310 --> 00:28:50,359
for the betterment of our nation and our

644
00:28:58,090 --> 00:28:54,320
world at NASA we'll do our part to keep

645
00:29:01,060 --> 00:28:58,100
our vision big but achievable I want you

646
00:29:04,779 --> 00:29:01,070
all to stay with us and stay on the cusp

647
00:29:08,859 --> 00:29:04,789
of imagination Wonder and an insatiable

648
00:29:12,039 --> 00:29:08,869
quest for knowledge believe me the best

649
00:29:13,720 --> 00:29:12,049
is yet to come thank you all so very

650
00:29:15,580 --> 00:29:13,730
much and I think I'm going to take some

651
00:29:32,960 --> 00:29:15,590
questions if that's okay good the

652
00:29:37,710 --> 00:29:35,430
general Bowden thank you so much for a

653
00:29:41,039 --> 00:29:37,720
share with us your vision for coronation

654
00:29:44,789 --> 00:29:41,049
space and also aeronautics I get shortly

655
00:29:46,470 --> 00:29:44,799
we will have a Q&A session and and so

656
00:29:47,940 --> 00:29:46,480
please pass your questions to the center

657
00:29:49,830 --> 00:29:47,950
of the aisle and the students who picked

658
00:29:52,889 --> 00:29:49,840
them up so we have questions maybe you

659
00:29:54,180 --> 00:29:52,899
can pass on to to the center and why

660
00:29:58,549 --> 00:29:54,190
these students are collecting questions

661
00:30:03,570 --> 00:30:01,230
what do you see is the role for

662
00:30:06,990 --> 00:30:03,580
aerospace engineers both aeronautics and

663
00:30:09,419 --> 00:30:07,000

astronautics as having you know and also

664
00:30:10,769 --> 00:30:09,429
how for those four are engaged in

665
00:30:12,389 --> 00:30:10,779
aerospace engineering how did you

666
00:30:14,639 --> 00:30:12,399
broaden their perspective so they can

667
00:30:18,000 --> 00:30:14,649
better serve our nation's posts in space

668
00:30:20,639 --> 00:30:18,010
and Aeronautics as I mentioned in my

669
00:30:23,039 --> 00:30:20,649
comments I think the future for an

670
00:30:26,490 --> 00:30:23,049
aeronautical engineer any engineer to be

671
00:30:29,310 --> 00:30:26,500
quite honest is bright you know if arrow

672
00:30:30,480 --> 00:30:29,320
is not your thing and you're interested

673
00:30:34,230 --> 00:30:30,490
mechanical engineering or Electrical

674
00:30:35,639 --> 00:30:34,240
Engineering I'd say press I happen to

675
00:30:37,769 --> 00:30:35,649
think they're the magical engineers

676
00:30:40,350 --> 00:30:37,779
because they're sort of the universal

677
00:30:43,710 --> 00:30:40,360
engineers if your interest is health

678
00:30:45,570 --> 00:30:43,720
care we need you so I think you're going

679
00:30:48,000 --> 00:30:45,580
to find that the NASA of the future in

680
00:30:50,070 --> 00:30:48,010
trying to do the innovative things that

681
00:30:52,230 --> 00:30:50,080
we are that we are endeavoring to do to

682
00:30:54,600 --> 00:30:52,240
answer the president's challenge will

683
00:30:56,250 --> 00:30:54,610
need representation from each of you

684
00:30:58,560 --> 00:30:56,260
sitting here in the audience and you

685
00:31:02,310 --> 00:30:58,570
know I address my comments too I kept

686
00:31:07,200 --> 00:31:02,320
using the term young i consider myself

687
00:31:09,389 --> 00:31:07,210
young it's in here and it's in here and

688
00:31:10,980 --> 00:31:09,399

it's in the way that you feel about

689
00:31:12,570 --> 00:31:10,990
things so i think everyone in this

690
00:31:14,970 --> 00:31:12,580
audience is young and you would not be

691
00:31:17,070 --> 00:31:14,980
out here and we have a place for every

692
00:31:21,720 --> 00:31:17,080
one of you young minds and we hope

693
00:31:26,570 --> 00:31:21,730
you'll stay interested in us there any

694
00:31:36,029 --> 00:31:34,529
okay how will we be working with our

695
00:31:38,249 --> 00:31:36,039
international partners be on the

696
00:31:39,749 --> 00:31:38,259
international space station how do we

697
00:31:41,669 --> 00:31:39,759
work with our international partners be

698
00:31:44,519 --> 00:31:41,679
on international space station right now

699
00:31:46,590 --> 00:31:44,529
we have about 115 active international

700
00:31:48,090 --> 00:31:46,600
agreements that are that have nothing to

701
00:31:51,720 --> 00:31:48,100
do with the international space station

702
00:31:55,289 --> 00:31:51,730
many of them are decades old some

703
00:31:56,759 --> 00:31:55,299
started when dr. Diaz lazare but we most

704
00:31:59,430 --> 00:31:56,769
of our international agreements are in

705
00:32:03,720 --> 00:31:59,440
the area of earth science we find that

706
00:32:05,340 --> 00:32:03,730
most other nations seek to do things in

707
00:32:07,769 --> 00:32:05,350
the science arena in the earth science

708
00:32:10,249 --> 00:32:07,779
arena that have what they call says did

709
00:32:12,659 --> 00:32:10,259
fulfill what they call societal needs

710
00:32:15,899 --> 00:32:12,669
nASA has a problem for example called

711
00:32:17,369 --> 00:32:15,909
servire it now it's headquartered out of

712
00:32:19,350 --> 00:32:17,379
the Marshall Space Flight Center in the

713
00:32:22,200 --> 00:32:19,360

University of Alabama Huntsville where

714
00:32:24,930 --> 00:32:22,210
we take 30 years worth of archived earth

715
00:32:27,570 --> 00:32:24,940
science data along with contemporary

716
00:32:29,190 --> 00:32:27,580
data that's coming down every day from a

717
00:32:30,659 --> 00:32:29,200
series of earth science satellites and

718
00:32:35,129 --> 00:32:30,669
we feed it to two places around the

719
00:32:37,649 --> 00:32:35,139
world one is in in Nairobi Kenya the

720
00:32:39,269 --> 00:32:37,659
other one is in Panama and we provide it

721
00:32:42,149 --> 00:32:39,279
to the countries of Central and South

722
00:32:43,499 --> 00:32:42,159
America in 215 East African nations to

723
00:32:45,659 --> 00:32:43,509
help their leaders with disaster

724
00:32:47,909 --> 00:32:45,669
management with water resource

725
00:32:51,299 --> 00:32:47,919
management crop planning and control and

726
00:32:53,369 --> 00:32:51,309
we're even today helping them to design

727
00:32:56,460 --> 00:32:53,379
models to deal with flooding as well as

728
00:32:58,710 --> 00:32:56,470
droughts when I leave the country in a

729
00:33:04,200 --> 00:32:58,720
few weeks I'll actually be stopping

730
00:33:07,200 --> 00:33:04,210
through a place in near India where

731
00:33:09,509 --> 00:33:07,210
we're going to open the third site for

732
00:33:11,369 --> 00:33:09,519
severe where we'll actually touch that

733
00:33:14,119 --> 00:33:11,379
part of the world with with the same

734
00:33:17,759 --> 00:33:14,129
program so our international cooperation

735
00:33:21,060 --> 00:33:17,769
spans the gamut from space exploration

736
00:33:24,029 --> 00:33:21,070
all the way through to education okay

737
00:33:25,980 --> 00:33:24,039
what advice do you have for non-science

738
00:33:29,730 --> 00:33:25,990

or non-engineering people to become a

739
00:33:32,909 --> 00:33:29,740
part NASA ooh hang in there with us come

740
00:33:36,770 --> 00:33:32,919
work with us my number one my number one

741
00:33:41,660 --> 00:33:36,780
partner every morning is my attorney

742
00:33:43,730 --> 00:33:41,670
I know I kid I kid around all the time I

743
00:33:45,200 --> 00:33:43,740
have a general counsel I have an Office

744
00:33:47,150 --> 00:33:45,210
of General Counsel and right now I think

745
00:33:49,400 --> 00:33:47,160
we have 30 attorneys at NASA

746
00:33:51,980 --> 00:33:49,410
headquarters and then each NASA in each

747
00:33:54,380 --> 00:33:51,990
of the the nine NASA centers in the Jet

748
00:33:56,570 --> 00:33:54,390
Propulsion labs has an office that has

749
00:33:59,180 --> 00:33:56,580
the general counsel we deal with

750
00:34:02,540 --> 00:33:59,190
everything from contracts contractual

751
00:34:04,520 --> 00:34:02,550
disputes environmental issues we are

752
00:34:06,890 --> 00:34:04,530
presently involved with a big issue with

753
00:34:10,700 --> 00:34:06,900
the state of California for example on

754
00:34:12,890 --> 00:34:10,710
cleanup issues labor relations you name

755
00:34:14,210 --> 00:34:12,900
it so that's an example if you happen to

756
00:34:20,140 --> 00:34:14,220
be a person I think I talked to somebody

757
00:34:22,940 --> 00:34:20,150
today who was in oh I call it hotel REE

758
00:34:25,909 --> 00:34:22,950
but it's it's you know running hotels

759
00:34:27,980 --> 00:34:25,919
and managing facilities like that every

760
00:34:30,200 --> 00:34:27,990
time an astronaut gets ready to go fly

761
00:34:32,480 --> 00:34:30,210
in space several months before we fly we

762
00:34:35,240 --> 00:34:32,490
meet with the dieticians who are all

763
00:34:37,700 --> 00:34:35,250

NASA personnel they help us decide what

764
00:34:39,230 --> 00:34:37,710
it is we want to eat for seven days or

765
00:34:41,930 --> 00:34:39,240
six months or however long you're going

766
00:34:44,210 --> 00:34:41,940
to be in space you make up your menu and

767
00:34:47,570 --> 00:34:44,220
coordination with them they take a look

768
00:34:49,760 --> 00:34:47,580
at it and say need more calories they

769
00:34:51,590 --> 00:34:49,770
never say you need less they always say

770
00:34:54,649 --> 00:34:51,600
need more calories need some manganese

771
00:34:57,080 --> 00:34:54,659
some potassium all this other kind of

772
00:35:00,380 --> 00:34:57,090
stuff so dietitians play a critical role

773
00:35:03,110 --> 00:35:00,390
in spaceflight administrative personnel

774
00:35:04,820 --> 00:35:03,120
my coming here somebody had to do all

775
00:35:06,590 --> 00:35:04,830
the ticketing and everything else we

776
00:35:09,350 --> 00:35:06,600
don't go outside all that work is done

777
00:35:11,480 --> 00:35:09,360
by NASA employees so you name it if as I

778
00:35:16,970 --> 00:35:11,490
mentioned in my comments if there is an

779
00:35:19,310 --> 00:35:16,980
honorable profession okay if there is an

780
00:35:22,160 --> 00:35:19,320
honorable profession we can use you I

781
00:35:28,790 --> 00:35:22,170
even i'm looking for a chaplain for an

782
00:35:30,170 --> 00:35:28,800
answer I need him or her other than

783
00:35:31,730 --> 00:35:30,180
being an astronaut what other

784
00:35:34,640 --> 00:35:31,740
experiences helped you prepare to be the

785
00:35:37,070 --> 00:35:34,650
NASA Administrator I think two things

786
00:35:38,510 --> 00:35:37,080
more than anything else prepared me to

787
00:35:40,040 --> 00:35:38,520
be the NASA Administrator having the

788
00:35:42,500 --> 00:35:40,050

greatest set appearance in the world my

789
00:35:45,550 --> 00:35:42,510
mom and dad who are my role models and

790
00:35:48,200 --> 00:35:45,560
my idols and looked down on us tonight

791
00:35:49,850 --> 00:35:48,210
they taught me three things they taught

792
00:35:52,040 --> 00:35:49,860
me that I had to study really hard

793
00:35:54,170 --> 00:35:52,050
if I ever wanted to achieve anything

794
00:35:56,180 --> 00:35:54,180
that I had to be willing to work really

795
00:35:58,160 --> 00:35:56,190
hard you know just just get in there and

796
00:36:00,140 --> 00:35:58,170
grind it out and then probably most

797
00:36:02,630 --> 00:36:00,150
importantly to never be afraid of

798
00:36:05,090 --> 00:36:02,640
failure to never let anybody tell me

799
00:36:06,740 --> 00:36:05,100
what I couldn't do I grew up in the

800
00:36:09,770 --> 00:36:06,750
segregated south I grew up in Columbia

801
00:36:11,570 --> 00:36:09,780
South Carolina and i was born in 1946

802
00:36:15,320 --> 00:36:11,580
for those of you who are trying to

803
00:36:18,140 --> 00:36:15,330
figure it out I'm 63 64 somewhere in

804
00:36:22,730 --> 00:36:18,150
that neighborhood at my stage it gets

805
00:36:25,010 --> 00:36:22,740
foggy but I watch my mom and dad work as

806
00:36:26,630 --> 00:36:25,020
teachers they they were career I mean

807
00:36:30,530 --> 00:36:26,640
career teachers and educators and they

808
00:36:32,600 --> 00:36:30,540
worked because they loved it they got up

809
00:36:35,420 --> 00:36:32,610
every morning just just raring to go out

810
00:36:38,540 --> 00:36:35,430
in and teach and help young people and

811
00:36:40,760 --> 00:36:38,550
they inspired me but they taught me that

812
00:36:42,560 --> 00:36:40,770
I just could not be a teacher because I

813
00:36:46,040 --> 00:36:42,570

couldn't work that hard for that little

814
00:36:48,800 --> 00:36:46,050
money and then I think the second thing

815
00:36:50,450 --> 00:36:48,810
that that more than prepared me to be

816
00:36:52,490 --> 00:36:50,460
the NASA Administrator was my 34 years

817
00:36:54,460 --> 00:36:52,500
in the Marine Corps I don't know whether

818
00:36:57,380 --> 00:36:54,470
any Marines in the audience or any

819
00:36:59,570 --> 00:36:57,390
sailors soldiers airmen Coast Guardsmen

820
00:37:01,790 --> 00:36:59,580
if you are I give you my heartfelt

821
00:37:06,470 --> 00:37:01,800
thanks for what you do or what you have

822
00:37:08,480 --> 00:37:06,480
done veterans you know you you serve you

823
00:37:10,750 --> 00:37:08,490
didn't have to do what you did and

824
00:37:13,280 --> 00:37:10,760
that's really important for this nation

825
00:37:16,520 --> 00:37:13,290
the things that I learned in my time in

826
00:37:18,920 --> 00:37:16,530
the Marine Corps have just equipped me

827
00:37:20,240 --> 00:37:18,930
incredibly well I tell everybody at NASA

828
00:37:23,410 --> 00:37:20,250
people sitting here on the front row

829
00:37:27,230 --> 00:37:23,420
from NASA know that I'm unabashedly

830
00:37:30,380 --> 00:37:27,240
unashamed of saying that I am privileged

831
00:37:33,500 --> 00:37:30,390
to try to lead the second greatest group

832
00:37:35,510 --> 00:37:33,510
of people in the world all of our NASA

833
00:37:38,660 --> 00:37:35,520
employees second only to United States

834
00:37:41,960 --> 00:37:38,670
Marines so that's kind of what helped

835
00:37:44,990 --> 00:37:41,970
prepare me what is the current status of

836
00:37:46,460 --> 00:37:45,000
the Orion project and the Ares project

837
00:37:48,530 --> 00:37:46,470
and what do you expect from these in the

838
00:37:50,270 --> 00:37:48,540

future orion and erich what are what's

839
00:37:53,270 --> 00:37:50,280
the current status Orion in Aries Orion

840
00:37:54,920 --> 00:37:53,280
in Aries are two components of a program

841
00:37:58,010 --> 00:37:54,930
that was called constellation or that is

842
00:38:00,320 --> 00:37:58,020
called constellation and you need to you

843
00:38:03,170 --> 00:38:00,330
know I talked about politics and

844
00:38:06,290 --> 00:38:03,180
Washington let me tell you that

845
00:38:09,460 --> 00:38:06,300
facts of life okay right now because we

846
00:38:12,049 --> 00:38:09,470
are still operating under the 2010

847
00:38:14,390 --> 00:38:12,059
Appropriations Act that the you know

848
00:38:16,520 --> 00:38:14,400
that's how that's my budget so I am

849
00:38:18,460 --> 00:38:16,530
required by law to continue to maintain

850
00:38:21,319 --> 00:38:18,470
and work on the constellation program

851
00:38:23,380 --> 00:38:21,329
although President Obama and I decided

852
00:38:27,319 --> 00:38:23,390
that that was not the program for NASA

853
00:38:30,380 --> 00:38:27,329
going forward so what we are trying to

854
00:38:32,299 --> 00:38:30,390
do is continue to work as much as we can

855
00:38:34,700 --> 00:38:32,309
to gain as many benefits from the

856
00:38:37,190 --> 00:38:34,710
constellation program areas in Orion to

857
00:38:40,160 --> 00:38:37,200
learn as much as we can from it we did a

858
00:38:42,410 --> 00:38:40,170
chest call Ares 1x where we launched for

859
00:38:46,099 --> 00:38:42,420
the first time in decades a brand new

860
00:38:49,329 --> 00:38:46,109
rocket Ares one would have been the

861
00:38:52,400 --> 00:38:49,339
human carrying rocket looks like a stick

862
00:38:54,109 --> 00:38:52,410
it's a five segmented solid or it was to

863
00:38:58,370 --> 00:38:54,119

have been a five segmented solid rocket

864
00:39:00,349 --> 00:38:58,380
booster Orion is the crew module that

865
00:39:02,599 --> 00:39:00,359
was to go with that program we are

866
00:39:04,609 --> 00:39:02,609
looking to see what we can do to utilize

867
00:39:06,650 --> 00:39:04,619
the contracts that we have with those

868
00:39:08,720 --> 00:39:06,660
programs to utilize what we've learned

869
00:39:11,660 --> 00:39:08,730
from those those particular programs to

870
00:39:13,789 --> 00:39:11,670
carry them on as we go to deep space so

871
00:39:15,079 --> 00:39:13,799
those continue we continue to work on

872
00:39:17,240 --> 00:39:15,089
those programs until the end of this

873
00:39:20,410 --> 00:39:17,250
fiscal year until we get a new 2011

874
00:39:24,049 --> 00:39:20,420
budget the 2011 budget will allow us

875
00:39:26,720 --> 00:39:24,059
hopefully to move on into trying to get

876
00:39:29,420 --> 00:39:26,730
beyond low-earth orbit to bring on

877
00:39:30,620 --> 00:39:29,430
commercial enterprises your president

878
00:39:32,990 --> 00:39:30,630
and I talked a little bit earlier

879
00:39:34,940 --> 00:39:33,000
tonight about her interest in particular

880
00:39:36,620 --> 00:39:34,950
and several other people in the School

881
00:39:38,720 --> 00:39:36,630
of Engineering interest in understanding

882
00:39:41,210 --> 00:39:38,730
what it is that we need from the

883
00:39:42,349 --> 00:39:41,220
commercial sector in terms of access to

884
00:39:44,359 --> 00:39:42,359
low Earth orbit I always tell people

885
00:39:46,579 --> 00:39:44,369
when you go to space there two things

886
00:39:50,390 --> 00:39:46,589
that I look at I look at access that's

887
00:39:51,650 --> 00:39:50,400
how do you get there NASA knows how to

888
00:39:54,020 --> 00:39:51,660

get to low-earth orbit we've

889
00:39:56,480 --> 00:39:54,030
demonstrated that to lots of people we

890
00:39:58,549 --> 00:39:56,490
have an incredible capability within the

891
00:40:01,400 --> 00:39:58,559
United States in in commercial entities

892
00:40:03,650 --> 00:40:01,410
who have built rockets for us since time

893
00:40:06,740 --> 00:40:03,660
began it has always been a commercial

894
00:40:08,569 --> 00:40:06,750
enterprise the way we procured them has

895
00:40:10,490 --> 00:40:08,579
been different we have always they've

896
00:40:12,079 --> 00:40:10,500
always been built as a part of a nasa

897
00:40:13,700 --> 00:40:12,089
project and then we took them on and

898
00:40:15,960 --> 00:40:13,710
home them and operated them that's

899
00:40:17,820 --> 00:40:15,970
really expensive and it

900
00:40:19,620 --> 00:40:17,830
kept us from being able to do the types

901
00:40:21,480 --> 00:40:19,630
of exploration that we really want to

902
00:40:23,670 --> 00:40:21,490
and need to do for the nation in the

903
00:40:27,240 --> 00:40:23,680
world and so we're going to go into a

904
00:40:29,609 --> 00:40:27,250
different procurement model if you will

905
00:40:31,530 --> 00:40:29,619
where we're going to let the commercial

906
00:40:33,570 --> 00:40:31,540
enterprises continue to produce rockets

907
00:40:35,760 --> 00:40:33,580
we're going to rent them or lease them

908
00:40:38,010 --> 00:40:35,770
or whatever is necessary when I need a

909
00:40:39,390 --> 00:40:38,020
rocket if i want to send astronauts to

910
00:40:41,880 --> 00:40:39,400
low-earth orbit to the International

911
00:40:43,890 --> 00:40:41,890
Space Station I'm kidding here when I

912
00:40:45,359 --> 00:40:43,900
say I'm gonna get on the phone but it'll

913
00:40:47,430 --> 00:40:45,369

sense essentially I'll get on the phone

914
00:40:49,170 --> 00:40:47,440
and I'll call a commercial entity and

915
00:40:51,030 --> 00:40:49,180
I'll say okay I need a rocket in six

916
00:40:52,320 --> 00:40:51,040
months because I've got a crew of four

917
00:40:56,370 --> 00:40:52,330
that I want to send to the International

918
00:40:59,849 --> 00:40:56,380
Space Station and we have not decided

919
00:41:02,099 --> 00:40:59,859
exactly how we want to run the the

920
00:41:05,190 --> 00:41:02,109
operation whether we train the crew and

921
00:41:06,720 --> 00:41:05,200
we can completely control the launch and

922
00:41:08,609 --> 00:41:06,730
the recovery and everything or whether

923
00:41:09,660 --> 00:41:08,619
we let them do it but that's the way

924
00:41:11,720 --> 00:41:09,670
that's going to go and we're going to

925
00:41:13,800 --> 00:41:11,730
spend your money the taxpayers money

926
00:41:15,390 --> 00:41:13,810
primarily devoted to building a

927
00:41:18,120 --> 00:41:15,400
heavy-lift launch vehicle with a vehicle

928
00:41:21,380 --> 00:41:18,130
like Orion that will take humans from

929
00:41:23,700 --> 00:41:21,390
low Earth orbit back to the moon on to

930
00:41:26,220 --> 00:41:23,710
asteroids and near-earth objects and

931
00:41:28,800 --> 00:41:26,230
then on father in the deeps place deep

932
00:41:32,310 --> 00:41:28,810
space and eventually to a place we call

933
00:41:34,589 --> 00:41:32,320
Mars going along with that what is the

934
00:41:37,020 --> 00:41:34,599
biggest obstacle and going to Mars two

935
00:41:39,510 --> 00:41:37,030
biggest obstacles actually the number

936
00:41:41,220 --> 00:41:39,520
one obstacle for me because I'm the

937
00:41:43,859 --> 00:41:41,230
person that's got to say people can get

938
00:41:48,540 --> 00:41:43,869

on the rocket and go as radiation the we

939
00:41:51,630 --> 00:41:48,550
don't we don't fully comprehend yet what

940
00:41:54,510 --> 00:41:51,640
the full threat from radiation outside

941
00:41:56,970 --> 00:41:54,520
of low-earth orbit is we do know that it

942
00:42:01,020 --> 00:41:56,980
poses a significant threat to human

943
00:42:04,500 --> 00:42:01,030
safety you know humans can probably

944
00:42:06,810 --> 00:42:04,510
survive the trip to Mars in the current

945
00:42:08,550 --> 00:42:06,820
environment in current vehicles but we

946
00:42:11,040 --> 00:42:08,560
think that there may be damage to the

947
00:42:12,780 --> 00:42:11,050
central nervous system you know they may

948
00:42:14,490 --> 00:42:12,790
reach their destination and capable of

949
00:42:17,370 --> 00:42:14,500
doing well what it is we sent them to do

950
00:42:19,349 --> 00:42:17,380
so radiation is the number one thing we

951
00:42:21,570 --> 00:42:19,359
can build bigger shields but that's

952
00:42:24,359 --> 00:42:21,580
weight and weight is just that's the

953
00:42:25,770 --> 00:42:24,369
worst enemy of exploration you gotta you

954
00:42:28,829 --> 00:42:25,780
know we live in this gravity well call

955
00:42:29,280 --> 00:42:28,839
earth and the heavier you are the more

956
00:42:31,380 --> 00:42:29,290
power

957
00:42:33,630 --> 00:42:31,390
work it takes to leave the gravity well

958
00:42:36,170 --> 00:42:33,640
so we want lightweight vehicles that

959
00:42:38,580 --> 00:42:36,180
means as little shielding as possible

960
00:42:40,740 --> 00:42:38,590
some medical people believe that there

961
00:42:43,110 --> 00:42:40,750
are prophylactic ways that you can treat

962
00:42:45,270 --> 00:42:43,120
someone so that the body will take

963
00:42:47,370 --> 00:42:45,280

radiation and it won't be damaged the

964
00:42:49,680 --> 00:42:47,380
way that it is today I'm not sure that

965
00:42:51,270 --> 00:42:49,690
that's the best way to do it but we just

966
00:42:53,700 --> 00:42:51,280
don't know so radiation is the number

967
00:42:56,730 --> 00:42:53,710
one second biggest challenge is in space

968
00:43:00,240 --> 00:42:56,740
propulsion and its speed any fighter

969
00:43:02,640 --> 00:43:00,250
pilots in here or would be fighter pilot

970
00:43:05,370 --> 00:43:02,650
or sons and daughters of fighter pilots

971
00:43:10,350 --> 00:43:05,380
okay there is this say I'm not a fighter

972
00:43:13,170 --> 00:43:10,360
pilot I'm a marine attack pilot used to

973
00:43:16,140 --> 00:43:13,180
be but there is a saying in the fighter

974
00:43:17,790 --> 00:43:16,150
community that speed is life and when

975
00:43:20,640 --> 00:43:17,800
you're going from low Earth orbit to

976
00:43:22,680 --> 00:43:20,650
another planet speed is life if we can

977
00:43:25,640 --> 00:43:22,690
reduce the time of transit from Earth to

978
00:43:27,960 --> 00:43:25,650
Mars from eight months to say half that

979
00:43:31,440 --> 00:43:27,970
that's half the exposure to radiation

980
00:43:33,330 --> 00:43:31,450
and that may be enough that you know

981
00:43:35,250 --> 00:43:33,340
with current technologies we can safely

982
00:43:37,140 --> 00:43:35,260
send humans there and bring them back we

983
00:43:39,840 --> 00:43:37,150
don't know that but in space propulsion

984
00:43:42,620 --> 00:43:39,850
is probably our next greatest challenge

985
00:43:45,540 --> 00:43:42,630
so that those are the two big things

986
00:43:47,130 --> 00:43:45,550
different track okay do you think the

987
00:43:50,010 --> 00:43:47,140
privatization of space will have any

988
00:43:51,930 --> 00:43:50,020

benefits beyond financial I'm not sure

989
00:43:54,210 --> 00:43:51,940
they'll have fine the question was do I

990
00:43:56,700 --> 00:43:54,220
think the privatization of space and and

991
00:43:58,860 --> 00:43:56,710
I would not characterize it as the

992
00:44:02,130 --> 00:43:58,870
privatization of space what we are going

993
00:44:04,470 --> 00:44:02,140
to do is introduce commercial activities

994
00:44:06,960 --> 00:44:04,480
for access to low-earth orbit and I

995
00:44:08,850 --> 00:44:06,970
didn't finish my whole statement before

996
00:44:10,950 --> 00:44:08,860
I said there are two things when I talk

997
00:44:13,140 --> 00:44:10,960
about space exploration there's access

998
00:44:14,910 --> 00:44:13,150
how do you get humans into space how do

999
00:44:16,410 --> 00:44:14,920
you get them to low-earth orbit because

1000
00:44:18,660 --> 00:44:16,420
no matter what you're going to do you

1001
00:44:20,370 --> 00:44:18,670
start in low-earth orbit you know you

1002
00:44:22,260 --> 00:44:20,380
can put humans in low-earth orbit on the

1003
00:44:23,490 --> 00:44:22,270
International Space Station or you can

1004
00:44:25,890 --> 00:44:23,500
put them going around Earth on a

1005
00:44:28,110 --> 00:44:25,900
spacecraft and then you can either do an

1006
00:44:30,150 --> 00:44:28,120
earth orbit rendezvous or a rendezvous

1007
00:44:31,890 --> 00:44:30,160
on the way to where you're going but you

1008
00:44:34,080 --> 00:44:31,900
got to get them there in the first place

1009
00:44:36,420 --> 00:44:34,090
and then the transit from low Earth

1010
00:44:39,450 --> 00:44:36,430
orbit to wherever else it is that you

1011
00:44:41,460 --> 00:44:39,460
want to go that's exploration there

1012
00:44:43,230 --> 00:44:41,470
you're doing stuff we other than going

1013
00:44:47,280 --> 00:44:43,240

to the moon

1014
00:44:49,560 --> 00:44:47,290
6 times 12 human being setting foot on

1015
00:44:52,350 --> 00:44:49,570
that planet all of whom happened to be

1016
00:44:55,200 --> 00:44:52,360
Americans by the way and that's not a

1017
00:44:57,060 --> 00:44:55,210
trick question I should I should have

1018
00:45:00,000 --> 00:44:57,070
asked the question I love asking very

1019
00:45:01,710 --> 00:45:00,010
learned groups okay how many people

1020
00:45:06,060 --> 00:45:01,720
walked on the moon everybody gets the

1021
00:45:08,850 --> 00:45:06,070
answer right how many 12 and then the

1022
00:45:12,359 --> 00:45:08,860
second question is how many countries

1023
00:45:15,000 --> 00:45:12,369
are represented in that 12 groups of

1024
00:45:18,300 --> 00:45:15,010
people group of people who walked on the

1025
00:45:21,420 --> 00:45:18,310
moon and you would be surprised at the

1026
00:45:26,790 --> 00:45:21,430
answers that you get in very learn it

1027
00:45:33,150 --> 00:45:26,800
groups everything from 12 to six four

1028
00:45:35,970 --> 00:45:33,160
three and then I say how about one you

1029
00:45:40,350 --> 00:45:35,980
know there's only been one nation that's

1030
00:45:42,240 --> 00:45:40,360
right that deserves a whoo I mean you we

1031
00:45:44,250 --> 00:45:42,250
should all be proud of that and whether

1032
00:45:46,260 --> 00:45:44,260
you're an American or not sitting in

1033
00:45:48,840 --> 00:45:46,270
this audience it is something about

1034
00:45:51,750 --> 00:45:48,850
which we should be incredibly proud that

1035
00:45:54,840 --> 00:45:51,760
was hard some of you think it was easy

1036
00:45:56,910 --> 00:45:54,850
and some of you think going to space is

1037
00:46:01,220 --> 00:45:56,920
easy because we have to admit we make it

1038
00:46:04,500 --> 00:46:01,230

look easy it is not easy going to space

1039
00:46:10,170 --> 00:46:04,510
that is incredibly difficult you know

1040
00:46:12,840 --> 00:46:10,180
getting off this planet is hard and it

1041
00:46:14,970 --> 00:46:12,850
will continue to be difficult but we're

1042
00:46:17,820 --> 00:46:14,980
going to utilize the commercial entities

1043
00:46:19,500 --> 00:46:17,830
to provide access so that we can spend

1044
00:46:21,599 --> 00:46:19,510
the taxpayers money in doing the

1045
00:46:24,210 --> 00:46:21,609
exploration which is going beyond so I'm

1046
00:46:26,760 --> 00:46:24,220
comfortable with the commercial

1047
00:46:29,700 --> 00:46:26,770
enterprise providing the access in it I

1048
00:46:31,730 --> 00:46:29,710
don't view it as privatization if it

1049
00:46:34,490 --> 00:46:31,740
works well somebody will make money

1050
00:46:37,800 --> 00:46:34,500
that's you know that's what they call

1051
00:46:40,859 --> 00:46:37,810
capitalism and that's why they call it

1052
00:46:43,170 --> 00:46:40,869
commercial and its commercial because

1053
00:46:45,630 --> 00:46:43,180
those entities put their own assets into

1054
00:46:47,310 --> 00:46:45,640
it with some investment on the part of

1055
00:46:50,040 --> 00:46:47,320
the United States and we've always done

1056
00:46:52,290 --> 00:46:50,050
it that way we don't do it quite as much

1057
00:46:54,570 --> 00:46:52,300
as other nations but we have always done

1058
00:46:56,670 --> 00:46:54,580
it that way we put some money up some

1059
00:46:58,230 --> 00:46:56,680
seed money and then they use that to

1060
00:47:00,210 --> 00:46:58,240
help with development and then they go

1061
00:47:03,270 --> 00:47:00,220
make money some of you how many of you

1062
00:47:05,730 --> 00:47:03,280
were in the stock market come on come on

1063
00:47:08,580 --> 00:47:05,740

I know and it's not doing as well as

1064
00:47:10,590 --> 00:47:08,590
you'd like probably but how many of you

1065
00:47:12,300 --> 00:47:10,600
are in stock market again how many of

1066
00:47:15,690 --> 00:47:12,310
you have stock in a company like Boeing

1067
00:47:19,230 --> 00:47:15,700
or Lockheed Martin or I don't think

1068
00:47:22,260 --> 00:47:19,240
SpaceX is public yet no but you know

1069
00:47:24,300 --> 00:47:22,270
when they provide transportation access

1070
00:47:26,490 --> 00:47:24,310
for us to go to space to the to the

1071
00:47:29,400 --> 00:47:26,500
International Space Station some of you

1072
00:47:33,270 --> 00:47:29,410
are going to make money and that's the

1073
00:47:36,420 --> 00:47:33,280
whole concept that's I am told by my

1074
00:47:40,230 --> 00:47:36,430
friends who are economist and all this

1075
00:47:44,160 --> 00:47:40,240
stuff that that's the engine of our you

1076
00:47:46,890 --> 00:47:44,170
know our society its commerce and it's

1077
00:47:49,080 --> 00:47:46,900
capitalism so don't forget that that's

1078
00:47:50,010 --> 00:47:49,090
what kind of separate sometimes we're

1079
00:47:53,130 --> 00:47:50,020
not as good as some of the other

1080
00:47:56,640 --> 00:47:53,140
countries it claimed it that's evil you

1081
00:47:58,740 --> 00:47:56,650
know but that's what we do so going back

1082
00:47:59,820 --> 00:47:58,750
to this feed speed vein what new

1083
00:48:02,220 --> 00:47:59,830
technologies are being studied for

1084
00:48:04,260 --> 00:48:02,230
faster space travel Oh what new

1085
00:48:10,380 --> 00:48:04,270
technologies are being studied we look

1086
00:48:12,870 --> 00:48:10,390
at things such as ion engines an area

1087
00:48:14,790 --> 00:48:12,880
that we the United States don't look at

1088
00:48:18,570 --> 00:48:14,800

right now because you all are averse to

1089
00:48:20,250 --> 00:48:18,580
it is nuclear propulsion almost every

1090
00:48:21,690 --> 00:48:20,260
one of our international partners is

1091
00:48:23,180 --> 00:48:21,700
interested in getting into nuclear

1092
00:48:26,940 --> 00:48:23,190
propulsion when we talk about

1093
00:48:28,410 --> 00:48:26,950
international cooperation I some of you

1094
00:48:30,270 --> 00:48:28,420
may have heard me speak or you may have

1095
00:48:32,010 --> 00:48:30,280
read something that I said we are going

1096
00:48:34,920 --> 00:48:32,020
to put our international partners in the

1097
00:48:37,230 --> 00:48:34,930
critical path what that means is as we

1098
00:48:38,550 --> 00:48:37,240
develop new systems we're going to look

1099
00:48:40,020 --> 00:48:38,560
at an international partner and we're

1100
00:48:41,700 --> 00:48:40,030
going to say what do you bring to the

1101
00:48:44,370 --> 00:48:41,710
party and they're going to say we want

1102
00:48:47,420 --> 00:48:44,380
to do a nuclear engine to go from low

1103
00:48:50,970 --> 00:48:47,430
Earth orbit to Mars and I'm going to say

1104
00:48:53,609 --> 00:48:50,980
we can't do that you know because right

1105
00:48:55,980 --> 00:48:53,619
now we just have chosen that we don't

1106
00:48:58,290 --> 00:48:55,990
want to do that in our nation if you can

1107
00:49:00,390 --> 00:48:58,300
do it then that's your contribution you

1108
00:49:03,260 --> 00:49:00,400
know you put up the money you develop it

1109
00:49:06,570 --> 00:49:03,270
and we'll use it so nuclear engines

1110
00:49:08,190 --> 00:49:06,580
plasma fusion I have a friend named for

1111
00:49:10,130 --> 00:49:08,200
dr. Franklin Chang do it

1112
00:49:12,359 --> 00:49:10,140
who has an engine called VASIMR engine

1113
00:49:14,819 --> 00:49:12,369

that's being developed both in Costa

1114
00:49:17,130 --> 00:49:14,829
Rica his home country and and down in

1115
00:49:19,410 --> 00:49:17,140
Houston Texas and it's a constantly

1116
00:49:22,230 --> 00:49:19,420
accelerating engine that theoretically

1117
00:49:24,780 --> 00:49:22,240
can get you to Mars and in a matter of a

1118
00:49:26,010 --> 00:49:24,790
few months not the eight months that we

1119
00:49:32,190 --> 00:49:26,020
talked about before so those are a

1120
00:49:33,510 --> 00:49:32,200
couple ok back to constellation what you

1121
00:49:35,730 --> 00:49:33,520
already hit on this a little bit but

1122
00:49:37,260 --> 00:49:35,740
what do you believe was lacking in

1123
00:49:39,569 --> 00:49:37,270
constellation holes or gaps that you

1124
00:49:42,150 --> 00:49:39,579
think might be fixed or changed in a

1125
00:49:44,010 --> 00:49:42,160
future program if i look at

1126
00:49:45,540 --> 00:49:44,020
constellation how many of you know what

1127
00:49:48,900 --> 00:49:45,550
constellation is have heard the term

1128
00:49:50,700 --> 00:49:48,910
before when when constellation came

1129
00:49:52,020 --> 00:49:50,710
about everybody know how it started a

1130
00:49:55,160 --> 00:49:52,030
part of the vision for Space Exploration

1131
00:49:57,990 --> 00:49:55,170
in the bush administration constellation

1132
00:50:00,150 --> 00:49:58,000
was an incredible concept the vision for

1133
00:50:02,579 --> 00:50:00,160
Space Exploration I think was really

1134
00:50:04,170 --> 00:50:02,589
good and it said we are going to go

1135
00:50:06,890 --> 00:50:04,180
beyond low-earth orbit we're going to

1136
00:50:09,480 --> 00:50:06,900
explore vast reaches of the universe

1137
00:50:11,160 --> 00:50:09,490
we're going to use and the system that

1138
00:50:13,980 --> 00:50:11,170

NASA chose to develop was call

1139
00:50:16,410 --> 00:50:13,990
constellation and as it started out it

1140
00:50:18,569 --> 00:50:16,420
was going to be two spacecraft for all

1141
00:50:20,309 --> 00:50:18,579
intents and purposes one stick like

1142
00:50:22,319 --> 00:50:20,319
Erie's one that was going to take us to

1143
00:50:23,880 --> 00:50:22,329
low Earth orbit to the International

1144
00:50:26,430 --> 00:50:23,890
Space Station into low-earth orbit where

1145
00:50:28,940 --> 00:50:26,440
we could then rendezvous with and get on

1146
00:50:31,319 --> 00:50:28,950
a vehicle that would take us to Mars

1147
00:50:34,079 --> 00:50:31,329
cargo and other things would be launched

1148
00:50:36,540 --> 00:50:34,089
on a big heavy lift launch vehicle that

1149
00:50:41,490 --> 00:50:36,550
would take the things like Rovers and

1150
00:50:43,890 --> 00:50:41,500
and other surface systems that we would

1151
00:50:47,490 --> 00:50:43,900
need to work at Mars through the years

1152
00:50:50,490 --> 00:50:47,500
from the inception of the the visions

1153
00:50:52,920 --> 00:50:50,500
for Space Exploration a strange thing

1154
00:50:55,980 --> 00:50:52,930
happened which is not unusual in our

1155
00:50:58,680 --> 00:50:55,990
country neither the Congress nor the

1156
00:51:03,240 --> 00:50:58,690
administration chose to fund it and so

1157
00:51:05,309 --> 00:51:03,250
each year we decided and and I you know

1158
00:51:06,720 --> 00:51:05,319
as a as a taxpayer someone who could

1159
00:51:09,300 --> 00:51:06,730
have talked to my congressman I'm just

1160
00:51:11,250 --> 00:51:09,310
as guilty because I watched as they said

1161
00:51:12,900 --> 00:51:11,260
okay we're we're not really going to

1162
00:51:15,240 --> 00:51:12,910
give you the money that you need to do

1163
00:51:17,700 --> 00:51:15,250

this and so each year NASA made the

1164
00:51:20,069 --> 00:51:17,710
conscious decision to okay will delay

1165
00:51:21,270 --> 00:51:20,079
this or will defer that and when I

1166
00:51:23,010 --> 00:51:21,280
became the NASA Administrator

1167
00:51:25,770 --> 00:51:23,020
traitor the vision for space exploration

1168
00:51:29,460 --> 00:51:25,780
and the constellation program was a

1169
00:51:34,260 --> 00:51:29,470
lunar focused program with no surface

1170
00:51:36,870 --> 00:51:34,270
systems struggling to get the the ira's

1171
00:51:40,470 --> 00:51:36,880
one rocket ready to take humans to

1172
00:51:44,010 --> 00:51:40,480
low-earth orbit with a crew vehicle that

1173
00:51:47,840 --> 00:51:44,020
used technologies from you know not

1174
00:51:50,250 --> 00:51:47,850
today but sometime ago and no vision no

1175
00:51:53,430 --> 00:51:50,260
possibility that we were going to reach

1176
00:51:56,070 --> 00:51:53,440
Mars or a neo or anything else other

1177
00:51:59,220 --> 00:51:56,080
than maybe the moon in in my lifetime

1178
00:52:01,410 --> 00:51:59,230
and then when we got to lunar orbit no

1179
00:52:03,000 --> 00:52:01,420
way to get to the surface because we we

1180
00:52:05,340 --> 00:52:03,010
had taken the money away from the

1181
00:52:07,320 --> 00:52:05,350
descent system we had taken all the

1182
00:52:09,240 --> 00:52:07,330
money away from the surface systems so

1183
00:52:10,530 --> 00:52:09,250
we would be able to orbit the moon but

1184
00:52:12,630 --> 00:52:10,540
we wouldn't be able to do anything when

1185
00:52:14,280 --> 00:52:12,640
we got there so you know my

1186
00:52:16,470 --> 00:52:14,290
conversations with the president it just

1187
00:52:18,870 --> 00:52:16,480
didn't seem like it was a smart thing to

1188
00:52:21,290 --> 00:52:18,880

continue to pursue to continue to hope

1189
00:52:23,310 --> 00:52:21,300
that we could make this thing work out

1190
00:52:25,950 --> 00:52:23,320
one of the things I think you will see

1191
00:52:27,810 --> 00:52:25,960
as we struggle to come to grips with the

1192
00:52:29,700 --> 00:52:27,820
budget for the coming year and the

1193
00:52:32,250 --> 00:52:29,710
succeeding years is that we're going to

1194
00:52:34,890 --> 00:52:32,260
have to make very difficult choices as

1195
00:52:36,990 --> 00:52:34,900
to just how do we phase the systems that

1196
00:52:38,640 --> 00:52:37,000
take us beyond low-earth orbit you can't

1197
00:52:40,380 --> 00:52:38,650
do everything at once so you'll decide

1198
00:52:42,900 --> 00:52:40,390
okay should we start working on a

1199
00:52:44,940 --> 00:52:42,910
heavy-lift launch vehicle first let the

1200
00:52:48,900 --> 00:52:44,950
technology come along that will make the

1201
00:52:52,230 --> 00:52:48,910
crew vehicle itself something new and

1202
00:52:54,330 --> 00:52:52,240
exciting do we do we begin to work on

1203
00:52:56,280 --> 00:52:54,340
the crew vehicle and stop part of the

1204
00:52:57,600 --> 00:52:56,290
way along then begin to work on the

1205
00:52:59,790 --> 00:52:57,610
heavy-lift launch vehicle so that when

1206
00:53:01,230 --> 00:52:59,800
both have reached the technological

1207
00:53:03,990 --> 00:53:01,240
maturity that we want we marry them

1208
00:53:06,000 --> 00:53:04,000
together and we boom go on off to Mars

1209
00:53:08,580 --> 00:53:06,010
and other places those are decisions

1210
00:53:10,830 --> 00:53:08,590
that we agonize over right now and and

1211
00:53:12,690 --> 00:53:10,840
the harem it's frustrating to people

1212
00:53:14,160 --> 00:53:12,700
sometimes but we really have got to find

1213
00:53:17,370 --> 00:53:14,170

new and innovative ways to do the things

1214
00:53:20,190 --> 00:53:17,380
we want to do and that's to people who

1215
00:53:22,470 --> 00:53:20,200
like to go do it now we're not doing it

1216
00:53:24,480 --> 00:53:22,480
now we're trying to do it right and

1217
00:53:26,760 --> 00:53:24,490
we're trying to do it so that I tell

1218
00:53:28,650 --> 00:53:26,770
people it's got to be three things it's

1219
00:53:31,500 --> 00:53:28,660
got to be affordable which means i get a

1220
00:53:33,210 --> 00:53:31,510
19 billion dollar budget and i have

1221
00:53:34,170 --> 00:53:33,220
promised people that i am not going to

1222
00:53:35,790 --> 00:53:34,180
touch science

1223
00:53:38,430 --> 00:53:35,800
i am not going to touch money for

1224
00:53:40,290 --> 00:53:38,440
aeronautics i'm going to find money for

1225
00:53:42,660 --> 00:53:40,300
technological technology development

1226
00:53:43,680 --> 00:53:42,670
education and then whatever is left over

1227
00:53:46,080 --> 00:53:43,690
is what we're going to use for

1228
00:53:47,910 --> 00:53:46,090
exploration and then we still gotta

1229
00:53:50,250 --> 00:53:47,920
carve out some to sustain the

1230
00:53:53,310 --> 00:53:50,260
International Space Station through 2020

1231
00:53:54,690 --> 00:53:53,320
or so so it's got to be affordable it's

1232
00:53:57,210 --> 00:53:54,700
got to be sustainable what does that

1233
00:53:59,600 --> 00:53:57,220
mean it has to survive over multiple

1234
00:54:03,090 --> 00:53:59,610
administration's and multiple Congress's

1235
00:54:04,860 --> 00:54:03,100
or else why started there are several

1236
00:54:06,390 --> 00:54:04,870
ways that I think you do that the

1237
00:54:08,610 --> 00:54:06,400
International Space Station is perhaps

1238
00:54:10,410 --> 00:54:08,620

the best example of how you make

1239
00:54:13,590 --> 00:54:10,420
something sustainable you put

1240
00:54:16,680 --> 00:54:13,600
internationals into the critical path so

1241
00:54:18,690 --> 00:54:16,690
that it is no longer yours and you can't

1242
00:54:21,210 --> 00:54:18,700
just unilaterally decide that okay it's

1243
00:54:24,450 --> 00:54:21,220
gone when the Augustine committee first

1244
00:54:26,490 --> 00:54:24,460
met they said that they were unanimous

1245
00:54:27,840 --> 00:54:26,500
in their opinion that we should

1246
00:54:30,150 --> 00:54:27,850
terminate the International Space

1247
00:54:31,800 --> 00:54:30,160
Station in 2016 and then the

1248
00:54:34,050 --> 00:54:31,810
international partner started coming in

1249
00:54:36,720 --> 00:54:34,060
one by one and they all insisted that

1250
00:54:40,470 --> 00:54:36,730
you cannot do that that we have put ten

1251
00:54:43,650 --> 00:54:40,480
years worth of treasure and sweat and

1252
00:54:45,810 --> 00:54:43,660
everything into developing the system we

1253
00:54:47,820 --> 00:54:45,820
now are ready to start doing science and

1254
00:54:49,470 --> 00:54:47,830
you just cannot let it go and it was the

1255
00:54:51,570 --> 00:54:49,480
international partners that convinced

1256
00:54:53,070 --> 00:54:51,580
the Augustine committee to recommend to

1257
00:54:56,040 --> 00:54:53,080
the president the president then in

1258
00:54:59,370 --> 00:54:56,050
Congress to say okay we're good with

1259
00:55:00,720 --> 00:54:59,380
that let's let's let's us agree to

1260
00:55:02,790 --> 00:55:00,730
extend the life of the International

1261
00:55:03,840 --> 00:55:02,800
Space Station to at least twenty twenty

1262
00:55:05,760 --> 00:55:03,850
and we're in the process now of

1263
00:55:08,070 --> 00:55:05,770

certifying it so that we can fly it to

1264
00:55:10,080 --> 00:55:08,080
20 28 should the should the member

1265
00:55:11,700 --> 00:55:10,090
nations decide but it's not a unilateral

1266
00:55:14,580 --> 00:55:11,710
decision on the part of the United

1267
00:55:18,140 --> 00:55:14,590
States we have five partners the United

1268
00:55:22,700 --> 00:55:18,150
States the European Space Agency Japan

1269
00:55:27,600 --> 00:55:22,710
Canada and who did I forget Russia Oh

1270
00:55:32,160 --> 00:55:27,610
Russia holy Jim moly how could i forget

1271
00:55:34,230 --> 00:55:32,170
Russia but every single partner has to

1272
00:55:35,490 --> 00:55:34,240
say we're on board Russia has said

1273
00:55:37,410 --> 00:55:35,500
they're on board we were just notified

1274
00:55:39,600 --> 00:55:37,420
by the Japanese last week that they're

1275
00:55:40,950 --> 00:55:39,610
on board the United States is on board

1276
00:55:42,600 --> 00:55:40,960
so we're waiting for the European Space

1277
00:55:45,390 --> 00:55:42,610
Agency but they assure us that they're

1278
00:55:47,910 --> 00:55:45,400
coming and Canada has to say that so I

1279
00:55:50,039 --> 00:55:47,920
think that's critical to the

1280
00:55:53,400 --> 00:55:50,049
the sustainment part and then the final

1281
00:55:55,980 --> 00:55:53,410
thing is it has to be realistic you know

1282
00:55:58,650 --> 00:55:55,990
it has to be obtainable it cannot be a

1283
00:56:00,990 --> 00:55:58,660
pipe dream we have this nation has lived

1284
00:56:04,799 --> 00:56:01,000
with pipe dreams for far too long when I

1285
00:56:06,599 --> 00:56:04,809
came to NASA in 1980 I never dreamed of

1286
00:56:08,099 --> 00:56:06,609
being an astronaut I'll admit that I'd

1287
00:56:11,430 --> 00:56:08,109
never dreamed of being an astronaut I

1288
00:56:12,750 --> 00:56:11,440

kind of stumbled in through it but when

1289
00:56:13,920 --> 00:56:12,760
I finally came to be an astronaut I

1290
00:56:15,630 --> 00:56:13,930
thought I would fly on the shuttle a

1291
00:56:17,339 --> 00:56:15,640
couple of times and then I'd be off

1292
00:56:18,960 --> 00:56:17,349
training to go to the moon and i would i

1293
00:56:21,420 --> 00:56:18,970
would be among the first Americans to

1294
00:56:22,740 --> 00:56:21,430
return to the surface of the Moon not

1295
00:56:25,200 --> 00:56:22,750
visit there a couple of times and then

1296
00:56:27,599 --> 00:56:25,210
going to Mars I really thought that I

1297
00:56:30,329 --> 00:56:27,609
honestly did and i think we probably

1298
00:56:33,329 --> 00:56:30,339
would have been well on the way had we

1299
00:56:34,680 --> 00:56:33,339
not lost challenger in 1986 there some

1300
00:56:37,410 --> 00:56:34,690
of you who are old enough to remember

1301
00:56:39,569 --> 00:56:37,420
that it was traumatic for the nation

1302
00:56:42,030 --> 00:56:39,579
traumatic for the world and it just kind

1303
00:56:44,910 --> 00:56:42,040
of stopped us in our tracks for a couple

1304
00:56:46,950 --> 00:56:44,920
of decades to be quite honest so it's

1305
00:56:49,170 --> 00:56:46,960
got to be something that is realistic in

1306
00:56:51,329 --> 00:56:49,180
those three things are critical and I

1307
00:56:54,599 --> 00:56:51,339
think we're going to do that I apologize

1308
00:56:55,620 --> 00:56:54,609
for the long answer how will nasty use

1309
00:56:59,309 --> 00:56:55,630
technology to help the environment

1310
00:57:01,829 --> 00:56:59,319
especially with the BP oil spill um you

1311
00:57:03,210 --> 00:57:01,839
use it how do we use technology to help

1312
00:57:05,579 --> 00:57:03,220
the environment we have something called

1313
00:57:08,069 --> 00:57:05,589

the a train well you may have to help me

1314
00:57:11,579 --> 00:57:08,079
explain this the a train not a train

1315
00:57:14,370 --> 00:57:11,589
really but it's a series of six

1316
00:57:17,609 --> 00:57:14,380
satellites now right it's not important

1317
00:57:19,620 --> 00:57:17,619
how many I didn't want to put I didn't

1318
00:57:21,510 --> 00:57:19,630
want to put dr. Diaz on the spot you

1319
00:57:23,880 --> 00:57:21,520
know five or six but they're

1320
00:57:25,289 --> 00:57:23,890
earth-orbiting satellites that are we

1321
00:57:27,059 --> 00:57:25,299
call it the a train because they're in

1322
00:57:29,579 --> 00:57:27,069
the st. relatively the same orbit and

1323
00:57:32,730 --> 00:57:29,589
they go around our 16 times every normal

1324
00:57:35,490 --> 00:57:32,740
earth day and so they get three looks at

1325
00:57:37,470 --> 00:57:35,500
every piece of Earth as they travel one

1326
00:57:40,980 --> 00:57:37,480
straight down one from here and one from

1327
00:57:43,020 --> 00:57:40,990
here as their orbit precesses yeah

1328
00:57:46,770 --> 00:57:43,030
you're still counting huh yeah I think

1329
00:57:49,829 --> 00:57:46,780
it's six but but the instruments aboard

1330
00:57:53,039 --> 00:57:49,839
the satellites in the a train when the

1331
00:57:55,260 --> 00:57:53,049
earth earthquake struck haiti instantly

1332
00:57:58,680 --> 00:57:55,270
we had images coming to the ground going

1333
00:58:00,720 --> 00:57:58,690
to the rescue workers in haiti that very

1334
00:58:02,340 --> 00:58:00,730
first day we image

1335
00:58:04,290 --> 00:58:02,350
three landslides west of port-au-prince

1336
00:58:07,500 --> 00:58:04,300
that it probably would have been weeks

1337
00:58:09,390 --> 00:58:07,510
if not months for people to discover you

1338
00:58:11,130 --> 00:58:09,400

know we're there probably with people

1339
00:58:14,880 --> 00:58:11,140
buried beneath it so we were able to get

1340
00:58:18,300 --> 00:58:14,890
that down real time with the Gulf oil

1341
00:58:20,010 --> 00:58:18,310
spill instantly we had imagery coming

1342
00:58:22,590 --> 00:58:20,020
down from several of the satellites in

1343
00:58:24,840 --> 00:58:22,600
the a train that characterized the oil

1344
00:58:28,160 --> 00:58:24,850
spill said okay this is how big it is

1345
00:58:31,200 --> 00:58:28,170
it's moving this way or it's not moving

1346
00:58:32,880 --> 00:58:31,210
you know the one thing that we can't do

1347
00:58:34,890 --> 00:58:32,890
because we just don't have the ability

1348
00:58:37,800 --> 00:58:34,900
to look beneath the surface of the water

1349
00:58:40,710 --> 00:58:37,810
from space just yet not controlling

1350
00:58:42,870 --> 00:58:40,720
controlled any way we could not tell the

1351
00:58:44,640 --> 00:58:42,880
depth of the spill that would have been

1352
00:58:46,740 --> 00:58:44,650
the missing piece if we people who

1353
00:58:47,850 --> 00:58:46,750
talked about the plume underwater it

1354
00:58:49,620 --> 00:58:47,860
would have been great if we had an

1355
00:58:51,990 --> 00:58:49,630
instrument that could do that but but we

1356
00:58:54,870 --> 00:58:52,000
just don't but that's NASA technology

1357
00:58:57,090 --> 00:58:54,880
it's it's NASA NOAA Department of

1358
00:58:59,580 --> 00:58:57,100
Defense it's the US government's

1359
00:59:01,830 --> 00:58:59,590
technology from space earth imaging

1360
00:59:04,070 --> 00:59:01,840
technology that allow us to do things

1361
00:59:09,750 --> 00:59:04,080
like help with the Gulf oil spill

1362
00:59:14,280 --> 00:59:09,760
hurricane help me here no no they just

1363
00:59:17,970 --> 00:59:14,290

went zipping up the East Coast Earl we

1364
00:59:21,630 --> 00:59:17,980
sent for the first time ever NASA sent

1365
00:59:24,540 --> 00:59:21,640
two aircraft into Earl one was actually

1366
00:59:28,190 --> 00:59:24,550
over Earl it was a an unmanned an

1367
00:59:30,450 --> 00:59:28,200
unmanned aerial system a global hawk

1368
00:59:33,540 --> 00:59:30,460
that had a number of instruments on

1369
00:59:35,580 --> 00:59:33,550
board that imaged Earl from above ahead

1370
00:59:38,610 --> 00:59:35,590
of dc-8 for all intents and purposes

1371
00:59:41,030 --> 00:59:38,620
that went through the eye wall several

1372
00:59:44,010 --> 00:59:41,040
pairs passes in and out of the hurricane

1373
00:59:45,930 --> 00:59:44,020
getting data to pass to the National

1374
00:59:48,990 --> 00:59:45,940
Weather Service the National Hurricane

1375
00:59:51,510 --> 00:59:49,000
Center and all that kind of stuff giving

1376
00:59:53,250 --> 00:59:51,520
them real-time data so we knew how what

1377
00:59:55,440 --> 00:59:53,260
track Earl was most likely going to

1378
00:59:57,870 --> 00:59:55,450
follow and I mean it was incredibly

1379
01:00:00,990 --> 00:59:57,880
accurate the forecast and it's because

1380
01:00:03,720 --> 01:00:01,000
we now NASA assets can go inside

1381
01:00:06,030 --> 01:00:03,730
hurricanes can go above hurricanes and

1382
01:00:07,650 --> 01:00:06,040
can help provide real-time data to

1383
01:00:09,540 --> 01:00:07,660
scientists who can make predictions and

1384
01:00:12,420 --> 01:00:09,550
forecasts in life so just a couple of a

1385
01:00:14,010 --> 01:00:12,430
couple of examples okay now that we're

1386
01:00:15,600 --> 01:00:14,020
nearing the completion

1387
01:00:17,610 --> 01:00:15,610
in of the assembly phase of space

1388
01:00:19,650 --> 01:00:17,620

station what do we hope to gain with the

1389
01:00:20,820 --> 01:00:19,660
next 10 plus years of science and

1390
01:00:22,250 --> 01:00:20,830
research on Space Station what do we

1391
01:00:24,270 --> 01:00:22,260
hope to gain with the next 10 plus years

1392
01:00:28,650 --> 01:00:24,280
one of the first things that we're

1393
01:00:31,230 --> 01:00:28,660
hoping to do is privatized is not the

1394
01:00:32,160 --> 01:00:31,240
right word we want to establish how many

1395
01:00:33,960 --> 01:00:32,170
of you are familiar with the Hubble

1396
01:00:36,360 --> 01:00:33,970
Space Telescope and the Space Telescope

1397
01:00:39,060 --> 01:00:36,370
Science Institute it on the campus of

1398
01:00:40,800 --> 01:00:39,070
Johns Hopkins NASA does not control the

1399
01:00:42,990 --> 01:00:40,810
Hubble Space Telescope you know we took

1400
01:00:44,700 --> 01:00:43,000
it to orbit and after checkout and

1401
01:00:45,780 --> 01:00:44,710
everything we handed it off to the to

1402
01:00:48,360 --> 01:00:45,790
the Hubble Space Telescope Science

1403
01:00:49,460 --> 01:00:48,370
Institute which is a non-government I

1404
01:00:52,020 --> 01:00:49,470
think it's non-governmental

1405
01:00:54,360 --> 01:00:52,030
non-governmental organization and they

1406
01:00:57,360 --> 01:00:54,370
they get requests for time on Hubble

1407
01:00:59,400 --> 01:00:57,370
they schedule it they give it to people

1408
01:01:01,470 --> 01:00:59,410
we want to do the same thing with the

1409
01:01:03,390 --> 01:01:01,480
International Space Station we want to

1410
01:01:05,670 --> 01:01:03,400
we want to stand up a non-governmental

1411
01:01:07,500 --> 01:01:05,680
organization that will conduct peer

1412
01:01:08,490 --> 01:01:07,510
reviews of experiments that people say

1413
01:01:10,500 --> 01:01:08,500

they want to fly aboard the

1414
01:01:13,410 --> 01:01:10,510
International Space Station we want to

1415
01:01:15,240 --> 01:01:13,420
ensure that we have good science we have

1416
01:01:17,340 --> 01:01:15,250
established a relatively good track

1417
01:01:19,560 --> 01:01:17,350
record of putting good science on ISS

1418
01:01:21,240 --> 01:01:19,570
and we want to enhance that we want to

1419
01:01:23,310 --> 01:01:21,250
make it even better we have a lot of

1420
01:01:24,870 --> 01:01:23,320
underutilized capability on the

1421
01:01:27,000 --> 01:01:24,880
international space station so we need

1422
01:01:29,460 --> 01:01:27,010
commercial entities universities

1423
01:01:31,980 --> 01:01:29,470
international partners other government

1424
01:01:33,900 --> 01:01:31,990
agencies we need to get them to utilize

1425
01:01:36,450 --> 01:01:33,910
what we the capabilities that we have on

1426
01:01:38,190 --> 01:01:36,460
station so we really believe that over

1427
01:01:39,960 --> 01:01:38,200
the next 10 years you're going to see

1428
01:01:41,790 --> 01:01:39,970
incredible scientific advantages and

1429
01:01:43,680 --> 01:01:41,800
advancements come from the International

1430
01:01:46,260 --> 01:01:43,690
Space Station I mentioned salmonella you

1431
01:01:51,500 --> 01:01:46,270
know Salmonella like the virus the bad

1432
01:01:57,230 --> 01:01:51,510
stuff bacteria serendipitously big word

1433
01:02:01,550 --> 01:01:57,240
okay by accident we were studying

1434
01:02:05,790 --> 01:02:01,560
bacteria and trying to find what effect

1435
01:02:10,050 --> 01:02:05,800
microgravity had on on various forms of

1436
01:02:13,140 --> 01:02:10,060
bacteria we found that in most cases it

1437
01:02:16,230 --> 01:02:13,150
is not good because they just explode

1438
01:02:18,090 --> 01:02:16,240

and in one of those experiments we went

1439
01:02:19,410 --> 01:02:18,100
in and what we the researchers went in

1440
01:02:22,530 --> 01:02:19,420
and they found that they could actually

1441
01:02:24,180 --> 01:02:22,540
separate out some of the some of the

1442
01:02:26,120 --> 01:02:24,190
bacteria that were related to the

1443
01:02:28,039 --> 01:02:26,130
Salmonella disease

1444
01:02:31,249 --> 01:02:28,049
and we now they have developed a

1445
01:02:33,470 --> 01:02:31,259
potential vaccine against salmonella so

1446
01:02:36,380 --> 01:02:33,480
those kinds of things in terms of

1447
01:02:40,069 --> 01:02:36,390
medical research biomedical research I

1448
01:02:42,559 --> 01:02:40,079
was talking with some of your staff and

1449
01:02:45,170 --> 01:02:42,569
students here today about some of the

1450
01:02:46,999 --> 01:02:45,180
experiments that you all are doing and

1451
01:02:51,769 --> 01:02:47,009
somebody yell it out because I will get

1452
01:02:54,490 --> 01:02:51,779
it wrong but it's it's biological help

1453
01:02:57,339 --> 01:02:54,500
me remember we were talking about

1454
01:03:02,650 --> 01:02:57,349
measuring the effects of gravity on on

1455
01:03:06,259 --> 01:03:02,660
biosystems on cellular stuff taio

1456
01:03:07,880 --> 01:03:06,269
biomems technology going back to

1457
01:03:10,549 --> 01:03:07,890
radiation I asked the question I said

1458
01:03:12,289 --> 01:03:10,559
okay if you if gravity if you can

1459
01:03:15,380 --> 01:03:12,299
measure the effect that gravity has on

1460
01:03:17,690 --> 01:03:15,390
the cells in the body and functions and

1461
01:03:20,269 --> 01:03:17,700
the human body can we do that with

1462
01:03:22,700 --> 01:03:20,279
radiation because if i can find

1463
01:03:25,640 --> 01:03:22,710

alternative ways to actually doing

1464
01:03:27,950 --> 01:03:25,650
animal tests or things like that it

1465
01:03:30,980 --> 01:03:27,960
makes my life much easier to put it

1466
01:03:33,950 --> 01:03:30,990
mildly so things that you're doing here

1467
01:03:36,740 --> 01:03:33,960
at Purdue have direct application to

1468
01:03:39,349 --> 01:03:36,750
what we need to find out to advance our

1469
01:03:41,180 --> 01:03:39,359
ability to go into deep space whether

1470
01:03:44,660 --> 01:03:41,190
it's biomedical engineering biomedical

1471
01:03:46,069 --> 01:03:44,670
science physics propulsion you name it

1472
01:03:49,279 --> 01:03:46,079
you're doing some incredible stuff here

1473
01:03:51,529 --> 01:03:49,289
it's really exciting well thank you for

1474
01:03:52,880 --> 01:03:51,539
your time we really appreciate you being

1475
01:03:53,930 --> 01:03:52,890
willing to do a question answer so if we

1476
01:04:10,320 --> 01:03:53,940
could have one more round of applause

1477
01:04:14,750 --> 01:04:12,680
out

1478
01:04:16,730 --> 01:04:14,760
I'll leave but I'll say two things I

1479
01:04:18,589 --> 01:04:16,740
really do want to thank thank you

1480
01:04:21,319 --> 01:04:18,599
president Cordova for for the

1481
01:04:23,870 --> 01:04:21,329
hospitality today it's been a hectic day

1482
01:04:26,059 --> 01:04:23,880
for us who came in from Houston from

1483
01:04:28,520 --> 01:04:26,069
Houston from Washington see what a

1484
01:04:31,400 --> 01:04:28,530
hectic day has been but it's been an

1485
01:04:33,290 --> 01:04:31,410
incredible insightful and inspirational

1486
01:04:36,470 --> 01:04:33,300
day for us to have an opportunity to

1487
01:04:38,450 --> 01:04:36,480
meet the students the faculty the kids

1488
01:04:41,390 --> 01:04:38,460

that you all reach from the local

1489
01:04:43,130 --> 01:04:41,400
schools through the first program and

1490
01:04:46,460 --> 01:04:43,140
and what I would tell you is what my mom

1491
01:04:48,589 --> 01:04:46,470
and dad told me study really hard while

1492
01:04:50,630 --> 01:04:48,599
you're here you know really put yourself

1493
01:04:53,480 --> 01:04:50,640
into what you're doing you have an

1494
01:04:55,280 --> 01:04:53,490
incredible opportunity at one of the

1495
01:04:58,069 --> 01:04:55,290
world's foremost universities so take

1496
01:05:01,309 --> 01:04:58,079
advantage of it enjoy yourselves while

1497
01:05:04,609 --> 01:05:01,319
you're here because you're also at one

1498
01:05:06,349 --> 01:05:04,619
of the best universities to party I know

1499
01:05:09,730 --> 01:05:06,359
the president probably doesn't like that

1500
01:05:12,559 --> 01:05:09,740
but I you know it's all right and and

1501
01:05:14,930 --> 01:05:12,569
then finally as I said before don't be

1502
01:05:17,750 --> 01:05:14,940
afraid of failure set goals for

1503
01:05:20,780 --> 01:05:17,760
yourselves believe in yourselves and

1504
01:05:22,250 --> 01:05:20,790
just go do what you know you can do so

1505
01:05:37,840 --> 01:05:22,260
how I'll leave you with that thank you

1506
01:05:41,990 --> 01:05:40,460
again I get your Boden left the stage

1507
01:05:44,210 --> 01:05:42,000
but again again want to thank general

1508
01:05:45,950 --> 01:05:44,220
Bowden for sharing his vision his plan

1509
01:05:47,450 --> 01:05:45,960
for NASA and also his wonderful advice

1510
01:05:49,760 --> 01:05:47,460
and answer all the questions from the

1511
01:05:51,470 --> 01:05:49,770
audience but to this audience I thank

1512
01:05:52,970 --> 01:05:51,480
you so much for participating and wish