



1

00:00:08,040 --> 00:00:11,780

>>> I GUARANTEE YOU THAT AT SOME
POINT, EVERYTHING IS GOING TO GO

2

00:00:11,780 --> 00:00:13,040

SOUTH ON YOU.

3

00:00:13,040 --> 00:00:17,450

YOU'RE GOING TO SAY THIS IS IT.

4

00:00:17,450 --> 00:00:22,109

THIS IS HOW I END.

5

00:00:22,109 --> 00:00:24,390

>> MORTON'S DEAD.

6

00:00:24,390 --> 00:00:28,950

>> WE HAVE TO GO.

7

00:00:28,950 --> 00:00:35,090

NOW YOU CAN EITHER ACCEPT THAT
OR YOU CAN GET TO WORK.

8

00:00:35,090 --> 00:00:38,590

THIS WILL COME AS QUITE A SHOCK
TO MY CREW MATES.

9

00:00:38,590 --> 00:00:41,010

AND TO NASA.

10

00:00:41,010 --> 00:00:48,270

AND TO THE ENTIRE WORLD, BUT I'M
STILL ALIVE.

11

00:00:48,270 --> 00:00:49,270

SURPRISE.

12

00:00:49,270 --> 00:00:51,490

HERE'S THE RUB.

13

00:00:51,490 --> 00:00:55,510
IT WILL BE FOUR YEARS FOR
ANOTHER MISSION TO REACH ME.

14

00:00:55,510 --> 00:01:00,140
AND I'M GOING TO HAVE TO HAVE
DESIGNED THE LAST 31 DAYS.

15

00:01:00,140 --> 00:01:03,960
SO I HAVE TO MAKE WATER AND GROW
FOOD ON A PLANET WHERE NOTHING

16

00:01:03,960 --> 00:01:04,960
GROWS.

17

00:01:04,960 --> 00:01:07,090
BUT IF I CAN FIGURE OUT A WAY TO
MAKE CONTACT WITH NASA, THEN

18

00:01:07,090 --> 00:01:09,979
NONE OF THIS MATTERS ANYWAY.

19

00:01:09,979 --> 00:01:11,630
>> INCOMING MESSAGE.

20

00:01:11,630 --> 00:01:17,799
>> MARK WATNEY IS STILL ALIVE.

21

00:01:17,799 --> 00:01:22,560
>> IN YOUR FACE, NEIL ARMSTRONG.

22

00:01:22,560 --> 00:01:23,560
>> SO LET'S DO THE MATH.

23

00:01:23,560 --> 00:01:25,540
I HAVE ENOUGH FOOD TO LAST FOR
50 DAYS.

24

00:01:25,540 --> 00:01:29,049

>> HE'S GOING TO STARVE TO DEATH.

25

00:01:29,049 --> 00:01:33,970

>> SO I HAVE TO [BLEEP] THE SCIENCE.

26

00:01:33,970 --> 00:01:36,070

>> HE'S 50 MILES AWAY FROM HOME.

27

00:01:36,070 --> 00:01:37,119

HE'S TOTALLY ALONE.

28

00:01:37,119 --> 00:01:40,970

>> I'M THE GREATEST BOTANIST ON THIS PLANET.

29

00:01:40,970 --> 00:01:44,030

>> BUT WE NEED THE HERMES CREW.

30

00:01:44,030 --> 00:01:47,830

>> WE HAVE A HIGH CHANCE OF KILLING ONE OR SIX.

31

00:01:47,830 --> 00:01:49,900

>> I'M NOT RISKING OUR LIVES.

32

00:01:49,900 --> 00:01:50,900

IT'S BIGGER THAN ONE PERSON.

33

00:01:50,900 --> 00:01:51,900

>> NO.

34

00:01:51,900 --> 00:01:52,900

IT'S NOT.

35

00:01:52,900 --> 00:01:53,900
>> NASA REJECTED THE MISSION.

36
00:01:53,900 --> 00:01:56,240
>> IF WE DO THIS --
>> WE'RE TALKING MUTINY.

37
00:01:56,240 --> 00:01:59,560
ANYTHING GOES WRONG WE DIE.

38
00:01:59,560 --> 00:02:00,560
>> DO YOU REALIZE HOW CRAZY THIS
IS?

39
00:02:00,560 --> 00:02:01,560
>> WE HAVE NO OTHER OPTIONS.

40
00:02:01,560 --> 00:02:02,560
>> NO MATTER WHAT HAPPENS, TELL
THE WORLD, TELL MY FAMILY THAT I

41
00:02:02,560 --> 00:02:42,310
NEVER STOPPED FIGHTING TO MAKE
IT HOME.

42
00:02:42,310 --> 00:02:49,379
[APPLAUSE]
>> I'M SITTING HERE POUNDING ON

43
00:02:49,379 --> 00:02:51,219
THE PODIUM SO THAT'S WHAT YOU
HEAR.

44
00:02:51,219 --> 00:02:54,629
IT'S NOT A BAND IN THE
BACKGROUND.

45
00:02:54,629 --> 00:02:57,269
IT'S AN INCREDIBLE PLEASURE FOR
ME TO BE HERE.

46

00:02:57,269 --> 00:02:58,870

AND TO GREET ALL OF YOU.

47

00:02:58,870 --> 00:03:02,420

AND I HOPE -- HOPEFULLY, YOU ALL
FEEL THE EXCITEMENT ABOUT NASA'S

48

00:03:02,420 --> 00:03:03,859

JOURNEY TO MARS LIKE I DO.

49

00:03:03,859 --> 00:03:09,099

I WANT TO THANK ANDY WEIR FOR
THE STORY OF "THE MARTIAN" THAT

50

00:03:09,099 --> 00:03:12,739

STARTED ALL THIS STUFF AND HIS
DEDICATION TO GETTING IT RIGHT.

51

00:03:12,739 --> 00:03:17,060

IT TO THANK OUR FRIENDS AT 21st
CENTURY FOX FOR ALSO WANTING TO

52

00:03:17,060 --> 00:03:23,829

GET IT RIGHT AND FOR RECOGNIZING
WHAT THE GREAT OPPORTUNITY WE

53

00:03:23,829 --> 00:03:27,870

HAVE WITH THE OPENING OF THIS
FILM TO TALK ABOUT OUR REAL LIVE

54

00:03:27,870 --> 00:03:30,560

JOURNEY TO MARS UNFOLDING RIGHT
NOW.

55

00:03:30,560 --> 00:03:31,560

TODAY.

56

00:03:31,560 --> 00:03:35,069

IN SO MANY PLACES AND SO MANY
WAYS ACROSS NASA.

57

00:03:35,069 --> 00:03:37,169
IT'S IMPORTANT FOR THE PEOPLE OF
THIS COUNTRY AND AROUND THE

58

00:03:37,169 --> 00:03:40,469
WORLD TO FEEL THAT INSPIRATION
AND JOIN US ON THIS JOURNEY.

59

00:03:40,469 --> 00:03:44,790
LET ME -- I OWE YOU ALL AN
EXPLANATION FOR MY ENTHUSIASM

60

00:03:44,790 --> 00:03:48,819
AND I'M NOT SURE HOW MANY OF YOU
UNDERSTAND WHY I'M SO ENTHUSED.

61

00:03:48,819 --> 00:03:55,829
35 YEARS 2.5 MONTHS AGO, I'LL
LET YOU DO THE CALCULATION

62

00:03:55,829 --> 00:03:58,930
BECAUSE SOME OF YOU WEREN'T
BORN.

63

00:03:58,930 --> 00:04:04,209
THAT WAS JULY 1, 1980.

64

00:04:04,209 --> 00:04:08,859
I DROVE -- I CHECKED IN TO THE
JOHNSON SPACE CENTER AT HOUSTON,

65

00:04:08,859 --> 00:04:11,729
TEXAS, TO BECOME AN ASTRONAUT.

66

00:04:11,729 --> 00:04:14,200
AND I WAS GOING TO BE MATT
DAMON.

67

00:04:14,200 --> 00:04:17,760

NOT STRANDED ON MARS, BUT THE
FIRST MARTIAN.

68

00:04:17,760 --> 00:04:22,090

AND SO FOR ME IT'S REALLY
EXCITING TO SEE, YOU KNOW, US

69

00:04:22,090 --> 00:04:23,639

CONTINUE WITH THIS JOURNEY.

70

00:04:23,639 --> 00:04:28,510

BACK THEN, WE WERE 30 YEARS AWAY
FROM GOING TO MARS AND I TELL

71

00:04:28,510 --> 00:04:31,500

PEOPLE THAT WE'RE CLOSER THAN
EVER BEFORE IN MY MIND TO

72

00:04:31,500 --> 00:04:36,050

GETTING TO MARS BECAUSE WE ARE
NOW MUCH CLOSER THAN 30 YEARS.

73

00:04:36,050 --> 00:04:37,490

I TRULY BELIEVE.

74

00:04:37,490 --> 00:04:40,710

SO THAT'S WHAT WE WANT TO TALK A
LITTLE BIT ABOUT TODAY, BECAUSE

75

00:04:40,710 --> 00:04:42,260

WE WANT TO TALK ABOUT REAL
MARTIANS.

76

00:04:42,260 --> 00:04:45,760

WE WANT TO TALK ABOUT THE
CHALLENGES THAT WE HAVE, YOU

77

00:04:45,760 --> 00:04:48,680
KNOW, HOW WE PLAN TO DO THIS
KIND OF THING.

78
00:04:48,680 --> 00:04:51,050
AND IT'S REALLY, REALLY
IMPORTANT FOR ALL OF US IN THIS

79
00:04:51,050 --> 00:04:55,220
AUDITORIUM, LOOKING IN TO
EXPLAIN TO THE AMERICAN PUBLIC,

80
00:04:55,220 --> 00:05:01,030
ONE, WHY IT'S IMPORTANT, WHY WE
THINK IT'S DOABLE AND -- BUT

81
00:05:01,030 --> 00:05:03,440
HELP THEM UNDERSTAND THE
CHALLENGES OF WHAT WE'RE ABOUT,

82
00:05:03,440 --> 00:05:05,580
BECAUSE IT'S NOT AN EASY TASK.

83
00:05:05,580 --> 00:05:10,490
THIS AMBITIOUS GOAL WILL
TRANSFORM TECHNOLOGY AND IT WILL

84
00:05:10,490 --> 00:05:11,660
DEFINE OUR GENERATION.

85
00:05:11,660 --> 00:05:16,920
EACH OF YOU AND THAT MEANS EVERY
SINGLE -- WHAT'S YOUR NAME BACK

86
00:05:16,920 --> 00:05:18,050
THERE?

87
00:05:18,050 --> 00:05:20,310
YOUNG MAN.

88

00:05:20,310 --> 00:05:24,060

THERE'S ONLY ONE LITTLE KID THAT
I CAN SEE IN HERE.

89

00:05:24,060 --> 00:05:28,320

WHAT'S YOUR NAME?

90

00:05:28,320 --> 00:05:32,350

HUH?

91

00:05:32,350 --> 00:05:35,000

IS IT -- COME UP HERE FOR A
MINUTE.

92

00:05:35,000 --> 00:05:36,200

ALL RIGHT.

93

00:05:36,200 --> 00:05:39,030

YOU JUST BROKE MY TRAIN OF
THOUGHT AND MY SCRIPT.

94

00:05:39,030 --> 00:05:40,890

COME UP HERE FOR A MINUTE.

95

00:05:40,890 --> 00:05:42,870

ARE THERE TWO?

96

00:05:46,430 --> 00:05:44,190

BRING BOTH.

97

00:05:46,430 --> 00:05:52,770

QUICKLY, QUICKLY, QUICKLY.

98

00:05:52,770 --> 00:05:53,770

I KNOW I'M MESSING UP -- OKAY.

99

00:05:53,770 --> 00:05:54,770

I'LL GET US BACK, ALL RIGHT.

100

00:05:54,770 --> 00:05:57,110

HANG WITH ME.

101

00:05:57,110 --> 00:05:58,110

COME ON UP.

102

00:05:58,110 --> 00:05:59,280

WHERE, IS IT YOUR BROTHER?

103

00:05:59,280 --> 00:06:00,280

OH, COME ON.

104

00:06:00,280 --> 00:06:01,280

BRING YOUR BROTHER UP.

105

00:06:01,280 --> 00:06:05,430

TELL HIM DON'T BE AFRAID.

106

00:06:05,430 --> 00:06:06,430

DON'T BE BASHFUL.

107

00:06:06,430 --> 00:06:07,610

HOW OLD ARE YOU?

108

00:06:07,610 --> 00:06:09,980

TELL ME HOW OLD YOU ARE.

109

00:06:09,980 --> 00:06:12,900

COME ON UP.

110

00:06:12,900 --> 00:06:15,640

I PLEAD WITH YOU.

111

00:06:15,640 --> 00:06:17,240

YOU'RE 10?

112

00:06:17,240 --> 00:06:21,230
COME UP FOR A SECOND.

113
00:06:21,230 --> 00:06:22,230
WHAT'S YOUR NAME?

114
00:06:22,230 --> 00:06:23,230
LINUS?

115
00:06:23,230 --> 00:06:24,230
YOUR BROTHER BACK THERE?

116
00:06:24,230 --> 00:06:25,230
WHAT'S YOUR BROTHER'S NAME?

117
00:06:31,130 --> 00:06:26,230
DARWIN.

118
00:06:31,130 --> 00:06:34,060
DON'T BE A STICK IN THE MUD.

119
00:06:34,060 --> 00:06:35,880
WHAT GRADE ARE YOU?

120
00:06:35,880 --> 00:06:38,910
WHAT GRADE IS DARWIN IN?

121
00:06:38,910 --> 00:06:39,910
THIRD?

122
00:06:39,910 --> 00:06:43,660
ARE YOU GOING TO BE A MARTIAN?

123
00:06:43,660 --> 00:06:45,410
YOU DON'T KNOW YET.

124
00:06:45,410 --> 00:06:47,080
WELL, DON'T GO AWAY.

125

00:06:47,080 --> 00:06:48,330

THIS IS IMPORTANT.

126

00:06:48,330 --> 00:06:50,420

I'M TRYING TO HELP HERE.

127

00:06:50,420 --> 00:06:51,620

IS THAT YOUR MOM?

128

00:06:51,620 --> 00:06:52,620

DO YOU KNOW WHAT SHE DOES?

129

00:06:52,620 --> 00:06:55,730

DOES SHE WORK FOR NASA?

130

00:06:55,730 --> 00:06:58,910

WHAT DOES YOUR DAD DO?

131

00:06:58,910 --> 00:07:02,010

IS HE BACK THERE?

132

00:07:02,010 --> 00:07:03,560

WHERE'S DAD?

133

00:07:03,560 --> 00:07:05,889

STAND UP, DAD.

134

00:07:05,889 --> 00:07:06,889

WHAT'S YOUR NAME?

135

00:07:06,889 --> 00:07:09,780

AND WHAT DO YOU DO?

136

00:07:09,780 --> 00:07:13,020

ARE YOU A MARTIAN?

137

00:07:13,020 --> 00:07:16,000
DID YOU KNOW WHAT -- DID YOU
HEAR WHAT YOUR DAD JUST SAID?

138
00:07:16,000 --> 00:07:17,000
>> YEAH.

139
00:07:17,000 --> 00:07:18,000
>> HE'S A HELIO PHYSICIST?

140
00:07:18,000 --> 00:07:19,660
DO YOU KNOW WHAT MEANS?

141
00:07:19,660 --> 00:07:25,670
NEITHER DO I.
AND I RUN THIS ORGANIZATION.

142
00:07:25,670 --> 00:07:28,550
NO, I DO KNOW WHAT YOU DO.

143
00:07:28,550 --> 00:07:29,930
OKAY?

144
00:07:29,930 --> 00:07:31,210
THANK YOU FOR COMING UP.

145
00:07:31,210 --> 00:07:32,210
OKAY.

146
00:07:32,210 --> 00:07:33,210
ENJOY IT.

147
00:07:33,210 --> 00:07:34,570
THANK YOU VERY MUCH.

148
00:07:34,570 --> 00:07:40,270
ARE YOU THE ONLY PARENTS THAT
BROUGHT YOUR KIDS OUT?

149

00:07:40,270 --> 00:07:41,720

ANY MORE?

150

00:07:41,720 --> 00:07:44,620

DID I MISS SOMEBODY?

151

00:07:44,620 --> 00:07:49,560

DARWIN, YOU'RE MY FAN -- I'M FAN
OF YOURS AND ANY TIME YOU WANT

152

00:07:49,560 --> 00:07:51,830

TO COME BACK AND COME UP HERE
AND HELP ME DO THIS, YOU CAN DO

153

00:07:51,830 --> 00:07:52,830

THAT.

154

00:07:52,830 --> 00:07:57,070

OKAY, BECAUSE WHAT I'M ABOUT TO
SAY IS FOR YOU AND YOUR BROTHER.

155

00:07:57,070 --> 00:08:00,300

AS I WAS SAYING, YOU KNOW, WHAT
WE'RE ABOUT IS GOING TO

156

00:08:00,300 --> 00:08:04,160

TRANSFORM TECHNOLOGY AND DEFINE
OUR GENERATION AND ACTUALLY IT'S

157

00:08:04,160 --> 00:08:05,810

GOING TO DEFINE THEIR
GENERATION.

158

00:08:05,810 --> 00:08:09,160

ALL OF US WILL BE -- WE'LL BE
SITTING IN ROCKING CHAIRS.

159

00:08:09,160 --> 00:08:10,160

ALMOST ALL OF US.

160

00:08:10,160 --> 00:08:12,030

MANY OF US WILL BE.

161

00:08:12,030 --> 00:08:15,060

BUT DARWIN AND HIS BROTHER WILL
NOT BE.

162

00:08:15,060 --> 00:08:17,870

LINUS AND DARWIN ARE GOING TO BE
DOING THIS STUFF.

163

00:08:17,870 --> 00:08:19,050

THAT'S WHAT WE'RE ABOUT.

164

00:08:19,050 --> 00:08:22,580

EACH OF YOU IN THE NASA
WORKFORCE IS AN IMPORTANT PART

165

00:08:22,580 --> 00:08:26,430

OF THIS JOURNEY THROUGH YOUR
PASSION AND YOUR DEDICATION TO

166

00:08:26,430 --> 00:08:27,880

WHAT WE DO.

167

00:08:27,880 --> 00:08:31,800

IT'S YOUR DEDICATION, IT'S YOUR
MOTIVATION AND DRIVE THAT KEEPS

168

00:08:31,800 --> 00:08:33,769

NASA MOVING FORWARD.

169

00:08:33,769 --> 00:08:38,200

NOT JUST WITH MOMENTUM, BUT ALSO
WITH PRECISION AND FOCUS.

170

00:08:38,200 --> 00:08:42,449

WE ARE FARTHER DOWN THE PATH TO

SENDING HUMANS TO MARS AND THAT

171

00:08:42,449 --> 00:08:46,089

WAS A REASON FOR ME GIVING YOU
MY PASSION.

172

00:08:46,089 --> 00:08:48,670

WHY I AM WHERE I AM.

173

00:08:48,670 --> 00:08:56,300

35.35 YEARS AND 2 1/2 MONTHS IS
A LOT LONGER THAN, YOU KNOW,

174

00:08:56,300 --> 00:08:58,339

BETWEEN NOW AND 2030s.

175

00:08:58,339 --> 00:09:02,600

SO, YOU KNOW, BE PATIENT.

176

00:09:02,600 --> 00:09:05,740

WE HAVE A LOT OF WORK TO DO TO
GET HUMANS TO MARS, BUT WE'LL

177

00:09:05,740 --> 00:09:06,740

GET THERE.

178

00:09:06,740 --> 00:09:10,579

BOOTS ON MARS IS POSSIBLY THE
MOST EXCITING THING HUMANS WILL

179

00:09:10,579 --> 00:09:11,800

EVER DO.

180

00:09:11,800 --> 00:09:15,680

AND I LOVE THAT WE'RE HERE TODAY
TALKING NOT ONLY ABOUT WHAT WE

181

00:09:15,680 --> 00:09:19,940

WANT AND NEED TO DO THAT GOAL,

BUT THE WAYS WE HAVE ALREADY

182

00:09:19,940 --> 00:09:21,079

STARTED THE WORK TO GET THERE.

183

00:09:21,079 --> 00:09:24,850

BECAUSE WE HAVE BEEN DOING THIS
FOR 40 YEARS BELIEVE IT OR NOT.

184

00:09:24,850 --> 00:09:27,850

WE HAVE BEEN ENGAGED IN GETTING
TO MARS, GETTING HUMANS TO MARS

185

00:09:27,850 --> 00:09:29,870

FOR AT LEAST 40 YEARS NOW.

186

00:09:29,870 --> 00:09:34,269

BEGINNING WITH, YOU KNOW, THE
FIRST PRECURSORS.

187

00:09:34,269 --> 00:09:37,470

YOU KNOW, MUCH OF WHAT WE DO
TODAY WAS SCIENCE FICTION WHEN I

188

00:09:37,470 --> 00:09:40,879

WAS GROWING UP IN COLUMBIA,
SOUTH CAROLINA.

189

00:09:40,879 --> 00:09:43,829

WE HAVE MANY ACCOMPLISHMENTS OF
WHICH WE CAN BE PROUD, WHICH IS

190

00:09:43,829 --> 00:09:47,699

PEOPLE WORKING IN SPACE
CONTINUOUSLY TODAY WHICH WE HAVE

191

00:09:47,699 --> 00:09:52,610

DONE NOW FOR ALMOST 15 YEARS OR
SENDING A SPACECRAFT OUT OF THE

192

00:09:52,610 --> 00:09:54,779

SOLAR SYSTEM.

193

00:09:54,779 --> 00:09:58,660

OR ONE TO VISIT PLUTO AS
RECENTLY HAPPENED OR PLANNING AN

194

00:09:58,660 --> 00:10:03,230

ACTUAL HUMAN TRIP TO THE RED
PLANET ON WHICH WE'RE EMBARKED.

195

00:10:03,230 --> 00:10:06,670

SO I HAVE NO DOUBT THAT WE CAN
ACCOMPLISH WHAT WE HAVE SET OUR

196

00:10:06,670 --> 00:10:08,350

MINDS TO DO.

197

00:10:08,350 --> 00:10:12,639

TODAY WE ALL HAVE A CHANCE TO
HEAR FROM THE EXPERTS.

198

00:10:12,639 --> 00:10:16,129

THESE MEN AND WOMEN CAN TELL YOU
WHAT'S GOING ON RIGHT NOW AND

199

00:10:16,129 --> 00:10:18,230

WHERE WE'RE GOING NEXT.

200

00:10:18,230 --> 00:10:21,449

THEY'LL DISCUSS WHERE OUR
KNOWLEDGE GAPS ARE AND WHAT

201

00:10:21,449 --> 00:10:23,480

WE'RE DOING TO FILL THEM.

202

00:10:23,480 --> 00:10:26,249

EARLIER THIS WEEK, CAST MEMBERS
FROM "THE MARTIAN" TALKED WITH

203

00:10:26,249 --> 00:10:29,059

ASTRONAUTS LIVING ON THE
INTERNATIONAL SPACE STATION

204

00:10:29,059 --> 00:10:33,029

INCLUDING SCOTT KELLY WHO JUST
PASSED HIS HALFWAY POINT DURING

205

00:10:33,029 --> 00:10:35,389

HIS ONE-YEAR MISSION ABOARD THE
MISSION.

206

00:10:35,389 --> 00:10:38,339

A MISSION THAT'S GATHERING
CRITICAL DATA NEEDED FOR FUTURE

207

00:10:38,339 --> 00:10:40,709

HUMAN MARS MISSIONS.

208

00:10:40,709 --> 00:10:43,999

THEY HEARD FIRSTHAND HOW THAT
LABORATORY IS WORKING ON SCIENCE

209

00:10:43,999 --> 00:10:46,110

OFFERED FOR THE EARTH.

210

00:10:46,110 --> 00:10:48,999

THE ACTORS SAW THE INTERNATIONAL
SPACE STATION TRAINING FACILITY,

211

00:10:48,999 --> 00:10:53,120

THEY HEARD FROM THE TEAM WORKING
ON PLANETARY ROVERS, LEARNED

212

00:10:53,120 --> 00:10:58,910

ABOUT SPACE ROCK SYSTEM ROCKET
AND THEN THEY VISITED THE

213

00:10:58,910 --> 00:11:03,369
MISSION CONTROL CENTER WHERE
SUPPORT IS PROVIDED FOR RESEARCH

214
00:11:03,369 --> 00:11:04,999
AND FOR OPERATIONS.

215
00:11:04,999 --> 00:11:08,351
AS MOST OF YOU IN THIS AUDIENCE
KNOW, THAT'S JUST THE TIP OF THE

216
00:11:08,351 --> 00:11:11,709
ICEBERG WHEN IT COMES TO ALL WE
DO AT NASA.

217
00:11:11,709 --> 00:11:18,300
OUR MARTIAN GUESTS SAW HOW WE'RE
ENABLING EXPLORATION INTO TOOLS

218
00:11:18,300 --> 00:11:20,680
FOR UNDERSTANDING EARTH RIGHT
NOW.

219
00:11:20,680 --> 00:11:24,180
NEW KNOWLEDGE THAT WILL INFORM
FUTURE MARS EXPLORERS.

220
00:11:24,180 --> 00:11:26,149
THIS IS OUR STORY.

221
00:11:26,149 --> 00:11:27,500
IT'S OUR STORY.

222
00:11:27,500 --> 00:11:29,829
THIS IS OUR JOURNEY TO MARS.

223
00:11:29,829 --> 00:11:32,999
IT'S THE REAL STUFF OF SCIENCE.

224

00:11:32,999 --> 00:11:35,619
TECHNOLOGY AND HUMAN SPACE
FLIGHT.

225
00:11:35,619 --> 00:11:39,369
EARLIER THIS WEEK, WE LAUNCHED
THE REAL MARTIANS WEB PAGE WHERE

226
00:11:39,369 --> 00:11:42,930
YOU CAN SEE VIDEOS OF YOUR
FELLOW EMPLOYEES TELLING THEIR

227
00:11:42,930 --> 00:11:45,720
STORES AND HOW THEY'RE
SUPPORTING THE JOURNEY TO MARS.

228
00:11:45,720 --> 00:11:48,350
IT WILL BE UPDATED THREE TIMES A
WEEK.

229
00:11:48,350 --> 00:11:57,540
THAT'S WHAT THEY TELL ME, WITH
NEW VIDEOS S THAT RIGHT, MR.

230
00:11:57,540 --> 00:11:58,540
BROWN?

231
00:11:58,540 --> 00:11:59,540
ALL RIGHT.

232
00:11:59,540 --> 00:12:01,709
SO VISIT EARLY AND OFTEN.

233
00:12:01,709 --> 00:12:04,009
I'M LOOKING FORWARD TO HEARING
THE QUESTIONS THAT YOU HAVE

234
00:12:04,009 --> 00:12:07,683
TODAY AND TO TALKING SOME MORE
WITH ANDY AND JIM WHO IS MAYBE

235

00:12:07,683 --> 00:12:11,820

OUR -- JIM GREEN WHO IS MAYBE
OUR HEAD MARTIAN HERE AT NASA

236

00:12:11,820 --> 00:12:13,179

HEADQUARTERS.

237

00:12:13,179 --> 00:12:16,540

TODAY WE TAKE PART IN THE
ONGOING DIALOGUE ABOUT WHAT IT'S

238

00:12:16,540 --> 00:12:19,660

GOING TO TAKE TO GET HUMANS TO
MARS.

239

00:12:19,660 --> 00:12:22,839

I KNOW IT INVIGORATES ME EVERY
SINGLE DAY ON THE JOB TO WORK ON

240

00:12:22,839 --> 00:12:25,630

ONE OF THE BIGGEST THINGS
HUMANITY HAS EVER ATTEMPTED AND

241

00:12:25,630 --> 00:12:28,339

I THINK IT'S THIS GENERATION'S
MOMENT.

242

00:12:28,339 --> 00:12:31,889

THE CHANCE FOR THE NEXT GIANT
LEAP.

243

00:12:31,889 --> 00:12:39,129

A CHILD TODAY THAT WAS BORN LESS
THAN 15 YEARS AGO HAS NEVER,

244

00:12:39,129 --> 00:12:44,779

NEVER KNOWN A MOMENT WHEN HUMANS
DIDN'T LIVE WITH THE INTERNET OR

245

00:12:44,779 --> 00:12:46,529

LIVE IN SPACE.

246

00:12:46,529 --> 00:12:47,529

THINK ABOUT THAT.

247

00:12:47,529 --> 00:12:50,980

I MEAN, THAT'S OUR KIDS AND
GRANDKIDS.

248

00:12:50,980 --> 00:12:54,089

A CHILD TODAY WHO IS 15 YEARS OR
YOUNGER HAS NEVER KNOWN A MOMENT

249

00:12:54,089 --> 00:12:56,749

WITHOUT THE INTERNET OR WHEN
HUMANS WERE NOT LIVING OR

250

00:12:56,749 --> 00:12:58,759

WORKING IN SPACE.

251

00:12:58,759 --> 00:13:02,250

THEY ARE THE SPACE GENERATION.

252

00:13:02,250 --> 00:13:04,679

THEY'RE THE ONES WHO ARE GOING
TO SET DOWN ON THE RED PLANET

253

00:13:04,679 --> 00:13:06,940

FOR THE FIRST TIME.

254

00:13:06,940 --> 00:13:10,829

OUR FIRST MARTIANS ARE --
THEY'RE IN SCHOOL RIGHT NOW.

255

00:13:10,829 --> 00:13:12,100

THEY'RE IN ELEMENTARY SCHOOL.

256

00:13:12,100 --> 00:13:13,100
KINDERGARTENS.

257

00:13:13,100 --> 00:13:17,830
AND THIS MOVIE AND ALL THE
MISSIONS THAT THEY SEE NASA

258

00:13:17,830 --> 00:13:25,389
FLYING COULD PUSH THEM FIRMLY IN
THE TECHNOLOGY OR ENGINEERING OR

259

00:13:25,389 --> 00:13:31,490
MATH AND WE WANT THEM TO PURSUE
THE CAREERS TO KEEP AMERICA THE

260

00:13:31,490 --> 00:13:33,450
LEADER IN SPACE.

261

00:13:33,450 --> 00:13:36,339
THAT KIND OF INSPIRATION IS
PROBABLY ONE OF THE MOST POTENT

262

00:13:36,339 --> 00:13:39,029
THINGS THAT WE CAN PROVIDE TO
THE NEXT GENERATION.

263

00:13:41,699 --> 00:13:40,699
THAT'S YOU.

264

00:13:41,699 --> 00:13:44,079
AND WHAT YOU DO.

265

00:13:44,079 --> 00:13:47,050
THAT'S WHAT MAKES US SO
DIFFERENT.

266

00:13:47,050 --> 00:13:50,209
SO DIFFERENT.

267

00:13:50,209 --> 00:13:52,959
FROM ANY OTHER AGENCY OF THIS
GOVERNMENT.

268
00:13:52,959 --> 00:13:53,959
YOU KNOW?

269
00:13:53,959 --> 00:13:59,550
WE ARE THE INSPIRATION FOR THE
SPACE GENERATION.

270
00:13:59,550 --> 00:14:02,750
THAT'S WHAT WE'RE DOING RIGHT
NOW, SO LET'S GET STARTED AND

271
00:14:02,750 --> 00:14:03,889
HEAR MORE ABOUT THIS.

272
00:14:03,889 --> 00:14:07,569
FIRST, LET'S HEAR FROM TWO NASA
EMPLOYEES WORKING ON OUR JOURNEY

273
00:14:07,569 --> 00:14:12,009
TO MARS ABOUT HOW THEY SEE THE
WORK REFLECTED IN "THE MARTIAN."

274
00:14:12,009 --> 00:14:17,929
WITH US ALEXANDER McDONALD FROM
THE OFFICE OF CHIEF TECHNOLOGIST

275
00:14:17,929 --> 00:14:21,439
AND TARA RUTLY, ASSOCIATE ISS
PROGRAM SCIENTIST IN THE OFFICE

276
00:14:21,439 --> 00:14:23,389
OF CHIEF SCIENTIST.

277
00:14:23,389 --> 00:14:29,459
SO ALEXANDER AND TARA, I KNOW I
SAW YOU ALL --

278

00:14:29,459 --> 00:14:30,730

>> WE'RE HERE.

279

00:14:30,730 --> 00:14:33,920

>> THERE THEY ARE OVER THERE.

280

00:14:33,920 --> 00:14:35,829

COME ON UP.

281

00:14:35,829 --> 00:14:36,829

>> ALL RIGHT.

282

00:14:36,829 --> 00:14:37,829

THANK YOU.

283

00:14:37,829 --> 00:14:38,829

THANK YOU, ADMINISTRATOR BOLDEN.

284

00:14:38,829 --> 00:14:39,829

WE'RE GOING TO DO IT FROM HERE.

285

00:14:39,829 --> 00:14:40,829

>> I'M SITTING DOWN.

286

00:14:40,829 --> 00:14:41,829

>> WE'RE CHILLIN'.

287

00:14:41,829 --> 00:14:43,670

WE'RE GOING TO RELAX WITH THE
FELLOW EMPLOYEES BUT IT'S REALLY

288

00:14:43,670 --> 00:14:45,600

HARD TO FOLLOW THE INSPIRING
WORDS.

289

00:14:45,600 --> 00:14:46,600

I DON'T KNOW, ALEX.

290

00:14:46,600 --> 00:14:47,649

I DON'T KNOW.

291

00:14:47,649 --> 00:14:50,670

ALEX AND I HAVE BEEN TALKING
ABOUT THE BOOK.

292

00:14:50,670 --> 00:14:53,709

WE HAVE BEEN SHARING SOME FUN
DISCUSSION OVER THE PAST FEW

293

00:14:53,709 --> 00:14:54,709

DAYS.

294

00:14:54,709 --> 00:14:55,709

I ASSUME HE READ THE BOOK.

295

00:14:55,709 --> 00:14:57,399

>> YES, IT WAS INCREDIBLE.

296

00:14:57,399 --> 00:15:00,800

>> MOST OF US HERE HAVE READ THE
BOOK AND WE HAVE BEEN TALKING

297

00:15:00,800 --> 00:15:03,569

ABOUT SOME OF THE INSPIRATIONING
PARTS OF THE BOOK AND HOW

298

00:15:03,569 --> 00:15:10,149

THEY'RE RELEVANT TO THE BOOK --
RELEVANT TO WHAT WE DO AT NASA.

299

00:15:10,149 --> 00:15:13,269

I THINK WE'RE MOSTLY INSPIRED BY
THE HUMAN NATURE, THE NEED TO

300

00:15:13,269 --> 00:15:14,269

JUST PROVIDE.

301

00:15:14,269 --> 00:15:17,350

WE ARE EXPLORING AND THEN
SURVIVAL KICKS IN AND THE WAY

302

00:15:17,350 --> 00:15:22,089

THAT WATNEY SURVIVED IS BASED ON
SCIENCE AND TECHNOLOGY THAT WE

303

00:15:22,089 --> 00:15:25,279

HERE AT NASA ARE PART OF EVERY
SINGLE DAY.

304

00:15:25,279 --> 00:15:28,019

FOR THOSE OF US WHO READ IT, IT
WAS ALL FAMILIAR.

305

00:15:28,019 --> 00:15:30,449

IT'S ALL FAMILIAR.

306

00:15:30,449 --> 00:15:33,230

AND FOR ME I WORK IN THE SPACE
STATION PROGRAM IN THE SCIENCE

307

00:15:33,230 --> 00:15:34,230

OFFICE.

308

00:15:34,230 --> 00:15:36,050

WE ARE DOING THINGS NOW AS PART
OF THAT PROGRAM.

309

00:15:36,050 --> 00:15:41,010

AGENCY WIDE, BUT WE HAVE A LOW
EARTH ORBIT PLATFORM WHERE WE

310

00:15:41,010 --> 00:15:43,079

CAN GET REAL WORK DONE.

311

00:15:43,079 --> 00:15:46,410

THINGS LIKE THE ONE-YEAR MISSION
WHERE WE'RE TRYING TO TACKLE THE

312

00:15:46,410 --> 00:15:49,170

CHANGES THAT HAPPENED TO THE
HUMAN BODY SO WE STAY LONGER IN

313

00:15:49,170 --> 00:15:53,860

SPACE AND REALLY EXCITING AND
INSPIRING, THINK ABOUT THE WAY

314

00:15:53,860 --> 00:15:54,860

THAT IT WAS WRITTEN.

315

00:15:54,860 --> 00:15:56,820

IT WAS WRITTEN FROM WATNEY'S
PERSPECTIVE.

316

00:15:56,820 --> 00:16:01,519

IF HE WASN'T JOURNALING WE
WOULDN'T HAVE THE EXCITING

317

00:16:01,519 --> 00:16:02,519

THINGS IN THE BOOK.

318

00:16:02,519 --> 00:16:08,579

OUR ASTRONAUTS, WE HAVE
THOUSANDS OF PAGES OF JOURNALS

319

00:16:08,579 --> 00:16:11,600

THAT ARE BEING STUDIED RIGHT NOW
TO UNDERSTAND THE PSYCHOLOGICAL

320

00:16:11,600 --> 00:16:14,269

BEHAVIOR PATTERNS ASSOCIATED
WITH THE VARIOUS ENVIRONMENTS

321

00:16:14,269 --> 00:16:16,480

LIVING UP THERE IN SPACE.

322

00:16:16,480 --> 00:16:20,239

SO ALL ACROSS THE AGENCY RIGHT
NOW TO SPECIFICALLY FOR STATION,

323

00:16:20,239 --> 00:16:21,239

THAT'S MY THOUGHTS ON IT.

324

00:16:21,239 --> 00:16:22,719

WHAT ARE YOU THINKING?

325

00:16:22,719 --> 00:16:26,779

>> FOR ME, WHAT WAS SO INSPIRING
WAS TO SEE A BOOK TREAT SUCH

326

00:16:26,779 --> 00:16:27,779

DETAILS.

327

00:16:27,779 --> 00:16:32,819

THE ECONOMIC TRADEOFFS OF POTATO
PRODUCTION ON MARS.

328

00:16:32,819 --> 00:16:35,779

>> POTATO PRODUCTION, YEAH.

329

00:16:35,779 --> 00:16:38,569

>> WE HAVEN'T HAD A HUGE PUBLIC
CONVERSATION ABOUT MARTIAN

330

00:16:38,569 --> 00:16:42,730

POTATO PRODUCTION AND SPOILER
ALERT HERE, POTATOES ARE SUPER

331

00:16:42,730 --> 00:16:44,410

IMPORTANT TO THE MARTIAN.

332

00:16:44,410 --> 00:16:47,410

YOU HAVE TO FIGURE OUT HOW TO
GET YOUR CALORIES SO WE HAVE

333

00:16:47,410 --> 00:16:52,670

ENOUGH MULTIVITAMIN, GOT SOME
PROTEIN, PROTEIN BARS AND HE HAS

334

00:16:52,670 --> 00:16:57,540

TO FIGURE OUT HOW DO I PRODUCE
ENOUGH FOOD TO SURVIVE FOR THE

335

00:16:57,540 --> 00:17:00,029

YEAR THAT HE'S GOING TO BE
THERE?

336

00:17:00,029 --> 00:17:01,029

>> THAT'S RIGHT.

337

00:17:01,029 --> 00:17:02,679

>> HE HAS TO DO IT WITH ONLY THE
THINGS HE HAS AVAILABLE.

338

00:17:02,679 --> 00:17:07,429

SO HE HAS TO KIND OF DO THE
JUJITSU MATH TO ENGAGE IN

339

00:17:07,429 --> 00:17:09,970

SOMETHING AROUND THE AGENCY
PEOPLE HAVE BEEN DOING FOR A

340

00:17:09,970 --> 00:17:12,000

LONG TIME WHICH IS SPACE
AGRICULTURE.

341

00:17:12,000 --> 00:17:20,340

I THINK THE BOOK INTRODUCES THE
SPACE AGRICULTURE AND ON THE ISS

342

00:17:20,340 --> 00:17:25,790

NOW, WE HAD A BIG MILESTONE IN
THE DEVELOPMENT OF THIS FIELD

343

00:17:25,790 --> 00:17:27,959
WITH THE VEGGIE EXPERIMENT.

344

00:17:27,959 --> 00:17:34,660
WE HAD ASTRONAUTS WHO HAD GROWN
LETTUCE AND ABLE TO EAT IT AND

345

00:17:34,660 --> 00:17:35,660
ENJOY IT.

346

00:17:35,660 --> 00:17:38,270
SO I THINK THE MARTIAN TAKES THE
WHOLE FIELD THAT I THINK'S

347

00:17:38,270 --> 00:17:40,830
IMPORTANT IN THE FUTURE AND
REALLY BRINGS IT HOME AS A

348

00:17:40,830 --> 00:17:42,510
CRITICAL METHOD OF SURVIVAL.

349

00:17:42,510 --> 00:17:43,510
>> SO COOL.

350

00:17:43,510 --> 00:17:45,150
YOU REMEMBER HOW HE GREW THE
POTATOES, RIGHT?

351

00:17:45,150 --> 00:17:51,060
HE NEEDED SPECIAL MICROBES SO
IT'S TRUE.

352

00:17:51,060 --> 00:17:52,730
BEFORE THE ASTRONAUTS WERE
ALLOWED TO EAT IT, THEY HAD TO

353

00:17:52,730 --> 00:17:55,990
GO HOME FOR SAMPLING OF THE
MICROBES.

354

00:17:55,990 --> 00:18:00,120

AND AS WE READ THE BOOK, I THINK
WE RELATED TO THINGS LIKE THAT.

355

00:18:00,120 --> 00:18:02,040

SO ALEX, IT'S BEEN FUN.

356

00:18:02,040 --> 00:18:03,040

>> INDEED.

357

00:18:03,040 --> 00:18:05,210

>> I WANTED TO SAY, YOU KNOW,
THINGS THAT SPACE STATION IS

358

00:18:05,210 --> 00:18:08,250

DOING RIGHT NOW, I WANTED TO
SAY, YOU KNOW, THE ADDITIVE

359

00:18:08,250 --> 00:18:11,390

MANUFACTURING, WE HAVE GOT
TESTING THE INFLATABLE HABITATS

360

00:18:11,390 --> 00:18:12,390

COMING UP.

361

00:18:12,390 --> 00:18:16,190

WE HAVE ROBOTIC SERVICING
MISSIONS, WAYS THAT PREDISPOSE

362

00:18:16,190 --> 00:18:25,650

US
TO POSITION OUR LOGISTICS.

363

00:18:25,650 --> 00:18:26,650

IT'S BEEN FUN.

364

00:18:26,650 --> 00:18:27,650

A GOOD BOOK.

365

00:18:27,650 --> 00:18:29,120

THANK YOU FOR CHATTING WITH US
TODAY, ALEX.

366

00:18:29,120 --> 00:18:32,760

FUN TALKING TO YOU ABOUT POTATO
ECONOMICS.

367

00:18:32,760 --> 00:18:36,870

>> POTATOES ARE THE FUTURE.

368

00:18:36,870 --> 00:18:37,870

>> ALL KINDS OF WAYS.

369

00:18:37,870 --> 00:18:40,370

WE HAVE DISCUSSED ALL KINDS OF
WAYS OF POTATOES BUT NOT COOKED

370

00:18:40,370 --> 00:18:48,960

IF YOU WANT THE BEST CALORIES.

371

00:18:48,960 --> 00:18:49,960

[APPLAUSE]

OKAY.

372

00:18:49,960 --> 00:18:51,710

SO NOW, IT'S REALLY GOING TO BE
COOL TO HEAR FROM OUR VERY OWN

373

00:18:51,710 --> 00:18:52,920

HEAD MARTIAN, DR.

374

00:18:52,920 --> 00:18:55,210

JIM GREEN,
DIRECTOR OF PLANETARY SCIENCES

375

00:18:55,210 --> 00:18:59,000

BECAUSE HE'S GOING TO TALK TO US
ABOUT SCIENCE FACTS AND FICTION

376

00:18:59,000 --> 00:19:04,010

IN "THE MARTIAN" THEN WE'LL HAVE
ANDY WEIR TALK TO US AFTER THAT.

377

00:19:04,010 --> 00:19:09,570

BUT FIRST, WE'LL LISTEN TO A
MESSAGE FROM DIRECTOR RIDLEY

378

00:19:09,570 --> 00:19:14,460

SCOTT, AND SEE WHAT HIS THOUGHTS
ARE ON THE JOURNEY TO MARS.

379

00:19:14,460 --> 00:19:21,990

>> WE HAVE PONDERED OUR
NEIGHBOR, MARS, CAN WE LIVE

380

00:19:21,990 --> 00:19:27,230

THERE, HOW SOON CAN HUMAN GOES
THERE?

381

00:19:27,230 --> 00:19:30,070

THESE ARE QUESTIONS THAT
FASCINATED ME AS A FILMMAKER AND

382

00:19:30,070 --> 00:19:34,030

THAT NASA HELPED TO ANSWER WHEN
I CAME OUT TO FILM "THE

383

00:19:34,030 --> 00:19:35,030

MARTIAN."

384

00:19:35,030 --> 00:19:38,170

SENDING HUMANS TO MARS SAFELY IS
A PRIORITY AT NASA.

385

00:19:38,170 --> 00:19:41,580

IT STARTED THE LANDING OF
ROBOTIC ROVERS AND MARTIANS ON

386

00:19:41,580 --> 00:19:44,350

SOIL, SUCH AS SPIRIT.

387

00:19:44,350 --> 00:19:45,740

AND CURIOSITY.

388

00:19:45,740 --> 00:19:48,800

THE DATA AND IMAGES OF THESE
MAGNIFICENT ROBOTS ARE SENT BACK

389

00:19:48,800 --> 00:19:52,100

TO EARTH AND THEY HAVE PEAKED
OUR IMAGINATION AND HEIGHTENED

390

00:19:52,100 --> 00:19:53,620

OUR DETERMINATION TO GO.

391

00:19:53,620 --> 00:19:58,700

FOR THE SAFE JOURNEY AND THE
TOUCHDOWN OF THE HUMANS IN THE

392

00:19:58,700 --> 00:19:59,700

2030s.

393

00:19:59,700 --> 00:20:02,630

HUMANS ARE PREPARING FOR THE
JOURNEY BY LIVING 250 MILES

394

00:20:02,630 --> 00:20:09,710

OVERHEAD ON THE INTERNATIONAL
SPACE STATION WHERE THERE IS NO

395

00:20:09,710 --> 00:20:10,930

GRAVITY.

396

00:20:10,930 --> 00:20:14,390

THE ROUND TRIP TO MARS CAN TAKE
500 DAYS OR LONGER.

397

00:20:14,390 --> 00:20:18,640

IT REQUIRES THE NEW ORION
SPACECRAFT AND ROCKET.

398

00:20:18,640 --> 00:20:24,990

WHEN WE INVENT NEW TECHNOLOGIES
IT BENEFITS ALL OF HUMANITY,

399

00:20:24,990 --> 00:20:28,380

CONTRIBUTING TO NEW BREAK
THROUGHS IN MEDICINE, AND

400

00:20:28,380 --> 00:20:29,380

MANUFACTURING.

401

00:20:29,380 --> 00:20:31,690

THE JOURNEY TO MARS WILL CHANGE
OUR HISTORY BOOKS FOREVER.

402

00:20:31,690 --> 00:20:35,360

REWRITING WHAT WE KNOW ABOUT THE
RED PLANET, EXPANDING DEEP INTO

403

00:20:35,360 --> 00:20:37,250

THE SOLAR SYSTEM.

404

00:20:37,250 --> 00:20:43,410

FOLLOW NASA'S JOURNEY TO MARS AT
NASA.GOV.

405

00:20:43,410 --> 00:20:49,550

>> YES, THAT WAS GREAT.

406

00:20:49,550 --> 00:20:51,090

BRILLIANT.

407

00:20:51,090 --> 00:20:52,090

THANK YOU VERY MUCH FOR THAT.

408

00:20:52,090 --> 00:20:53,950

THAT WAS A GREAT MESSAGE.

409

00:20:53,950 --> 00:20:57,060

YOU KNOW, IT'S NOT EVERY DAY
THAT WE GET TO CELEBRATE SCIENCE

410

00:20:57,060 --> 00:21:01,430

FICTION IN AN AGENCY THAT DEALS
WITH SCIENCE FACT EVERY DAY.

411

00:21:01,430 --> 00:21:05,490

BUT THE MARTIAN REALLY IS A VERY
IMPORTANT PART OF OUR CULTURE OF

412

00:21:05,490 --> 00:21:06,600

SCIENCE FICTION.

413

00:21:06,600 --> 00:21:10,530

YOU KNOW, IF YOU DON'T DREAM
ABOUT THE FUTURE, YOU DON'T HAVE

414

00:21:10,530 --> 00:21:11,580

A FUTURE.

415

00:21:11,580 --> 00:21:16,050

YOU HAVE TO RECOGNIZE HOW
IMPORTANT IT IS FOR THOSE THINGS

416

00:21:16,050 --> 00:21:20,040

TO STAY IN YOUR MIND.

417

00:21:20,040 --> 00:21:22,520

UNDERSTAND THE DIRECTION YOU
WANT TO MOVE TOWARDS AND THEN

418

00:21:22,520 --> 00:21:24,320

MOVE TOWARDS IT.

419

00:21:24,320 --> 00:21:26,420

WHAT'S REALLY GREAT ABOUT THE
BOOK AND OF COURSE THE MOVIE

420

00:21:26,420 --> 00:21:30,860

THAT FOLLOWS THE BOOK VERY WELL
IS IT'S JUST AROUND THE CORNER.

421

00:21:30,860 --> 00:21:34,570

NOW, TODAY IN THE FEW MINUTES
THAT I HAVE ONE OF THE THINGS

422

00:21:34,570 --> 00:21:39,540

THAT I WANTED TO DO IN THE NEXT
SLIDE IS TO TALK ABOUT WHAT MARS

423

00:21:39,540 --> 00:21:44,010

MIGHT REALLY BE LIKE RELATIVE TO
THE MOVIE.

424

00:21:44,010 --> 00:21:45,010

NEXT SLIDE, PLEASE.

425

00:21:45,010 --> 00:21:47,900

AND OF COURSE IN THE MOVIE IT
STARTS OUT WITH THIS ENORMOUS

426

00:21:47,900 --> 00:21:48,920

DUST STORM.

427

00:21:48,920 --> 00:21:53,670

ONE THAT'S VERY CAPABLE, THAT
HAMMERS IT AND BREAKS THE PIECES

428

00:21:53,670 --> 00:21:59,120

APART AND THROWS THEM EVERYWHERE
AS SHOWN FROM THE SCENES.

429

00:21:59,120 --> 00:22:00,360

NEXT SLIDE.

430

00:22:00,360 --> 00:22:06,700

HOWEVER, FROM ORBIT, WE DO SEE
THESE INTENSE DUST STORMS.

431

00:22:06,700 --> 00:22:11,240

AND THEY CAN LOOK REALLY
FORBODING, BUT IN REALITY --

432

00:22:11,240 --> 00:22:15,070

NEXT SLIDE, PLEASE, THE DUST
STORMS ARE NOWHERE NEAR AS

433

00:22:15,070 --> 00:22:16,110

POWERFUL.

434

00:22:16,110 --> 00:22:20,100

THE PRESSURE ON EARTH IS SO
MUCH -- ON MARS IS SO MUCH LESS

435

00:22:20,100 --> 00:22:24,700

THAN THE EARTH THAT EVEN 120
MILE AN HOUR WIND WHICH DOES

436

00:22:24,700 --> 00:22:28,540

OCCUR ON MARS WON'T BE ENOUGH TO
STRAIGHTEN AN AMERICAN FLAG

437

00:22:28,540 --> 00:22:30,260

SITTING ON THE SURFACE.

438

00:22:30,260 --> 00:22:31,260

ALL RIGHT?

439

00:22:31,260 --> 00:22:35,270

HOWEVER, WHAT HAPPENS IS THE
DUST GETS SUSPENDED IN SPACE, IN

440

00:22:35,270 --> 00:22:39,410
THE ATMOSPHERE, RATHER, TO
SOMETIMES 20 AND 30 KILOMETERS

441
00:22:39,410 --> 00:22:40,780
HIGH.

442
00:22:40,780 --> 00:22:42,880
AND BLOCKS OUT THE SUN.

443
00:22:42,880 --> 00:22:47,030
MAKES IT LOOK LIKE NIGHT, EVEN
AT NOON.

444
00:22:47,030 --> 00:22:51,930
AND SO CONSEQUENTLY, IT CAN BE
FORMIDABLE IF YOU'RE USING SOLAR

445
00:22:51,930 --> 00:22:54,030
POWER, DEPENDING ON THAT.

446
00:22:54,030 --> 00:22:56,790
SO THESE ARE ACTUALLY THE FACTS
THAT WE HAVE TO DEAL WITH AS WE

447
00:22:56,790 --> 00:22:58,980
GO TO MARS.

448
00:22:58,980 --> 00:23:01,230
NEXT SLIDE, PLEASE.

449
00:23:01,230 --> 00:23:04,600
SO WE HAVE BEEN ON MARS IN MANY
LOCATIONS.

450
00:23:04,600 --> 00:23:08,650
HERE'S AN OVERVIEW OF THE
LANDERS AND ROVERS FROM VIKING

451

00:23:08,650 --> 00:23:14,320
PATHFINDER, PHOENIX, AND
CURIOSITY AND OPPORTUNITY.

452
00:23:14,320 --> 00:23:16,220
THOSE TWO ARE OPERATING TODAY.

453
00:23:16,220 --> 00:23:17,740
THESE ARE THEIR LOCATIONS.

454
00:23:17,740 --> 00:23:21,401
IN THE FUTURE WE'RE PLANNING TO
LAND IN FLIGHT WITH THE LAUNCH

455
00:23:21,401 --> 00:23:24,700
WINDOW OPENING UP ON MARCH 4th
OF NEXT YEAR.

456
00:23:24,700 --> 00:23:28,490
INSIGHT IS A LANDER AND IT'S
GOING TO LOOK AT THE SEISMOLOGY

457
00:23:28,490 --> 00:23:31,060
AND THE HEAT FLOW OF THE PLANET.

458
00:23:31,060 --> 00:23:32,550
THOSE ARE VERY IMPORTANT.

459
00:23:32,550 --> 00:23:36,450
WE SEE AVALANCHES FROM SPACE,
FROM THE MARS RECONNAISSANCE

460
00:23:36,450 --> 00:23:37,450
ORBITER.

461
00:23:37,450 --> 00:23:42,950
IS THERE MARS QUAKES, HOW
INTENSE ARE THEY, SHOULD WE BE

462

00:23:42,950 --> 00:23:44,370
CONCERNED ABOUT IT?

463
00:23:44,370 --> 00:23:47,920
WHAT ABOUT HOW THE HEAT LEAVES
THE PLANET, IS THAT SOMETHING

464
00:23:47,920 --> 00:23:53,060
THAT WE CAN USE LIKE GEOTHERMAL
ACTIVITY THAT WE DO HERE ON

465
00:23:53,060 --> 00:23:54,060
EARTH?

466
00:23:54,060 --> 00:23:56,640
CAN WE USE THE THERMAL ENERGY OF
MARS TO BE ABLE TO HEAT OUR

467
00:23:56,640 --> 00:23:57,640
HOUSES.

468
00:23:57,640 --> 00:24:00,240
THIS IS SOMETHING FROM THE
SCIENTIFIC POINT OF VIEW WE WANT

469
00:24:00,240 --> 00:24:04,520
TO ANSWER, AND FROM THE HUMAN
EXPLORATION POINT ARE EXTREMELY

470
00:24:04,520 --> 00:24:05,560
IMPORTANT.

471
00:24:05,560 --> 00:24:07,850
HERE'S WHERE THE AIRES SITE IS.

472
00:24:07,850 --> 00:24:10,400
IT'S ABOVE PATHFINDER.

473
00:24:10,400 --> 00:24:12,040

NEXT SLIDE, PLEASE.

474

00:24:12,040 --> 00:24:16,750

AS YOU SAW IN THE TRAILER, NICK
WATNEY HAS TO COMMUNICATE WITH

475

00:24:16,750 --> 00:24:18,180

EFFORT.

476

00:24:18,180 --> 00:24:21,300

COMMUNICATION IS A SUBTEXT IN
THE MOVIE.

477

00:24:21,300 --> 00:24:28,380

HE TALKS TO HIS GOPRO, SOMETHING
HE HAS TO DO TO THINK ABOUT WHAT

478

00:24:28,380 --> 00:24:31,490

HE'S GOING DO IN THE FUTURE AND
HOW HE'S GOING TO COPE IN THE

479

00:24:31,490 --> 00:24:34,810

ACTIVITY, IN ADDITION TO
PRODUCING THE NORMAL LOG ONE

480

00:24:34,810 --> 00:24:38,450

DOES DATING BACK TO "STAR TREK,"
OF COURSE.

481

00:24:38,450 --> 00:24:41,330

RECOGNIZING THE PATHFINDER MIGHT
BE A CAPABILITY THAT HE USED TO

482

00:24:41,330 --> 00:24:44,860

COMMUNICATE BACK TO EARTH, HE
MAKES THE TREK.

483

00:24:44,860 --> 00:24:48,240

THAT'S PROBABLY 500 KILOMETERS
FROM AIRES 3.

484

00:24:48,240 --> 00:24:52,930

BUT WHAT IS -- WHAT IS A JOURNEY
ON MARS FOR OUR ASTRONAUTS?

485

00:24:52,930 --> 00:24:55,880

IT'S REALLY WHAT WE CALL THE
EXPLORATION ZONE.

486

00:24:55,880 --> 00:24:59,620

IT'S A ZONE OF ABOUT 100
KILOMETERS IN DIAMETER.

487

00:24:59,620 --> 00:25:00,920

NEXT SLIDE, PLEASE.

488

00:25:00,920 --> 00:25:04,850

AND HERE YOU SEE WHAT'S REALLY
IN THE EXPLORATION ZONE.

489

00:25:04,850 --> 00:25:06,740

WE WILL LAND IN AN AREA.

490

00:25:06,740 --> 00:25:08,640

WE WILL LIVE IN ANOTHER AREA.

491

00:25:08,640 --> 00:25:12,920

WE WILL DO SCIENTIFICALLY
COMPELLING RESEARCH IN DIFFERENT

492

00:25:12,920 --> 00:25:14,790

REGIONS.

493

00:25:14,790 --> 00:25:19,850

AND WE WILL USE THE RESOURCES AT
HAND, EXTRACTING OXYGEN FROM THE

494

00:25:19,850 --> 00:25:21,140

AIR, PERHAPS EVEN WATER.

495

00:25:21,140 --> 00:25:24,400

WE KNOW NOW THAT MARS IS MORE
HUMID THAN WE THOUGHT.

496

00:25:24,400 --> 00:25:26,690

CAN WE GROW MORE THINGS ON MARS?

497

00:25:26,690 --> 00:25:30,710

WE KNOW THERE ARE NITRATES IN
THE SOIL, FAR MORE THAN WE EVER

498

00:25:30,710 --> 00:25:31,710

IMAGINED.

499

00:25:31,710 --> 00:25:37,000

THE MORE WE LEARNED ABOUT MARS
THE MORE WE CAN DESIGN HUMAN

500

00:25:37,000 --> 00:25:41,800

EXPLORATION TO LIVE, SURVIVE AND
WORK ON THE PLANET AND RETURN.

501

00:25:41,800 --> 00:25:46,720

WE WILL USE THESE THROUGH THESE
RESOURCE UTILIZATION ACTIVITIES.

502

00:25:46,720 --> 00:25:48,810

ISRU THEY'RE CALLED.

503

00:25:48,810 --> 00:25:53,850

THIS IS THE KIND OF ACTIVITY
THAT COMBINES SCIENCE,

504

00:25:53,850 --> 00:25:58,540

TECHNOLOGY AND HUMAN EXPLORATION
IN OUR JOURNEY TOWARDS MARS.

505

00:25:58,540 --> 00:26:01,380

SO IN THE BRIEF FEW MINUTES THAT
I HAVE, I HOPE I HAVE GIVEN YOU

506

00:26:01,380 --> 00:26:05,000

AN IDEA AS TO OUR PLANS IN THE
FUTURE.

507

00:26:05,000 --> 00:26:08,820

WHEN I GO TO THE MOVIES THIS IS
NO DIFFERENT, I CHECK MY SCIENCE

508

00:26:08,820 --> 00:26:09,920

AT THE DOOR.

509

00:26:09,920 --> 00:26:11,740

I LIVE AND BREATHE IT ALL DAY.

510

00:26:11,740 --> 00:26:15,120

I WANT TO ENJOY THE ENVIRONMENT,
BUT WHAT'S REALLY GREAT ABOUT

511

00:26:15,120 --> 00:26:18,440

IT, IT GETS SO MANY THINGS
RIGHT.

512

00:26:18,440 --> 00:26:21,190

AND SO I HOPE YOU WILL ENJOY THE
BOOK AND ENJOY THE MOVIE.

513

00:26:21,190 --> 00:26:22,780

NEXT SLIDE, PLEASE.

514

00:26:22,780 --> 00:26:25,850

BECAUSE THERE'S AN EVOLUTION OF
ACTIVITY, IT STARTS WITH THE

515

00:26:25,850 --> 00:26:30,200

SCIENCE THAT WE DO AND THE
UNDERSTANDING THAT WE HAVE ABOUT

516

00:26:30,200 --> 00:26:34,190

GOING TO MARS AND IT'S ESSENTIAL
THAT WE DO THAT AND THAT WILL

517

00:26:34,190 --> 00:26:38,600

ENABLE HUMAN EXPLORATION TO BE
SUCCESSFUL.

518

00:26:38,600 --> 00:26:44,250

THANK YOU VERY MUCH.

519

00:26:44,250 --> 00:26:51,370

[APPLAUSE]

SO NOW IT'S MY GREAT PLEASURE TO

520

00:26:51,370 --> 00:26:56,880

INTRODUCE ANDY WEIR, THE AUTHOR
OF "THE MARTIAN."

521

00:26:56,880 --> 00:26:59,410

AND I BELIEVE HE'S COMING IN
OVER THE INTERNET.

522

00:26:59,410 --> 00:27:01,100

THERE HE IS.

523

00:27:01,100 --> 00:27:02,230

HEY, ANDY.

524

00:27:02,230 --> 00:27:06,300

IT'S ALL YOURS.

525

00:27:06,300 --> 00:27:09,940

>> HI.

526

00:27:09,940 --> 00:27:12,150

THERE WE GO.

527

00:27:12,150 --> 00:27:14,150
WELL, HI.

528
00:27:14,150 --> 00:27:17,200
AS JIM SAID I'M ANDY WEIR AND I
WROTE "THE MARTIAN."

529
00:27:17,200 --> 00:27:19,920
IT'S A GREAT PLEASURE TO BE HERE
TODAY.

530
00:27:19,920 --> 00:27:22,140
BACK WHEN I WAS A KID I WANTED
TO BE A WRITER, I ALWAYS WANTED

531
00:27:22,140 --> 00:27:25,090
ON THE A WRITER BUT I ALWAYS
LIKE EATING REGULAR MEALS AND

532
00:27:25,090 --> 00:27:28,250
LIVING PLACES OTHER THAN PARK
BENCHES SO I DECIDED TO GO INTO

533
00:27:28,250 --> 00:27:29,750
I THINKER -- ENGINEERING.

534
00:27:29,750 --> 00:27:34,810
SO I WAS A COMPUTER PROGRAMMER
FOR 25 YEARS BEFORE I MANAGED TO

535
00:27:34,810 --> 00:27:38,310
BUNGLER INTO THIS BOOK THAT I
WROTE.

536
00:27:38,310 --> 00:27:41,180
I NEVER IMAGINED IT WOULD BE AS
SUCCESSFUL AS IT IS.

537
00:27:41,180 --> 00:27:45,320
I'M JUST BASICALLY A SPACE DORK

WHO WROTE A STORY EXPECTING A

538

00:27:45,320 --> 00:27:49,740

FEW THOUSAND PEOPLE WHO LOVE
SCIENCE TO ENJOY IT AND THAT'S

539

00:27:49,740 --> 00:27:51,730

ABOUT IT.

540

00:27:51,730 --> 00:27:55,630

BUT I CAN TELL YOU THAT 25 YEARS
OF BEING A COMPUTER PROGRAMMER

541

00:27:55,630 --> 00:27:57,650

HAS TAUGHT ME ONE IMPORTANT
THING.

542

00:27:57,650 --> 00:27:59,900

YOU NEED TO BACK UP YOUR WORK.

543

00:27:59,900 --> 00:28:03,710

SO THAT'S WHY IT'S SO IMPORTANT
THAT WE LEARN HOW TO SEND HUMANS

544

00:28:03,710 --> 00:28:04,970

TO OTHER WORLDS.

545

00:28:04,970 --> 00:28:08,770

BECAUSE AS LONG AS OUR ENTIRE
SPECIES REMAINS ON A SINGLE

546

00:28:08,770 --> 00:28:12,230

PLANET, WE HAVE A NONZERO CHANCE
OF EXTINCTION.

547

00:28:12,230 --> 00:28:15,560

COULD BE A WAR, COULD BE AN
ASTEROID OR A PLAGUE, I DON'T

548

00:28:15,560 --> 00:28:16,560
KNOW.

549
00:28:16,560 --> 00:28:19,580
BUT IF WE'RE LIVING ON TWO
DIFFERENT WORLDS OR MORE OUR

550
00:28:19,580 --> 00:28:22,200
CHANCE OF DYING OUT DROPS TO
BASICALLY ZERO.

551
00:28:22,200 --> 00:28:26,220
NOW, WHEN I WROTE "THE MARTIAN"
I HAD ONE HUGE ADVANTAGE AND

552
00:28:26,220 --> 00:28:28,720
THAT I DON'T ACTUALLY HAVE TO BE
RIGHT.

553
00:28:28,720 --> 00:28:31,120
I GAVE IT MY BEST SHOT AND I
TRIED TO MAKE THE SCIENCE AS

554
00:28:31,120 --> 00:28:32,530
ACCURATE AS POSSIBLE.

555
00:28:32,530 --> 00:28:34,380
BUT IF I'M WRONG, NOBODY DIES.

556
00:28:34,380 --> 00:28:36,020
NOBODY GETS HURT.

557
00:28:36,020 --> 00:28:39,880
ALL I GET IS A FEW NASA FOLKS
GLANCING AT THE BOOK ROLLING

558
00:28:39,880 --> 00:28:42,540
THEIR EYES AND SAYING HE GOT
THAT WRONG AND THEN THEY MOVE ON

559

00:28:42,540 --> 00:28:43,660

WITH THE STORY.

560

00:28:43,660 --> 00:28:46,540

WAS THERE ARE NUMEROUS PROBLEMS
THAT NEED TO BE SOLVED AND

561

00:28:46,540 --> 00:28:50,390

SOLVED CORRECTLY BY THE
ENGINEERS AND SCIENTISTS AT NASA

562

00:28:50,390 --> 00:28:54,380

AND AROUND THE WORLD BEFORE WE
CAN GET TO MARS.

563

00:28:54,380 --> 00:28:57,550

FIRST OFF, WE NEED TO FIND OUT
HOW TO GET INTO LOWER EARTH

564

00:28:57,550 --> 00:29:02,290

ORBIT CHEAPER THAN WE ARE RIGHT
NOW.

565

00:29:02,290 --> 00:29:07,270

HAVING THE SPACE STATION ON THE
TRAJECTORY ON ANYTHING

566

00:29:07,270 --> 00:29:11,400

RESEMBLING A REASONABLE BUDGET
UNTIL WE HAVE BETTER BOOSTER

567

00:29:11,400 --> 00:29:14,470

TECHNOLOGY.

568

00:29:14,470 --> 00:29:21,350

AND SPACEX AND OTHERS ARE
DRIVING THAT PRICE DOWN.

569

00:29:21,350 --> 00:29:24,390

NEXT UP WE NEED A PROPULSION
SYSTEM TO GET THERE.

570

00:29:24,390 --> 00:29:28,340

I THINK PROPULSION IS THE WAY TO
GO NOT OTHERS AGREE.

571

00:29:28,340 --> 00:29:33,300

OTHERS THINK THAT LUNAR FUEL
DEPOTS ARE A GOOD WAY TO MAKE

572

00:29:33,300 --> 00:29:34,650

THINGS HAPPEN.

573

00:29:34,650 --> 00:29:38,060

AND THE IMPORTANT THING IS THAT
WE HAVE THESE DISCUSSIONS.

574

00:29:38,060 --> 00:29:40,830

NEXT UP, WE NEED TO DEAL WITH
RADIATION.

575

00:29:40,830 --> 00:29:45,980

THE EARTH'S MAGNETIC FIELD
PROTECTS ISS FROM THE HARMFUL

576

00:29:45,980 --> 00:29:49,550

RADIATION IN DEEP SPACE OR FROM
MOST OF IT, BUT A SHIP TRAVELING

577

00:29:49,550 --> 00:29:51,750

TO MARS AND THE ASTRONAUTS
TRAVELING TO MARS WOULD HAVE A

578

00:29:51,750 --> 00:29:55,720

SEVERE PROBLEM WITH I. THAT
NEEDS TO BE SOLVED AND THE ONLY

579

00:29:55,720 --> 00:29:59,760

WAY WE HAVE TO SOLVE THAT IS BY

ADDING MAST TO THE SHIP.

580

00:29:59,760 --> 00:30:03,910

AND FINALLY, WE NEED TO DEAL
WITH THE PROBLEM OF LONG TERM

581

00:30:03,910 --> 00:30:06,320

HUMAN HABITATION IN SPACE.

582

00:30:06,320 --> 00:30:09,460

THAT'S WHAT THE ASTRONAUTS
ABOARD ISS ARE WORKING ON RIGHT

583

00:30:09,460 --> 00:30:10,460

NOW.

584

00:30:10,460 --> 00:30:13,420

MY PERSONAL BELIEF IS THAT WE
SHOULD BE WORKING ON CENTRIFUGAL

585

00:30:13,420 --> 00:30:17,820

GRAVITY, BUT IT'S IMPORTANT TO
FIND OUT WHAT HAPPENS WHEN YOU

586

00:30:17,820 --> 00:30:21,920

HAVE AN ASTRONAUT IN SPACE FOR A
LONG TIME AND FIND OUT THE

587

00:30:21,920 --> 00:30:24,360

EFFECTS IT HAS ON THE HUMAN
BODY.

588

00:30:24,360 --> 00:30:27,490

AS I SAID, FORTUNATELY, I DIDN'T
NEED TO GET ANY OF THIS STUFF

589

00:30:27,490 --> 00:30:28,490

RIGHT.

590

00:30:28,490 --> 00:30:29,490

I CAN JUST SPECULATE.

591

00:30:29,490 --> 00:30:31,400

NOTHING BAD HAPPENS IF I GET IT
WRONG.

592

00:30:31,400 --> 00:30:33,880

EVERYTHING BAD HAPPENS IF NASA
GETS IT WRONG.

593

00:30:33,880 --> 00:30:37,550

THAT'S WHY WE'RE ON OUR JOURNEY
NOW TO TRY TO GET ASTRONAUTS TO

594

00:30:37,550 --> 00:30:40,890

MARS IN THE 20, 30s, MAYBE
LATER.

595

00:30:40,890 --> 00:30:44,100

AND WE'LL JUST -- WE'LL JUST ALL
WORK TOGETHER TO MAKE THAT

596

00:30:44,100 --> 00:30:45,100

HAPPEN.

597

00:30:45,100 --> 00:30:46,840

BACK TO YOU.

598

00:30:46,840 --> 00:30:51,610

[APPLAUSE]

>> VERY COOL.

599

00:30:51,610 --> 00:30:54,790

THANKS, ANDY.

600

00:30:54,790 --> 00:30:58,080

ACTUALLY VERY GOOD TO VIRTUALLY
MEET YOU.

601
00:30:58,080 --> 00:31:01,480
I'M TARA RUTLY AND I HAVE SOME
QUESTIONS FOR YOU.

602
00:31:01,480 --> 00:31:04,400
SUBMITTED FROM OUR OWN NASA
EMPLOYEES.

603
00:31:04,400 --> 00:31:06,890
SO LET'S FIND OUT WHAT THE NASA
FAMILY WOULD LIKE TO HEAR ABOUT.

604
00:31:06,890 --> 00:31:08,240
ARE YOU READY?

605
00:31:08,240 --> 00:31:09,240
>> YEAH.

606
00:31:09,240 --> 00:31:10,240
>> OKAY.

607
00:31:10,240 --> 00:31:11,240
LET'S GO.

608
00:31:11,240 --> 00:31:13,120
FIRST QUESTION, THIS ONE IS FROM
AMES.

609
00:31:13,120 --> 00:31:16,090
IF YOU HAD THE OPPORTUNITY WOULD
YOU GO TO MARS OR AT LEAST A

610
00:31:16,090 --> 00:31:22,110
MARS SIM YOULATION -- SIMULATION
STATION?

611
00:31:22,110 --> 00:31:28,490
>> NO, I WRITE ABOUT BRAVE
PEOPLE BUT I'M NOT ONE OF THEM.

612
00:31:28,490 --> 00:31:29,490
>> ALL RIGHT.

613
00:31:29,490 --> 00:31:31,150
NO NEED TO ELABORATE.

614
00:31:31,150 --> 00:31:37,610
NUMBER TWO, WHERE DID THE IDEA
ORIGINATE FOR YOUR BOOK?

615
00:31:37,610 --> 00:31:38,610
THIS IS FROM HEADQUARTERS.

616
00:31:38,610 --> 00:31:43,470
>> WELL, I WAS -- WELL, I WAS
SITTING AROUND IMAGINING HOW A

617
00:31:43,470 --> 00:31:47,440
MANNED SPACE FLIGHT TO MARS
COULD GO, USING ONLY REAL

618
00:31:47,440 --> 00:31:48,440
TECHNOLOGY.

619
00:31:48,440 --> 00:31:51,970
AND I STARTED COMING UP WITH
OKAY, HOW DO WE GET THEM THERE,

620
00:31:51,970 --> 00:31:54,330
WHAT DO WE DO WITH THEM ONCE
THEY'RE THERE, HOW DO WE GET

621
00:31:54,330 --> 00:32:00,070
THEM SAFELY BACK TO EARTH WHAT
DO WE DO IF OR THAT BREAKS, YOU

622
00:32:00,070 --> 00:32:04,500
NEED TO ACCOUNT FOR FAILURES

ANYBODY AT NASA CAN TELL YOU

623

00:32:04,500 --> 00:32:05,810

THAT.

624

00:32:05,810 --> 00:32:08,310

I STARTED TO REALIZE THAT THE
PROBLEMS THAT THE CREW WOULD

625

00:32:08,310 --> 00:32:10,750

FACE AND THE INCREASINGLY
DESPERATE THINGS THEY HAD TO DO

626

00:32:10,750 --> 00:32:13,860

TO STAY ALIVE STARTED TO SOUND
PRETTY INTERESTING AND MIGHT

627

00:32:13,860 --> 00:32:17,220

MAKE FOR A GREAT STORY SO I
CREATED A PROTAGONIST AND

628

00:32:17,220 --> 00:32:23,550

SUBJECTED HIM TO ALL OF THEM.

629

00:32:23,550 --> 00:32:27,110

>> NEXT QUESTION IS FROM JOHNSON
SPACE CENTER.

630

00:32:27,110 --> 00:32:33,590

I'M AN ANTHROPOLOGISTS WORKING
WITH FOLKS HERE ON MY

631

00:32:33,590 --> 00:32:40,610

DISSERTATION WORK.

632

00:32:40,610 --> 00:32:45,710

WHY DIDN'T THE AIRES 3 CREW HAVE
ANOTHER TYPE OF ADVANCED ROBOT

633

00:32:45,710 --> 00:32:48,520

WITH THEM ON MARS?

634

00:32:48,520 --> 00:32:51,840

>> BECAUSE I WAS WRITING A STORY
THAT I WANTED TO BE COOL AND

635

00:32:51,840 --> 00:32:52,840

AWESOME.

636

00:32:52,840 --> 00:32:56,150

AND I WAS JUST TRYING TO HARKEN
BACK TO THE APOLLO ERA AND PULL

637

00:32:56,150 --> 00:32:57,520

ON THE HEART STRINGS.

638

00:32:57,520 --> 00:33:00,590

IT WASN'T AN ACCURATE
REPRESENTATION OF WHAT I THOUGHT

639

00:33:00,590 --> 00:33:03,550

THE MANNED MISSION TO MARS WOULD
BE.

640

00:33:03,550 --> 00:33:07,370

IT'S FUNNY THAT I'M ASKED A
QUESTION BY AN EXPERT IN THIS

641

00:33:07,370 --> 00:33:08,370

FIELD.

642

00:33:08,370 --> 00:33:11,970

I THINK THE FIRST TIME WE SENT
HUMANS TO MARS IT WILL -- FIRST

643

00:33:11,970 --> 00:33:13,970

OFF, IT WILL BE A LARGE
INTERNATIONAL EFFORT.

644

00:33:13,970 --> 00:33:16,080

I DOUBT AT THE JUST BE NASA ON
ITS OWN.

645

00:33:16,080 --> 00:33:17,670

IT WILL MORE LIKE ISS.

646

00:33:17,670 --> 00:33:21,050

SECOND OFF, I THINK IT WILL BE
HUMANS IN MARS ORBIT CONTROLLING

647

00:33:21,050 --> 00:33:22,870

ROBOTS ON THE SURFACE.

648

00:33:22,870 --> 00:33:26,210

SO YOU HAVE HUMAN BRAINS
CONTROLLING ROBOTS WITH NO

649

00:33:26,210 --> 00:33:27,210

LATENCY.

650

00:33:27,210 --> 00:33:30,100

I THINK THAT'S GOING TO BE THE
SHORTEST ROUTE TO GETTING AS

651

00:33:30,100 --> 00:33:32,330

MUCH SCIENCE AS POSSIBLE OUT OF
MARS.

652

00:33:32,330 --> 00:33:38,050

AND SO I THINK THAT IN REAL LIFE
AS OPPOSED TO MY STORY, THE

653

00:33:38,050 --> 00:33:41,870

HUMAN ROBOT CONTROLLED -- REMOTE
CONTROLLED EXPLORATION OF MARS

654

00:33:41,870 --> 00:33:44,750

IN REAL TIME IS GOING TO BE

CRITICAL AND WILL PROBABLY BE

655

00:33:44,750 --> 00:33:47,620

THE FIRST MANNED MARS MISSION.

656

00:33:47,620 --> 00:33:48,620

>> FANTASTIC.

657

00:33:48,620 --> 00:33:49,620

OKAY.

658

00:33:49,620 --> 00:33:50,620

THANK YOU.

659

00:33:50,620 --> 00:33:51,620

THE NEXT QUESTION IS FROM
GODDARD.

660

00:33:51,620 --> 00:33:53,870

ANDY, WE LOVED YOUR NOVEL.

661

00:33:53,870 --> 00:33:57,580

I WAS CONFUSED BY THE STRONG
STORM THAT COULD POSSIBLY TOPPLE

662

00:33:57,580 --> 00:33:59,710

A SPACECRAFT.

663

00:33:59,710 --> 00:34:02,450

AND SO WAS THE BASIS FOR THIS
ACTUAL SURVEY INFORMATION FROM

664

00:34:02,450 --> 00:34:07,530

NASA MISSIONS OR EXTRAPOLATED
FROM SOMETHING OR A PLOT TO MOVE

665

00:34:07,530 --> 00:34:09,210

THE STORY ALONG?

666

00:34:09,210 --> 00:34:12,839

THE STRONG STORM ON MARS?

667

00:34:12,839 --> 00:34:16,169

>> I MADE IT ALL UP.

668

00:34:16,169 --> 00:34:20,909

IT WAS -- THERE IS NOTHING --
NOTHING LIKE THAT COULD ACTUALLY

669

00:34:20,909 --> 00:34:23,170

HAPPEN ON THE SURFACE OF MARS.

670

00:34:23,170 --> 00:34:27,350

THE ATMOSPHERIC DENSITY IS ABOUT
ONE HALF OF 1% OF EARTH'S

671

00:34:27,350 --> 00:34:30,150

ATMOSPHERE.
150 KILOMETER AN HOUR SAND

672

00:34:30,150 --> 00:34:40,600

STORMS HAPPEN, BUT IT FEELS LIKE
A GENTLE BREEZE ON EARTH.

673

00:34:40,600 --> 00:34:45,001

THERE'S AN EXPLOSION, AND THAT
CAUSES ALL THE PROBLEMS, BUT IT

674

00:34:45,001 --> 00:34:46,669

JUST WASN'T AS COOL.

675

00:34:46,669 --> 00:34:47,669

IT WASN'T AS INTERESTING.

676

00:34:47,669 --> 00:34:50,570

IT WAS A MAN VERSUS NATURE STORY
AND I WANTED NATURE TO GET THE

677

00:34:50,570 --> 00:34:52,040

FIRST PUNCH IN.

678

00:34:52,040 --> 00:34:55,649

I MADE THAT CONCESSION TO
REALITY.

679

00:34:55,649 --> 00:34:57,520

I KIND OF REGRET IT.

680

00:34:57,520 --> 00:35:01,610

ESPECIALLY NOW THAT I HAVE
CONTACTS ALL OVER AEROSPACE.

681

00:35:01,610 --> 00:35:05,060

I NOW KNOW THERE'S LIGHTNING ON
MARS AND THAT COULD HAVE BEEN A

682

00:35:05,060 --> 00:35:07,210

GREAT WAY TO HAVE THE PLOT START
OFF.

683

00:35:07,210 --> 00:35:08,210

>> YEAH.

684

00:35:08,210 --> 00:35:10,750

>> BUT I DIDN'T KNOW THAT AT THE
TIME.

685

00:35:10,750 --> 00:35:11,860

SO IT IS WHAT IT IS.

686

00:35:11,860 --> 00:35:14,340

BUT IT WAS A DELIBERATE
CONCESSION TO NARRATIVE.

687

00:35:14,340 --> 00:35:18,520

I KNEW I WAS LYING AT THE TIME.

688

00:35:18,520 --> 00:35:19,690

>> OH.

689

00:35:19,690 --> 00:35:20,690

VERY GOOD.

690

00:35:20,690 --> 00:35:21,690

OKAY.

691

00:35:21,690 --> 00:35:22,690

BUT WE HAVE ONE MORE QUESTION
FOR YOU.

692

00:35:22,690 --> 00:35:27,740

SORRY, WE WON'T GET TO ALL OF
THEM, BUT THIS IS FROM MARSHALL.

693

00:35:27,740 --> 00:35:31,119

DO YOU CONSIDER NUCLEAR
PROPULSION FOR POWERING THE

694

00:35:31,119 --> 00:35:36,220

HERMES --

>> NUCLEAR THERMAL THAT'S WHERE

695

00:35:36,220 --> 00:35:39,350

YOU USE A NUCLEAR REACTOR TO
HEAT UP THE ELEMENT AND SPIT IT

696

00:35:39,350 --> 00:35:40,350

OUT THE BACK?

697

00:35:40,350 --> 00:35:41,350

>> YES.

698

00:35:41,350 --> 00:35:45,490

I'M GETTING NODS FROM THE
AUDIENCE YOU'RE CORRECT ON THAT.

699

00:35:45,490 --> 00:35:48,020

>> YEAH, YEAH.

700

00:35:48,020 --> 00:35:51,710

I DON'T KNOW ENOUGH ABOUT THE
DIFFERENCE BETWEEN NUCLEAR

701

00:35:51,710 --> 00:35:56,050

THERMAL AND MAGNETIC ION
PROPULSION.

702

00:35:56,050 --> 00:35:59,170

IN THE BOOK, THEY HAVE BASICALLY
BASS AHER DRIVES.

703

00:35:59,170 --> 00:36:02,750

IF NUCLEAR THERMAL IS A BETTER
IMPULSE FOR THE PROPELLANT, I

704

00:36:02,750 --> 00:36:04,230

SAY DO THAT.

705

00:36:04,230 --> 00:36:07,590

I DON'T BELIEVE THERE'S ANY WAY
TO GO TO MARS WITHOUT A REACTOR

706

00:36:07,590 --> 00:36:08,990

ABOARD THE SHIP.

707

00:36:08,990 --> 00:36:10,860

SO PEOPLE NEED TO ACCEPT THAT.

708

00:36:10,860 --> 00:36:13,960

THEN THE NEXT QUESTION IS WHAT
IS IT THAT GETS US THIS WITH THE

709

00:36:13,960 --> 00:36:16,290

LEAST AMOUNT OF PROPELLANT MASS?

710

00:36:16,290 --> 00:36:18,330

SO I GUESS I DON'T KNOW ENOUGH
TO ANSWER THAT QUESTION.

711

00:36:18,330 --> 00:36:20,630

BUT I THINK IT SHOULD BE, YOU
KNOW, SOMETHING THAT'S ON THE

712

00:36:20,630 --> 00:36:21,740

TABLE AND CONSIDERED.

713

00:36:21,740 --> 00:36:22,740

>> YEAH.

714

00:36:22,740 --> 00:36:23,740

COOL.

715

00:36:23,740 --> 00:36:24,740

THANK YOU.

716

00:36:24,740 --> 00:36:25,740

WELL, THANK YOU, ANDY.

717

00:36:25,740 --> 00:36:26,740

THAT WAS OUR -- THAT WAS ALL THE
TIME WE HAVE.

718

00:36:26,740 --> 00:36:29,190

I'M SORRY WE COULDN'T GET TO ALL
THE QUESTION, IT WAS A LONG THE

719

00:36:29,190 --> 00:36:32,410

LIST, BUT THANK YOU FOR YOUR
TIME TODAY.

720

00:36:32,410 --> 00:36:36,460

>> THANKS FOR HAVING ME.

721

00:36:36,460 --> 00:36:40,520

[APPLAUSE]

>> ALL RIGHT, EVERYONE.

722

00:36:40,520 --> 00:36:47,160

WE HAVE HEARD ANDY'S STORY AND
NOW WE'LL HEAR MORE ABOUT THE

723

00:36:47,160 --> 00:36:48,800

NASA MISSION TO MARS STORY.

724

00:36:48,800 --> 00:36:51,070

SO WE'LL HEAR FROM OUR
LEADERSHIP.

725

00:36:51,070 --> 00:36:53,790

WE ARE GOING TO MARS AND TO TELL
US ABOUT THOSE DIFFERENT THINGS

726

00:36:53,790 --> 00:36:57,330

I'LL TURN IT OVER TO NASA'S OWN
DEPUTY ADMINISTRATOR DAVID

727

00:36:57,330 --> 00:37:00,510

NEWMAN AND WHILE THEY'RE GETTING
READY AND SHE'S GETTING READY IN

728

00:37:00,510 --> 00:37:03,090

THE NEXT PANEL LET'S LOOK AT

729

00:37:03,090 --> 00:37:08,380

NASA'S BRAND-NEW VIDEO ABOUT OUR
JOURNEY TO MARS.

730

00:37:08,380 --> 00:37:15,140

>> FOR FIRST TIME SINCE THE
APOLLO MOON LANDINGS, NASA IS

731

00:37:15,140 --> 00:37:20,200

PREPARING TO SEND ASTRONAUTS

BEYOND EARTH ORBIT.

732

00:37:20,200 --> 00:37:26,470

AND THIS TIME THE MISSION IS THE
MOST AMBITIOUS WE HAVE EVER

733

00:37:26,470 --> 00:37:29,360

UNDERTAKEN.

734

00:37:29,360 --> 00:37:40,920

THE JOURNEY TO MARS.

735

00:37:40,920 --> 00:37:43,630

CARRYING OUT THIS JOURNEY WILL
REQUIRE BRINGING TOGETHER THE

736

00:37:43,630 --> 00:37:45,630

BEST OF OUR EFFORTS.

737

00:37:45,630 --> 00:37:49,470

FROM ROBOTIC PROBES TO
TECHNOLOGY DEVELOPMENT TO

738

00:37:49,470 --> 00:37:54,030

ASTRONAUTS IN ORBIT, TO ROBUST
NEW SPACE VEHICLES.

739

00:37:54,030 --> 00:37:59,510

THE JOURNEY IS ALREADY UNDERWAY
RIGHT HERE, RIGHT NOW.

740

00:37:59,510 --> 00:38:01,869

ASTRONAUTS ABOARD THE
INTERNATIONAL SPACE STATION ARE

741

00:38:01,869 --> 00:38:04,840

LEARNING MORE ABOUT LIVING AND
WORKING IN SPACE FOR LONG

742

00:38:04,840 --> 00:38:06,450
PERIODS OF TIME.

743
00:38:06,450 --> 00:38:10,760
VITAL INFORMATION FOR THE
CHALLENGING TRIP TO MARS.

744
00:38:10,760 --> 00:38:15,560
TRANSPORTATION TO AND FROM THE
STATION WILL BE PROVIDED BY OUR

745
00:38:15,560 --> 00:38:18,620
AMERICAN COMMERCIAL CARGO AND
CREW PARTNERS.

746
00:38:18,620 --> 00:38:25,670
NEXT USING THE ORION CREW
VEHICLE AND THE LAUNCH ROCKET,

747
00:38:25,670 --> 00:38:29,350
NASA WILL MOVE INTO THE PROVING
GROUND OF SPACE, AROUND AND

748
00:38:29,350 --> 00:38:30,540
BEYOND THE MOON.

749
00:38:30,540 --> 00:38:34,690
HERE WE WILL CARRY OUT
INCREASINGLY AMBITIOUS MISSIONS

750
00:38:34,690 --> 00:38:38,350
TO TEST OUT NEW SYSTEMS AND
CAPABILITIES NEEDED TO REACH

751
00:38:38,350 --> 00:38:39,760
MARS.

752
00:38:39,760 --> 00:38:43,870
LIKE DEEP SPACE HABITATS AND
ADVANCED PROPULSION SYSTEMS.

753

00:38:43,870 --> 00:38:50,380

EVEN AS WE SPEAK, OUR ROBOTIC
SCOUTS ARE ALREADY EXPLORING THE

754

00:38:50,380 --> 00:38:52,300

RED PLANET.

755

00:38:52,300 --> 00:38:55,180

PREPARING THE WAY FOR ASTRONAUTS
TO JOIN THEM.

756

00:38:55,180 --> 00:38:58,740

ONCE WE HAVE MATURED OUR
CAPABILITIES IN THE PROVING

757

00:38:58,740 --> 00:39:04,220

GROUND, WE'LL BE READY FOR EARTH
INDEPENDENCE, REACHING OUR

758

00:39:04,220 --> 00:39:05,660

PLANETARY NEIGHBOR.

759

00:39:05,660 --> 00:39:11,960

NOT JUST AS TEMPORARY VISITORS,
BUT AS PIONEERS EXPANDING HUMAN

760

00:39:11,960 --> 00:39:18,710

PRESENCE INTO OUR SOLAR SYSTEM.

761

00:39:18,710 --> 00:39:26,870

[APPLAUSE]

>> HELLO.

762

00:39:26,870 --> 00:39:34,601

SHOUT OUT TO ALL OF OUR NASA
CENTERS FOR JOINING US AND FOR

763

00:39:34,601 --> 00:39:35,670

EVERYONE ELSE.

764

00:39:35,670 --> 00:39:38,520
GOT TO SEE THE LITTLE END
TRAILER OF THE VIDEO BE

765

00:39:38,520 --> 00:39:41,820
AVAILABLE TO EVERYONE.

766

00:39:41,820 --> 00:39:45,440
IF YOU'RE WATCHING NASA TV, IN
THE PAST HOUR, YOU GOT TO SEE

767

00:39:45,440 --> 00:39:48,050
SOMETHING I WANT TO HIGHLIGHT.

768

00:39:48,050 --> 00:39:49,050
STUDENTS.

769

00:39:49,050 --> 00:39:52,080
AND ALL AROUND THE COUNTRY
THROUGH OUR DISTANCE LEARNING

770

00:39:52,080 --> 00:39:57,130
NETWORK THEY GOT TO TAKE THEIR
OWN JOURNEY TO MARS WITH AUTHOR

771

00:39:57,130 --> 00:39:58,130
ANDY WEIR.

772

00:39:58,130 --> 00:39:59,330
THANK YOU, ANDY.

773

00:39:59,330 --> 00:40:00,330
AND DR.

774

00:40:00,330 --> 00:40:04,160
CHRIS McKAY FROM NASA,
THANK YOU FOR CHRIS FOR WORKING

775

00:40:04,160 --> 00:40:07,120

WITH THE STUDENT, LETTING THEM
LIVE THE DREAM.

776

00:40:07,120 --> 00:40:08,700

IT WAS COOL.

777

00:40:08,700 --> 00:40:13,010

WE ARE ALL MARTIANS SO HELLO TO
ALL THE FOLKS HERE AT NASA

778

00:40:13,010 --> 00:40:14,140

HEADQUARTERS.

779

00:40:14,140 --> 00:40:18,960

ALL OF US ARE REAL MARTIANS AND
WE'RE GOING TO BE CELEBRATING

780

00:40:18,960 --> 00:40:20,920

AND TELLING OUR OWN STORY.

781

00:40:20,920 --> 00:40:24,100

AND IT'S REALLY ALL OF YOU
MAKING THIS WORK HAPPEN ON A

782

00:40:24,100 --> 00:40:25,640

DAILY BASIS -- ON A DAILY BASIS.

783

00:40:25,640 --> 00:40:27,630

I GET TO WELCOME DR.

784

00:40:27,630 --> 00:40:31,450

JIM GREEN
WHO YOU ALREADY MET, THE LEAD

785

00:40:31,450 --> 00:40:33,440

GURU MARTIAN IN THIS.

786

00:40:33,440 --> 00:40:36,730

HE'S THE DIRECTOR OF THE
PLANETARY SCIENCE DIVISION HERE

787

00:40:36,730 --> 00:40:39,900

AT NASA SCIENCE DIVISION
DIRECTORATE.

788

00:40:39,900 --> 00:40:44,980

NEXT TO HIM IS JEFF TEE HI, AND
OFFICER FROM OUR SPACE

789

00:40:44,980 --> 00:40:47,350

TECHNOLOGY MISSION DIRECT.

790

00:40:47,350 --> 00:40:54,830

AND THEN
FROM HUMAN EXPLORATIONS

791

00:40:54,830 --> 00:40:57,300

AND OPERATIONS MISSION
DIRECTORATE.

792

00:40:57,300 --> 00:41:01,440

LOOKING FORWARD TO JOINING THEM
IN A PANEL BUT FIRST I WANT TO

793

00:41:01,440 --> 00:41:04,960

TELL YOU WHERE I HAVE BEEN AND
QUICK SNIPPET TO THE LAST FEW

794

00:41:04,960 --> 00:41:05,960

MONTHS.

795

00:41:05,960 --> 00:41:07,700

I HAD THE OPPORTUNITY TO TRAVEL
TO ALL OF OUR NASA CENTERS.

796

00:41:07,700 --> 00:41:10,230

AND I HAVE TO TELL YOU I'M
OVERWHELMED WITH ALL THE

797

00:41:10,230 --> 00:41:11,710
PROGRESS WE'RE MAKING TO MARS.

798

00:41:11,710 --> 00:41:15,020
I CAME HERE, I'M FOCUSED ON THE
EXPLORATION, TECHNOLOGY,

799

00:41:15,020 --> 00:41:18,440
INNOVATION AND EDUCATION AND
WE'RE THERE.

800

00:41:18,440 --> 00:41:19,440
THIS IS HARDWARE.

801

00:41:19,440 --> 00:41:20,440
THIS IS SOFTWARE.

802

00:41:20,440 --> 00:41:21,440
IT IS BEING BUILT.

803

00:41:21,440 --> 00:41:23,609
I GOT TO SEE THE SPACE LAUNCH
SYSTEM.

804

00:41:23,609 --> 00:41:24,869
IT'S REALLY BIG.

805

00:41:24,869 --> 00:41:27,760
GOT TO SEE IT BEING
MANUFACTURED.

806

00:41:27,760 --> 00:41:32,660
THIS HEAVY LIFT LAUNCH
CAPABILITY, IT'S REALLY COME ON.

807

00:41:32,660 --> 00:41:36,390

OF COURSE IT'S ACCOMPANIED BY
THE ORION VEHICLE THAT JUST THIS

808

00:41:36,390 --> 00:41:39,080

WEEK THE TWO HALVES CAME
TOGETHER OR WERE WELDED.

809

00:41:39,080 --> 00:41:41,880

THAT'S IMPORTANT WHEN YOU'RE IN
A SPACE VEHICLE.

810

00:41:41,880 --> 00:41:44,300

YOU WANT YOUR HALVES TO COME
TOGETHER AND BE WELDED.

811

00:41:44,300 --> 00:41:47,670

ALSO I GOT TO SEE THE RS 25
ENGINE FIRING.

812

00:41:47,670 --> 00:41:51,310

YEAH, I'M AN AEROSPACE ENGINEER
SO I HAVE SEEN LAUNCHES, I HAVE

813

00:41:51,310 --> 00:41:52,310

FLOWN A LOT OF EXPERIMENTS.

814

00:41:52,310 --> 00:41:57,460

BUT I GO TO KENNEDY SPACE
CENTER, IT WENT UP.

815

00:41:57,460 --> 00:42:02,150

SO TO SEE AN ENGINE FIRING,
NOTHING GOES UP.

816

00:42:02,150 --> 00:42:03,540

IT STAYS ON THE GROUND.

817

00:42:03,540 --> 00:42:07,090

THAT'S A LOT OF CONCRETE, RIGHT
TO KEEP EVERYTHING DOWN AND THE

818

00:42:07,090 --> 00:42:10,560

SMOKE THAT COMES OUT THE BACK IS
WATER VAPORATE.

819

00:42:10,560 --> 00:42:12,730

WHICH IS GREAT.

820

00:42:12,730 --> 00:42:17,950

THIS IS TO GET US TO MARS.

821

00:42:17,950 --> 00:42:21,170

THESE ARE THE VEHICLES THAT'LL
TAKE US THERE.

822

00:42:21,170 --> 00:42:23,859

SO IN MANY WAYS WE'LL KIND OF IN
A TEACHABLE MOMENT WHEN IT COMES

823

00:42:23,859 --> 00:42:25,390

TO MARS.

824

00:42:25,390 --> 00:42:26,390

GREAT MOVIE.

825

00:42:26,390 --> 00:42:27,570

I'M USUALLY A CRITIC.

826

00:42:27,570 --> 00:42:31,150

I LOVE JIM -- OKAY, LEAVE YOUR
CRITIQUE AT HOME.

827

00:42:31,150 --> 00:42:32,500

GO TO THE MOVIE AND ENJOY IT.

828

00:42:32,500 --> 00:42:33,500

I'M GUILTY OF THAT.

829

00:42:33,500 --> 00:42:34,970
THEY HAVE THE PHYSICS WRONG.

830
00:42:34,970 --> 00:42:36,310
THANKS TO ANDY.

831
00:42:36,310 --> 00:42:39,150
THIS IS A WELL RESEARCHED MOVIE.

832
00:42:39,150 --> 00:42:43,210
IT HAS A LOT OF -- YOU KNOW,
GREAT FACTUAL THINGS.

833
00:42:43,210 --> 00:42:45,310
AND ONE MORE THING MAYBE HE GOT
RIGHT.

834
00:42:45,310 --> 00:42:47,960
THE JOURNEY JUST TO NOTE THE
COMMANDER OF THE MISSION IS A

835
00:42:47,960 --> 00:42:49,070
WOMAN.

836
00:42:49,070 --> 00:42:50,820
SO MAYBE HE GOT THAT RIGHT.

837
00:42:50,820 --> 00:42:52,930
THANKS, ANDY.

838
00:42:52,930 --> 00:42:59,280
SO AS YOU KNOW, NASA FOLKS
WORKED WITH THE MOVIE FOLKS TO

839
00:42:59,280 --> 00:43:01,700
AGAIN TO TRY TO GET IT AS
REALISTIC AND ACCURATE AS

840
00:43:01,700 --> 00:43:05,110

POSSIBLE SO WE CAN BE HAPPY WITH THAT.

841

00:43:05,110 --> 00:43:08,790

AND I WANT TO HIGHLIGHT JUST A LITTLE BIT OF NASA TECHNOLOGY

842

00:43:08,790 --> 00:43:09,790

AND INNOVATION.

843

00:43:09,790 --> 00:43:11,590

YOU START WITH THE BASICS SO ENERGY.

844

00:43:11,590 --> 00:43:17,100

IM PROPULSION HAS BEEN MENTIONED BUT THAT'S WHAT NASA IS DOING,

845

00:43:17,100 --> 00:43:18,860

WE ARE TESTING IT.

846

00:43:18,860 --> 00:43:22,970

I GOT TO SEE THAT AT GLENN RESEARCH CENTER.

847

00:43:22,970 --> 00:43:26,360

LIKE A SOFT BREEZE, RIGHT?

848

00:43:26,360 --> 00:43:32,300

LOW FORCE, BUT THAT CONSTANT ACCELERATION CAN GET YOU GOING

849

00:43:32,300 --> 00:43:33,300

REALLY FAST.

850

00:43:33,300 --> 00:43:34,300

CONSTANTLY ACCELERATING.

851

00:43:34,300 --> 00:43:37,280

NOW WE'RE TALKING ABOUT 200,000
MILES PER HOUR.

852

00:43:37,280 --> 00:43:38,870

A LOT OF FORCE.

853

00:43:38,870 --> 00:43:41,860

MAKING THE INVESTMENTS FOR THE
NEXT STEP.

854

00:43:41,860 --> 00:43:45,500

BEYOND EARTH ORBIT AND THEN
EVENTUALLY TO MARS.

855

00:43:45,500 --> 00:43:47,780

LEARNED ABOUT RTGs, RIGHT.

856

00:43:47,780 --> 00:43:54,700

RADIO -- RADIO ISOTOPE
ELECTRONIC -- BATTERIES, WE HAVE

857

00:43:54,700 --> 00:43:57,320

USED THEM IN TWO MISSIONS.

858

00:43:57,320 --> 00:44:07,250

OF COURSE WE NEED THE NEXT
GENERATION ONES BUT IT'S REAL.

859

00:44:07,250 --> 00:44:08,359

YOU KNOW, THE HARDWARE IS REAL.

860

00:44:08,359 --> 00:44:09,490

THE SOFTWARE IS REAL.

861

00:44:09,490 --> 00:44:11,060

WE'RE ON MARS TODAY.

862

00:44:11,060 --> 00:44:15,930

YOU CAN DO SOME SERIOUS KIND OF

CRAZY MANEUVERS.

863

00:44:15,930 --> 00:44:19,230

AND RECENT RTGs ON THE DAWN
SPACECRAFT, DWARF PLANETS ARE MY

864

00:44:19,230 --> 00:44:20,609

FAVORITE THIS SUMMER.

865

00:44:20,609 --> 00:44:27,090

FUN TO CELEBRATE THE SPACE --
AND LIFE SUPPORT SYSTEM.

866

00:44:27,090 --> 00:44:28,930

ENVIRONMENTALLY CLOSED LIFE
SUPPORT SYSTEM.

867

00:44:28,930 --> 00:44:32,690

SO RIGHT ON STATION, WE HAVE THE
OXYGEN GENERATION SYSTEM.

868

00:44:32,690 --> 00:44:35,230

IT'S WORKING MOST OF THE TIME.

869

00:44:35,230 --> 00:44:39,450

WHAT'S THE BREAK THROUGH, WELL,
IN MARS 2020 WE'RE FLYING MOXIE.

870

00:44:39,450 --> 00:44:41,410

HOW COOL IS THAT?

871

00:44:41,410 --> 00:44:43,260

CARBON DIOXIDE, ATMOSPHERE FROM
MARS.

872

00:44:43,260 --> 00:44:46,890

KIND OF SQUEEZING -- NOT SURE
HOW WE'LL SQUEEZE IT.

873

00:44:46,890 --> 00:44:47,890
WE HAVE OXYGEN.

874
00:44:47,890 --> 00:44:50,530
NOT ENOUGH FOR HUMANS, BUT A
LITTLE TEST, YOU KNOW?

875
00:44:50,530 --> 00:44:52,550
WE'RE GOING TO MAKE OXYGEN ON
ANOTHER PLANET.

876
00:44:52,550 --> 00:44:56,180
THE FIRST TIME TO MAKE OXYGEN ON
ANOTHER PLANET AND WE'RE DOING

877
00:44:56,180 --> 00:44:57,220
IT.

878
00:44:57,220 --> 00:44:58,220
AND GET TO THE WATER.

879
00:44:58,220 --> 00:44:59,220
WE NEED WATER, RIGHT?

880
00:44:59,220 --> 00:45:02,850
AIR, WATER IS ESSENTIAL FOR A
LIFE SUPPORT SYSTEM SO UP ON

881
00:45:02,850 --> 00:45:05,420
STATION WE HAVE THE WATER
RECLAMATION SYSTEM.

882
00:45:05,420 --> 00:45:09,710
YES, WE ARE RECYCLING URINE,
YOUR BATH WATER, YOU KNOW,

883
00:45:09,710 --> 00:45:10,950
YOU'RE BRUSHING YOUR TEETH.

884

00:45:10,950 --> 00:45:13,620
BUT WHAT'S THE NEXT GENERATION?

885
00:45:13,620 --> 00:45:15,480
WE HAVE TO RECYCLE A LOT OF
WATER.

886
00:45:15,480 --> 00:45:18,510
NOW, WHEN WE GET TO MARS, YOU
KNOW, CAN WE GET SOME OF THAT

887
00:45:18,510 --> 00:45:21,230
FROZEN ICE ON THE SUB SURFACE,
PROBABLY.

888
00:45:21,230 --> 00:45:23,390
BUT LET'S PACK OUR WATER IN
CASE.

889
00:45:23,390 --> 00:45:25,940
IT'S GOOD FROM THE ENGINEERING
PERSPECTIVE.

890
00:45:25,940 --> 00:45:28,650
IF WE CAN MAKE IT, GREAT.

891
00:45:28,650 --> 00:45:29,650
THEN FOOD.

892
00:45:29,650 --> 00:45:34,060
HOPEFULLY, YOU WERE ALL WATCHING
AUGUST 10th, FARMING IN SPACE,

893
00:45:34,060 --> 00:45:35,060
RIGHT?

894
00:45:35,060 --> 00:45:36,060
THE ASTRONAUTS GOT TO EAT THE
LETTUCE.

895

00:45:36,060 --> 00:45:39,650

I THINK IT'S KIND OF SMALL
LETTUCE, BUT IT WILL GET BIGGER.

896

00:45:39,650 --> 00:45:46,500

THE TECHNOLOGIES ARE REAL,
THEY'RE LOOKING AT FRESH FOOD

897

00:45:46,500 --> 00:45:47,500

PRODUCTION.

898

00:45:47,500 --> 00:45:52,119

AND SO THANK YOU TO ALL OF YOU
IN THE AUDIENCE AND ALL OF OUR

899

00:45:52,119 --> 00:45:53,119

CENTERS.

900

00:45:53,119 --> 00:45:55,700

WE ARE THE REAL MARTIANS AND NOW
I'M LOOKING FORWARD TO LEARNING

901

00:45:55,700 --> 00:45:56,700

MORE.

902

00:45:56,700 --> 00:46:10,980

SO I'LL TURN IT OVER TO

903

00:46:10,980 --> 00:46:11,980

THE
PANEL.

904

00:46:11,980 --> 00:46:12,980

THANK YOU.

905

00:46:12,980 --> 00:46:13,980

[APPLAUSE]

>> GREAT.

906
00:46:13,980 --> 00:46:14,980
>> OKAY.

907
00:46:14,980 --> 00:46:15,980
I'LL -- MY NAME IS GREG
WILLIAMS.

908
00:46:15,980 --> 00:46:17,220
I'M DEPUTY ASSOCIATE MINISTER
FOR POLICY AND PLANS.

909
00:46:17,220 --> 00:46:21,010
YOU SAW IN THE VIDEO A -- AT THE
VERY END OUR STRATEGY FOR GOING

910
00:46:21,010 --> 00:46:25,370
TO MARS WHICH IS A GIANT SQUID
ATTACK.

911
00:46:25,370 --> 00:46:27,130
IT WILL BE VERY EFFECTIVE.

912
00:46:27,130 --> 00:46:30,240
WHAT'S REPRESENTED AS YOU GO
FROM LEFT TO RIGHT IN THAT

913
00:46:30,240 --> 00:46:33,340
PICTURE OUR CAPABILITIES WE'RE
BUILDING TODAY.

914
00:46:33,340 --> 00:46:35,510
IT STARTS OF COURSE WITH THE
INTERNATIONAL SPACE STATION

915
00:46:35,510 --> 00:46:38,990
WHICH AS CHARLIE MENTIONED WE'RE
OCCUPIED IN FOR THE LAST 15

916
00:46:38,990 --> 00:46:39,990

YEARS.

917

00:46:39,990 --> 00:46:44,230

YESTERDAY WE PASSED THE HALFWAY
POINT FOR THE ONE-YEAR MISSION

918

00:46:44,230 --> 00:46:45,510

WHICH IS TREMENDOUSLY EXCITING.

919

00:46:45,510 --> 00:46:49,580

THERE WAS A GREAT LUNCH TIME
TALK TODAY ABOUT THE TWIN STUDY

920

00:46:49,580 --> 00:46:54,600

THAT WAS ONGOING AND THE
DISCOVERIES MADE IN THE LAST TWO

921

00:46:54,600 --> 00:46:57,000

YEARS IN FUNDAMENTAL BIOLOGY.

922

00:46:57,000 --> 00:46:59,619

IT DERIVES FROM THE SAMPLE SIZE
OF ONE OR TWO.

923

00:46:59,619 --> 00:47:01,030

PRETTY REMARKABLE.

924

00:47:01,030 --> 00:47:06,550

THOSE -- THOSE SPACE STATION
MISSIONS INCREMENTS ARE SUPPLIED

925

00:47:06,550 --> 00:47:09,540

BY A COMMERCIAL CREW PROGRAM
WHICH IS CURRENTLY IN

926

00:47:09,540 --> 00:47:10,540

DEVELOPMENT.

927

00:47:10,540 --> 00:47:12,680

WE PASSED THE ONE YEAR MILESTONE
SINCE THOSE CONTRACTS WERE

928

00:47:12,680 --> 00:47:13,680
AWARDED.

929

00:47:13,680 --> 00:47:18,220
AND BOEING AND SPACEX ARE OFF
AND RUNNING WITH THEIR SYSTEMS.

930

00:47:18,220 --> 00:47:23,180
SPACEX AND ORBITAL ARE TRYING
AGAIN AFTER THE TOUGH LUCK THIS

931

00:47:23,180 --> 00:47:28,280
PAST YEAR BUT THEY'RE NOT
STOPPING, THEY'RE PRESSING ON.

932

00:47:28,280 --> 00:47:32,920
AND THAT WILL RESUME AGAIN THIS
FALL.

933

00:47:32,920 --> 00:47:35,070
WE HAVE ONE BEING BUILT.

934

00:47:35,070 --> 00:47:41,510
WE FLEW FT-1 AND WE LEARNED A
GREAT DEAL IN THAT ABOUT HOW THE

935

00:47:41,510 --> 00:47:44,430
ORION VEHICLE IS GOING TO
PERFORM IN THE RETURN FROM MARS

936

00:47:44,430 --> 00:47:47,140
TYPE VELOCITIES THROUGH THE
EARTH'S ATMOSPHERE.

937

00:47:47,140 --> 00:47:49,609
WHAT'S REALLY EXCITING ABOUT
HEADQUARTERS TYPE, WE OBSESS

938

00:47:49,609 --> 00:47:55,880

OVER THE DIVISION MEMOS AND ALL
THAT.

939

00:47:55,880 --> 00:47:58,750

WE KIND OF FORGET WHAT THE
CENTER FOLKS ALREADY KNOW.

940

00:47:58,750 --> 00:48:04,290

WHICH THOUGH WE'RE DOING THE
PDRs REAL HARDWARE IS BEING

941

00:48:04,290 --> 00:48:05,290

DEVELOPED.

942

00:48:05,290 --> 00:48:09,170

BEING FABRICATED AND BEING
WELDED AND BEING SHIPPED AROUND

943

00:48:09,170 --> 00:48:11,030

TO THE CENTERS AND TESTED.

944

00:48:11,030 --> 00:48:14,090

DAVID MENTIONED THE RF-25
FIRINGS, THERE ARE SEVEN OF

945

00:48:14,090 --> 00:48:15,090

THOSE NOW.

946

00:48:15,090 --> 00:48:20,320

WE'LL PULL OUT THIS NEXT YEAR
THE -- THEY'LL FLY ON THE SLS

947

00:48:20,320 --> 00:48:22,170

AND TEST THOSE.

948

00:48:22,170 --> 00:48:24,650

WE REFER TO THOSE AS RS 25s.

949

00:48:24,650 --> 00:48:27,780

THEY'RE NO LONGER SSME'S.

950

00:48:27,780 --> 00:48:30,320

SO THEY'RE BEING TESTED IN A
SPACE LAUNCH SYSTEM FLIGHT

951

00:48:30,320 --> 00:48:36,510

PROFILE WITH SPACE LAUNCH SYSTEM
FUEL PRESSURES AND REALLY MAKING

952

00:48:36,510 --> 00:48:38,400

PROGRESS WITH THOSE AND OFF AND
RUNNING.

953

00:48:38,400 --> 00:48:42,710

ORION AS DAVE MENTIONED EARLIER,
CONE PANELS ARE BEING FABRICATE

954

00:48:42,710 --> 00:48:44,200

AND WELDED.

955

00:48:44,200 --> 00:48:45,830

HATCH PANELS BEING FABRICATED.

956

00:48:45,830 --> 00:48:48,310

THAT HARDWARE IS FLOWING.

957

00:48:48,310 --> 00:48:53,920

THERE'S -- IF YOU SAW THE VIDEO
OF THE FLAT PLATFORM BEING

958

00:48:53,920 --> 00:48:57,430

SHIPPED DOWN THE HIGHWAY TO
KENNEDY SPACE CENTER THE

959

00:48:57,430 --> 00:49:01,450

VERTICAL ASSEMBLY BUILDING IS

BEING REOUTFITTED FOR STACKING

960

00:49:01,450 --> 00:49:05,080

AND ASSEMBLING FOR THE SPACE
LAUNCH SYSTEM.

961

00:49:05,080 --> 00:49:09,310

SO IT COULD BARELY MAKE THE BIG
CONCERNS AROUND THE TURNS IS

962

00:49:09,310 --> 00:49:11,080

FIRST OF SEVERAL BEING
DELIVERED.

963

00:49:11,080 --> 00:49:15,800

SO IT'S REALLY EXCITING TO ME
THAT THIS IS NOT A PAPER

964

00:49:17,800 --> 00:49:16,800

PROGRAM.

965

00:49:17,800 --> 00:49:18,800

WITH REAL HARDWARE BEING BUILT.

966

00:49:18,800 --> 00:49:20,250

WE HAVE A LONG WAY TO GO.

967

00:49:20,250 --> 00:49:22,450

BUT WE'RE OFF AND RUNNING.

968

00:49:22,450 --> 00:49:26,580

AND SO THANK YOU TO ALL PEOPLE
WHO ARE WORKING AT THE CENTERS

969

00:49:26,580 --> 00:49:29,030

AND EVEN HERE AT HEADQUARTERS.

970

00:49:29,030 --> 00:49:30,030

WE'RE DOING IT TOGETHER.

971

00:49:30,030 --> 00:49:31,200

WE'RE GOING TO MAKE IT HAPPEN.

972

00:49:31,200 --> 00:49:33,310

AND THIS NEXT SEVERAL YEARS IS
GOING TO BE REALLY EXCITING.

973

00:49:33,310 --> 00:49:39,360

IT WILL BE PRESSED TOWARD THE
ONE MISSION AND THEN THE M 2

974

00:49:39,360 --> 00:49:40,360

MISSION.

975

00:49:40,360 --> 00:49:41,670

>> THANKS, GREG.

976

00:49:41,670 --> 00:49:44,130

YEAH, TELL US MORE ABOUT THE
TECHNOLOGY.

977

00:49:44,130 --> 00:49:45,130

>> SURE.

978

00:49:45,130 --> 00:49:46,340

YEAH, GLAD TOO.

979

00:49:46,340 --> 00:49:50,230

I'M THE SENIOR TECHNICAL OFFICER
OF SPACE TECHNOLOGY.

980

00:49:50,230 --> 00:49:55,460

I'M SITTING HERE BETWEEN MISSION
DIRECTORS AND OPERATIONS MISSION

981

00:49:55,460 --> 00:49:56,830

DIRECTORATE.

982

00:49:56,830 --> 00:50:01,630

OUR JOB IN SPACE TECHNOLOGY, ONE
OF OUR KEY JOBS IS TO PROVIDE

983

00:50:01,630 --> 00:50:05,849

THE NEW TECHNOLOGIES, THE NEW
CAPABILITIES SO THESE GUYS CAN

984

00:50:05,849 --> 00:50:07,830

CARRY OUT THE MISSIONS THEY WANT
TO DO.

985

00:50:07,830 --> 00:50:10,380

SO LOOK AT THIS JOURNEY TO MARS.

986

00:50:10,380 --> 00:50:14,350

YOU KNOW, I GOT UP THIS MORNING,
I HAD THE NICE EAST FACING

987

00:50:14,350 --> 00:50:15,650

WINDOWS, I LOOKED OUT THERE.

988

00:50:15,650 --> 00:50:17,550

IT WAS BEFORE DAWN.

989

00:50:17,550 --> 00:50:18,970

VERY BRIGHT STAR.

990

00:50:18,970 --> 00:50:20,680

THAT WAS VENUS IN THE SKY.

991

00:50:20,680 --> 00:50:25,760

I LOOKED DOWN AND TO THE LEFT
FROM VENUS, THERE WAS MARS IN

992

00:50:25,760 --> 00:50:27,710

THE MORNING SKY.

993

00:50:27,710 --> 00:50:30,930
I ACTUALLY JUST FINISHED READING
THE BOOK RECENTLY.

994
00:50:30,930 --> 00:50:33,240
SO IT IS A PAGE TURNER.

995
00:50:33,240 --> 00:50:34,240
A GRIPPING STORY.

996
00:50:34,240 --> 00:50:35,950
I RECOMMEND IT.

997
00:50:35,950 --> 00:50:38,960
SO, YOU KNOW, LOOKING AT MARS
THERE.

998
00:50:38,960 --> 00:50:43,700
I'M THINKING PEOPLE ARE GOING TO
BE WALKING AROUND THERE.

999
00:50:43,700 --> 00:50:50,330
AND WE CAN BE INVOLVED IN MAKING
THAT HAPPEN.

1000
00:50:50,330 --> 00:50:54,109
THE GRIPPING STORY OF MARK
WATNEY AND HIM BEING STRANDED ON

1001
00:50:54,109 --> 00:50:58,640
MARS KIND OF THE -- IMMERSED US
IN THINKING WHAT IT IS LIKE TO

1002
00:50:58,640 --> 00:51:00,220
LIVE THERE.

1003
00:51:00,220 --> 00:51:11,760
HE'S THE MAIN CHARACTER AND YOU
CAN SEE TECHNOLOGY IS NEEDED FOR

1004
00:51:11,760 --> 00:51:12,869
THE MARS MISSION.

1005
00:51:12,869 --> 00:51:26,390
REALLY OUR CHARACTERS IN THE
BOOK.

1006
00:51:26,390 --> 00:51:32,450
THE CHARACTERS, HOW HE
INTERACTS?

1007
00:51:32,450 --> 00:51:39,760
THIS, HOW HE TREATS THEM AND
IT'S A BIG PART OF THE BOOK, SO

1008
00:51:39,760 --> 00:51:43,540
IN SPACE TECHNOLOGY OUR JOB IS
TO PROVIDE THOSE TECHNOLOGIES.

1009
00:51:43,540 --> 00:51:48,010
WHEN YOU THINK ABOUT A JOURNEY
TO MARS, I'D LIKE TO GET BEHIND

1010
00:51:48,010 --> 00:51:53,330
US THERE, IT SEEMS -- IT SHOULD
HAVE SOME MUSIC WITH IT OR

1011
00:51:53,330 --> 00:51:57,090
SOMETHING, BUT IT'S REALLY
ABOUT -- YOU HAVE TO GET THERE,

1012
00:51:57,090 --> 00:52:00,270
YOU HAVE TO LAND THERE, WHICH IS
HARDER THAN IT SOUNDS LIKE IT

1013
00:52:00,270 --> 00:52:01,270
OUGHT TO BE.

1014
00:52:01,270 --> 00:52:04,070

JIM KNOWS THAT FROM LANDING A
LOT OF THINGS ON MARS OVER THE

1015

00:52:04,070 --> 00:52:06,430
YEARS AND THEN YOU HAVE TO LIVE
THERE.

1016

00:52:06,430 --> 00:52:10,040
THE BOOK IS ALL ABOUT REALLY
LIVING THERE.

1017

00:52:10,040 --> 00:52:13,750
SO FROM SPACE TECH, WE'RE
DEVELOPING THE TECHNOLOGIES THAT

1018

00:52:13,750 --> 00:52:15,320
ARE GOING TO ALLOW US TO DO ALL
THOSE THINGS.

1019

00:52:15,320 --> 00:52:18,150
GETTING THERE, WE'RE LOOKING AT
HIGH POWERED SOLAR ELECTRIC

1020

00:52:18,150 --> 00:52:19,359
PROPULSION.

1021

00:52:19,359 --> 00:52:21,920
THE DAWN PROBE THAT WAS
MENTIONED EARLIER, IT'S

1022

00:52:21,920 --> 00:52:26,490
CURRENTLY AROUND CERIS.

1023

00:52:26,490 --> 00:52:34,780
TO MOVE THE CARGO, WE NEED MORE
THAN THAT WE'LL NEED A HUNDRED

1024

00:52:34,780 --> 00:52:36,620
KILOWATTS, MAYBE A FEW HUNDRED
KILOWATTS.

1025

00:52:36,620 --> 00:52:41,640

SO WE HAVE A SOLAR ELECTRIC
PROPULSION PROGRAM THAT'S

1026

00:52:41,640 --> 00:52:42,880

DEVELOPING THE TECHNOLOGIES.

1027

00:52:42,880 --> 00:52:44,710

HIGHER POWER SOLAR ARRAYS.

1028

00:52:44,710 --> 00:52:46,609

HIGH POWER THRUSTERS.

1029

00:52:46,609 --> 00:52:49,810

HIGHER UNITS THAT CAN AND
WHATALL THE -- THAT CAN HANDLE

1030

00:52:49,810 --> 00:52:50,810

THE POWER.

1031

00:52:50,810 --> 00:52:53,710

TECHNOLOGY IS NEEDED TO LAND
THERE.

1032

00:52:53,710 --> 00:52:57,670

WE HAVE A WHOLE SUITE OF
PROJECTS THAT ARE LOOKING AT

1033

00:52:57,670 --> 00:53:02,580

SUPER SCIENCE DECELERATION
DEVICES, SUPERSONIC RETRO

1034

00:53:02,580 --> 00:53:03,940

PROPULSION.

1035

00:53:03,940 --> 00:53:08,270

DIFFERENT MEANS OF LANDING LARGE
PAYLOADS ON MARS, THE BIGGEST

1036

00:53:08,270 --> 00:53:11,800

PAYLOAD JIM HAS LANDED ON MARS
IS I THINK ABOUT A METRIC TON,

1037

00:53:11,800 --> 00:53:12,800

RIGHT?

1038

00:53:12,800 --> 00:53:17,030

AND FOR GREG'S NEEDS OVER THE
COMING DECADE OR TWO WE'LL NEED

1039

00:53:17,030 --> 00:53:19,190

TO LAND ABOUT 20 METRIC TONS.

1040

00:53:19,190 --> 00:53:22,630

SO THAT'S A LOT MORE PAYLOAD TO
PUT ON MARS.

1041

00:53:22,630 --> 00:53:25,580

YOU'LL NEED DIFFERENT SORTS OF
DECELERATION DEVICES.

1042

00:53:25,580 --> 00:53:30,650

WE HAVE PROGRAMS AT JPL, AT
AMES, AND AT LANGLEY, AT

1043

00:53:30,650 --> 00:53:33,670

JOHNSON, LOOKING AT THE
DIFFERENT TECHNOLOGIES NEEDED

1044

00:53:33,670 --> 00:53:35,470

FOR LANDING ON MARS.

1045

00:53:35,470 --> 00:53:36,660

LIVING ON MARS.

1046

00:53:36,660 --> 00:53:40,330

DAVID MENTIONED THE OXYGEN, ISRU

EXPERIMENT.

1047

00:53:40,330 --> 00:53:43,500

WE CALL IT MOXIE, AS A NAME.

1048

00:53:43,500 --> 00:53:48,070

SO YOU'LL SEE THE PROTAGONIST IN
THE BOOK HAS A LOT OF MOXIE.

1049

00:53:48,070 --> 00:53:51,540

SO WE'LL SUCK IN THE MARS
ATMOSPHERE, WHICH IS CO 2 AND

1050

00:53:51,540 --> 00:53:53,330

MAKE OXYGEN.

1051

00:53:53,330 --> 00:53:56,720

IT'S A TECH DEMO AND IT WILL FIT
ON JIM'S NEXT ROVER SO IT WILL

1052

00:53:56,720 --> 00:54:00,730

BE PRETTY SMALL, SO WE
DEMONSTRATE THAT IT WORKS ON

1053

00:54:00,730 --> 00:54:04,570

MARS, YOU HAVE OXYGEN YOU ASK
BREATH.

1054

00:54:04,570 --> 00:54:07,390

YOU'VE GOT OXYGEN YOU CAN USE
FOR PROPULSION.

1055

00:54:07,390 --> 00:54:12,070

WE HAVE LOOKED AT ADVANCES IN
SPACE SUITS.

1056

00:54:12,070 --> 00:54:15,040

SPACE SUITS PLAY A BIG ROLE, HOW
HE USES THEM FOR DIFFERENT

1057

00:54:15,040 --> 00:54:16,040

PURPOSES.

1058

00:54:16,040 --> 00:54:18,800

EVEN CUTS THEM UP AND USES THE
FABRIC FOR DIFFERENT THINGS.

1059

00:54:18,800 --> 00:54:22,900

WE HAVE LOOKED AT ADVANCED
TECHNOLOGIES FOR THE LIFE

1060

00:54:22,900 --> 00:54:26,500

SUPPORT SYSTEMS THAT DAVID
MENTIONED.

1061

00:54:26,500 --> 00:54:30,520

SO THERE'S HIGH BAND WIDTH
COMMUNICATION TECHNOLOGIES.

1062

00:54:30,520 --> 00:54:33,760

THERE'S HIGH PRECISION
NAVIGATION TECHNOLOGIES.

1063

00:54:33,760 --> 00:54:38,050

THERE'S ADVANCED ENERGY STORAGE
AND POWER GENERATION TECHNOLOGY.

1064

00:54:38,050 --> 00:54:41,869

SO ALL OF THE THINGS YOU NEED TO
GET THERE, TO LAND THERE, TO

1065

00:54:41,869 --> 00:54:43,840

EXIST THERE ON MARS.

1066

00:54:43,840 --> 00:54:46,500

THAT'S WHAT WE'RE TRYING TO
DEVELOP IN SPACE TECHNICIAN

1067

00:54:46,500 --> 00:54:48,210

SPACE DIRECTORATE.

1068

00:54:48,210 --> 00:54:53,760

>> SO KIM, TELL US ABOUT --
THANK YOU FOR YOUR EARLIER TALK,

1069

00:54:53,760 --> 00:54:57,700

BUT WHAT ELSE DO WE NEED TO KNOW
SO WE CAN BE BEST INFORMED.

1070

00:54:57,700 --> 00:55:02,089

>> ALL RIGHT, FROM A SCIENCE
PERSPECTIVE THIS IS ACTUALLY THE

1071

00:55:02,089 --> 00:55:06,839

50th YEAR OF OUR VERY FIRST
PROBE, MARINER 4.

1072

00:55:06,839 --> 00:55:11,880

LOOP BY MARS AND WHAT IT SAW,
WAS A REGION MUCH MORE

1073

00:55:11,880 --> 00:55:12,880

MOONLIGHT.

1074

00:55:12,880 --> 00:55:16,320

THE SCIENTISTS WERE INCREDIBLY
DEPRESSED BUT WE KEPT GOING BACK

1075

00:55:16,320 --> 00:55:20,760

TO MARS AND WE KEPT REALIZING
HOW DIVERSE IT REALLY IS.

1076

00:55:20,760 --> 00:55:23,480

HOW FASCINATING IT REALLY IS.

1077

00:55:23,480 --> 00:55:24,480

IT'S BEAUTIFUL VISTAS.

1078

00:55:24,480 --> 00:55:27,720
S GOT HUGE CANYONS -- IT'S GOT
HUGE CANYONS THAT MAKE THE GRAND

1079
00:55:27,720 --> 00:55:31,070
CANYON LOOK ITTY BITTY.

1080
00:55:31,070 --> 00:55:34,320
IF IT'S STRETCHED ACROSS THE
UNITED STATES, IT WOULD

1081
00:55:34,320 --> 00:55:37,700
LITERALLY OPEN UP THE PACIFIC TO
THE ATLANTIC.

1082
00:55:37,700 --> 00:55:43,630
YOU KNOW, MARK WATNEY IN THE
BOOK SITS AT A AN -- AN AREA ON

1083
00:55:43,630 --> 00:55:47,580
MARS AND WATCHING THE SUN SET
AND IT'S SO BEAUTIFUL BECAUSE HE

1084
00:55:47,580 --> 00:55:48,600
CAN.

1085
00:55:48,600 --> 00:55:51,400
HE REALLY ENJOYS THE ENVIRONMENT
HE'S IN.

1086
00:55:51,400 --> 00:55:54,920
IT'S ABSOLUTELY ASTOUNDING IN
MANY WAYS.

1087
00:55:54,920 --> 00:55:58,990
WHAT WE HAVE LEARNED ABOUT MARS
IN TALKING WITH ANDY ABOUT THE

1088
00:55:58,990 --> 00:56:02,339
BOOK -- ANDY WANTED TO GET THE

BOOK OUT BEFORE CURIOSITY LANDED

1089

00:56:02,339 --> 00:56:05,600

ON MARS BECAUSE HE KNEW THINGS
WOULD BE DISCOVERED AND INDEED

1090

00:56:05,600 --> 00:56:07,770

THEY HAVE.

1091

00:56:07,770 --> 00:56:11,390

WE NOW UNDERSTAND, WE LITERALLY
SEE WATER WEEPING OUT OF

1092

00:56:11,390 --> 00:56:17,060

AQUIFERS DOWN THE SIDES OF
OUR -- OF MANY OF THE CRATERS,

1093

00:56:17,060 --> 00:56:22,210

PARTICULARLY IN VALISMARINUS SO
THERE ARE LOTS OF WATER PLACES

1094

00:56:22,210 --> 00:56:24,869

LEFT ON MARS.

1095

00:56:24,869 --> 00:56:31,990

SO MOXIE BRINGS IN CO₂ THROUGH
AN ELECTROLYSIS, SO WE POP OFF

1096

00:56:31,990 --> 00:56:37,280

THE OXYGEN AND WE GET RID OF THE
CARBON MONOXIDE.

1097

00:56:37,280 --> 00:56:38,890

BUT WE STORE THE OXYGEN.

1098

00:56:38,890 --> 00:56:41,360

WE DO THAT ALL DAY LONG.

1099

00:56:41,360 --> 00:56:43,250

YOU KNOW, AT VARIOUS TIMES.

1100

00:56:43,250 --> 00:56:44,250

WHY IS THAT IMPORTANT?

1101

00:56:44,250 --> 00:56:47,119

THE PRESSURE CHANGES ON MARS ARE ENORMOUS.

1102

00:56:47,119 --> 00:56:50,120

EVEN THOUGH THERE ARE SMALL PRESSURE CHANGES, HOW DOES THE

1103

00:56:50,120 --> 00:56:51,170

EXPERIMENT WORK?

1104

00:56:51,170 --> 00:56:56,280

THE TEMPERATURE VARIATION ON ONE DAY, IT'S ANYWHERE FROM 120 TO

1105

00:56:56,280 --> 00:56:59,339

140 DEGREES IN ONE DAY.

1106

00:56:59,339 --> 00:57:02,600

YOU KNOW, THE HIGH HERE IN D.C.

1107

00:57:02,600 --> 00:57:05,950

OVER A YEAR MIGHT BE A HUNDRED DEGREES IN VARIATION, BUT DO

1108

00:57:05,950 --> 00:57:07,950

THAT DAY AFTER DAY AFTER DAY.

1109

00:57:07,950 --> 00:57:12,839

THAT'S THE HARSH ENVIRONMENT THAT MARK WATNEY HAS TO TACKLE.

1110

00:57:12,839 --> 00:57:15,890

SO OUR KNOWLEDGE ABOUT MARS IS

INCREASING SIGNIFICANTLY.

1111

00:57:15,890 --> 00:57:19,800

BUT ONE ASPECT OF THE BOOK THAT
I REALLY ENJOYED SIGNIFICANTLY

1112

00:57:19,800 --> 00:57:23,150

IS ACTUALLY THE HUMAN ASPECT OF
IT.

1113

00:57:23,150 --> 00:57:26,460

YOU KNOW, MARK WATNEY AT ONE
POINT WHEN HE COMES BACK AND HE

1114

00:57:26,460 --> 00:57:30,970

GOES DOWN THE LIST OF WHAT'S
GOING TO KILL HIM FIRST, HE

1115

00:57:30,970 --> 00:57:36,660

LOOKS VERY DEPRESSED AND IT'S
ALL ABOUT HOW HE'LL DIE NEXT,

1116

00:57:36,660 --> 00:57:39,540

AND YOU SEE THAT SCIENCE PART
THAT SCIENCE AND ENGINEERING

1117

00:57:39,540 --> 00:57:42,170

PART OF HIS BRAIN KICKS IN.

1118

00:57:42,170 --> 00:57:45,720

THAT ALLOWS HIM TO START THE
PROCESS OF BREAKING UP AN

1119

00:57:45,720 --> 00:57:47,540

ENORMOUS CHALLENGE INTO

1120

00:57:47,540 --> 00:57:52,530

BITE-SIZED CHUNKS INTO SOMETHING
HE CAN TACKLE AND WIN AND GO ON

1121
00:57:52,530 --> 00:57:53,930
TO THE NEXT CHALLENGE.

1122
00:57:53,930 --> 00:57:57,339
WE SEE THAT EVERY DAY IN THE
NASA CENTERS.

1123
00:57:57,339 --> 00:58:00,650
THIS IS SOMETHING THAT'S ENDEMIC
TO WHAT WE HAVE AS PART OF OUR

1124
00:58:00,650 --> 00:58:01,869
CULTURE.

1125
00:58:01,869 --> 00:58:04,460
THIS IS WHAT'S GOING TO GET US
TO MARS.

1126
00:58:04,460 --> 00:58:09,450
THE ABILITY TO THINK OUR WAY
THROUGH SCIENCE AND ENGINEERING

1127
00:58:09,450 --> 00:58:13,680
TO THE Nth DEGREE THAT WILL
ENABLE US TO WORK AND LIVE IN

1128
00:58:13,680 --> 00:58:14,680
THE ENVIRONMENT.

1129
00:58:14,680 --> 00:58:17,100
THAT ALSO SPURS OUR ECONOMY.

1130
00:58:17,100 --> 00:58:21,560
THAT ALSO IS SUCH AN ESSENTIAL
PART OF I BELIEVE THE AMERICAN

1131
00:58:21,560 --> 00:58:26,300
CULTURE THAT WE'RE ALONG FOR THE
RIDE, ENJOY IT, BECAUSE IT WILL

1132

00:58:26,300 --> 00:58:27,770

BE PRETTY ASTOUNDING.

1133

00:58:27,770 --> 00:58:30,330

IT'S JUST RIGHT AROUND THE
CORNER.

1134

00:58:30,330 --> 00:58:35,480

>> SO NOW I ASK EVERYONE TO YELL
OR CLAP IN A SECOND.

1135

00:58:35,480 --> 00:58:40,710

VERY -- ASK EVERYONE TO EMBRACE
YOUR INNER MARTIAN AND WE ARE ON

1136

00:58:40,710 --> 00:58:42,580

THE REAL LIFE JOURNEY TO MARS.

1137

00:58:42,580 --> 00:58:43,980

THANK YOU, NASA.

1138

00:58:43,980 --> 00:58:46,160

I WANT TO THANK OUR PANELISTS.

1139

00:58:46,160 --> 00:58:50,430

I'VE LEARNED A LOT.

1140

00:58:50,430 --> 00:58:56,210

[APPLAUSE]

AND I'LL ASK IF WE CAN JUST STAY

1141

00:58:56,210 --> 00:58:59,170

HERE IN THE INTEREST OF TIME,
THANKS FOR YOUR PATIENCE.

1142

00:58:59,170 --> 00:59:03,210

BUT WE WANT TO CELEBRATE AND
HIGHLIGHT ONE OF OUR OWN, SO AS

1143

00:59:03,210 --> 00:59:04,210

MR.

1144

00:59:04,210 --> 00:59:07,440

BOLDEN MENTIONED WE ARE
SHOWING VIDEOS OF REAL MARTIANS

1145

00:59:07,440 --> 00:59:08,790

SO NOW WE'LL SHOW YOU ONE.

1146

00:59:08,790 --> 00:59:11,470

THERE WILL BE NEW ONES EACH
WEEK.

1147

00:59:11,470 --> 00:59:14,969

WITH THAT, LET'S SEE A REAL
MARTIAN.

1148

00:59:14,969 --> 00:59:18,580

>> HI, I'M JENNIFER STERN.

1149

00:59:18,580 --> 00:59:29,130

JOIN ME AS WE JOURNEY TO MARS.

1150

00:59:29,130 --> 00:59:31,990

I WORK ON THE INSTRUMENT CALLED
THE SAMPLE ANALYSIS AT MARS

1151

00:59:31,990 --> 00:59:34,760

INSTRUMENT SUITE ON THE
CURIOSITY ROVER.

1152

00:59:34,760 --> 00:59:39,230

WHAT THAT DOES IS IT MEASURES
THE SURFACE IN THE ATMOSPHERE OF

1153

00:59:39,230 --> 00:59:40,230

MARS.

1154

00:59:40,230 --> 00:59:42,640

MY PARTICULAR INTEREST IS
NITROGEN COMPOUNDS.

1155

00:59:42,640 --> 00:59:46,230

ONE REALLY COOL THING WE FOUND
IS NITRATE.

1156

00:59:46,230 --> 00:59:49,600

IT'S A BIOLOGICALLY AND
CHEMICALLY BASED COMPOUND.

1157

00:59:49,600 --> 00:59:55,440

IT CAN MAKE AMINO COMPOUNDS.

1158

00:59:55,440 --> 00:59:59,560

WORKING ON MARS AND THE
CURIOSITY ROVER IS AWESOME

1159

00:59:59,560 --> 01:00:03,050

BECAUSE WE'RE MAKING THESE
COMPLEX CHEMICAL MEASUREMENTS ON

1160

01:00:03,050 --> 01:00:05,030

THE SURFACE OF ANOTHER PLANET.

1161

01:00:05,030 --> 01:00:07,470

THESE ARE MEASUREMENTS THAT ARE
DIFFICULT SOMETIMES TO EVEN MAKE

1162

01:00:07,470 --> 01:00:09,180

IN YOUR OWN LABORATORY.