

Mercury



1

00:00:06,180 --> 00:00:16,960

GOOD AFTERNOON AND WELCOME TO THIS WAS SO
NATIONAL

2

00:00:16,960 --> 00:00:21,439

AIR AND SPACE MUSEUM.

I AM CURATOR JENNIFER LEVASSEUR, I CURATOR

3

00:00:21,439 --> 00:00:23,570

FOR ASTRONAUT
EQUIPMENT.

4

00:00:23,570 --> 00:00:28,500

AND I WELCOME YOU TO TODAY'S PROGRAM.
WHICH IS ON APPROPRIATE ATTIRE.

5

00:00:28,500 --> 00:00:31,760

I WANT TO THANK OUR SPONSORS FOR "WHAT'S NEW
IN AEROSPACE? --

6

00:00:31,760 --> 00:00:35,020

APPROPRIATE ATTIRE" AND I HOPE THIS SHOW IS
INFORMATIVE.

7

00:00:35,020 --> 00:00:38,140

AND TO SOME DEGREE FOR ALL OF YOU.
I WANT TO MAKE SURE YOU HAVE OPPORTUNITIES

8

00:00:38,140 --> 00:00:39,570

TO ASK LOTS OF
QUESTIONS.

9

00:00:39,570 --> 00:00:43,660

WE WILL HAVE A COUPLE OF BREAKS BETWEEN TALKS.
HE WILL BE ABLE TO STAND UP TO THE MICROPHONE

10

00:00:43,660 --> 00:00:45,090

WHICH IS RIGHT HERE
IN THE CENTER.

11

00:00:45,090 --> 00:00:48,270

WE ALSO HAVE AN ONLINE AUDIENCE AT HOME THEY
WILL HAVE AN

12

00:00:48,270 --> 00:00:52,390

OPPORTUNITY TO ASK QUESTIONS AS WELL.
WELCOME TO ALL OF YOU HERE AS WELL.

13

00:00:52,390 --> 00:00:56,990

LET'S GET STARTED.
OUR PROGRAM IS ON APPROPRIATE ATTIRE, OF PAST,

14

00:00:56,990 --> 00:00:59,760

PRESENT AND FUTURE
OF ASTRONAUTS.

15

00:00:59,760 --> 00:01:03,649

WHAT IS IT THAT THEY NEED TO BE IN SPACE,
TO DO SPACE WALKS AND

16

00:01:03,649 --> 00:01:08,540

TO DO OTHER WORK IN SPACE?
LEAVING THE SPACECRAFT MEANS THAT YOU NEED

17

00:01:08,540 --> 00:01:11,920

TO HAVE ESSENTIALLY
SPACECRAFT AROUND YOU.

18

00:01:11,920 --> 00:01:16,290

YOU HAVE TO CARRY EVERYTHING AROUND YOU AS
YOU LEAVE THE VEHICLE.

19

00:01:16,290 --> 00:01:19,409

AND WHITE WAS THE FIRST AMERICAN TO DO A SPACEWALK
BACK IN 1965

20

00:01:19,409 --> 00:01:22,720

ON THE JEDI 4 MISSION.
HE HAD AN UMBILICAL TYING HIM BACK TO THE

21

00:01:22,720 --> 00:01:31,590

SPACECRAFT.

I THINK WE HAVE AN IMAGE OF THAT, – WE ALSO

22

00:01:31,590 --> 00:01:37,630

HAD A SPACEWALKING

EXHIBITION HERE THAT SET THE STAGE AS FAR

23

00:01:37,630 --> 00:01:41,170

AS ARTIFACTS GO.

WE DISPLAYED A NUMBER OF PIECES YOU SEE IN

24

00:01:41,170 --> 00:01:44,600

THAT PHOTOGRAPH.

THE APOLLO 11 ASTRONAUTS WERE THE FIRST ASTRONAUTS

25

00:01:44,600 --> 00:01:48,680

TO WALK ON THE

SURFACE OF THEIR MOON WEARING THEIR BACKPACKS

26

00:01:48,680 --> 00:01:51,520

THAT WERE LEFT ON

THE MOON.

27

00:01:51,520 --> 00:01:54,549

AND ASTRONAUTS WHO WORK ON THE SPACE SHUTTLE

AND SPACE STATION

28

00:01:54,549 --> 00:01:58,630

TODAY STILL REQUIRE A SUIT THAT PROTECTS THEM

DURING THOSE LONG

29

00:01:58,630 --> 00:02:04,729

SPACEWALKS, SOMETIMES AROUND EIGHT HOURS LONG.

THE SERVICE SATELLITES, AND OF COURSE BUILD

30

00:02:04,729 --> 00:02:07,270

AND MAINTAINING THE

ACTUAL SPACE STATION.

31

00:02:07,270 --> 00:02:10,929

SO OUR GUEST TODAY WILL DISCUSS PAST, PRESENT
AND WHERE

32

00:02:10,929 --> 00:02:15,359

ENGINEERING AND DESIGN OF SPACE SUITS IS GOING
IN THE FUTURE.

33

00:02:15,359 --> 00:02:20,379

AS WE MOVE BEYOND EARTH AND TOWARDS MARS.
SO LET ME MAKE SOME INTRODUCTIONS OF OUR GUEST

34

00:02:20,379 --> 00:02:23,189

TODAY.
ON MY PART LEFT IS DOCTOR CATHLEEN LEWIS,

35

00:02:23,189 --> 00:02:27,719

SHE IS OUR CURATOR HERE
AT INTERNATIONAL PROGRAMS AND SPACESUITS.

36

00:02:27,719 --> 00:02:32,300

SHE IS A SPECIALIST IN SOVIET AND RUSSIANS
PROGRAMS IN PARTICULAR

37

00:02:32,300 --> 00:02:35,980

AND SHE IS GETTING TOGETHER A HISTORY OF AMERICAN
AND RUSSIAN

38

00:02:35,980 --> 00:02:40,090

SPACES RIGHT NOW BUT SHE HAS HER PASTOR LOWS
AND MASTERS DEGREES

39

00:02:40,090 --> 00:02:44,040

FROM DELTA UNIVERSITY AND A PHD IN HISTORY
FROM GEORGE WASHINGTON

40

00:02:44,040 --> 00:02:47,519

UNIVERSITY.
SHE IS ALSO THE CURATOR FOR SPACE RACE EXPLORATION

41

00:02:47,519 --> 00:02:48,519

RIGHT NEXT
HER.

42

00:02:48,519 --> 00:02:53,769

ON MY IMMEDIATE LEFT IS DOCTOR DAVA NEWMAN
WHO IS THE EXECUTIVE

43

00:02:53,769 --> 00:03:02,120

DEPUTY ADMINISTRATOR AT NASA.
SHE HAS HER PHD AND MASTERS DEGREE FROM MIT

44

00:03:02,120 --> 00:03:08,139

WHERE SHE WAS ALSO A
PROFESSOR THERE FOR ABOUT 25 YEARS AS I UNDERSTAND

45

00:03:08,139 --> 00:03:11,370

RIGHT.
SHE WAS CONFIRMED BY THE SENATE LAST YEAR

46

00:03:11,370 --> 00:03:16,059

AND BEGAN HER SERVICE
AT NASA IN MAY 2016.

47

00:03:16,059 --> 00:03:18,620

AND HER EXPERTISE IS IN THE FIELD OF SPACE
AND BIOENGINEERING.

48

00:03:18,620 --> 00:03:30,599

JOIN ME IN WELCOMING OUR GUEST TODAY.[APPLAUSE]
AND I WILL LET KATHY GET STARTED WITH YOUR

49

00:03:30,599 --> 00:03:34,500

PRESENTATION.
>>Cathleen: IF I CAN GET MY FIRST SLIDE.

50

00:03:34,500 --> 00:03:40,870

THIS IS ACTUALLY MY NEGATIVE ONE SLIDE.
THIS IS A COLLAGE OF THE SPACESUITS WE HAVE

51

00:03:40,870 --> 00:03:43,749

IN THE AIR AND SPACE
MUSEUM COLLECTION.

52

00:03:43,749 --> 00:03:47,879

OF THEM ARE RECOGNIZABLE TO YOU OTHERS NOT
AS WE FREQUENTLY GET

53

00:03:47,879 --> 00:03:51,059

THE QUESTION WHY YOU NEED SOMEBODY SPACESUITS
IN THE COLLECTION?

54

00:03:51,059 --> 00:03:57,939

AND WHY DO YOU HAVE SUCH DIFFERENT DEVICE?
AND IN FACT WE HAVE A COLLECTION OF ABOUT

55

00:03:57,939 --> 00:04:03,609

287 AT LAST COUNT,
SOMETIMES THEY MULTIPLY IN CAPTIVITY.

56

00:04:03,609 --> 00:04:10,889

THE SPACESUITS PARTS IN THE COLLECTION.
WE HAVE MERCURY, GEMINI, AND APOLLO.

57

00:04:10,889 --> 00:04:15,639

THAT YOU ARE ALL FAMILIAR WITH, ESPECIALLY
THE 12 SPACESUITS THAT

58

00:04:15,639 --> 00:04:21,310

WALKED ON THE SURFACE OF THE MOON.
AND WE HAVE EACH OF THEM IN THE NATIONAL COLLECTION.

59

00:04:21,310 --> 00:04:26,539

BUT WE ALSO HAVE SUITS THAT COME FROM THE
SPACE FLIGHT ERA.

60

00:04:26,539 --> 00:04:31,680

WE HAVE SUITS THAT ARE DEVELOPMENTAL SUITS,
THAT ARE CONTACT

61

00:04:31,680 --> 00:04:36,259

SUITS.

WE HAVE SUITS THAT WILL NEVER FLY, THAT WERE

62

00:04:36,259 --> 00:04:38,500

DESIGNED FOR

PROGRAMS THAT NEVER HAPPENED.

63

00:04:38,500 --> 00:04:42,240

BUT THEY ARE ALL IMPORTANT PART OF THE HISTORY
OF SPACE AND

64

00:04:42,240 --> 00:04:44,770

DEVELOPMENT.

AND THAT'S WHY WE COLLECT THEM, NOT BECAUSE

65

00:04:44,770 --> 00:04:49,970

THEY ARE DEFINING ANY

SPECIFIC PROGRAM BUT THEY ARE DEFINING THE

66

00:04:49,970 --> 00:04:56,420

IDEA OF THE SPACESUIT.

AND WHEN I AM LOOKING AT SPACESUITS I AM LOOKING

67

00:04:56,420 --> 00:04:59,379

AT WHAT ELEMENT

IS GOING INTO MAKING THEM.

68

00:04:59,379 --> 00:05:04,900

AND MIXTURE OF IMAGINATION, THE MISSION THEY
ARE FULFILLING AND

69

00:05:04,900 --> 00:05:10,220

ENGINEERING.

WHEN YOU WALK INTO THIS GALA TODAY OUT AHEAD,

70

00:05:10,220 --> 00:05:17,570

AND I DON'T KNOW IF

I HAVE, A CENTER WHEN RING SPACE STATION FOR

71
00:05:17,570 --> 00:05:23,800
THIS WAS WITH
CONSULTATION OF WHEN BROWN ON WHAT THE SPACE

72
00:05:23,800 --> 00:05:28,229
STATION WOULD LOOK
LIKE, A ROTATING SPACE STATION THAT HAS ARTIFICIAL

73
00:05:28,229 --> 00:05:33,080
GRAVITY TO THE
ASTRONAUTS FOR THIS WAS 1976 IT WAS BROADCAST

74
00:05:33,080 --> 00:05:37,910
OVER WALT DISNEY'S
FUNDING PROGRAM.

75
00:05:37,910 --> 00:05:41,430
AND WHAT WE HAVE IS THE SPACE STATION THAT
WAS USED IN THE

76
00:05:41,430 --> 00:05:45,020
FILMING.
WHAT WE DO NOT HAVE ARE THE SPACESUITS THAT

77
00:05:45,020 --> 00:05:48,030
WERE DESIGNED FOR USE
IN THAT SPACE STATION.

78
00:05:48,030 --> 00:05:53,150
AND THESE ARE PHOTOGRAPHS OR DRAWINGS AND
A PHOTOGRAPH OF VON

79
00:05:53,150 --> 00:05:58,210
BROWN WORKING WITH THAT SPACESUIT AND IT WAS
THOSE AT THE SOUP

80
00:05:58,210 --> 00:06:02,949
CANNED SOUP.
THE ASTRONAUT WOULD DO A SPACEWALK, CLIMB

81
00:06:02,949 --> 00:06:07,490
INTO THE SPACE SHOOT
AND USE ROBOTIC ARM TO DO CONSTRUCTION ON

82
00:06:07,490 --> 00:06:12,219
THE SPACE STATION.
YOU CAN SEE THE TURNAROUND IN THE SPACESUITS.

83
00:06:12,219 --> 00:06:16,360
AND THAT WAS VON BROWN CONCEPT OF WHAT THE
SPACESUIT WOULD LOOK

84
00:06:16,360 --> 00:06:21,600
LIKE FOR THAT PARTICULAR SPACE MISSION.
WORKING ON THE SPACE STATION.

85
00:06:21,600 --> 00:06:24,789
IT IS VERY IMPORTANT TO REMEMBER EVERY STATION
HAS TO BE

86
00:06:24,789 --> 00:06:29,110
DEDICATED TO THE MISSION, TO THE SPACECRAFT
THEY ARE WORKING ON.

87
00:06:29,110 --> 00:06:35,819
VON BROWN WAS NOT THE FIRST TO PUT – HAVE
IMPACT AND INSIGHT ONTO

88
00:06:35,819 --> 00:06:41,870
WHAT A SPACESUIT SHOULD LOOK LIKE.
THIS IS A FILM ADVERTISEMENT FOR A SOVIET

89
00:06:41,870 --> 00:06:52,139
FILM FROM THE EARLY
1930S, CALLED THE TZASINSKI, THE FATHER CONSTANTINE

90
00:06:52,139 --> 00:06:59,379
VANBROWSER
SAID IT WOULD LOOK LIKE FOR EXPLORING THE

91
00:06:59,379 --> 00:07:05,150
MOON.
AND THROUGHOUT, AND IN THE UNITED STATES WE

92
00:07:05,150 --> 00:07:08,169
WERE WATCHING DISNEY
ON TV.

93
00:07:08,169 --> 00:07:12,820
WE WERE WATCHING STAR TREK.
IN RUSSIA, IN THE SOVIET UNION, THEY WERE

94
00:07:12,820 --> 00:07:18,930
WATCHING SPACE TIME
FICTION FILMS AND ALSO HAD SPACESUIT DESIGNS.

95
00:07:18,930 --> 00:07:23,930
AND THESE WERE THE FILMING MODELS THAT WERE
RETAINED AND

96
00:07:23,930 --> 00:07:29,270
COLLECTED AT THE LENINGRAD SCIENTIFIC FILM
ASSOCIATION IN ST.

97
00:07:29,270 --> 00:07:34,330
PETERSBURG, RUSSIA.
AND THEY WERE USED TO MAKE A SERIES OF FILMS

98
00:07:34,330 --> 00:07:42,370
ON HUMAN EXPLORATION
OF THE MOON, OF MARS, AND OF VENUS.

99
00:07:42,370 --> 00:07:45,840
THESE ARE SOME OF MY FAVORITE OF THE SUSPENDED
SUITS.

100
00:07:45,840 --> 00:07:50,110
ONE THING TO NOTE THAT IN THESE COLLECTIONS
THEY WERE NOT ONLY

101
00:07:50,110 --> 00:07:53,699
MEN EXPLORING OTHER WORLDS, THERE WERE WOMEN
AS WELL.

102
00:07:53,699 --> 00:07:58,590
SO YOU HAVE DIFFERENT ANATOMIES REPRESENTED
IN DEVELOPING THE

103
00:07:58,590 --> 00:08:03,469
SPACESUITS.
BUT WHEN IT CAME DOWN DOG TIME FOR NASA TO

104
00:08:03,469 --> 00:08:09,479
HAVE MERCURY IN 1979
THEY HAD A SHORT TIMEFRAME AND THEY HAD TO

105
00:08:09,479 --> 00:08:16,259
DEAL WITH REALITY.
THEY HAD SPACE TO MAKE SPACESUITS FOR PIRATES

106
00:08:16,259 --> 00:08:21,090
AND THEY HAD TO
MERGE TO GET A DATE THAT WOULD WORK INSIDE

107
00:08:21,090 --> 00:08:24,490
THE SPACECRAFT THAT
THEY WERE DESIGNING TO FULFILL THAT MISSION.

108
00:08:24,490 --> 00:08:28,840
AND WHAT THEY HAD, IS ON YOUR LEFT, IS THE
MARK FORCE SPACESUIT

109
00:08:28,840 --> 00:08:32,719
THAT WAS DEVELOPED BY THE EF GOODRICH COMPANY
FOR THE NAVY.

110
00:08:32,719 --> 00:08:37,810
IT WAS DESIGNED FOR FIGHTER PILOTS SO THEY
COULD WITHSTAND RAPID

111

00:08:37,810 --> 00:08:44,870

CHANGES IN G FORCES WHEN THEY WERE MANEUVERING.
AND THERE WAS ALSO THE MC-2 FORCE OF THE DAVID

112

00:08:44,870 --> 00:08:49,300

CLARK COMPANY WAS
DESIGNING ABOUT THE SAME TIME FOR HIGH ALTITUDE

113

00:08:49,300 --> 00:08:51,380

PILOTS.
FOR THE AIR FORCE.

114

00:08:51,380 --> 00:08:56,320

THE SILVER COLOR WAS AN EXPERIMENT THAT DAVID
CLARK COMPANY WAS

115

00:08:56,320 --> 00:09:01,610

WORKING WITH AT THIS TIME TO AMELIORATE THE
PROBLEMS THAT PILOTS

116

00:09:01,610 --> 00:09:04,330

WERE COMPLAINING ABOUT WITH OVERHEATING IN
THE COCKPIT.

117

00:09:04,330 --> 00:09:09,230

THEY WERE GETTING VERY, VERY HOT IN THAT VERY
BRIGHT COCKPIT WHAT

118

00:09:09,230 --> 00:09:16,339

THEY WERE GOING VERY HIGH ALTITUDES.
AND THE RESULT WAS THE MERCURY SPACESUIT.

119

00:09:16,339 --> 00:09:21,290

YOU CAN SEE JOHN GLENN JUST OUTSIDE OF THE
SPACE RACE GALLERY

120

00:09:21,290 --> 00:09:29,019

NEXT DOOR, WITH THE MERCURY SPACESUIT.
TOOK THE MARK FORCE USED THE SILVER ALUMINIZED

121

00:09:29,019 --> 00:09:33,160

CODING ON THE TOP

FOR REFLECTIVE PURPOSES, JUST IN CASE.

122

00:09:33,160 --> 00:09:36,370

THEY KNEW IT WAS A PROBLEM FOR HIGH ALTITUDE
PILOTS SO THEY

123

00:09:36,370 --> 00:09:43,149

THOUGHT WE WOULD TRY IT FOR ASTRONAUTS.
IT WAS ALL RETROFITTED TO FIT INSIDE THE MERCURY

124

00:09:43,149 --> 00:09:48,220

SPACE CAPSULE.

THAT WAS FRIENDSHIP SEVEN, UNFORTUNATELY FOR

125

00:09:48,220 --> 00:09:57,959

YOU BEHIND THE

GALLERIES THAT ARE HIDDEN IN THE CASE.

126

00:09:57,959 --> 00:10:01,660

AND FOR THE GEMINI PROGRAM NASA TOOK A SIMILAR
APPROACH.

127

00:10:01,660 --> 00:10:04,690

THIS TIME THEY WENT TO THE DAVID CLARK COMPANY,
THEY TOOK THEIR

128

00:10:04,690 --> 00:10:09,930

HIGH ALTITUDE SUITS, MODIFIED THEM, RETROFITTED
THEM FOR LIFE

129

00:10:09,930 --> 00:10:15,630

SUPPORT TO THE SPACECRAFT.

THEY DIDN'T HAVE TO WORRY ABOUT – THEY KNEW

130

00:10:15,630 --> 00:10:21,880

THE SPACE SUITS WERE

TO THE SPACECRAFT, AND ONCE AGAIN HAVING THE

131
00:10:21,880 --> 00:10:26,190
TIME OF HIS LIFE
FLOATING OUTSIDE OF THE MERCURY – THE GEMINI

132
00:10:26,190 --> 00:10:30,930
SPACECRAFT.
BUT WHEN IT CAME TIME FOR APOLLO THEY HAD

133
00:10:30,930 --> 00:10:34,589
TO RETHINK THEIR
APPROACH IN DESIGNING SPACESUITS.

134
00:10:34,589 --> 00:10:37,610
FIRST OF ALL, THE ASTRONAUTS WOULD HAVE TO
WALK.

135
00:10:37,610 --> 00:10:41,980
THEY HAD DESIGNED PILOT SEASON THEY HAD TO
DESIGN THE SUIT THAT

136
00:10:41,980 --> 00:10:45,300
THE ASTRONAUT WOULD HAVE TO BE ABLE TO WALK
IN.

137
00:10:45,300 --> 00:10:49,959
IN ORDER TO TAKE THAT FIRST STEP ON THE SURFACE
OF THE MOON.

138
00:10:49,959 --> 00:10:53,589
IN ADDITION THE ASTRONAUTS WOULD HAVE TO HAVE
A SPACESUIT THAT

139
00:10:53,589 --> 00:10:59,779
WOULD OPERATE NOT ONE.
THIS IS THE COMMAND MODULE COLUMBIA AS THE

140
00:10:59,779 --> 00:11:03,650
3-D SCANNER IN.
AND THEY WOULD HAVE TO WORK OUT IN THE COLUMBIA

141

00:11:03,650 --> 00:11:06,380

AS THE LEAD
MODULE.

142

00:11:06,380 --> 00:11:10,019

AND IN THE LUNAR MODULE SO YOU HAVE A SPACESUIT
THAT HAS TO WORK

143

00:11:10,019 --> 00:11:15,850

IN THREE DIFFERENT ARENAS PERFECTLY.
SPACECRAFT, LUNAR MODULAR AND THE SURFACE

144

00:11:15,850 --> 00:11:21,040

OF THE MOON.
AND THAT IS HOW THE APOLLO SPACESUIT CAME

145

00:11:21,040 --> 00:11:26,920

ABOUT.
THIS IS A FULLY, FORM FITTED SPACECRAFT, THE

146

00:11:26,920 --> 00:11:29,690

ASTRONAUT IS
COMPLETELY AUTONOMOUS AND ABLE TO WALK AROUND

147

00:11:29,690 --> 00:11:35,100

IN SPACE.
AND NOT HAVE TO RELY ON ANY CONNECTION, ANY

148

00:11:35,100 --> 00:11:38,269

UMBILICAL TO THE
SPACECRAFT BUT ALSO FEEL COMFORTABLE WHILE

149

00:11:38,269 --> 00:11:43,139

IN THE SPACECRAFT WILL
OPERATING IT AND HOW THE SYSTEMS WORK ON BOTH

150

00:11:43,139 --> 00:11:46,399

SIDES.
THE ASTRONAUTS NEEDED THE LIFE-SUPPORT INSIDE

151
00:11:46,399 --> 00:11:50,600
THE SPACECRAFT IN
ORDER TO GET THE LIFE-SUPPORT SYSTEM WORKING

152
00:11:50,600 --> 00:11:52,259
BEFORE THEY TOOK A
SPACEWALK.

153
00:11:52,259 --> 00:11:58,040
SO THEY NEEDED A PERFECT FIT, AN AMAZING AMOUNT
OF ENGINEERING.

154
00:11:58,040 --> 00:12:03,050
AND THAT IS NEIL ARMSTRONG'S SPACESUIT AS
IT MAY APPEAR IN A FEW

155
00:12:03,050 --> 00:12:08,949
YEARS HERE IN THE MUSEUM IN TWO YEARS.
WE WILL BE PUTTING IT BACK ON DISPLAY, JUST

156
00:12:08,949 --> 00:12:14,899
TO GIVE YOU AN IDEA.
NOW THIS COMBINATION OF IMAGINATION, MISSION,

157
00:12:14,899 --> 00:12:20,290
AND ENGINEERING IS
COMING AROUND ALMOST FULL CIRCLE FROM THE

158
00:12:20,290 --> 00:12:24,190
DISNEY WHEEL.
AND WHEN YOU LOOK AT IT IT WAS JUST ANNOUNCED

159
00:12:24,190 --> 00:12:30,690
A FEW WEEKS AGO
THAT MOSK HAS CREATED A HOLLYWOOD COSTUME

160
00:12:30,690 --> 00:12:35,579
DESIGNER TO DESIGN THE
SPACE SUIT FOR HIS DRAGON CAPSULE PART HE

161
00:12:35,579 --> 00:12:40,600
DECIDED HE WANTED
SOMETHING DARING AND SHOWING CLEARLY THE NEW

162
00:12:40,600 --> 00:12:46,230
DESIGN INNOVATION
AND COMPULSION FOR EXPLORING.

163
00:12:46,230 --> 00:12:49,120
BUT HE HAS TAKEN THE DESIGN HE HAS GOTTEN
FROM THE COSTUME

164
00:12:49,120 --> 00:12:52,970
DESIGNER AND HE IS REENGINEERING IT TO FIT
BACK INTO THE

165
00:12:52,970 --> 00:12:58,250
SPACECRAFT SO THAT IT WOULD WORK.
HIS ASSUMPTION IS THAT WITH THE ENGINEERING

166
00:12:58,250 --> 00:13:03,360
OF COSTUMES TODAY,
WHICH ARE VERY DIFFERENT FROM 50 YEARS AGO,

167
00:13:03,360 --> 00:13:07,339
THAT HE CAN'T ASSUME
THAT THE LIFE-SUPPORT WILL FIT IN.

168
00:13:07,339 --> 00:13:13,259
BECAUSE YOU HAVE TO HAVE COOLING, AND BREATHING
SUPPLIES IN

169
00:13:13,259 --> 00:13:19,589
COSTUMES FOR HOLLYWOOD.
AND THE ENGINEER DESIGNER IS JOSÉ FERNANDEZ

170
00:13:19,589 --> 00:13:24,050
WHO IS THE HEAD OF
IRON WORKS AS DESIGNED.

171
00:13:24,050 --> 00:13:29,089
AND IS KNOWN FOR DESIGNING THE IRON MAN COSTUME
AMONG OTHERS IN

172
00:13:29,089 --> 00:13:31,449
43 HOLLYWOOD MOVIES.
SO, QUESTION?

173
00:13:31,449 --> 00:13:36,410
>> ABSOLUTELY, WE ARE WELCOMING QUESTIONS
ONLINE AND HERE ON THE

174
00:13:36,410 --> 00:13:43,259
AUDIENCE.
IF ANYONE IN THE AUDIENCE WHAT STICKS UP TO

175
00:13:43,259 --> 00:13:44,829
THE MICROPHONE AND
ASK SOMETHING YOU'RE MORE THAN WELCOME TO.

176
00:13:44,829 --> 00:13:51,139
CATHY, DO YOU WANT TO STAND OR SIT FEEL FREE.
BUT WE WILL GET THINGS ROLLING.

177
00:13:51,139 --> 00:13:54,959
>>Man: GOOD AFTERNOON I AM STEVE FROM ARLINGTON,
VIRGINIA.

178
00:13:54,959 --> 00:13:57,920
THE QUESTION I HAVE FOR THE CURATOR IS THE
SUITS ARE MADE TO

179
00:13:57,920 --> 00:14:00,389
DESIGN DIRECT SUNLIGHT IS SPACE WHAT YOU HAVE
TO HAVE THEM TO

180
00:14:00,389 --> 00:14:05,569
SURVIVE IN THE SMITHSONIAN, THE MUSEUM.
>>Cathy : VERY GOOD QUESTION AND I DIDN'T

181
00:14:05,569 --> 00:14:14,029
PLANT THAT ONE.
YES, SPACESUITS ARE MEANT TO SURVIVE IN SPACE.

182
00:14:14,029 --> 00:14:18,680
WITH TEMPERATURES OF PLUS OR -250 DEGREES
CELSIUS THEY HAVE TO

183
00:14:18,680 --> 00:14:23,440
SURVIVE THE RADIATION, WITH ITEMS MOVING AT
250 MILES PER HOUR,

184
00:14:23,440 --> 00:14:33,000
THEY HAVE TO BE FUNCTIONAL, AND GETTING OXYGEN
INTO THE

185
00:14:33,000 --> 00:14:37,670
SPACESUIT.
THE CO2 OUT OF THE SPACESUIT, ALL OF THAT.

186
00:14:37,670 --> 00:14:42,740
BUT THEY ARE MADE OF MATERIALS THAT ARE NOT
NECESSARILY HIGH TECH

187
00:14:42,740 --> 00:14:48,190
BUT SYNTHETIC MATERIALS THAT WE HAVE, WE USE
IN EVERYDAY LIFE AND

188
00:14:48,190 --> 00:14:52,070
LAYERED IN SUCH A WAY.
BUT THOSE MATERIALS BECAUSE THEY ARE SYNTHETIC,

189
00:14:52,070 --> 00:14:55,740
THEY ARE PLASTIC.
THEY HAVE A HALF LIFE OF 50 YEARS.

190
00:14:55,740 --> 00:15:00,459
THAT MEANS JOHN GLENN SUE, NEIL ARMSTRONG'S
SUIT, HAVE APPROACHED

191
00:15:00,459 --> 00:15:07,800
THE HALF-LIFE OF SOME OF THEIR MATERIALS.
WHAT WE HAVE DISCOVERED IN INVESTIGATING AND

192
00:15:07,800 --> 00:15:11,339
LOOKING INTO
MATERIALS OF INDIVIDUAL, LOOKING AT THEM AS

193
00:15:11,339 --> 00:15:13,920
A WHOLE AS A
SPACESUIT.

194
00:15:13,920 --> 00:15:19,181
THE BEST ENVIRONMENT FOR THEM IS RELATIVELY
LOW HUMIDITY AND LESS

195
00:15:19,181 --> 00:15:23,430
THAN 30 PERCENT AND THEN COOL BUT NOT COLD
TEMPERATURES.

196
00:15:23,430 --> 00:15:26,430
THAT IS THE BEST WAY TO KEEP THE SPACESUIT
TOGETHER AS A WHOLE

197
00:15:26,430 --> 00:15:30,910
THING.
WE ALWAYS GET MATERIALS THAT START SAYING,

198
00:15:30,910 --> 00:15:33,350
IT WOULD BE MUCH
EASIER FOR YOU TO PRESERVE THEM IF YOU COULD

199
00:15:33,350 --> 00:15:35,910
TAKE THEM ALL APART
BUT WE CAN'T TAKE THEM ALL APART.

200
00:15:35,910 --> 00:15:41,920
THEY ARE HISTORICAL OBJECTS.
SO WE HAVE OUR SPACESUITS IN A STORAGE YOU

201
00:15:41,920 --> 00:15:47,050
DON'T FACILITY, THEY
ARE IN A LARGE ROOM THAT IS KEPT UNDER THOSE

202
00:15:47,050 --> 00:15:50,750
CLIMATE CONDITIONS.
WHAT WE ARE WORKING ON RIGHT NOW IS FINDING

203
00:15:50,750 --> 00:15:54,910
WAYS TO REPLICATE
THOSE CLIMATE CONDITIONS FOR EXHIBITION SO

204
00:15:54,910 --> 00:16:00,250
WE CAN GET MORE OF
THAT 287 COLLECTION ON DISPLAY FOR THE PUBLIC

205
00:16:00,250 --> 00:16:01,250
THROUGHOUT THE
WORLD.

206
00:16:01,250 --> 00:16:06,009
BECAUSE WE REALLY WOULD LIKE TO PRESERVE THEM
AND NOBODY SEES IT,

207
00:16:06,009 --> 00:16:09,750
THERE IS NO POINT TO PRESERVE THEM BUT WE
WANT MORE PEOPLE TO SEE

208
00:16:09,750 --> 00:16:15,450
THE SPACESUITS.
THE BINDING CASES THAT DEAL PROPERLY, THERE

209
00:16:15,450 --> 00:16:19,959
ARE AMAZING ADVANCES
IN CLIMATE CHANGES THAT CAN MAINTAIN CLIMATE

210
00:16:19,959 --> 00:16:24,399
INSIDE MUSEUM
OBJECTS TODAY AND THAT IS WHAT WE ARE WORKING

211
00:16:24,399 --> 00:16:28,019
ON.
THAT IS HOW NEIL ARMSTRONG SUIT WILL BE DISPLAYED

212
00:16:28,019 --> 00:16:31,100
IN 2019 WHEN IT
GOES ON DISPLAY.

213
00:16:31,100 --> 00:16:36,790
>>Man: I I AM JARED NETTLES FROM SAN JOSE,
CALIFORNIA.

214
00:16:36,790 --> 00:16:41,040
I WAS WONDERING TO BOTH OF YOU, WHAT ARE THE
CHALLENGES YOU SEE

215
00:16:41,040 --> 00:16:44,060
COMING UP WITH THE SPACESUIT DESCENT, ESPECIALLY
AS WE TALK ABOUT

216
00:16:44,060 --> 00:16:48,060
GOING TO MARS AND ONTO THE MORE INCREASINGLY
HOSTILE ENVIRONMENTS

217
00:16:48,060 --> 00:16:53,139
IS SPACE.
AND DEALING WITH THE IONIZING RADIATION OVER

218
00:16:53,139 --> 00:16:54,610
LONG PERIODS OF
TIME.

219
00:16:54,610 --> 00:17:05,150
WHAT ARE YOUR THOUGHTS IN THAT DIRECTION?
>>Woman: YES, GO AHEAD.

220
00:17:05,150 --> 00:17:12,340
>> THE FIRST THING YOU DO, THE JUMP FROM APOLLO
– GEMINI TO

221
00:17:12,340 --> 00:17:15,740
APOLLO WAS VERY IMPORTANT FOR THE ASTRONAUTS
HAD TO WALK.

222
00:17:15,740 --> 00:17:21,760
NOW WITH THE ISS THE ASTRONAUTS DON'T WALK,
THE LOWER HALF OF THE

223
00:17:21,760 --> 00:17:25,490
SUITS ARE NOT VERY MOBILE.
EVERYTHING GOES TO MISSION.

224
00:17:25,490 --> 00:17:30,530
AS FAR AS RADIATION IS CONCERNED THAT IS A
CONCERN AND I THINK

225
00:17:30,530 --> 00:17:42,950
JENNIFER IS BETTER TRAINED TO ANSWER THAT.
B6 THE SUITS ARE THE FUTURE OF DESIGN AND

226
00:17:42,950 --> 00:17:46,850
DEVELOPMENT.
RADIATION IS A NUMBER ONE SHOWSTOPPER FOR

227
00:17:46,850 --> 00:17:50,530
ASTRONAUTS, SOMETHING
THAT MAKES SENSE TO INCORPORATE THAT INTO

228
00:17:50,530 --> 00:17:53,590
THE SUIT DESIGN.
YOU HAVE TO INCORPORATE THAT INTO YOUR SHELTERS

229
00:17:53,590 --> 00:17:54,590
AND THINGS LIKE
THAT.

230
00:17:54,590 --> 00:17:58,840
YOU WILL NEED A HIGH, MASSIVE PROTECTION OF
THE RADIATION.

231
00:17:58,840 --> 00:18:05,070
LIKE TALKING ABOUT THE SUIT LIFE SUPPORT DESIGN
AND FOR THE

232
00:18:05,070 --> 00:18:08,630
RADIATION ALL PROTECTIONS.
THANKS.

233
00:18:08,630 --> 00:18:19,170
>>Dava: THERE IS AN ONLINE QUESTION.
WHAT CAN YOU LEARN FROM APOLLO SPACESUITS

234
00:18:19,170 --> 00:18:24,800
THAT HAVE CONTRIBUTED
TO MODERN SPACESUITS?

235
00:18:24,800 --> 00:18:29,530
CATHY?
>>Cathy : FIRST OF ALL, AT THE TIME THERE

236
00:18:29,530 --> 00:18:34,810
IS AN ELEGANT HEALING
SYSTEM THAT WAS A PRESSURE SYSTEM BETWEEN

237
00:18:34,810 --> 00:18:38,210
TWO SIPPERS.
THERE IS A RUBBER GASKET THAT GOES BETWEEN

238
00:18:38,210 --> 00:18:42,940
THE TWO SIPPERS.
WHEN THE SUIT IS PRESSURIZED THE TWO SIPPERS

239
00:18:42,940 --> 00:18:47,390
PRESSED TOGETHER AND
COMPRESS THE RUBBER GASKET AND THAT FORMS

240
00:18:47,390 --> 00:18:49,880
A SEAL.
AND IT WORKED PERFECTLY WELL FOR THE APOLLO

241
00:18:49,880 --> 00:18:53,250
PROGRAM.
IN FACT THEY TESTED AND RETESTED THE SUIT

242
00:18:53,250 --> 00:18:57,920
AFTER THE MISSION, THEY
WERE ABLE TO RE-PRESSURIZED EACH OF THE SUITS

243
00:18:57,920 --> 00:19:02,640
WITHOUT ANY
SIGNIFICANT INCREASE IN THE LOSS OF AIR INSIDE

244
00:19:02,640 --> 00:19:07,530
THE SUIT.
BUT FOR LONG-TERM USE THEY ARE VERY UNRELIABLE

245
00:19:07,530 --> 00:19:16,300
THEY WILL NOT WORK
– THEY STOPPED WORKING AFTER ABOUT 5-6 PRESSURIZATION.

246
00:19:16,300 --> 00:19:20,410
WHAT I LEARNED JUST RECENTLY, THEY WALKED
OUT WITH THE PRESSURE

247
00:19:20,410 --> 00:19:25,660
SIPPERS ON EVERY SUIT UP TO TWO WEEKS BEFORE
LAUNCH IS ON THE

248
00:19:25,660 --> 00:19:28,470
APOLLO PROGRAM.
THEY WERE JUST WALKING OUT AND WHEN THEY CAME

249
00:19:28,470 --> 00:19:31,920
TO A POINT OF
FAILURE AND PUTTING A NEW ZIPPER IN.

250
00:19:31,920 --> 00:19:38,070
YOU LOOK AT SUITS NOW AND BECAUSE OF THE LARGE
PART OF THE BULK

251
00:19:38,070 --> 00:19:46,320
CAUSED BY THE CURRENT EM USE THAT THEY USE.
THE MODELS WE HAVE OUTSIDE THIS DOOR IS THE

252
00:19:46,320 --> 00:19:52,740
FACT THAT THERE ARE
LARGE BEARINGS, WASTE BEARINGS THAT HAVE COMPRESSION

253
00:19:52,740 --> 00:19:53,740
GASKETS ON
THE INSIDE.

254
00:19:53,740 --> 00:20:00,090
BUT THEY ARE NOT THE FIRST.
AT THE TIME THE APOLLO PROGRAM HAD TO GO WITH

255
00:20:00,090 --> 00:20:04,410
A LIGHTER WEIGHT
THEY WERE GOING WITH FULL OXYGEN MASKS AND

256
00:20:04,410 --> 00:20:07,080
AS A WEIGHT
CONSIDERATION.

257
00:20:07,080 --> 00:20:11,740
I AM ASSUMING WE ARE PLANNING TO DO FULL ATMOSPHERE
SO WE ARE

258
00:20:11,740 --> 00:20:16,220
GOING TO HAVE TO FIND WAYS TO MAKE THAT COMPRESSION
FEEL LIGHTER.

259
00:20:16,220 --> 00:20:22,770
>>Dava: YOU DON'T HAVE TO HAVE A FULL ATMOSPHERE
SUIT, FOR ONE

260
00:20:22,770 --> 00:20:29,300
ATMOSPHERIC, IT WOULD MAKE A SENSE THAT A
SUIT IS THREE QUARTERS

261
00:20:29,300 --> 00:20:32,560
OF THAT.
SO THERE IS A LOT OF GOOD REASONS FOR MOBILITY,

262
00:20:32,560 --> 00:20:36,840
YOU CAN ACTUALLY
REDUCE THE PRESSURE OF THE SUIT AND YOU COULD

263
00:20:36,840 --> 00:20:38,540
PERFORM PERFECTLY
WELL IN IT.

264
00:20:38,540 --> 00:20:46,090
WHAT THE APOLLO DESIGN IS THE FORMER RESEARCH,
ON THE MOON AND

265
00:20:46,090 --> 00:20:50,250
LOW GRAVITY ENVIRONMENTS.
YOU DON'T HAVE TO DO THAT GREAT BUNNY HOP

266
00:20:50,250 --> 00:20:57,160
THING SO WE GET ANOTHER
CHANCE OF IT WE WILL GET MORE OF A LOPING.

267
00:20:57,160 --> 00:21:01,170
BUT NOT THAT LOGO, WE HAVE TO PUT IN BETTER
BIOMECHANICS INTO THE

268
00:21:01,170 --> 00:21:02,770
SUIT.
ANOTHER QUESTION?

269
00:21:02,770 --> 00:21:08,760
>>Man: HELLO MY NAME IS EVAN I AM FROM BOSTON.
YOU MAY HAVE ALREADY TOUCH ON SOME OF THE

270
00:21:08,760 --> 00:21:11,520
THINGS I WAS HOPING TO
ASK YOU ABOUT.

271
00:21:11,520 --> 00:21:16,380
BUT SPECIFICALLY, WHEN WE DESIGN ANYTHING
WE START WITH SMALL

272
00:21:16,380 --> 00:21:21,950
STEPS FORWARD IN TECHNOLOGY.
AND THERE ARE ALWAYS GREAT LEAPS THAT HAPPEN

273
00:21:21,950 --> 00:21:25,170
IN TECHNOLOGY, BY
THE ALUMINUM COATING YOU ALREADY SPOKE ABOUT

274
00:21:25,170 --> 00:21:27,700
AND THE COMPRESSION
BEARINGS ON THE SUIT.

275
00:21:27,700 --> 00:21:30,520
WHAT DO YOU THINK IS THE NEXT TECHNOLOGICAL
BREAKTHROUGH, THE ONE

276
00:21:30,520 --> 00:21:34,640
BEYOND THAT THAT MAYBE RESEARCH RIGHT NOW?
WHAT YOU THINK THOSE BREAKTHROUGHS ARE GOING

277
00:21:34,640 --> 00:21:38,660
TO BE FOR SPACE?
>>Dava: GREAT QUESTION.

278
00:21:38,660 --> 00:21:41,770
>>Jennifer: SOME OF THE BREAKTHROUGHS HAVE
BEEN THE SMALL STEPS

279
00:21:41,770 --> 00:21:48,290
FROM GOING TO THE EXISTING LAYERING MATERIALS,
WHAT WAS BEING

280
00:21:48,290 --> 00:21:53,320
USED FOR APOLLO.
THEY USE SIMILAR LAYERING'S BUT THEY USE MATERIALS

281

00:21:53,320 --> 00:21:55,670

THAT ARE
LIGHTER WEIGHT AND MORE DURABLE.

282

00:21:55,670 --> 00:22:06,750

SO THAT SAVES SOME OF THE WHITE.
GOING ON AS DAVID SAID, LATER WEIGHT AND GLOVES.

283

00:22:06,750 --> 00:22:11,980

GLOVES ARE THE MOST IMPORTANT PART OF EXPLORATION.
WE NEED OUR HANDS TO EXPLORE.

284

00:22:11,980 --> 00:22:16,580

WE AS HUMANS USE OUR HANDS TO EXPRESS OURSELVES
AS PART OF OUR

285

00:22:16,580 --> 00:22:24,560

BRAIN DEVELOPMENT AND USING OUR HANDS.
THE CURRENT ISS SHUTTLE SPACE IT HAS GONE

286

00:22:24,560 --> 00:22:26,040

THROUGH SIX
GENERATIONS.

287

00:22:26,040 --> 00:22:29,250

THEY ARE WORKING ON A SEVENTH GENERATION OF
GLOVES.

288

00:22:29,250 --> 00:22:34,140

GETTING A CLUB THAT BOTH PROTECTS AND IS PLIABLE
AND GIVES THE

289

00:22:34,140 --> 00:22:37,520

ASTRONAUT A TACTILE SENSE TO BE ABLE TO DO
MEANINGFUL WORK.

290

00:22:37,520 --> 00:22:42,770

AND ALSO TO BE ABLE TO GIVE QUICK, SHARP SIGNALS
TO HIS OR HER

291

00:22:42,770 --> 00:22:46,090

COMPANION.

OUT IN SPACE WITHOUT TALKING.

292

00:22:46,090 --> 00:22:52,140

>>Cathy : IS VERY ESSENTIAL.

I DON'T – I THINK IT IS A ITERATIVE PROCESS

293

00:22:52,140 --> 00:22:54,210

THEY HAVE TRIED A LOT

OF THINGS.

294

00:22:54,210 --> 00:23:02,810

THEY HAVE GONE OTHER DIRECTIONS FROM EXPERIMENTS.

SOME OF THOSE SIX GENERATIONS WERE NEVER USED

295

00:23:02,810 --> 00:23:06,760

IN SPACE.

THEY WERE JUST TESTED, SO LOVE DEVELOPMENT

296

00:23:06,760 --> 00:23:12,390

I THINK IT'S FROM MY

PERSPECTIVE, AND I AM WRITING A BOOK ON IT,

297

00:23:12,390 --> 00:23:16,930

IS THE MOST IMPORTANT

AND THE GREATEST CHALLENGE IN TERMS OF SPACESUIT

298

00:23:16,930 --> 00:23:18,910

DEVELOPMENT AT

THIS POINT.

299

00:23:18,910 --> 00:23:23,850

>>Dava: I HOPE WE INCORPORATE SPACESUIT TECHNOLOGY

AND NOT YOUR

300

00:23:23,850 --> 00:23:27,550

GRANDFATHER'S SUITS.

THEY ARE LIGHT, FORMFITTING, AND I HOPE WE

301

00:23:27,550 --> 00:23:29,380

CAN GET RID OF THE 14
LAYERS.

302

00:23:29,380 --> 00:23:33,770

ALL RIGHT WE WILL TURN OFF TO DOCTOR NEWMAN.
TAKE THE FLOOR.

303

00:23:33,770 --> 00:23:38,090

>>Jennifer: HI, EVERYONE.

I AM GOING TO STAND UP TO INTERACT WITH YOU

304

00:23:38,090 --> 00:23:41,080

AS WELL.

A NICE SIZE GROUP TO BE HERE BUT IF YOU ARE

305

00:23:41,080 --> 00:23:44,950

STANDING UP COME IN
AND GLAD TO BE HERE.

306

00:23:44,950 --> 00:23:48,680

I WANT TO TAKE YOU TO MARS AND A LITTLE BIT
BEYOND TO TELL YOU

307

00:23:48,680 --> 00:23:52,990

WHAT WE ARE DOING TO HIGHLIGHT A LOT OF GREAT
WORK AT NASA.

308

00:23:52,990 --> 00:24:05,140

SO MAYBE, SEE IF MY CLICKER IS WORKING.

THE SCENES ARE A LITTLE BIT DARK BUT HOPEFULLY

309

00:24:05,140 --> 00:24:09,980

YOU CAN SEE THIS.

IN 26 YEARS ANYONE UNDER 26 RACER HAND?

310

00:24:09,980 --> 00:24:15,080

ALL RIGHT, YOUR ENTIRE LIFETIME THE HUBBLE
SPACECRAFT HAS BEEN IN

311
00:24:15,080 --> 00:24:22,170
ORBIT, IT IS SEARCHING INTO THE SOLAR SYSTEM.
WE HAVE LOOKED AT 13 BILLION LIGHT YEARS.

312
00:24:22,170 --> 00:24:27,170
AND IT IS STILL GOING SO I LOVE TO SHOW THIS.
THIS IS A WONDERLAND TO CLUSTER THAT WE ARE

313
00:24:27,170 --> 00:24:28,430
DISCOVERING EVERY
DAY.

314
00:24:28,430 --> 00:24:32,120
WE GET NEW DATA, DO GALAXIES, THOUSANDS AND
THOUSANDS OF NEW

315
00:24:32,120 --> 00:24:36,950
GALAXIES FROM HUBBLE.
IT CELEBRATED THE 27TH ANNIVERSARY LAST MONTH,

316
00:24:36,950 --> 00:24:43,350
IT IS THE GREATEST
OPTICAL SPACE SPACE TELESCOPE.

317
00:24:43,350 --> 00:24:49,490
WE CALL IT GWST IT WILL BE LAUNCHED IN 2018.
IT WILL BE 100 MORE TIMES POWERFUL THAN HUBBLE.

318
00:24:49,490 --> 00:24:57,910
AS MASTERSON SAYS, ARE DOUBLE LAWYER, IT WILL
REALLY BREAKTHROUGH

319
00:24:57,910 --> 00:25:05,050
IN TERMS OF DARK ENERGY AND DARK MATTER.
AND HELPING US ANSWER THE ENDURING QUESTION,

320
00:25:05,050 --> 00:25:09,740
WHERE DO WE COME
FROM, WHERE ARE WE NOW, ARE THERE OTHER HABITABLE

321

00:25:09,740 --> 00:25:13,890

PLANETS, WAS
THERE PAST LIFE IN THE PLANET.

322

00:25:13,890 --> 00:25:18,470

THOSE ARE OUR QUESTIONS, ARE WE ALONE IN THE
GALAXY.

323

00:25:18,470 --> 00:25:26,170

AND THAT INFORMS US OF OUR FUTURE GOING ON.
NEW HORIZONS, EVERYBODY PAY ATTENTION TO NEW

324

00:25:26,170 --> 00:25:28,910

HORIZONS.
YES, WE DIDN'T KNOW WHAT PLUTO LOOK LIKE IT

325

00:25:28,910 --> 00:25:35,510

WAS PRETTY FUZZY.
WE GOT THERE IN ORBIT ARE LAST JULY AND NOW

326

00:25:35,510 --> 00:25:37,490

WE KNOW A LOT ABOUT
PLUTO.

327

00:25:37,490 --> 00:25:41,860

WE KEEP GETTING IMAGES BACK, IT IS ICY, AND
LOTS OF INTERESTING

328

00:25:41,860 --> 00:25:47,830

CHEMICAL COMPOSITIONS TO IT.
AND I CALL THIS DWARF PLANET INTERESTING.

329

00:25:47,830 --> 00:25:51,870

I DON'T KNOW IF YOU HAVE HEARD OF OUR DAWN
SPACECRAFT, WINNING

330

00:25:51,870 --> 00:25:59,370

THE MOST TEDIOUS AWARD.
DAWN IS A SPACECRAFT THAT IS AT ANOTHER DWARF

331

00:25:59,370 --> 00:26:02,710

PLANET CERES, IN AN
AFTER NIGHT BILL.

332

00:26:02,710 --> 00:26:10,380

BETWEEN MERCURY AND IT IS.
WE WENT CLOSER IN ORBIT AND WE DIDN'T KNOW

333

00:26:10,380 --> 00:26:12,420

WHAT THEY WERE.
YOU KNOW, WHAT IS HAPPENING?

334

00:26:12,420 --> 00:26:21,230

WE FOUND OUT IN DECEMBER THAT IS A JUNO MOUNT,
THAT IS 20

335

00:26:21,230 --> 00:26:27,800

KILOMETERS HIGH, THAT IS A MOUNTAIN ON THE
DWARF PLANET.

336

00:26:27,800 --> 00:26:30,730

WE ARE STILL IN ORBIT WE ARE STILL GETTING
DATA BACK.

337

00:26:30,730 --> 00:26:36,820

WHERE WILL YOU BE JULY 4TH?
HOPEFULLY HERE AT THE JET PROPULSION LAB WE

338

00:26:36,820 --> 00:26:40,500

WILL BE TO JUPITER.
SO OUR JUNO MISSION GETS TO JUPITER.

339

00:26:40,500 --> 00:26:47,800

WE ARE ON THE COUNTDOWN IT GETS TO JUPITER.
IT IS THE EARLIEST SOLAR POWERED SPACECRAFT

340

00:26:47,800 --> 00:26:50,850

HAS EVER FLOWN AND WE
WILL OPEN IT UP TO STUDENT SCIENTIST.

341
00:26:50,850 --> 00:26:54,570
I HOPE YOU WILL GO ON OUR NASA WEBSITE, WITH
THE JUNO CAMP.

342
00:26:54,570 --> 00:26:58,670
WE WILL POINT TO JUPITER AS A WORD YOU WANT
TO EXPLORE ON JUPITER

343
00:26:58,670 --> 00:27:01,950
AND WE WILL PUT OUR JUNO CAMP AND WE WILL
EXPLORE JUPITER

344
00:27:01,950 --> 00:27:07,790
TOGETHER.
AND THE FIREWORKS TO CELEBRATE NASA GETTING

345
00:27:07,790 --> 00:27:17,590
TO JUPITER ON JULY
4TH. WE HAVE OUR IT IS THE FIRST TIME WE GO

346
00:27:17,590 --> 00:27:21,000
TO AN ASTEROID.
IT WILL TAKE A FEW YEARS FOR US TO GET IT

347
00:27:21,000 --> 00:27:26,290
BACK BUT AGAIN, COME
BACK AND LOOK AT THAT CHARACTERISTIC SIGNATURE.

348
00:27:26,290 --> 00:27:32,590
LOOKING FOR ORGANIC, ANY EVIDENCE OF PAST
LIFE IN THE UNIVERSE.

349
00:27:32,590 --> 00:27:36,950
>>> HOPEFULLY YOU KNOW, LATE LAST FALL WE
HAVE EVIDENCE FOR

350
00:27:36,950 --> 00:27:41,300
FLOWING WATER ON MARS.
THE SALTY, BRAINY, YOU DON'T WANT TO DRINK

351

00:27:41,300 --> 00:27:42,970

IT YET BUT IT IS
SEASONAL.

352

00:27:42,970 --> 00:27:45,460

THIS IS A HUGE SCIENTIFIC BREAKTHROUGH FOR
US.

353

00:27:45,460 --> 00:27:53,950

WE KNOW THAT MARS ICECAPS, THERE WAS ICE.
WHEN YOU SEARCH FOR LIFE, WE SAY FOLLOW THE

354

00:27:53,950 --> 00:27:55,530

WATER, OR FOLLOW THE
ICE.

355

00:27:55,530 --> 00:28:00,070

BUT NOW WE HAVE WATER ON MARS.
SO WE ARE LOOKING AT THIS, WE KEEP TAKING

356

00:28:00,070 --> 00:28:03,300

DATA FROM OUR MARS
RECONNAISSANCE ORBITER AND WE ARE GETTING

357

00:28:03,300 --> 00:28:07,511

BETTER THAN WATER.
WE DON'T NEED SOUND ON THIS.

358

00:28:07,511 --> 00:28:11,610

THIS IS A SIMULATION OF MARS, IT HAS ONE PERCENT
CARBON

359

00:28:11,610 --> 00:28:14,750

ATMOSPHERE.
ONE PERCENT OF THE ATMOSPHERE WE HAVE HERE

360

00:28:14,750 --> 00:28:18,620

ON EARTH.
WE KNOW WHY MARS LAWSUITS ATMOSPHERE, WE ARE

361
00:28:18,620 --> 00:28:23,140
STILL STUDYING IT
BUT THIS IS RECENT DATA OF THE SOLAR RADIATION

362
00:28:23,140 --> 00:28:29,340
AND THE SOLAR WIND
THAT ARE IONS COMING OFF "THE MARTIAN" SURFACE.

363
00:28:29,340 --> 00:28:34,710
NOW SPACE SHIP EARTH, OUR NUMBER ONE PLANET,
WE HAVE THIS GLOBAL

364
00:28:34,710 --> 00:28:41,110
MAGNETIC FILM THAT PROTECT US FROM THE SUN.
MARS, NOT SO LUCKY.

365
00:28:41,110 --> 00:28:44,940
SISTER PLANET, HALF THE SIZE OF EARTH BUT
MARS NOT SO LUCKY.

366
00:28:44,940 --> 00:28:50,840
IT'S ATMOSPHERE HAS BEEN DEPLETED AWAY.
THIS IS REAL HISTORY LESSON THIS IS 4.5 BILLION

367
00:28:50,840 --> 00:28:56,960
YEARS FOR MARS.
MARS WAS WET, WARM, MAYBE WET AND WILD.

368
00:28:56,960 --> 00:29:00,390
WONDERFUL PLACE TO BE 4.5 BILLION YEARS AGO
THEN SOMETHING WENT

369
00:29:00,390 --> 00:29:03,890
TERRIBLY WELL WRONG.
BECAUSE TODAY NOW IS MARS, I WOULDN'T SAY

370
00:29:03,890 --> 00:29:06,711
DEAD PLANET, BUT WE ARE
LOOKING AT IT.

371
00:29:06,711 --> 00:29:09,340
BECAUSE WE ARE LOOKING AT PAST EVIDENCE OF
LIFE ON MARS.

372
00:29:09,340 --> 00:29:14,370
THAT WOULD TELL US A LOT ABOUT LIFE HERE ON
EARTH AND OUR ORIGINS

373
00:29:14,370 --> 00:29:17,910
AND HISTORY IN THE SOLAR SYSTEM.
SO WE ARE EXPLORING MARS EVERYDAY.

374
00:29:17,910 --> 00:29:21,110
ONE THING ABOUT THE INTERNATIONAL SPACE STATION
IS THIS GREAT

375
00:29:21,110 --> 00:29:25,090
AUDITORIUM BECAUSE I HAVE REALLY GREAT SKILL
MODEL HANGING UP.

376
00:29:25,090 --> 00:29:28,760
THE SPACE STATION AS BIG AS A FOOTBALL FIELD
AND WE HAVE SIX

377
00:29:28,760 --> 00:29:35,130
ASTRONAUTS LIVING ON BOARD TODAY.
ANYONE 16 YEARS AND YOUNGER RAISE YOUR HAND?

378
00:29:35,130 --> 00:29:39,770
THERE WE HAD THE 26-YEAR-OLD.
EVERY DAY YOU HAVE BEEN ALIVE WE HAVE HAD

379
00:29:39,770 --> 00:29:45,200
ASTRONAUTS IN SPACE.
IT ONLY TAKES 90 MINUTES TO GO AROUND EARTH.

380
00:29:45,200 --> 00:29:50,700
BERNIE FAST, PRETTY FAST THEY SEE A LOT OF
WONDERFUL SUNRISES AND

381
00:29:50,700 --> 00:29:55,900
SUNSETS EVERY DAY.
THEN I WANT TO MAKE SURE THAT YOU KNOW NASA

382
00:29:55,900 --> 00:29:59,810
IS ALIVE AND WELL BUT
WE ARE MORE ACTIVE IN DEVELOPMENT THAN WE

383
00:29:59,810 --> 00:30:02,240
HAVE EVER BEEN IN THE
LAST FOUR DECADES.

384
00:30:02,240 --> 00:30:06,670
WE ARE GOING FROM SPACE STATIONS BACK TO LUNAR
ORBIT, WE CALL IT

385
00:30:06,670 --> 00:30:10,500
EARTH MOON ORBIT AND DEEP SPACE.
WE DO IT IS OUR SPACE LAUNCH.

386
00:30:10,500 --> 00:30:16,290
WE HAVE A VIDEO FOR YOU IT IS NOT JUST POWERPOINT.
WE ARE BUILDING AND CONSTRUCTING.

387
00:30:16,290 --> 00:30:22,320
WE JUST TOOK A CORE SEGMENT OF SLS, OUR SPACE
LAUNCH SYSTEM WITH

388
00:30:22,320 --> 00:30:47,170
THE ORION MODULE ON TOP.
¶MUSIC ¶

389
00:30:47,170 --> 00:32:21,590
¶[MUSIC CONTINUES]\¶
SUITE THAT IS EXPLORE SURE WHEN.

390
00:32:21,590 --> 00:32:27,280
WE LAUNCHED OUR SPACE STATION.
LUNCH IN THE EARLY 2020S WITH THE ORION CAPSULE

391

00:32:27,280 --> 00:32:28,700

WITH ASTRONAUTS
ON BOARD.

392

00:32:28,700 --> 00:32:33,190

THIS GIVES US FROM EARTH TO LUNAR ORBIT IN
THE 2020S AND THEN WE

393

00:32:33,190 --> 00:32:37,320

GO ONWARD TO MARS IN THE 2030S.
IT IS VERY EXCITING.

394

00:32:37,320 --> 00:32:41,120

THAT ARE 1000 COMPANIES INVOLVED AND WE ARE
WORKING IN EVERY

395

00:32:41,120 --> 00:32:44,730

STATE OF THE UNITED STATES FOR THESE DEVELOPMENTS
OF OUR NEXT

396

00:32:44,730 --> 00:32:51,320

BIG, HEAVY LAUNCH.
MORE POWERFUL THAN SATURN FIVE, SO ONWARD

397

00:32:51,320 --> 00:32:55,141

TO MARS.
I WANT TO REMIND YOU A LITTLE BIT, I THINK

398

00:32:55,141 --> 00:32:58,540

I WILL SKIP THIS
GRAPHIC IT IS A LITTLE BIT DARK IN HERE.

399

00:32:58,540 --> 00:33:02,090

WE HAVE BEEN ON MARS WITH OUR ROVERS AND OUR
ORBITERS FOR THE

400

00:33:02,090 --> 00:33:05,500

LAST SIX YEARS.
SO WE CELEBRATE OUR LAST 15 YEARS.

401
00:33:05,500 --> 00:33:10,430
AS I SAID TODAY WE HAVE FIVE LANDERS AND ORBITERS
AT MARS TODAY.

402
00:33:10,430 --> 00:33:14,150
AND WE HAVE OUR POLAR JOURNEY, THE PRESIDENT
HAS CHARGED US WITH

403
00:33:14,150 --> 00:33:19,820
LANDING HUMANS TO MARS IN THE 2030S.
AND I AM UP FOR IT AND I LOVE SEEING ALL THE

404
00:33:19,820 --> 00:33:23,140
FOLKS HERE WHO HAVE
CALL THAT THEY ARE UNDER 26 BECAUSE YOU ARE

405
00:33:23,140 --> 00:33:26,039
THE MARS GENERATION
BUT I AM NOT GOING, I AM GETTING DOWN DOING

406
00:33:26,039 --> 00:33:27,690
EVERYTHING IN MY
POWER TO GET YOU THERE.

407
00:33:27,690 --> 00:33:32,940
WE HOPE TO GET ON MARS AND THIS COMING TIME
I WANT TO TELL YOU

408
00:33:32,940 --> 00:33:38,340
ABOUT SCOTT KELLY'S MISSION ON THE SPACE STATION.
AGAIN WITH THE PROPS IN THE BACK, SIX PEOPLE

409
00:33:38,340 --> 00:33:40,510
LIVING ON THE
INTERNATIONAL SPACE STATION.

410
00:33:40,510 --> 00:33:43,660
BUT WE HAD A SPECIAL OPPORTUNITY IN THE LAST
YEAR.

411
00:33:43,660 --> 00:33:46,820
SCOTT KELLY WAS ON THE SPACE STATION FOR ONE
YEAR, THE LONGEST

412
00:33:46,820 --> 00:33:50,410
MISSION WE HAVE HAD FOR INTERNATIONAL SPACE
STATION ASTRONAUTS.

413
00:33:50,410 --> 00:33:54,970
AND WE STUDIED HIS BODY AND PHYSIOLOGY.
SOMEBODY EARLIER TALKED ABOUT RADIATION.

414
00:33:54,970 --> 00:33:57,741
ON THE INTERNATIONAL SPACE STATION IT IS THE
FIRST STAGE OF THE

415
00:33:57,741 --> 00:34:00,730
JOURNEY TO MARS.
WE'RE LEARNING HOW ASTRONAUTS LIVE AND WORK

416
00:34:00,730 --> 00:34:05,520
IN ISOLATED
ENVIRONMENT AND WE DID THE FIRST GENETIC RESEARCH

417
00:34:05,520 --> 00:34:10,440
AND SCIENCE.
SCOTT HAS AN IDENTICAL TWIN BROTHER MARK,

418
00:34:10,440 --> 00:34:13,710
HE IS THE CONTROL FOR
THE ASTRONAUTS HIMSELF AND WE WERE ABLE TO

419
00:34:13,710 --> 00:34:18,139
TEST THE TWO BROTHERS.
WE ARE DOING DNA SEQUENCING RIGHT NOW AND

420
00:34:18,139 --> 00:34:20,379
WILL GET OUR RESULTS
OUT SOON.

421

00:34:20,379 --> 00:34:23,129

SCOTT JUST CAME BACK, HE IS A LITTLE SORE,
HE IS WALKING A LITTLE

422

00:34:23,129 --> 00:34:26,029

SLOW BUT HE IS ALL RIGHT.
A LONG TIME TO BE IN BASE.

423

00:34:26,029 --> 00:34:31,950

JEFF WILLIAMS IS ON THE CURRENT CREW OF SIX.
HE WILL BREAK ALL OF SCOTT'S RECORDS, THIS

424

00:34:31,950 --> 00:34:36,470

IS HIS THIRD SPACE
STATION, EACH INCREMENT OF SIX MONTHS.

425

00:34:36,470 --> 00:34:40,339

SO JEFF HAS BEEN UP THERE THIS IS HIS SIX
MONTHS, SO SIX MONTHS,

426

00:34:40,339 --> 00:34:45,000

SIX MONTHS AND SIX MONTHS BUT HE IS GETTING
READY TO BREAK FOR

427

00:34:45,000 --> 00:34:47,649

THE NASA ASTRONAUT, THE LONGEST PERSON IN
SPACE.

428

00:34:47,649 --> 00:34:54,769

THERE IS SCOTT, HERE LAST WEEK AT THE AIR
AND NATIONAL SPACE.

429

00:34:54,769 --> 00:35:01,609

THEY ARE EATING 53, TO EAT FOOD IN SPACE.
BACK TO OUR JOURNEY ON MARS WE NEED TO LEARN

430

00:35:01,609 --> 00:35:05,579

HOW TO GROW AND LIVE
AND LITERALLY LIVED OFF THE LAND.

431
00:35:05,579 --> 00:35:08,759
SO OUR SMALL EXPERIMENT HERE WE ARE LOOKING
AT THE BIO

432
00:35:08,759 --> 00:35:14,730
REGENERATIVE LIFE-SUPPORT SYSTEM.
THESE ARE SOME TECHNOLOGIES WE TALK ABOUT

433
00:35:14,730 --> 00:35:18,910
STUDENTS IN THIS PANEL
AND LIFE-SUPPORT SYSTEMS ARE SO CRITICAL.

434
00:35:18,910 --> 00:35:22,060
WE NEED BREAKTHROUGHS IN OUR LIFE SUPPORT
SYSTEM TO OUR SPACE

435
00:35:22,060 --> 00:35:25,599
STATION TO GET INTO DEEP SPACE AND DEEP SPACE
HABITATS.

436
00:35:25,599 --> 00:35:29,190
THAT IS AN ENVIRONMENT THAT IS MUCH HARSHER
THAN THE SPACE

437
00:35:29,190 --> 00:35:31,690
STATION.
SO WE ARE LOOKING AT ALL THESE TECHNOLOGIES,

438
00:35:31,690 --> 00:35:33,290
IN SPACE
MANUFACTURING.

439
00:35:33,290 --> 00:35:38,289
WE ARE DOING SPACE MANUFACTURING, WE HAVE
OUR PRINTER SO NOW THEY

440
00:35:38,289 --> 00:35:43,740
PRINT THEIR OWN RIDGES.
IF THEY NEED A PART IT TAKES MONTHS TO GET

441
00:35:43,740 --> 00:35:46,640
SOMETHING ELSE UP
THERE SO THEY CAN PRINT THEIR OWN PARTS THAT

442
00:35:46,640 --> 00:35:50,599
THEY NEED.
THOUGH WE ARE REALLY DOING IN SPACE MANUFACTURING,

443
00:35:50,599 --> 00:35:54,010
THE SPACE
LAUNCH SYSTEM, THE BIG POCKET I SHOWED YOU.

444
00:35:54,010 --> 00:35:59,240
WE ARE USING A LOT OF MANUFACTURING UNDER
THE NEW TECHNOLOGY WE

445
00:35:59,240 --> 00:36:06,690
ARE INCORPORATING INTO OUR NEW ROCKETS.
THIS IS SCOTT ANSWERING A TWEET FROM THE INTERNATIONAL

446
00:36:06,690 --> 00:36:09,270
SPACE
STATION.

447
00:36:09,270 --> 00:36:12,280
AND WE ARE LIVING OFF OF THE EARTH BUT FOR
THE EARTH.

448
00:36:12,280 --> 00:36:16,740
WE DO ABOUT 250 SCIENCE EXPERIMENTS EVERY
INCREMENT, EVERY SIX

449
00:36:16,740 --> 00:36:19,080
MONTHS.
SCOTT DID ABOUT 400 BECAUSE HE WAS UP THERE

450
00:36:19,080 --> 00:36:22,079
FOR SO LONG.
WE ARE LOOKING AT THE TECHNOLOGY INVESTMENTS

451

00:36:22,079 --> 00:36:24,210

AS WELL AND LEARNING
FROM THAT.

452

00:36:24,210 --> 00:36:28,859

EACH MISSION IS AMAZING.
KATE RUBINS GOES UP NEXT A FEW WEEKS.

453

00:36:28,859 --> 00:36:31,609

KATE RUBINS IS ONE OF OUR NEXT NASA ASTRONAUTS,
SHE IS AN

454

00:36:31,609 --> 00:36:35,710

INCREDIBLE BIOLOGIST AND SHE WILL DO DNA SEQUENCING
IN ORBIT, THE

455

00:36:35,710 --> 00:36:44,150

FIRST TIME IN MICROGRAVITY WE CAN DO THAT.
I WANT TO MENTION, DOCTOR LEWIS IS SLIDE ENDED

456

00:36:44,150 --> 00:36:52,450

WITH THE SPACING.
THE NEW NASA, WE ARE FUNDING INDUSTRIES LIKE

457

00:36:52,450 --> 00:36:55,619

NEVER BEFORE, IN
PUBLIC, PRIVATE PARTNERSHIPS.

458

00:36:55,619 --> 00:37:03,160

SPACE AND ORBITAL A TK, TAKING CARGO TO OUR
SPACE STATIONS.

459

00:37:03,160 --> 00:37:08,180

SO THE NEW MODEL FOR US.
WE ALSO HAVE SPACE AND BOEING WILL TAKE HER

460

00:37:08,180 --> 00:37:12,130

ASTRONAUTS, WE CALL
OUR COMMERCIAL CREW PROGRAM AND WE WILL BE

461
00:37:12,130 --> 00:37:17,880
TESTING THIS YEAR AND
2017 AND 2018 AS THE FIRST NASA ASTRONAUTS.

462
00:37:17,880 --> 00:37:21,690
WE HAVE FOUR IDENTIFIED COMMERCIAL CREW.
THEY WILL BE GOING UP TO THE STATE SPACE STATION

463
00:37:21,690 --> 00:37:25,460
BUT NOT ON A
NASA OWNED VEHICLE WE ARE PAYING FOR THE SERVICES.

464
00:37:25,460 --> 00:37:29,530
BECAUSE WE WANT TO GO ON TO LUNAR ORBIT AND
ON TO MARS.

465
00:37:29,530 --> 00:37:41,230
I HAVE THE RUSSIANS, THE SO YES, IT IS 15
COUNTRIES WORKING 24/7

466
00:37:41,230 --> 00:37:45,589
OVER THE LAST 15 YEARS.
WE THINK THIS IS A GREAT MODEL FOR INTERNATIONAL

467
00:37:45,589 --> 00:37:48,780
COOPERATION AND
SPACE EXPLORATION.

468
00:37:48,780 --> 00:37:52,890
SO I THINK AT THE SPACE STATION AS A EXPERIMENT
UNTO ITSELF OF

469
00:37:52,890 --> 00:37:55,779
THE MARS MISSION.
WE'RE LEARNING A LOT ABOUT SCIENCE.

470
00:37:55,779 --> 00:38:02,339
IT IS PHASE I, IT IS HELPING US FOR THE NEXT
2020S AND 2030S.

471
00:38:02,339 --> 00:38:05,339
I HAVE AN INFO GRAPHIC HERE THAT MAY BE HARD
FOR YOU TO SEE.

472
00:38:05,339 --> 00:38:08,960
IT IS THE HISTORY OF ALL OF OUR PROBES ON
MARS.

473
00:38:08,960 --> 00:38:14,200
COLOR-CODED FOR RED AND ORANGE FOR THE SOVIET
UNION.

474
00:38:14,200 --> 00:38:18,559
THERE ARE OTHER COLORS UP THERE, TOO.
AND IF YOU CAN SEE THEM YOU CAN SEE FIRST

475
00:38:18,559 --> 00:38:21,840
LOOK AT MARS.
WHEN WE TRY TO FLY BY AND SEE MARS THERE.

476
00:38:21,840 --> 00:38:27,540
THEN WE TRIED TO ORBIT AND IT WAS HARD.
MARS WAS REALLY FAR AWAY IT IS REALLY TOUGH.

477
00:38:27,540 --> 00:38:29,589
REALLY CHALLENGING THAT IS WHY AS AN AEROSPACE
ENGINEER I LOVE

478
00:38:29,589 --> 00:38:33,720
IT.
AND AS YOU CAN SEE THESE LATER ONCE – I

479
00:38:33,720 --> 00:38:35,270
DON'T KNOW IF I HAVE A
POINTER.

480
00:38:35,270 --> 00:38:42,010
BUT A HUGE SUCCESS, EVERYTHING THAT GOES TO
MARS NOW WILL HELP

481
00:38:42,010 --> 00:38:44,910
EACH OTHER.
THE INDIAN SPACE STATION THEIR FIRST ATTEMPT,

482
00:38:44,910 --> 00:38:46,390
THEY HAVE AN
ORBITER.

483
00:38:46,390 --> 00:38:50,029
AND THEY CAN SEE THIS.
IT IS FANTASTIC.

484
00:38:50,029 --> 00:38:54,480
WE ARE SHARING DATA FROM OUR AMAZING ORBITERS,
I TOLD YOU HOW

485
00:38:54,480 --> 00:38:59,869
MARS LOST THE ATMOSPHERE AND THE INDIAN OBSERVER
ARE SHARING DATA

486
00:38:59,869 --> 00:39:03,559
AND TAKING DATA.
SO EVERY DAY WE GET SCIENCE COMING BACK FROM

487
00:39:03,559 --> 00:39:06,079
MARS.
AS A MATTER OF FACT THERE'S A GREAT APP ON

488
00:39:06,079 --> 00:39:10,810
OUR WEBSITE, IF YOU
WANT TO KNOW THE TEMPERATURE OF MARS TODAY.

489
00:39:10,810 --> 00:39:12,760
I ALWAYS WAKE UP WITH EARTH'S TEMPERATURE
AND MARS TEMPERATURE.

490
00:39:12,760 --> 00:39:17,990
IT IS ALWAYS COOL, ALWAYS FREEZING BUT IT
GETS YOU CLOSER.

491
00:39:17,990 --> 00:39:24,770
BETWEEN FREEZING AND -200.
SO DOWNLOAD OUR APP IF YOU WANT TO KNOW WHAT

492
00:39:24,770 --> 00:39:26,829
THE TEMPERATURE IS.
AND THESE ARE PRECURSORS.

493
00:39:26,829 --> 00:39:30,359
THESE ARE ALL SUCCESSFUL EXPLORATION, AND
ALL SUCCESSFUL

494
00:39:30,359 --> 00:39:36,580
ASPIRATIONS HAVE BEEN WHEN THEY GOT TO THE
NEW WORLD AND LEARNED

495
00:39:36,580 --> 00:39:39,730
HOW TO LIVE OFF THE LAND.
WHEN WE GET TO MARS WE HAVE TO FIGURE OUT

496
00:39:39,730 --> 00:39:44,200
THOSE RESOURCES, HOW DO
WE UTILIZE WHAT IS THERE?

497
00:39:44,200 --> 00:39:48,650
KIND OF ORANGE AND RED AND THERE'S A LOT OF
METHANE.

498
00:39:48,650 --> 00:39:51,730
WE LIKE METHANE IT WOULD MAKE A REALLY GOOD
FUEL OR PROPULSION

499
00:39:51,730 --> 00:39:58,579
BUT HOW CAN WE MAKE ROCKET FUEL?
IT IS ONE PERCENT CARBON DIOXIDE ATMOSPHERE.

500
00:39:58,579 --> 00:40:03,420
WHILE OUR MARS 20 ROVER OUR NEXT BIG ROVER
TO GO TO MARS AS THIS

501
00:40:03,420 --> 00:40:14,630
GREAT EXPERIMENT ON IT CALLED MOXIE, IT WILL
TAKE THAT MERCURIC,

502
00:40:14,630 --> 00:40:18,390
IT IS SUMMERTIME WHO WILL MAKE EXIGENT ON
ANOTHER PLANET.

503
00:40:18,390 --> 00:40:24,759
THIS ALL HELPS US TO GET HUMANS THERE.
WE HAVE HAD INCREDIBLE INTERNATIONAL RELATIONSHIPS

504
00:40:24,759 --> 00:40:27,900
WE HAVE, THE
GREAT FRAMEWORK WE HAVE GOING ON IN SPACE

505
00:40:27,900 --> 00:40:29,330
ON THE INTERNATIONAL
SPACE STATION.

506
00:40:29,330 --> 00:40:33,230
WE WILL BE ON THE SPACE STATIONS WITH OUR
PARTNERS UNTIL 2024.

507
00:40:33,230 --> 00:40:38,210
ALL OF THE 2020S WE HAVE SLS GOING TO THE
MOON ORBIT AND BEYOND.

508
00:40:38,210 --> 00:40:43,079
I WOULDN'T BE AN AEROSPACE ENGINEER IF I DIDN'T
INTO THE

509
00:40:43,079 --> 00:40:46,619
AERONAUTIC SIDE.
IT IS VERY EXCITING BUT WE HAVE WONDERFUL

510
00:40:46,619 --> 00:40:51,819
INVESTMENTS THAT ARE
BACKED, EXPERIMENTAL AIRPLANES, THERE ARE

511
00:40:51,819 --> 00:40:55,690
A COUPLE OF THEM
HANGING ON THE WALL AROUND HERE AND IN THE

512
00:40:55,690 --> 00:41:00,089
WHOLE MUSEUM.
RIGHT NOW THE TOP ONE, THAT IS A LOW SUPERSONIC

513
00:41:00,089 --> 00:41:04,720
TRANSPORT.
SO WE ARE FUNDING THE RESEARCH AND CAN'T WAIT

514
00:41:04,720 --> 00:41:07,290
FOR THE COMMERCIAL
COMPANIES TO TAKE THIS OVER.

515
00:41:07,290 --> 00:41:13,329
IF I GET TO EUROPE ON MAY
I WOULD LOVE TO GO IN THREE HOURS THAT EIGHT

516
00:41:13,329 --> 00:41:18,059
HOURS, RIGHT?
SO THESE SUPERSONICS WILL FLY AT MACH 2, THREE,

517
00:41:18,059 --> 00:41:23,240
FOUR WE WILL SEE.
THE MIDDLE ONES ARE ULTRA EFFICIENT AIRCRAFT

518
00:41:23,240 --> 00:41:27,990
COMING TO YOU SOON.
IT IS 60 PERCENT REDUCTION IN FUEL AND 30

519
00:41:27,990 --> 00:41:29,930
PERCENT NOISE
REDUCTION.

520
00:41:29,930 --> 00:41:35,869
THESE ARE OUR ENVIRONMENTAL AIR, NOT SMALL
ONE IN THE BOTTOM THAT

521

00:41:35,869 --> 00:41:41,980

IS A HYBRID ELECTRIC AIRCRAFT THAT HAS 12
ELECTRIC MOTORS.

522

00:41:41,980 --> 00:41:46,450

SIX ON EACH SIDE OF THE WING SO HOPEFULLY
HOPE THAT WE ARE ALL

523

00:41:46,450 --> 00:41:49,150

FLYING IN THEM SOON.
AS COMMERCIAL PASSENGERS.

524

00:41:49,150 --> 00:41:53,460

THEN I WANT TO TAKE MY FINAL COMMENTS AND
BRING IT BACK TO THIS

525

00:41:53,460 --> 00:41:58,470

BEAUTIFUL VIEW OF EARTH WHICH I CALL SPACE
SHIP EARTH.

526

00:41:58,470 --> 00:42:04,740

THIS IS EARTH, THE SUN IS HERE, THIS WONDERFUL
POINT IN BETWEEN,

527

00:42:04,740 --> 00:42:10,099

THE GRAVITY NEUTRAL POINT IS CALLED THE L-1,
THE LAGRANGIAN

528

00:42:10,099 --> 00:42:20,290

POINT, AND THIS IS A SPACE PROBE.
THINK OF IT AS A BIG SPACE BUOY, AND WE HAVE

529

00:42:20,290 --> 00:42:24,680

THIS WONDERFUL SPACE
WEATHER BUOY HALFWAY BETWEEN THE EARTH AND

530

00:42:24,680 --> 00:42:29,579

THE SUN AND IT IS
TAKING ALL THE MEASUREMENTS FROM THE SUN RADIATION,

531
00:42:29,579 --> 00:42:31,869
AND IT IS
SAYING EARTH HERE IS WHAT IS COMING YOUR WAY.

532
00:42:31,869 --> 00:42:37,819
THE SUN IS ACTIVE I AM HERE TO TELL YOU.
IT IS BASICALLY HELPING US WITH SPACE WEATHER

533
00:42:37,819 --> 00:42:38,890
AND THINGS LIKE
THAT.

534
00:42:38,890 --> 00:42:44,450
LESS YOU CAN DOWNLOAD THIS APP, DISCOVER AND
EVERY DAY YOU GET

535
00:42:44,450 --> 00:42:48,309
BEAUTIFUL IMAGES OF EARTH AND YOU SEE THE
MOON ORBIT.

536
00:42:48,309 --> 00:42:52,150
THIS REALLY IS THE FAR SIDE OF THE MOON NOT
THE DARK SIDE OF THE

537
00:42:52,150 --> 00:42:59,109
MOON.
THE FAR SIDE OF THE MOON AND WE PASS IT.

538
00:42:59,109 --> 00:43:04,010
CURRENTLY OUR NASA EARTH SCIENCES WE HAVE
MORE THAN 20 SATELLITES

539
00:43:04,010 --> 00:43:10,430
IN ORBIT TODAY RIGHT NOW.
WE ARE LOOKING AT OCEAN, OCEAN TEMPERATURES,

540
00:43:10,430 --> 00:43:14,180
WE ARE LOOKING AT
TERRAIN, WE ARE LOOKING AT HOW SOIL.

541
00:43:14,180 --> 00:43:19,890
WE HAVE POINTED ALL THESE SATELLITES TO CANADA,
IN ANY EMERGENCY

542
00:43:19,890 --> 00:43:24,730
WITH A BIG FIRES GOING ON IN CANADA.
OUR SATELLITE AND RESEARCHERS POINTED AT THEM

543
00:43:24,730 --> 00:43:29,150
TO HELP THE
WILDFIRES GET DATA AS QUICKLY AS POSSIBLE

544
00:43:29,150 --> 00:43:32,010
TO HELP ANY NATURAL
DISASTER AROUND EARTH.

545
00:43:32,010 --> 00:43:37,890
SO VERY ACTIVE IN THE SENSE.
I WANT TO SHOW YOU IN THE LAST CENTURY OF

546
00:43:37,890 --> 00:43:44,760
DATA, BLUE IS GOOD, THE
RED IS A TEND TO AGREE ADDITION.

547
00:43:44,760 --> 00:43:53,979
YOU CAN RAISE YOUR HAND IF YOU'RE GETTING
BORING.

548
00:43:53,979 --> 00:43:58,559
>> THANK YOU FOR PLAYING.
FANTASTIC.

549
00:43:58,559 --> 00:44:05,570
WELL, 2014 WAS OUR HOTTEST YEAR ON RECORD,
2015 THE HOTTEST YEAR,

550
00:44:05,570 --> 00:44:09,470
WE ARE TAKING 2016 DATA RIGHT NOW AND APRIL
JUST BROKE ALL

551
00:44:09,470 --> 00:44:14,990
RECORDS.
OKAY, I WANT TO AND MY COMMENTS HERE FOR ALL

552
00:44:14,990 --> 00:44:16,109
OF YOU FOLKS IN
HERE.

553
00:44:16,109 --> 00:44:20,539
I DON'T WANT TO SPEND MY ENTIRE CAREER TO
EDUCATION.

554
00:44:20,539 --> 00:44:24,109
I ALWAYS PUT IN THE ARTS AND NEED EVERY SINGLE
ONE OF YOU BOYS

555
00:44:24,109 --> 00:44:30,400
AND GIRLS, THE SPACES AS WELL.
WE NEED THE STORYTELLERS I NEED THE ARTIST.

556
00:44:30,400 --> 00:44:34,109
YOU ARE THE VISIONARIES, YOU ARE THE STORYTELLERS
YOU TELL US

557
00:44:34,109 --> 00:44:39,809
WHAT OUR JOURNEY TO MARS LOOKS LIKE.
YOU TELL HUMANITY BUT WE ARE ALL ABOUT.

558
00:44:39,809 --> 00:44:45,490
I AM PRETTY STEAMED BUT WE ARE NOT MAKING
PROGRESS MORE QUICKLY,

559
00:44:45,490 --> 00:44:49,210
WE NEED EVERY SINGLE YOUNG PERSON AND PARENTS
IN PUBLIC.

560
00:44:49,210 --> 00:44:54,460
I THINK WE NEED AN AXIS OF DESIGN AND ENGINEER.
I AM AN ENGINEER MYSELF TO SEE WHAT A ROCKET

561

00:44:54,460 --> 00:44:56,890

SCIENTIST LOOK LIKE.

IF YOU WANT TO BE A ROCKET SCIENTIST THAT

562

00:44:56,890 --> 00:45:02,109

IS OKAY, IF YOU ARE A

DESIGNER I NEED YOU, IF YOU ARE IN THE ARTS

563

00:45:02,109 --> 00:45:05,570

IF YOU THINK YOU

ENVISION YOURSELF AS A SCIENTIST WE ARE HERE

564

00:45:05,570 --> 00:45:07,329

TO SAY WE ARE ALL

IN.

565

00:45:07,329 --> 00:45:12,370

WE NEED ALL THE RESOURCES WE CAN.

WHATEVER YOUR PASSION IS THAT IS HOW I LOOK

566

00:45:12,370 --> 00:45:14,250

AT IT.

AND THANK YOU FOR YOUR ATTENTION.

567

00:45:14,250 --> 00:45:19,670

I THINK WE CAN ANSWER SOME OF THOSE QUESTIONS.

SO THE BOOTS ON MARS THAT IS THE LAST.

568

00:45:19,670 --> 00:45:23,520

>>Dava: THAT IS A GREAT SEGUE TO GETTING MORE
QUESTIONS GOING.

569

00:45:23,520 --> 00:45:27,450

I WANT TO REMIND PEOPLE HERE THEY CAN STEP
UP TO THE MICROPHONE

570

00:45:27,450 --> 00:45:29,609

FOR OUR QUESTION AND ANSWER BUT WE WILL BE
TAKING QUESTIONS

571
00:45:29,609 --> 00:45:33,640
ONLINE.
I WANTED TO START WITH A QUESTION FIRST WHICH

572
00:45:33,640 --> 00:45:37,880
HOPEFULLY DRAWS TO
THE TWO OF YOUR SUBJECT MATTERS, YOUR PRESENTATIONS

573
00:45:37,880 --> 00:45:41,019
TOGETHER.
WHICH IS, PEOPLE COME TO THIS EXHIBITION IN

574
00:45:41,019 --> 00:45:44,510
PARTICULAR LOOKING
FOR SOME KIND OF ANSWER OR THOUGHTS ABOUT

575
00:45:44,510 --> 00:45:46,440
WHERE WE ARE GOING IN
THE FUTURE.

576
00:45:46,440 --> 00:45:50,759
GOING TO MARS.
USUALLY HOLLYWOOD IS THE ONE WHO PROVIDES

577
00:45:50,759 --> 00:45:52,680
US PART OF THOSE
VISIONS.

578
00:45:52,680 --> 00:45:59,319
SO I HAVE TO ASK THE TIMELY QUESTION ABOUT
WHAT HOLLYWOOD

579
00:45:59,319 --> 00:46:03,920
PRESENTED VIA "THE MARTIAN". HOW MUCH OF THAT
WHETHER IT BE

580
00:46:03,920 --> 00:46:10,359
TECHNOLOGY OR SPACE YOU DESIGN REALLY, GIVES
US A SENSE OF A-WHAT

581
00:46:10,359 --> 00:46:18,660
IT WILL BE LIKE WHEN WE GET THERE.
AND B- WHAT ARE WE GOING TO DO WHEN WE GET

582
00:46:18,660 --> 00:46:23,049
THERE.
>> HOW MANY OF YOU SAW "THE MARTIAN"?

583
00:46:23,049 --> 00:46:27,529
IT WAS GREAT, WE LOVE IT, WE CONSULTED.
FIRST OF ALL ANDY WE ARE WROTE A GREAT BOOK,

584
00:46:27,529 --> 00:46:30,359
TECHNICALLY IT IS
PHENOMENAL IT IS GREAT.

585
00:46:30,359 --> 00:46:36,279
ONLY GOT ABOUT THREE THINGS WRONG.
AND HE IS PHENOMENAL AND HE WAS GREAT.

586
00:46:36,279 --> 00:46:44,210
QUICKLY RIDLEY START DID A GREAT, THEY ARE
GREAT THEY HAD THEIR

587
00:46:44,210 --> 00:46:48,029
NASA UNIFORMS ON AND THAT IS GOOD FOR BOX
OFFICE TICKETS.

588
00:46:48,029 --> 00:46:51,320
BUT WHAT WE CARE ABOUT IS THAT IT IS PORTRAYED
– WE LOVE IT WHEN

589
00:46:51,320 --> 00:46:54,990
THEY GET THE PHYSICS OF THE TECHNOLOGY RIGHT
AND THEY NAILED IT.

590
00:46:54,990 --> 00:47:00,380
I'LL LET KATHY JUMP IN, THE SPACES WERE RIGHT
OF HOLLYWOOD, THE

591
00:47:00,380 --> 00:47:04,520
SPACES WHAT DO YOU THINK?
>>Cathy : I HAVE ALWAYS TOLD YOU THE HELMETS

592
00:47:04,520 --> 00:47:08,410
ARE ALWAYS TOO BIG.
IT IS A HOLLYWOOD THING, I UNDERSTAND THEY

593
00:47:08,410 --> 00:47:12,670
HAVE TO HAVE THE NICE
PICTURES OF THEIR STARS WITH THE HELMETS BIG.

594
00:47:12,670 --> 00:47:19,260
AND A SPACE SUIT HELMET IS VERY CLAUSTROPHOBIC,
THEY ARE VERY

595
00:47:19,260 --> 00:47:21,590
SMALL, THEY ARE VERY TIGHT FITTING YOU DON'T
WANT THAT EXTRA

596
00:47:21,590 --> 00:47:26,390
VOLUME.
>> AND DUCT TAPE, I LOVE DUCT TAPE ON EVERY

597
00:47:26,390 --> 00:47:32,150
MISSION.
BUT THAT HAS THE FORCE OF 80 POUNDS THAT WANTS

598
00:47:32,150 --> 00:47:35,099
TO PLAY YOUR
HELMET OFF SO THAT IS NOT GOING TO CUT IT.

599
00:47:35,099 --> 00:47:38,470
MAYBE THAT IS A GOOD START WITH THERE WERE
A FEW THINGS LIKE

600
00:47:38,470 --> 00:47:44,940
THAT.
>>Dava: NOW TO AN ONLINE QUESTION NEXT.

601
00:47:44,940 --> 00:47:50,799
WHAT WILL FUTURE SPACES BE ABLE TO DO THAT
PREVIOUS SUITS

602
00:47:50,799 --> 00:47:52,710
COULDN'T?
KATHY?

603
00:47:52,710 --> 00:47:55,769
>>Cathy : THEY WILL BE MORE MOBILE THEY WILL
BE LIGHTER.

604
00:47:55,769 --> 00:48:01,799
THEY WILL PROBABLY ELIMINATE THE PROBLEM OF
GETTING DUST FROM

605
00:48:01,799 --> 00:48:07,260
FOREIGN WORLD'S INSIDE THE SPACECRAFT.
ONE THING THEY HAVE BEEN WORKING ON IS FINDING

606
00:48:07,260 --> 00:48:11,039
– DESIGNING
SPACESUITS THAT WILL ATTACH TO A ROVING VEHICLE

607
00:48:11,039 --> 00:48:15,359
SO THE ASTRONAUTS
CAN CLIMB IN AND OUT WEARING THE SPACESUIT

608
00:48:15,359 --> 00:48:18,509
FROM THE OUTSIDE BUT
NOT BRING ALL THE DIRT.

609
00:48:18,509 --> 00:48:27,069
I HAVE TWO DOGS MY HOUSE IS FILTHY.
IMAGINE GOING TO MARS, YOU DON'T WANT DUST

610
00:48:27,069 --> 00:48:29,130
AND LITTER ON THE
INSIDE.

611
00:48:29,130 --> 00:48:36,380
>>Dava: KNOW, AND AN ONLINE QUESTION.
FOR MARS I WANT TO GET DOWN AND LOOK FOR PAST

612
00:48:36,380 --> 00:48:41,390
LIFE.
WANT TO DO PUSH-UPS AND THINGS LIKE THAT.

613
00:48:41,390 --> 00:48:45,210
BUT WE CAN'T DO ANY OF THAT IN CURRENT SPACES
SO IT HAS TO BE

614
00:48:45,210 --> 00:48:49,739
SOMETHING THAT IS VERY MOBILE, VERY LIGHT.
AS KATHY MENTIONED AND IT IS ABOUT THE SUITS,

615
00:48:49,739 --> 00:48:51,279
THE ROVERS, THEIR
ROBOTICS.

616
00:48:51,279 --> 00:48:56,839
WE ARE A BIG TEAM OF EXPLORERS WHEN WE GO
SEARCHING AROUND AND

617
00:48:56,839 --> 00:49:02,029
MAPPING MARS NOW.
BUT WE WILL NOT ALL OF OUR 50 YEARS OF EXPLORATION

618
00:49:02,029 --> 00:49:05,080
TO MARS TO
DATE AS IT IS WE GET PEOPLE THERE.

619
00:49:05,080 --> 00:49:08,230
IN JUST A FEW DAYS WE WILL GO FARTHER IN FIVE
DAYS AND WE DID IN

620
00:49:08,230 --> 00:49:11,829
50 YEARS.
>>Woman: YOU MENTIONED THE SPACESUIT OF HAVING

621
00:49:11,829 --> 00:49:17,339
THE SUIT, AND WE
HAVE AN EXAMPLE HERE BEHIND THE AUDIENCE.

622
00:49:17,339 --> 00:49:21,050
BE SURE TO TAKE A LOOK AT THAT BEFORE WE LEAVE.
AND WE HAVE AN AUDIENCE QUESTION.

623
00:49:21,050 --> 00:49:25,309
>>Man: HELLO MY NAME IS PATRICK EUGENE FROM
SALT LAKE CITY.

624
00:49:25,309 --> 00:49:30,970
AND WE HEAR A LOT OF THE TECHNOLOGIES THAT
CROSS OVER FROM THIS

625
00:49:30,970 --> 00:49:35,730
SPACE INDUSTRY TO OUR DAILY LIFE.
AND I AM CURIOUS, IN PARTICULAR, IF THERE

626
00:49:35,730 --> 00:49:40,799
ARE ANY THAT HAVE
CROSSED OVER THAT WE HAVE DESIGNED SPACESUITS.

627
00:49:40,799 --> 00:49:44,930
AND IF THERE IS ANYTHING RECENTLY THAT WE
MIGHT EXPECT TO SEE IN

628
00:49:44,930 --> 00:49:56,239
A GENERAL PUBLIC IN THE NEAR FUTURE?
>> SO WE HAVE A 1600, AND WE WOULD LOVE TO

629
00:49:56,239 --> 00:50:00,079
SHOW THAT BUT IF YOU
ARE AN ENTREPRENEUR, SOME OF MY FAVORITE TO

630
00:50:00,079 --> 00:50:04,690
BE SPECIFIC.
BUT PORTABLE ULTRASOUND, A LOT OF BIOMEDICAL

631

00:50:04,690 --> 00:50:06,880

INSTRUMENTATION,
LIGHTER, AND MOBILE.

632

00:50:06,880 --> 00:50:14,009

THAT IS ALL WE CAN USE IN OUR ENVIRONMENT.
REALLY IMPORTANT, HANDHELD ULTRASONIC.

633

00:50:14,009 --> 00:50:18,010

OTHER THINGS FOR CARDIOVASCULAR AND CATHETERS
FOR THE BIOMEDICAL

634

00:50:18,010 --> 00:50:23,720

LIST IS LONG.
SO NOT TANK AND NOT VELCRO.

635

00:50:23,720 --> 00:50:29,670

>> THAT DON'T COME FROM NASA?
>> A WE DO REALLY COOL THINGS.

636

00:50:29,670 --> 00:50:34,720

WE JUST LET OUT 56 NASA PATENTS THEY ARE ONLINE,
THEY ARE

637

00:50:34,720 --> 00:50:37,019

AVAILABLE.
IF THERE IS AN ENTREPRENEUR OUT THERE THAT

638

00:50:37,019 --> 00:50:41,230

WANTS TO GET THAT
PATENT WE WANT FOLKS TO COMMERCIALIZE AND

639

00:50:41,230 --> 00:50:45,489

START BUSINESSES.
THEY TEND TO BE IN MATERIAL SCIENCE OF STRUCTURAL

640

00:50:45,489 --> 00:50:49,859

MECHANICS,
PLAYING WITH SPACECRAFT THINGS LIKE THAT.

641
00:50:49,859 --> 00:50:56,070
OTHER SPACES, ESPECIALLY THAT KATHY, THE ALUMINIZED
MYLAR, YOUR

642
00:50:56,070 --> 00:51:00,660
WARM BLANKETS YOU USE LIKE ON THE BEACH FOR
THAT DIRECTLY COMES.

643
00:51:00,660 --> 00:51:07,579
>>Cathy : A LOT OF THE TIMES YOU MAY HAVE
TECHNOLOGY THAT MAY NOT

644
00:51:07,579 --> 00:51:11,299
HAVE BEEN.
I AM THINKING ABOUT ALL THE PEOPLE WHO ARE

645
00:51:11,299 --> 00:51:14,770
WEARING TRACKERS
FURTHER STEPS ON THE ARM?

646
00:51:14,770 --> 00:51:19,579
THAT WAS TECHNOLOGY THAT EXISTED BEFORE BUT
BECAUSE OF NASA'S

647
00:51:19,579 --> 00:51:27,690
INTEREST IN USING ACTIVITY LOGGERS ON THE
ASTRONAUTS, THAT WOULD

648
00:51:27,690 --> 00:51:33,720
NOT HAVE BEEN IF NASA HAD NOT BEEN IN INTEREST.
THERE WOULD'VE BEEN A SETBACK AND JUST USED

649
00:51:33,720 --> 00:51:37,349
FOR MILITARY PURPOSES
WHICH IS HOW IT ORIGINATED.

650
00:51:37,349 --> 00:51:42,519
YOU LOOK AT THOSE TECHNOLOGIES, HEART RATE
MONITORS, NASA IS

651
00:51:42,519 --> 00:51:49,619
MAKING THINGS.
THE HYDRO FORMED ELECTRON BUBBLES ON SPACESUIT

652
00:51:49,619 --> 00:51:52,849
HELMETS, THAT WAS
A TECHNOLOGY THAT WE DEVELOPED AROUND THE

653
00:51:52,849 --> 00:51:56,930
TIME AND REFINED AND
PERFECTED FOR THE APOLLO SPACES IT IS STILL

654
00:51:56,930 --> 00:52:01,059
USED TODAY.
IT IS PERFORMING FOR MUCH OF THE LIFESPAN.

655
00:52:01,059 --> 00:52:07,599
WHEN YOU SEE ON TELEVISION AND APPLIANCES,
THAT IS HOW IT

656
00:52:07,599 --> 00:52:11,319
STARTED.
NASA NOT ONLY INITIATES THE DEVELOPMENT BUT

657
00:52:11,319 --> 00:52:13,220
ALSO ACCELERATES THE
DEVELOPMENT.

658
00:52:13,220 --> 00:52:17,190
AND IF YOU WANT TO HAVE AN IDEA, TALKING ABOUT
PATENTS.

659
00:52:17,190 --> 00:52:21,880
IF YOU GO TO THE PATENT TRADEMARK OFFICE JUST
GO TO NASA ON THEIR

660
00:52:21,880 --> 00:52:25,579
SEARCH AND YOU WILL GET THOUSANDS.
I DON'T KNOW IF THERE ARE MILLIONS BUT I AM

661

00:52:25,579 --> 00:52:29,450

SURE THERE ARE TENS
OF THOUSANDS OF PATENTS.

662

00:52:29,450 --> 00:52:33,529

AND EVERYTHING THAT NASA DOES IS IMMEDIATELY
PATENTED SO IT IS A

663

00:52:33,529 --> 00:52:38,630

WONDERFUL TOOL AS A HISTORIAN TO LOOK AT THE
REFINEMENT.

664

00:52:38,630 --> 00:52:41,809

PATENT GOES THROUGH AND IN A COUPLE OF YEARS
OF THING IS

665

00:52:41,809 --> 00:52:47,400

TACKED ON TO THE NEXT NEW PATENTS.
TO MAKE THE TECHNOLOGY EVEN BETTER.

666

00:52:47,400 --> 00:52:52,500

>>Dava: AND OTHER QUESTION.

>>Man: MY NAME IS ALEX FROM PHILADELPHIA.

667

00:52:52,500 --> 00:52:56,589

PATRICK SO MY QUESTION SO I HAD TO MAKE A
NEW ONE.

668

00:52:56,589 --> 00:52:59,369

ARE THERE ANY COMMERCIAL TECHNOLOGIES THAT
YOU THINK SHOULD BE

669

00:52:59,369 --> 00:53:03,460

INTEGRATED IN FUTURE SPACES THAT ARE CURRENTLY?
>>Jennifer: ABSOLUTELY.

670

00:53:03,460 --> 00:53:14,999

ADVANCED MATERIALS, WE ARE ALMOST THERE.
THERE ARE THINGS LIKE THAT.

671
00:53:14,999 --> 00:53:18,599
THE REALLY TAKING A LOOK AT MATERIALS AND
STUFF LIKE THAT I

672
00:53:18,599 --> 00:53:22,470
DEFINITELY THINK WE CAN INCORPORATE THINGS
INTO THE FUTURE SUITS.

673
00:53:22,470 --> 00:53:28,609
>>Cathy : ONE THING I THINK IS DEVELOPING
GOING BACK TO GLOVES.

674
00:53:28,609 --> 00:53:33,089
ARE THE METAL FIBERS IN THE FINGERS, SO THE
ASTRONAUTS CAN'T

675
00:53:33,089 --> 00:53:41,359
OPERATE TOUCHSCREENS WHILE THEY ARE IN SPACES.
THAT IS SOMETHING THAT THEY SHOULD PATENT

676
00:53:41,359 --> 00:53:45,650
THAT IDEA.
>>Jennifer: AND THE HELMET, THE FUTURE HELMET

677
00:53:45,650 --> 00:53:49,830
SHOULD, I AGREE
WITH CATHY, IT SHOULD BE FORMFITTING.

678
00:53:49,830 --> 00:53:53,779
IT IS ABOUT THE INFORMATION SYSTEM AND THE
HELMET.

679
00:53:53,779 --> 00:53:57,280
WE HAVE A WHOLE LENS UP WITH THEIR ASTRONAUTS,
IT IS NOT

680
00:53:57,280 --> 00:54:01,220
VIRTUAL-REALITY BUT AUGMENTED REALITY BECAUSE
YOU CAN SEE OUT.

681
00:54:01,220 --> 00:54:04,380
BUT IF YOU WANT THAT OVERLAY, THAT IS GOING
TO BE REALLY

682
00:54:04,380 --> 00:54:09,220
IMPORTANT FOR FUTURE SPACESUITS.
IT IS A HELMET, BUT YOU CAN CALL AND SAY WHAT

683
00:54:09,220 --> 00:54:11,890
IS THE
THREE-DIMENSIONAL TOPOGRAPHY OF MARS.

684
00:54:11,890 --> 00:54:18,940
CAN I WALK DOWN THE SLOPE OR NOT?
GUESS WHAT MY ROVERS BROKE, SO IT BRINGS UP

685
00:54:18,940 --> 00:54:22,549
A 3-D MODEL AND SAY
LOOK, THIS IS OUT.

686
00:54:22,549 --> 00:54:27,710
WE ARE USING TOOLS NOW, SOMETHING THAT IS
RICH INFORMATION SYSTEM

687
00:54:27,710 --> 00:54:32,220
IN THE HELMET AND OPEN ARCHITECTURE TYPE OF
IT SYSTEM FOR FUTURE

688
00:54:32,220 --> 00:54:34,960
SUITS.
>>Dava: WE HAVE AN ONLINE QUESTION NEXT.

689
00:54:34,960 --> 00:54:42,380
HOWEVER ASTRONAUTS CONTRIBUTED TO THE DESIGN
OF THE STATES?

690
00:54:42,380 --> 00:54:49,880
IN THE PAST THEY HAD SOMETHING TO SAY ABOUT
SUITS.

691

00:54:49,880 --> 00:54:54,339

>>Jennifer: THEY HAVE CONTRIBUTED AS BEING
USERS, IT IS CRITICAL.

692

00:54:54,339 --> 00:54:59,430

ANYTHING, THEY HAVE TO BE BETA TESTED THEY
HAVE TO BE IN A

693

00:54:59,430 --> 00:55:05,829

REALISTIC ENVIRONMENT OR HERE IN THE LAB.
AGAIN, THE LESSONS LEARNED FROM THE APOLLO

694

00:55:05,829 --> 00:55:10,140

ASTRONAUTS IS CRITICAL
BECAUSE THEY USED THOSE IS ON THE MOON AND

695

00:55:10,140 --> 00:55:13,809

THE CAME BACK AND SAID
LET'S WORK ON THESE GLOVES.

696

00:55:13,809 --> 00:55:18,170

YOU KNOW.
>>Cathy : THEY CAME AND THEY COMPLAINED WHAT

697

00:55:18,170 --> 00:55:22,410

THEY ARE
UNCOMFORTABLE, AND THEY TAKE IT TO THEIR LIMITS.

698

00:55:22,410 --> 00:55:28,650

THERE ARE RESTRAINING WIRES ALONG THE CROTCH
OF APOLLO SUITS THAT

699

00:55:28,650 --> 00:55:33,269

CAME ABOUT BECAUSE ASTRONAUTS WERE DOING LUNGES,
THOUSANDS AND

700

00:55:33,269 --> 00:55:38,319

THOUSANDS OF LUNCHES UNTIL THE SUIT FAILED.
SO THEY HAD TO HAVE SOME KIND OF RESTRAINING

701

00:55:38,319 --> 00:55:43,069

WIRE TO MAKE SURE
THEY DIDN'T POP A SEEM IN THE CROTCH.

702

00:55:43,069 --> 00:55:50,440

IT IS ESSENTIAL BECAUSE THERE LIVES DEPEND
ON THE SUIT AND HAVE

703

00:55:50,440 --> 00:55:54,589

TO BE COMFORTABLE IN ORDER TO DO THE WORK.
THAT THEY HAVE TO DO ON WHATEVER MISSION THEY

704

00:55:54,589 --> 00:55:58,140

ARE ON.
>>Jennifer: I SHOULD MENTION TO, CATHY, THE

705

00:55:58,140 --> 00:56:02,260

CHANGE THE DIFFERENT
OF THE SPACES.

706

00:56:02,260 --> 00:56:08,089

THEY ARE NO LONGER DESIGNED EACH INDIVIDUAL
TYPICALLY THEY ARE

707

00:56:08,089 --> 00:56:13,510

MORE PIECE TOGETHER FROM DIFFERENT SIZES.
>>Cathy : THEY ARE MADE OUT OF PROPONENTS

708

00:56:13,510 --> 00:56:18,489

THAT EACH ASTRONAUTS
HAVE TO FIT THE SUITS THEMSELVES SO THEY CAN

709

00:56:18,489 --> 00:56:20,170

ASSEMBLE A SUIT FROM
PARTS.

710

00:56:20,170 --> 00:56:24,760

AND THEY HAVE A SUIT THAT IS NOT TOO COMFORTABLE
OR BECKY BECAUSE

711
00:56:24,760 --> 00:56:29,819
YOU DON'T WANT TO THAT EXTRA ROOM.
IT IS NOT SOMETHING YOU WANT A LOT OF SIZE

712
00:56:29,819 --> 00:56:34,029
TO MOVE IN.
SO THE ASTRONAUT HAS TO LEARN HOW TO FIT THE

713
00:56:34,029 --> 00:56:37,950
SUIT AS OPPOSED TO
HAVING THE SUIT FITTED FOR HIM.

714
00:56:37,950 --> 00:56:42,710
>>Dava: AND GO BACK TO THE FUTURE TO MARS.
ONE LAST AUDIENCE QUESTION.

715
00:56:42,710 --> 00:56:50,690
>>Man: I MY NAME IS ZAC FOR MICHIGAN.
SO YOU HAD TO START EARLIER WITH REGARDS TO

716
00:56:50,690 --> 00:56:55,729
TOUCHSCREENS AND LIKE
APOLLO.

717
00:56:55,729 --> 00:56:58,890
TECHNOLOGY IS ADVANCING SO QUICKLY WHERE DO
YOU GUYS SEE IN SOME

718
00:56:58,890 --> 00:57:04,229
INSTANCES DECIDE WHETHER THAT TECHNOLOGY IS
WORTH INTEGRATING OR

719
00:57:04,229 --> 00:57:10,300
IF IT IS TO A NEW OR TOO MANY THINGS TO FIGURE
OUT TO CONSIDER?

720
00:57:10,300 --> 00:57:13,609
>>Jennifer: GREAT QUESTION, HOPEFULLY IT IS
NOT TOO NEW BUT IT

721

00:57:13,609 --> 00:57:17,770

HAS TO BE RELIABLE.

WE HAVE THAT REQUIREMENT.

722

00:57:17,770 --> 00:57:21,980

SPACE IS A GREAT PLACE BECAUSE THE ENVIRONMENTS
ARE SO STRICT.

723

00:57:21,980 --> 00:57:28,119

THESE EXTREME RADIATION, WE HAVE THE ELECTRONIC
INSTRUMENTS AND

724

00:57:28,119 --> 00:57:31,890

THINGS LIKE THAT.

WE TRY TO KNOW WHAT IS GOING ON AND THAT IS

725

00:57:31,890 --> 00:57:35,039

GREAT FOR

UNIVERSITIES AND PRIVATE INDUSTRIES TO PUSH

726

00:57:35,039 --> 00:57:41,500

US.

SO WE ALSO HAVE ROADMAP TECHNOLOGIES.

727

00:57:41,500 --> 00:57:57,869

WHERE WERE ASTRONAUTS MAKE SAFETY, THINGS
LIKE THAT.

728

00:57:57,869 --> 00:58:05,440

SO IT IS A BALANCE, BUT IT HAS TO BE PROVEN
BECAUSE THIS THIRD

729

00:58:05,440 --> 00:58:10,829

PHASE WHEN WE GET TO MARS, AND THE 2030S WE
ARE COMPLETELY EARTH

730

00:58:10,829 --> 00:58:13,119

INDEPENDENT.

NO HELP FROM MARS.

731

00:58:13,119 --> 00:58:16,499

THAT AUTONOMOUS SYSTEM THAT THE GOING FORWARD
IT HAS TO BE

732

00:58:16,499 --> 00:58:19,559

COMPLETELY EARTH INDEPENDENT.

>>Dava: I WANT TO THANK ALL OF YOU FOR SUPPORTING