1
00:00:00,000 --> 00:00:02,240
Over the last two decades, 15

2
00:00:02,275 --> 00:00:04,446
countries from around the world,

3
00:00:04,481 --> 00:00:06,774
led by the United States, have

4
00:00:06,809 --> 00:00:08,622
combined their resources to

5
00:00:08,657 --> 00:00:10,246
create the International Space

6
00:00:10,281 --> 00:00:12,053
Station orbiting more than 200

7
00:00:12,088 --> 00:00:14,437
miles above the planet. Since

8
00:00:14,472 --> 00:00:16,142
the completion of the station■s

9
00:00:16,177 --> 00:00:18,206
assembly in 2011, it has become

10
00:00:18,241 --> 00:00:19,541
an operational research

11
00:00:19,576 --> 00:00:21,710
laboratory. As astronauts conduct

12
00:00:21,745 --> 00:00:23,774
experiments - called payloads for

13
00:00:23,809 --> 00:00:25,997

researchers around the globe, they

14
00:00:26,032 --> 00:00:27,581
are assisted by the folks here in

15
00:00:27,616 --> 00:00:29,229
the Payload Operations Integration

16
00:00:29,264 --> 00:00:31,157
Center at NASA's Marshall Space

17
00:00:31,192 --> 00:00:33,358
Flight Center in Huntsville, Alabama.

18
00:00:33,393 --> 00:00:35,054
Teams in this science command

19
00:00:35,089 --> 00:00:37,798
post work around the clock, 365

20
00:00:37,833 --> 00:00:39,870
days a year and can even perform

21
00:00:39,905 --> 00:00:41,901
some research remotely while the

22
00:00:41,936 --> 00:00:43,909
crew sleeps. Space station

23
00:00:43,944 --> 00:00:45,645
operations are managed in 6 month

24
00:00:45,680 --> 00:00:48,390
periods called expeditions. The

25
00:00:48,425 --> 00:00:50,062
arrival of each new space station

26
00:00:50,097 --> 00:00:52,237
crew signifies the start of a new

27
00:00:52,272 --> 00:00:55,126
expedition. Each expedition has

28
00:00:55,161 --> 00:00:57,421
more than 200 experiments, and

29
00:00:57,456 --> 00:00:58,757
the team here in the Payload

30
00:00:58,792 --> 00:01:00,589
Operations Integration Center is

31
00:01:00,624 --> 00:01:02,261
the focal point for U.S. science

32
00:01:02,296 --> 00:01:04,822
activities. Coordinating research

33
00:01:04,857 --> 00:01:06,717
requires communication links with

34
00:01:06,752 --> 00:01:08,478
the crew and with scientists around

35
00:01:08,513 --> 00:01:10,702
the world. But most importantly, it

36
00:01:10,737 --> 00:01:12,589
requires the expertise of a trained

37
00:01:12,624 --> 00:01:14,717
ground crew led by the Payload

38
00:01:14,752 --> 00:01:17,005

Operations Director. Im kind of like

39
00:01:17,040 --> 00:01:19,229
conductor of an orchestra. I make

40
00:01:19,264 --> 00:01:21,110
sure all the individual musicians

41
00:01:21,145 --> 00:01:22,822
are playing their parts, and that

42
00:01:22,857 --> 00:01:24,526
were all playing the same song.

43
00:01:24,561 --> 00:01:26,982
As leader of the team, I guide

44
00:01:27,017 --> 00:01:28,693
payload activities aboard the space

45
00:01:28,728 --> 00:01:31,005
station. And to do this, I work very

46
00:01:31,040 --> 00:01:33,261
closely with the flight director at

47
00:01:33,296 --> 00:01:35,614
Mission Control in Houston, our

48
00:01:35,649 --> 00:01:37,582
international partners and scientists

49
00:01:37,617 --> 00:01:39,774
all over the globe to integrate the

50
00:01:39,809 --> 00:01:41,910
other activities with the science

51
00:01:41,945 --> 00:01:44,132
research. While the POD is working

52
00:01:44,167 --> 00:01:46,149
on the big picture, the Operations

53
00:01:46,184 --> 00:01:47,709
Controller makes sure the

54
00:01:47,744 --> 00:01:49,293
day-to-day activities needed for

55
00:01:49,328 --> 00:01:50,925
space station research are

56
00:01:50,960 --> 00:01:52,790
unfolding as planned. If youve

57
00:01:52,825 --> 00:01:53,958
ever been on a trip with a tight

58
00:01:53,993 --> 00:01:55,037
schedule you probably understand

59
00:01:55,072 --> 00:01:56,470
how difficult it is to stick to that

60
00:01:56,505 --> 00:01:58,462
schedule. Almost everyday is a tight

61
00:01:58,497 --> 00:01:59,701
schedule for the crew members on

62
00:01:59,736 --> 00:02:01,781
board the space station. We as

63
00:02:01,816 --> 00:02:03,061

operations controllers are

64
00:02:03,096 --> 00:02:04,717
responsible for ensuring that the

65
00:02:04,752 --> 00:02:05,902
crew safely perform those

66
00:02:05,937 --> 00:02:07,405
activities as they are scheduled.

67
00:02:07,440 --> 00:02:08,478
As with any complicated

68
00:02:08,513 --> 00:02:09,790
operations, you probably know

69
00:02:09,825 --> 00:02:11,870
issues can come up. We also help

70
00:02:11,905 --> 00:02:12,990
the crew work through those

71
00:02:13,025 --> 00:02:15,053
issues safely and to get back to

72
00:02:15,088 --> 00:02:17,357
the scheduled activities. Those

73
00:02:17,392 --> 00:02:18,317
issues can range from the

74
00:02:18,352 --> 00:02:19,661
hardware that they are using,

75
00:02:19,696 --> 00:02:21,189
software that may be running, or

76
00:02:21,224 --> 00:02:22,942
even the procedures they are

77
00:02:22,977 --> 00:02:24,918
using. We even have a mockup

78
00:02:24,953 --> 00:02:26,702
nearby of the Destiny Laboratory.

79
00:02:26,737 --> 00:02:28,861
It allows us to run through those

80
00:02:28,896 --> 00:02:30,573
fix actions to make sure they're

81
00:02:30,608 --> 00:02:32,485
good or even run through normal

82
00:02:32,520 --> 00:02:33,901
procedures to make sure theyre

83
00:02:33,936 --> 00:02:36,173
more efficient. The voice of the

84
00:02:36,208 --> 00:02:38,022
operations center is the Payload

85
00:02:38,057 --> 00:02:40,278
Communications Manager, also

86
00:02:40,313 --> 00:02:42,270
known as the PAYCOM. Im the one

87
00:02:42,305 --> 00:02:43,806
guy in this room that gets to talk

88
00:02:43,841 --> 00:02:45,686

to the astronauts on a daily basis.

89
00:02:45,721 --> 00:02:48,013
We discuss the science experiments

90
00:02:48,048 --> 00:02:49,749
that they run, answer any questions

91
00:02:49,784 --> 00:02:51,630
that they may have, and relay any

92
00:02:51,665 --> 00:02:53,606
information that needs to go up to

93
00:02:53,641 --> 00:02:55,398
the crew. So its very neat to

94
00:02:55,433 --> 00:02:57,126
get to build a relationship with

95
00:02:57,161 --> 00:02:59,558
them before and during their

96
00:02:59,593 --> 00:03:01,198
six-month stay on board station.

97
00:03:01,233 --> 00:03:02,661
We like to say we have

98
00:03:02,696 --> 00:03:04,149
friends in high places.

99
00:03:04,184 --> 00:03:06,293
With all those experiments, you

100
00:03:06,328 --> 00:03:07,934
can just imagine how much data has

101
00:03:07,969 --> 00:03:10,077
to be collected, and the DMC or

102
00:03:10,112 --> 00:03:12,238
Data Management Coordinator makes

103
00:03:12,273 --> 00:03:14,662
sure all that gets back to Earth.

104
00:03:14,697 --> 00:03:16,438
I route the data and video from the

105
00:03:16,473 --> 00:03:18,381
International Space Station to

106
00:03:18,416 --> 00:03:19,437
ground systems so that people

107
00:03:19,472 --> 00:03:21,109
across the world can see it. While

108
00:03:21,144 --> 00:03:22,926
on station, astronauts do a lot of

109
00:03:22,961 --> 00:03:25,062
experiments and I route some of

110
00:03:25,097 --> 00:03:26,694
that video so we have insight as

111
00:03:26,729 --> 00:03:29,150
to what they're doing. They also

112
00:03:29,185 --> 00:03:30,894
do a lot of television interviews and

113
00:03:30,929 --> 00:03:32,925

I route that video so that you may

114
00:03:32,960 --> 00:03:35,053
see it in your home. Most

115
00:03:35,088 --> 00:03:36,317
experiments on the space

116
00:03:36,352 --> 00:03:37,789
station are installed in different

117
00:03:37,824 --> 00:03:39,966
sections called racks. The Payload

118
00:03:40,001 --> 00:03:42,326
Rack Officer, or PRO helps with

119
00:03:42,361 --> 00:03:44,966
operations in those rack facilities.

120
00:03:45,001 --> 00:03:46,678
Many of the racks and experiments,

121
00:03:46,713 --> 00:03:48,278
including the Destiny laboratory

122
00:03:48,313 --> 00:03:49,701
were built and tested here at

123
00:03:49,736 --> 00:03:51,261
Marshall. We can do certain

124
00:03:51,296 --> 00:03:52,613
command functions from the

125
00:03:52,648 --> 00:03:54,222
ground to assist the crew and

126
00:03:54,257 --> 00:03:55,901
we also have hardware on the

127
00:03:55,936 --> 00:03:57,262
ground that we can use to mirror

128
00:03:57,297 --> 00:03:59,134
crew functions so that we can help

129
00:03:59,169 --> 00:04:01,045
them if they have any questions or

130
00:04:01,080 --> 00:04:02,726
issues during experiment

131
00:04:02,761 --> 00:04:04,613
operations. We monitor commands

132
00:04:04,648 --> 00:04:06,485
as they go up to station and we

133
00:04:06,520 --> 00:04:08,349
view rack data as it comes down

134
00:04:08,384 --> 00:04:09,709
from station so that we can make

135
00:04:09,744 --> 00:04:11,782
sure all experiments remain safe

136
00:04:11,817 --> 00:04:13,494
and operational. The Lead

137
00:04:13,529 --> 00:04:15,021
Increment Scientist Representative

138
00:04:15,056 --> 00:04:17,045

liaisons between the ISS lead

139
00:04:17,080 --> 00:04:18,950
scientist for the expedition, the

140
00:04:18,985 --> 00:04:20,613
payload operations center, and

141
00:04:20,648 --> 00:04:22,333
the scientists with experiments in

142
00:04:22,368 --> 00:04:24,253
space. I live in Houston and work

143
00:04:24,288 --> 00:04:26,358
in Huntsville for 3 week rotations.

144
00:04:26,393 --> 00:04:28,262
Whenever issues arise, we have

145
00:04:28,297 --> 00:04:30,397
to make a decision quickly, so we

146
00:04:30,432 --> 00:04:31,741
have to be very familiar with

147
00:04:31,776 --> 00:04:33,453
space station research priorities.

148
00:04:33,488 --> 00:04:35,285
The goal of our team is to

149
00:04:35,320 --> 00:04:37,333
maximize a science return on

150
00:04:37,368 --> 00:04:39,197
space station and to verify that

151
00:04:39,232 --> 00:04:40,574
scientists from all over the world

152
00:04:40,609 --> 00:04:42,158
are satisfied with their results.

153
00:04:42,193 --> 00:04:43,982
The real-time planning function is

154
00:04:44,017 --> 00:04:45,606
carried out by the Timeline Change

155
00:04:45,641 --> 00:04:47,630
Officer. As you know, even the best

156
00:04:47,665 --> 00:04:49,502
plans sometimes change. When this

157
00:04:49,537 --> 00:04:51,293
happens on the space station, I am

158
00:04:51,328 --> 00:04:52,733
the one who has to come up with

159
00:04:52,768 --> 00:04:54,062
a new plan, but I don't do this

160
00:04:54,097 --> 00:04:55,981
alone. I work with my team here

161
00:04:56,016 --> 00:04:57,286
to review plans before they are

162
00:04:57,321 --> 00:04:59,325
performed on board. When changes have

163
00:04:59,360 --> 00:05:00,813

to be made, I coordinate with NASA

164
00:05:00,848 --> 00:05:02,614
control centers and scientists across

165
00:05:02,649 --> 00:05:04,605
the globe to devise the best plan for

166
00:05:04,640 --> 00:05:06,821
all of the experiments. And of

167
00:05:06,856 --> 00:05:08,653
course, since the space station is the

168
00:05:08,688 --> 00:05:11,101
size of a five-bedroom house,

169
00:05:11,136 --> 00:05:12,790
someone has to keep track of

170
00:05:12,825 --> 00:05:13,878
everything needed for

171
00:05:13,913 --> 00:05:16,014
experiments. For U.S. payloads thats

172
00:05:16,049 --> 00:05:18,446
a job for the Stowage Engineer. Have

173
00:05:18,481 --> 00:05:19,950
you ever lost anything inside your

174
00:05:19,985 --> 00:05:22,413
house? Come on, we all have. Now

175
00:05:22,448 --> 00:05:24,085
imagine trying to keep up with all

176
00:05:24,120 --> 00:05:25,749
of your household items from over

177
00:05:25,784 --> 00:05:28,134
200 miles away! As a stowage

178
00:05:28,169 --> 00:05:29,517
engineer, that's what we do

179
00:05:29,552 --> 00:05:31,606
everyday. We provide the crew

180
00:05:31,641 --> 00:05:33,213
with locations for all their tools,

181
00:05:33,248 --> 00:05:34,925
parts, and materials required to do

182
00:05:34,960 --> 00:05:37,453
their job. Now what happens when

183
00:05:37,488 --> 00:05:39,277
something gets lost you say?

184
00:05:39,312 --> 00:05:40,845
That's when we have to go back

185
00:05:40,880 --> 00:05:42,021
through our database to try to find

186
00:05:42,056 --> 00:05:43,877
the last time and location that the

187
00:05:43,912 --> 00:05:45,413
tool was used, so hopefully we

188
00:05:45,448 --> 00:05:47,181

can track it down. Each year,

189
00:05:47,216 --> 00:05:49,054
hundreds of science experiments

190
00:05:49,089 --> 00:05:50,662
are conducted on the International

191
00:05:50,697 --> 00:05:52,382
Space Station, which already has

192
00:05:52,417 --> 00:05:54,245
broken records for the hours of

193
00:05:54,280 --> 00:05:56,413
science conducted by humans in

194
00:05:56,448 --> 00:05:58,638
a space laboratory. The people

195
00:05:58,673 --> 00:06:00,358
working in the Payload Operations