
C5
EXIT
STS 127
KOPRA
Support Crew

1
00:00:08,629 --> 00:00:07,190
all the work that verts and wilmore are

2
00:00:10,150 --> 00:00:08,639
doing on their spacewalk tomorrow is

3
00:00:12,070 --> 00:00:10,160
getting the station ready for new

4
00:00:14,870 --> 00:00:12,080
hardware two international docking

5
00:00:16,950 --> 00:00:14,880
adapters uh called ida's that will be

6
00:00:19,349 --> 00:00:16,960
installed on station docking ports so

7
00:00:20,790 --> 00:00:19,359
that future commercial vehicles can dock

8
00:00:22,870 --> 00:00:20,800
to the space station

9
00:00:24,710 --> 00:00:22,880
the adapters were manufactured at boeing

10
00:00:26,550 --> 00:00:24,720
at a boeing facility near johnson space

11
00:00:28,470 --> 00:00:26,560
center and recently my colleague kyle

12
00:00:30,630 --> 00:00:28,480
herring visited the facility to talk

13
00:00:33,110 --> 00:00:30,640

about the hardware with sean kelly

14
00:00:35,350 --> 00:00:33,120
nasa's senior project manager for the

15
00:00:36,389 --> 00:00:35,360
relocation and international docking

16
00:00:38,310 --> 00:00:36,399
adapters

17
00:00:39,670 --> 00:00:38,320
and kyle asked sean why we need these

18
00:00:42,310 --> 00:00:39,680
adapters

19
00:00:45,830 --> 00:00:42,320
so the international docking adapter is

20
00:00:47,510 --> 00:00:45,840
actually the first uh implementation of

21
00:00:49,029 --> 00:00:47,520
our international docking system

22
00:00:50,869 --> 00:00:49,039
standard we've developed that over the

23
00:00:52,950 --> 00:00:50,879
past few years with all our

24
00:00:55,189 --> 00:00:52,960
international partners so it's really

25
00:00:57,270 --> 00:00:55,199
the first standard that we have in the

26
00:01:00,549 --> 00:00:57,280
space flight business and

27
00:01:03,110 --> 00:01:00,559
as such we wanted to lead lead the way

28
00:01:04,549 --> 00:01:03,120
and nasa established an effort to

29
00:01:07,350 --> 00:01:04,559
develop the international docking

30
00:01:09,510 --> 00:01:07,360
adapter uh we try to put the emphasis on

31
00:01:11,590 --> 00:01:09,520
international because although it's in

32
00:01:14,390 --> 00:01:11,600
the critical path for commercial crew

33
00:01:16,149 --> 00:01:14,400
it's also a key element for what we plan

34
00:01:18,469 --> 00:01:16,159
for other international partners to come

35
00:01:19,990 --> 00:01:18,479
to the space station and start utilizing

36
00:01:21,910 --> 00:01:20,000
it in the future

37
00:01:24,149 --> 00:01:21,920
well we know we've got some critical

38
00:01:24,950 --> 00:01:24,159

spacewalks that have to be done ahead of

39
00:01:38,230 --> 00:01:24,960
the

40
00:01:40,469 --> 00:01:38,240
relocation phase that that has to happen

41
00:01:42,550 --> 00:01:40,479
basically the setup before you actually

42
00:01:44,230 --> 00:01:42,560
get to the point of delivering the uh

43
00:01:45,590 --> 00:01:44,240
the idea

44
00:01:47,990 --> 00:01:45,600
so we're

45
00:01:50,149 --> 00:01:48,000
establishing two international docking

46
00:01:52,310 --> 00:01:50,159
ports one is on node two forward the

47
00:01:55,109 --> 00:01:52,320
other one is on node two zenith

48
00:01:56,310 --> 00:01:55,119
and that's to allow for the traffic

49
00:01:58,469 --> 00:01:56,320
models that we have for the space

50
00:01:59,830 --> 00:01:58,479
station multiple visiting vehicles and

51
00:02:01,670 --> 00:01:59,840
they'll even support two visiting

52
00:02:03,749 --> 00:02:01,680
vehicles at the same time

53
00:02:05,510 --> 00:02:03,759
uh commercial crew commercial cargo

54
00:02:07,510 --> 00:02:05,520
international partners we're in a good

55
00:02:09,749 --> 00:02:07,520
position to support the various traffic

56
00:02:12,390 --> 00:02:09,759
models that we have planned as part of

57
00:02:15,190 --> 00:02:12,400
that though we have to also allow for

58
00:02:16,550 --> 00:02:15,200
birthing and today we have two birthing

59
00:02:18,790 --> 00:02:16,560
ports we want to maintain that

60
00:02:21,510 --> 00:02:18,800
capability to have two birthing ports on

61
00:02:23,589 --> 00:02:21,520
the space station so we want to

62
00:02:25,430 --> 00:02:23,599
in order to do that we have to move some

63
00:02:26,869 --> 00:02:25,440

elements around

64
00:02:29,990 --> 00:02:26,879
so one of the elements we've got to move

65
00:02:31,750 --> 00:02:30,000
is the existing pma pressurized mating

66
00:02:33,910 --> 00:02:31,760
adapter that

67
00:02:35,990 --> 00:02:33,920
we had two of those for spit to support

68
00:02:37,750 --> 00:02:36,000
space shuttle we'll have two of those as

69
00:02:40,150 --> 00:02:37,760
the basis on which to put the

70
00:02:43,190 --> 00:02:40,160
international docking adapters but we

71
00:02:46,309 --> 00:02:43,200
have to move one of the pmas pma3 we

72
00:02:48,830 --> 00:02:46,319
also have to move the pmm pressurized

73
00:02:50,869 --> 00:02:48,840
multi-purpose module from its current

74
00:02:53,509 --> 00:02:50,879
location uh in order to get the

75
00:02:55,509 --> 00:02:53,519
clearances and and approach corridors

76
00:02:57,350 --> 00:02:55,519
that we want for the visiting vehicles

77
00:02:59,750 --> 00:02:57,360
this entails a tremendous amount of

78
00:03:01,190 --> 00:02:59,760
relocation this is the

79
00:03:02,869 --> 00:03:01,200
largest

80
00:03:05,110 --> 00:03:02,879
project we've done certainly since the

81
00:03:08,869 --> 00:03:05,120
end of the shuttle program

82
00:03:11,350 --> 00:03:08,879
it spans three increments five evas

83
00:03:14,309 --> 00:03:11,360
about 800 hours of internal crew time to

84
00:03:16,790 --> 00:03:14,319
configure the station so it's a very

85
00:03:18,550 --> 00:03:16,800
exciting project to to do and we're

86
00:03:20,710 --> 00:03:18,560
really setting the gateway for the

87
00:03:21,990 --> 00:03:20,720
future for commercial crew and and other

88
00:03:23,670 --> 00:03:22,000

international partners to come to the

89
00:03:25,589 --> 00:03:23,680
space station one of the reasons that

90
00:03:27,589 --> 00:03:25,599
we're here actually is we are in

91
00:03:29,509 --> 00:03:27,599
boeing's facility down the road the

92
00:03:30,630 --> 00:03:29,519
houston product support center boeing

93
00:03:33,589 --> 00:03:30,640
obviously

94
00:03:34,509 --> 00:03:33,599
a contractor to build these but it's a

95
00:03:37,589 --> 00:03:34,519
it's a

96
00:03:39,350 --> 00:03:37,599
multi-contractor partnership because

97
00:03:43,190 --> 00:03:39,360
not only is boeing building this but

98
00:03:47,830 --> 00:03:43,200
it's going to be launched on a spacex

99
00:03:50,309 --> 00:03:47,840
falcon 9 aboard a dragon in the future

100
00:03:52,390 --> 00:03:50,319
the first ida is already at the kennedy

101
00:03:55,910 --> 00:03:52,400
space center the first flight unit this

102
00:03:57,429 --> 00:03:55,920
one is the flight unit number two

103
00:04:00,149 --> 00:03:57,439
you've been part of this for quite a

104
00:04:02,229 --> 00:04:00,159
while talk about that that partnership

105
00:04:03,190 --> 00:04:02,239
between not only nasa and boeing but

106
00:04:05,750 --> 00:04:03,200
also

107
00:04:08,309 --> 00:04:05,760
the spacex component of this to get this

108
00:04:09,990 --> 00:04:08,319
project completed

109
00:04:12,789 --> 00:04:10,000
so this has been a the international

110
00:04:15,270 --> 00:04:12,799
docking adapter project has been uh

111
00:04:17,909 --> 00:04:15,280
involved numerous contractors we've had

112
00:04:19,909 --> 00:04:17,919
our prime contractor boeing as the lead

113
00:04:21,909 --> 00:04:19,919

integration contractor for it but

114
00:04:24,469 --> 00:04:21,919
they've used numerous contractors across

115
00:04:25,830 --> 00:04:24,479
the united states i believe at last

116
00:04:30,150 --> 00:04:25,840
count we were

117
00:04:32,310 --> 00:04:30,160
drawing products from 25 or 28 states so

118
00:04:35,990 --> 00:04:32,320
it's it really is a large collaborative

119
00:04:38,230 --> 00:04:36,000
effort we also get major components the

120
00:04:41,189 --> 00:04:38,240
primary structure from

121
00:04:44,390 --> 00:04:41,199
russia from energia and that has

122
00:04:46,390 --> 00:04:44,400
been very uh beneficial to the schedule

123
00:04:48,310 --> 00:04:46,400
and also to the international

124
00:04:50,390 --> 00:04:48,320
collaboration aspect of of the

125
00:04:52,469 --> 00:04:50,400
international docking adapter

126
00:04:54,230 --> 00:04:52,479
and of course we're flying it on on

127
00:04:57,189 --> 00:04:54,240
spacex so

128
00:04:59,830 --> 00:04:57,199
taking something new flying it on a from

129
00:05:01,830 --> 00:04:59,840
a boeing prime contractor international

130
00:05:03,270 --> 00:05:01,840
components on it

131
00:05:05,029 --> 00:05:03,280
multiple components from across the

132
00:05:07,270 --> 00:05:05,039
united states and flying it into a

133
00:05:08,629 --> 00:05:07,280
commercial cargo vehicle the space

134
00:05:10,710 --> 00:05:08,639
station that's all

135
00:05:12,629 --> 00:05:10,720
been very rewarding and very interesting

136
00:05:14,230 --> 00:05:12,639
and really brought in a lot of elements

137
00:05:16,710 --> 00:05:14,240
from

138
00:05:17,990 --> 00:05:16,720

across the agency to try and make this

139
00:05:20,629 --> 00:05:18,000
happen

140
00:05:22,390 --> 00:05:20,639
as i mentioned we're in the hpsc and

141
00:05:25,909 --> 00:05:22,400
what we're standing next to is this the

142
00:05:29,590 --> 00:05:27,430
where we're standing you can see the

143
00:05:31,990 --> 00:05:29,600
size comparison but talk us through just

144
00:05:35,029 --> 00:05:32,000
a little bit about this unit and uh how

145
00:05:36,790 --> 00:05:35,039
big it is and and size wise and weight

146
00:05:39,749 --> 00:05:36,800
wise that that's being delivered to the

147
00:05:41,749 --> 00:05:39,759
station so this is international docking

148
00:05:44,230 --> 00:05:41,759
adapter number two this is serial number

149
00:05:47,110 --> 00:05:44,240
two uh the first unit's down at kennedy

150
00:05:49,830 --> 00:05:47,120
space center uh we will fly this up on

151
00:05:52,230 --> 00:05:49,840
on a dragon this will go up on spacex

152
00:05:53,350 --> 00:05:52,240
nine is the current schedule for that

153
00:05:57,029 --> 00:05:53,360
and

154
00:05:59,029 --> 00:05:57,039
around it so that it can aid the

155
00:06:02,070 --> 00:05:59,039
installation for the crew

156
00:06:05,029 --> 00:06:02,080
we also mount it in the in the trunk for

157
00:06:07,029 --> 00:06:05,039
drag or first dragon uh by trunnion pin

158
00:06:08,950 --> 00:06:07,039
so we have these trunnion pins and that

159
00:06:11,670 --> 00:06:08,960
allows us to have a very secure amount

160
00:06:13,510 --> 00:06:11,680
the ida actually will hang suspended

161
00:06:16,150 --> 00:06:13,520
under dragon as it's going uphill and

162
00:06:17,390 --> 00:06:16,160
then it'll be extracted from the trunk

163
00:06:20,309 --> 00:06:17,400

it weighs about

164
00:06:22,870 --> 00:06:20,319
1150 pounds it's as you can see it's

165
00:06:25,350 --> 00:06:22,880
roughly 30 inches from base to top on

166
00:06:28,070 --> 00:06:25,360
the very bottom it has a ceiling surface

167
00:06:30,469 --> 00:06:28,080
and that's what will go on to the pma it

168
00:06:33,909 --> 00:06:30,479
has guide pedals that allow it to be

169
00:06:37,189 --> 00:06:33,919
accurately installed we're going to have

170
00:06:38,870 --> 00:06:37,199
robotic extraction from the dragon trunk

171
00:06:41,029 --> 00:06:38,880
and that the

172
00:06:42,629 --> 00:06:41,039
spittom will bring the

173
00:06:45,510 --> 00:06:42,639
ida to about

174
00:06:47,830 --> 00:06:45,520
two feet 10 inches within

175
00:06:49,110 --> 00:06:47,840
the pma and then the crew will reach out

176
00:06:50,950 --> 00:06:49,120
they'll grab it they'll put some tether

177
00:06:53,189 --> 00:06:50,960
straps on it then they'll bring that

178
00:06:55,270 --> 00:06:53,199
down manually it'll be released by the

179
00:06:58,390 --> 00:06:55,280
robotics will be manually brought down

180
00:07:00,550 --> 00:06:58,400
by the crew onto the pma at which point

181
00:07:02,230 --> 00:07:00,560
it'll be closed and then we'll use some

182
00:07:03,430 --> 00:07:02,240
of these connectors on this panel and

183
00:07:10,150 --> 00:07:03,440
some

184
00:07:11,909 --> 00:07:10,160
it'll be fully installed on onto the pma

185
00:07:14,550 --> 00:07:11,919
for permanent use

186
00:07:17,110 --> 00:07:14,560
the crew that's actually going to

187
00:07:18,469 --> 00:07:17,120
do the manual part of this installation

188
00:07:20,550 --> 00:07:18,479

is uh

189
00:07:23,830 --> 00:07:20,560
scott kelly obviously is one of those

190
00:07:27,670 --> 00:07:23,840
crew members going up for a year and

191
00:07:29,350 --> 00:07:27,680
as recently as uh probably january even

192
00:07:31,350 --> 00:07:29,360
maybe earlier this month he was looking

193
00:07:33,110 --> 00:07:31,360
at these down at the cape and and

194
00:07:35,189 --> 00:07:33,120
looking at what he's going to do on

195
00:07:36,790 --> 00:07:35,199
orbit based on what you just said right

196
00:07:38,710 --> 00:07:36,800
so we've had scott kelly out here to

197
00:07:41,589 --> 00:07:38,720
look at the hardware no not only eye to

198
00:07:43,350 --> 00:07:41,599
one but also out of two he's seen the

199
00:07:44,629 --> 00:07:43,360
seen it during the buildup process so he

200
00:07:46,150 --> 00:07:44,639
gets to see some of the internal

201
00:07:47,909 --> 00:07:46,160
workings of it

202
00:07:49,270 --> 00:07:47,919
we've made sure that all the crew

203
00:07:50,869 --> 00:07:49,280
members that are potential candidates

204
00:07:52,390 --> 00:07:50,879
for installing it

205
00:07:54,790 --> 00:07:52,400
have had the opportunity to see it and

206
00:07:58,230 --> 00:07:54,800
get familiar with the hardware

207
00:08:00,150 --> 00:07:58,240
this is 1150 pounds so it's it's not

208
00:08:01,589 --> 00:08:00,160
trivial even though it's weightless in

209
00:08:03,510 --> 00:08:01,599
orbit still

210
00:08:05,110 --> 00:08:03,520
a big heavy object for them to move

211
00:08:06,629 --> 00:08:05,120
around from a mass point of view in

212
00:08:08,390 --> 00:08:06,639
orbit so we wanted to make sure they

213
00:08:11,029 --> 00:08:08,400

were fully familiar with it before they

214
00:08:12,309 --> 00:08:11,039
flew and i believe scott kelly's gonna

215
00:08:14,550 --> 00:08:12,319
have the opportunity to install both

216
00:08:16,390 --> 00:08:14,560
item 1 and ida 2

217
00:08:18,070 --> 00:08:16,400
on orbit

218
00:08:21,029 --> 00:08:18,080
we're in the space vehicle mock-up

219
00:08:23,270 --> 00:08:21,039
facility the location for the mock-ups

220
00:08:25,510 --> 00:08:23,280
that you see associated with the

221
00:08:28,469 --> 00:08:25,520
international docking adapter sean and i

222
00:08:30,309 --> 00:08:28,479
are here to uh for sean to give us a

223
00:08:32,550 --> 00:08:30,319
little demonstration of what actually

224
00:08:34,709 --> 00:08:32,560
will happen on orbit and what these

225
00:08:37,430 --> 00:08:34,719
mock-ups are used for in terms of

226
00:08:40,389 --> 00:08:37,440
training to get crews ready to head to

227
00:08:42,389 --> 00:08:40,399
orbit so sean uh give us a little demo

228
00:08:44,630 --> 00:08:42,399
here of what we're looking at and the

229
00:08:47,190 --> 00:08:44,640
importance of it to the international

230
00:08:48,790 --> 00:08:47,200
docking adapter in the future of the

231
00:08:49,910 --> 00:08:48,800
commercial crew and other visiting

232
00:08:52,310 --> 00:08:49,920
vehicles

233
00:08:54,870 --> 00:08:52,320
sure so what we have here is the

234
00:08:56,790 --> 00:08:54,880
international docking adapter as you saw

235
00:08:58,790 --> 00:08:56,800
in the previous video it has three

236
00:09:00,630 --> 00:08:58,800
pedals it's also mounted on the

237
00:09:03,269 --> 00:09:00,640
pressurized mating adapter which is the

238
00:09:05,590 --> 00:09:03,279

back portion of this mock-up the crew

239
00:09:07,670 --> 00:09:05,600
uses this mock-up for ingress and egress

240
00:09:09,350 --> 00:09:07,680
training as well as familiarization

241
00:09:11,430 --> 00:09:09,360
training for it you can see it's not

242
00:09:12,949 --> 00:09:11,440
highly detailed but it's an adequate

243
00:09:14,230 --> 00:09:12,959
level of detail for all the training

244
00:09:15,350 --> 00:09:14,240
operations that they have in the

245
00:09:17,829 --> 00:09:15,360
facility

246
00:09:19,910 --> 00:09:17,839
what we have behind me is the active

247
00:09:21,590 --> 00:09:19,920
docking system this represents what

248
00:09:23,670 --> 00:09:21,600
would be on the front of the visiting

249
00:09:26,070 --> 00:09:23,680
vehicle a commercial crew vehicle or

250
00:09:28,230 --> 00:09:26,080
other international partner vehicle

251
00:09:31,829 --> 00:09:28,240
this also has three pedals on it as well

252
00:09:35,030 --> 00:09:31,839
as mechanical latches these latches will

253
00:09:36,710 --> 00:09:35,040
strike over to the ida on their striker

254
00:09:39,110 --> 00:09:36,720
plates and that's how the

255
00:09:40,790 --> 00:09:39,120
the attachment of the visiting vehicle

256
00:09:42,630 --> 00:09:40,800
to the ida will happen

257
00:09:44,470 --> 00:09:42,640
uh that normally happens with a soft

258
00:09:46,150 --> 00:09:44,480
capture system extended

259
00:09:49,190 --> 00:09:46,160
and then that soft capture system

260
00:09:51,269 --> 00:09:49,200
retracts thereby making the two

261
00:09:52,230 --> 00:09:51,279
halves of the docking system go together

262
00:09:53,910 --> 00:09:52,240
and mate

263
00:09:56,389 --> 00:09:53,920

that creates a pressurized seal and a

264
00:09:58,870 --> 00:09:56,399
structural seal between the two of them

265
00:09:59,750 --> 00:09:58,880
the crew training aspect of this

266
00:10:01,190 --> 00:09:59,760
we

267
00:10:02,949 --> 00:10:01,200
they obviously work with the actual

268
00:10:05,190 --> 00:10:02,959
flight hardware

269
00:10:07,110 --> 00:10:05,200
but they also have to interface with

270
00:10:09,350 --> 00:10:07,120
this training equipment

271
00:10:10,550 --> 00:10:09,360
and describe that for us it's really

272
00:10:12,870 --> 00:10:10,560
more of a

273
00:10:14,230 --> 00:10:12,880
ingress and egress type function for the

274
00:10:16,710 --> 00:10:14,240
crew members rather than the

275
00:10:19,269 --> 00:10:16,720
functionality of the the actual system

276
00:10:20,790 --> 00:10:19,279
right correct so

277
00:10:22,550 --> 00:10:20,800
when a visiting vehicle comes there's a

278
00:10:23,990 --> 00:10:22,560
lot of reconfiguration you have to do on

279
00:10:25,670 --> 00:10:24,000
the space station

280
00:10:27,190 --> 00:10:25,680
you've got power and data exchange that

281
00:10:29,269 --> 00:10:27,200
happens automatically as part of the

282
00:10:31,350 --> 00:10:29,279
docking adapter but there's also air

283
00:10:33,590 --> 00:10:31,360
exchange that has to happen they have to

284
00:10:36,470 --> 00:10:33,600
put in some duct work and

285
00:10:38,389 --> 00:10:36,480
that's to allow air exchange between the

286
00:10:40,630 --> 00:10:38,399
visiting vehicle and the space station

287
00:10:42,790 --> 00:10:40,640
once it's docked and so they have to do

288
00:10:44,470 --> 00:10:42,800

that configuration as well as

289
00:10:46,630 --> 00:10:44,480
there's a

290
00:10:49,110 --> 00:10:46,640
existing target that they use for

291
00:10:50,470 --> 00:10:49,120
docking on the front of the hatch and

292
00:10:52,710 --> 00:10:50,480
once that hatch is open they have to

293
00:10:54,870 --> 00:10:52,720
remove that docking target from the

294
00:10:57,350 --> 00:10:54,880
hatch so they can egress into the

295
00:10:59,030 --> 00:10:57,360
vehicle smoothly well sean we really do

296
00:11:00,870 --> 00:10:59,040
appreciate you taking time out to show

297
00:11:02,150 --> 00:11:00,880
us this hardware that's headed for the

298
00:11:03,990 --> 00:11:02,160
international space station the

299
00:11:04,710 --> 00:11:04,000
international docking adapter both of

300
00:11:06,949 --> 00:11:04,720
them

301
00:11:08,470 --> 00:11:06,959
obviously getting ready to fly and and

302
00:11:10,310 --> 00:11:08,480
we really appreciate you taking the time