1
00:00:05,829 --> 00:00:03,750
welcome to mission control houston and

2
00:00:08,390 --> 00:00:05,839
we have a special guest as mentioned

3
00:00:10,870 --> 00:00:08,400
earlier mario runco a veteran of three

4
00:00:13,749 --> 00:00:10,880
space shuttle missions to

5
00:00:15,749 --> 00:00:13,759
orbit and he has a lot of experience in

6
00:00:17,510 --> 00:00:15,759
earth observations as a matter of fact

7
00:00:19,910 --> 00:00:17,520
he was one of the principals in

8
00:00:21,750 --> 00:00:19,920
designing and getting the window

9
00:00:23,830 --> 00:00:21,760
observational research facility up to

10
00:00:26,470 --> 00:00:23,840
the international space station which

11
00:00:27,349 --> 00:00:26,480
uses a special optical quality window to

12
00:00:29,269 --> 00:00:27,359
allow

13
00:00:31,189 --> 00:00:29,279

the very best photography of the earth

14
00:00:33,430 --> 00:00:31,199
below by astronauts aboard the orbiting

15
00:00:35,750 --> 00:00:33,440
outpost welcome mario well thank you

16
00:00:38,549 --> 00:00:35,760
kyle appreciate it glad to be here great

17
00:00:40,709 --> 00:00:38,559
to have you here too and uh tell us a

18
00:00:41,670 --> 00:00:40,719
little bit about yourself and your space

19
00:00:42,470 --> 00:00:41,680
flights

20
00:00:44,869 --> 00:00:42,480
well

21
00:00:48,069 --> 00:00:44,879
as you mentioned i did three uh back in

22
00:00:49,510 --> 00:00:48,079
the 90s 91 through 96

23
00:00:51,830 --> 00:00:49,520
on the space shuttle

24
00:00:53,270 --> 00:00:51,840
and that was uh when i was involved with

25
00:00:55,910 --> 00:00:53,280
the space flights there that was the

26
00:00:58,709 --> 00:00:55,920
start of my passion for

27
00:01:00,790 --> 00:00:58,719
earth observation and utilizing the

28
00:01:02,389 --> 00:01:00,800
space platform for

29
00:01:04,229 --> 00:01:02,399
studying the earth

30
00:01:06,230 --> 00:01:04,239
and we had a picture of you and it was a

31
00:01:08,310 --> 00:01:06,240
little hard to find pictures of you all

32
00:01:09,830 --> 00:01:08,320
by yourself because apparently you were

33
00:01:12,230 --> 00:01:09,840
the guy behind the camera most of the

34
00:01:14,310 --> 00:01:12,240
time yes sir i was uh i i was a

35
00:01:16,149 --> 00:01:14,320
shutterbug on board trying to document

36
00:01:17,030 --> 00:01:16,159
not only uh what we did on board but

37
00:01:18,149 --> 00:01:17,040
also

38
00:01:19,830 --> 00:01:18,159

uh

39
00:01:22,469 --> 00:01:19,840
the out the window views which were

40
00:01:24,070 --> 00:01:22,479
spectacular to to say the least

41
00:01:25,830 --> 00:01:24,080
well so tell us i know you brought some

42
00:01:27,429 --> 00:01:25,840
of the your favorite beauty shots tell

43
00:01:29,910 --> 00:01:27,439
us a little bit about earth observations

44
00:01:31,749 --> 00:01:29,920
from on orbit well uh a pleasure well

45
00:01:34,149 --> 00:01:31,759
first firstly that when you get up on

46
00:01:36,149 --> 00:01:34,159
orbit it and you get your first view

47
00:01:38,789 --> 00:01:36,159
outside the window it is

48
00:01:40,789 --> 00:01:38,799
strikingly beautiful breathtaking the

49
00:01:43,429 --> 00:01:40,799
adjectives and the superlatives could

50
00:01:45,830 --> 00:01:43,439
not describe the the feeling and sense

51
00:01:48,550 --> 00:01:45,840
of uh beauty that you get i have one

52
00:01:51,429 --> 00:01:48,560
image of of what we

53
00:01:53,510 --> 00:01:51,439
what we see very very commonly on orbit

54
00:01:55,670 --> 00:01:53,520
and that's a of a sunset

55
00:01:57,910 --> 00:01:55,680
and one of the things about sunsets and

56
00:02:00,149 --> 00:01:57,920
you may not think of astronauts uh being

57
00:02:02,709 --> 00:02:00,159
in the space business and and being very

58
00:02:04,550 --> 00:02:02,719
technical is being romantic but on board

59
00:02:07,830 --> 00:02:04,560
uh whenever there's a sunrise or a

60
00:02:10,389 --> 00:02:07,840
sunset the the the call goes out on

61
00:02:12,309 --> 00:02:10,399
board and uh somebody yells sunrise or

62
00:02:13,830 --> 00:02:12,319
sunset and everybody kind of when they

63
00:02:16,869 --> 00:02:13,840

have the opportunity drops what they're

64
00:02:18,550 --> 00:02:16,879
doing and for the few moments uh

65
00:02:21,270 --> 00:02:18,560
runs up to the window or floats up to

66
00:02:23,270 --> 00:02:21,280
the window and uh and watches uh

67
00:02:25,350 --> 00:02:23,280
the sunset and and it is spectacularly

68
00:02:27,030 --> 00:02:25,360
beautiful what the good news is we can

69
00:02:29,270 --> 00:02:27,040
see that uh

70
00:02:31,990 --> 00:02:29,280
16 times every day as we orbit the earth

71
00:02:33,990 --> 00:02:32,000
uh every 90 minutes so that's and and it

72
00:02:36,390 --> 00:02:34,000
is really really spectacular as you

73
00:02:38,150 --> 00:02:36,400
might have seen in the image there and

74
00:02:40,390 --> 00:02:38,160
and there's some other places on the

75
00:02:43,430 --> 00:02:40,400
planet that that also jump out at you if

76
00:02:45,270 --> 00:02:43,440
you if you go to a google earth map or

77
00:02:46,869 --> 00:02:45,280
something like that and and just kind of

78
00:02:49,589 --> 00:02:46,879
look at the western hemisphere you'll

79
00:02:51,110 --> 00:02:49,599
see in the eastern western atlantic east

80
00:02:53,030 --> 00:02:51,120
off the east coast of the us and the in

81
00:02:55,509 --> 00:02:53,040
the bahamas you'll see this bright

82
00:02:57,990 --> 00:02:55,519
turquoise spot and and if you get in a

83
00:02:59,990 --> 00:02:58,000
close-up at which we have here uh for

84
00:03:02,149 --> 00:03:00,000
the viewers here uh there's a place

85
00:03:04,949 --> 00:03:02,159
called tongue of the ocean and my uh

86
00:03:07,030 --> 00:03:04,959
being an oceanographer uh this is a very

87
00:03:09,910 --> 00:03:07,040
uh not only strikingly beautiful place

88
00:03:11,270 --> 00:03:09,920

but it's a place to study and and

89
00:03:16,070 --> 00:03:11,280
has

90
00:03:17,990 --> 00:03:16,080
interesting features you can see the the

91
00:03:20,390 --> 00:03:18,000
dark blue area it looks it looks

92
00:03:22,390 --> 00:03:20,400
obviously like a giant tongue and hence

93
00:03:25,270 --> 00:03:22,400
the name but that is very very deep

94
00:03:26,949 --> 00:03:25,280
water and just to the to the south below

95
00:03:29,270 --> 00:03:26,959
uh the bottom of the tongue you see some

96
00:03:31,110 --> 00:03:29,280
sand dunes there uh and that's very

97
00:03:33,670 --> 00:03:31,120
shallow water and and you can see the

98
00:03:35,270 --> 00:03:33,680
ripples caused by the waves in the sand

99
00:03:37,030 --> 00:03:35,280
at the bottom of the ocean even from

100
00:03:39,270 --> 00:03:37,040
space and that's andros islands off to

101
00:03:41,350 --> 00:03:39,280
the west it again just the the deep

102
00:03:45,190 --> 00:03:41,360
blues and the turquoises there are are

103
00:03:50,229 --> 00:03:46,869
and then so tell us a little bit about

104
00:03:52,630 --> 00:03:50,239
uh the uh activities that go on aboard

105
00:03:54,550 --> 00:03:52,640
the space station okay uh well on the

106
00:03:56,470 --> 00:03:54,560
space station uh you know we do have the

107
00:03:58,949 --> 00:03:56,480
cupola windows and we have the uh

108
00:04:01,910 --> 00:03:58,959
destiny module laboratory window uh

109
00:04:03,910 --> 00:04:01,920
their their optical quality the the lab

110
00:04:07,190 --> 00:04:03,920
window has the scratch pane removed so

111
00:04:09,270 --> 00:04:07,200
we can do science and remote sensing and

112
00:04:10,869 --> 00:04:09,280
uh there is the as you mentioned earlier

113
00:04:13,830 --> 00:04:10,879

the window observational research

114
00:04:15,990 --> 00:04:13,840
facility uh into which we put remote

115
00:04:18,229 --> 00:04:16,000
sensing and photographic equipment that

116
00:04:20,310 --> 00:04:18,239
can be operated either by the crew or

117
00:04:22,950 --> 00:04:20,320
from the ground in the case like uh we

118
00:04:25,110 --> 00:04:22,960
see here chris hadfield installing our

119
00:04:27,670 --> 00:04:25,120
latest payload called iserv

120
00:04:30,070 --> 00:04:27,680
uh which is uh

121
00:04:32,310 --> 00:04:30,080
payload designed to

122
00:04:34,390 --> 00:04:32,320
monitor

123
00:04:36,629 --> 00:04:34,400
disaster areas around the planet whether

124
00:04:39,189 --> 00:04:36,639
they be from tornadoes as it happened in

125
00:04:41,030 --> 00:04:39,199
moore oklahoma or

126
00:04:43,189 --> 00:04:41,040
tsunamis hurricanes whatever the case

127
00:04:47,030 --> 00:04:43,199
may be and and and the ability of the

128
00:04:49,430 --> 00:04:47,040
camera to to frequently overfly the same

129
00:04:51,110 --> 00:04:49,440
place many times is an advantage that

130
00:04:53,189 --> 00:04:51,120
the space station has that many of our

131
00:04:55,030 --> 00:04:53,199
earth observation satellites do not have

132
00:04:57,430 --> 00:04:55,040
because most of them are sun synchronous

133
00:05:00,550 --> 00:04:57,440
orbit and they pass over once every 16

134
00:05:02,070 --> 00:05:00,560
days so as things change we can indeed

135
00:05:04,390 --> 00:05:02,080
get uh

136
00:05:07,189 --> 00:05:04,400
many many updates and imagery provided

137
00:05:09,350 --> 00:05:07,199
the cloud cover uh is available

138
00:05:12,550 --> 00:05:09,360

and that's a joint activity between nasa

139
00:05:14,390 --> 00:05:12,560
and the usaid right or you said agency

140
00:05:15,590 --> 00:05:14,400
that tracks these kinds of disasters

141
00:05:18,710 --> 00:05:15,600
around the world and they put in

142
00:05:20,150 --> 00:05:18,720
requests uh to the the the uh payload uh

143
00:05:22,710 --> 00:05:20,160
folks and then they they train the

144
00:05:25,350 --> 00:05:22,720
camera to take the in uh the the image

145
00:05:27,510 --> 00:05:25,360
in this case uh uh the iserv instrument

146
00:05:29,510 --> 00:05:27,520
is a nine inch telescope and it's a

147
00:05:31,830 --> 00:05:29,520
little unusual and it's about as large

148
00:05:34,070 --> 00:05:31,840
as we can put into the uh the wharf rack

149
00:05:36,070 --> 00:05:34,080
the uh the abbreviation for window

150
00:05:38,150 --> 00:05:36,080
observational research facility

151
00:05:40,070 --> 00:05:38,160
and but we had to do something a little

152
00:05:41,830 --> 00:05:40,080
bit different and most telescopes are

153
00:05:45,350 --> 00:05:41,840
reflecting telescopes with which this

154
00:05:47,590 --> 00:05:45,360
one is has the uh secondary mirror that

155
00:05:49,749 --> 00:05:47,600
bounces the the light that comes off of

156
00:05:51,830 --> 00:05:49,759
the mirror to the eyepiece well that's

157
00:05:53,430 --> 00:05:51,840
removed and the camera is actually on

158
00:05:54,390 --> 00:05:53,440
the front end

159
00:05:57,110 --> 00:05:54,400
of

160
00:06:00,150 --> 00:05:57,120
the the the telescope it blocks a little

161
00:06:01,830 --> 00:06:00,160
bit of the field of view as does the

162
00:06:05,909 --> 00:06:01,840
secondary mirror

163
00:06:08,629 --> 00:06:05,919

but it allows for a wider footprint

164
00:06:11,189 --> 00:06:08,639
so when if you're not exactly precise on

165
00:06:12,550 --> 00:06:11,199
your pointing you can still acquire the

166
00:06:14,950 --> 00:06:12,560
the place on the ground that you're

167
00:06:16,950 --> 00:06:14,960
trying to image okay yeah you've got

168
00:06:20,790 --> 00:06:16,960
some more images tell us about these

169
00:06:22,870 --> 00:06:20,800
okay the next image up is an image from

170
00:06:25,270 --> 00:06:22,880
our isaac payload which is international

171
00:06:27,990 --> 00:06:25,280
space station agricultural camera this

172
00:06:30,230 --> 00:06:28,000
was a multi-spectral camera it had uh

173
00:06:32,550 --> 00:06:30,240
bay of three bands green red and

174
00:06:34,390 --> 00:06:32,560
infrared and you see here the image in

175
00:06:38,150 --> 00:06:34,400
the red area on the image is the area

176
00:06:41,430 --> 00:06:38,160
that the the isaac camera took and it is

177
00:06:44,469 --> 00:06:41,440
overlaid on a landsat thematic mapper uh

178
00:06:45,749 --> 00:06:44,479
visible image and what is interesting

179
00:06:48,950 --> 00:06:45,759
about

180
00:06:51,110 --> 00:06:48,960
when you do multi-spectral in this case

181
00:06:55,270 --> 00:06:51,120
the green red and near-infrared if you

182
00:06:57,350 --> 00:06:55,280
do a combination of the uh

183
00:07:00,070 --> 00:06:57,360
the the bands you get a false color

184
00:07:02,550 --> 00:07:00,080
composite as you have here and what is

185
00:07:05,589 --> 00:07:02,560
striking is it brings up the vegetation

186
00:07:08,070 --> 00:07:05,599
shows up in red rather than green but

187
00:07:09,909 --> 00:07:08,080
then it is very sensitive to differences

188
00:07:12,870 --> 00:07:09,919

in vegetation so you can monitor the

189
00:07:14,309 --> 00:07:12,880
health of forests of crops and and and

190
00:07:15,350 --> 00:07:14,319
one of the things here this is port

191
00:07:17,589 --> 00:07:15,360
charlotte

192
00:07:19,029 --> 00:07:17,599
florida and you can see some right

193
00:07:21,589 --> 00:07:19,039
toward the center of the picture you can

194
00:07:23,110 --> 00:07:21,599
see some brighter red areas of a

195
00:07:24,950 --> 00:07:23,120
different shade and that's the ability

196
00:07:26,629 --> 00:07:24,960
of the camera to discern the difference

197
00:07:28,150 --> 00:07:26,639
in vegetation and the health of the

198
00:07:30,629 --> 00:07:28,160
vegetation in that case those brighter

199
00:07:32,870 --> 00:07:30,639
red areas are actually golf courses so

200
00:07:35,670 --> 00:07:32,880
they're much more uh the wet they're

201
00:07:38,150 --> 00:07:35,680
they're greener and and so uh

202
00:07:40,230 --> 00:07:38,160
i use this image as an example to that

203
00:07:42,790 --> 00:07:40,240
that shows when a plant is either very

204
00:07:45,749 --> 00:07:42,800
healthy or stressed you can detect that

205
00:07:47,510 --> 00:07:45,759
from the space platform and so farmers

206
00:07:50,150 --> 00:07:47,520
uh around the country are able to use

207
00:07:51,909 --> 00:07:50,160
these images to help check on how their

208
00:07:53,990 --> 00:07:51,919
crops are doing if they're tied into the

209
00:07:56,390 --> 00:07:54,000
system right and and they they were

210
00:07:57,909 --> 00:07:56,400
through the uh the space operations

211
00:07:58,869 --> 00:07:57,919
center at the university of north dakota

212
00:08:01,830 --> 00:07:58,879
the the

213
00:08:04,710 --> 00:08:01,840

the where from where the uh isaac camera

214
00:08:07,990 --> 00:08:04,720
came and this camera uh actually they

215
00:08:10,070 --> 00:08:08,000
they were taking images and that and

216
00:08:12,309 --> 00:08:10,080
what where in the short growing season

217
00:08:14,309 --> 00:08:12,319
in the upper midwest is very critical

218
00:08:16,390 --> 00:08:14,319
that nothing goes wrong otherwise the

219
00:08:19,589 --> 00:08:16,400
crop is lost and and then of course

220
00:08:22,629 --> 00:08:19,599
profit and and and livelihood so uh they

221
00:08:24,950 --> 00:08:22,639
use the the images to monitor the crops

222
00:08:27,430 --> 00:08:24,960
that if they have an issue in the field

223
00:08:29,909 --> 00:08:27,440
they can go to that particular spot uh

224
00:08:30,950 --> 00:08:29,919
in their field and has the resolution to

225
00:08:33,269 --> 00:08:30,960
do that

226
00:08:35,190 --> 00:08:33,279
and what you can do is it let's say

227
00:08:37,430 --> 00:08:35,200
there's a fungal infection and a root

228
00:08:38,550 --> 00:08:37,440
crop like sugar beets they can go out

229
00:08:40,389 --> 00:08:38,560
and then

230
00:08:41,670 --> 00:08:40,399
diagnose the problem

231
00:08:44,389 --> 00:08:41,680
in the area

232
00:08:46,710 --> 00:08:44,399
by the fungicide and address the problem

233
00:08:49,670 --> 00:08:46,720
the the benefit environmentally is that

234
00:08:51,750 --> 00:08:49,680
i can target specifically the area

235
00:08:53,829 --> 00:08:51,760
rather than in the past where practices

236
00:08:56,470 --> 00:08:53,839
were that you'd have to do the entire

237
00:08:59,110 --> 00:08:56,480
field or the entire acreage rather than

238
00:09:01,430 --> 00:08:59,120

the the area that of concern so that was

239
00:09:02,949 --> 00:09:01,440
i imagine that also helps to keep that

240
00:09:06,150 --> 00:09:02,959
kind of a problem from spreading to

241
00:09:07,910 --> 00:09:06,160
other farms exact crops exactly it it's

242
00:09:09,590 --> 00:09:07,920
it's a win-win it saves the farmer money

243
00:09:12,070 --> 00:09:09,600
he doesn't have to spend as much on on

244
00:09:14,870 --> 00:09:12,080
the in this case fungicide for example

245
00:09:16,389 --> 00:09:14,880
and he doesn't have to uh spread as much

246
00:09:17,829 --> 00:09:16,399
around the environment which then once

247
00:09:19,509 --> 00:09:17,839
it's in the environment it goes into the

248
00:09:23,190 --> 00:09:19,519
water table and the streams and all of

249
00:09:25,750 --> 00:09:23,200
that so so uh again it's it it's it's an

250
00:09:28,389 --> 00:09:25,760
advance in technology that really helps

251
00:09:30,949 --> 00:09:28,399
uh day-to-day work or on the planet and

252
00:09:32,870 --> 00:09:30,959
in this case uh raising our food crop

253
00:09:34,389 --> 00:09:32,880
and theoretically lower prices at the

254
00:09:35,990 --> 00:09:34,399
grocery store if you don't spend that

255
00:09:39,190 --> 00:09:36,000
much money taking care of your crops

256
00:09:41,350 --> 00:09:39,200
exactly so it it all goes in and and

257
00:09:43,990 --> 00:09:41,360
actually the the farmers are pretty i

258
00:09:46,550 --> 00:09:44,000
mean technologically they they are

259
00:09:48,870 --> 00:09:46,560
i had learned in dealing with them uh

260
00:09:51,269 --> 00:09:48,880
that they they are

261
00:09:53,350 --> 00:09:51,279
pretty savvy technologically they stay

262
00:09:54,949 --> 00:09:53,360
at the leading edge because it behooves

263
00:09:56,550 --> 00:09:54,959

them to do so

264
00:09:58,710 --> 00:09:56,560
all right now i think we probably have

265
00:10:00,550 --> 00:09:58,720
time for one more image mario let's take

266
00:10:02,790 --> 00:10:00,560
a look at the next one that you had okay

267
00:10:04,870 --> 00:10:02,800
this one is uh from our iserv payload

268
00:10:07,030 --> 00:10:04,880
and this one is uh happens to be of the

269
00:10:09,110 --> 00:10:07,040
grand canyon uh you can see it running

270
00:10:10,790 --> 00:10:09,120
right down the the center of the

271
00:10:12,069 --> 00:10:10,800
photograph and this is the colorado

272
00:10:14,630 --> 00:10:12,079
river of course running through the

273
00:10:16,470 --> 00:10:14,640
grand canyon in arizona and this is an

274
00:10:19,030 --> 00:10:16,480
example of what sort of the iserv

275
00:10:21,350 --> 00:10:19,040
payload can do it it would narrow in and

276
00:10:23,910 --> 00:10:21,360
zoom in on a particular area and let's

277
00:10:25,590 --> 00:10:23,920
say the colorado river were flooding and

278
00:10:27,829 --> 00:10:25,600
it would overspill its banks of course

279
00:10:29,910 --> 00:10:27,839
not at the grand canyon that would be a

280
00:10:31,910 --> 00:10:29,920
big flood but yeah uh this is just an

281
00:10:33,990 --> 00:10:31,920
example but you would be able to see the

282
00:10:37,269 --> 00:10:34,000
extent of where the flooding had

283
00:10:40,069 --> 00:10:37,279
occurred and and manage and then help uh

284
00:10:42,550 --> 00:10:40,079
area responders uh with that information

285
00:10:45,670 --> 00:10:42,560
to manage and address the situation

286
00:10:48,310 --> 00:10:45,680
locally so uh it it is designed to help

287
00:10:49,750 --> 00:10:48,320
with uh uh disaster assistance

288
00:10:51,509 --> 00:10:49,760

uh primarily

289
00:10:53,350 --> 00:10:51,519
well mara renko thank you so much for

290
00:10:55,269 --> 00:10:53,360
joining us today and you know you have a

291
00:10:57,990 --> 00:10:55,279
really interesting background uh from

292
00:11:00,470 --> 00:10:58,000
the bronx and your former police officer

293
00:11:01,910 --> 00:11:00,480
yes oceanographer and all that and i

294
00:11:04,550 --> 00:11:01,920
want to let everybody know that you're

295
00:11:06,230 --> 00:11:04,560
also went to rutgers in new jersey and

296
00:11:07,829 --> 00:11:06,240
we have a distance learning network

297
00:11:11,670 --> 00:11:07,839
event coming up a little bit later on

298
00:11:13,030 --> 00:11:11,680
today at 1105 a.m central time and mario

299
00:11:14,630 --> 00:11:13,040
renko is going to be talking with

300
00:11:16,630 --> 00:11:14,640
students at a school in new jersey at

301
00:11:18,230 --> 00:11:16,640
that time so we'll look forward to

302
00:11:19,829 --> 00:11:18,240
continuing on our discussions with you

303
00:11:21,509 --> 00:11:19,839
later today mario and thanks for coming

304
00:11:22,870 --> 00:11:21,519
and talking to us about crew earth

305
00:11:24,550 --> 00:11:22,880
observations from the international