



**Mikael Wolff, ESA**

CRUISE Lead  
and Co-investigator

1  
00:00:06,299 --> 00:00:04,380  
we've been mentioning a variety of the

2  
00:00:07,920 --> 00:00:06,309  
kinds of experiments that International

3  
00:00:10,470 --> 00:00:07,930  
Space Station the crew members perform

4  
00:00:12,810 --> 00:00:10,480  
and those experiments come in a wide

5  
00:00:15,930 --> 00:00:12,820  
range of their different scientific

6  
00:00:18,600 --> 00:00:15,940  
disciplines some of it very deep and

7  
00:00:20,970 --> 00:00:18,610  
theoretical some of it designed to learn

8  
00:00:23,070 --> 00:00:20,980  
more about how people can live in the

9  
00:00:25,650 --> 00:00:23,080  
space environment and some of it is

10  
00:00:28,260 --> 00:00:25,660  
demonstrating concepts for technology

11  
00:00:31,230 --> 00:00:28,270  
that could assist future exploration to

12  
00:00:33,389 --> 00:00:31,240  
deep space and today commander Kevin

13  
00:00:35,279 --> 00:00:33,399

Ford performed one of those latter

14

00:00:38,040 --> 00:00:35,289

experiments you're seeing some video

15

00:00:40,770 --> 00:00:38,050

that we recorded that was a downlink to

16

00:00:43,139 --> 00:00:40,780

earlier today of Ford performing a

17

00:00:45,090 --> 00:00:43,149

European Space Agency investigation

18

00:00:47,639 --> 00:00:45,100

that's aimed at improving crew

19

00:00:50,969 --> 00:00:47,649

operations efficiency and as their

20

00:00:54,000 --> 00:00:50,979

autonomy as well joining us this morning

21

00:00:56,610 --> 00:00:54,010

to talk more about cruise which is crew

22

00:00:59,189 --> 00:00:56,620

user interface system enhancement is

23

00:01:02,699 --> 00:00:59,199

Michael Wolff a senior software engineer

24

00:01:04,560 --> 00:01:02,709

and ESA's lead and co-investigator for

25

00:01:06,330 --> 00:01:04,570

the crews experiment speaking with us

26

00:01:08,790 --> 00:01:06,340

this morning from his office at the

27

00:01:10,740 --> 00:01:08,800

european space research and Technology

28

00:01:13,140 --> 00:01:10,750

Center the Nord wig in the Netherlands

29

00:01:15,000 --> 00:01:13,150

Michael tell me about the background of

30

00:01:18,120 --> 00:01:15,010

this project and how you got involved in

31

00:01:20,610 --> 00:01:18,130

it okay a good morning Pat first and

32

00:01:24,450 --> 00:01:20,620

thanks for the chance to chat with you

33

00:01:26,010 --> 00:01:24,460

about this we our group here at ISA and

34

00:01:29,460 --> 00:01:26,020

our industrial colleagues we've been

35

00:01:33,300 --> 00:01:29,470

interested in improving the onboard user

36

00:01:36,540 --> 00:01:33,310

interface for a long time essentially

37

00:01:40,170 --> 00:01:36,550

trying to make astronauts performance

38

00:01:41,880 --> 00:01:40,180

improve and also get better there you

39

00:01:44,100 --> 00:01:41,890

use the satisfaction for when they

40

00:01:46,260 --> 00:01:44,110

actually working up there and the

41

00:01:49,710 --> 00:01:46,270

streams we've been doing this in is

42

00:01:52,500 --> 00:01:49,720

technology demonstrations say building

43

00:01:55,080 --> 00:01:52,510

block demonstrations but we're also been

44

00:01:57,240 --> 00:01:55,090

thinking same or in larger term or

45

00:02:00,540 --> 00:01:57,250

trying to establish a path towards

46

00:02:03,660 --> 00:02:00,550

building a is smart assistance a and E

47

00:02:06,960 --> 00:02:03,670

partner to actually give a more broader

48

00:02:09,359 --> 00:02:06,970

support I'd say that what we did today

49

00:02:11,699 --> 00:02:09,369

the commander session with cruise is a

50

00:02:14,260 --> 00:02:11,709

building block type of technology

51  
00:02:16,970 --> 00:02:14,270  
demonstration and often operations them

52  
00:02:18,980 --> 00:02:16,980  
or maybe a way to help understand this

53  
00:02:22,100 --> 00:02:18,990  
is to turn that question on its head

54  
00:02:24,620 --> 00:02:22,110  
what is the deficiency in the way the

55  
00:02:25,970 --> 00:02:24,630  
crews operate now what do you what do

56  
00:02:30,530 --> 00:02:25,980  
you see in the current way that they

57  
00:02:32,540 --> 00:02:30,540  
operate that should be improved well

58  
00:02:34,490 --> 00:02:32,550  
first Adam I don't think it's only

59  
00:02:36,560 --> 00:02:34,500  
deficiencies we do we do have some

60  
00:02:38,600 --> 00:02:36,570  
advantages with the electronic systems

61  
00:02:40,630 --> 00:02:38,610  
on board I mean we can carry less paper

62  
00:02:44,330 --> 00:02:40,640  
and thereby we get things a little bit

63  
00:02:47,120 --> 00:02:44,340

more cost effective operations but but

64

00:02:50,030 --> 00:02:47,130

certainly one deficiency is of course

65

00:02:52,220 --> 00:02:50,040

that it takes a long time to spin in

66

00:02:54,200 --> 00:02:52,230

technologies from from ground into the

67

00:02:56,390 --> 00:02:54,210

space segments install validation and

68

00:02:58,670 --> 00:02:56,400

safety aspects has to be taken into

69

00:03:02,450 --> 00:02:58,680

account and this is this is what we're

70

00:03:05,540 --> 00:03:02,460

trying to do especially we've seen that

71

00:03:09,170 --> 00:03:05,550

for manual tasks in-flight maintenance

72

00:03:11,870 --> 00:03:09,180

task type of things the user interface

73

00:03:13,820 --> 00:03:11,880

that is provided today for for the

74

00:03:16,340 --> 00:03:13,830

astronauts is not so-called test

75

00:03:19,850 --> 00:03:16,350

transparent enough which means the user

76

00:03:21,740 --> 00:03:19,860

interface often gets in the way while

77

00:03:24,740 --> 00:03:21,750

they are doing our primary tasks say

78

00:03:28,699 --> 00:03:24,750

you're adjusting available or doing a

79

00:03:31,250 --> 00:03:28,709

repair and prepare and activity their

80

00:03:33,410 --> 00:03:31,260

ability to consult the instructions is

81

00:03:37,640 --> 00:03:33,420

hampering them from doing the actual

82

00:03:42,080 --> 00:03:37,650

work that's correct and we also seen

83

00:03:45,590 --> 00:03:42,090

that the operation the actual

84

00:03:47,750 --> 00:03:45,600

instructions for avionics task when you

85

00:03:49,550 --> 00:03:47,760

actually have to attune something deep

86

00:03:52,540 --> 00:03:49,560

down in the system you usually have the

87

00:03:54,860 --> 00:03:52,550

operations content the procedures

88

00:03:57,949 --> 00:03:54,870

separated from the flight software

89

00:04:02,690 --> 00:03:57,959

displays and one of our sub experiments

90

00:04:06,560 --> 00:04:02,700

today is to deter to go towards the

91

00:04:09,320 --> 00:04:06,570

design where we have both operations

92

00:04:12,050 --> 00:04:09,330

instructions and flight software pots in

93

00:04:15,320 --> 00:04:12,060

the same flow in the procedure something

94

00:04:17,780 --> 00:04:15,330

that is not yet available on board we've

95

00:04:20,210 --> 00:04:17,790

noticed that part of this procedure is

96

00:04:22,190 --> 00:04:20,220

to do with the use of voice activation

97

00:04:24,620 --> 00:04:22,200

and there's a piece of hardware that we

98

00:04:28,070 --> 00:04:24,630

saw in the video where the Kevin Ford

99

00:04:30,860 --> 00:04:28,080

was wearing a little headset microphone

100

00:04:32,600 --> 00:04:30,870

which is not brand new technology are

101  
00:04:34,939 --> 00:04:32,610  
you just trying to make better use of

102  
00:04:38,480 --> 00:04:34,949  
what already exists are you trying to

103  
00:04:42,230 --> 00:04:38,490  
develop something new I would say to a

104  
00:04:44,149 --> 00:04:42,240  
large extent it is has been in type of

105  
00:04:46,159 --> 00:04:44,159  
experiments we're spinning in from from

106  
00:04:48,529 --> 00:04:46,169  
the consumer market and what's available

107  
00:04:53,270 --> 00:04:48,539  
for us here down on ground and indeed as

108  
00:04:55,730 --> 00:04:53,280  
you noticed it is it's a felon normal

109  
00:04:59,779 --> 00:04:55,740  
microphone and headset is using their so

110  
00:05:03,020 --> 00:04:59,789  
but but a voice dialogue has not been

111  
00:05:05,029 --> 00:05:03,030  
available for truth before that has been

112  
00:05:07,670 --> 00:05:05,039  
other experiments our NASA colleagues

113  
00:05:09,830 --> 00:05:07,680

have indeed experiment with this but

114

00:05:13,010 --> 00:05:09,840

moving from experiments towards action

115

00:05:16,249 --> 00:05:13,020

or operational interfaces has not yet

116

00:05:18,649 --> 00:05:16,259

taken place and we trying to learn more

117

00:05:20,570 --> 00:05:18,659

about this so we can based on this

118

00:05:24,709 --> 00:05:20,580

experiment we can design systems that

119

00:05:26,749 --> 00:05:24,719

are that this will actually work and I

120

00:05:28,929 --> 00:05:26,759

noticed in some of the paperwork that

121

00:05:32,420 --> 00:05:28,939

one member of your science team is

122

00:05:36,110 --> 00:05:32,430

Italian astronaut paolo nespoli anissa

123

00:05:37,939 --> 00:05:36,120

astronaut has having his point of view a

124

00:05:40,399 --> 00:05:37,949

veteran station crew members point of

125

00:05:44,089 --> 00:05:40,409

view helped you in your in your

126

00:05:47,180 --> 00:05:44,099

development for us yes it's always very

127

00:05:49,969 --> 00:05:47,190

important to have end users involved as

128

00:05:52,100 --> 00:05:49,979

astronauts involved and an Paolo and

129

00:05:53,749 --> 00:05:52,110

also his other colleagues as European

130

00:05:57,439 --> 00:05:53,759

astronaut centers for example Frank

131

00:06:00,829 --> 00:05:57,449

Levin has helped us both in the

132

00:06:03,019 --> 00:06:00,839

development and in the testing so it's

133

00:06:05,390 --> 00:06:03,029

not only for the final test but we need

134

00:06:07,010 --> 00:06:05,400

all stakeholders astronauts and

135

00:06:09,469 --> 00:06:07,020

operations engineers to be involved

136

00:06:12,019 --> 00:06:09,479

throughout development and testing to

137

00:06:14,719 --> 00:06:12,029

get a product that we think can do the

138

00:06:17,240 --> 00:06:14,729

job that we expected to do so how did it

139

00:06:19,369 --> 00:06:17,250

go this morning Kevin Ford was working

140

00:06:21,499 --> 00:06:19,379

with in two sessions on the on the

141

00:06:22,999 --> 00:06:21,509

timeline here with a procedural display

142

00:06:25,939 --> 00:06:23,009

and then with a voice-activated

143

00:06:30,829 --> 00:06:25,949

procedure viewer tell us how today's

144

00:06:32,390 --> 00:06:30,839

work went and I I could only follow it

145

00:06:34,879 --> 00:06:32,400

the same way you did which was the voice

146

00:06:39,350 --> 00:06:34,889

loot and from video and certainly the

147

00:06:40,250 --> 00:06:39,360

paper procedure display look to go very

148

00:06:43,040 --> 00:06:40,260

there

149

00:06:45,260 --> 00:06:43,050

fine we were on time and we had the

150

00:06:47,680 --> 00:06:45,270

whole test completed we will be very

151  
00:06:50,780 --> 00:06:47,690  
interested in seeing the data generated

152  
00:06:53,450 --> 00:06:50,790  
later on it was the voice-activated

153  
00:06:57,050 --> 00:06:53,460  
procedure viewer that we did and that

154  
00:06:58,970 --> 00:06:57,060  
task was selected to be as realistic as

155  
00:07:01,250 --> 00:06:58,980  
possible so this was in an in-flight

156  
00:07:05,120 --> 00:07:01,260  
maintenance task and with in-flight

157  
00:07:08,060 --> 00:07:05,130  
maintenance task comes also say other

158  
00:07:11,960 --> 00:07:08,070  
issues and I think there was one issue

159  
00:07:14,900 --> 00:07:11,970  
with the tools here and that means

160  
00:07:17,650 --> 00:07:14,910  
overall that there was some some time

161  
00:07:21,710 --> 00:07:17,660  
pressure i believe and high workload on

162  
00:07:23,360 --> 00:07:21,720  
Kevin and a in such a situation and this

163  
00:07:27,230 --> 00:07:23,370

is part of what we want to learn about

164

00:07:30,530 --> 00:07:27,240

also it is it is excellent to be able to

165

00:07:33,380 --> 00:07:30,540

do one thing to do user interaction in

166

00:07:36,620 --> 00:07:33,390

more than one way to voice and

167

00:07:41,240 --> 00:07:36,630

point-and-click but it's of course easy

168

00:07:44,180 --> 00:07:41,250

to do the most a the one that you must

169

00:07:45,800 --> 00:07:44,190

use to first so I believe we got we got

170

00:07:49,010 --> 00:07:45,810

some good they were voice commanding in

171

00:07:51,260 --> 00:07:49,020

there but we have a mixture above both

172

00:07:53,390 --> 00:07:51,270

commanding and traditional commanding so

173

00:07:55,520 --> 00:07:53,400

again when we look at the data there

174

00:07:57,200 --> 00:07:55,530

it's both the objective in this

175

00:07:59,810 --> 00:07:57,210

objective data it will be very

176

00:08:02,450 --> 00:07:59,820

interesting to see and I believe that

177

00:08:05,360 --> 00:08:02,460

Chris Hadfield is going to do a similar

178

00:08:09,770 --> 00:08:05,370

type of run for you later on right

179

00:08:11,660 --> 00:08:09,780

that's correct so thereby we we cannot

180

00:08:14,300 --> 00:08:11,670

say of course that we have a full

181

00:08:18,260 --> 00:08:14,310

statistical can do a full statistical

182

00:08:20,300 --> 00:08:18,270

analysis but with two and astronauts

183

00:08:22,880 --> 00:08:20,310

performing our experiment we will have a

184

00:08:24,950 --> 00:08:22,890

much better on the idea that only the

185

00:08:27,680 --> 00:08:24,960

ground-based experiments that we've done

186

00:08:29,660 --> 00:08:27,690

before that we are hopefully we got the

187

00:08:32,320 --> 00:08:29,670

kind of insight we need to design these

188

00:08:35,360 --> 00:08:32,330

systems so what's the next step after

189

00:08:36,860 --> 00:08:35,370

Ford and Hadfield do this you said you

190

00:08:38,930 --> 00:08:36,870

wanted to you need to look at the data

191

00:08:43,520 --> 00:08:38,940

but what will be the next step for you

192

00:08:45,980 --> 00:08:43,530

and your team yeah after analysis I I

193

00:08:47,540 --> 00:08:45,990

think we're heading towards more type of

194

00:08:49,550 --> 00:08:47,550

building block experiments for example

195

00:08:52,830 --> 00:08:49,560

having these so-called procedure you

196

00:08:55,750 --> 00:08:52,840

were on a state-of-the-art

197

00:08:58,270 --> 00:08:55,760

and also adapt its user interface to

198

00:09:00,820 --> 00:08:58,280

something that we're more used to on the

199

00:09:02,800 --> 00:09:00,830

ground this is also in cooperation with

200

00:09:07,750 --> 00:09:02,810

our NASA colleagues and the procedure

201  
00:09:10,150 --> 00:09:07,760  
group there we are also looking at more

202  
00:09:12,730 --> 00:09:10,160  
wearable system so you should not have

203  
00:09:14,980 --> 00:09:12,740  
to be floating back and forth to your

204  
00:09:16,690 --> 00:09:14,990  
laptop for any reason but you should be

205  
00:09:19,600 --> 00:09:16,700  
able to bring bring your equipment with

206  
00:09:21,910 --> 00:09:19,610  
you to your to your workplace and we

207  
00:09:24,820 --> 00:09:21,920  
hope we can test these things in the

208  
00:09:27,070 --> 00:09:24,830  
near future and of course with with

209  
00:09:30,130 --> 00:09:27,080  
voice which is one of the new natural

210  
00:09:32,350 --> 00:09:30,140  
user interfaces we hope we can implement

211  
00:09:34,390 --> 00:09:32,360  
a full dialogue this time we only had

212  
00:09:37,720 --> 00:09:34,400  
full voice dialogue this time we only

213  
00:09:40,210 --> 00:09:37,730

had always commanding but the system

214

00:09:44,020 --> 00:09:40,220

itself was in a sense silent it didn't

215

00:09:47,010 --> 00:09:44,030

really speak back let's see is that the

216

00:09:49,390 --> 00:09:47,020

goal then and in the long run is are you

217

00:09:53,260 --> 00:09:49,400

trying once this is all developed and

218

00:09:55,420 --> 00:09:53,270

implemented are you trying to create a

219

00:09:57,190 --> 00:09:55,430

system where like in science fiction

220

00:10:00,820 --> 00:09:57,200

where people can talk to the computers

221

00:10:03,070 --> 00:10:00,830

and the computers talk back or you could

222

00:10:05,290 --> 00:10:03,080

say Lily you could have that science

223

00:10:07,360 --> 00:10:05,300

fiction picture a friendly hair but of

224

00:10:09,280 --> 00:10:07,370

course it's not only that you can talk

225

00:10:10,990 --> 00:10:09,290

it's also what you're talking about so

226

00:10:15,220 --> 00:10:11,000

it should it should be robust and

227

00:10:19,090 --> 00:10:15,230

resilient a partner or crew assistant

228

00:10:21,370 --> 00:10:19,100

that that can help the crew member the

229

00:10:26,020 --> 00:10:21,380

astronaut and the astronaut team to work

230

00:10:28,450 --> 00:10:26,030

together and share the tasks properly

231

00:10:31,090 --> 00:10:28,460

and give appropriate support depending

232

00:10:33,250 --> 00:10:31,100

on the individual's needs and that is

233

00:10:35,070 --> 00:10:33,260

then we've gone beyond building blocks

234

00:10:38,310 --> 00:10:35,080

and actually we'll build a system

235

00:10:41,110 --> 00:10:38,320

hopefully we have a chance to do some of

236

00:10:44,590 --> 00:10:41,120

testing for this kind of system to

237

00:10:48,090 --> 00:10:44,600

support more autonomous operations when

238

00:10:52,060 --> 00:10:48,100

ISS can be used as an analog foreign

239

00:10:53,590 --> 00:10:52,070

mission beyond low-earth orbit sounds

240

00:10:55,480 --> 00:10:53,600

great and actually I was thinking more

241

00:10:57,130 --> 00:10:55,490

of a talking to the star trek computer

242

00:11:00,640 --> 00:10:57,140

rather than how but it's the same time

243

00:11:03,490 --> 00:11:00,650

separately in principle it should work

244

00:11:05,110 --> 00:11:03,500

that to Michael I appreciate your taking

245

00:11:05,740 --> 00:11:05,120

the time to bring us up to speed on this

246

00:11:08,110 --> 00:11:05,750

its variant

247

00:11:10,570 --> 00:11:08,120

sting thank you thank you very much

248

00:11:12,790 --> 00:11:10,580

flooding able to come on like a wolf is

249

00:11:15,010 --> 00:11:12,800

a senior software engineer with the