
NASA
801
N801NA

1
00:01:32,200 --> 00:01:29,550
[Music]

2
00:01:34,569 --> 00:01:32,210
hello I'm Samson Rainey with NASA's

3
00:01:37,510 --> 00:01:34,579
earth science news team and welcome to

4
00:01:39,429 --> 00:01:37,520
hangar 703 and NASA's Armstrong Flight

5
00:01:40,419 --> 00:01:39,439
Research Center in sunny Palmdale

6
00:01:42,520 --> 00:01:40,429
California

7
00:01:44,949 --> 00:01:42,530
you know in its time NASA has

8
00:01:46,510 --> 00:01:44,959
accomplished really big things such as

9
00:01:49,899 --> 00:01:46,520
sending humans to the moon

10
00:01:51,819 --> 00:01:49,909
putting Rovers on Mars and see looking

11
00:01:54,029 --> 00:01:51,829
out into the deep recesses of the

12
00:01:57,130 --> 00:01:54,039
universe well this is another big

13
00:01:59,020 --> 00:01:57,140

accomplishment that hits really close to

14
00:02:01,240 --> 00:01:59,030
home and that's NASA's fleet of Earth

15
00:02:03,550 --> 00:02:01,250
orbiting satellites for decades

16
00:02:05,979 --> 00:02:03,560
scientists have used these satellites as

17
00:02:08,889 --> 00:02:05,989
their eyes to observe how our planet is

18
00:02:13,050 --> 00:02:08,899
changing from weather and climate across

19
00:02:15,670 --> 00:02:13,060
the globe to fires or oceans forests

20
00:02:18,339 --> 00:02:15,680
agriculture even the air that we breathe

21
00:02:20,619 --> 00:02:18,349
but sometimes we need to take a closer

22
00:02:22,599 --> 00:02:20,629
look to get a better understanding of

23
00:02:24,610 --> 00:02:22,609
how our planets working and that is the

24
00:02:27,550 --> 00:02:24,620
purpose of NASA's earth science field

25
00:02:30,069 --> 00:02:27,560
campaigns under NASA support scientists

26
00:02:32,379 --> 00:02:30,079
get up close and personal with their

27
00:02:34,390 --> 00:02:32,389
subject matter making observations and

28
00:02:36,160 --> 00:02:34,400
gathering measurements in order to

29
00:02:38,680 --> 00:02:36,170
unlock new understanding of how our

30
00:02:40,539 --> 00:02:38,690
world works today we are giving you a

31
00:02:42,759 --> 00:02:40,549
taste of five new or airborne campaigns

32
00:02:45,580 --> 00:02:42,769
headed into the field this year with

33
00:02:47,830 --> 00:02:45,590
NASA aircraft in tow competitively

34
00:02:49,750 --> 00:02:47,840
selected these multi-year funded

35
00:02:51,819 --> 00:02:49,760
campaigns called earth ventures

36
00:02:53,170 --> 00:02:51,829
suborbital missions were chosen for

37
00:02:54,729 --> 00:02:53,180
their potential to not only better

38
00:02:57,099 --> 00:02:54,739

understand the current state of our

39
00:02:59,349 --> 00:02:57,109
world but also to predict change and

40
00:03:00,970 --> 00:02:59,359
this year's class is all American that's

41
00:03:03,580 --> 00:03:00,980
right all the campaigns are based out of

42
00:03:05,289 --> 00:03:03,590
the continental United States so without

43
00:03:08,080 --> 00:03:05,299
further ado let's preview those five

44
00:03:11,440 --> 00:03:08,090
campaigns starting from the west coast

45
00:03:13,780 --> 00:03:11,450
out of NASA Ames in Silicon Valley the

46
00:03:16,509 --> 00:03:13,790
sub meso scale ocean dynamics experiment

47
00:03:18,550 --> 00:03:16,519
or s mode is deploying airplanes a ship

48
00:03:20,650 --> 00:03:18,560
and a fleet of autonomous platforms 200

49
00:03:22,180 --> 00:03:20,660
miles off the coast of San Francisco so

50
00:03:23,589 --> 00:03:22,190
study how swirling currents of water

51
00:03:25,150 --> 00:03:23,599
called eddies play a role in the

52
00:03:28,330 --> 00:03:25,160
exchange of heat between ocean and

53
00:03:30,159 --> 00:03:28,340
atmosphere from Salina Kansas dynamics

54
00:03:33,009 --> 00:03:30,169
and chemistry of the summer stratosphere

55
00:03:35,110 --> 00:03:33,019
or D cards will fly high with NASA's er2

56
00:03:36,819 --> 00:03:35,120
aircraft to investigate how strong

57
00:03:39,340 --> 00:03:36,829
summertime storms that punch into the

58
00:03:40,449 --> 00:03:39,350
stratosphere changes chemistry including

59
00:03:42,819 --> 00:03:40,459
ozone

60
00:03:45,190 --> 00:03:42,829
flying out of New Orleans and NASA's

61
00:03:47,349 --> 00:03:45,200
Johnson Space Center NASA aircraft will

62
00:03:49,599 --> 00:03:47,359
join researchers on boat for the Delta X

63
00:03:51,369 --> 00:03:49,609

mission to observe the interactions

64
00:03:53,470 --> 00:03:51,379
between water and sediment in the

65
00:03:55,270 --> 00:03:53,480
Mississippi River Delta to get a better

66
00:03:57,640 --> 00:03:55,280
handle on why some parts of the Delta

67
00:03:59,199 --> 00:03:57,650
are disappearing and others are not from

68
00:04:03,250 --> 00:03:59,209
Langley's Research Center in Hampton

69
00:04:05,140 --> 00:04:03,260
Virginia NASA aircraft with the aerosol

70
00:04:07,030 --> 00:04:05,150
cloud meteorology interactions over the

71
00:04:09,009 --> 00:04:07,040
western Atlantic experiment were

72
00:04:10,959 --> 00:04:09,019
activated while maneuver in and around

73
00:04:13,030 --> 00:04:10,969
clouds to identify how tiny particles

74
00:04:15,159 --> 00:04:13,040
called aerosols interact with them and

75
00:04:16,990 --> 00:04:15,169
influenced weathering climate and lastly

76
00:04:18,969 --> 00:04:17,000
as part of the investigation of micro

77
00:04:21,520 --> 00:04:18,979
physics and precipitation for Atlantic

78
00:04:24,129 --> 00:04:21,530
coast threatening snow storms or impacts

79
00:04:25,719 --> 00:04:24,139
aircraft based out of Lance's Wallops

80
00:04:28,089 --> 00:04:25,729
Flight Facility on Virginia's Eastern

81
00:04:30,460 --> 00:04:28,099
Shore will fly head-on into snow storms

82
00:04:32,740 --> 00:04:30,470
to investigate how the most intense

83
00:04:34,779 --> 00:04:32,750
snowfall is formed in order to improve

84
00:04:39,879 --> 00:04:34,789
observations from space and ultimately

85
00:04:42,610 --> 00:04:39,889
improve weather forecasts and with

86
00:04:45,010 --> 00:04:42,620
winter upon us across much of the

87
00:04:46,830 --> 00:04:45,020
country we think that impacts is

88
00:04:49,960 --> 00:04:46,840

probably the best place to start and

89
00:04:53,439 --> 00:04:49,970
welcoming on to the stage is Lynn

90
00:04:55,180 --> 00:04:53,449
McMurray who is the lead scientist for

91
00:04:56,439 --> 00:04:55,190
impact she's also an atmospheric

92
00:04:58,420 --> 00:04:56,449
scientist of the University of

93
00:05:01,390 --> 00:04:58,430
Washington thanks for joining us then

94
00:05:03,370 --> 00:05:01,400
it's great to be here so we're looking

95
00:05:06,520 --> 00:05:03,380
at unraveling the mysteries of these

96
00:05:08,200 --> 00:05:06,530
bands of snow in clouds could you tell

97
00:05:10,120 --> 00:05:08,210
us a little bit more about that and how

98
00:05:13,360 --> 00:05:10,130
you're going about it sure I'd be happy

99
00:05:15,850 --> 00:05:13,370
to so as you know snowstorms are fairly

100
00:05:17,790 --> 00:05:15,860
large and the cloud systems with them

101
00:05:20,110 --> 00:05:17,800
spanned hundreds and hundreds of miles

102
00:05:22,749 --> 00:05:20,120
but what's really interesting is the

103
00:05:25,360 --> 00:05:22,759
snowfall within these large areas of

104
00:05:28,810 --> 00:05:25,370
clouds are not evenly distributed

105
00:05:31,570 --> 00:05:28,820
they are often organized in narrow bands

106
00:05:33,310 --> 00:05:31,580
of snow high snowfall amounts and this

107
00:05:36,249 --> 00:05:33,320
is what we're trying to investigate is

108
00:05:38,950 --> 00:05:36,259
the processes that contribute to this

109
00:05:41,080 --> 00:05:38,960
banded structure and how it varies from

110
00:05:43,180 --> 00:05:41,090
Storm to storm some storms don't have

111
00:05:46,240 --> 00:05:43,190
the bands and others do have a lot of

112
00:05:49,300 --> 00:05:46,250
them and we are studying this on

113
00:05:52,120 --> 00:05:49,310

multiple scales from the larger scale

114
00:05:53,410 --> 00:05:52,130
down to the micro physical scale the

115
00:05:56,320 --> 00:05:53,420
scale of the snow

116
00:05:58,840 --> 00:05:56,330
Krystal's themselves and they very lots

117
00:06:01,660 --> 00:05:58,850
they vary in shape and size and amount

118
00:06:04,900 --> 00:06:01,670
and the snow crystals are one of the key

119
00:06:07,030 --> 00:06:04,910
features that we are studying in in the

120
00:06:08,590 --> 00:06:07,040
impacts well and my understanding is

121
00:06:11,110 --> 00:06:08,600
you're the first champion up this year

122
00:06:13,720 --> 00:06:11,120
so you're heading out next week I am

123
00:06:15,820 --> 00:06:13,730
heading out next week yes we are the

124
00:06:18,610 --> 00:06:15,830
first campaign to start actually in two

125
00:06:20,890 --> 00:06:18,620
days I leave for Wallops we are going to

126
00:06:24,910 --> 00:06:20,900
be flying an aircraft that you will be

127
00:06:26,620 --> 00:06:24,920
seeing later on today the ER - it's

128
00:06:29,140 --> 00:06:26,630
already equipped with all the

129
00:06:32,350 --> 00:06:29,150
instruments that I need for my campaign

130
00:06:35,440 --> 00:06:32,360
the r2 is going to be flying high above

131
00:06:38,530 --> 00:06:35,450
the snowstorms themselves at altitude

132
00:06:40,960 --> 00:06:38,540
about 68,000 feet or 20 kilometers

133
00:06:43,180 --> 00:06:40,970
it'll be equipped with remote sensing

134
00:06:45,460 --> 00:06:43,190
instruments that are the same as what we

135
00:06:48,310 --> 00:06:45,470
have on satellites both radars and

136
00:06:51,040 --> 00:06:48,320
what's called radiometers and below that

137
00:06:54,280 --> 00:06:51,050
in coordination with the ER - we will

138
00:06:56,740 --> 00:06:54,290

fly what's called the p3 aircraft and it

139
00:06:59,290 --> 00:06:56,750
gets lucky it gets to fly in the snow

140
00:07:01,000 --> 00:06:59,300
clouds themselves it kind of bumpy

141
00:07:03,580 --> 00:07:01,010
sometimes because it's very turbulent

142
00:07:05,760 --> 00:07:03,590
but they have acquitted it's it's

143
00:07:09,760 --> 00:07:05,770
equipped with instruments that measure

144
00:07:12,250 --> 00:07:09,770
the snow crystals that I talked about

145
00:07:14,830 --> 00:07:12,260
and also the environment in which the

146
00:07:17,920 --> 00:07:14,840
snow crystals form so the environmental

147
00:07:20,560 --> 00:07:17,930
conditions and we'll also do what's

148
00:07:25,240 --> 00:07:20,570
called a dropsonde and measure the probe

149
00:07:26,680 --> 00:07:25,250
temperature V and the wind so the point

150
00:07:28,690 --> 00:07:26,690
of the two aircraft again so that you

151
00:07:30,130 --> 00:07:28,700
need one that's going through the the

152
00:07:33,730 --> 00:07:30,140
snow bands and the other one will be

153
00:07:35,860 --> 00:07:33,740
above the snow right so we need the

154
00:07:39,820 --> 00:07:35,870
coordination to help us to understand

155
00:07:43,210 --> 00:07:39,830
how one measures from space so the er-2

156
00:07:44,800 --> 00:07:43,220
is simulating the satellite and so we

157
00:07:46,780 --> 00:07:44,810
take measurements just like a satellite

158
00:07:48,790 --> 00:07:46,790
would but then we measure inside the

159
00:07:51,280 --> 00:07:48,800
snow bands themselves so we can relate

160
00:07:54,040 --> 00:07:51,290
what's going on in the clouds to what is

161
00:07:55,900 --> 00:07:54,050
being seen above by the satellite cool

162
00:07:57,550 --> 00:07:55,910
well I think that anyone who's lived

163
00:08:00,640 --> 00:07:57,560

through a snowy winter can appreciate

164
00:08:03,190 --> 00:08:00,650
any effort to improve our snow forecast

165
00:08:04,750 --> 00:08:03,200
well I'll let you in your own words why

166
00:08:06,940 --> 00:08:04,760
is this such important it's so important

167
00:08:08,440 --> 00:08:06,950
well I'm kind of on those be

168
00:08:10,750 --> 00:08:08,450
who would think snowstorms are beautiful

169
00:08:13,120 --> 00:08:10,760
sand they are the snow is a beautiful

170
00:08:15,220 --> 00:08:13,130
thing to see and that sees trees covered

171
00:08:17,340 --> 00:08:15,230
with snow but we all know it's also

172
00:08:20,380 --> 00:08:17,350
hazardous especially hazardous for

173
00:08:22,140 --> 00:08:20,390
transportation and public safety so it's

174
00:08:24,610 --> 00:08:22,150
very important to be able to forecast

175
00:08:26,830 --> 00:08:24,620
the amounts of snowfall and that's

176
00:08:28,720 --> 00:08:26,840
what's really variable in these storms

177
00:08:30,700 --> 00:08:28,730
we can't do that very well we need to

178
00:08:33,370 --> 00:08:30,710
improve that and then measurements we

179
00:08:35,620 --> 00:08:33,380
make and impacts will help us improve

180
00:08:37,990 --> 00:08:35,630
those forecasts it'll also help us

181
00:08:40,480 --> 00:08:38,000
improve how we measure from space so

182
00:08:42,040 --> 00:08:40,490
that we can monitor storms all around

183
00:08:44,560 --> 00:08:42,050
the world especially places that don't

184
00:08:46,270 --> 00:08:44,570
have information and real quickly and so

185
00:08:47,740 --> 00:08:46,280
what's the motivating factor for you man

186
00:08:49,630 --> 00:08:47,750
you have your snow earrings if there's

187
00:08:52,360 --> 00:08:49,640
snow socks you're a big fan of the

188
00:08:55,450 --> 00:08:52,370

weather I see I am totally a big fan of

189
00:08:56,920 --> 00:08:55,460
Heather Ivan I've been watching the

190
00:08:59,770 --> 00:08:56,930
weather ever since I was really little I

191
00:09:02,380 --> 00:08:59,780
do a lot of activities and in order to

192
00:09:05,020 --> 00:09:02,390
know when and where to ride your bike or

193
00:09:07,390 --> 00:09:05,030
go hiking I need to do that and so it's

194
00:09:09,850 --> 00:09:07,400
really exciting scientists and be able

195
00:09:12,220 --> 00:09:09,860
to study these snow storms and learn the

196
00:09:13,870 --> 00:09:12,230
details of the inside the storms well

197
00:09:15,670 --> 00:09:13,880
thanks so much for joining us Lyn it's

198
00:09:17,500 --> 00:09:15,680
been a pleasure to be here thank you so

199
00:09:20,320 --> 00:09:17,510
much of course so we caught up with my

200
00:09:21,790 --> 00:09:20,330
colleague Chelsea BRT who actually went

201
00:09:23,380 --> 00:09:21,800
to visit your teammates there as they

202
00:09:25,690 --> 00:09:23,390
prep for this flight happening next week

203
00:09:27,220 --> 00:09:25,700
and she's gonna show us what it's like

204
00:09:32,440 --> 00:09:27,230
to find one of these NASA science

205
00:09:33,550 --> 00:09:32,450
aircraft Chelsea thanks Sampson we're

206
00:09:36,130 --> 00:09:33,560
here at NASA's Wallops Flight Facility

207
00:09:37,960 --> 00:09:36,140
on the Eastern Shore of Virginia home to

208
00:09:40,240 --> 00:09:37,970
the p3 beef the aircraft that you see

209
00:09:42,070 --> 00:09:40,250
here behind me this research aircraft as

210
00:09:43,780 --> 00:09:42,080
well as NASA's er2 are gonna be

211
00:09:45,760 --> 00:09:43,790
collecting data from the skies as early

212
00:09:47,500 --> 00:09:45,770
as next week let's go meet up with

213
00:09:49,660 --> 00:09:47,510

deputy principal investigator for the

214
00:09:50,980 --> 00:09:49,670
impacts mission dr. John York's who's

215
00:09:56,200 --> 00:09:50,990
going to tell us a little bit more about

216
00:09:58,420 --> 00:09:56,210
the instruments onboard let's go okay so

217
00:09:59,770 --> 00:09:58,430
we're here inside the p3 aircraft

218
00:10:02,110 --> 00:09:59,780
I'm here with dr. John York's how you

219
00:10:04,330 --> 00:10:02,120
doing today good hi Lynn and everyone at

220
00:10:06,040 --> 00:10:04,340
NASA Armstrong so this research aircraft

221
00:10:07,660 --> 00:10:06,050
is totally outfitted with a bunch of

222
00:10:10,990 --> 00:10:07,670
scientific gear what do we have onboard

223
00:10:13,090 --> 00:10:11,000
today so impacts uses cloud probes on

224
00:10:15,970 --> 00:10:13,100
the wings of the p3 and these cloud

225
00:10:18,760 --> 00:10:15,980
probes take high-resolution images of

226
00:10:20,380 --> 00:10:18,770
ice and snow particles and we then use

227
00:10:21,910 --> 00:10:20,390
those images to determine the size

228
00:10:24,730 --> 00:10:21,920
shape and other properties of the

229
00:10:28,030 --> 00:10:24,740
particles that data is then transmitted

230
00:10:30,670 --> 00:10:28,040
inside the airplane to computers where

231
00:10:33,819 --> 00:10:30,680
scientists sit and monitor the data and

232
00:10:37,509 --> 00:10:33,829
the instruments another important

233
00:10:40,540 --> 00:10:37,519
instrument if we follow us is the drop

234
00:10:44,710 --> 00:10:40,550
song now the drop sound is a 12 inch

235
00:10:47,199 --> 00:10:44,720
tube kind of similar to the tube in a

236
00:10:50,079 --> 00:10:47,209
paper towel roll and it has sensors

237
00:10:52,660 --> 00:10:50,089
inside and a small parachute at the top

238
00:10:55,900 --> 00:10:52,670

and we have an instrument back here if

239
00:10:58,569 --> 00:10:55,910
you follow us that actually acts a lot

240
00:11:01,420 --> 00:10:58,579
like a t-shirt cannon and we'll shoot

241
00:11:04,660 --> 00:11:01,430
these drops ons out into the atmosphere

242
00:11:06,699 --> 00:11:04,670
where they fall through the sky about 25

243
00:11:10,660 --> 00:11:06,709
miles an hour and measure temperature

244
00:11:13,180 --> 00:11:10,670
humidity and wind speed and all this

245
00:11:16,569 --> 00:11:13,190
data is important for determining the

246
00:11:17,920 --> 00:11:16,579
structure of snow bands so it seems to

247
00:11:20,110 --> 00:11:17,930
me like snowstorms are pretty difficult

248
00:11:21,970 --> 00:11:20,120
to predict how will this data from the

249
00:11:23,860 --> 00:11:21,980
impacts measure and help us understand

250
00:11:27,100 --> 00:11:23,870
them more so we're gonna combine the

251
00:11:29,230 --> 00:11:27,110
data from both the er-2 and the p3 and

252
00:11:33,970 --> 00:11:29,240
when we combine all that data we'll be

253
00:11:36,990 --> 00:11:33,980
able to improve the measurements from

254
00:11:40,449 --> 00:11:37,000
space of precipitation and also the

255
00:11:43,329 --> 00:11:40,459
model predictions of snowfall very cool

256
00:11:45,370 --> 00:11:43,339
thank you so it seems like our science

257
00:11:47,319 --> 00:11:45,380
teams are ready our instrument teams are

258
00:11:49,150 --> 00:11:47,329
ready there's one more person we have to

259
00:11:51,790 --> 00:11:49,160
talk to before we get this mission off

260
00:11:53,439 --> 00:11:51,800
the ground and that is our NASA pilot so

261
00:11:55,150 --> 00:11:53,449
joining us here today is an SAP eyelet

262
00:11:57,400 --> 00:11:55,160
John Baker ah John thanks for being with

263
00:11:59,199 --> 00:11:57,410

us so what is it going to be like flying

264
00:12:00,670 --> 00:11:59,209
through these snowstorms well it

265
00:12:01,509 --> 00:12:00,680
shouldn't be too different than driving

266
00:12:03,819 --> 00:12:01,519
through a snowstorm

267
00:12:06,460 --> 00:12:03,829
now generally pilots like to avoid

268
00:12:08,560 --> 00:12:06,470
things like turbulence convective

269
00:12:09,939 --> 00:12:08,570
activity in icing and the winter storm

270
00:12:11,889 --> 00:12:09,949
is we won't have the convective activity

271
00:12:13,240 --> 00:12:11,899
typically see in the summer storm so we

272
00:12:14,920 --> 00:12:13,250
don't usually have to worry about the

273
00:12:17,319 --> 00:12:14,930
lightning and hail like we would in the

274
00:12:18,730 --> 00:12:17,329
summer but there will be turbulence

275
00:12:21,130 --> 00:12:18,740
there will be winds and there will be

276
00:12:22,449 --> 00:12:21,140
icing conditions the good news is the p3

277
00:12:25,329 --> 00:12:22,459
aircraft that will be flying is very

278
00:12:27,790 --> 00:12:25,339
very robust any icing and de-icing

279
00:12:30,010 --> 00:12:27,800
systems our engines our wings and our

280
00:12:31,900 --> 00:12:30,020
empanadas will be protected so we should

281
00:12:33,060 --> 00:12:31,910
be pretty good in most cases it just

282
00:12:35,120 --> 00:12:33,070
keep an eye out and

283
00:12:37,710 --> 00:12:35,130
make sure we stay out of the worst areas

284
00:12:39,569 --> 00:12:37,720
so it seems like flying conditions while

285
00:12:41,430 --> 00:12:39,579
difficult may be okay for the pilots

286
00:12:43,860 --> 00:12:41,440
what about the passengers on board how

287
00:12:45,210 --> 00:12:43,870
will it feel taking this flight compared

288
00:12:46,500 --> 00:12:45,220

to a commercial flight that folks at

289
00:12:48,300 --> 00:12:46,510
home may have taken during the holidays

290
00:12:49,829 --> 00:12:48,310
it shouldn't be too different there

291
00:12:51,420 --> 00:12:49,839
might be some areas that were asked to

292
00:12:53,189 --> 00:12:51,430
fly in that are a little more turbulent

293
00:12:55,050 --> 00:12:53,199
than they would experience in a regular

294
00:12:56,699 --> 00:12:55,060
flight but overall it should be in

295
00:12:58,019 --> 00:12:56,709
pretty good shape just a good seat belt

296
00:12:59,430 --> 00:12:58,029
and not walking around when they

297
00:13:03,030 --> 00:12:59,440
shouldn't be in they should be okay

298
00:13:06,300 --> 00:13:03,040
sounds good so I have to ask I'm curious

299
00:13:08,430 --> 00:13:06,310
this is the coolest job in the world how

300
00:13:11,189 --> 00:13:08,440
does one become a NASA pilot it is a

301
00:13:12,750 --> 00:13:11,199
pretty cool job in general most people

302
00:13:14,280 --> 00:13:12,760
get their backgrounds from the military

303
00:13:16,019 --> 00:13:14,290
and that's because we fly a lot of

304
00:13:18,960 --> 00:13:16,029
different aircrafts here here Wallops

305
00:13:20,639 --> 00:13:18,970
and some of the other centers and and we

306
00:13:22,590 --> 00:13:20,649
flying conditions that most people avoid

307
00:13:24,030 --> 00:13:22,600
so they're looking for people that have

308
00:13:26,819 --> 00:13:24,040
a lot of experience and can kind of

309
00:13:28,500 --> 00:13:26,829
handle a wide range of flight conditions

310
00:13:30,540 --> 00:13:28,510
and you're usually going to find that in

311
00:13:32,430 --> 00:13:30,550
the military great well thank you for

312
00:13:34,199 --> 00:13:32,440
joining us here today from all of us

313
00:13:36,389 --> 00:13:34,209

here at Wallops happy flying and best of

314
00:13:40,230 --> 00:13:36,399
luck during your mission Sampson back to

315
00:13:41,490 --> 00:13:40,240
you great thanks so much Chelsea so

316
00:13:43,439 --> 00:13:41,500
we're moving on from East Coast

317
00:13:45,360 --> 00:13:43,449
snowstorms to intense

318
00:13:47,879 --> 00:13:45,370
summertime storms that breach the

319
00:13:50,460 --> 00:13:47,889
stratosphere in the Midwest joining us

320
00:13:53,370 --> 00:13:50,470
right now is Ken Bowman atmospheric

321
00:13:55,860 --> 00:13:53,380
scientists at Texas A&M who's also lead

322
00:13:57,509 --> 00:13:55,870
scientists for D cots or dynamics and

323
00:13:59,910 --> 00:13:57,519
chemistry of the summer stratosphere

324
00:14:01,949 --> 00:13:59,920
can't thanks so much for joining us good

325
00:14:03,090 --> 00:14:01,959
morning Sampson it's great to be here so

326
00:14:04,559 --> 00:14:03,100
I think it's interesting that most

327
00:14:06,780 --> 00:14:04,569
people find it surprising that while

328
00:14:08,850 --> 00:14:06,790
most of our weather actually happens in

329
00:14:10,650 --> 00:14:08,860
the troposphere every now and then with

330
00:14:13,050 --> 00:14:10,660
these really strong storms that kind of

331
00:14:14,370 --> 00:14:13,060
reach the stratosphere and we're not

332
00:14:16,920 --> 00:14:14,380
quite sure what's going on there do you

333
00:14:20,220 --> 00:14:16,930
want to talk about the background on

334
00:14:22,410 --> 00:14:20,230
that and I plan on investigating sure so

335
00:14:24,090 --> 00:14:22,420
as you said most of the Earth's weather

336
00:14:25,379 --> 00:14:24,100
happens in the lowest layer in the

337
00:14:28,410 --> 00:14:25,389
atmosphere which is called the

338
00:14:31,259 --> 00:14:28,420

troposphere and above that is the

339
00:14:34,079 --> 00:14:31,269
stratosphere which is very stable and

340
00:14:37,170 --> 00:14:34,089
very dry and it also contains the

341
00:14:39,960 --> 00:14:37,180
Earth's ozone layer which protects the

342
00:14:40,770 --> 00:14:39,970
earth from dangerous solar radiation

343
00:14:43,530 --> 00:14:40,780
from the Sun

344
00:14:46,470 --> 00:14:43,540
but some storms are actually intense

345
00:14:48,240 --> 00:14:46,480
enough that they overshoot the the top

346
00:14:51,690 --> 00:14:48,250
of the troposphere into the lower

347
00:14:54,930 --> 00:14:51,700
stratosphere and they carry water and

348
00:14:58,740 --> 00:14:54,940
pollutants and particles and things into

349
00:15:00,750 --> 00:14:58,750
the into the stratosphere so I'm

350
00:15:03,750 --> 00:15:00,760
guessing you need specialized aircraft

351
00:15:05,940 --> 00:15:03,760
to get that high of regen yes so just

352
00:15:08,760 --> 00:15:05,950
like impacts we're going to be using the

353
00:15:11,850 --> 00:15:08,770
NASA a are too high altitude research

354
00:15:13,740 --> 00:15:11,860
aircraft it's it's really a unique

355
00:15:15,470 --> 00:15:13,750
platform for making the kind of

356
00:15:18,270 --> 00:15:15,480
measurements that we need to do and

357
00:15:20,990 --> 00:15:18,280
unlike impacts which is using remote

358
00:15:24,390 --> 00:15:21,000
sensing instruments for our project

359
00:15:26,220 --> 00:15:24,400
we'll the er-2 will be carrying 12

360
00:15:29,910 --> 00:15:26,230
different instruments to measure

361
00:15:33,900 --> 00:15:29,920
atmospheric gases and particles and

362
00:15:36,420 --> 00:15:33,910
meteorological parameters and our the

363
00:15:39,030 --> 00:15:36,430

plan of the project is to fly the

364
00:15:42,000 --> 00:15:39,040
aircraft through the outflow from these

365
00:15:45,150 --> 00:15:42,010
storms in the lower stratosphere the big

366
00:15:48,840 --> 00:15:45,160
question is why why is this a pressing

367
00:15:50,370 --> 00:15:48,850
science question so the stratosphere is

368
00:15:52,770 --> 00:15:50,380
actually quite important for the Earth's

369
00:15:55,910 --> 00:15:52,780
climate and of course it contains the

370
00:15:57,900 --> 00:15:55,920
ozone layer which is vulnerable to

371
00:16:00,120 --> 00:15:57,910
students when they get up into the

372
00:16:03,030 --> 00:16:00,130
stratosphere so we're going to be

373
00:16:04,680 --> 00:16:03,040
studying the summertime stratosphere

374
00:16:08,850 --> 00:16:04,690
there are a lot of things we don't know

375
00:16:10,860 --> 00:16:08,860
about the the composition and the

376
00:16:13,950 --> 00:16:10,870
radiation and the dynamics of the lower

377
00:16:16,160 --> 00:16:13,960
stratosphere and the main goal is to

378
00:16:19,500 --> 00:16:16,170
make sure we understand how the

379
00:16:22,350 --> 00:16:19,510
stratosphere works now so that as the

380
00:16:24,450 --> 00:16:22,360
climate changes and the composition of

381
00:16:27,329 --> 00:16:24,460
the atmosphere continues to change we'll

382
00:16:29,460 --> 00:16:27,339
be able to predict and better understand

383
00:16:32,880 --> 00:16:29,470
how the stratosphere might change in the

384
00:16:35,160 --> 00:16:32,890
future and so basically I know that a

385
00:16:36,960 --> 00:16:35,170
lot of campaigns scientists have some

386
00:16:39,870 --> 00:16:36,970
sort of idea of what we expect to find

387
00:16:41,520 --> 00:16:39,880
is this a case where it's a real

388
00:16:43,290 --> 00:16:41,530

discovery mission you're not sure

389
00:16:45,030 --> 00:16:43,300
exactly what's gonna happen you're just

390
00:16:47,070 --> 00:16:45,040
this is very novel results coming

391
00:16:49,230 --> 00:16:47,080
forward yeah this is the first mission

392
00:16:50,820 --> 00:16:49,240
that's really been designed specifically

393
00:16:53,130 --> 00:16:50,830
to look at these overshooting

394
00:16:53,580 --> 00:16:53,140
thunderstorms and what they put into the

395
00:16:56,580 --> 00:16:53,590
lower

396
00:16:59,070 --> 00:16:56,590
stratosphere so we've seen glimpses of

397
00:17:00,570 --> 00:16:59,080
this on previous missions that happen to

398
00:17:03,570 --> 00:17:00,580
fly through the outflow from these

399
00:17:06,210 --> 00:17:03,580
storms but we expect to be targeting

400
00:17:09,510 --> 00:17:06,220
these on almost a daily basis as they

401
00:17:11,550 --> 00:17:09,520
they happen over the central us well so

402
00:17:12,600 --> 00:17:11,560
Ken what you personally to this size and

403
00:17:14,340 --> 00:17:12,610
you could have picked anywhere in the

404
00:17:17,610 --> 00:17:14,350
atoms for the study but your focus on

405
00:17:19,260 --> 00:17:17,620
this area why is that so we're doing a

406
00:17:21,840 --> 00:17:19,270
lot of different things indeed cots

407
00:17:24,420 --> 00:17:21,850
ranging from chemistry to aerosol

408
00:17:27,330 --> 00:17:24,430
physics to small scale dynamics to

409
00:17:29,430 --> 00:17:27,340
global scale dynamics but my personal

410
00:17:32,940 --> 00:17:29,440
interest in the project is really an

411
00:17:35,700 --> 00:17:32,950
atmospheric transport and mixing and so

412
00:17:37,530 --> 00:17:35,710
if you've ever stirred cream into a

413
00:17:39,510 --> 00:17:37,540

coffee cup and you've looked at the the

414
00:17:42,240 --> 00:17:39,520
beautiful patterns that you get as it

415
00:17:43,890 --> 00:17:42,250
mixes into the coffee the same thing

416
00:17:45,900 --> 00:17:43,900
actually happens in the atmosphere but

417
00:17:48,300 --> 00:17:45,910
at scales that are a million times

418
00:17:50,400 --> 00:17:48,310
larger so these storms inject material

419
00:17:52,380 --> 00:17:50,410
and and I'm really interested in how

420
00:17:54,420 --> 00:17:52,390
that gets mixed and distributed all the

421
00:17:56,340 --> 00:17:54,430
way around the globe cool well that

422
00:17:58,680 --> 00:17:56,350
sounds very interesting as well well

423
00:18:01,140 --> 00:17:58,690
thank you so much Ken sure thanks I'm

424
00:18:04,140 --> 00:18:01,150
pretty lucky today because joining us in

425
00:18:07,260 --> 00:18:04,150
the hangar is one of her NASA pilots

426
00:18:09,360 --> 00:18:07,270
Dean Gucci Neely who's going to give us

427
00:18:11,340 --> 00:18:09,370
some insights into what it's like to fly

428
00:18:14,930 --> 00:18:11,350
in that rarefied space on the year or

429
00:18:16,980 --> 00:18:14,940
two Dean take it away good morning

430
00:18:18,900 --> 00:18:16,990
thanks everybody for coming out today

431
00:18:21,300 --> 00:18:18,910
and as you just heard from a few of the

432
00:18:23,040 --> 00:18:21,310
principal investigators and the science

433
00:18:26,610 --> 00:18:23,050
teams on some of the campaign's that we

434
00:18:29,040 --> 00:18:26,620
have coming up at NASA the aircraft you

435
00:18:31,500 --> 00:18:29,050
see behind me is the er-2 and that

436
00:18:33,480 --> 00:18:31,510
becomes the instrument of choice as far

437
00:18:35,520 --> 00:18:33,490
as a platform they can Terry carry a

438
00:18:37,290 --> 00:18:35,530

large package of instruments from

439
00:18:40,080 --> 00:18:37,300
multiple teams that want to look down

440
00:18:43,260 --> 00:18:40,090
through the atmosphere from the top down

441
00:18:44,460 --> 00:18:43,270
it's still the highest man air-breathing

442
00:18:46,560 --> 00:18:44,470
aircraft in the world

443
00:18:48,930 --> 00:18:46,570
there's five of us at NASA that fly this

444
00:18:51,540 --> 00:18:48,940
aircraft behind me and what we're going

445
00:18:54,210 --> 00:18:51,550
to do to support this is take this up in

446
00:18:56,070 --> 00:18:54,220
a single-seat cockpit wearing this

447
00:18:58,380 --> 00:18:56,080
uniform as you see which I'll explain a

448
00:19:00,750 --> 00:18:58,390
little bit more why in a minute but the

449
00:19:02,220 --> 00:19:00,760
idea is that we can take the package of

450
00:19:04,320 --> 00:19:02,230
instruments that are actually installed

451
00:19:06,790 --> 00:19:04,330
on the aircraft behind me up above

452
00:19:08,650 --> 00:19:06,800
nearly all of yours atmosphere

453
00:19:10,300 --> 00:19:08,660
and look all the way down through it

454
00:19:12,400 --> 00:19:10,310
studying what you just heard about with

455
00:19:14,140 --> 00:19:12,410
the D cuts and impact science campaigns

456
00:19:16,120 --> 00:19:14,150
that we'll be looking forward to

457
00:19:19,810 --> 00:19:16,130
executing this in the coming months this

458
00:19:22,390 --> 00:19:19,820
year in that environment this is a

459
00:19:25,630 --> 00:19:22,400
inherently unstable aircraft small

460
00:19:27,250 --> 00:19:25,640
cockpit but we fly up so high that

461
00:19:29,290 --> 00:19:27,260
there's not enough pressure in the air

462
00:19:32,410 --> 00:19:29,300
to keep all the liquids in our body

463
00:19:35,620 --> 00:19:32,420

together if we lose cabin pressurization

464
00:19:37,810 --> 00:19:35,630
then all the liquids would boil so hence

465
00:19:40,150 --> 00:19:37,820
the pilot has to wear this full pressure

466
00:19:41,620 --> 00:19:40,160
suit so wearing a space suit up in that

467
00:19:44,530 --> 00:19:41,630
environment has its own set of

468
00:19:46,870 --> 00:19:44,540
challenges as well but it's actually why

469
00:19:48,970 --> 00:19:46,880
the NASA pilots enjoy it because we love

470
00:19:51,340 --> 00:19:48,980
a challenge we love to learn we love to

471
00:19:53,260 --> 00:19:51,350
explore a few of the things about the

472
00:19:55,990 --> 00:19:53,270
spacesuit itself that I'm wearing right

473
00:19:59,740 --> 00:19:56,000
now I'm dressed as if I'm ready to climb

474
00:20:02,950 --> 00:19:59,750
right into the aircraft the as we start

475
00:20:04,900 --> 00:20:02,960
to suit up into this the first things

476
00:20:07,000 --> 00:20:04,910
that the a pilot will notice typically

477
00:20:08,860 --> 00:20:07,010
is that you start to lose all of it they

478
00:20:11,020 --> 00:20:08,870
take all your senses away so you lose

479
00:20:13,570 --> 00:20:11,030
the sense of feel you can't really feel

480
00:20:15,670 --> 00:20:13,580
anything with the big gloves on here

481
00:20:17,500 --> 00:20:15,680
as soon as I close this faceplate in a

482
00:20:20,620 --> 00:20:17,510
minute then I'm completely pressurized

483
00:20:22,600 --> 00:20:20,630
inside I can't I have limited visibility

484
00:20:24,760 --> 00:20:22,610
I can't smell anything I can't hear

485
00:20:26,860 --> 00:20:24,770
anybody around me talking and that

486
00:20:28,540 --> 00:20:26,870
becomes a challenge for some people but

487
00:20:31,240 --> 00:20:28,550
we're well trained and experienced in

488
00:20:32,920 --> 00:20:31,250

this and to the NASA pilots we

489
00:20:35,740 --> 00:20:32,930
absolutely love it this is just like

490
00:20:37,120 --> 00:20:35,750
another set of pajamas to me and so what

491
00:20:39,730 --> 00:20:37,130
I'll show you in a minute is what this

492
00:20:42,070 --> 00:20:39,740
looks like as we inflate the suit apply

493
00:20:44,020 --> 00:20:42,080
the pressure into it which keeps

494
00:20:47,130 --> 00:20:44,030
everything in my body together in a high

495
00:20:50,380 --> 00:20:47,140
altitude low pressure environment and

496
00:20:52,630 --> 00:20:50,390
that's the challenge that we have trying

497
00:20:54,940 --> 00:20:52,640
to be in this environment be pumped up

498
00:20:57,070 --> 00:20:54,950
in a spacesuit and flying an unstable

499
00:20:58,750 --> 00:20:57,080
aircraft at the same time where we've

500
00:21:01,060 --> 00:20:58,760
got to put these science instruments

501
00:21:03,670 --> 00:21:01,070
right over the point where the science

502
00:21:06,100 --> 00:21:03,680
teams really want to study what's going

503
00:21:09,160 --> 00:21:06,110
on in the Earth's atmosphere and how it

504
00:21:11,140 --> 00:21:09,170
behaves so it's a fascinating science

505
00:21:12,640 --> 00:21:11,150
project that we're into here it's an

506
00:21:15,430 --> 00:21:12,650
amazing environment to be in

507
00:21:17,560 --> 00:21:15,440
up that high altitude there's nothing

508
00:21:19,740 --> 00:21:17,570
like getting up there where you can look

509
00:21:21,960 --> 00:21:19,750
out over the distance and see the curve

510
00:21:23,880 --> 00:21:21,970
to the earth and that dark purple to

511
00:21:25,980 --> 00:21:23,890
black sky up there that we don't see

512
00:21:29,630 --> 00:21:25,990
down here on the ground because we have

513
00:21:31,860 --> 00:21:29,640

moisture that's filtering that but

514
00:21:33,900 --> 00:21:31,870
that's an adventure and it's an amazing

515
00:21:35,400 --> 00:21:33,910
privilege and we're looking forward to

516
00:21:36,960 --> 00:21:35,410
supporting these science campaigns

517
00:21:39,720 --> 00:21:36,970
studying the Earth's atmosphere and its

518
00:21:40,980 --> 00:21:39,730
behavior this year now what I'll show

519
00:21:43,650 --> 00:21:40,990
you now I'm going to seal up the

520
00:21:45,780 --> 00:21:43,660
faceplate and we'll turn the oxygen on

521
00:21:47,820 --> 00:21:45,790
and I'll show you what this looks like

522
00:21:56,570 --> 00:21:47,830
pressurized and then I'll hand it back

523
00:22:03,360 --> 00:21:58,800
okay just like sitting down in the

524
00:22:04,890 --> 00:22:03,370
cockpit we'll inflate the suit and then

525
00:22:23,220 --> 00:22:04,900
I've got to fight against the suit to

526
00:22:28,570 --> 00:22:26,410
okay as this inflates my mobility

527
00:22:30,670 --> 00:22:28,580
becomes very limited here and I have to

528
00:22:33,160 --> 00:22:30,680
fight against it so look down at

529
00:22:36,010 --> 00:22:33,170
different parts of the cockpit I've got

530
00:22:38,050 --> 00:22:36,020
to pull the faceplate around so this is

531
00:22:39,910 --> 00:22:38,060
the challenge I described but we love it

532
00:22:41,530 --> 00:22:39,920
it's a great environment to be in and

533
00:22:43,680 --> 00:22:41,540
it's an awesome privilege to be involved

534
00:22:48,520 --> 00:22:43,690
in this study of the Earth's atmosphere

535
00:22:50,740 --> 00:22:48,530
Sampson back to you well that's quite

536
00:22:54,400 --> 00:22:50,750
the demo Dean don't get too comfortable

537
00:22:56,710 --> 00:22:54,410
over there so we are headed from the top

538
00:22:59,590 --> 00:22:56,720

of the atmosphere back down to the ocean

539
00:23:02,140 --> 00:22:59,600
because with me now is Tom Farrar

540
00:23:04,750 --> 00:23:02,150
physical oceanographer with Woods Hole

541
00:23:06,640 --> 00:23:04,760
Oceanographic Institution and also lead

542
00:23:09,780 --> 00:23:06,650
scientists for some meso scale ocean

543
00:23:11,440 --> 00:23:09,790
dynamics experiment or s mode I don't

544
00:23:13,360 --> 00:23:11,450
high Simpson

545
00:23:15,250 --> 00:23:13,370
so swirling currents in the ocean called

546
00:23:16,990 --> 00:23:15,260
Eddie's and their role in heat transport

547
00:23:18,690 --> 00:23:17,000
can tell us a little bit more about that

548
00:23:22,390 --> 00:23:18,700
and how you're planning on studying it

549
00:23:24,550 --> 00:23:22,400
yes well the the world's oceans are

550
00:23:27,100 --> 00:23:24,560
about a thousand times wider than they

551
00:23:29,310 --> 00:23:27,110
are deep and so if you were to zoom out

552
00:23:32,470 --> 00:23:29,320
and look at the earth from outer space

553
00:23:35,080 --> 00:23:32,480
the oceans are like a thin sheet of

554
00:23:37,470 --> 00:23:35,090
water covering the earth almost like a

555
00:23:41,260 --> 00:23:37,480
sheet of paper draped over the earth and

556
00:23:43,960 --> 00:23:41,270
because of this the flow in the oceans

557
00:23:47,590 --> 00:23:43,970
is primarily horizontal at the largest

558
00:23:50,560 --> 00:23:47,600
scales but the oceans are turbulent and

559
00:23:54,910 --> 00:23:50,570
they're full of Eddie's at all possible

560
00:23:58,330 --> 00:23:54,920
scales from the largest scale the scale

561
00:24:00,280 --> 00:23:58,340
of the ocean gyres down to Eddie's just

562
00:24:03,820 --> 00:24:00,290
that would fit on the tip of your finger

563
00:24:06,550 --> 00:24:03,830

and something interesting happens as we

564
00:24:09,580 --> 00:24:06,560
move from those largest scales down

565
00:24:12,010 --> 00:24:09,590
towards smaller scales when the width of

566
00:24:13,870 --> 00:24:12,020
the Eddie's is similar to the depth of

567
00:24:17,770 --> 00:24:13,880
the Eddie's you can have significant

568
00:24:19,630 --> 00:24:17,780
vertical motions and this can be

569
00:24:22,360 --> 00:24:19,640
important for the transport of things

570
00:24:24,160 --> 00:24:22,370
like heat and nutrients and we think

571
00:24:26,260 --> 00:24:24,170
this is important too

572
00:24:29,580 --> 00:24:26,270
heat exchange between the ocean and

573
00:24:31,770 --> 00:24:29,590
atmosphere and to life in the ocean

574
00:24:33,420 --> 00:24:31,780
so from what I gather when you head out

575
00:24:35,610 --> 00:24:33,430
there in April this is gonna be a huge

576
00:24:38,070 --> 00:24:35,620
production do you want to describe some

577
00:24:40,710 --> 00:24:38,080
of the moving parts involved yes there

578
00:24:43,980 --> 00:24:40,720
is a lot going on in s mode we'll have

579
00:24:47,160 --> 00:24:43,990
three different aircraft making

580
00:24:49,340 --> 00:24:47,170
measurements from different altitudes we

581
00:24:54,270 --> 00:24:49,350
need to measure a lot of things like the

582
00:24:57,720 --> 00:24:54,280
ocean currents ocean chlorophyll ocean

583
00:24:59,580 --> 00:24:57,730
temperature and heat exchange between

584
00:25:02,880 --> 00:24:59,590
the ocean and atmosphere so we'll have

585
00:25:06,540 --> 00:25:02,890
three aircraft at NASA Gulfstream

586
00:25:10,290 --> 00:25:06,550
aircraft at high altitudes at NASA King

587
00:25:13,070 --> 00:25:10,300
Air b200 at intermediate altitudes and a

588
00:25:19,020 --> 00:25:13,080

Twin Otter aircraft at low altitudes and

589
00:25:21,000 --> 00:25:19,030
we'll also have a research vessel an

590
00:25:24,840 --> 00:25:21,010
oceanographic research vessel and a

591
00:25:26,820 --> 00:25:24,850
bunch of robotic ocean vehicles so a lot

592
00:25:29,490 --> 00:25:26,830
of effort going on here what's the big

593
00:25:32,670 --> 00:25:29,500
path why is such a big effort to put

594
00:25:35,640 --> 00:25:32,680
this experiment into action well the

595
00:25:40,860 --> 00:25:35,650
oceans can hold a huge amount of heat if

596
00:25:44,130 --> 00:25:40,870
you took just the upper meter of of the

597
00:25:47,610 --> 00:25:44,140
oceans and cooled that one meter of

598
00:25:50,040 --> 00:25:47,620
water by one degree and put that heat in

599
00:25:52,890 --> 00:25:50,050
the atmosphere it would be enough heat

600
00:25:54,570 --> 00:25:52,900
to heat the whole planetary atmosphere

601
00:25:57,690 --> 00:25:54,580
by one degree

602
00:26:01,050 --> 00:25:57,700
so that heat transport to and away from

603
00:26:03,300 --> 00:26:01,060
the ocean surface is really important

604
00:26:05,970 --> 00:26:03,310
well in terms of the climate impact I

605
00:26:07,190 --> 00:26:05,980
can see that yes it'll help us move

606
00:26:10,260 --> 00:26:07,200
forward with those kind of modeling

607
00:26:12,360 --> 00:26:10,270
great so yeah on a personal note why why

608
00:26:15,390 --> 00:26:12,370
interested in physical oceanography we

609
00:26:17,640 --> 00:26:15,400
know people that study you know dolphins

610
00:26:19,290 --> 00:26:17,650
fishes what interests you know about the

611
00:26:24,360 --> 00:26:19,300
actual physical properties of the ocean

612
00:26:27,570 --> 00:26:24,370
well I've always enjoyed learning how

613
00:26:30,300 --> 00:26:27,580

things work and I studied physics in

614
00:26:32,550 --> 00:26:30,310
college and that was when I learned that

615
00:26:33,650 --> 00:26:32,560
there was such a thing as ocean physics

616
00:26:41,730 --> 00:26:33,660
and

617
00:26:44,580 --> 00:26:41,740
gotten to go on ocean voyages all over

618
00:26:46,799 --> 00:26:44,590
the world and to work with people from

619
00:26:49,169 --> 00:26:46,809
all over the world so it's it's been

620
00:26:49,770 --> 00:26:49,179
really a great career wow sounds like a

621
00:26:52,770 --> 00:26:49,780
lot of fun

622
00:26:55,049 --> 00:26:52,780
yeah so we can't actually go to the

623
00:26:56,610 --> 00:26:55,059
ocean right now and see those

624
00:26:58,220 --> 00:26:56,620
instruments in action but we can do the

625
00:27:01,289 --> 00:26:58,230
next best thing because our colleague

626
00:27:03,990 --> 00:27:01,299
your s mode colleague Laurent brer

627
00:27:06,600 --> 00:27:04,000
brought a wave glider autonomous

628
00:27:08,280 --> 00:27:06,610
platform into the hangar so do you wanna

629
00:27:13,560 --> 00:27:08,290
go check it out right now yeah let's do

630
00:27:17,360 --> 00:27:13,570
awesome so the wave glider is gonna be

631
00:27:22,890 --> 00:27:17,370
on the RV Oceanus right well here we go

632
00:27:25,440 --> 00:27:22,900
yes the research vessel Oceanus will go

633
00:27:27,450 --> 00:27:25,450
from newport oregon to the region

634
00:27:29,669 --> 00:27:27,460
offshore of san francisco and it will

635
00:27:31,919 --> 00:27:29,679
take about two days for the ship to get

636
00:27:34,230 --> 00:27:31,929
there Wow and his Laurent who's actually

637
00:27:37,110 --> 00:27:34,240
gonna be in the RV Oh Shi anis am i

638
00:27:39,630 --> 00:27:37,120

correct we're in awesome and so you are

639
00:27:40,950 --> 00:27:39,640
kind of manning these wave gliders right

640
00:27:43,500 --> 00:27:40,960
so there's several of them and you'll be

641
00:27:45,870 --> 00:27:43,510
kind of they'll be under your care yeah

642
00:27:50,430 --> 00:27:45,880
so we'll be dragging them around trying

643
00:27:52,320 --> 00:27:50,440
to keep them together and making

644
00:27:53,940 --> 00:27:52,330
measurement at the same time so yeah it

645
00:27:55,860 --> 00:27:53,950
looks like a very large surfboard

646
00:27:57,870 --> 00:27:55,870
without a lot of complex parts and I

647
00:27:59,250 --> 00:27:57,880
imagine it cruising on the surface of

648
00:28:00,780 --> 00:27:59,260
the Pacific Ocean do you want to point

649
00:28:03,030 --> 00:28:00,790
out some of the measurements is making

650
00:28:06,150 --> 00:28:03,040
yeah sure so we're gonna make

651
00:28:09,810 --> 00:28:06,160
measurement both in the air and in the

652
00:28:11,820 --> 00:28:09,820
water so for example this sensor is a

653
00:28:15,210 --> 00:28:11,830
weather station so it's gonna measure

654
00:28:18,570 --> 00:28:15,220
the wind speed wind direction hair

655
00:28:23,970 --> 00:28:18,580
temperature humidity atmospheric

656
00:28:27,000 --> 00:28:23,980
pressure rain another cool instrument is

657
00:28:31,289 --> 00:28:27,010
this really sonic animator which gonna

658
00:28:35,250 --> 00:28:31,299
measure the fine structure of the of the

659
00:28:39,000 --> 00:28:35,260
air flow above the waves in the air we

660
00:28:42,419 --> 00:28:39,010
also have a bunch of GPS which give us a

661
00:28:43,590 --> 00:28:42,429
position of the wave glider but also its

662
00:28:46,169 --> 00:28:43,600
motion and

663
00:28:48,330 --> 00:28:46,179

it's motion we are able to retrieve the

664
00:28:50,909 --> 00:28:48,340
main characteristic of the wave fields

665
00:28:54,060 --> 00:28:50,919
such as the wave height also carry out

666
00:28:57,120 --> 00:28:54,070
of the waves and then we have an instant

667
00:29:00,539 --> 00:28:57,130
ball of instrument and then is the in

668
00:29:03,600 --> 00:29:00,549
the water so this instrument allows us

669
00:29:06,659 --> 00:29:03,610
to measure the temperature the salinity

670
00:29:09,810 --> 00:29:06,669
of the water from the surface down to

671
00:29:12,570 --> 00:29:09,820
above hundred and fifty meter and along

672
00:29:15,180 --> 00:29:12,580
that we also have a current profiler

673
00:29:17,970 --> 00:29:15,190
which measures the current speed and

674
00:29:20,700 --> 00:29:17,980
direction pretty much from the surface

675
00:29:23,820 --> 00:29:20,710
down to about and red meters wow that's

676
00:29:25,350 --> 00:29:23,830
a lot of capability for one platform I'm

677
00:29:27,570 --> 00:29:25,360
so I'm looking at the top and it almost

678
00:29:29,640 --> 00:29:27,580
looks like solar panels I'm just picking

679
00:29:33,270 --> 00:29:29,650
the question of how this thing moves and

680
00:29:35,130 --> 00:29:33,280
I see fins I see other yes so that's one

681
00:29:39,060 --> 00:29:35,140
of the cool thing about the wave ladder

682
00:29:43,770 --> 00:29:39,070
is just use power of the energy of the

683
00:29:45,539 --> 00:29:43,780
wave as a mean of proportion so and the

684
00:29:47,490 --> 00:29:45,549
solar panel are just to charge the

685
00:29:50,820 --> 00:29:47,500
battery that we used to power the

686
00:29:54,210 --> 00:29:50,830
instrument and control and communicate

687
00:29:56,399 --> 00:29:54,220
communication unit and so to give you

688
00:29:59,310 --> 00:29:56,409

the principle of operation is really

689
00:30:04,049 --> 00:29:59,320
simple the flat here stays at the

690
00:30:06,720 --> 00:30:04,059
surface and sub at the bottom equipped

691
00:30:10,850 --> 00:30:06,730
with this fin stays about eight meter

692
00:30:14,159 --> 00:30:10,860
deep and most of them moves up and down

693
00:30:18,419 --> 00:30:14,169
under the action of the waves and with

694
00:30:21,659 --> 00:30:18,429
the L of these fins this vertical motion

695
00:30:25,049 --> 00:30:21,669
is converted into horizontal motion

696
00:30:27,180 --> 00:30:25,059
leading to the proportion and so this is

697
00:30:28,799 --> 00:30:27,190
controlled by remote control back from

698
00:30:31,010 --> 00:30:28,809
the ship yes exactly

699
00:30:34,230 --> 00:30:31,020
by satellite communication so we know

700
00:30:36,690 --> 00:30:34,240
its position it studies and the cool

701
00:30:40,710 --> 00:30:36,700
thing about it is that we do some

702
00:30:44,279 --> 00:30:40,720
real-time processing of our sensors and

703
00:30:46,320 --> 00:30:44,289
we send them back to shore every 15

704
00:30:48,320 --> 00:30:46,330
minutes and update so we know the

705
00:30:52,580 --> 00:30:48,330
conditions they are facing and we can

706
00:30:56,360 --> 00:30:52,590
just operation of Faria and also our

707
00:30:57,769 --> 00:30:56,370
trajectory based on those conditions

708
00:31:01,070 --> 00:30:57,779
wow that's pretty high-tech that's

709
00:31:03,259 --> 00:31:01,080
incredible Tom this is just one of many

710
00:31:04,970 --> 00:31:03,269
instruments that are gonna be in use on

711
00:31:07,240 --> 00:31:04,980
this campaign in the ocean what is the

712
00:31:11,600 --> 00:31:07,250
special niche about this wave glider

713
00:31:14,120 --> 00:31:11,610

well the wave gliders and really the

714
00:31:17,659 --> 00:31:14,130
other robotic platforms that we'll have

715
00:31:20,840 --> 00:31:17,669
in the ocean will be giving us a view of

716
00:31:22,879 --> 00:31:20,850
the 3d structure of the ocean and we're

717
00:31:25,549 --> 00:31:22,889
especially interested in the flow of

718
00:31:28,549 --> 00:31:25,559
water so these will give us a 3d view of

719
00:31:30,919 --> 00:31:28,559
that water and how the eddies are

720
00:31:33,230 --> 00:31:30,929
swirling and the currents are coming

721
00:31:34,850 --> 00:31:33,240
together leading to vertical motion in

722
00:31:36,620 --> 00:31:34,860
the ocean cool well that is very

723
00:31:38,240 --> 00:31:36,630
interesting and we're working in

724
00:31:40,610 --> 00:31:38,250
combination with the aircraft to get

725
00:31:44,450 --> 00:31:40,620
measurements above below so it's a very

726
00:31:46,310 --> 00:31:44,460
4d look at what's going on in these

727
00:31:48,379 --> 00:31:46,320
Eddie's that's right the aircraft will

728
00:31:50,539 --> 00:31:48,389
give us a great spacial picture but

729
00:31:53,389 --> 00:31:50,549
they're seeing just the surface of the

730
00:31:55,009 --> 00:31:53,399
ocean awesome thanks so much Tom well

731
00:31:56,750 --> 00:31:55,019
good luck with the wave gliders and good

732
00:31:59,480 --> 00:31:56,760
luck with being on that ship Thank You

733
00:32:02,450 --> 00:31:59,490
Laurent and Tom good luck with the

734
00:32:04,370 --> 00:32:02,460
entire campaign thank you alright so

735
00:32:06,769 --> 00:32:04,380
next we're moving on with my colleague

736
00:32:09,230 --> 00:32:06,779
Joe Atkinson he's actually at Langley

737
00:32:11,149 --> 00:32:09,240
and he's talking with some of the team

738
00:32:12,500 --> 00:32:11,159

members for our next field campaign

739
00:32:14,930 --> 00:32:12,510
we're going to talk about is called the

740
00:32:17,120 --> 00:32:14,940
activate mission it's the aerosol cloud

741
00:32:21,200 --> 00:32:17,130
meteorology interactions over the

742
00:32:23,299 --> 00:32:21,210
western Atlantic take it away Joe hi I'm

743
00:32:25,070 --> 00:32:23,309
Joe Atkinson and I am at the hangar here

744
00:32:27,529 --> 00:32:25,080
at NASA's Langley Research Center in

745
00:32:29,570 --> 00:32:27,539
Hampton Virginia this historic facility

746
00:32:30,830 --> 00:32:29,580
where Gemini and Apollo astronauts

747
00:32:33,440 --> 00:32:30,840
trained to do rendezvous docking

748
00:32:35,330 --> 00:32:33,450
maneuvers and where we keep our fleet of

749
00:32:37,610 --> 00:32:35,340
research aircraft will be home base for

750
00:32:39,320 --> 00:32:37,620
activate scientists and crew when they

751
00:32:41,330 --> 00:32:39,330
begin conducting research flights out

752
00:32:43,970 --> 00:32:41,340
over the nearby and super conveniently

753
00:32:46,879 --> 00:32:43,980
located Atlantic Ocean just next month

754
00:32:49,039 --> 00:32:46,889
I'm joined today by Luke Ziemba he is

755
00:32:52,039 --> 00:32:49,049
the instrument scientist here at Langley

756
00:32:54,200 --> 00:32:52,049
for activate behind us you can see the

757
00:32:55,820 --> 00:32:54,210
Falcon and King air aircraft that they

758
00:32:58,430 --> 00:32:55,830
will be using when I look back at the

759
00:33:00,049 --> 00:32:58,440
Falcon it has all these crazy probes and

760
00:33:01,850 --> 00:33:00,059
sciency looking things sticking out of

761
00:33:02,180 --> 00:33:01,860
the top of it what are we looking at

762
00:33:04,730 --> 00:33:02,190
what

763
00:33:06,110 --> 00:33:04,740

things do so for activate we're making

764
00:33:07,460 --> 00:33:06,120
lots of different measurements so we

765
00:33:09,289 --> 00:33:07,470
need lots of different probes and

766
00:33:10,940 --> 00:33:09,299
instruments in the aircraft if we look

767
00:33:12,889 --> 00:33:10,950
at the crown of the aircraft you can see

768
00:33:15,259 --> 00:33:12,899
four inlets on the left side as you're

769
00:33:17,450 --> 00:33:15,269
looking at the aircraft is a gas Inlet

770
00:33:20,060 --> 00:33:17,460
that we use to bring in air and measure

771
00:33:22,129 --> 00:33:20,070
the concentrations of Co co2 and methane

772
00:33:24,379 --> 00:33:22,139
in the atmosphere next over is an

773
00:33:25,700 --> 00:33:24,389
aerosol Inlet that we measure the

774
00:33:27,860 --> 00:33:25,710
properties of particles in the

775
00:33:29,840 --> 00:33:27,870
atmosphere so the optical chemical and

776
00:33:32,240 --> 00:33:29,850
micro physical properties of aerosols

777
00:33:34,789 --> 00:33:32,250
next over is what we call a CVI or

778
00:33:36,860 --> 00:33:34,799
counter flow virtual impactor and that

779
00:33:38,600 --> 00:33:36,870
rejects those aerosol particles and we

780
00:33:40,340 --> 00:33:38,610
only look at droplets that enter the

781
00:33:42,019 --> 00:33:40,350
probe and then we we evaporate those

782
00:33:44,090 --> 00:33:42,029
droplets and look at their composition

783
00:33:46,369 --> 00:33:44,100
and then lastly we have a cloud water

784
00:33:48,919 --> 00:33:46,379
collector and that collects droplets

785
00:33:50,539 --> 00:33:48,929
inside the clouds brings them into the

786
00:33:52,759 --> 00:33:50,549
aircraft through tubes and then we

787
00:33:54,619 --> 00:33:52,769
collect water samples in vials that we

788
00:33:55,369 --> 00:33:54,629

take back to the laboratory and look at

789
00:33:57,740 --> 00:33:55,379
post-mission

790
00:33:59,720 --> 00:33:57,750
we have some instruments on the wings

791
00:34:01,669 --> 00:33:59,730
here as well can you tell us what those

792
00:34:03,950 --> 00:34:01,679
do the wing probes measure the cloud

793
00:34:05,509 --> 00:34:03,960
properties on the right wing we have

794
00:34:07,909 --> 00:34:05,519
what we call a cloud aerosol

795
00:34:10,129 --> 00:34:07,919
precipitation spectrometer or caps and

796
00:34:12,409 --> 00:34:10,139
that measures the size of the droplets

797
00:34:14,210 --> 00:34:12,419
and the number concentration of them on

798
00:34:16,579 --> 00:34:14,220
the left wing is a similar probe that's

799
00:34:18,169 --> 00:34:16,589
operated by DLR and that probe measures

800
00:34:19,909 --> 00:34:18,179
the number concentration and size of

801
00:34:23,149 --> 00:34:19,919
droplets but over a different range of

802
00:34:25,639 --> 00:34:23,159
particle sizes oh wow so we're getting

803
00:34:27,050 --> 00:34:25,649
on to the Falcon here and and I can see

804
00:34:28,669 --> 00:34:27,060
that it's pretty crowded and you don't

805
00:34:30,950 --> 00:34:28,679
even have everything on here yet right

806
00:34:32,540 --> 00:34:30,960
so so tell me a little bit about what

807
00:34:34,250 --> 00:34:32,550
its gonna be like that's right so we're

808
00:34:35,690 --> 00:34:34,260
currently integrating the Falcon meaning

809
00:34:37,730 --> 00:34:35,700
we were putting our instruments on we

810
00:34:39,500 --> 00:34:37,740
currently have three racks on the plane

811
00:34:41,030 --> 00:34:39,510
and we're gonna have three more sitting

812
00:34:42,680 --> 00:34:41,040
essentially right where we are on the

813
00:34:44,300 --> 00:34:42,690

plane now and you have to have people on

814
00:34:45,770 --> 00:34:44,310
the plane see though right so during

815
00:34:47,089 --> 00:34:45,780
flights we're gonna have two pilots up

816
00:34:48,740 --> 00:34:47,099
front but we're also gonna have to

817
00:34:50,780 --> 00:34:48,750
scientific operators that will sit in

818
00:34:52,190 --> 00:34:50,790
front of racks and monitor instruments

819
00:34:54,800 --> 00:34:52,200
and keep them calibrated what does the

820
00:34:56,329 --> 00:34:54,810
Falcon do we're based out of Hampton

821
00:34:58,400 --> 00:34:56,339
based here at home but we're gonna be

822
00:35:00,200 --> 00:34:58,410
flying out over the ocean so we can do

823
00:35:02,240 --> 00:35:00,210
local flights out over the ocean or we

824
00:35:03,950 --> 00:35:02,250
can go to Bermuda and back or target

825
00:35:05,809 --> 00:35:03,960
different cloud environments our flights

826
00:35:08,510 --> 00:35:05,819
are about four hours in duration and we

827
00:35:11,540 --> 00:35:08,520
fly from about 500 feet above the water

828
00:35:12,770 --> 00:35:11,550
surface up to about 5,000 feet and we're

829
00:35:15,350 --> 00:35:12,780
porpoising between those altitudes

830
00:35:18,050 --> 00:35:15,360
constantly while you're doing that the

831
00:35:19,250 --> 00:35:18,060
there is gonna be flying too so so talk

832
00:35:20,480 --> 00:35:19,260
to me a little bit about what the King

833
00:35:22,370 --> 00:35:20,490
Air is gonna be doing right so the

834
00:35:24,350 --> 00:35:22,380
uniqueness of activate is that we have

835
00:35:26,330 --> 00:35:24,360
coordinated flights between two aircraft

836
00:35:28,310 --> 00:35:26,340
so we're flying low but the King Air is

837
00:35:30,800 --> 00:35:28,320
flying up at 9 kilometers looking down

838
00:35:32,210 --> 00:35:30,810

on the scene with remote sensors and

839
00:35:34,760 --> 00:35:32,220
especially with the new system that we

840
00:35:36,860 --> 00:35:34,770
have drops on system you actually have a

841
00:35:38,240 --> 00:35:36,870
drops on here in your hands can you kind

842
00:35:40,190 --> 00:35:38,250
of explain to us what we're looking at

843
00:35:41,870 --> 00:35:40,200
here sure the drops on has a parachute

844
00:35:43,730 --> 00:35:41,880
on one end and it has sensors on the

845
00:35:46,010 --> 00:35:43,740
other we measure temperature pressure

846
00:35:47,630 --> 00:35:46,020
relative humidity and wind direction and

847
00:35:49,430 --> 00:35:47,640
speed with the Sun we use a launcher

848
00:35:50,870 --> 00:35:49,440
from the aircraft and it drops at about

849
00:35:52,580 --> 00:35:50,880
11 meters per second and we get a

850
00:35:55,670 --> 00:35:52,590
sounding of the atmosphere as it falls

851
00:35:56,750 --> 00:35:55,680
you have two other instruments on the

852
00:35:59,330 --> 00:35:56,760
King air what are they

853
00:36:01,010 --> 00:35:59,340
research scanning polarimeter and HS RL

854
00:36:02,960 --> 00:36:01,020
are high spectral resolution lidar

855
00:36:04,790 --> 00:36:02,970
onboard those two instruments in

856
00:36:06,260 --> 00:36:04,800
conjunction allow us to retrieve the

857
00:36:07,880 --> 00:36:06,270
properties that were measuring on the

858
00:36:09,770 --> 00:36:07,890
Falcon aircraft we don't actually have

859
00:36:12,520 --> 00:36:09,780
them to show you here but we are gonna

860
00:36:14,570 --> 00:36:12,530
take you to the lab to see the HS RL

861
00:36:16,520 --> 00:36:14,580
this is our instrument and how its

862
00:36:18,350 --> 00:36:16,530
configured on the aircraft this is a

863
00:36:21,410 --> 00:36:18,360

high spectral resolution lidar so what

864
00:36:23,390 --> 00:36:21,420
we do is we send different color pulses

865
00:36:24,710 --> 00:36:23,400
of laser light out into the atmosphere

866
00:36:26,300 --> 00:36:24,720
from the bottom half of the instrument

867
00:36:28,160 --> 00:36:26,310
those laser pulses go into the

868
00:36:29,720 --> 00:36:28,170
atmosphere we collect that scattered

869
00:36:31,760 --> 00:36:29,730
light energy from the atmosphere with

870
00:36:33,140 --> 00:36:31,770
our telescope and then direct that light

871
00:36:35,090 --> 00:36:33,150
into the various detectors in the

872
00:36:36,980 --> 00:36:35,100
instrument head at the operator station

873
00:36:38,450 --> 00:36:36,990
I can look at those various signals

874
00:36:39,950 --> 00:36:38,460
coming from all the the detectors

875
00:36:41,630 --> 00:36:39,960
getting information about the aerosols

876
00:36:43,400 --> 00:36:41,640
and clouds now why that's important

877
00:36:44,810 --> 00:36:43,410
you've already heard about the detailed

878
00:36:46,880 --> 00:36:44,820
measurements that the Falcon is is

879
00:36:48,650 --> 00:36:46,890
taking as they're flying down low well

880
00:36:50,840 --> 00:36:48,660
we're flying up high and we're measuring

881
00:36:52,730 --> 00:36:50,850
it's a remote sense sensor so we're

882
00:36:54,770 --> 00:36:52,740
measuring from the aircraft all the way

883
00:36:56,810 --> 00:36:54,780
down to the surface and we can combine

884
00:36:58,640 --> 00:36:56,820
those measurements from both aircraft to

885
00:37:00,680 --> 00:36:58,650
really get detailed information and dig

886
00:37:03,320 --> 00:37:00,690
into the science of how air Sol's and

887
00:37:04,790 --> 00:37:03,330
clouds interact alright so that was our

888
00:37:06,860 --> 00:37:04,800

behind-the-scenes look at what we're

889
00:37:08,660 --> 00:37:06,870
doing here at Langley to get ready for

890
00:37:10,550 --> 00:37:08,670
activate thank you so much Lou and

891
00:37:15,260 --> 00:37:10,560
thanks to Dave Harper back to you at

892
00:37:16,850 --> 00:37:15,270
Armstrong well thanks for the report Joe

893
00:37:18,950 --> 00:37:16,860
there's a lot going on on that aircraft

894
00:37:21,590 --> 00:37:18,960
it seems well joining me right now is

895
00:37:24,920 --> 00:37:21,600
actually the lead scientist for active a

896
00:37:26,210 --> 00:37:24,930
and it's our main solution atmospheric

897
00:37:27,740 --> 00:37:26,220
scientists out of the University of

898
00:37:29,270 --> 00:37:27,750
Arizona I mean thanks for joining us

899
00:37:30,770 --> 00:37:29,280
today thank you Samson

900
00:37:32,150 --> 00:37:30,780
so it looks like your mission is in good

901
00:37:33,080 --> 00:37:32,160
hands according to that video right

902
00:37:37,130 --> 00:37:33,090
correct

903
00:37:38,780 --> 00:37:37,140
so as we all know clouds are a common

904
00:37:40,580 --> 00:37:38,790
feature in the lower atmosphere and

905
00:37:42,560 --> 00:37:40,590
they're not just beautiful objects to

906
00:37:44,540 --> 00:37:42,570
look at in the sky but they play a very

907
00:37:47,360 --> 00:37:44,550
important role in our planets energy

908
00:37:50,240 --> 00:37:47,370
balance because they're very reflective

909
00:37:52,340 --> 00:37:50,250
but we don't fully understand how clouds

910
00:37:54,860 --> 00:37:52,350
work especially how they form and how

911
00:37:56,600 --> 00:37:54,870
they evolve and so we need to change

912
00:37:59,900 --> 00:37:56,610
that and it begins with understanding

913
00:38:01,790 --> 00:37:59,910

how you even make a cloud droplet so the

914
00:38:03,920 --> 00:38:01,800
seeds of cloud droplets are these little

915
00:38:06,380 --> 00:38:03,930
aerosol particles things like dust or

916
00:38:08,750 --> 00:38:06,390
smoke and when we breathe we're inhaling

917
00:38:10,640 --> 00:38:08,760
large amounts of particles and they vary

918
00:38:13,460 --> 00:38:10,650
widely in terms of you know what they're

919
00:38:15,170 --> 00:38:13,470
made of and their size so it turns out

920
00:38:17,660 --> 00:38:15,180
that depending on the number and amount

921
00:38:19,430 --> 00:38:17,670
of particles you have cloud droplets can

922
00:38:22,790 --> 00:38:19,440
have very different properties in terms

923
00:38:24,560 --> 00:38:22,800
of their size their composition and

924
00:38:26,120 --> 00:38:24,570
their lifetime and this leads to varied

925
00:38:28,370 --> 00:38:26,130
effects on weather and climate

926
00:38:30,410 --> 00:38:28,380
so to understand these complex

927
00:38:30,950 --> 00:38:30,420
interactions between particles and

928
00:38:33,560 --> 00:38:30,960
clouds

929
00:38:36,380 --> 00:38:33,570
we need airborne measurements and we

930
00:38:38,630 --> 00:38:36,390
need information below inside and above

931
00:38:41,060 --> 00:38:38,640
alves all at once and it's really hard

932
00:38:43,250 --> 00:38:41,070
to do this with just one airplane so

933
00:38:45,920 --> 00:38:43,260
activate embraces this approach as you

934
00:38:47,390 --> 00:38:45,930
just saw in the video to use two planes

935
00:38:49,550 --> 00:38:47,400
that will fly in a coordinated fashion

936
00:38:53,510 --> 00:38:49,560
to get all the information we need at

937
00:38:55,310 --> 00:38:53,520
once so we will do about 150 joint

938
00:38:58,070 --> 00:38:55,320

flights over the next three years over

939
00:38:59,330 --> 00:38:58,080
the western North Atlantic Ocean so I

940
00:39:01,220 --> 00:38:59,340
mean what kinds of aerosols are we

941
00:39:03,110 --> 00:39:01,230
looking at in this particular campaign

942
00:39:05,240 --> 00:39:03,120
what types of aerosols well there's a

943
00:39:07,340 --> 00:39:05,250
wide range of different pollution

944
00:39:09,050 --> 00:39:07,350
sources that impact the Western North

945
00:39:11,270 --> 00:39:09,060
Atlantic Ocean that was one of the

946
00:39:13,540 --> 00:39:11,280
reasons we chose this region because we

947
00:39:16,430 --> 00:39:13,550
need a wide diversity in terms of

948
00:39:19,550 --> 00:39:16,440
emission sources and weather types so we

949
00:39:21,770 --> 00:39:19,560
have biogenic emissions from from plants

950
00:39:23,870 --> 00:39:21,780
from the ocean we have sea salt we have

951
00:39:26,300 --> 00:39:23,880
biomass burning we have dusts from

952
00:39:28,420 --> 00:39:26,310
Africa in certain times of the year and

953
00:39:31,420 --> 00:39:28,430
we have urban emissions as well of

954
00:39:34,850 --> 00:39:31,430
coming off the East Coast over the ocean

955
00:39:36,350 --> 00:39:34,860
so you know I know we've had a few

956
00:39:38,900 --> 00:39:36,360
campaigns that were looking at these

957
00:39:40,610 --> 00:39:38,910
similar processes aerosols and clouds

958
00:39:41,960 --> 00:39:40,620
we've been off the coast of Africa we've

959
00:39:43,400 --> 00:39:41,970
been

960
00:39:45,230 --> 00:39:43,410
in the maritime continent by the

961
00:39:46,670 --> 00:39:45,240
Philippines and so it looks like we're

962
00:39:48,740 --> 00:39:46,680
having a growing compendium of these

963
00:39:50,120 --> 00:39:48,750

measurements so what's the point of

964
00:39:52,430 --> 00:39:50,130
having all these different measurements

965
00:39:55,250 --> 00:39:52,440
taking place across the world yeah so

966
00:39:57,170 --> 00:39:55,260
again the the science of aerosol cloud

967
00:39:59,660 --> 00:39:57,180
interactions what we are struggling with

968
00:40:01,940 --> 00:39:59,670
the research community is a general lack

969
00:40:04,099 --> 00:40:01,950
of statistics it there are so many

970
00:40:06,680 --> 00:40:04,109
factors influencing cloud properties

971
00:40:09,220 --> 00:40:06,690
that we just need more and more and more

972
00:40:11,630 --> 00:40:09,230
data in different regions that are

973
00:40:13,670 --> 00:40:11,640
there's a different types of particles

974
00:40:16,790 --> 00:40:13,680
different types of weather and so having

975
00:40:18,530 --> 00:40:16,800
data across the world and you know

976
00:40:20,510 --> 00:40:18,540
what's very special about activate is

977
00:40:22,880 --> 00:40:20,520
just the sheer amount of flights we're

978
00:40:24,859 --> 00:40:22,890
gonna do is very very large you know

979
00:40:26,450 --> 00:40:24,869
we're gonna get about 1,200 hours of

980
00:40:29,420 --> 00:40:26,460
flight data which is kind of

981
00:40:31,820 --> 00:40:29,430
unprecedented and so we need statistics

982
00:40:34,370 --> 00:40:31,830
and so combining all these campaign data

983
00:40:35,780 --> 00:40:34,380
and using activate it's it's really

984
00:40:39,109 --> 00:40:35,790
going to help the international research

985
00:40:40,490 --> 00:40:39,119
community it's incredible so how did you

986
00:40:41,870 --> 00:40:40,500
get motivated to get into this kind of

987
00:40:43,609 --> 00:40:41,880
science I mean it's not something that

988
00:40:47,390 --> 00:40:43,619

people just stumble into I'm assuming

989
00:40:50,210 --> 00:40:47,400
right so since I was a child I've always

990
00:40:52,430 --> 00:40:50,220
been fascinated inspired by airplanes so

991
00:40:54,170 --> 00:40:52,440
although I never pursued flying myself

992
00:40:56,210 --> 00:40:54,180
I've just liked looking at them and

993
00:40:57,859 --> 00:40:56,220
being on planes so that you know one of

994
00:40:59,960 --> 00:40:57,869
the best parts of this research is not

995
00:41:01,970 --> 00:40:59,970
just being on the plane but being able

996
00:41:04,520 --> 00:41:01,980
to steal steer the direction of flights

997
00:41:06,260 --> 00:41:04,530
and doing impactful research and to

998
00:41:08,450 --> 00:41:06,270
sweeten it up even more for me

999
00:41:11,260 --> 00:41:08,460
my background is aerosols but my

1000
00:41:13,550 --> 00:41:11,270
professional role model my father he's a

1001
00:41:15,680 --> 00:41:13,560
hydrologist who studies precipitation

1002
00:41:17,990 --> 00:41:15,690
and of course the link between aerosols

1003
00:41:20,240 --> 00:41:18,000
and precip are clouds which is the

1004
00:41:21,740 --> 00:41:20,250
heartbeat of the activate mission it's

1005
00:41:24,560 --> 00:41:21,750
incredible so following in your father's

1006
00:41:25,760 --> 00:41:24,570
footsteps and your work in forming the

1007
00:41:27,800 --> 00:41:25,770
other's work I think that's kind of

1008
00:41:29,300 --> 00:41:27,810
beautiful thank you Susie great thanks

1009
00:41:32,210 --> 00:41:29,310
so much army for joining us good luck on

1010
00:41:35,089 --> 00:41:32,220
that campaign thank you so we are from

1011
00:41:36,710 --> 00:41:35,099
small particles in the clouds to one of

1012
00:41:38,660 --> 00:41:36,720
the largest waterways in the world we're

1013
00:41:41,359 --> 00:41:38,670

moving on to the Delta X mission and

1014
00:41:43,339 --> 00:41:41,369
we're looking at water flow and sediment

1015
00:41:46,250 --> 00:41:43,349
to figure out why some parts other

1016
00:41:48,170 --> 00:41:46,260
Mississippi River Delta are disappearing

1017
00:41:51,050 --> 00:41:48,180
while others are not and joining me to

1018
00:41:53,000 --> 00:41:51,060
talk about that is lead scientist Mark

1019
00:41:55,320 --> 00:41:53,010
Simard from Jet Propulsion Laboratory

1020
00:41:57,630 --> 00:41:55,330
thanks for joining us mark thank you

1021
00:41:58,980 --> 00:41:57,640
so my stuck with some of the processes

1022
00:42:01,380 --> 00:41:58,990
that are at play at the Mississippi

1023
00:42:04,590 --> 00:42:01,390
River Delta and how you're looking at

1024
00:42:08,400 --> 00:42:04,600
those things river deltas form along the

1025
00:42:11,340 --> 00:42:08,410
coast as the water from the river meets

1026
00:42:13,680 --> 00:42:11,350
the slow-moving ocean the water from the

1027
00:42:16,200 --> 00:42:13,690
river itself slows down and the

1028
00:42:19,410 --> 00:42:16,210
sediments that it transports toward the

1029
00:42:21,120 --> 00:42:19,420
coast actually deposited at the mouth of

1030
00:42:23,040 --> 00:42:21,130
the river and as those sediments

1031
00:42:26,060 --> 00:42:23,050
accumulate they build up soil so

1032
00:42:29,070 --> 00:42:26,070
elevation of the director ground goes up

1033
00:42:31,950 --> 00:42:29,080
so at one point there the water will be

1034
00:42:36,090 --> 00:42:31,960
sufficiently shallow to for vegetation

1035
00:42:39,420 --> 00:42:36,100
to grow so vegetation will contribute to

1036
00:42:42,300 --> 00:42:39,430
the further processing of the the

1037
00:42:44,730 --> 00:42:42,310
sediments so it will help maintain the

1038
00:42:46,740 --> 00:42:44,740

sediment in place and also potentially

1039
00:42:49,200 --> 00:42:46,750
accelerate the capture of those

1040
00:42:51,840 --> 00:42:49,210
sediments and not only that was the

1041
00:42:56,390 --> 00:42:51,850
there's also an ecological process in

1042
00:42:59,430 --> 00:42:56,400
which as the plants grow they produce

1043
00:43:00,930 --> 00:42:59,440
organic material which they inject in

1044
00:43:04,950 --> 00:43:00,940
the ground through the roots of course

1045
00:43:07,260 --> 00:43:04,960
and every year they just contribute just

1046
00:43:09,960 --> 00:43:07,270
like the sediment to elevation of the

1047
00:43:13,110 --> 00:43:09,970
ground in the deltas so the text looks

1048
00:43:15,420 --> 00:43:13,120
at those two processes so the sediment

1049
00:43:17,630 --> 00:43:15,430
transport and deposition and the second

1050
00:43:20,820 --> 00:43:17,640
one is the ecological part which is the

1051
00:43:22,500 --> 00:43:20,830
plant organic contribution to solar

1052
00:43:24,750 --> 00:43:22,510
elevation credible and for those of you

1053
00:43:27,540 --> 00:43:24,760
guys watching NASA TV that noise is a

1054
00:43:30,630 --> 00:43:27,550
hanger in motion this is a live working

1055
00:43:32,640 --> 00:43:30,640
hanger so don't mind that noise brain

1056
00:43:35,130 --> 00:43:32,650
mark so let's think let's think about

1057
00:43:36,630 --> 00:43:35,140
all the ways that we can study these

1058
00:43:37,890 --> 00:43:36,640
processes of what's going on in the

1059
00:43:42,570 --> 00:43:37,900
field when you get out there this summer

1060
00:43:46,560 --> 00:43:42,580
okay so Delta X basically uses NASA

1061
00:43:50,520 --> 00:43:46,570
assets set of three instruments that are

1062
00:43:55,110 --> 00:43:50,530
used to calibrate numerical models those

1063
00:43:56,850 --> 00:43:55,120

models will simulate the hydrology of

1064
00:43:59,080 --> 00:43:56,860
the system so the water circulating

1065
00:44:02,110 --> 00:43:59,090
through the channels and across

1066
00:44:03,850 --> 00:44:02,120
the marshes and it will also simulate

1067
00:44:06,460 --> 00:44:03,860
the deposition of sediments and the

1068
00:44:08,430 --> 00:44:06,470
plant growth so we use three aircrafts

1069
00:44:11,470 --> 00:44:08,440
of which two are radars

1070
00:44:15,340 --> 00:44:11,480
the radars are used to measure the

1071
00:44:17,980 --> 00:44:15,350
hydrology of the system in the channel

1072
00:44:19,480 --> 00:44:17,990
network and also through other marshes

1073
00:44:22,870 --> 00:44:19,490
that we'll look at the propagation for

1074
00:44:28,180 --> 00:44:22,880
example of the tidal wave propagating

1075
00:44:31,000 --> 00:44:28,190
upward inland in the Martians the we

1076
00:44:33,700 --> 00:44:31,010
have a third instrument that will look

1077
00:44:35,230 --> 00:44:33,710
at the content of sediment so the amount

1078
00:44:38,320 --> 00:44:35,240
of sediment that are found in the water

1079
00:44:41,050 --> 00:44:38,330
and it will also look at plant

1080
00:44:44,470 --> 00:44:41,060
productivity and that third one is an

1081
00:44:46,480 --> 00:44:44,480
imaging spectrometer Wow well you know

1082
00:44:47,950 --> 00:44:46,490
that a lot of people live around the

1083
00:44:49,180 --> 00:44:47,960
Mississippi River does you want to talk

1084
00:44:52,870 --> 00:44:49,190
about the importance of this research

1085
00:44:55,540 --> 00:44:52,880
for the region well most of the deltas

1086
00:44:58,560 --> 00:44:55,550
the larger Delta's in the world are

1087
00:45:02,920 --> 00:44:58,570
sinking under current sea level rise

1088
00:45:06,490 --> 00:45:02,930

they are threatened so they have to

1089
00:45:09,370 --> 00:45:06,500
accumulate sufficient soil and elevate

1090
00:45:12,100 --> 00:45:09,380
the ground to keep up with sea-level

1091
00:45:15,310 --> 00:45:12,110
rise in the Mississippi Delta we're

1092
00:45:17,230 --> 00:45:15,320
looking at our most ten millimeters of

1093
00:45:19,180 --> 00:45:17,240
relative sea-level rise so that includes

1094
00:45:22,780 --> 00:45:19,190
subsidence of the ground and sea level

1095
00:45:25,180 --> 00:45:22,790
rise itself so it has to accumulate a

1096
00:45:28,600 --> 00:45:25,190
lot of sediment so we see on the

1097
00:45:32,320 --> 00:45:28,610
monitors now the loss of land so those

1098
00:45:36,250 --> 00:45:32,330
red areas or the loss of lands in the

1099
00:45:38,530 --> 00:45:36,260
Mississippi Delta so if you take this

1100
00:45:42,190 --> 00:45:38,540
land area that has been lost in the last

1101
00:45:44,770 --> 00:45:42,200
few decades we're losing land at the

1102
00:45:48,210 --> 00:45:44,780
rate similar to one football field every

1103
00:45:50,440 --> 00:45:48,220
hour so in other words better

1104
00:45:52,570 --> 00:45:50,450
understanding of what to expect in the

1105
00:45:54,820 --> 00:45:52,580
future will help inform the planning yes

1106
00:45:57,190 --> 00:45:54,830
so that that model that we're

1107
00:45:59,680 --> 00:45:57,200
calibrating once it's calibrated we can

1108
00:46:02,620 --> 00:45:59,690
use it to predict which parts of the

1109
00:46:05,350 --> 00:46:02,630
Mississippi Delta will be drowning under

1110
00:46:07,840 --> 00:46:05,360
sea level rise and which ones will

1111
00:46:10,050 --> 00:46:07,850
survive so that way we can actually use

1112
00:46:12,870 --> 00:46:10,060
that model to guide and

1113
00:46:15,290 --> 00:46:12,880

support potential restoration projects

1114
00:46:17,430 --> 00:46:15,300
this seems like very fascinating work

1115
00:46:21,120 --> 00:46:17,440
mark how did you get involved in this

1116
00:46:23,970 --> 00:46:21,130
kind of science so my background is

1117
00:46:29,340 --> 00:46:23,980
physics so I tend to like things that

1118
00:46:31,440 --> 00:46:29,350
are complex not only is the system

1119
00:46:34,680 --> 00:46:31,450
complex because of the power deity the

1120
00:46:37,320 --> 00:46:34,690
constant the perpetual dance between the

1121
00:46:39,870 --> 00:46:37,330
ocean and the river which comes in and

1122
00:46:43,050 --> 00:46:39,880
out but there's also the complexity due

1123
00:46:44,910 --> 00:46:43,060
to the people right I like people and I

1124
00:46:47,760 --> 00:46:44,920
think at this point science is

1125
00:46:51,120 --> 00:46:47,770
sufficiently advanced so that it can be

1126
00:46:53,490 --> 00:46:51,130
used to help people and care for the

1127
00:46:55,440 --> 00:46:53,500
livelihood of those half billion people

1128
00:46:58,080 --> 00:46:55,450
that live across the world in these

1129
00:47:00,390 --> 00:46:58,090
coastal areas okay well thanks so much

1130
00:47:01,890 --> 00:47:00,400
mark I agree it's important work you

1131
00:47:03,480 --> 00:47:01,900
know one of the key instruments that is

1132
00:47:06,240 --> 00:47:03,490
gonna be used for Delta X is the

1133
00:47:09,420 --> 00:47:06,250
uninhabited aerial vehicle synthetic

1134
00:47:10,950 --> 00:47:09,430
aperture radar UAV SAR and it happens to

1135
00:47:13,800 --> 00:47:10,960
be right behind us

1136
00:47:16,170 --> 00:47:13,810
Dean Neely is going to reprise his role

1137
00:47:18,000 --> 00:47:16,180
as NASA pilot and talk about what it's

1138
00:47:21,870 --> 00:47:18,010

like to fly these science flights

1139
00:47:24,870 --> 00:47:21,880
gucchi take it away all right welcome

1140
00:47:26,070 --> 00:47:24,880
back so today as you just heard a little

1141
00:47:28,470 --> 00:47:26,080
bit about that you have a science

1142
00:47:30,450 --> 00:47:28,480
mission looking down at the surface of

1143
00:47:33,480 --> 00:47:30,460
the earth in all different parts of the

1144
00:47:35,310 --> 00:47:33,490
world the aircraft behind me is what was

1145
00:47:38,130 --> 00:47:35,320
formerly an Air Force c20 it's a

1146
00:47:40,260 --> 00:47:38,140
Gulfstream GE and if you look at the the

1147
00:47:42,390 --> 00:47:40,270
white pod over my shoulder here that's

1148
00:47:44,430 --> 00:47:42,400
at the bottom of the aircraft that is

1149
00:47:47,010 --> 00:47:44,440
the main science instrument that

1150
00:47:49,980 --> 00:47:47,020
synthetic aperture radar is what we take

1151
00:47:54,530 --> 00:47:49,990
up high in the Earth's atmosphere where

1152
00:47:57,810 --> 00:47:54,540
we can fly through a very precise path

1153
00:48:00,120 --> 00:47:57,820
repeatedly and look at slight movements

1154
00:48:04,190 --> 00:48:00,130
down on the Earth's surface whether it's

1155
00:48:06,960 --> 00:48:04,200
looking at topography changes vegetation

1156
00:48:10,500 --> 00:48:06,970
earthquake fault lines any movement

1157
00:48:13,980 --> 00:48:10,510
there glacier movements volcanoes that

1158
00:48:16,500 --> 00:48:13,990
sort of thing this instrument here the

1159
00:48:18,630 --> 00:48:16,510
the radar pod underneath it has been

1160
00:48:20,940 --> 00:48:18,640
coupled to a special precision auto

1161
00:48:22,329 --> 00:48:20,950
pilot in the aircraft that NASA's

1162
00:48:25,719 --> 00:48:22,339
heavily modified

1163
00:48:28,890 --> 00:48:25,729

so that the pilots can repeatedly fly

1164
00:48:32,259 --> 00:48:28,900
through a small ten-minute are 10 meter

1165
00:48:35,499 --> 00:48:32,269
- think of it as like flying through a

1166
00:48:37,539 --> 00:48:35,509
soda straw and put that radar looking at

1167
00:48:39,880 --> 00:48:37,549
the exact same position repeatedly

1168
00:48:42,429 --> 00:48:39,890
whether it's a couple of days later or

1169
00:48:44,559 --> 00:48:42,439
several months or a year later and look

1170
00:48:46,929 --> 00:48:44,569
at changes on the Earth's surface and

1171
00:48:49,449 --> 00:48:46,939
that's an amazing thing to do from up in

1172
00:48:52,059 --> 00:48:49,459
the aircraft the way we operate that is

1173
00:48:55,259 --> 00:48:52,069
the pilots will hand fly on the normal

1174
00:48:57,999 --> 00:48:55,269
aircraft autopilot and maneuver into

1175
00:49:00,189 --> 00:48:58,009
using some of the symbology we have tied

1176
00:49:03,400 --> 00:49:00,199
to that radar pod to get the aircraft

1177
00:49:05,679 --> 00:49:03,410
and the synthetic aperture radar right

1178
00:49:07,870 --> 00:49:05,689
where they need it and then we couple up

1179
00:49:10,150 --> 00:49:07,880
that precision autopilot and then the

1180
00:49:12,400 --> 00:49:10,160
magic starts to happen there and that's

1181
00:49:14,469 --> 00:49:12,410
where the observation happens on the

1182
00:49:17,109 --> 00:49:14,479
Earth's surface looking at just my new

1183
00:49:18,969 --> 00:49:17,119
changes down to a centimeter and that's

1184
00:49:21,579 --> 00:49:18,979
how we're able to study how the behavior

1185
00:49:23,620 --> 00:49:21,589
of the earth itself is going from the

1186
00:49:26,229 --> 00:49:23,630
pilots perspective it's a great

1187
00:49:27,759 --> 00:49:26,239
opportunity to fly a beautiful business

1188
00:49:30,519 --> 00:49:27,769

jet like this in a very different

1189
00:49:32,949 --> 00:49:30,529
environment so typically what we're

1190
00:49:35,410 --> 00:49:32,959
doing up there is working as a team with

1191
00:49:37,209 --> 00:49:35,420
a radar operator in the back and a

1192
00:49:40,870 --> 00:49:37,219
mission director along with the two

1193
00:49:43,419 --> 00:49:40,880
pilots and we coordinate all the action

1194
00:49:46,419 --> 00:49:43,429
again to put the objective is to put

1195
00:49:48,669 --> 00:49:46,429
that radar right in the exact spot that

1196
00:49:51,549 --> 00:49:48,679
we had previously put it on for other

1197
00:49:54,099 --> 00:49:51,559
missions and we can compare that data it

1198
00:49:56,859 --> 00:49:54,109
takes a lot of skill it's very frantic

1199
00:49:59,529 --> 00:49:56,869
in the last few seconds as we fly into

1200
00:50:01,599 --> 00:49:59,539
the tube by hand and then couple up that

1201
00:50:03,429 --> 00:50:01,609
autopilot but it's very rewarding when

1202
00:50:05,589 --> 00:50:03,439
you get to see some of the the final

1203
00:50:07,599 --> 00:50:05,599
product and see what comes out of the

1204
00:50:12,099 --> 00:50:07,609
study as you just heard a little bit

1205
00:50:13,509 --> 00:50:12,109
about there all right it's it's a nice

1206
00:50:14,979 --> 00:50:13,519
opportunity not to have to wear a

1207
00:50:16,419 --> 00:50:14,989
spacesuit in this one as well as you can

1208
00:50:18,999 --> 00:50:16,429
see I look a little bit more comfortable

1209
00:50:21,339 --> 00:50:19,009
here and I have all my senses back and I

1210
00:50:23,559 --> 00:50:21,349
can eat and drink and that sort of thing

1211
00:50:24,969 --> 00:50:23,569
so we enjoy flying this as well as all

1212
00:50:26,289 --> 00:50:24,979
the other platforms that you're going to

1213
00:50:28,449 --> 00:50:26,299

hear about today that carry these

1214
00:50:29,609 --> 00:50:28,459
amazing science instruments as we study

1215
00:50:32,679 --> 00:50:29,619
the Earth's atmosphere

1216
00:50:35,559 --> 00:50:32,689
alright Samson back to you thanks so

1217
00:50:37,599 --> 00:50:35,569
much Buchi well there you have it folks

1218
00:50:39,789 --> 00:50:37,609
five campaigns spread out across the

1219
00:50:41,769 --> 00:50:39,799
u.s. tackling a diverse set of science

1220
00:50:44,079 --> 00:50:41,779
questions but this is only the beginning

1221
00:50:45,969 --> 00:50:44,089
we want you to keep following us as we

1222
00:50:49,420 --> 00:50:45,979
cover each of these campaigns throughout

1223
00:50:51,880 --> 00:50:49,430
the year we posting blogs photos videos

1224
00:50:54,130 --> 00:50:51,890
we'll have Q&A s will be giving as much

1225
00:50:56,620 --> 00:50:54,140
of the action as we possibly can please

1226
00:50:59,229 --> 00:50:56,630
follow us on nasa.gov slash earth

1227
00:51:01,719 --> 00:50:59,239
expeditions for all the latest and also

1228
00:51:03,370 --> 00:51:01,729
follow us on social media and NASA Earth