1
00:00:02,516 --> 00:00:18,606
[Music]

2
00:00:19,106 --> 00:00:19,886
>> You got the other one?

3
00:00:20,866 --> 00:00:21,876
>> Yeah, you want
to torque it though?

4
00:00:22,046 --> 00:00:25,056
>> No, if you've got it tight.

5
00:00:28,476 --> 00:00:31,886
>> The goal of the El Nino rapid
response experiment is to look

6
00:00:31,886 --> 00:00:35,966
at how changes in the weather
patterns, the evaporation

7
00:00:35,966 --> 00:00:37,296
of moisture in the tropics,

8
00:00:37,646 --> 00:00:39,946
how that is changed during
a major El Nino event

9
00:00:39,946 --> 00:00:41,286
like the current one out there.

10
00:00:41,666 --> 00:00:45,666
And then to look at how those
changes further impact the

11
00:00:45,666 --> 00:00:47,616
weather on the west coast
of the United States.

12
00:00:48,276 --> 00:00:49,406
My name is Gary Wick.

13
00:00:49,536 --> 00:00:52,756
I'm a physicist with NOAA Earth
System Research Laboratory,

14
00:00:52,756 --> 00:00:54,986
physical sciences
division in Boulder.

15
00:00:55,316 --> 00:00:56,786
And I'm on assignment

16
00:00:56,786 --> 00:00:58,966
to the unmanned aircraft
systems program within NOAA.

17
00:01:07,136 --> 00:01:09,776
>> Boy that was the
easiest we ever did it.

18
00:01:10,086 --> 00:01:12,836
>> During this campaign we have
four instruments onboard the

19
00:01:12,836 --> 00:01:13,656
Global Hawk Aircraft.

20
00:01:14,366 --> 00:01:16,546
The first is a dropsonde system,

21
00:01:17,216 --> 00:01:21,406
which it deploys the
very small sensors,

22
00:01:21,516 --> 00:01:23,696
much like weather
balloons that go up.

23
00:01:23,746 --> 00:01:24,576
But these go down.

24
00:01:24,976 --> 00:01:26,746
So these small sensors,
they're about the size

25
00:01:26,746 --> 00:01:27,886
of a paper towel roll,

26
00:01:28,296 --> 00:01:30,976
and as they fall they
collect very high resolution,

27
00:01:30,976 --> 00:01:33,536
vertical resolution
measurements of temperature,

28
00:01:33,656 --> 00:01:35,096
humidity and wind speed.

29
00:01:35,436 --> 00:01:38,006
So they give us a very detailed
picture of the atmosphere.

30
00:01:38,106 --> 00:01:39,086
>> Ready Mike?

31
00:01:39,086 --> 00:01:39,256
>> Yeah.

32
00:01:39,256 --> 00:01:43,366
>> In addition to that,
we have the HAMSR,

33
00:01:43,876 --> 00:01:46,686
which is a microwave
sounding instrument.

34
00:01:46,916 --> 00:01:49,306
And that provides
sampling much like one

35
00:01:49,306 --> 00:01:51,926
of the weather satellites
that is used extensively

36
00:01:51,926 --> 00:01:52,826
in our weather models.

37
00:01:54,886 --> 00:01:57,276
The third instrument is HIWRAP.

38
00:01:57,556 --> 00:01:59,976
It's a Doppler precipitation
radar.

39
00:02:00,406 --> 00:02:02,296
So just like the weather
radars on the ground,

40
00:02:02,296 --> 00:02:04,356
we're flying a radar
on the aircraft

41
00:02:04,726 --> 00:02:06,926
which gives three
dimensional coverage

42
00:02:06,976 --> 00:02:09,596
of precipitation
of rain droplets.

43
00:02:10,076 --> 00:02:12,206
And with information
from those rain droplets,

44

00:02:12,326 --> 00:02:14,376
we can drive continuous
measurements

45
00:02:14,376 --> 00:02:16,636
of the wind speed
in the atmosphere.

46
00:02:17,006 --> 00:02:20,656
The final instrument is
the NOAA ozone sensor,

47
00:02:20,976 --> 00:02:23,696
which provides measurements
of ozone concentration

48
00:02:23,816 --> 00:02:25,566
at the flight level
of the Global Hawk.

49
00:02:26,686 --> 00:02:31,036
The Global Hawk provides amazing
capability for this experiment,

50
00:02:31,036 --> 00:02:33,376
just in its ability
to be airborne

51
00:02:33,376 --> 00:02:35,176
for up to 24 hours or more.

52
00:02:35,616 --> 00:02:37,576
But by being aloft
for that long,

53
00:02:37,576 --> 00:02:40,976
we can sample a large
range of the ocean.

54
00:02:40,976 --> 00:02:42,806

You know, almost like
a satellite does.

55
00:02:43,156 --> 00:02:46,266
With the Global Hawk we
get very detailed sampling

56
00:02:46,266 --> 00:02:49,186
like an aircraft but
with the endurance

57
00:02:49,186 --> 00:02:50,526
that a satellite would give us.

58
00:02:50,896 --> 00:02:54,576
So we're able to sample this
large area and look at changes

59
00:02:54,576 --> 00:02:56,786
in the atmosphere that
wouldn't be possible

60
00:02:56,786 --> 00:02:58,666
with other traditional
manned aircraft.

61
00:03:02,146 --> 00:03:03,576
>> My name is John Neuhaus.

62
00:03:03,576 --> 00:03:06,536
I'm Deputy Project Manager for
the NASA Global Hawk program.

63
00:03:06,536 --> 00:03:07,966
I'm actually a commissioned
officer

64
00:03:08,396 --> 00:03:09,596
with the NOAA Commission Corps.

65
00:03:09,976 --> 00:03:12,556
I've been flying the Global Hawk
here at NASA for four years,

66
00:03:12,936 --> 00:03:14,866
as an aircraft commander
and instructor pilot.

67
00:03:15,606 --> 00:03:16,676
So as you can see here,

68
00:03:16,676 --> 00:03:19,526
the Global Hawk has no
yoke or stick to fly with.

69
00:03:19,966 --> 00:03:22,536
We use a mouse from
takeoff to landing,

70
00:03:22,576 --> 00:03:24,256
climb and descents
when we're underway.

71
00:03:24,536 --> 00:03:26,436
Everything is automated
in the Global Hawk.

72
00:03:26,856 --> 00:03:30,276
So all I need to do is do a
mouse click here on the screen

73
00:03:30,276 --> 00:03:33,026
to say take off or
to land, climb,

74
00:03:33,026 --> 00:03:34,686
descent, maintain an altitude.

75
00:03:35,026 --> 00:03:37,276

Everything is done
by this mouse click.

76
00:03:37,276 --> 00:03:39,576
And it's very much like flying

77
00:03:39,576 --> 00:03:41,996
in autopilot in a
manned aircraft.

78
00:03:43,716 --> 00:03:46,456
And what NOAA is using
this is as a study

79
00:03:46,456 --> 00:03:50,926
to use unmanned aerial vehicles
over high impact weather events

80
00:03:50,926 --> 00:03:54,346
such as hurricanes, and in this
campaign we're actually using it

81
00:03:54,346 --> 00:03:55,916
over El Nino events
in the Pacific.

82
00:03:56,296 --> 00:03:59,566
We're going to be working
with Air Force C-130s.

83
00:03:59,566 --> 00:04:01,276
We're going to be working
with NOAA gulf streams.

84
00:04:01,856 --> 00:04:03,946
And also a NOAA ship,
the Ronald H. Brown.

85
00:04:04,526 --> 00:04:09,136
So we've got C-130s covering one

part, G-4 covering another part,

86
00:04:09,166 --> 00:04:10,686
and the ship covering
other stuff.

87
00:04:11,056 --> 00:04:13,976
And we're going to be in the
parts that are harder to reach.

88
00:04:29,126 --> 00:04:31,996
We typically take off at first
light so we can get to the area

89
00:04:31,996 --> 00:04:36,256
of interest to study El Nino
weather per the science request.

90
00:04:36,256 --> 00:04:39,016
This usually takes about
eight hours to transit

91
00:04:39,016 --> 00:04:40,256
to the area that we're studying.

92
00:04:40,756 --> 00:04:43,776
And once we're there we spend
several hours analyzing all kind

93
00:04:43,776 --> 00:04:46,696
of weather phenomena that
has piqued the interest

94
00:04:46,696 --> 00:04:47,966
of the scientist.

95
00:04:47,966 --> 00:04:49,216
It usually takes
about eight hours

96
00:04:49,216 --> 00:04:51,286
to bring the plane back
home, so that gives us

97
00:04:51,286 --> 00:04:54,506
about a total flight time of
24 hours per each sorte.

98
00:05:02,046 --> 00:05:04,686
>> I'm Herman Posada, and I'm
a UAS Research Pilot here

99
00:05:04,686 --> 00:05:06,796
at NASA Armstrong
Flight Research Center.

100
00:05:07,126 --> 00:05:09,206
And I fly the Global Hawk
for airborne science.

101
00:05:10,086 --> 00:05:12,836
While we're flying the aircraft
from launching many screens,

102
00:05:12,836 --> 00:05:15,556
mostly we're looking at
we're on the right track

103
00:05:15,556 --> 00:05:17,626
that science has
requested us to fly on.

104
00:05:18,096 --> 00:05:20,536
We are also obviously
looking at various parameters

105
00:05:20,536 --> 00:05:22,466
of the aircraft, make sure
we don't get into any trouble

106
00:05:22,466 --> 00:05:25,446
with the airspeed,
altitude, or the heading.

107
00:05:25,816 --> 00:05:28,026
The flight plans
continuously gets updated

108
00:05:28,026 --> 00:05:30,406
as science changes
the area of interest.

109
00:05:30,456 --> 00:05:32,886
Obviously these storms
are moving,

110
00:05:33,096 --> 00:05:36,236
and we are trying to
keep up with them.

111
00:05:37,056 --> 00:05:40,056
>> So in the Global Hawk
Operations Center during a

112
00:05:40,056 --> 00:05:42,996
flight, we're going to
be monitoring the flight

113
00:05:42,996 --> 00:05:46,636
with this wonderful mission
tool suite capability

114
00:05:46,636 --> 00:05:47,896
that NASA has developed.

115
00:05:47,896 --> 00:05:50,716
And with that, it allows
us to see the data coming

116

00:05:50,716 --> 00:05:54,106
in from the aircraft in
real time, satellite data

117
00:05:54,266 --> 00:05:56,036
and multiple things for us

118
00:05:56,036 --> 00:05:58,216
to really see what's
happening as we go along.

119
00:05:58,606 --> 00:06:03,436
And so we'll be watching for is
can we see the weather patterns?

120
00:06:03,436 --> 00:06:07,736
Can we see patterns in the
humidity that let us know

121
00:06:07,736 --> 00:06:10,346
that we're sampling the areas
that are eventually going

122
00:06:10,346 --> 00:06:13,266
to move downstream
and impact the US?

123
00:06:13,446 --> 00:06:16,016
The Global Hawk's a one-of-a-kind capability

124
00:06:16,206 --> 00:06:19,676
that in NOAA we have a
great observing system

125
00:06:19,676 --> 00:06:22,266
from satellites to
aircraft to ships.

126
00:06:22,646 --> 00:06:23,796
But there's nothing

127
00:06:23,796 --> 00:06:25,896
that provides the
capability of the Global Hawk.

128
00:06:25,896 --> 00:06:28,636
So within NOAA we
really want to see

129
00:06:28,696 --> 00:06:31,056
if that is a really
good addition

130
00:06:31,056 --> 00:06:32,546
to our current observing system.

131
00:06:33,026 --> 00:06:34,116
And so by collaborating

132
00:06:34,116 --> 00:06:36,636
with NASA we get this
wonderful opportunity

133
00:06:36,636 --> 00:06:40,986
to test its capabilities, see
its impact on the forecast,

134
00:06:40,986 --> 00:06:42,516
and then hopefully
that opens the door

135
00:06:42,516 --> 00:06:45,266
for a broader collaboration
down the line