1
00:00:01,000 --> 00:00:02,720
■

2
00:00:02,720 --> 00:00:04,280
>>This is a lab.

3
00:00:05,240 --> 00:00:07,000
Measuring instrumentation,

4
00:00:07,000 --> 00:00:08,000
probes,

5
00:00:08,000 --> 00:00:09,080
sensors,

6
00:00:09,080 --> 00:00:10,960
gas and liquid chemicals,

7
00:00:10,960 --> 00:00:12,320
computers...

8
00:00:13,440 --> 00:00:15,240
Yeah! This is a lab...

9
00:00:15,720 --> 00:00:17,800
But maybe not the lab
you would expect...

10
00:00:18,560 --> 00:00:21,880
Meet the NASA DC-8
airborne laboratory.

11
00:00:38,120 --> 00:00:41,520
>>The airplane is designed for
different instrumentation suites

12
00:00:41,520 --> 00:00:44,080
depending on the the

missions that we fly.

13
00:00:44,440 --> 00:00:46,320
We have multiple zenith

14
00:00:46,320 --> 00:00:47,840
ports that look up,

15
00:00:47,840 --> 00:00:48,840
we have multiple nadir

16
00:00:48,840 --> 00:00:49,840
ports that look down

17
00:00:49,840 --> 00:00:51,760
and, of course, many of
the window blanks there.

18
00:00:56,480 --> 00:00:58,800
>>There are 25 instruments
onboard the aircraft,

19
00:00:59,040 --> 00:01:01,280
not only from NASA,
but from many universities

20
00:01:01,280 --> 00:01:03,560
and other government labs
and organizations

21
00:01:03,760 --> 00:01:06,160
and together they paint
a picture of the atmosphere

22
00:01:06,160 --> 00:01:07,160
that can allow us

23
00:01:07,160 --> 00:01:08,480
to completely evaluate

24
00:01:08,480 --> 00:01:10,680
what emission
sources in the peninsula

25
00:01:10,680 --> 00:01:12,640
are contributing
to poor air quality

26
00:01:12,880 --> 00:01:14,800
and how the chemistry
actually works

27
00:01:14,800 --> 00:01:16,800
in terms of the outcome
at the end of the day

28
00:01:16,800 --> 00:01:19,400
when ozone and particles
are such a concern.

29
00:01:19,680 --> 00:01:21,680
>>This integration is about
as big as we do

30
00:01:21,680 --> 00:01:23,760
and, if you have seen
onboard the airplane,

31
00:01:23,760 --> 00:01:26,280
you can see it's very full
with all the racks

32
00:01:26,280 --> 00:01:30,760
and most of the windows covered
with the in-situ probes

33
00:01:32,200 --> 00:01:35,600
>>The KORUS-AQ campaign
will gather air quality data

34
00:01:35,600 --> 00:01:38,760
in and around the Korean
peninsula from multiple sources

35
00:01:38,760 --> 00:01:41,640
such as ground stations
and maritime sensors.

36
00:01:41,880 --> 00:01:44,080
However, the KORUS-AQ aircraft

37
00:01:44,080 --> 00:01:47,000
will be the ones to provide
the most detailed information

38
00:01:47,000 --> 00:01:51,200
over a larger geographical area
and at different altitudes.

39
00:01:52,960 --> 00:01:55,360
>>So in order to understand
how it all works

40
00:01:55,360 --> 00:01:57,520
we have several aircraft
that we have to fly.

41
00:01:57,520 --> 00:01:59,240
One is the one I'm
standing on right now

42
00:01:59,240 --> 00:02:00,720
the NASA DC-8.

43
00:02:00,880 --> 00:02:03,720
The DC-8's role is to measure
the atmosphere directly.

44

00:02:03,960 --> 00:02:06,600
From this aircraft we can
measure over 100

45
00:02:06,600 --> 00:02:08,440
different compounds
in the atmosphere.

46
00:02:08,640 --> 00:02:10,960
>>The airplane flies
as easily at 500 ft

47
00:02:10,960 --> 00:02:13,400
as it does at higher altitudes.

48
00:02:13,640 --> 00:02:16,360
That enables us to do
both remote sensing,

49
00:02:16,360 --> 00:02:19,240
which is using radars...
or LIDARs...

50
00:02:19,240 --> 00:02:21,040
as well as we can fly lower.

51
00:02:21,040 --> 00:02:23,440
We can do vertical profiles
with our in-situ sensors,

52
00:02:23,440 --> 00:02:26,040
which is currently what we
got mostly on this airplane.

53
00:02:26,240 --> 00:02:27,600
>>In order to understand the
atmosphere, there are

54
00:02:27,600 --> 00:02:29,920
many different molecules

that we have to measure.

55
00:02:30,200 --> 00:02:32,080
The satellite will not
see all of them.

56
00:02:32,320 --> 00:02:35,160
And so by being able to measure
what the satellite will see

57
00:02:35,160 --> 00:02:37,600
and, at the same time,
see all of the details

58
00:02:37,600 --> 00:02:40,320
we can begin to understand
what sources,

59
00:02:40,320 --> 00:02:44,160
what meteorologies and
what combinations of conditions

60
00:02:44,160 --> 00:02:46,280
will affect what we
see from space.

61
00:02:47,160 --> 00:02:49,720
>>By combining detailed
measurements from aircraft

62
00:02:49,720 --> 00:02:52,600
with those made by satellites,
we can get a better picture

63
00:02:52,600 --> 00:02:54,800
of pollutants in
our atmosphere.

64
00:02:58,680 --> 00:03:01,080
>>So this aircraft

carries instruments

65
00:03:01,080 --> 00:03:03,520
that work just like the
satellite instruments.

66
00:03:03,520 --> 00:03:08,080
The higher we fly, the wider
the patch of earth we can see.

67
00:03:08,880 --> 00:03:12,000
>>During the campaign,
NASA King Air aircraft

68
00:03:12,000 --> 00:03:15,040
will mimic the measurements
future satellites will make.

69
00:03:18,040 --> 00:03:21,920
>>We fly at about 28,000 feet
and, at that altitude,

70
00:03:22,280 --> 00:03:25,200
we see about a 5 mile

71
00:03:25,200 --> 00:03:27,280
wide patch of ground.

72
00:03:27,400 --> 00:03:28,400
Like mowing the grass!

73
00:03:28,400 --> 00:03:29,400
We're trying to cover

74
00:03:29,400 --> 00:03:30,680
a patch on the ground

75
00:03:30,680 --> 00:03:32,120
continuously and make a map

76
00:03:32,120 --> 00:03:34,720
of what the pollutant
distribution looks like.

77
00:03:38,680 --> 00:03:40,600
>>So we have a small
King Air aircraft

78
00:03:40,600 --> 00:03:42,840
flying above all
throughout the day

79
00:03:42,840 --> 00:03:44,480
measuring the way
the future satellite

80
00:03:44,480 --> 00:03:45,480
will measure air quality.

81
00:03:46,120 --> 00:03:48,480
Meanwhile, the DC-8
flies underneath

82
00:03:48,480 --> 00:03:51,320
showing what the distribution of
pollution is above the ground.

83
00:03:51,800 --> 00:03:54,040
That allows us to understand
how to connect

84
00:03:54,040 --> 00:03:56,680
what the satellite sees
with what's at ground level.

85
00:03:59,400 --> 00:04:03,640
>>KORUS-AQ has in its team
two smaller aircraft equipped

86
00:04:03,640 --> 00:04:06,680
with atmospheric chemistry
measuring instrumentation.

87
00:04:07,600 --> 00:04:10,320
a King Air from
NASA Langley Research Center,

88
00:04:10,600 --> 00:04:12,280
and a King Air provided to the

89
00:04:12,280 --> 00:04:15,280
Korean National Institute for
Environmental Research

90
00:04:15,280 --> 00:04:17,080
by Hanseo University.

91
00:04:20,000 --> 00:04:24,960
>>HANSEO King Air aircraft is
relatively similar to NASA DC-8.

92
00:04:24,960 --> 00:04:26,560
It can freely access

93
00:04:26,560 --> 00:04:27,600
sources of pollution

94
00:04:27,600 --> 00:04:28,880
and measure air quality

95
00:04:28,880 --> 00:04:30,200
in the capital territory

96
00:04:30,200 --> 00:04:33,600
that cannot be
approached using the DC-8.

97

00:04:35,440 --> 00:04:39,520
>>Working all together, scientists
from the KORUS-AQ campaign,

98
00:04:39,520 --> 00:04:42,880
will provide valuable data and
test the technologies needed

99
00:04:42,880 --> 00:04:45,000
to better understand air quality

100
00:04:45,000 --> 00:04:48,040
and the flow of pollutants
within our atmosphere.

101
00:04:49,640 --> 00:04:51,800
>>We can only fly the planes
for a very short period

102
00:04:51,800 --> 00:04:53,000
but the details

103
00:04:53,000 --> 00:04:54,640
that you get from the aircraft,

104
00:04:54,640 --> 00:04:56,840
help inform the observations

105
00:04:56,840 --> 00:04:58,320
from space and from the ground

106
00:04:58,320 --> 00:05:01,240
and how models can
interpret those observations.

107
00:05:04,760 --> 00:05:06,800
>>From this mission
we will have better models

108

00:05:06,800 --> 00:05:10,160
and better mission
data for Asia.

109
00:05:10,160 --> 00:05:13,400
And so we'll be able to
extend the usefulness of this

110
00:05:13,400 --> 00:05:15,400
well beyond South Korea

111
00:05:15,400 --> 00:05:17,000
to other developing cities

112
00:05:17,000 --> 00:05:18,400
around the world.