
HOND
BOSTON
WHALER

1
00:00:04,870 --> 00:00:05,870
[MUSIC]

2
00:00:05,870 --> 00:00:10,420
WELCOME TO EARTH EXPEDITIONS- AN IN DEPTH
LOOK AT HOW NASA STUDIES EARTH, BEYOND SATELLITES.

3
00:00:10,420 --> 00:00:15,280
THE VIEW FROM SPACE GIVES US A GLOBAL PICTURE,
BUT WE GO CLOSER TO THE GROUND TO GET A GRANULAR

4
00:00:15,280 --> 00:00:21,650
VIEW OF WHAT'S GOING ON BY USING SHIPS,
AIRCRAFT, GROUND STATIONS AND OUR OWN EYES.

5
00:00:21,650 --> 00:00:24,300
WE CALL THESE CLOSER LOOKS "FIELD CAMPAIGNS".

6
00:00:24,300 --> 00:00:27,489
NASA HAS A LONG HISTORY OF FIELD CAMPAIGNS.

7
00:00:27,489 --> 00:00:31,810
JUST IN THE PAST MONTHS, NASA SCIENTISTS HAVE
BEEN ALL OVER THE WORLD—FROM THE GLACIERS

8
00:00:31,810 --> 00:00:36,149
IN GREENLAND TO THE FORESTS OF SOUTH KOREA,
TO THE CRASHING WAVES OF THE NORTH ATLANTIC.

9
00:00:36,149 --> 00:00:40,460
WE'RE GETTING THE DATA THAT IS REVEALING
THE SECRETS ABOUT OUR CHANGING PLANET.

10
00:00:40,460 --> 00:00:41,460
ALOHA!

11
00:00:41,460 --> 00:00:43,429
AND WELCOME BACK TO NASA'S EARTH EXPEDITIONS.

12
00:00:43,429 --> 00:00:47,379
TODAY WE'RE GOING TO HAWAII TO STUDY ONE
OF THE MOST DYNAMIC AND EXCITING PARTS OF

13
00:00:47,379 --> 00:00:49,210
THE EARTH SYSTEM, CORAL REEFS.

14
00:00:49,210 --> 00:00:52,440
THEY'RE A SOURCE FOR FOOD, MEDICAL ADVANCES,
TOURISM.

15
00:00:52,440 --> 00:00:55,230
AND THEY'RE AMAZING—HARD CORALS HAVE ACTUALLY
OUTLIVED DINOSAURS!

16
00:00:55,230 --> 00:00:59,839
IF YOU SEARCH ONLINE FOR "CORAL REEF IMAGES"
YOU PROBABLY THINK WE KNOW A LOT ABOUT THEM.

17
00:00:59,839 --> 00:01:04,750
WE SIMPLE DON'T HAVE ENOUGH DATA TO UNDERSTAND
WHICH IMPACTS TO THE REEF ARE THE MOST DAMAGING.

18
00:01:04,750 --> 00:01:08,810
AND THAT MAKES IT IMPOSSIBLE TO FIGURE OUT
HOW REEFS ARE GOING TO CHANGE IN THE FUTURE.

19
00:01:08,810 --> 00:01:13,210
SO THAT'S WHY WE'RE SENDING OUT NASA'S
MISSION APPROPRIATELY NAMED CORAL, THE CORAL

20
00:01:13,210 --> 00:01:15,280
REEF AIRBORNE LABORATORY.

21
00:01:15,280 --> 00:01:18,580
CORAL WILL LOOK AT HOW REEFS ARE RESPONDING
TO OUR CHANGE GOING ON IN OUR OCEANS RIGHT

22
00:01:18,580 --> 00:01:19,580

NOW.

23
00:01:19,580 --> 00:01:21,740
WITH TEAMS HIGH IN THE AIR AND DIVERS DOWN
IN THE OCEAN.

24
00:01:21,740 --> 00:01:25,340
TO LEARN MORE, LET'S HEAR FROM MICHELLE
IN HAWAII.

25
00:01:25,340 --> 00:01:26,620
[MUSIC]

26
00:01:26,620 --> 00:01:29,180
HEY EVERYBODY.

27
00:01:29,180 --> 00:01:32,550
MY NAME IS MICHELLE GIERACH, AND I AM THE
PROJECT SCIENTIST FOR THE CORAL REEF AIRBORNE

28
00:01:32,550 --> 00:01:34,730
LABORATORY, OR CORAL MISSION.

29
00:01:34,730 --> 00:01:39,170
RIGHT NOW WE ARE AT AIR SERVICE HAWAII WITH
THE HEART AND SOUL OF THE CORAL MISSION WHICH

30
00:01:39,170 --> 00:01:42,850
IS THE TEMPUS SUPPLIED SOLUTIONS GULF STREAM
IV, OR G4.

31
00:01:42,850 --> 00:01:48,290
WHAT MAKES THIS AIRCRAFT SO IMPORTANT TO CORAL
IS WHAT IT HAS WITHIN, INSIDE THE PLANE.

32
00:01:48,290 --> 00:01:53,290
IT IS THE PORTABLE REMOTE IMAGING SPECTROMETER,
OR PRISM INSTRUMENT, AND IT SEES THROUGH THE

33

00:01:53,290 --> 00:01:59,780
BOTTOM OF THE PLANE TO ASSES CORAL REEF CONDITION
AT 28,000 FEET ABOVE THE OCEAN SURFACE.

34
00:01:59,780 --> 00:02:06,360
WE ARE IN HAWAII AS PART OF, ONE OF OUR FIELD
CAMPAIGNS, SPECIFICALLY OUR OPERATIONAL READINESS

35
00:02:06,360 --> 00:02:11,319
TEST IN WHICH WE HAVE AN IN-WATER TEAM IN
KANEOHE BAY TAKING OBSERVATIONS.

36
00:02:11,319 --> 00:02:16,099
WE'LL HAVE THE G4 FLYING OVER COLLECTING
OBSERVATIONS.

37
00:02:16,099 --> 00:02:20,709
THE TWO TOGETHER PROVIDES AN INDICATION OF
WHAT THE CORAL REEF CONDITION IS WITHIN KANEOHE

38
00:02:20,709 --> 00:02:21,709
BAY.

39
00:02:21,709 --> 00:02:27,219
AND THIS IS, SORT OF THE NEXUS OF CORAL - THE
IN-WATER WITH THE AIRCRAFT TO GIVE A BETTER

40
00:02:27,219 --> 00:02:31,629
UNDERSTANDING OF WHAT ARE OUR CORAL REEFS
CURRENTLY UNDERGOING, AND HOW WILL THEY CHANGE

41
00:02:31,629 --> 00:02:33,140
IN RESPECT TO CLIMATE.

42
00:02:33,140 --> 00:02:34,140
[SWOOSH]

43
00:02:34,140 --> 00:02:38,459
SO THIS MISSION IS GOING TO HELP US UNDERSTAND
CORALS A LOT BETTER THAN WE KNOW RIGHT NOW

44
00:02:38,459 --> 00:02:42,450
YEAH AND I THINK SOMETHING PEOPLE NEED TO
REALIZE IS THAT THOSE CORALS ARE DYNAMIC FEATURES

45
00:02:42,450 --> 00:02:46,819
YOU KNOW THEY CAN LIKE SHRINK AND GROW JUST
A NATURAL THINGS, THE FORCE THINGS HAPPENING

46
00:02:46,819 --> 00:02:50,512
IN CLIMATE RIGHT NOW THEY'RE CAUSING MASSIVE
CHANGES AND WE NEED TO UNDERSTAND WE NEED

47
00:02:50,512 --> 00:02:53,909
TO UNDERSTAND HOW THEY ARE CONNECTING UP TO
THE CORALS AND THAT'S WHY THE CORAL MISSION

48
00:02:53,909 --> 00:02:54,909
IS SO IMPORTANT.

49
00:02:54,909 --> 00:02:57,620
YEAH IT'S VERY UNEXPECTED SO EARLIER WE
ACTUALLY DID ANOTHER MISSION OCEAN MELTING

50
00:02:57,620 --> 00:02:59,620
GREENLAND TO MEASURE GLACIERS.

51
00:02:59,620 --> 00:03:03,840
SO HOW IS CORAL AND THESE GLACIERS IN GREENLAND
SIMILAR?

52
00:03:03,840 --> 00:03:07,430
YEAH SO YOU THINK ABOUT IT THE OCEAN IS ONE
OF THE MOST POWERFUL COMPONENTS OF THE EARTH

53
00:03:07,430 --> 00:03:12,239
SYSTEM IT STORES A LOT OF HEAT AND IN THE
CASE OF OCEANS MELTING GREENLAND OR EVEN UNDERSTANDING

54

00:03:12,239 --> 00:03:16,439
THE REEFS WE'RE DOING A COMBINATION OF THINGS,
WE GOT THESE SATELLITES GOING ACROSS THE SKY

55
00:03:16,439 --> 00:03:21,279
YOU KNOW TAKING PICTURES LOOKING DOWN AND
THEN WE HAVE OUR AIRPLANES YOU KNOW THE AIRPLANES

56
00:03:21,279 --> 00:03:25,049
GOING ACROSS AT THE LOWER LEVEL AND THEY'RE
DOING THINGS LIKE IN OCEAN MELTING GREENLAND

57
00:03:25,049 --> 00:03:29,519
YOU'RE ACTUALLY DROPPING LITTLE SENSORS INTO
THE OCEAN THAT ACTUALLY PUT A STRING OUT TO

58
00:03:29,519 --> 00:03:33,409
UNDERSTAND THE TEMPERATURE AND THE COMPOSITION
BUT THEN FOR ALL THESE MISSIONS TOO WE PUT

59
00:03:33,409 --> 00:03:39,219
PEOPLE RIGHT DOWN IN THE WATER IN BOATS WE
PUT PEOPLE OVER THE SIDE AND ALL THIS STUFF

60
00:03:39,219 --> 00:03:42,780
HAS TO COME IN CONCERT TO HELP US REALLY UNDERSTAND
THE EARTH SYSTEM.

61
00:03:42,780 --> 00:03:43,780
RIGHT, RIGHT.

62
00:03:43,780 --> 00:03:47,469
EVEN COMPUTER MODELS AT THE END OF THE DAY
WHICH IS WHAT WE PUT THIS INTO

63
00:03:47,469 --> 00:03:52,969
SO SAY YOU'RE YOUNG PERSON IN HIGH SCHOOL
OR COLLEGE, AND YOU WANT TO LEARN HOW TO BE

64
00:03:52,969 --> 00:03:54,569

A SCIENTIST INVOLVED WITH THESE MISSIONS?

65
00:03:54,569 --> 00:03:56,219
HOW DOES NASA HELP?

66
00:03:56,219 --> 00:03:58,370
NASA IS ALL ABOUT STEM EDUCATION.

67
00:03:58,370 --> 00:04:03,219
SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS
ARE THE BASIS FOR WHAT NASA DOES, SO WE HAVE

68
00:04:03,219 --> 00:04:07,299
PROGRAMS LIKE THE NASA STUDENT AIRBORNE RESEARCH
PROGRAM THAT HELP GET THE CAREER BALL ROLLING.

69
00:04:07,299 --> 00:04:11,730
LET'S HEAR FROM EMILY, OUT AT NASA'S ARMSTRONG
FLIGHT RESEARCH CENTER IN PALMDALE, CALIFORNIA

70
00:04:11,730 --> 00:04:12,730
FOR MORE DETAILS.

71
00:04:12,730 --> 00:04:14,860
[MUSIC]
HI, I'M EMILY SCHALLER, AND I'M THE PROJECT

72
00:04:14,860 --> 00:04:19,400
MANAGER FOR A NASA SUMMER INTERNSHIP CALLED
THE STUDENT AIRBORNE RESEARCH PROGRAM, OR

73
00:04:19,400 --> 00:04:20,400
NASA SARP.

74
00:04:20,400 --> 00:04:24,520
I'M HERE AT NASA ARMSTRONG FLIGHT RESEARCH
CENTER IN PALMDALE, CALIFORNIA.

75
00:04:24,520 --> 00:04:29,410

AS YOU CAN SEE, THIS IS A MASSIVE HANGAR FOR
NASA'S FLYING LABORATORIES, INCLUDING THIS

76
00:04:29,410 --> 00:04:34,230
PLANE, THE DC-8, WHICH IS USED FOR EARTH SCIENCE
RESEARCH ALL OVER THE WORLD.

77
00:04:34,230 --> 00:04:37,860
THIRTY-TWO STUDENTS FROM THIRTY-TWO DIFFERENT
COLLEGES AND UNIVERSITIES FROM ACROSS THE

78
00:04:37,860 --> 00:04:42,699
UNITED STATES JUST FLEW ONBOARD THE DC-8 OVER
SOUTHERN AND CENTRAL CALIFORNIA.

79
00:04:42,699 --> 00:04:45,180
SARP IS AN OPPORTUNITY OF A LIFETIME.

80
00:04:45,180 --> 00:04:49,960
STUDENTS GET AN END-TO-END, HANDS-ON RESEARCH
EXPERIENCE IN ALL ASPECTS OF AN AIRBORNE EARTH

81
00:04:49,960 --> 00:04:50,960
SCIENCE CAMPAIGN.

82
00:04:50,960 --> 00:04:56,599
THEY HAVE THE OPPORTUNITY TO WORK SIDE-BY-SIDE
WITH NASA SCIENTISTS, PILOTS AND ENGINEERS.

83
00:04:56,599 --> 00:05:02,020
THIS YEAR, STUDENTS ARE COLLECTING DATA WITH
A SUITE OF INSTRUMENTS USED BY THE RECENTLY

84
00:05:02,020 --> 00:05:05,310
COMPLETED KOREA U.S. AIR QUALITY MISSION,
OR KORUS-AQ.

85
00:05:05,310 --> 00:05:09,419
STUDENTS HELP OPERATE SCIENTIFIC INSTRUMENTS
IN-FLIGHT IN CONDITIONS NOT TYPICALLY FLOWN

86
00:05:09,419 --> 00:05:11,389
ON COMMERCIAL AIRCRAFT.

87
00:05:11,389 --> 00:05:15,620
STUDENTS ALSO COLLECT DATA AT GROUND SITES
IN CALIFORNIA, AND ALONG THE COAST.

88
00:05:15,620 --> 00:05:20,050
IN ADDITION TO THE DC-8, STUDENTS WILL ALSO
USE AIRBORNE IMAGING DATA COLLECTED FROM THE

89
00:05:20,050 --> 00:05:23,150
NASA ER-2 HIGH ALTITUDE RESEARCH AIRCRAFT.

90
00:05:23,150 --> 00:05:27,660
BY THE CONCLUSION OF THE PROGRAM, EACH STUDENT
DEVELOPS AN INDIVIDUAL RESEARCH PROJECT FROM

91
00:05:27,660 --> 00:05:31,819
DATA COLLECTED IN THE AIR, ON THE GROUND,
AND FROM SATELLITES.

92
00:05:31,819 --> 00:05:36,370
THE GOAL OF SARP IS TO TRAIN THE NEXT GENERATION
OF EARTH SYSTEM SCIENTISTS AND ENGINEERS.

93
00:05:36,370 --> 00:05:40,810
MANY SARP ALUMNI HAVE GONE ON TO PARTICIPATE
IN OTHER NASA AIRBORNE RESEARCH MISSIONS.

94
00:05:40,810 --> 00:05:43,490
AND SOME HAVE EVEN COME BACK TO SARP AS MENTORS.

95
00:05:43,490 --> 00:05:47,430
THE STUDENT AIRBORNE RESEARCH PROGRAM WRAPS
UP IN IRVINE, CALIFORNIA IN AUGUST.

96
00:05:47,430 --> 00:05:51,760

BUT FOR MANY OF THESE STUDENTS, THIS EXPERIENCE
COULD LAUNCH THEIR CAREERS IN EARTH SYSTEM

97
00:05:51,760 --> 00:05:52,760
SCIENCE.

98
00:05:52,760 --> 00:05:54,410
[MUSIC]
ONE OF THE CHALLENGES IN BECOMING AN EARTH

99
00:05:54,410 --> 00:05:58,690
SCIENTIST IS THAT IT'S NOT A CAREER OPPORTUNITY
THAT A LOT OF PEOPLE EVEN KNOW IS OUT THERE.

100
00:05:58,690 --> 00:06:01,870
SO WE RUN PROGRAMS LIKE SARP TO GET YOUNG
PEOPLE ENGAGED.

101
00:06:01,870 --> 00:06:04,050
EDUCATION IS IMPORTANT, AND SO IS FIELD RESEARCH.

102
00:06:04,050 --> 00:06:08,490
BUT GET OUT IN THE FIELD, AND BE A PART OF
A RESEARCH TEAM YOU HAVE TO HAVE ADAPTATION

103
00:06:08,490 --> 00:06:12,560
SKILLS AND YOU HAVE TO KNOW HOW ASK FOR HELP
IN THOSE DIFFICULT SITUATIONS.

104
00:06:12,560 --> 00:06:17,419
AND SOMETIMES IN AN AIRBORNE MISSION, YOU
MAY FIND YOURSELF WITHOUT AN AIRPLANE…

105
00:06:17,419 --> 00:06:20,100
EVERY YEAR YOU START OUT WITH ZERO.

106
00:06:20,100 --> 00:06:24,009
ZERO MILES FLOWN, ZERO DATA COLLECTED.

107

00:06:24,009 --> 00:06:29,199
THIS YEAR, ICEBRIDGE STARTED OUT WITH YET
ANOTHER BIG ZERO THERE WERE NO AIRCRAFT AVAILABLE

108
00:06:29,199 --> 00:06:35,349
FOR THE MISSION, AS NASA'S DECADES-OLD P-3
WAS GETTING RE-WINGED.

109
00:06:35,349 --> 00:06:38,330
SO THE TEAM TURNED TO THEIR FRIENDS AT NOAA
FOR HELP.

110
00:06:38,330 --> 00:06:43,759
AND THEY GOT …
MISS PIGGY, ANOTHER P-3 AIRCRAFT AND A VETERAN

111
00:06:43,759 --> 00:06:50,689
OF 88 HURRICANE MISSIONS FROM FLOYD TO FRANCES
TO KATRINA, OPERATED BY A CRACK FLIGHT CREW

112
00:06:50,689 --> 00:06:56,819
READY TO TACKLE THE FAR FROZEN NORTH FOR THE
FIRST TIME.

113
00:06:56,819 --> 00:07:02,349
AFTER INSTALLING ICEBRIDGE'S MANY INSTRUMENTS
INTO THE AIRCRAFT, PERFORMING NEEDED MAINTENANCE,

114
00:07:02,349 --> 00:07:09,449
AND FLYING A FEW TEST FLIGHTS OVER TAMPA BAY,
THE ICEBRIDGE TEAM WAS FINALLY READY TO GO.

115
00:07:09,449 --> 00:07:14,270
THE TEAM'S FIRST TARGET WAS TO TAKE MEASUREMENTS
OF SEA ICE IN THE ARCTIC OCEAN, AND AFTER

116
00:07:14,270 --> 00:07:20,000
A FEW WEEKS, ICEBRIDGE HAD ACHIEVED SOLID
COVERAGE OF THE WESTERN ARCTIC BASIN, AND

117

00:07:20,000 --> 00:07:25,560
ON ONE MISSION, EVEN GRAZED THE NORTH POLE
ITSELF, COMING WITHIN 200 METERS OF THE TOP

118
00:07:25,560 --> 00:07:28,400
OF THE WORLD.

119
00:07:28,400 --> 00:07:32,379
FROM THERE, THE MISSION CHANGED ITS FOCUS
TO NORTHERN LAND ICE, AND AFTER

120
00:07:32,379 --> 00:07:37,910
WAITING DAYS FOR THE FOG TO LIFT, FINALLY
MANAGED TO HIT A CRUCIAL TARGET – THE ZACHARIAE

121
00:07:37,910 --> 00:07:39,520
ISSTROM.

122
00:07:39,520 --> 00:07:46,570
THIS MASSIVE GLACIER DRAINS 5% OF THE GREENLAND
ICE SHEET, AND IN 2012, ENTERED INTO A PHASE

123
00:07:46,570 --> 00:07:51,490
OF RAPID RETREAT, MAKING REPEAT MEASUREMENTS
ALL THE MORE CRUCIAL.

124
00:07:51,490 --> 00:07:52,699
[MUSIC]

125
00:07:52,699 --> 00:07:55,280
PLANES IN THE AIR AND CORAL IN THE SEA.

126
00:07:55,280 --> 00:07:58,750
GLACIERS IN THE OCEAN AND AEROSOLS IN THE
AIR.

127
00:07:58,750 --> 00:08:00,789
SATELLITES AND DIVERS.

128

00:08:00,789 --> 00:08:05,379
SCUBA DIVERS AND FIRE FIGHTERS.

129
00:08:05,379 --> 00:08:09,289
ANCIENT MAPS AND MODERN MARVELS.

130
00:08:09,289 --> 00:08:12,110
YOU'RE WINNING THIS IS REALLY HARD.

131
00:08:12,110 --> 00:08:13,110
[LAUGHTER]

132
00:08:13,110 --> 00:08:14,870
IT WAS YOUR IDEA TO HAVE THE MAPS.

133
00:08:14,870 --> 00:08:20,349
IT WAS MY IDEA TO HAVE THE MAPS.

134
00:08:20,349 --> 00:08:32,219
ANYWAY YOUR PLANET IS CHANGING, AND WE'RE
ON IT

135
00:08:32,219 --> 00:08:34,490
KICK IT DJ

136
00:08:34,490 --> 00:08:35,490
[MUSIC]

137
00:08:35,490 --> 00:08:42,349
YEAH I GOT YOU, I GOT YOU YEAH AND I LETS
DO ALLITERATIONS IT'LL BE A FUN GAME.