



1
00:00:00,000 --> 00:00:03,550
Mission Control Announcer: 11...10...9...

2
00:00:03,570 --> 00:00:05,800
Ignition Sequence Start...

3
00:00:05,820 --> 00:00:07,810
Narrator: NASA's Ames Research Center played a

4
00:00:07,830 --> 00:00:10,570
critical role in the development and preparation

5
00:00:10,590 --> 00:00:13,340
for the flight test of NASA's new spacecraft

6
00:00:13,360 --> 00:00:15,570
called Orion.

7
00:00:15,590 --> 00:00:20,100
Designated Exploration Flight Test-1, or EFT-1,

8
00:00:20,120 --> 00:00:22,390
the mission will provide critical data that will

9
00:00:22,410 --> 00:00:25,700
enable engineers to improve Orion's design and

10
00:00:25,720 --> 00:00:27,800
reduce risk for the astronauts

11
00:00:27,820 --> 00:00:30,880
it will eventually carry.

12
00:00:30,900 --> 00:00:33,230
One of the biggest challenges for Orion is that it

13
00:00:33,250 --> 00:00:35,730

will re-enter Earth's atmosphere faster and

14

00:00:35,750 --> 00:00:38,680

encounter more heating than any previously manned

15

00:00:38,700 --> 00:00:42,180

missions including Apollo and the Space Shuttle.

16

00:00:47,320 --> 00:00:45,690

Arc Jet Engineer 1: 5...4...3...2...1...

17

00:00:47,340 --> 00:00:49,540

Narrator: To test Orion's new heat shield made of

18

00:00:49,560 --> 00:00:53,210

a material called Avcoat, Ames used its Arc Jet

19

00:00:53,230 --> 00:00:55,670

facility to simulate the heating and airflow

20

00:00:55,690 --> 00:00:59,700

conditions that occur during atmospheric re-entry.

21

00:00:59,720 --> 00:01:02,410

During these tests, the Avcoat surface reached

22

00:01:02,430 --> 00:01:08,180

temperatures of over 3,000 degrees Fahrenheit.

23

00:01:08,200 --> 00:01:10,600

Ames developed a group of sensors that was built

24

00:01:10,620 --> 00:01:13,250

into in the heat shield itself to monitor how well

25

00:01:13,270 --> 00:01:16,200

it performs during EFT-1.

26
00:01:16,220 --> 00:01:19,660
34 of these sensors will measure the near-surface

27
00:01:19,680 --> 00:01:22,070
and internal temperatures of the heat shield as

28
00:01:22,090 --> 00:01:24,930
Orion re-enters the atmosphere.

29
00:01:24,950 --> 00:01:27,690
This will give engineers a complete data profile

30
00:01:27,710 --> 00:01:30,200
of its performance, allowing them to see what

31
00:01:30,220 --> 00:01:32,830
succeeded and how to make future improvements to

32
00:01:32,850 --> 00:01:37,270
the thermal protection system.

33
00:01:37,290 --> 00:01:40,240
To optimize the design of the Orion Crew Vehicle,

34
00:01:40,260 --> 00:01:42,960
an 8-percent scale model was coated with pressure

35
00:01:42,980 --> 00:01:46,240
sensitive paint and was tested in the Ames 11-foot

36
00:01:46,260 --> 00:01:49,310
Unitary transonic wind tunnel.

37
00:01:49,330 --> 00:01:51,940
This testing simulated airflow and temperature

38
00:01:51,960 --> 00:01:54,950

changes the capsule will experience in flight

39

00:01:54,970 --> 00:01:57,790

after re-entering the atmosphere.

40

00:01:57,810 --> 00:02:00,570

The data collected is also essential to validating

41

00:02:00,590 --> 00:02:03,760

the accuracy of computational models that simulate

42

00:02:03,780 --> 00:02:09,610

the performance of space vehicles during re-entry.

43

00:02:09,630 --> 00:02:12,640

The Orion Launch Abort System required testing in

44

00:02:12,660 --> 00:02:15,110

the wind tunnels at Ames to better understand the

45

00:02:15,130 --> 00:02:18,850

behavior of the system during a complex variety

46

00:02:18,870 --> 00:02:20,080

of launch conditions.

47

00:02:20,100 --> 00:02:22,370

The focus of the study was to determine the

48

00:02:22,390 --> 00:02:25,300

interaction between the plume from the jets with

49

00:02:25,320 --> 00:02:29,140

the airflow effects of separation from the rocket.

50

00:02:29,160 --> 00:02:32,110

Another test used a 6-percent scale model of the

51
00:02:32,130 --> 00:02:34,990
Launch Abort System in the 11-foot wind tunnel to

52
00:02:35,010 --> 00:02:37,890
find ways of minimizing how loud the system would

53
00:02:37,910 --> 00:02:42,710
be, during an actual flight.

54
00:02:42,730 --> 00:02:45,210
Built in the 1960's to support the Apollo

55
00:02:45,230 --> 00:02:48,680
missions, Ames' Horizontal Free Flight Facility

56
00:02:48,700 --> 00:02:51,500
can fire models through a 75-foot-long test

57
00:02:51,520 --> 00:02:55,770
chamber at speeds ranging from 500 to 18,000

58
00:02:55,790 --> 00:02:57,590
miles per hour.

59
00:02:57,610 --> 00:02:59,830
(Bang of gun firing)

60
00:02:59,850 --> 00:03:02,460
Tests of the Orion capsule were essential to

61
00:03:02,480 --> 00:03:04,730
understanding how well the vehicle will fly

62
00:03:04,750 --> 00:03:07,290
through the air after re-entering the atmosphere,

63
00:03:07,310 --> 00:03:12,720

but before the critical parachute deployment.

64
00:03:12,740 --> 00:03:15,680
Ames also specializes in the use of computer

65
00:03:15,700 --> 00:03:19,070
modeling simulations referred to as computational

66
00:03:19,090 --> 00:03:23,270
fluid dynamics or CFD.

67
00:03:23,290 --> 00:03:26,070
This work has been important to understanding the

68
00:03:26,090 --> 00:03:29,460
turbulent wake behind the Orion capsule as it

69
00:03:29,480 --> 00:03:33,000
slows down enough to deploy its parachutes.

70
00:03:33,020 --> 00:03:35,940
Studies have also been conducted to optimize the

71
00:03:35,960 --> 00:03:38,880
thermal heating performance of Orion by using an

72
00:03:38,900 --> 00:03:41,180
Ames-developed software tool called

73
00:03:41,200 --> 00:03:45,100
Data Parallel Line Relaxation or DPLR.

74
00:03:45,120 --> 00:03:47,840
Engineers will compare their predicted results

75
00:03:47,860 --> 00:03:50,880
with actual data from the Arc Jet tests and data

76
00:03:50,900 --> 00:03:53,930
collected from the EFT-1 flight to improve the

77
00:03:53,950 --> 00:03:59,650
DPLR code for future spacecraft design.

78
00:03:59,670 --> 00:04:02,690
The scientists, engineers and researchers at Ames

79
00:04:02,710 --> 00:04:04,990
are proud to have played a critical role in the

80
00:04:05,010 --> 00:04:08,440
EFT-1 flight test as NASA continues to move

81
00:04:08,460 --> 00:04:10,980
forward on its human journey to asteroids and

82
00:04:11,000 --> 00:04:12,680
eventually to Mars.

83
00:04:12,700 --> 00:04:15,500
(Roar of rocket engine)