1
00:00:01,426 --> 00:00:08,176
MUSIC: NARRATOR: At the White Sands
Missile Range in Las Cruces, New Mexico,

2
00:00:08,736 --> 00:00:12,616
engineers and technicians are
preparing for a very special test.

3
00:00:13,396 --> 00:00:18,926
The Launch Abort System is a sophisticated new
rocket tower designed to pull a spacecraft away

4
00:00:19,006 --> 00:00:22,256
from danger on the pad and
during initial ascent.

5
00:00:22,866 --> 00:00:26,916
For the first time, all the components
of the system will work together.

6
00:00:27,116 --> 00:00:32,356
The test not only develops core
technology needed for future spacecraft,

7
00:00:33,196 --> 00:00:38,926
but also directly improves the chances
of crew survival in an emergency.

8
00:00:39,086 --> 00:00:41,656
The name of the test is Pad Abort 1.

9
00:00:41,946 --> 00:00:45,736
Music full.

10
00:00:45,776 --> 00:00:47,166
Music: 60's Surf music.

11
00:00:47,166 --> 00:01:02,726
NARRATOR: It's the mid 1960's, and the Apollo

Program is testing its Launch Escape System.

12
00:01:02,806 --> 00:01:09,786
At the White Sands Missile Range a squatty
rocket nicknamed Little Joe 2 launches an Apollo

13
00:01:09,906 --> 00:01:11,686
capsule for a high altitude test.

14
00:01:12,576 --> 00:01:16,256
Engineers want to see if the escape
system can pull the capsule away

15
00:01:16,256 --> 00:01:17,746
from danger in the event of an emergency.

16
00:01:18,236 --> 00:01:22,366
The unmanned test shows the escape system works!

17
00:01:22,626 --> 00:01:29,586
Sound Effect: Explosion Sound Years
later, an escape system was used

18
00:01:29,586 --> 00:01:31,666
for real on a Russian Soyuz rocket.

19
00:01:32,406 --> 00:01:37,566
When spilt fuel caught fire on the launch
pad, an escape rocket pulled the capsule away

20
00:01:37,566 --> 00:01:40,326
from the hazard, savingthe crew member's lives.

21
00:01:41,416 --> 00:01:46,506
For the Pad Abort 1 test, engineers
will utilize the Launch Abort System

22
00:01:46,776 --> 00:01:48,916
to lift a mock Orion crew module.

23
00:01:49,756 --> 00:01:53,876
The test simulates an emergency
situation not unlike the Soyuz incident,

24
00:01:54,586 --> 00:01:57,346
where the spacecraft is still
sitting on the launchpad.

25
00:01:58,156 --> 00:02:04,226
The Launch Abort System builds upon knowledge
of the past and applies modern technology

26
00:02:04,266 --> 00:02:08,486
and new innovations to make a more
capable means of escape for the crew.

27
00:02:09,426 --> 00:02:15,156
This technology can be utilized to make any
spacecraft safer for human space exploration.

28
00:02:15,266 --> 00:02:20,416
Mark Geyer: "Actually if you look
at Mercury, Gemini, and Apollo,

29
00:02:20,416 --> 00:02:23,536
they all had a launch abort
capability, different ways.

30
00:02:23,886 --> 00:02:27,666
For these capsule-like designs, there's a way to
pull it away from the booster and save the crew.

31
00:02:28,026 --> 00:02:30,786
So it takes that fundamental idea

32
00:02:31,176 --> 00:02:36,386
but our current Launch Abort System is actually
much better than those systems with the thrust,

33
00:02:36,426 --> 00:02:42,396
with the attitude control system that we
have on it we can actually get the crew away

34
00:02:42,396 --> 00:02:47,266
from the vast, vast majority of even very
unlikely contingencies we can imagine."

35
00:02:47,266 --> 00:02:51,756
NARRATOR: Three newly developed motors will
work together on the Launch Abort System

36
00:02:51,756 --> 00:02:55,896
to create a new level of control
and stability during flight.

37
00:02:57,016 --> 00:03:00,896
The Abort Motor is the most powerful,
and begins the escape process...

38
00:03:00,896 --> 00:03:03,176
Jay Estes: " Well, it's pretty amazing.

39
00:03:03,176 --> 00:03:06,026
The Abort Motor is the biggest
motor that lifts everything up.

40
00:03:06,026 --> 00:03:11,736
It's got about 500,000 lbs of thrust and it's
going to get the whole vehicle up off the ground

41
00:03:12,056 --> 00:03:16,076
to achieving about a Mach .6 in three seconds."

42
00:03:16,276 --> 00:03:21,386
NARRATOR: Tested in Utah, the Abort
Motor utilizes a new style of propulsion

43
00:03:21,546 --> 00:03:25,766

that saves space and weight, while
still achieving remarkable power...

44
00:03:25,766 --> 00:03:33,326
Mark Geyer : "Our, our booster is, is bigger so
what we decided to do rather than sit it on top

45
00:03:33,326 --> 00:03:38,556
of the lattice structure was actually turn
it upside down so that the thrust goes up

46
00:03:38,556 --> 00:03:41,936
and then turns out on the nozzles,
so we have a/ reverse thrust nozzle,

47
00:03:42,176 --> 00:03:44,296
so that's a new technology
that we've developed for this.

48
00:03:44,446 --> 00:03:48,796
Makes it shorter than it might otherwise need it
to be, which is good for mass and other things."

49
00:03:49,646 --> 00:03:53,886
NARRATOR: While the Abort Motor initially
pulls the spacecraft from danger,

50
00:03:54,346 --> 00:03:57,386
an Attitude Control Motor provides a new level

51
00:03:57,386 --> 00:04:00,266
of steering capability to
orient the spacecraft...

52
00:04:00,686 --> 00:04:07,166
Don Reed: "We have an Attitude Control Motor,
which has eight thrusters or pintle valves.

53
00:04:07,466 --> 00:04:11,666
So it's a solid rocket motor, single

solid rocket motor with eight valves.

54
00:04:12,236 --> 00:04:18,226
These valves can individually be varied to vary
the thrust at the eight different locations

55
00:04:18,536 --> 00:04:22,026
around the, circumference of
the top of the abort motor.

56
00:04:22,566 --> 00:04:23,376
It's more stable.

57
00:04:23,596 --> 00:04:28,866
It gets you in a better attitude when
it's time to deploy the parachutes.

58
00:04:28,866 --> 00:04:33,646
So it can get the crew module in
a much better and stable position.

59
00:04:34,346 --> 00:04:38,356
It also allows us to reduce the weight...the
overall weight of the Launch Abort System."

60
00:04:38,616 --> 00:04:43,056
NARRATOR: With the spacecraft safely away
from the danger and properly positioned

61
00:04:43,056 --> 00:04:46,896
to deploy parachutes...a third
motor...the Jettison Motor...

62
00:04:47,296 --> 00:04:52,826
ejects the entire Launch Abort System tower,
leaving the crew module to fly by itself.

63
00:04:53,586 --> 00:04:58,036
A forward bay cover is ejected and
parachutes deploy for a touchdown.

64
00:04:58,686 --> 00:05:04,876
Pad Abort 1 gives engineers a chance see how
the fully integrated Launch Abort System works

65
00:05:04,876 --> 00:05:06,176
under flight conditions.

66
00:05:06,656 --> 00:05:11,336
The build up to this test has utilized
the diverse talents of NASA centers,

67
00:05:11,556 --> 00:05:14,246
commercial industry and even the military...

68
00:05:14,246 --> 00:05:16,536
Mark Geyer: "We have a lot of
different things to integrate,

69
00:05:16,536 --> 00:05:19,476
so what we did on the NASA side is
we went to several different centers

70
00:05:19,476 --> 00:05:21,556
that had expertise in those areas.

71
00:05:21,556 --> 00:05:24,046
So Langley has great expertise with structures

72
00:05:24,046 --> 00:05:28,426
so they actually built the
crew module for this test.

73
00:05:28,426 --> 00:05:30,466
They also have great expertise in loads analysis

74
00:05:30,466 --> 00:05:33,826
so they're actually doing the
loads analysis for us on this test.

75
00:05:33,826 --> 00:05:38,446
Dryden, of course, has huge experience
in flight tests, mostly aircraft,

76
00:05:38,446 --> 00:05:42,816
and so we've been using them to help
us with the overall integration as well

77
00:05:42,816 --> 00:05:44,956
as actually putting the vehicle together.

78
00:05:44,956 --> 00:05:48,366
We shipped the capsule from Langley and
then the avionics came from Lockheed and,

79
00:05:48,366 --> 00:05:50,936
and it's been the Dryden guys
who have been integrating that

80
00:05:50,936 --> 00:05:52,736
and putting the capsule together
there at Dryden."

81
00:05:52,736 --> 00:05:56,786
NARRATOR: The crew module was then
shipped to the White Sands Missile Range,

82
00:05:56,786 --> 00:06:04,296
where a new 92 acre launch complex was built
for both the Pad Abort 1 and other flight tests.

83
00:06:04,296 --> 00:06:07,596
Here all the pieces came
together for the first time.

84
00:06:07,596 --> 00:06:13,536
Jay Estes: "So out here we're cooperating with
the Army here at White Sands Missile Range

85
00:06:13,536 --> 00:06:16,476
and there's a NASA center here,
the White Sands Test Facility."

86
00:06:16,476 --> 00:06:21,986
NARRATOR: The Orion project office at the
NASA Johnson Space Center is leading the team

87
00:06:21,986 --> 00:06:25,126
to test the Launch Abort
System, while the expertise

88
00:06:25,126 --> 00:06:29,226
of the NASA Marshall Space Flight Center
has been called upon for propulsion,

89
00:06:29,476 --> 00:06:31,586
assembly integration and production.

90
00:06:32,826 --> 00:06:37,846
The Pad Abort 1 test not only demonstrates
the new technologies and methods