
SLS
SPACE LAUNCH SYSTEM

1
00:00:00,000 --> 00:00:01,470
some music and applause throughout

2
00:00:01,670 --> 00:00:02,703
Welcome back to SLS Trivia!

3
00:00:02,903 --> 00:00:04,967
I'm your host, Kaitlin Rogers, and today

4
00:00:05,167 --> 00:00:07,903
We're going to test your knowledge about

5
00:00:08,103 --> 00:00:10,590
the rocket that will enable a new era of

6
00:00:10,790 --> 00:00:12,710
exploration, America's new deep-space

7
00:00:12,910 --> 00:00:15,007
rocket, the world's most powerful rocket

8
00:00:15,207 --> 00:00:17,415
-- the Space Launch System!

9
00:00:17,615 --> 00:00:19,894
As we speak SLS is being built and

10
00:00:20,094 --> 00:00:22,423
rigorously tested to the highest safety

11
00:00:22,623 --> 00:00:24,303
standards to protect our most precious

12
00:00:24,503 --> 00:00:27,478
cargo -- the astronauts. So, today's

13
00:00:27,678 --> 00:00:29,366

questions are all about safety.

14
00:00:29,566 --> 00:00:31,838
We can quiz if we want to, we can leave

15
00:00:32,038 --> 00:00:33,982
your friends behind. Cause your friends

16
00:00:34,182 --> 00:00:35,446
don't quiz, and if they don't quiz.

17
00:00:35,646 --> 00:00:37,326
Well they're no friends of mine.

18
00:00:37,526 --> 00:00:40,479
Everybody's taking the quiz-ah-ah-ah.

19
00:00:40,679 --> 00:00:41,598
Yes, the safety quiz!

20
00:00:41,798 --> 00:00:45,510
Question one.

21
00:00:45,710 --> 00:00:47,958
To protect astronauts in case a problem

22
00:00:48,158 --> 00:00:49,998
occurs during launch, the Orion crew

23
00:00:50,198 --> 00:00:52,286
module atop SLS will be equipped with

24
00:00:52,486 --> 00:00:53,351
what?

25
00:00:53,551 --> 00:00:55,087
Critical Issue Abort Option (CIAO)

26
00:00:55,287 --> 00:00:57,368
Emergency Evacuation Slide (EES)

27
00:00:57,568 --> 00:00:59,031
Launch Abort System (LAS)

28
00:00:59,231 --> 00:01:01,383
During launch and ascent, what's the

29
00:01:01,583 --> 00:01:03,453
astronauts escape plan? What will keep

30
00:01:03,653 --> 00:01:04,967
them safe if a failure were to occur?

31
00:01:05,167 --> 00:01:07,686
In case of a problem during launch or

32
00:01:07,886 --> 00:01:10,351
ascent, the Launch Abort System will

33
00:01:10,551 --> 00:01:13,262
jettison astronauts in Orion safely away

34
00:01:13,462 --> 00:01:15,983
from SLS. The "rocket on top of the rocket"

35
00:01:16,183 --> 00:01:18,254
can activate within milliseconds, delivering

36
00:01:18,454 --> 00:01:21,254
the crew up to one mile in altitude, before

37
00:01:21,454 --> 00:01:23,750
safely parachuting back to Earth.

38
00:01:23,950 --> 00:01:25,790

On to question number two.

39
00:01:25,990 --> 00:01:27,678
As a rocket is propelled upward,

40
00:01:27,878 --> 00:01:29,942
propellants can surge downward to the

41
00:01:30,142 --> 00:01:32,246
engines causing powerful up-and-down

42
00:01:32,446 --> 00:01:34,463
vibrations. This phenomenon is most

43
00:01:34,663 --> 00:01:36,535
commonly referred to as what?

44
00:01:36,735 --> 00:01:38,350
The Locomotion Interruption,

45
00:01:38,550 --> 00:01:39,598
The Pogo Effect, or

46
00:01:39,798 --> 00:01:42,031
The Bouncy Castle Conundrum

47
00:01:42,231 --> 00:01:44,367
During launch, g-forces can push

48
00:01:44,567 --> 00:01:46,455
additional propellants into the engines

49
00:01:46,655 --> 00:01:48,143
causing the rocket surge forward.

50
00:01:48,343 --> 00:01:50,463
The surge reduces engine pressure,

51
00:01:50,663 --> 00:01:52,575
creating a feedback loop of alternating

52
00:01:52,775 --> 00:01:53,894
increasing and decreasing thrust,

53
00:01:54,094 --> 00:01:56,238
causing the rocket to "bounce."

54
00:01:56,438 --> 00:01:58,478
Because of the similarities with bouncing

55
00:01:58,678 --> 00:02:00,503
up and down on a pogo stick, engineers

56
00:02:00,703 --> 00:02:03,846
call this the pogo effect. These oscillations

57
00:02:04,046 --> 00:02:06,750
along the thrust axis of a rocket can be

58
00:02:06,950 --> 00:02:08,567
dangerous if they match the resonant

59
00:02:08,767 --> 00:02:10,351
frequency of the rocket’s structure.

60
00:02:10,551 --> 00:02:12,262
Not only could this damage the rocket,

61
00:02:12,462 --> 00:02:14,574
but the alternating positive and negative

62
00:02:14,774 --> 00:02:17,054
g-forces in the crew module could be

63
00:02:17,254 --> 00:02:18,566

dangerous for the astronauts.

64
00:02:18,766 --> 00:02:20,983
To overcome this and ensure astronaut

65
00:02:21,183 --> 00:02:23,646
safety, the SLS rocket's four RS-25

66
00:02:23,846 --> 00:02:26,047
engines have gas-pressurized chambers,

67
00:02:26,247 --> 00:02:28,719
known as pogo accumulators, that act like

68
00:02:28,919 --> 00:02:30,861
shock absorbers for the propellants and

69
00:02:31,061 --> 00:02:32,830
regulate their flow into the engines.

70
00:02:33,030 --> 00:02:36,503
Fun fact, as we build new RS-25 engines

71
00:02:36,703 --> 00:02:38,678
for future missions, we're incorporating

72
00:02:38,878 --> 00:02:40,559
dozens of additively manufactured

73
00:02:40,759 --> 00:02:43,479
components. By 3-D printing the pogo

74
00:02:43,679 --> 00:02:45,487
accumulator, we've eliminated more than

75
00:02:45,687 --> 00:02:48,222
100 welds, reduced costs for the part by

76
00:02:48,422 --> 00:02:50,646
nearly 35 percent and production time by

77
00:02:50,846 --> 00:02:53,846
more than 80 percent! Safe and efficient,

78
00:02:54,046 --> 00:02:55,214
how about that!

79
00:02:55,414 --> 00:02:58,343
Time for the final question of the day, Q3.

80
00:02:58,543 --> 00:03:01,407
Speaking of the RS-25, the engine

81
00:03:01,607 --> 00:03:03,247
previously supported which program?

82
00:03:03,447 --> 00:03:04,958
Saturn Program

83
00:03:05,158 --> 00:03:06,461
Space Shuttle Program

84
00:03:06,661 --> 00:03:08,350
Kerbal Space Program

85
00:03:08,550 --> 00:03:10,630
With more than one million seconds of

86
00:03:10,830 --> 00:03:13,782
hot-fire experience, RS-25, which is the

87
00:03:13,982 --> 00:03:15,863
epitome of reliability, was selected to

88
00:03:16,063 --> 00:03:18,191

power the SLS core stage, but what

89
00:03:18,391 --> 00:03:19,695
program did it power before?

90
00:03:19,895 --> 00:03:21,918
We're not launching little green aliens

91
00:03:22,118 --> 00:03:23,702
like the video game Kerbal Space Program,

92
00:03:23,902 --> 00:03:26,174
we're launching humans, and that's why

93
00:03:26,374 --> 00:03:28,549
the SLS core stage will be powered by

94
00:03:28,749 --> 00:03:31,269
the proven RS-25, formerly known as the

95
00:03:31,469 --> 00:03:34,237
Space Shuttle Main Engine. As part of

96
00:03:34,437 --> 00:03:36,061
the shuttle program, the RS-25

97
00:03:36,261 --> 00:03:38,933
supported 135 missions!

98
00:03:39,133 --> 00:03:42,036
So, there you have it! From the top of the

99
00:03:42,236 --> 00:03:44,628
rocket, to the bottom, and everywhere in

100
00:03:44,828 --> 00:03:46,900
between we're doing everything to make

101
00:03:47,100 --> 00:03:48,917
sure SLS is as safe as possible.

102
00:03:49,117 --> 00:03:51,181
How'd you do? Let us know in the

103
00:03:51,381 --> 00:03:52,989
comments, and make sure to share with

104
00:03:53,189 --> 00:03:54,109
your friends.

105
00:03:54,309 --> 00:03:55,509
For more about the Space Launch System,

106
00:03:55,709 --> 00:03:57,693
follow us on Twitter and Facebook, and

107
00:03:57,893 --> 00:04:00,637
visit NASA.gov/SLS!