



1
00:00:08,500 --> 00:00:10,500
If I want to get safely
from point A to point B,

2
00:00:10,920 --> 00:00:13,337
I need precision, dexterity, and control.

3
00:00:14,513 --> 00:00:15,669
See?

4
00:00:15,669 --> 00:00:17,011
Let's talk about the
brain behind the brawn

5
00:00:17,011 --> 00:00:18,554
of the Space Launch System.

6
00:00:18,554 --> 00:00:20,498
- [Neil Armstrong] That's
one small step for man.

7
00:00:20,498 --> 00:00:22,202
(upbeat music)

8
00:00:22,202 --> 00:00:24,170
- Traveling through space is hard.

9
00:00:24,170 --> 00:00:25,840
That's why NASA's Space Launch System

10
00:00:25,840 --> 00:00:28,410
will have to be the most
powerful rocket in the world.

11
00:00:28,410 --> 00:00:29,981
How is SLS able to meet the challenges

12
00:00:29,981 --> 00:00:31,962

of exploring deep space?

13

00:00:31,962 --> 00:00:34,781

Well, when it comes to our
journey to Mars and beyond,

14

00:00:34,781 --> 00:00:36,864

there are no small steps.

15

00:00:38,591 --> 00:00:40,871

So, what made the difference
with our skateboard?

16

00:00:40,871 --> 00:00:42,221

It was built for speed and it had weight

17

00:00:42,221 --> 00:00:44,653

to pull it in the direction
that we wanted it to go

18

00:00:44,653 --> 00:00:46,682

but it was missing a brain
and a complex nervous system

19

00:00:46,682 --> 00:00:47,642

to guide it.

20

00:00:47,642 --> 00:00:49,661

The Space Launch System
may be the biggest rocket

21

00:00:49,661 --> 00:00:51,562

in the world, but its
successful journey depends

22

00:00:51,562 --> 00:00:53,973

on combining its power with
well-reasoned decisions

23

00:00:53,973 --> 00:00:55,333
and actions.

24

00:00:55,333 --> 00:00:57,801

The thing that turns a big
powerful machine like SLS

25

00:00:57,801 --> 00:00:59,978

into a smart, precise vehicle capable

26

00:00:59,978 --> 00:01:02,933

of interplanetary travel is avionics.

27

00:01:02,933 --> 00:01:06,100

Behind me are the Core Stage Avionics.

28

00:01:10,130 --> 00:01:13,461

Avionics, which literally means
aviation plus electronics,

29

00:01:13,461 --> 00:01:16,239

is the computers, the
routers, the power systems,

30

00:01:16,239 --> 00:01:19,729

the processors, and the software
that tell SLS what to do.

31

00:01:19,729 --> 00:01:22,328

Avionics is a lot like
our body's nervous system.

32

00:01:22,328 --> 00:01:25,471

And that begins with the brain.

33

00:01:25,471 --> 00:01:27,130

This is the mind of SLS.

34

00:01:27,130 --> 00:01:29,139

It's three identical flight computers,

35

00:01:29,139 --> 00:01:30,522

which makes split-second decisions

36

00:01:30,522 --> 00:01:32,373

about trajectory and navigation.

37

00:01:32,373 --> 00:01:34,061

The cool thing about

these powerful computers

38

00:01:34,061 --> 00:01:35,961

is that when they receive information,

39

00:01:35,961 --> 00:01:39,311

they each process it independently

and decide on an action.

40

00:01:39,311 --> 00:01:41,220

They compare the results

and in the unlikely event

41

00:01:41,220 --> 00:01:43,469

that one of them decides

differently than the other two,

42

00:01:43,469 --> 00:01:44,891

it's outvoted.

43

00:01:44,891 --> 00:01:46,310

The SLS avionics are so important,

44

00:01:46,310 --> 00:01:48,020

that the entire system

has already been running

45

00:01:48,020 --> 00:01:49,751

simulated missions in A.R.T.E.M.I.S.,

46

00:01:49,751 --> 00:01:52,168
a virtual launch environment.

47

00:01:56,911 --> 00:01:59,260
SLS will have imagined its
journey hundreds of times,

48

00:01:59,260 --> 00:02:02,020
so every decision it makes
will be the right one.

49

00:02:03,020 --> 00:02:04,490
To get information to make decisions,

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00:02:04,500 --> 00:02:07,250
the flight computers rely on
sensors all around the rocket

51

00:02:07,260 --> 00:02:09,500
in the same way that our
brain gets sensory information

52

00:02:09,600 --> 00:02:12,100
from our eyes, our ears,
our fingers, and so on.

53

00:02:12,200 --> 00:02:14,500
SLS' avionics controller boxes

54

00:02:14,600 --> 00:02:16,500
and over 55 miles of cabling

55

00:02:16,600 --> 00:02:17,900
act as its nerve and nerve endings,

56

00:02:18,000 --> 00:02:20,000
carrying information to and
from the flight computers.

57

00:02:20,900 --> 00:02:23,500

As you can see, getting
where we want to go

58

00:02:23,600 --> 00:02:25,000

requires so much more
than strength and speed.

59

00:02:25,100 --> 00:02:27,900

It also requires an
intelligent complex system

60

00:02:28,000 --> 00:02:29,750

to get us to deep space.

61

00:02:34,250 --> 00:02:35,800

To pull off a trick like that,

62

00:02:35,900 --> 00:02:37,200

I'm gonna have to use my brain.

63

00:02:38,300 --> 00:02:40,250

But, right now my brain is telling me