1
00:00:01,010 --> 00:00:01,553
Eagle, we've got you now. It's looking good, over.

2
00:00:04,000 --> 00:00:05,000
Roger, copy.

3
00:00:10,070 --> 00:00:16,803
What was one small step for Neil Armstrong was a giant leap
from his beginnings at Purdue University.

4
00:00:17,010 --> 00:00:18,210
Students at Purdue all have a chance to follow in the footsteps

5
00:00:20,010 --> 00:00:20,236
of former Purdue students and Apollo astronauts
Neil Armstrong and Gene Cernan.

6
00:00:25,050 --> 00:00:26,050
(Music)

7
00:00:34,050 --> 00:00:36,240
David Helderman: Hello and welcome to the High Pressure Lab
at the Maurice J. Zucrow Laboratories at Purdue.

8
00:00:39,060 --> 00:00:42,993
I'll be showing you some of our rocket test capabilities.

9
00:00:48,070 --> 00:00:48,660
So here we are at the rocket test cell.

10
00:00:50,080 --> 00:00:50,766
Over here on my left you'll see the 10,000 lb thrust stand at Purdue

11
00:00:54,060 --> 00:00:55,450
with the capability to flow RP1 which is rocket propellant 1
gaseous hydrogen and liquid oxygen.

12
00:00:59,070 --> 00:01:03,070

We can flow cooling water at about 110 gallons in 6 seconds,

13
00:01:04,000 --> 00:01:05,226
which is about enough to fill a swimming pool in 6 or 7 minutes.

14
00:01:07,040 --> 00:01:07,916
And the temperatures that the rocket engine sees
range from minus 290 degrees Fahrenheit

15
00:01:12,030 --> 00:01:18,830
to flame temperatures of 6,000 degrees, which is about
half the temperature of the surface of the sun.

16
00:01:21,000 --> 00:01:22,039
Nicholas Nugent: This is our control room.

17
00:01:22,040 --> 00:01:23,593
This is where we remotely control and monitor all
the experiments through 3 TVs here in the front.

18
00:01:27,020 --> 00:01:28,036
From here, everything is remotely controlled as well
through a series of computer programs.

19
00:01:32,070 --> 00:01:32,786
All of this is student developed and student generated.

20
00:01:35,020 --> 00:01:37,886
The students modify it on a per-test basis.

21
00:01:38,000 --> 00:01:38,733
It helps them understand how the actual system operates.

22
00:01:41,000 --> 00:01:41,200
So we are going into a test here.

23
00:01:43,000 --> 00:01:44,000
3, 2, 1, 0.

24
00:01:45,030 --> 00:01:46,096
(Thrusters fire)

25
00:01:51,010 --> 00:01:53,236
Mauritz deRidder: My experiment is the NASA's CUIP
hydrogen oxygen multi-element experiment.

26
00:01:55,050 --> 00:01:58,070
So we are taking liquid hydrogen and oxygen and forcing it
through 7 fuel injector elements inside a combustion chamber,

27
00:02:00,030 --> 00:02:01,410
which is really useful to people who are designing rocket engines.

28
00:02:03,050 --> 00:02:03,690
It's a sort of study that hasn't been done before.

29
00:02:06,010 --> 00:02:08,069
We are really lucky to be able to do this
at Purdue with a stand this big.

30
00:02:08,070 --> 00:02:08,786
It's important because we are doing the
fundamental science on the types of engines

31
00:02:13,020 --> 00:02:15,640
that are going to form the next generation of engines
that will take people to the moon and to Mars

32
00:02:17,000 --> 00:02:17,616
and get us where we need to go in space.

33
00:02:19,050 --> 00:02:21,173
John Tsohas: High speed computing has enabled us to analyze
and design rocket engine parts by use of computer simulations.

34
00:02:25,060 --> 00:02:27,316
The advent of high speed computing has led to better
understanding of combustion and stability

35
00:02:29,070 --> 00:02:31,336
leading to improved engine designs

36
00:02:32,030 --> 00:02:32,660
and contributing to a reduction in the number of costly
ground tests required to achieve stability.

37
00:02:38,000 --> 00:02:39,703
Yen Yu: Hi, I am working on combustion
and stability in rocket engines.

38
00:02:41,030 --> 00:02:48,763
When rocket engine experience high frequency combustion
and stability, it will make a high pitched screeching noise.

39
00:02:51,050 --> 00:02:51,603
When you don’t do anything about it, the engine might
blow up and cause a space mission to fail.

40
00:02:57,030 --> 00:03:01,963
My job is to understand what causes
instability and find ways to avoid it.

41
00:03:02,060 --> 00:03:04,430
Randy Smith: So as part of my research,
I take what they are doing out at the lab

42
00:03:05,090 --> 00:03:08,356
and try and do something similar on the computer.

43
00:03:09,020 --> 00:03:09,563
So this entails using computer programming and coding

44
00:03:12,010 --> 00:03:12,646
to try and simulate what is going on inside the rocket.

45
00:03:15,040 --> 00:03:15,393
When the results do match the experiment, then it's very exciting

46
00:03:19,020 --> 00:03:20,636
because that means that we are getting closer
to actually simulating the real physics of the rocket.

47
00:03:24,070 --> 00:03:25,316
One of the other perks is that I get to use a NASA supercomputer

48
00:03:27,090 --> 00:03:31,023
which is the equivalent to having 14,000 desktop computers.

49
00:03:32,010 --> 00:03:33,360
I really enjoy working for NASA and here at Purdue,

50
00:03:34,060 --> 00:03:35,526
It’s a great school.

51
00:03:36,020 --> 00:03:38,069
Alex Sandroni: At Purdue University,
we are using the lessons from the past

52
00:03:38,070 --> 00:03:38,653
to prepare for the future through the development
of new and exciting technologies.

53
00:03:43,020 --> 00:03:46,016
It is with these technologies that scientists and engineers
will develop the next generation of spacecraft

54
00:03:47,090 --> 00:03:49,423
to go to the moon, Mars and beyond.