1
00:00:01,351 --> 00:00:06,723
[Music]

2
00:00:06,723 --> 00:00:09,760
>>Armstrong Flight Research
Center's origins date back to

3
00:00:09,760 --> 00:00:13,764
1946, when thirteen National
Advisory Committee for

4
00:00:13,764 --> 00:00:16,934
Aeronautics engineers and
support staff arrived in

5
00:00:16,934 --> 00:00:21,171
California's Mojave Desert on a
quest for supersonic flight with

6
00:00:21,171 --> 00:00:25,375
the X-1, the first aircraft to
be designated an X , or

7
00:00:25,375 --> 00:00:30,781
experimental, vehicle, by the
U.S. Air Force.

8
00:00:30,781 --> 00:00:33,383
The first Air Force flight to
pass Mach 1 came on

9
00:00:33,383 --> 00:00:40,624
October 14,1947, with the NACA
following on March 4, 1948.

10
00:00:40,624 --> 00:00:49,299
[Music]

11
00:00:49,299 --> 00:00:51,501

>>Other X-planes followed the
X-1,

12
00:00:51,501 --> 00:00:55,906
designed to find data related to
speed, temperature, structure,

13
00:00:55,906 --> 00:00:59,009
control, or human physiology.

14
00:00:59,009 --> 00:01:01,912
[Music]

15
00:01:01,912 --> 00:01:05,249
>>By the early 2000s, NASA
Armstrong was testing

16
00:01:05,249 --> 00:01:09,953
the first integrated
hypersonic scramjet,the X-43.

17
00:01:09,953 --> 00:01:17,127
The air-breathing engines
reached Mach 7 and Mach 10.

18
00:01:17,127 --> 00:01:20,030
[Sonic Boom]

19
00:01:20,030 --> 00:01:21,832
[Startled Woman]: What was
that???!!

20
00:01:21,832 --> 00:01:24,434
>>A defining feature of many
high-speed air vehicles is a

21
00:01:24,434 --> 00:01:28,805
loud sonic boom. Over the years,
NASA tried to mitigate these

22
00:01:28,805 --> 00:01:33,110
booms, modifying various
aircraft, like the F-5 Shaped

23
00:01:33,110 --> 00:01:38,315
Sonic Boom Demonstration, F-15,
and F-18, to test theories and

24
00:01:38,315 --> 00:01:42,052
new technologies. Armstrong even
used schlieren imaging of

25
00:01:42,052 --> 00:01:47,024
aircraft in flight to better
understand sonic shock waves.

26
00:01:47,024 --> 00:01:50,360
And finally, seven decades after
helping to create the first

27
00:01:50,360 --> 00:01:55,032
sonic boom, NASA is designing a
new x-plane to demonstrate quiet

28
00:01:55,032 --> 00:01:58,702
boom capabilities, which could
make non-disruptive supersonic

29
00:01:58,702 --> 00:02:00,604
flight over land possible.

30
00:02:00,604 --> 00:02:01,905
[quiet boom]

31
00:02:01,905 --> 00:02:06,943
[Music]

32
00:02:06,943 --> 00:02:09,046
>>Armstrong began flying

Unmanned

33
00:02:09,046 --> 00:02:13,183
Aircraft Systems, or UASs, as
research vehicles as far back

34
00:02:13,183 --> 00:02:16,687
as the 1960s, and developed the
first purpose-built Ground

35
00:02:16,687 --> 00:02:20,290
Control Station for these
aircraft.

36
00:02:20,290 --> 00:02:21,958
More recently,
Armstrong and other

37
00:02:21,958 --> 00:02:25,262
NASA centers began working to
integrate Unmanned Aircraft

38
00:02:25,262 --> 00:02:27,731
Systems into our National Air
Space.

39
00:02:27,731 --> 00:02:28,965
[radio chatter]

40
00:02:28,965 --> 00:02:30,701
[Jet flying]

41
00:02:30,701 --> 00:02:34,805
>>In the 1970s, Armstrong
developed digital fly-by-wire,

42
00:02:34,805 --> 00:02:38,909
control technology that replaced
hydraulic systems and eventually

43
00:02:38,909 --> 00:02:42,846
transferred to military and
commercial aviation, cars,

44
00:02:42,846 --> 00:02:45,382
motorcycles and boats.

45
00:02:45,382 --> 00:02:48,352
The 80s and 90s saw the center
develop thrust vectoring for

46
00:02:48,352 --> 00:02:52,522
jets, making them more
maneuverable, and investigating

47
00:02:52,522 --> 00:02:56,360
safety improvements for
commercial aviation.

48
00:02:56,360 --> 00:02:59,463
In the early 90s, Armstrong
began the Environmental Research

49
00:02:59,463 --> 00:03:02,833
Aircraft and Sensor Technology
program to develop greener

50
00:03:02,833 --> 00:03:05,736
aircraft and study the
environment.

51
00:03:05,736 --> 00:03:10,640
The solar-powered Helios reached
an altitude of 96,863 feet

52
00:03:10,640 --> 00:03:13,310
during the program and
prototypes of

53

00:03:13,310 --> 00:03:16,747
the Predator-B eventually led to
one of NASA's current science

54
00:03:16,747 --> 00:03:22,919
platforms,Ikhana. A new
x-plane, the all- electric X-57,

55
00:03:22,919 --> 00:03:25,789
promises high-efficiency,
quieter, more environmentally

56
00:03:25,789 --> 00:03:30,227
friendly flight. We are also
currently testing a new,

57
00:03:30,227 --> 00:03:34,431
morphing flap that can reduce
noise and improve performance,

58
00:03:34,431 --> 00:03:40,337
and new control techniques for
increased efficiency.

59
00:03:40,337 --> 00:03:44,241
[Music]

60
00:03:44,241 --> 00:03:46,943
>>While the center's
initial focus was aeronautics,

61
00:03:46,943 --> 00:03:50,247
within 10 years it added space
as a research objective.

62
00:03:50,247 --> 00:03:52,849
[Rocket flying]

63
00:03:52,849 --> 00:03:55,318
>>The development of Reaction

Control Systems for the

64
00:03:55,318 --> 00:04:01,358
legendary X-15 was critical for
spaceflight.

65
00:04:01,358 --> 00:04:04,261
Later space work included the
Lunar Landing Research Vehicle

66
00:04:04,261 --> 00:04:08,632
to train Apollo astronauts to
land on the Moon, and Lifting

67
00:04:08,632 --> 00:04:12,969
Bodies, designed to return from
space and fly to a landing

68
00:04:12,969 --> 00:04:17,707
instead of descending under a
parachute. Armstrong's lifting

69
00:04:17,707 --> 00:04:20,944
body track record made it the
obvious site for approach and

70
00:04:20,944 --> 00:04:23,246
landing tests of the
space shuttle prototype

71
00:04:23,246 --> 00:04:27,317
Enterprise, and, later, Sierra
Nevada Corporation's Dream

72
00:04:27,317 --> 00:04:30,954
Chaser spacecraft. During
the Space Shuttle years,

73
00:04:30,954 --> 00:04:33,623
54 missions landed here.

74
00:04:33,623 --> 00:04:37,160
[Music]

75
00:04:37,160 --> 00:04:39,963
>>Armstrong was involved in
testing the pad launch abort

76
00:04:39,963 --> 00:04:43,767
test capsule for NASA's next
spacecraft, the Orion crew

77
00:04:43,767 --> 00:04:46,570
module, which will take
astronauts on our Journey to

78
00:04:46,570 --> 00:04:47,804
Mars.

79
00:04:47,804 --> 00:04:50,173
The capsule's instrumentation
and wiring took place at the

80
00:04:50,173 --> 00:04:54,177
Center, as did its weight and
balance, center of gravity,

81
00:04:54,177 --> 00:04:56,079
and combined systems testing.

82
00:04:56,079 --> 00:04:58,515
[Music]

83
00:04:58,515 --> 00:05:01,485
>>Software for the Space
Launch System, the rocket that

84
00:05:01,485 --> 00:05:06,022
will fly Orion into space, was

tested onboard Armstrong's F-18,

85
00:05:06,022 --> 00:05:08,792
which flew to simulate a rocket
flight path.

86
00:05:08,792 --> 00:05:12,429
Another Armstrong F-18, this
time diving nearly vertically,

87
00:05:12,429 --> 00:05:15,432
was used to test a radar system
that helped land the Mars

88
00:05:15,432 --> 00:05:19,970
Curiosity rover on the surface
of Mars in 2012.

89
00:05:19,970 --> 00:05:22,939
[radio chatter]

90
00:05:22,939 --> 00:05:25,542
>>Always pursuing breakthroughs
in atmospheric flight and

91
00:05:25,542 --> 00:05:28,879
and operations, our Center has
investigated new air launch

92
00:05:28,879 --> 00:05:32,048
techniques that could yield
dramatic cost savings for access

93
00:05:32,048 --> 00:05:36,152
to space, and equal gains in
efficiency.

94
00:05:36,152 --> 00:05:39,723
In addition, Armstrong's Flight
Loads Laboratory performed

95
00:05:39,723 --> 00:05:42,759
mechanical load testing on a
Hypersonic Inflatable

96
00:05:42,759 --> 00:05:46,363
Aerodynamic Decelerator, or
HIAD, that could slow

97
00:05:46,363 --> 00:05:51,334
spacecraft for entry into a
planet's atmosphere.

98
00:05:51,334 --> 00:05:53,703
In order to spur space
technology development in the

99
00:05:53,703 --> 00:05:57,274
private sector, the Center runs
the Space Technology Mission

100
00:05:57,274 --> 00:06:00,477
Directorate's Flight
Opportunities Program, funding

101
00:06:00,477 --> 00:06:03,146
tests, in space-like
environments, of new

102
00:06:03,146 --> 00:06:05,882
technologies intended for
commercial suborbital

103
00:06:05,882 --> 00:06:10,220
spacecraft. Among other things,
the program has matured a 3-D

104
00:06:10,220 --> 00:06:13,723
printer that can print parts and
tools on the International Space

105
00:06:13,723 --> 00:06:16,326
Station.

106
00:06:16,326 --> 00:06:20,597
[Music]

107
00:06:20,597 --> 00:06:23,300
>>The center has long operated a
number of aircraft for the

108
00:06:23,300 --> 00:06:27,003
Agency's Airborne Science
Program, flying scientists

109
00:06:27,003 --> 00:06:31,074
around the world to study the
Earth. This includes a DC-8

110
00:06:31,074 --> 00:06:34,511
flying laboratory,

111
00:06:34,511 --> 00:06:39,316
a C-20,

112
00:06:39,316 --> 00:06:44,921
two
ER-2 high-altitude aircraft,

113
00:06:44,921 --> 00:06:48,592
and two Global Hawks, all
carrying instruments to study

114
00:06:48,592 --> 00:06:53,964
our planet and its ever-changing
environment. NASA's Predator B,

115
00:06:53,964 --> 00:06:57,567
Ikhana,is used today as a

science platform. Besides

116
00:06:57,567 --> 00:07:00,971
assisting with imaging
wildfires, Ikhana gave us the

117
00:07:00,971 --> 00:07:04,341
first images of Orion returning
to Earth for splashdown in the

118
00:07:04,341 --> 00:07:07,978
Pacific after its initial
orbital flight.

119
00:07:07,978 --> 00:07:10,814
Armstrong also operates and
maintains the Stratospheric

120
00:07:10,814 --> 00:07:15,952
Observatory for Infrared
Astronomy, or SOFIA, a 747

121
00:07:15,952 --> 00:07:19,055
with the world's largest
airborne infrared telescope,

122
00:07:19,055 --> 00:07:22,025
yielding extraordinary
astronomical data about our

123
00:07:22,025 --> 00:07:26,196
solar system and far beyond.

124
00:07:26,196 --> 00:07:29,733
As Armstrong begins a new
decade, advances in science,

125
00:07:29,733 --> 00:07:34,070
technology, aeronautics and
space exploration are all rooted