



1
00:00:08,750 --> 00:00:07,070
like other commuters in the South Bay

2
00:00:11,150 --> 00:00:08,760
the people who work at Ames Research

3
00:00:13,759 --> 00:00:11,160
Center have to navigate the same boring

4
00:00:15,709 --> 00:00:13,769
traffic as everyone else but between the

5
00:00:17,840 --> 00:00:15,719
hangar that once housed a nineteen

6
00:00:20,210 --> 00:00:17,850
thirties airship and the largest wind

7
00:00:25,420 --> 00:00:20,220
tunnel is a world that takes them to the

8
00:00:25,430 --> 00:00:45,270
two

9
00:00:51,520 --> 00:00:48,730
in the 1960s the concept of a space

10
00:00:53,920 --> 00:00:51,530
shuttle was pure science fiction until

11
00:00:56,020 --> 00:00:53,930
NASA and President Nixon announced the

12
00:01:00,280 --> 00:00:56,030
space transportation system in early

13
00:01:02,500 --> 00:01:00,290

nineteen seventy-two this space vehicle

14

00:01:06,490 --> 00:01:02,510

would launch like a rocket to low-earth

15

00:01:08,260 --> 00:01:06,500

orbit its crew would release satellites

16

00:01:11,410 --> 00:01:08,270

and deliver parts for the space station

17

00:01:15,160 --> 00:01:11,420

a fiery plunge back into the atmosphere

18

00:01:16,780 --> 00:01:15,170

would turn the vehicle into a glider it

19

00:01:20,980 --> 00:01:16,790

could be piloted to a controlled landing

20

00:01:26,740 --> 00:01:20,990

on a runway it would be the most complex

21

00:01:29,770 --> 00:01:26,750

machine ever built on April 12 1981 NASA

22

00:01:32,710 --> 00:01:29,780

successfully launched sts-1 the first

23

00:01:36,430 --> 00:01:32,720

shuttle mission safely accelerating this

24

00:01:39,960 --> 00:01:36,440

machine to 17,500 miles an hour required

25

00:01:42,880 --> 00:01:39,970

years of sophisticated aerodynamic tests

26

00:01:44,859 --> 00:01:42,890

over half of all wind tunnel tests for

27

00:01:46,930 --> 00:01:44,869

the shuttle were done at Ames these

28

00:01:51,580 --> 00:01:46,940

facilities provided an unmatched range

29

00:01:53,830 --> 00:01:51,590

of sizes and speeds in the 1970s Ames

30

00:01:56,230 --> 00:01:53,840

tunnels allowed scientists to actually

31

00:01:57,880 --> 00:01:56,240

see complex shock waves created by the

32

00:01:59,970 --> 00:01:57,890

shuttle before the first orbiter

33

00:02:02,400 --> 00:01:59,980

Columbia ever flew

34

00:02:05,400 --> 00:02:02,410

the same wind tunnels conducted safety

35

00:02:07,680 --> 00:02:05,410

tests of new fuel tank features in 2005

36

00:02:11,910 --> 00:02:07,690

before the shuttle returned to flight

37

00:02:14,310 --> 00:02:11,920

status Ames computer simulations began

38

00:02:16,800 --> 00:02:14,320

in the 1970s and then improved

39

00:02:19,350 --> 00:02:16,810

exponentially today they can simulate

40

00:02:22,380 --> 00:02:19,360

speeds and conditions no wind tunnel

41

00:02:24,450 --> 00:02:22,390

could match work done on the Columbia

42

00:02:32,910 --> 00:02:24,460

supercomputer helped put the shuttle

43

00:02:37,740 --> 00:02:35,110

the shuttle has performed many

44

00:02:40,449 --> 00:02:37,750

transportation tasks while in orbit

45

00:02:43,860 --> 00:02:40,459

dozens of satellites and spacecraft were

46

00:02:48,930 --> 00:02:46,589

one was Galileo which was developed in

47

00:02:50,880 --> 00:02:48,940

part by Ames and eventually spent years

48

00:02:53,940 --> 00:02:50,890

orbiting Jupiter it sent back

49

00:02:55,770 --> 00:02:53,950

breathtaking photos more recently

50

00:03:02,830 --> 00:02:55,780

shuttles have carried components of the

51
00:03:08,210 --> 00:03:05,600
all astronauts agree the perspective

52
00:03:09,559 --> 00:03:08,220
from orbit is breathtaking but not all

53
00:03:11,869 --> 00:03:09,569
of them are comfortable with zero

54
00:03:14,000 --> 00:03:11,879
gravity now that humans are spending

55
00:03:15,949 --> 00:03:14,010
more time in this environment the study

56
00:03:18,460 --> 00:03:15,959
of how it affects living organisms is

57
00:03:21,199 --> 00:03:18,470
critical for the future of spaceflight

58
00:03:23,750 --> 00:03:21,209
aims life sciences division explored

59
00:03:25,490 --> 00:03:23,760
this subject for over 40 years some

60
00:03:28,030 --> 00:03:25,500
experiments were done on the ground and

61
00:03:30,440 --> 00:03:28,040
others were conducted on the shuttle

62
00:03:32,690 --> 00:03:30,450
flight experiments were installed in

63
00:03:35,839 --> 00:03:32,700

specially designed lab modules carried

64

00:03:37,819 --> 00:03:35,849

in the shuttles payload Bay starting in

65

00:03:40,119 --> 00:03:37,829

April of nineteen ninety-one Ames

66

00:03:43,449 --> 00:03:40,129

participated in shuttle missions such as

67

00:03:46,099 --> 00:03:43,459

Space Lab life sciences one and two

68

00:03:50,599 --> 00:03:46,109

international microgravity labs one and

69

00:03:52,160 --> 00:03:50,609

two Space Lab j and neuro lab these

70

00:03:55,479 --> 00:03:52,170

studied the effects of space flight

71

00:03:57,440 --> 00:03:55,489

conditions on plants animals and humans

72

00:04:00,289 --> 00:03:57,450

now we have a much better understanding

73

00:04:03,140 --> 00:04:00,299

of how zero gravity affects our balance

74

00:04:05,479 --> 00:04:03,150

and visual perception how muscles bone

75

00:04:08,559 --> 00:04:05,489

and blood are affected our immune

76
00:04:10,819 --> 00:04:08,569
systems change and how plants grow

77
00:04:12,740 --> 00:04:10,829
results have already helped astronauts

78
00:04:14,990 --> 00:04:12,750
adapt to different gravity levels on

79
00:04:21,220 --> 00:04:15,000
missions and recover faster after

80
00:04:26,170 --> 00:04:23,740
next to launch re-entry is the most

81
00:04:28,960 --> 00:04:26,180
dangerous part of a shuttles flight Ames

82
00:04:30,550 --> 00:04:28,970
developed a technique in 1953 that has

83
00:04:34,390 --> 00:04:30,560
been used by all American spacecraft

84
00:04:37,030 --> 00:04:34,400
since then Ames scientist Harvey Allen

85
00:04:40,240 --> 00:04:37,040
rendered 1950s spaceplane designs

86
00:04:42,160 --> 00:04:40,250
obsolete he showed that a blunt body not

87
00:04:44,650 --> 00:04:42,170
appointed one could survive re-entry

88
00:04:47,260 --> 00:04:44,660

better by creating a shockwave that

89

00:04:49,360 --> 00:04:47,270

would act as another heat shield this

90

00:04:51,790 --> 00:04:49,370

idea was used to create the shapes for

91

00:04:54,850 --> 00:04:51,800

Mercury Gemini Apollo in every other

92

00:04:57,070 --> 00:04:54,860

American space vehicle although the

93

00:04:58,900 --> 00:04:57,080

shuttle uses the same principle it still

94

00:05:02,020 --> 00:04:58,910

needs insulation from extreme heat

95

00:05:04,350 --> 00:05:02,030

starting in the 1970s Ames scientists

96

00:05:07,300 --> 00:05:04,360

developed feather-like insulation tiles

97

00:05:10,000 --> 00:05:07,310

Ames also develop the largest arc jet

98

00:05:12,360 --> 00:05:10,010

wind tunnel this high-speed blowtorch

99

00:05:15,160 --> 00:05:12,370

allowed them to test tile material at

100

00:05:16,960 --> 00:05:15,170

3,500 degrees the same temperature as

101
00:05:20,590 --> 00:05:16,970
the outer surface of a shuttle during

102
00:05:22,750 --> 00:05:20,600
reentry these reusable tiles were so

103
00:05:24,430 --> 00:05:22,760
successful they were incorporated into

104
00:05:28,000 --> 00:05:24,440
most of the shuttles main heat shield

105
00:05:30,700 --> 00:05:28,010
surfaces after a shuttle lands the

106
00:05:32,650 --> 00:05:30,710
stress on the tiles is obvious to help

107
00:05:35,050 --> 00:05:32,660
the technicians check thousands of tiles

108
00:05:36,870 --> 00:05:35,060
for damage Ames developed a handheld

109
00:05:39,409 --> 00:05:36,880
laser scanner that speeds the process

110
00:05:41,969 --> 00:05:39,419
considerably

111
00:05:44,999 --> 00:05:41,979
after debris damage the leading edge of

112
00:05:46,980 --> 00:05:45,009
Columbia's weighing in 2003 the arc jet

113
00:05:49,499 --> 00:05:46,990

was tasked with testing proposed patch

114

00:05:51,359 --> 00:05:49,509

materials the resulting test data was

115

00:05:53,639 --> 00:05:51,369

fed into the Columbia supercomputer

116

00:06:02,129 --> 00:05:53,649

which further predicted reliability on

117

00:06:04,950 --> 00:06:02,139

re-entry shuttle during descent has been

118

00:06:06,540 --> 00:06:04,960

described like a brick with wings an

119

00:06:09,659 --> 00:06:06,550

early question was how to give it

120

00:06:11,549 --> 00:06:09,669

effective flight control Ames earlier

121

00:06:14,209 --> 00:06:11,559

innovations provided a foundation for

122

00:06:17,040 --> 00:06:14,219

the shuttles basic concept starting in

123

00:06:18,989 --> 00:06:17,050

1957 al eggers and sy sy Ritson

124

00:06:20,909 --> 00:06:18,999

developed and tested lifting bodies

125

00:06:23,129 --> 00:06:20,919

simple shapes that could survive

126

00:06:24,869 --> 00:06:23,139

re-entry and provide just enough lift

127

00:06:29,249 --> 00:06:24,879

and control so they could glide

128

00:06:31,350 --> 00:06:29,259

unpowered to a safe landing high

129

00:06:33,959 --> 00:06:31,360

altitude drop tests at Edwards Air Force

130

00:06:38,489 --> 00:06:33,969

base in the 1960's proved their

131

00:06:41,249 --> 00:06:38,499

airworthiness before the orbiter

132

00:06:43,860 --> 00:06:41,259

Enterprise was flight tested in 1977

133

00:06:46,739 --> 00:06:43,870

Ames did extensive wind tunnel tests of

134

00:06:49,980 --> 00:06:46,749

the shuttle perched atop of 747 Carrier

135

00:06:52,679 --> 00:06:49,990

aircraft starting in nineteen seventy

136

00:06:54,929 --> 00:06:52,689

long before a final shuttle design a

137

00:06:56,790 --> 00:06:54,939

flight simulator at Ames allowed

138

00:06:58,670 --> 00:06:56,800

astronauts to fly approaches while

139

00:07:01,110 --> 00:06:58,680

testing prototype flight controls

140

00:07:03,540 --> 00:07:01,120

astronauts Gordon Fullerton and Fred

141

00:07:05,699 --> 00:07:03,550

Hayes practiced in a larger and moveable

142

00:07:09,179 --> 00:07:05,709

simulator at Ames before climbing into

143

00:07:11,040 --> 00:07:09,189

the enterprise miner control problems on

144

00:07:13,429 --> 00:07:11,050

the first flight were ironed out in the

145

00:07:18,809 --> 00:07:13,439

same simulator to improve later tests in

146

00:07:22,990 --> 00:07:21,339

the commuters who come to farthest to

147

00:07:25,179 --> 00:07:23,000

aims are the shuttle pilots and

148

00:07:29,080 --> 00:07:25,189

commanders starting with the crew of the

149

00:07:31,059 --> 00:07:29,090

first mission sts-1 and commander has

150

00:07:33,520 --> 00:07:31,069

practiced hundreds of landings in Ames

151
00:07:35,980 --> 00:07:33,530
vertical motion simulator it offers the

152
00:07:38,200 --> 00:07:35,990
most realistic motion available the

153
00:07:40,089 --> 00:07:38,210
head-up display developed here was

154
00:07:43,119 --> 00:07:40,099
incorporated into colombia's cockpit

155
00:07:49,300 --> 00:07:43,129
before the first flight in 1981 and is a

156
00:07:51,189 --> 00:07:49,310
part of every orbiter today Ames wind

157
00:07:53,110 --> 00:07:51,199
tunnel tests also prove the safety of

158
00:07:55,119 --> 00:07:53,120
the long-distance carrier that return

159
00:08:00,279 --> 00:07:55,129
the shuttle to Florida after landings in

160
00:08:02,800 --> 00:08:00,289
California today NASA is developing the

161
00:08:05,110 --> 00:08:02,810
crew exploration vehicle this Apollo

162
00:08:08,439 --> 00:08:05,120
shaped capsule will take astronauts back

163
00:08:12,820 --> 00:08:11,409

like it has for over 40 years Ames is

164

00:08:15,070 --> 00:08:12,830

contributing the same level of

165

00:08:17,679 --> 00:08:15,080

scientific expertise and craftsmanship

166

00:08:21,549 --> 00:08:17,689

to help create this new space vehicle

167

00:08:23,200 --> 00:08:21,559

and like they always have ames staff is

168

00:08:26,110 --> 00:08:23,210

still working with one foot on the