
LEWIS RESEARCH CENTER

1
00:00:00,000 --> 00:00:44,280
I

2
00:00:48,450 --> 00:00:46,560
on an upcoming shuttle flight an

3
00:00:51,210 --> 00:00:48,460
experiment will be conducted to study

4
00:00:58,140 --> 00:00:51,220
fire in the microgravity environment of

5
00:01:01,560 --> 00:00:58,150
Earth orbit the solid surface combustion

6
00:01:03,720 --> 00:01:01,570
experiment or ssce was built at the NASA

7
00:01:07,080 --> 00:01:03,730
Lewis Research Center in Cleveland Ohio

8
00:01:11,870 --> 00:01:07,090
to study the details of a fire spreading

9
00:01:15,150 --> 00:01:11,880
over a small solid fuel sample on earth

10
00:01:19,830 --> 00:01:15,160
gravity causes the hot gases in a flame

11
00:01:22,950 --> 00:01:19,840
to rise this air motion called buoyant

12
00:01:25,410 --> 00:01:22,960
convection brings fresh oxygen to the

13
00:01:28,499 --> 00:01:25,420

flame and effects the heat carried

14
00:01:31,680 --> 00:01:28,509
forward to ignite the fuel ahead of the

15
00:01:33,690 --> 00:01:31,690
flame buoyant convection is one of the

16
00:01:37,830 --> 00:01:33,700
more difficult aspects of fire for

17
00:01:40,730 --> 00:01:37,840
scientists to understand in microgravity

18
00:01:43,710 --> 00:01:40,740
boy and convection oven disappears

19
00:01:46,170 --> 00:01:43,720
without convection the flames oxygen

20
00:01:52,410 --> 00:01:46,180
supply and forward heat transfer depend

21
00:01:54,930 --> 00:01:52,420
upon different physical mechanisms these

22
00:01:57,810 --> 00:01:54,940
other mechanisms are present in normal

23
00:02:02,820 --> 00:01:57,820
gravity but are overwhelmed by boy and

24
00:02:05,820 --> 00:02:02,830
convection by performing the ssce

25
00:02:07,980 --> 00:02:05,830
experiment in microgravity scientists

26
00:02:13,600 --> 00:02:07,990
will be able to observe these simpler

27
00:02:17,780 --> 00:02:16,040
with the inside gain from this

28
00:02:20,330 --> 00:02:17,790
experiment scientists will better

29
00:02:22,160 --> 00:02:20,340
understand how the complex system of

30
00:02:28,190 --> 00:02:22,170
physical and chemical mechanisms

31
00:02:30,350 --> 00:02:28,200
interact in fires on earth several years

32
00:02:32,420 --> 00:02:30,360
ago NASA began investigating the

33
00:02:35,480 --> 00:02:32,430
possibility of doing experiments in the

34
00:02:37,580 --> 00:02:35,490
shuttle on combustion topics one being

35
00:02:39,950 --> 00:02:37,590
droplet combustion another flame

36
00:02:43,370 --> 00:02:39,960
spreading over solids and a third being

37
00:02:45,200 --> 00:02:43,380
pre-mixed combustion at that time I was

38
00:02:48,350 --> 00:02:45,210

doing flames spreading experiments and

39
00:02:51,200 --> 00:02:48,360
had proposed to NASA an experiment to be

40
00:02:53,030 --> 00:02:51,210
conducted on the shuttle and described

41
00:02:55,190 --> 00:02:53,040
the key features of the experiment and

42
00:02:59,720 --> 00:02:55,200
that experiment was ultimately designed

43
00:03:01,850 --> 00:02:59,730
by people at NASA Lewis technicians at

44
00:03:04,580 --> 00:03:01,860
Lewis built the hardware and performed a

45
00:03:06,500 --> 00:03:04,590
series of exhaustive tests to show it

46
00:03:11,380 --> 00:03:06,510
would work once it was launched in the

47
00:03:16,789 --> 00:03:14,119
scientists and engineers utilize special

48
00:03:20,119 --> 00:03:16,799
ground-based facilities for testing

49
00:03:22,429 --> 00:03:20,129
experiments in microgravity dropped

50
00:03:24,890 --> 00:03:22,439
hours at the NASA Lewis Research Center

51
00:03:27,530 --> 00:03:24,900
in Cleveland Ohio and special aircraft

52
00:03:30,770 --> 00:03:27,540
at Lewis and the Johnson Space Center in

53
00:03:33,740 --> 00:03:30,780
Houston Texas provide a few seconds of

54
00:03:38,860 --> 00:03:33,750
microgravity at a time to obtain a hint

55
00:03:44,509 --> 00:03:42,140
at the heart of the ssce a sealed vessel

56
00:03:47,509 --> 00:03:44,519
filled with an atmosphere of oxygen and

57
00:03:51,710 --> 00:03:47,519
nitrogen houses a single sample of solid

58
00:03:58,069 --> 00:03:51,720
fuel the test samples are materials like

59
00:03:59,720 --> 00:03:58,079
paper that burn easily and air the

60
00:04:02,089 --> 00:03:59,730
flight specimens are mounted in a

61
00:04:04,869 --> 00:04:02,099
special holder that keeps them secure

62
00:04:07,640 --> 00:04:04,879
during the rigors of a shuttle launch

63
00:04:09,500 --> 00:04:07,650

the sample holder is bolted into the

64
00:04:12,319 --> 00:04:09,510
test chamber and the chamber is sealed

65
00:04:18,069 --> 00:04:12,329
and filled with a test atmosphere before

66
00:04:21,170 --> 00:04:18,079
the hardware is placed in the shuttle in

67
00:04:24,980 --> 00:04:21,180
flight the experiment is started by a

68
00:04:26,930 --> 00:04:24,990
simple computer igniting the sample to

69
00:04:29,300 --> 00:04:26,940
movie cameras are activated by the

70
00:04:33,830 --> 00:04:29,310
computer to photograph the flame through

71
00:04:35,839 --> 00:04:33,840
the windows in the chamber the ssce is

72
00:04:40,520 --> 00:04:35,849
scheduled to fly aboard the shuttle

73
00:04:45,439 --> 00:04:40,530
eight times since October 1995 flights

74
00:04:52,189 --> 00:04:49,339
in the first three tests and ashless

75
00:04:56,269 --> 00:04:52,199
filter paper was burned in fifty percent

76
00:05:00,070 --> 00:04:56,279
oxygen at three different pressures this

77
00:05:03,439 --> 00:05:00,080
is an edge view of the burning paper at

78
00:05:08,779 --> 00:05:03,449
higher test pressures the flame produces

79
00:05:10,670 --> 00:05:08,789
more soot and is therefore brighter the

80
00:05:13,249 --> 00:05:10,680
flame is photographed from both the top

81
00:05:18,230 --> 00:05:13,259
and the side to gather detailed

82
00:05:20,570 --> 00:05:18,240
information about the flame shape at two

83
00:05:23,269 --> 00:05:20,580
times normal atmospheric pressure the

84
00:05:25,579 --> 00:05:23,279
flame is very City the soot particles

85
00:05:33,290 --> 00:05:25,589
glow providing the familiar bright

86
00:05:35,390 --> 00:05:33,300
orange flame before each flight shuttle

87
00:05:37,579 --> 00:05:35,400
astronauts are trained in both the

88
00:05:44,330 --> 00:05:37,589

scientific objectives of the experiment

89
00:05:50,930 --> 00:05:48,620
his life in July 1992 aboard the shuttle

90
00:05:56,330 --> 00:05:50,940
in the United States microgravity

91
00:05:58,820 --> 00:05:56,340
laboratory usml won the ssce experiment

92
00:06:01,310 --> 00:05:58,830
burned another ashless filter paper

93
00:06:04,430 --> 00:06:01,320
sample in an atmosphere of thirty-five

94
00:06:10,640 --> 00:06:04,440
percent oxygen and normal atmospheric

95
00:06:14,210 --> 00:06:10,650
pressure during the STS 47 mission

96
00:06:16,969 --> 00:06:14,220
mission specialists J AB perform the

97
00:06:19,930 --> 00:06:16,979
ssce experiment under thirty five

98
00:06:27,290 --> 00:06:19,940
percent oxygen and one and a half times

99
00:06:28,760 --> 00:06:27,300
normal atmospheric pressure the final

100
00:06:31,340 --> 00:06:28,770
three flights of the solid surface

101
00:06:32,540 --> 00:06:31,350
combustion experiment will be used to

102
00:06:36,230 --> 00:06:32,550
test the flames spreading

103
00:06:40,600 --> 00:06:36,240
characteristics of a thick fuel this

104
00:06:44,480 --> 00:06:40,610
fuel p.m. ma is more commonly known as

105
00:06:47,090 --> 00:06:44,490
plexiglass variations of atmospheric

106
00:06:50,810 --> 00:06:47,100
pressure and oxygen content will be

107
00:06:52,520 --> 00:06:50,820
similar to those for paper tests the

108
00:06:54,650 --> 00:06:52,530
experiments being conducted to gather

109
00:06:56,810 --> 00:06:54,660
information that will ultimately allow

110
00:06:58,940 --> 00:06:56,820
us to improve the fire safety aspects of

111
00:07:01,850 --> 00:06:58,950
space travel from the point of view of

112
00:07:03,980 --> 00:07:01,860
material selection and also extinguisher

113
00:07:05,870 --> 00:07:03,990

development and in addition flames

114
00:07:08,270 --> 00:07:05,880
spreading is a fundamental scientific

115
00:07:11,330 --> 00:07:08,280
problem has been investigated for a

116
00:07:14,180 --> 00:07:11,340
number of years and by doing experiments

117
00:07:16,040 --> 00:07:14,190
in reduced gravity we hope to be able to