1
00:00:00,000 --> 00:00:54,310
Oh

2
00:00:58,630 --> 00:00:56,710
the thermal energy storage or test

3
00:01:00,490 --> 00:00:58,640
experiments will fly aboard the space

4
00:01:02,020 --> 00:01:00,500
shuttle Columbia as part of NASA's

5
00:01:05,650 --> 00:01:02,030
office of aeronautics and space

6
00:01:07,870 --> 00:01:05,660
technology to carrier during the STS 62

7
00:01:09,880 --> 00:01:07,880
mission rolled engineers at the NASA

8
00:01:11,800 --> 00:01:09,890
Lewis Research Center are conducting

9
00:01:13,480 --> 00:01:11,810
materials research that will lead to the

10
00:01:16,050 --> 00:01:13,490
development of the next generation of

11
00:01:18,520 --> 00:01:16,060
power systems for future spacecraft

12
00:01:20,710 --> 00:01:18,530
fluoride salts have been selected as

13
00:01:22,300 --> 00:01:20,720

test material mainly because they melt

14
00:01:23,980 --> 00:01:22,310
and freeze at the high temperatures

15
00:01:26,650 --> 00:01:23,990
required for effective use in a

16
00:01:28,749 --> 00:01:26,660
space-based power system however a

17
00:01:31,150 --> 00:01:28,759
primary concern with fluorides

18
00:01:34,810 --> 00:01:31,160
is the change in volume as much as 30%

19
00:01:37,180 --> 00:01:34,820
when the test material is melted this

20
00:01:39,550 --> 00:01:37,190
change in volume produces a void or

21
00:01:41,859 --> 00:01:39,560
bubble when the material freezes how

22
00:01:45,820 --> 00:01:41,869
these voids behave under microgravity is

23
00:01:48,130 --> 00:01:45,830
not entirely understood suppose that

24
00:01:51,249 --> 00:01:48,140
when the salt freezes and contracts at

25
00:01:52,600 --> 00:01:51,259
zero gravity the void all forms near the

26
00:01:56,560 --> 00:01:52,610
surface of the container

27
00:01:58,660 --> 00:01:56,570
as we move from shade to sunlight there

28
00:02:02,469 --> 00:01:58,670
is no salt to conduct the heat away from

29
00:02:03,969 --> 00:02:02,479
the container surface at this point the

30
00:02:06,310 --> 00:02:03,979
container may be subjected to

31
00:02:10,120 --> 00:02:06,320
temperatures high enough to burn a hole

32
00:02:12,370 --> 00:02:10,130
on the other hand what happens if the

33
00:02:15,789 --> 00:02:12,380
void forms near the center of the

34
00:02:18,160 --> 00:02:15,799
container away from the surface since

35
00:02:20,920 --> 00:02:18,170
the salt nears the surface will melt

36
00:02:24,070 --> 00:02:20,930
first will there be enough room in the

37
00:02:27,039 --> 00:02:24,080
container to allow for the expansion of

38
00:02:30,280 --> 00:02:27,049

the salts from solid to liquid if not

39
00:02:33,759 --> 00:02:30,290
the containers may be distorted again

40
00:02:35,979 --> 00:02:33,769
hampering the entire system Oak Ridge

41
00:02:37,960 --> 00:02:35,989
National Laboratory in Tennessee has

42
00:02:39,940 --> 00:02:37,970
developed a three-dimensional program to

43
00:02:42,640 --> 00:02:39,950
describe in space void behavior in

44
00:02:46,479 --> 00:02:42,650
fluoride salts the program is named nor

45
00:02:48,820 --> 00:02:46,489
vex the nor vex called predictions for

46
00:02:51,880 --> 00:02:48,830
lithium fluoride salt behavior in space

47
00:02:54,610 --> 00:02:51,890
must be verified with data such data at

48
00:02:56,080 --> 00:02:54,620
the present time does not exist the test

49
00:02:58,270 --> 00:02:56,090
experiments have been developed to

50
00:03:01,120 --> 00:02:58,280
provide the low gravity data needed to

51
00:03:03,520 --> 00:03:01,130
verify the Norwex code a validated

52
00:03:05,700 --> 00:03:03,530
Norwex code will help lead to future

53
00:03:07,740 --> 00:03:05,710
solar dynamic power systems

54
00:03:10,440 --> 00:03:07,750
higher efficiency longer life and

55
00:03:12,300 --> 00:03:10,450
reduced weight to separate test

56
00:03:14,160 --> 00:03:12,310
experiments we'll fly aboard Columbia

57
00:03:19,470 --> 00:03:14,170
they are identical except for the

58
00:03:24,040 --> 00:03:22,210
the experiment section has a cylindrical

59
00:03:27,340 --> 00:03:24,050
canister charged with the test material

60
00:03:29,710 --> 00:03:27,350
a to zone heater surrounds the cannister

61
00:03:31,870 --> 00:03:29,720
the fluoride salts are melted here on

62
00:03:33,910 --> 00:03:31,880
earth and allowed to solidify with the

63
00:03:36,940 --> 00:03:33,920

cannister in a horizontal position

64
00:03:39,280 --> 00:03:36,950
this causes a void to be located along

65
00:03:41,050 --> 00:03:39,290
the canister wall at a position which is

66
00:03:43,449 --> 00:03:41,060
opposite the high temperature zone of

67
00:03:45,699 --> 00:03:43,459
the heater in the microgravity

68
00:03:47,980 --> 00:03:45,709
environment of space the test material

69
00:03:51,430 --> 00:03:47,990
will be subjected to four melt freeze

70
00:03:53,500 --> 00:03:51,440
cycles the acquired on-orbit data along

71
00:03:55,540 --> 00:03:53,510
with post flight data will determine the

72
00:03:57,760 --> 00:03:55,550
extent of the void movement toward the

73
00:03:59,680 --> 00:03:57,770
high-temperature heater zone the data

74
00:04:02,680 --> 00:03:59,690
will validate analytical predictions

75
00:04:04,690 --> 00:04:02,690
from the nor vex code the verified code

76
00:04:07,060 --> 00:04:04,700
will help lead to improved heat receiver

77
00:04:09,990 --> 00:04:07,070
designs for future solar dynamic power

78
00:04:12,010 --> 00:04:10,000
systems the thermal energy storage

79
00:04:14,050 --> 00:04:12,020
experiments are the first time these

80
00:04:16,390 --> 00:04:14,060
materials will be tested under extended

81
00:04:18,670 --> 00:04:16,400
microgravity conditions the acquired

82
00:04:20,440 --> 00:04:18,680
data is needed to verify analytical

83
00:04:22,840 --> 00:04:20,450
predictions for test material behavior

84
00:04:24,909 --> 00:04:22,850
these test experiments will point the

85
00:04:27,430 --> 00:04:24,919
way toward a reliable efficient and