1
00:00:32,440 --> 00:00:29,920
Space Station freedom the next step in

2
00:00:36,460 --> 00:00:32,450
our continuing effort to explore beyond

3
00:00:39,970 --> 00:00:36,470
Earth's boundaries as we establish a

4
00:00:43,479 --> 00:00:39,980
permanent presence in space new medical

5
00:00:47,950 --> 00:00:43,489
challenges will have to be met with

6
00:00:51,130 --> 00:00:47,960
longer missions larger crews and the

7
00:00:53,049 --> 00:00:51,140
complexities of a medical rescue the

8
00:00:55,180 --> 00:00:53,059
health of freedoms international crew

9
00:01:08,460 --> 00:00:55,190
will be essential for the success of

10
00:01:14,980 --> 00:01:12,910
the crew health care system or checks is

11
00:01:21,630 --> 00:01:14,990
currently being designed and developed

12
00:01:26,499 --> 00:01:24,010
distributed throughout the space station

13
00:01:29,050 --> 00:01:26,509

this system will provide the total

14
00:01:33,240 --> 00:01:29,060
spectrum of crew health care with three

15
00:01:37,320 --> 00:01:33,250
distinct but interconnected components

16
00:01:41,710 --> 00:01:37,330
the exercise countermeasures facility

17
00:01:46,120 --> 00:01:41,720
the environmental health system and the

18
00:01:47,650 --> 00:01:46,130
health maintenance facility following is

19
00:01:50,710 --> 00:01:47,660
a description of the exercise

20
00:01:59,919 --> 00:01:50,720
countermeasures facility or ECF

21
00:02:03,450 --> 00:01:59,929
component in space the human body is not

22
00:02:06,090 --> 00:02:03,460
working against the forces of gravity as

23
00:02:09,520 --> 00:02:06,100
the body adapts to weightlessness

24
00:02:14,470 --> 00:02:09,530
skeletal muscles shrink or atrophy and

25
00:02:16,840 --> 00:02:14,480
bone structure changes these and other

26
00:02:18,910 --> 00:02:16,850
physiological changes are part of the

27
00:02:23,800 --> 00:02:18,920
deconditioning process resulting from

28
00:02:25,930 --> 00:02:23,810
the effect of zero gravity exercise can

29
00:02:28,930 --> 00:02:25,940
be an extremely effective countermeasure

30
00:02:31,300 --> 00:02:28,940
to deconditioning the exercise

31
00:02:34,030 --> 00:02:31,310
countermeasures facility will provide a

32
00:02:36,280 --> 00:02:34,040
comprehensive exercise program so that

33
00:02:41,979 --> 00:02:36,290
future astronauts can remain physically

34
00:02:44,259 --> 00:02:41,989
fit during extended stays in space for

35
00:02:46,660 --> 00:02:44,269
different laboratories at NASA's Johnson

36
00:02:49,930 --> 00:02:46,670
Space Center are working on the exercise

37
00:02:53,500 --> 00:02:49,940
countermeasures facility the exercise

38
00:02:56,770 --> 00:02:53,510

development lab the exercise physiology

39
00:03:05,250 --> 00:02:56,780
lab the anthropometry and biomechanics

40
00:03:09,809 --> 00:03:07,500
products from the combined efforts of

41
00:03:12,839 --> 00:03:09,819
these labs will include special exercise

42
00:03:16,110 --> 00:03:12,849
equipment individualized exercise

43
00:03:18,869 --> 00:03:16,120
programs or prescriptions Medical

44
00:03:25,080 --> 00:03:18,879
monitors and computers designed to

45
00:03:27,240 --> 00:03:25,090
integrate the system the exercise

46
00:03:29,699 --> 00:03:27,250
development lab specializes in the

47
00:03:35,280 --> 00:03:29,709
operational and logistical concerns of

48
00:03:36,929 --> 00:03:35,290
exercising in space this lab is also

49
00:03:39,300 --> 00:03:36,939
responsible for development and

50
00:03:44,330 --> 00:03:39,310
integration of exercise hardware and

51
00:03:49,319 --> 00:03:46,680
equipment currently being considered for

52
00:03:54,930 --> 00:03:49,329
use on Space Station freedom includes a

53
00:04:03,470 --> 00:03:54,940
treadmill a combination bicycle rowing

54
00:04:08,729 --> 00:04:06,539
the exercise physiology lab is

55
00:04:10,890 --> 00:04:08,739
developing individualized exercise

56
00:04:14,640 --> 00:04:10,900
programs or prescriptions for

57
00:04:16,740 --> 00:04:14,650
crewmembers this lab is also evaluating

58
00:04:18,319 --> 00:04:16,750
the effectiveness of exercise programs

59
00:04:22,879 --> 00:04:18,329
in preventing or minimizing

60
00:04:27,890 --> 00:04:25,820
the anthropometry and biomechanics lab

61
00:04:30,260 --> 00:04:27,900
is evaluating and establishing the

62
00:04:33,679 --> 00:04:30,270
biomechanical effectiveness of exercise

63
00:04:35,809 --> 00:04:33,689

equipment this will help determine how

64
00:04:42,800 --> 00:04:35,819
well the human body interacts with the

65
00:04:44,989 --> 00:04:42,810
equipment in zero-gravity development of

66
00:04:47,390 --> 00:04:44,999
the biomechanical requirements for intra

67
00:04:52,129 --> 00:04:47,400
Vic Uhler and extra vehicular activities

68
00:04:54,409 --> 00:04:52,139
is also done in this lab the artificial

69
00:04:56,480 --> 00:04:54,419
intelligence lab is responsible for

70
00:05:00,200 --> 00:04:56,490
establishing requirements for database

71
00:05:02,659 --> 00:05:00,210
management data analysis and developing

72
00:05:05,830 --> 00:05:02,669
automation of the exercise protocol so

73
00:05:08,600 --> 00:05:05,840
bored freedom a computer-controlled

74
00:05:10,640 --> 00:05:08,610
expert system using an artificial

75
00:05:12,740 --> 00:05:10,650
intelligence program will be able to

76
00:05:17,959 --> 00:05:12,750
automatically adjust each astronauts

77
00:05:20,510 --> 00:05:17,969
daily exercise regimen in order to test

78
00:05:23,170 --> 00:05:20,520
the exercise equipment and verify the

79
00:05:25,550 --> 00:05:23,180
procedures prior to trials in space

80
00:05:27,649 --> 00:05:25,560
several methods are utilized on the

81
00:05:32,420 --> 00:05:27,659
ground to simulate the microgravity

82
00:05:35,050 --> 00:05:32,430
environment one method uses JSC's

83
00:05:38,300 --> 00:05:35,060
weightless environment test facility

84
00:05:43,639 --> 00:05:38,310
here neutral buoyancy is used to

85
00:05:47,119 --> 00:05:43,649
simulate microgravity conditions another

86
00:05:51,920 --> 00:05:47,129
method used in testing is NASA's kc-135

87
00:05:54,529 --> 00:05:51,930
a modified Boeing 707 airplane the plane

88
00:05:56,540 --> 00:05:54,539

is flown in parabolic arcs to create

89
00:05:58,219 --> 00:05:56,550
approximately 30 seconds of near

90
00:06:03,499 --> 00:05:58,229
weightlessness at the crest of each

91
00:06:06,320 --> 00:06:03,509
parabola dr. bernard harris head of the

92
00:06:08,779 --> 00:06:06,330
exercise countermeasures project at JSC

93
00:06:12,499 --> 00:06:08,789
explains the overall goals of the

94
00:06:15,019 --> 00:06:12,509
project basically there are two types of

95
00:06:17,779 --> 00:06:15,029
exercise that will provide for extended

96
00:06:18,730 --> 00:06:17,789
duration flight aerobic exercise which

97
00:06:21,589 --> 00:06:18,740
will be used with cardiovascular

98
00:06:24,410 --> 00:06:21,599
conditioning and anaerobic exercise will

99
00:06:26,640 --> 00:06:24,420
be used for muscle and bone conditioning

100
00:06:28,770 --> 00:06:26,650
providing exercise training in the

101
00:06:32,220 --> 00:06:28,780
microgravity environment will provide us

102
00:06:34,770 --> 00:06:32,230
a tremendous challenge without gravity

103
00:06:36,630 --> 00:06:34,780
acting on the body we're going to have

104
00:06:38,430 --> 00:06:36,640
design restraint systems which will

105
00:06:42,180 --> 00:06:38,440
actually hold the astronaut to the

106
00:06:44,070 --> 00:06:42,190
exercise equipment with extended

107
00:06:46,110 --> 00:06:44,080
duration missions we're concerned about

108
00:06:49,800 --> 00:06:46,120
the psychological welfare of the crew

109
00:06:51,900 --> 00:06:49,810
and the physiological aspects for this

110
00:06:53,910 --> 00:06:51,910
reason we have designed a motivational

111
00:07:00,120 --> 00:06:53,920
system to be used in conjunction with

112
00:07:02,610 --> 00:07:00,130
the exercise facility exercise in space

113
00:07:05,640 --> 00:07:02,620

is more than staying in condition for

114
00:07:07,500 --> 00:07:05,650
the return to Earth's gravity it is the

115
00:07:13,050 --> 00:07:07,510
key to good health over prolonged

116
00:07:15,960 --> 00:07:13,060
periods of weightlessness as part of the

117
00:07:18,330 --> 00:07:15,970
crew health care system the exercise

118
00:07:20,700 --> 00:07:18,340
countermeasures facility is being

119
00:07:23,520 --> 00:07:20,710
developed today to provide an exercise

120
00:07:26,160 --> 00:07:23,530
program that will improve pre-flight in