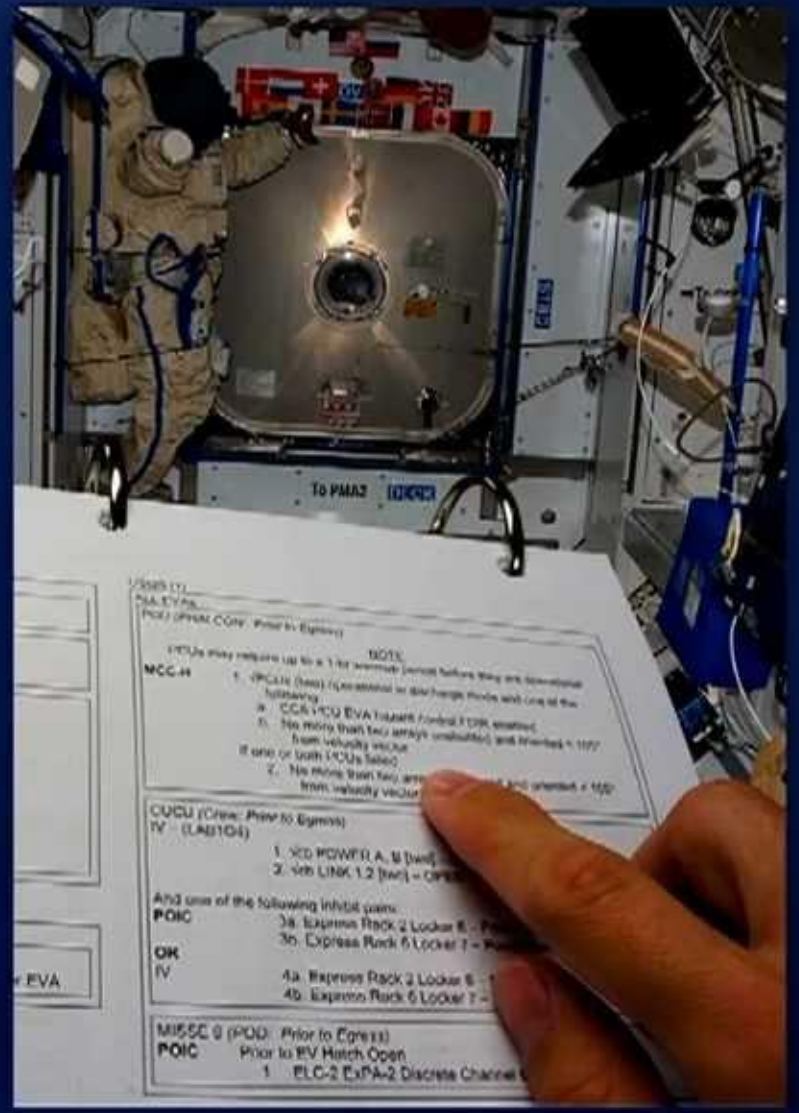
Astronauts can experience
up to +1.75 diopter shift in vision...



...and other vision changes
including "cotton wool" spots

1
00:00:06,309 --> 00:00:04,570
and welcome to Mission Control Houston

2
00:00:07,749 --> 00:00:06,319
we're going to send the signal out to

3
00:00:09,369 --> 00:00:07,759
Marshall Space Flight Center in

4
00:00:11,499 --> 00:00:09,379
Huntsville Alabama the payload

5
00:00:13,629 --> 00:00:11,509
operations integration Center so the

6
00:00:15,129 --> 00:00:13,639
Lori Meggs is standing by there to tell

7
00:00:17,980 --> 00:00:15,139
us more about the research on the space

8
00:00:19,269 --> 00:00:17,990
station hi Lori hi Kelly we're learning

9
00:00:21,279 --> 00:00:19,279
about the human body and how it

10
00:00:23,980 --> 00:00:21,289
functions in microgravity is paramount

11
00:00:26,080 --> 00:00:23,990
to future spaceflight astronauts are

12
00:00:28,120 --> 00:00:26,090
asked to participate in studies for the

13
00:00:30,099 --> 00:00:28,130

human research program and one of those

14
00:00:32,290 --> 00:00:30,109
studies going on right now is called the

15
00:00:34,119 --> 00:00:32,300
functional task tests and I recently

16
00:00:35,860 --> 00:00:34,129
spoke with the principal investigator of

17
00:00:38,500 --> 00:00:35,870
that to find out a little bit more about

18
00:00:40,810 --> 00:00:38,510
what they're doing we're involved in an

19
00:00:43,090 --> 00:00:40,820
ISS study called a functional task test

20
00:00:46,390 --> 00:00:43,100
and the functional task test is really

21
00:00:49,180 --> 00:00:46,400
looking at how multiple physiological

22
00:00:51,460 --> 00:00:49,190
systems impact ability of astronauts do

23
00:00:53,200 --> 00:00:51,470
functional tasks over the years we've

24
00:00:55,859 --> 00:00:53,210
done a really good job with defining how

25
00:00:58,570 --> 00:00:55,869
individual physiological systems in a

26
00:01:00,429 --> 00:00:58,580
change as a result of spaceflight but

27
00:01:03,399 --> 00:01:00,439
we've never put the pieces together in

28
00:01:05,350 --> 00:01:03,409
one complete study but more importantly

29
00:01:06,970 --> 00:01:05,360
we've never linked those physiological

30
00:01:09,420 --> 00:01:06,980
changes to functional changes in

31
00:01:11,980 --> 00:01:09,430
astronauts really operational changes so

32
00:01:14,680 --> 00:01:11,990
functional test test is really an

33
00:01:17,140 --> 00:01:14,690
integrative study involving three of the

34
00:01:19,450 --> 00:01:17,150
labs at JSC the cardiovascular lab

35
00:01:22,990 --> 00:01:19,460
neuroscience lab exercise physiology lab

36
00:01:25,720 --> 00:01:23,000
are focused specifically on making that

37
00:01:29,320 --> 00:01:25,730
link between functional changes and the

38
00:01:31,000 --> 00:01:29,330

underlying physiology involved and you

39
00:01:32,710 --> 00:01:31,010
ultimately the reason for doing that is

40
00:01:34,990 --> 00:01:32,720
we're interested in developing

41
00:01:37,090 --> 00:01:35,000
countermeasures and we want to focus on

42
00:01:38,800 --> 00:01:37,100
the counter measures on countermeasures

43
00:01:41,290 --> 00:01:38,810
on systems that really make a difference

44
00:01:44,080 --> 00:01:41,300
in terms of functional change have you

45
00:01:46,540 --> 00:01:44,090
seen over the years a lot of functional

46
00:01:48,399 --> 00:01:46,550
change and things that change in in my

47
00:01:50,440 --> 00:01:48,409
sure I mean so that some of the more

48
00:01:52,899 --> 00:01:50,450
obvious changes we see are in partial

49
00:01:54,760 --> 00:01:52,909
stability and ability to walk we've done

50
00:01:57,100 --> 00:01:54,770
previous studies where crew members

51
00:01:58,870 --> 00:01:57,110
walked obstacle courses and did those

52
00:02:01,060 --> 00:01:58,880
type of functions as we see significant

53
00:02:03,580 --> 00:02:01,070
partial instability half after

54
00:02:05,530 --> 00:02:03,590
spaceflight that's my sort of area of

55
00:02:07,300 --> 00:02:05,540
interest but of course you see changes

56
00:02:09,219 --> 00:02:07,310
in well and other physiological systems

57
00:02:11,680 --> 00:02:09,229
to let the cardiovascular system there's

58
00:02:13,180 --> 00:02:11,690
orthostatic intolerance which is the

59
00:02:14,840 --> 00:02:13,190
potential for fainting when when when

60
00:02:16,490 --> 00:02:14,850
the crewmember stands up

61
00:02:18,020 --> 00:02:16,500
as muscle performance changes their

62
00:02:20,420 --> 00:02:18,030
strength changes there's muscle atrophy

63
00:02:22,250 --> 00:02:20,430

so all those systems sort of combined

64
00:02:24,200 --> 00:02:22,260
together to create the change in

65
00:02:26,690 --> 00:02:24,210
functional outcome so how are we

66
00:02:29,270 --> 00:02:26,700
studying this how is it operationally

67
00:02:32,390 --> 00:02:29,280
for you this is a pre and post flight

68
00:02:34,670 --> 00:02:32,400
study and we test them three times

69
00:02:37,130 --> 00:02:34,680
pre-flight and then we were able to test

70
00:02:40,490 --> 00:02:37,140
them on 24 hours after landing the crew

71
00:02:42,230 --> 00:02:40,500
comes from ISS lands in Russia they fly

72
00:02:43,550 --> 00:02:42,240
back to Johnson Space Center and we

73
00:02:45,620 --> 00:02:43,560
start doing the data collection they are

74
00:02:48,470 --> 00:02:45,630
about 24 hours after landing and then we

75
00:02:50,690 --> 00:02:48,480
test them six days and 30 days done the

76
00:02:53,210 --> 00:02:50,700
way we test them is we have a set of

77
00:02:55,010 --> 00:02:53,220
functional tests that we do which are

78
00:02:59,660 --> 00:02:55,020
things like obstacle course testing

79
00:03:02,390 --> 00:02:59,670
hatch opening letter climbing various

80
00:03:04,880 --> 00:03:02,400
task of object displacement so various

81
00:03:06,550 --> 00:03:04,890
hands-on functional tasks and then we

82
00:03:10,430 --> 00:03:06,560
have a set of corresponding

83
00:03:12,650 --> 00:03:10,440
physiological tasks that look at various

84
00:03:15,550 --> 00:03:12,660
physiological changes that include

85
00:03:17,990 --> 00:03:15,560
changes in muscle performance

86
00:03:19,640 --> 00:03:18,000
neurological changes and cardiovascular

87
00:03:20,930 --> 00:03:19,650
changes and putting all those pieces

88
00:03:22,970 --> 00:03:20,940

together is really what we're trying to

89
00:03:24,350 --> 00:03:22,980
do I'm going to tell you I'd hate to be

90
00:03:25,760 --> 00:03:24,360
on Space Station then come back and have

91
00:03:29,210 --> 00:03:25,770
to run an obstacle course that would not

92
00:03:31,070 --> 00:03:29,220
be yes it is challenging absolutely tell

93
00:03:34,310 --> 00:03:31,080
me how long this has been going on and

94
00:03:36,620 --> 00:03:34,320
how long it will go on well we've

95
00:03:39,140 --> 00:03:36,630
already completed seven subjects we're

96
00:03:42,260 --> 00:03:39,150
asking for 13 subjects so we're about

97
00:03:44,270 --> 00:03:42,270
halfway through our subject count even

98
00:03:46,190 --> 00:03:44,280
doing the experiment for about two two

99
00:03:48,800 --> 00:03:46,200
and a half years we expect another two

100
00:03:51,050 --> 00:03:48,810
years to collect the rest of our data we

101
00:03:53,060 --> 00:03:51,060
learn anything so far that you can share

102
00:03:54,890 --> 00:03:53,070
some of the preliminary data when we

103
00:03:56,510 --> 00:03:54,900
look at some of the functional tasks so

104
00:03:59,900 --> 00:03:56,520
the clearly the functional tasks that

105
00:04:01,790 --> 00:03:59,910
require partial stability are are

106
00:04:04,670 --> 00:04:01,800
affected the mouse or the obstacle

107
00:04:06,950 --> 00:04:04,680
course test our posture stability test

108
00:04:08,720 --> 00:04:06,960
those are the tests tests that have less

109
00:04:10,220 --> 00:04:08,730
requirement for posterous to be like

110
00:04:12,650 --> 00:04:10,230
hatch opening where you can hold on to

111
00:04:16,000 --> 00:04:12,660
the hatch those testing that are less

112
00:04:18,250 --> 00:04:16,010
impaired by by by spaceflight

113
00:04:19,840 --> 00:04:18,260

and along the lines of human research we

114
00:04:20,980 --> 00:04:19,850
want to share some news about a recently

115
00:04:23,020 --> 00:04:20,990
identified health problem with

116
00:04:25,630 --> 00:04:23,030
astronauts vision and some new research

117
00:04:27,310 --> 00:04:25,640
that that is leading to is called the

118
00:04:29,500 --> 00:04:27,320
visual impairment and intracranial

119
00:04:31,930 --> 00:04:29,510
pressure risk and it has become the

120
00:04:33,490 --> 00:04:31,940
number one human space flight risk when

121
00:04:35,440 --> 00:04:33,500
we talk about intracranial pressure

122
00:04:37,300 --> 00:04:35,450
we're talking about pressure inside the

123
00:04:38,920 --> 00:04:37,310
brain and on-orbit crew members

124
00:04:41,380 --> 00:04:38,930
experience fluid shifts to the head

125
00:04:43,510 --> 00:04:41,390
caused by microgravity and therefore

126
00:04:45,520 --> 00:04:43,520
it's hypothesized that all crew members

127
00:04:47,740 --> 00:04:45,530
have elevated intracranial pressure to

128
00:04:49,510 --> 00:04:47,750
some degree researchers have linked this

129
00:04:52,000 --> 00:04:49,520
increased pressure to changes in vision

130
00:04:53,800 --> 00:04:52,010
and long-duration astronauts and when

131
00:04:56,410 --> 00:04:53,810
the vision impairment study began all

132
00:04:58,300 --> 00:04:56,420
crew members pre-flight had normal eye

133
00:05:00,220 --> 00:04:58,310
examinations but post flight

134
00:05:02,040 --> 00:05:00,230
measurements showed a degradation and

135
00:05:04,990 --> 00:05:02,050
vision primarily increasing

136
00:05:06,790 --> 00:05:05,000
farsightedness 41 crew members have

137
00:05:08,710 --> 00:05:06,800
flown to date and of those 19 were

138
00:05:11,050 --> 00:05:08,720

identified as having visual changes on

139
00:05:13,360 --> 00:05:11,060
their return six did not have symptoms

140
00:05:15,850 --> 00:05:13,370
and 16 others could not be classified

141
00:05:17,080 --> 00:05:15,860
classified as they flew in the early

142
00:05:18,640 --> 00:05:17,090
increments which did not have the

143
00:05:22,000 --> 00:05:18,650
imaging techniques available as in the

144
00:05:23,410 --> 00:05:22,010
last six to seven years now researchers

145
00:05:25,620 --> 00:05:23,420
are looking at finding a technique to

146
00:05:27,880 --> 00:05:25,630
measure these visual changes in flight

147
00:05:30,250 --> 00:05:27,890
non-invasively and to understand what's

148
00:05:31,960 --> 00:05:30,260
contributing to it a technique like this

149
00:05:33,640 --> 00:05:31,970
is highly sought after on earth as well

150
00:05:35,500 --> 00:05:33,650
as to measure intracranial pressure and

151
00:05:37,660 --> 00:05:35,510
NASA is on the cutting edge of that

152
00:05:39,940 --> 00:05:37,670
research and identifying devices that

153
00:05:41,530 --> 00:05:39,950
could be used in flight results of these

154
00:05:43,480 --> 00:05:41,540
studies may also be relevant for

155
00:05:45,820 --> 00:05:43,490
patients suffering from I diseases here

156
00:05:47,440 --> 00:05:45,830
on earth such as glaucoma NASA's human

157
00:05:49,330 --> 00:05:47,450
research program will look at this risk

158
00:05:50,800 --> 00:05:49,340
over the next 10 years and find

159
00:05:52,660 --> 00:05:50,810
investigators to study the intracranial