



1
00:00:00,506 --> 00:00:53,266
[Music]

2
00:00:53,766 --> 00:00:54,136
>> Amiko Kauderer:
[Silence] Welcome

3
00:00:54,136 --> 00:00:56,136
to the International Space
Station flight control room.

4
00:00:56,136 --> 00:00:57,466
We were looking at a video there

5
00:00:57,466 --> 00:01:00,136
with Mike Hopkins aboard the
International Space Station.

6
00:01:00,506 --> 00:01:01,336
Pumping some iron.

7
00:01:01,336 --> 00:01:03,496
Using the Advanced
Resistive Exercise Device.

8
00:01:03,746 --> 00:01:06,196
Today I have a special guest.

9
00:01:06,196 --> 00:01:07,316
He is Mark Guilliams.

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00:01:07,356 --> 00:01:10,926
He is the long-title Astronaut
Strength, Conditioning,

11
00:01:10,926 --> 00:01:13,116
and Rehabilitation Specialist.

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00:01:13,116 --> 00:01:14,736

Welcome Mark and thank
you for coming today.

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00:01:14,866 --> 00:01:15,196

>> Mark Guilliams: Thank you.

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00:01:15,776 --> 00:01:16,186

>> Amiko Kauderer: Alright.

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00:01:16,306 --> 00:01:18,306

Well, let's -- before
we get into talking

16

00:01:18,306 --> 00:01:19,346

about what Mike was doing,

17

00:01:19,346 --> 00:01:20,996

it looks a little
like bananas to me.

18

00:01:21,406 --> 00:01:21,606

>> Mark Guilliams: Yeah.

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00:01:21,786 --> 00:01:22,626

>> Amiko Kauderer:
But before we get

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00:01:22,626 --> 00:01:25,376

into that let's talk a
little about your background

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00:01:25,376 --> 00:01:27,776

in strength and conditioning
and tell me how you came

22

00:01:27,776 --> 00:01:29,166

about working with
the astronauts.

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00:01:29,336 --> 00:01:33,296

>> Mark Guilliams: Well, it started about 1992 when I was --

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00:01:33,296 --> 00:01:36,706

after graduating I went to graduate school and did my work

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00:01:36,706 --> 00:01:37,976

in exercise physiology.

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00:01:38,576 --> 00:01:41,456

One of my professors was actually a physiologist here.

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00:01:41,456 --> 00:01:43,326

Worked here; did research on exercise.

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00:01:43,326 --> 00:01:47,226

And I did an internship with him and I've been here ever since.

29

00:01:47,226 --> 00:01:50,416

I worked about 5 years in the exercise lab doing research

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00:01:50,416 --> 00:01:53,206

and then kind of transitioned into this group,

31

00:01:53,676 --> 00:01:57,036

when this group was formed back in like 1996, 1997,

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00:01:57,036 --> 00:01:58,136

and I've been here ever since.

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00:01:58,746 --> 00:01:59,086

>> Amiko Kauderer: Okay.

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00:01:59,426 --> 00:02:02,166

And so how is it that you
found your way working

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00:02:02,166 --> 00:02:02,806

with the astronauts?

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00:02:03,476 --> 00:02:04,726

>> Mark Guilliams:

Well, you know,

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00:02:04,726 --> 00:02:07,926

I've always been an
avid weightlifter

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00:02:07,926 --> 00:02:09,746

through high school and college.

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00:02:09,746 --> 00:02:14,296

When this group was formed
back in 1997 it was --

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00:02:14,296 --> 00:02:16,366

actually it was formed
to build the station.

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00:02:16,366 --> 00:02:18,956

It was to prepare crew members
to do all the EVAs that had

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00:02:18,956 --> 00:02:20,746

to be done to actually
build the station.

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00:02:21,286 --> 00:02:24,596

So they decided to form a
group that would work basically

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00:02:24,596 --> 00:02:25,456

like you would in college.

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00:02:25,456 --> 00:02:27,576

You have strength coaches
that train football players

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00:02:27,576 --> 00:02:28,346

or basketball players.

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00:02:28,346 --> 00:02:29,086

It's the same thing.

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00:02:29,086 --> 00:02:31,086

It would be specific to EVAs

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00:02:31,086 --> 00:02:32,916

and training crew
members to do EVAs.

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00:02:33,026 --> 00:02:33,176

>> Amiko Kauderer: Okay.

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00:02:33,176 --> 00:02:33,606

EVA's -- space walks.

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00:02:33,606 --> 00:02:35,066

>> Mark Guilliams: That's
kind of how it started.

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00:02:35,066 --> 00:02:36,046

Yes. Space walks [chuckles].

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00:02:36,286 --> 00:02:36,456

>> Amiko Kauderer: Okay.

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00:02:36,456 --> 00:02:38,336

Well now let's get to

talking about Mike.

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00:02:38,336 --> 00:02:42,276

I've seen it on the Twitter
verse and everywhere else

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00:02:42,276 --> 00:02:45,556

in social media that Mike is
basically a beast [chuckles].

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00:02:45,886 --> 00:02:46,146

>> Mark Guilliams: Well yeah.

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00:02:46,296 --> 00:02:47,166

He can be.

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00:02:47,166 --> 00:02:48,006

>> Amiko Kauderer:
He's a machine.

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00:02:48,106 --> 00:02:50,696

But we can all kind of do
these kinds of things, correct?

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00:02:50,736 --> 00:02:50,806

>> Mark Guilliams: Yeah.

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00:02:50,806 --> 00:02:51,136

Mm-hmm.

64

00:02:51,206 --> 00:02:52,136

>> Amiko Kauderer: It's
about conditioning.

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00:02:52,216 --> 00:02:52,346

>> Mark Guilliams: Yeah.

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00:02:52,346 --> 00:02:55,966

>> Amiko Kauderer: So let's

first talk about how do you go

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00:02:55,966 --> 00:03:00,156
about determining what an
astronauts training program

68

00:03:00,156 --> 00:03:01,756
would be, for example, Mikes?

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00:03:01,946 --> 00:03:04,166
>> Mark Guilliams: Well, for
example -- for the most part,

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00:03:04,316 --> 00:03:05,586
when it comes to
in-flight training,

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00:03:06,036 --> 00:03:08,376
every crew member we have
a template that we use

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00:03:08,416 --> 00:03:10,746
that there's certain things that
every crew member's going to do.

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00:03:11,376 --> 00:03:12,966
Then that -- then we take that.

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00:03:12,966 --> 00:03:14,186
We take their strengths.

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00:03:14,736 --> 00:03:17,696
And we take their ability,
or capacity or whatever,

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00:03:17,696 --> 00:03:20,056
and then we design that
to their work capacity.

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00:03:20,056 --> 00:03:23,376

So each crew member will pretty much do the same exercises,

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00:03:23,376 --> 00:03:24,756

they're just going to do it at their levels.

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00:03:25,276 --> 00:03:27,876

With Mike, what we did with Mike is Mike wanted

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00:03:27,876 --> 00:03:29,376

to do a little bit extra.

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00:03:29,886 --> 00:03:32,396

And he did it when he was down here at pre-flight training.

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00:03:32,396 --> 00:03:34,686

He likes to do what you saw in the video

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00:03:35,236 --> 00:03:37,236

where we take multiple exercises

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00:03:37,236 --> 00:03:38,606

and put them back-to-back-to-back.

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00:03:38,606 --> 00:03:41,336

Where you're training different movements, but trying to do it

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00:03:41,336 --> 00:03:43,046

with as very little rest as possible

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00:03:43,046 --> 00:03:44,356

to make it a little

bit more intense.

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00:03:44,666 --> 00:03:45,406

He likes to do that.

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00:03:45,406 --> 00:03:49,076

So what with him what we did is
I work with some outside folks,

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00:03:49,076 --> 00:03:51,196

and to come up with ways

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00:03:51,196 --> 00:03:54,396

of substituting different
exercises for certain things.

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00:03:54,396 --> 00:03:56,556

Like in this video we
saw he was supposed

93

00:03:56,556 --> 00:03:58,566

to be doing pull
ups and push ups.

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00:03:58,566 --> 00:04:00,806

Well we can't do pull
ups and push ups in 0 G

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00:04:01,076 --> 00:04:02,016

because there's no gravity.

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00:04:02,016 --> 00:04:03,386

So we had to compensate for that

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00:04:03,386 --> 00:04:04,966

so we did bench press
and bent over row.

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00:04:04,966 --> 00:04:07,136

Which are fairly similar exercises.

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00:04:07,136 --> 00:04:09,576

So what we did is we just substituted that.

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00:04:09,576 --> 00:04:12,356

We did that for multiple workouts

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00:04:12,506 --> 00:04:15,366

that he's been adding extra on top of what he's been doing.

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00:04:15,626 --> 00:04:15,886

>> Amiko Kauderer: Mm-hmm.

103

00:04:16,146 --> 00:04:18,416

So that brings me to a question

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00:04:18,416 --> 00:04:20,726

that I found actually on a social media.

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00:04:20,726 --> 00:04:22,616

We had a social media question coming

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00:04:22,616 --> 00:04:23,766

from a John Viewer [phonetic].

107

00:04:24,136 --> 00:04:25,696

He wanted to know, "Do rubber bands

108

00:04:25,696 --> 00:04:28,066

and elastics have the same resistance in space?"

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00:04:29,096 --> 00:04:29,846

>> Mark Guilliams: Yes they do.

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00:04:30,216 --> 00:04:30,316

>> Amiko Kauderer: Okay.

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00:04:30,316 --> 00:04:31,826

>> Mark Guilliams: They do have the same resistance in space.

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00:04:31,826 --> 00:04:33,126

>> Amiko Kauderer: So explain though now,

113

00:04:33,156 --> 00:04:35,896

we saw him using the Advanced Resistive Exercise Device.

114

00:04:35,896 --> 00:04:37,436

Explain that device just a little bit.

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00:04:37,716 --> 00:04:39,236

>> Mark Guilliams: Well the Advanced Resistive Exercise

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00:04:39,236 --> 00:04:42,666

Device, or the ARED, it uses vacuums to create the load.

117

00:04:43,296 --> 00:04:45,456

And what we want to try to do, as --

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00:04:45,636 --> 00:04:47,186

it would be a little different for rubber bands --

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00:04:47,186 --> 00:04:49,256

as rubber bands, there's a place

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00:04:49,436 --> 00:04:51,126

and point using those
when you're training.

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00:04:51,126 --> 00:04:53,206

But as you stretch the
rubber band it gets higher

122

00:04:53,206 --> 00:04:54,016

in resistance.

123

00:04:54,076 --> 00:04:55,676

The lower you go,
the lower resistance.

124

00:04:56,386 --> 00:04:59,126

With the way that we use
ARED with the vacuums,

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00:04:59,126 --> 00:05:01,316

is it provides a constant load.

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00:05:01,506 --> 00:05:02,896

More consistent with
free weights.

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00:05:03,266 --> 00:05:06,196

So if I put 100 pounds on the
bar, it's 100 pounds regardless

128

00:05:06,196 --> 00:05:07,986

of where it is in that movement.

129

00:05:08,266 --> 00:05:10,336

It's how we accelerate
or decelerate it

130

00:05:10,446 --> 00:05:11,736
that it applies the force.

131
00:05:11,776 --> 00:05:13,356
It's not controlled
by a rubber band.

132
00:05:13,676 --> 00:05:15,296
The rubber band is a
little bit different

133
00:05:15,296 --> 00:05:18,756
that it gives what we call
an Asymmetrical force curve.

134
00:05:19,246 --> 00:05:20,826
As far as -- you know, as far

135
00:05:20,826 --> 00:05:22,706
as a descending force
curve is what you get

136
00:05:22,706 --> 00:05:24,076
with resistive exercise.

137
00:05:24,076 --> 00:05:27,876
Not to get too technical
about it, but yeah --

138
00:05:28,076 --> 00:05:28,806
>> Amiko Kauderer: Too
technical [chuckles].

139
00:05:28,806 --> 00:05:29,116
Work. Okay.

140
00:05:29,156 --> 00:05:32,846
So also there are a couple
of other pieces of equipment

141

00:05:32,846 --> 00:05:34,136

up there, can you tell
me a little about those?

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00:05:34,136 --> 00:05:36,516

>> Mark Guilliams: Yeah we
also have the treadmill.

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00:05:36,606 --> 00:05:40,826

T2. And then we have this
cycle, the Cvis [phonetic]

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00:05:41,306 --> 00:05:44,196

and it works -- they work
basically the same way they

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00:05:44,196 --> 00:05:44,766

would down here.

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00:05:44,766 --> 00:05:46,926

The only difference is with
the cycle you're not --

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00:05:46,926 --> 00:05:49,586

it's a little harder to ride;
it's a little tougher to ride

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00:05:49,586 --> 00:05:51,256

because you don't have
gravity assisting you.

149

00:05:51,256 --> 00:05:52,916

You don't have handle
bars to hold onto.

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00:05:52,916 --> 00:05:54,956

It's almost kind of
like riding a unicycle,

151

00:05:54,956 --> 00:05:56,756
but doing it 350 watts.

152
00:05:56,756 --> 00:05:58,906
It becomes a little bit
more challenging, so --

153
00:05:58,996 --> 00:06:00,066
>> Amiko Kauderer: Mm-hmm.

154
00:06:00,066 --> 00:06:03,786
Okay. And also -- what --
was there anything different

155
00:06:03,816 --> 00:06:07,826
that you did with Mike
Hopkins as opposed to any

156
00:06:07,826 --> 00:06:08,796
of the other astronauts?

157
00:06:08,966 --> 00:06:11,526
I mean what different kinds of
things that you did with him?

158
00:06:11,526 --> 00:06:13,276
I mean you kind of talked
about some of it that --

159
00:06:13,446 --> 00:06:13,806
>> Mark Guilliams: Well

160
00:06:13,956 --> 00:06:17,856
from a pre-flight perspective
we didn't do much differently.

161
00:06:17,946 --> 00:06:19,646
The in-flight perspective
is just going

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00:06:19,646 --> 00:06:22,686

to be we've added some
of these extra workouts

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00:06:23,526 --> 00:06:26,106

into it that he wanted to do.

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00:06:26,106 --> 00:06:27,376

That he enjoys doing.

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00:06:27,376 --> 00:06:29,716

That's kind of the only
real difference that we did.

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00:06:30,136 --> 00:06:32,296

We're still doing
basically the same exercises,

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00:06:32,296 --> 00:06:34,546

we're just putting them
together in a different manner,

168

00:06:34,956 --> 00:06:37,456

trying to make it a little
more intense for him.

169

00:06:37,456 --> 00:06:38,136

>> Amiko Kauderer: It's insane.

170

00:06:38,246 --> 00:06:38,406

>> Mark Guilliams:
Yeah [chuckles].

171

00:06:38,986 --> 00:06:40,876

>> Amiko Kauderer: But
fun to watch and --

172

00:06:40,966 --> 00:06:43,406

you know, so this is about all

the time that we have right now,

173

00:06:43,406 --> 00:06:46,756

but I do understand that
the crew members work

174

00:06:46,756 --> 00:06:48,336

out about 2 hours every day.

175

00:06:48,626 --> 00:06:52,426

Can you tell me briefly
how do you maintain --

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00:06:52,426 --> 00:06:54,746

is there some kind of way

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00:06:54,746 --> 00:06:57,236

that you monitor what they
are doing while they are --

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00:06:57,236 --> 00:06:57,316

>> Mark Guilliams: Oh --

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00:06:57,406 --> 00:06:58,986

>> Amiko Kauderer: -- because
they're up there for 6 months.

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00:06:58,986 --> 00:07:00,086

And so how do you
monitor their activity.

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00:07:00,086 --> 00:07:00,196

>> Mark Guilliams: Yeah.

182

00:07:00,196 --> 00:07:03,556

Okay. So basically what we
do is they do 2 hours --

183

00:07:03,556 --> 00:07:06,326

they're scheduled for 2
1/2 hours ever single day,

184
00:07:06,796 --> 00:07:10,216
which equates to about 2
hours of actual workout time.

185
00:07:10,216 --> 00:07:13,366
And then we get data down
pretty much on a weekly basis

186
00:07:13,826 --> 00:07:16,816
so we know -- we're monitoring
what they're doing on T2 or C --

187
00:07:16,816 --> 00:07:19,116
or the cycle or the ARED.

188
00:07:19,606 --> 00:07:21,346
And we can do it by
spreadsheets or we --

189
00:07:21,516 --> 00:07:24,436
and we also have other data that
comes down through a station

190
00:07:24,436 --> 00:07:26,516
through computers that we
can look at heart rates.

191
00:07:26,766 --> 00:07:27,816
We can look at loads.

192
00:07:27,816 --> 00:07:29,546
We can look at -- pretty
much just like you would

193
00:07:29,546 --> 00:07:30,736
down here in 1G environment.

194

00:07:30,826 --> 00:07:32,176

And that's how we control it.

195

00:07:32,236 --> 00:07:32,326

>> Amiko Kauderer: Mm-hmm.

196

00:07:32,526 --> 00:07:33,596

Well and so you just said,

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00:07:33,756 --> 00:07:35,356

just like what you

can do down here --

198

00:07:35,356 --> 00:07:35,816

>> Mark Guilliams: Yeah.

199

00:07:35,816 --> 00:07:38,086

>> Amiko Kauderer: -- and so you
guys can actually follow along

200

00:07:38,086 --> 00:07:40,076

and train with Mike.

201

00:07:40,346 --> 00:07:41,036

Be like Mike.

202

00:07:41,456 --> 00:07:45,876

Go to [facebook.com](https://www.facebook.com/trainastronaut)
at /trainastronaut

203

00:07:45,876 --> 00:07:47,766

and take the challenge.

204

00:07:48,266 --> 00:07:48,686

Thank you.

205

00:07:49,046 --> 00:07:49,846

Thanks Mike for coming.

