HUBBLE
TOOL TIME
SERVICING MISSION 2

1
00:00:00,234 --> 00:00:06,707
>> JOHN: Quiet on the set!
[LAUGHTER] Hubble Space

2
00:00:06,707 --> 00:00:11,712
Telescope servicing mission two
take 129. [SLATE CLACKS]

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00:00:11,712 --> 00:00:24,358
[UPBEAT MUSIC]

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00:00:24,558 --> 00:00:27,794
>> JOHN: Hello, I'm John
Grunsfeld, NASA astronaut.

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00:00:27,794 --> 00:00:31,732
>>RUSS: Hello, I'm Russ
Werneth, I was the EVA manager

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00:00:31,732 --> 00:00:32,966
for Hubble Space Telescope
servicing missions. >>JOHNL An

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00:00:32,966 --> 00:00:36,270
Space Telescope servicing
missions. >> JOHN: An

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00:00:36,270 --> 00:00:40,040
extravehicular activity, or EVA,
is a long way of saying

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00:00:40,040 --> 00:00:42,910
"spacewalk," and I had the
pleasure of doing eight

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00:00:42,910 --> 00:00:45,879
spacewalks on the Hubble Space
Telescope. That's why I'm

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00:00:45,879 --> 00:00:48,682
wearing these spacewalking
gloves. >> RUSS: We noticed

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00:00:48,682 --> 00:00:51,852
that! >> JOHN: And of course, in
space it’s a vacuum so I had to

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00:00:51,852 --> 00:00:55,022
wear a spacesuit so that I had
oxygen to breath and these

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00:00:55,022 --> 00:00:58,959
gloves. Now the spacesuit was
pressurized to about a third of

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00:00:58,959 --> 00:01:03,430
the atmosphere’s pressure from
Earth, 4.2 PSI, and that means

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00:01:03,430 --> 00:01:06,166
that I was like in a balloon,
and that balloon being

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00:01:06,166 --> 00:01:09,770
pressurized means it was hard to
move. So, it made tools hard to

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00:01:09,770 --> 00:01:13,574
use too. >> RUSS: So, we had to
consider that when we were

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00:01:13,574 --> 00:01:17,277
engineering the tools used by
the astronauts, they had to be

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00:01:17,277 --> 00:01:21,381
unique tools, and that’s one of
the requirements, that it work

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00:01:21,381 --> 00:01:26,086
with the suit with those gloves.
>> JOHN: Yep, now in 1997 a team

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00:01:26,086 --> 00:01:29,589
of astronauts went up to the
Hubble Space Telescope on the

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00:01:29,589 --> 00:01:34,061
Servicing Mission Two, and on
that mission, they used the

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00:01:34,061 --> 00:01:37,464
features of the Hubble Space
Telescope, things like doors

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00:01:37,464 --> 00:01:41,335
that open and close and
instruments that can be removed

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00:01:41,335 --> 00:01:44,938
using the suit to pull the
instruments out, but you had to

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00:01:44,938 --> 00:01:48,508
unbolt ‘em first. Now they put
in two new scientific

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00:01:48,508 --> 00:01:51,378
instruments, and these are the
super-duper cameras that allow

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00:01:51,378 --> 00:01:56,383
us to observe the Universe, but
they needed those special tools.

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00:01:56,383 --> 00:02:00,153
>> RUSS: So, we built what we
call the Pistol Grip Tool, and

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00:02:00,153 --> 00:02:06,927
you can see by the ergonomics of
it that it is easy to hold,

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00:02:06,927 --> 00:02:09,830
although it does have a battery
down here, doesn't weigh

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00:02:09,830 --> 00:02:15,135
anything in space but it has
some mass to it. And the

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00:02:15,135 --> 00:02:20,507
advantage of this particular
tool is it has a computer chip

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00:02:20,507 --> 00:02:25,846
inside so everything the
astronauts did in removing or

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00:02:25,846 --> 00:02:30,484
inserting fasteners we had
recorded the number of turns,

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00:02:30,484 --> 00:02:38,525
the direction, the torque. So,
we knew exactly what was used

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00:02:38,525 --> 00:02:42,396
when that fastener was put in or
taken out, and that helped us in

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00:02:42,396 --> 00:02:46,199
future missions. >> JOHN: Yup,
now this tool was designed so it

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00:02:46,199 --> 00:02:50,370
could be used with a gloved hand
in a spacesuit, a big paddle, so

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00:02:50,370 --> 00:02:53,840
that when you pull the paddle
[TOOL WHIRRS] it pulls the

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00:02:53,840 --> 00:02:57,911
trigger to run the tool. It can
run counterclockwise, you can

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00:02:57,911 --> 00:03:01,681
switch it to clockwise. It runs
at different speeds too, this

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00:03:01,681 --> 00:03:06,520
was really slow, and you could
program the torque for the tool,

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00:03:06,520 --> 00:03:09,823
how much it turns or tightens,
and all of that was very

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00:03:09,823 --> 00:03:12,292
important. But there was one
characteristic of this tool

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00:03:12,292 --> 00:03:16,063
that's, I think, really unique,
it was flown for the first time

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00:03:16,063 --> 00:03:19,366
on that second servicing
mission, now virtually every

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00:03:19,366 --> 00:03:23,270
mission in space uses this tool
when they're doing spacewalks.

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00:03:23,270 --> 00:03:26,706
But who designed this tool?
>>RUSS: Well the primary

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00:03:26,706 --> 00:03:30,977
designer here at Goddard Space
Flight Center was Paul Richards.

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00:03:30,977 --> 00:03:35,549
And Paul actually did something
quite neat. He later became an

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00:03:35,549 --> 00:03:41,521
astronaut and flew on STS-102 to
Space Station, and he used the

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00:03:41,521 --> 00:03:45,292
tool that he developed here on
the ground that we started using

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00:03:45,292 --> 00:03:50,230
for HST and is also used by
International Space Station.

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00:03:50,230 --> 00:03:52,966
>>JOHN: Yep, virtually every
spacewalk carries a tool like

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00:03:52,966 --> 00:03:57,904
this. I think, one of the things
that makes humans unique, and

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00:03:57,904 --> 00:04:00,874
certainly one of the things that
makes it a lot of fun to work on

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00:04:00,874 --> 00:04:05,512
spacewalks is developing tools.
There are other animals that use

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00:04:05,512 --> 00:04:09,116
tools, but nobody in the animal
kingdom ever came up with

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00:04:09,116 --> 00:04:11,718
anything like this. Thanks for
the great tool Russ.

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00:04:11,718 --> 00:04:14,988
>> RUSS: Thanks for using the
great tool John!

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00:04:14,988 --> 00:04:17,991
[UPBEAT MUSIC]

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00:04:17,991 --> 00:04:22,863
[SILENCE]

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00:04:22,863 --> 00:04:25,031
>> RUSS: And we have to tell you
what “EVA” means. >> JOHN: You

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00:04:25,031 --> 00:04:29,536
didn't say “EVA.” >> OFF: You
gotta say it first. >> RUSS: I

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00:04:29,536 --> 00:04:33,740
didn't say it? >> JOHN: Nope.
[LAUGHTER] >> RUSS: What the?

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00:04:33,740 --> 00:04:36,343
What did I say? I wasn’t
listening but. >>OFF: You said

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00:04:36,343 --> 00:04:40,347
Hubble, you said Hubble EVA
Manager, but- [UPBEAT MUSIC]

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00:04:40,347 --> 00:04:42,616
>>MARK: Well we thought a couple
of terms that they use all the

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00:04:42,616 --> 00:04:46,086
time on Home Improvement would

be the best description of what

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00:04:46,086 --> 00:04:49,523
we've done to the Hubble Space
Telescope. And what we've

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00:04:49,523 --> 00:04:53,593
accomplished is that we've
re-wired it, and we've added