HOW INGENUITY TALKS TO US FROM MARS

GRAVITY ASSIST

1
00:00:01,920 --> 00:00:06,770
NASA flies spacecraft all over the solar system,
and orbits the Earth.

2
00:00:06,770 --> 00:00:09,799
How do we communicate with them when they're
so far away?

3
00:00:09,799 --> 00:00:12,150
Let's find out from an expert.

4
00:00:12,150 --> 00:00:18,180
Hi, I'm Jim Green, Chief Scientist at NASA
and this is the Gravity Assist Podcast.

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00:00:18,180 --> 00:00:23,140
In this season of Gravity Assist, we'll go
behind the scenes at NASA and we'll hear from

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00:00:23,140 --> 00:00:29,950
the scientists and engineers and others who
make these amazing space missions happen.

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00:00:29,950 --> 00:00:35,710
I'm here with Nacer Chahat, and he is the
Senior Antenna and Microwave Engineer with

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00:00:35,710 --> 00:00:39,989
NASA's Jet Propulsion Laboratory out in Pasadena,
California.

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00:00:39,989 --> 00:00:45,489
Well, you know, communication with our surface
assets on Mars is kind of complicated.

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00:00:45,489 --> 00:00:51,229
You know, when we landed Curiosity, I don't
see it carrying a big truck with a big dish

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00:00:51,229 --> 00:00:52,629
behind it.

12
00:00:52,629 --> 00:00:59,559
So how do we communicate back and forth with,
with our surface assets, like Insight, like

13
00:00:59,559 --> 00:01:01,279
Perseverance, like Curiosity?

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00:01:01,279 --> 00:01:03,620
Yes, so we have two concepts to do so.

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00:01:03,620 --> 00:01:07,240
The first one is to communicate with the orbiter.

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00:01:07,240 --> 00:01:14,071
So we have orbiters around Mars which we can
they are dedicated for science, but for a

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00:01:14,071 --> 00:01:18,580
critical event like that, we can use them
to relay the data to Earth.

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00:01:18,580 --> 00:01:24,429
And we also have on these landers and rover,
high-gain antennas that allow us to communicate

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00:01:24,429 --> 00:01:27,229
directly with Earth but a lower that rate.

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00:01:27,229 --> 00:01:31,560
So it's really a trade off, when we should
be using the orbiter or when we should be

21
00:01:31,560 --> 00:01:32,880
using the high-gain antenna.

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00:01:32,880 --> 00:01:37,630

Most of the time, we end up using the orbiter
because it allows us to transmit the science

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00:01:37,630 --> 00:01:38,630
much faster.

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00:01:38,630 --> 00:01:42,289
Well, you know, we're flying a helicopter
on Mars for the first time.

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00:01:42,289 --> 00:01:44,179
And we call that Ingenuity.

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00:01:44,179 --> 00:01:45,429
Did you get involved in that?

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00:01:45,429 --> 00:01:46,819
And what's your role?

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00:01:46,819 --> 00:01:53,670
My contribution was with the telecommunication
subsystem, to ensure that the rover can send

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00:01:53,670 --> 00:02:00,869
commands to the helicopter, and the helicopter
can send images or telemetry back to the rover.

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00:02:00,869 --> 00:02:05,799
So, I worked on the antenna design and also
worked on the system engineering.

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00:02:05,799 --> 00:02:11,430
Wow, that sounds really difficult because
this is a very small vehicle.

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00:02:11,430 --> 00:02:12,720
What's that antenna look like?

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00:02:12,720 --> 00:02:14,040

I don't remember seeing it.

34
00:02:14,040 --> 00:02:15,040
Does it stick out?

35
00:02:15,040 --> 00:02:18,760
Or is it part of it goes up to the top or,
where's it at?

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00:02:18,760 --> 00:02:24,060
Yeah, so on the top of the helicopter, there is
a solar panel, which allows us to recharge

37
00:02:24,060 --> 00:02:25,060
our battery.

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00:02:25,060 --> 00:02:29,730
And we decided to locate the antenna on this
surface, because this is what provided the

39
00:02:29,730 --> 00:02:33,293
largest area to use as a reflective surface.

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00:02:33,293 --> 00:02:37,650
So this is the simplest type of antenna that
you can ever use.

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00:02:37,650 --> 00:02:39,050
This is called a monopole.

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00:02:39,050 --> 00:02:41,659
So monopole is basically a single wire.

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00:02:41,659 --> 00:02:47,916
This type of monopole antenna are being used
when you need to communicate omnidirectionally.

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00:02:47,916 --> 00:02:53,918
Meaning, we need to communicate this with

the same capabilities in any direction.

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00:02:53,918 --> 00:02:56,727
It's very small - it's about five to six centimeter

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00:02:56,727 --> 00:03:05,416
So it sounds like though the Ingenuity communication
is only with, with Perseverance, and then

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00:03:05,519 --> 00:03:10,560
it's up to Perseverance to package that data
and then send it up to an orbiter which then

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00:03:10,560 --> 00:03:12,151
relays it back to Earth.

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00:03:12,151 --> 00:03:13,849
That's exactly it.

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00:03:13,849 --> 00:03:22,010
Altimeter data confirms that Ingenuity has
performed its first flight of a powered aircraft

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00:03:22,010 --> 00:03:23,010
on another planet!

52
00:03:23,010 --> 00:03:24,000
[cheering]

53
00:03:24,000 --> 00:03:29,915
When I saw the first flight, I couldn't help
but think of all of those hours working really

54
00:03:29,915 --> 00:03:32,400
hard to solve technical problems.