
PHILIPS

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00:00:06,529 --> 00:00:11,460
Researchers at NASA's Kennedy Space Center
in Florida are developing new metal alloys

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00:00:11,460 --> 00:00:14,849
that, when damaged, can repair themselves.

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00:00:14,849 --> 00:00:20,250
This innovative technology called "SMASH,"
for Shape Memory Alloy Self-Healing, could

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00:00:20,250 --> 00:00:26,599
provide improved safety margins to future
spacecraft landing on a distant planet.

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00:00:26,599 --> 00:00:32,070
Aircraft as well as spacecraft can be subjected
to material fatigue, the progressive and localized

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00:00:32,070 --> 00:00:37,260
structural damage that occurs when a material
is subjected to repetitive stress.

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00:00:37,260 --> 00:00:42,850
SMASH technology could be used to self-repair
these parts.

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00:00:42,850 --> 00:00:49,570
Earlier this year, the NASA's Aeronautics
Research Institute awarded an 18-month, $275,000

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00:00:49,570 --> 00:00:54,730
funding award to continue research and development
of the alloy that can self-repair damaged

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00:00:54,730 --> 00:00:59,140
parts using liquid-assisted shape memory metals.

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00:00:59,140 --> 00:01:04,390

Clara Wright is a materials engineer in NASA's
Engineering and Technology Directorate and

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00:01:04,390 --> 00:01:07,510
the principal investigator for the SMASH Project.

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00:01:07,510 --> 00:01:12,950
She works in Kennedy's failure analysis laboratory
where experts determine why structures break

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00:01:12,950 --> 00:01:16,040
down and how to avoid future malfunctions.

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00:01:16,040 --> 00:01:21,100
"As we move on, we can see a lot of applications
in the future that will show us that this

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00:01:21,100 --> 00:01:25,930
is a very viable type of material that can
be used to repair fatigue structures."

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00:01:25,930 --> 00:01:31,720
"We would use it in areas such as on an aircraft
where you have wings with a lot of cyclic

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00:01:31,720 --> 00:01:32,720
stresses.

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00:01:32,720 --> 00:01:38,159
And fatigue is a big problem and very prevalent,
especially in aero structures."

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00:01:38,159 --> 00:01:42,979
For a spacecraft traveling far from Earth,
a repair shop would not be an option.

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00:01:42,979 --> 00:01:46,649
Being able to perform repairs on the spot
could be the solution.

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00:01:46,649 --> 00:01:51,409
"The SMASH technology is a metal-to-metal
composite and it has an aluminum matrix.

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00:01:51,409 --> 00:01:56,369
We try to work with aluminum because that
is a structural material and you can use it

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00:01:56,369 --> 00:01:59,079
in aeronautics applications in aircraft.

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00:01:59,079 --> 00:02:05,530
What we want to do is to have it be designed
aerodynamically so it has a low melting phase."

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00:02:05,530 --> 00:02:09,140
"Also it has reinforcements made of shape
memory alloys.

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00:02:09,140 --> 00:02:13,430
A SMASH memory alloy is an alloy that wants
to retain its design shape.

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00:02:13,430 --> 00:02:19,400
We use a wire form and you can bend it into
any shape you want and you bring it up to

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00:02:19,400 --> 00:02:23,190
a particular temperature and it wants to go
back to its original shape."

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00:02:23,190 --> 00:02:28,980
If a crack begins in the area where SMASH
alloys have been used, the shape memory alloys'

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00:02:28,980 --> 00:02:32,489
wire reinforcements will stretch across the
crack.

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00:02:32,489 --> 00:02:36,810
Heating in the wires will pull the metal crack
surfaces back into the original shape and

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00:02:36,810 --> 00:02:42,310
the elevated temperatures also will cause
low melting phase in the alloy to become liquefied

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00:02:42,310 --> 00:02:44,190
to fill in any gaps.

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00:02:44,190 --> 00:02:50,680
"This technology can be used for any future
deep-space type exploration human or non-human

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00:02:50,680 --> 00:02:55,280
where you could have something detect a crack
and have a non-conductive heating source come

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00:02:55,280 --> 00:02:57,540
up to that area and repair the crack."

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00:02:57,540 --> 00:03:02,299
"We're also looking into seeing if we can
have some or our materials exposed in the

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00:03:02,299 --> 00:03:05,060
International Space Station and outside the
space station.

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00:03:05,060 --> 00:03:09,659
To see if our materials would be able to have
the same repair capabilities in space that

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00:03:09,659 --> 00:03:12,980
it has here on Earth."

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00:03:12,980 --> 00:03:18,440
Putting the technology to work in actual aircraft
or spacecraft is still a few years away.

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00:03:18,440 --> 00:03:23,879
Once put into use, safety margins would be
improved whether on an aircraft flying near

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00:03:23,879 --> 00:03:27,510
the Earth or a spaceship traveling far from
home.

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00:03:27,510 --> 00:03:30,459
"Our team is very excited to work on this.

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00:03:30,459 --> 00:03:36,620
We can see a future that could be an application
10 years down the road.