Engineers to fine-tune 'cold spray,' a next-gen 3D-printing technology for astronauts

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Engineers from Trinity College Dublin are leading a four-year, €500,000 European Space Agency (ESA) project to fine-tune 'Cold Spray,' (CS) – a revolutionary, environmentally friendly technology that deposits materials onto engineering components. The fruits of their labours will be seen on spacecraft in outer space as well as on a variety of household applications and on the transport vehicles we use every day.

Space science missions and applications that would avail of this technology include, for example, the ExoMars, Juice, Euclid, and Solar Orbiter missions, as well as the James Webb Space Telescope, and the International Space Station. Meanwhile, on Earth, CS could improve the surface properties of engineering components and create novel multi-material objects. A number of national companies will collaborate with the Trinity team on the technical side of the project.

Assistant Professor in Mechanical and Manufacturing Engineering in Trinity's School of Engineering, Dr Rocco Lupoi, is leading the project. He said: "This is the largest ESA research project awarded to Trinity, and we will bring CS to the next level. Not only will we bring down its cost through the development of innovative solutions, but we will also enhance its technical capabilities for use in Additive Manufacturing, which was recently ranked as a top 10 breakthrough technology by MIT's technology review."

There are numerous applications in space which would advance significantly given access to this technology. With the right level of

automation and robotic stage design this novel technique could also produce 3D components with low manufacturing cost. The concepts being brought forth in this project will specifically target these technological bottlenecks.

Head of Strategic and Emerging Technologies Team at ESA, Professor David Jarvis, said: "Once developed, the new form of cold spray manufacturing could unlock new capabilities in coated materials, as well as multi-material combinations currently not possible."

Leading the research at Trinity are Dr Lupoi, Dr Shaun McFadden and Dr Anthony Robinson, who are Assistant and Associate Professors in Mechanical and Manufacturing Engineering. They will work with Technical Officers at the ESA, Professor David Jarvis, Dr Wayne Voice and Mr Andrea Amaldi.

About Cold Spray (CS)

CS accelerates powders of desired materials at supersonic speeds before firing them onto structures via a nozzle. It is currently possible to build coatings or simple geometrical components made out of a wide range of materials (metals, composites, polymers) around 1,000 times more quickly than any other Additive Manufacturing or 3D-Printing technologies allow.

The process does not require heat, which is advantageous because it means there are no heat-affected zones, microstructural changes, or distortions to worry about on the end-products. CS is, however, expensive and inefficient, so part of the Trinity team's work will seek to drive costs down.

Provided by Trinity College Dublin