

# PERFECT IT

3D printing helps designers and engineers to make things that are lighter, more sustainable and cheaper.

By printing prototypes they can test for faults and make better designs, faster.

By printing end products in layers, designers have the freedom to create complex, multifunctional shapes. These shapes would be impractical, or even impossible, to produce with traditional manufacturing methods such as machining or moulding.

From plane parts to satellite components, what will 3D printed industrial innovations do for you?

## PERFECT IT

# CONTENTS

Build a better bank	1
Landing life from Mars	3
Sensors for satellites	5
Print it in one	7
Perfect aeroplane part	9

**PERFECT IT**

# 1. BUILD A BETTER BANK



**Prototype architectural models**

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# 1. BUILD A BETTER BANK

‘Builders in Kuwait have just laid the foundations of this skyscraper. I used models like this to explain plans and data to clients.

‘These models show how the building design helps shield it from the sun’s heat, how it minimises turbulence from wind and which parts will be most expensive to build.

‘We couldn’t make models like this without 3D printing. It helps us to communicate in 3D, understand buildings better and improve them.’

**Xavier De Kestelier**  
Architect



Image: Nigel Young/Foster + Partners



**Artist's impression of the Kuwait National Bank building**

Image: Foster + Partners

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## **2. LANDING LIFE FROM MARS**



**Mars probe crush zone**

**3**

Image: **Science Museum/Jennie Hills**  
Inv. No: **L2012-4106**

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# 2. LANDING LIFE FROM MARS

‘My technology will help the next Mars probe to return to Earth safely.’

‘Scientists want to send probes to Mars to collect soil, so they can look for signs of life. To protect the samples in the probe, my team of experts designed complex, strong, latticed crush zones that will take the impact of crash-landing. The 3D printed titanium lattice crumples and absorbs the impact.’

‘This technology could also be used to improve crash protection for cars.’

**David Wimpenny**

Technology manager

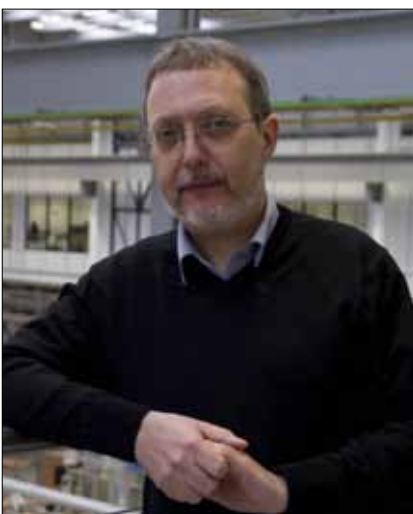
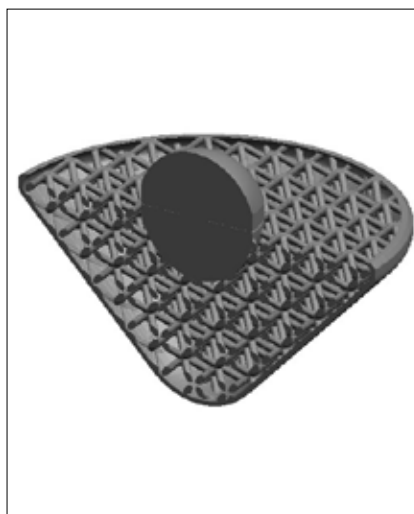


Image: MTC



**Inside the probe**

Image: Magna Parva Ltd

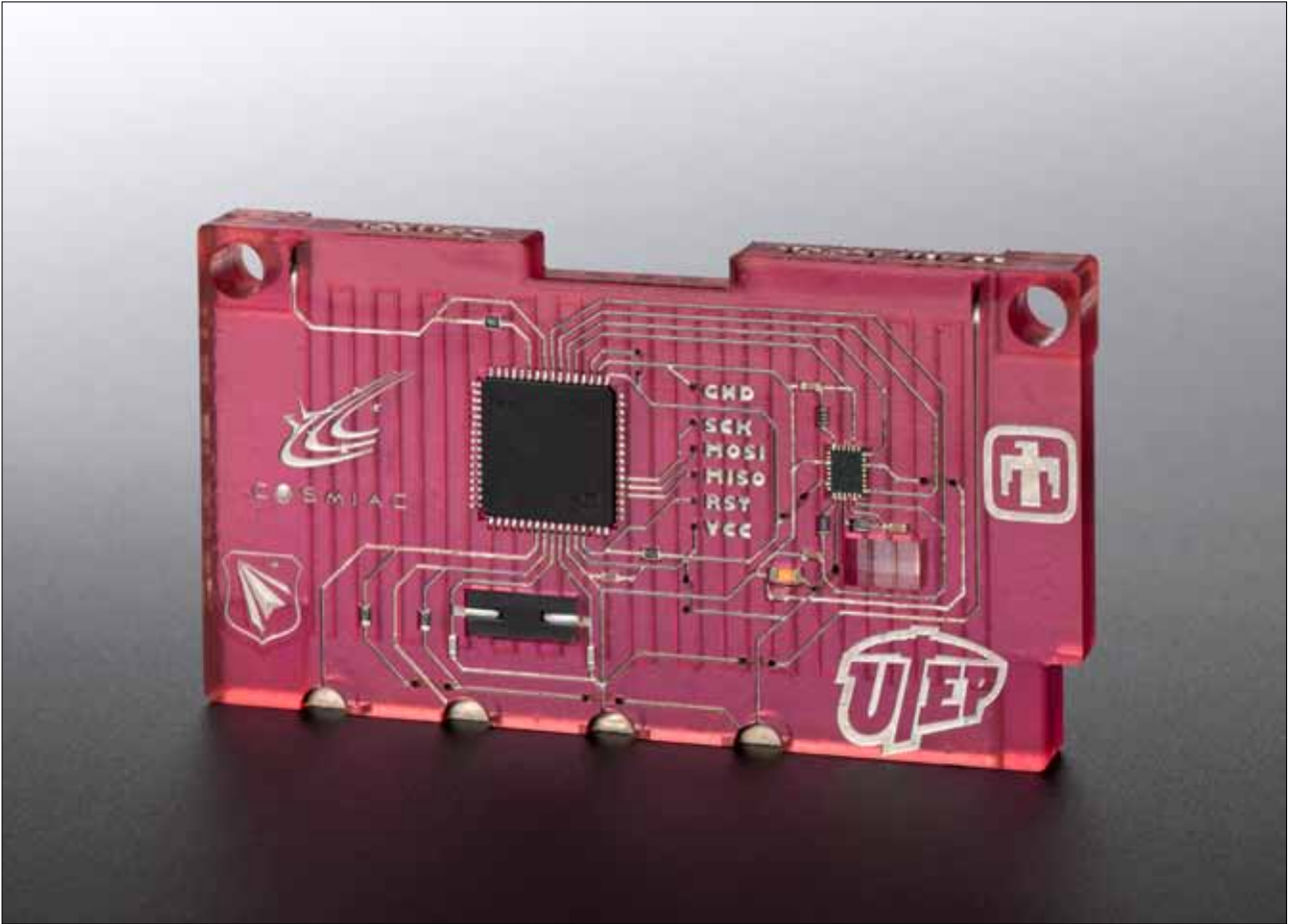


**Artist's impression of the probe's return to Earth**

Image: Magna Parva Ltd

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# 3. SENSORS FOR SATELLITES



Cosmiac satellite sensor array

# 3. SENSORS FOR SATELLITES

‘My team prints electric circuits into the surface of objects. We used metal inks to print a sensor network into a mini satellite being launched in 2013.

‘We are sending it into orbit to test if the technology works under the harsh conditions of space. Printing sensors directly *into* the satellite’s structure saves lots of room.

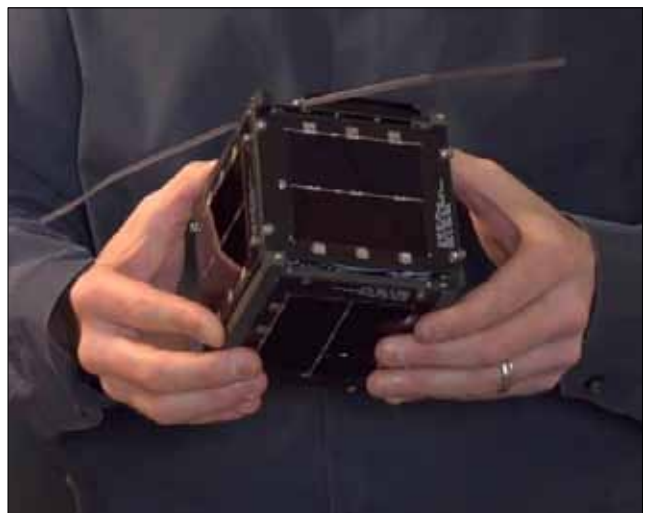
‘I want to print electric circuits inside objects; in the future your electronic devices might not be made of multiple parts, they’ll print in one piece.’

**Ryan Wicker**

Mechanical engineering professor



Image: University of Texas at El Paso



**Mini satellite**

Image: YouTube/NASA EDGE



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# 4. PRINT IT IN ONE



**Arm prototype**

## **4. PRINT IT IN ONE**

‘We designed and printed this prosthetic arm concept. It’s a mock-up that shows circuits that sense temperature, feel objects and control the arm’s movement.

‘3D printing gives us the freedom to make complex, optimised shapes, and our research aim is focused on printing in functionality – electrical, optical or even biological functions.

‘We’ve all seen printed phone cases. In the future the aim is to print the entire phone – printing whole systems rather than assembling parts.’

### **Richard Hague**

Director of research, with students **Mary Amos**, **Matt Cardell-Williams** and **Scott Wimhurst**



**Richard**

Image: The University of Nottingham



**Mary, Matt and Scott**

Image: The University of Nottingham



**Designing the arm**

Image: The University of Nottingham

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# 5. PERFECT AEROPLANE PART



**Traditionally manufactured hinge, prototype hinge and final printed hinge**

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# 5. PERFECT AEROPLANE PART

‘These three hinges show how my team improved a hinge for aeroplane hatches.

‘The first hinge is made the traditional way. We designed a complex 3D printed second hinge that was much lighter than the original. But it spread its load differently and put extra stress on neighbouring plane parts.

‘So we designed a third hinge. It spreads forces just like the original hinge, but it is much lighter.

‘3D printing lets me create complex parts in titanium. In the future it will make planes cheaper to produce, and lighter so they use less fuel.’

**Jon Meyer** Aerospace engineer



Image: Jon Meyer



**Location of the hatch hinge**

Image: Airbus SAS 2010, computer rendering by Fixion