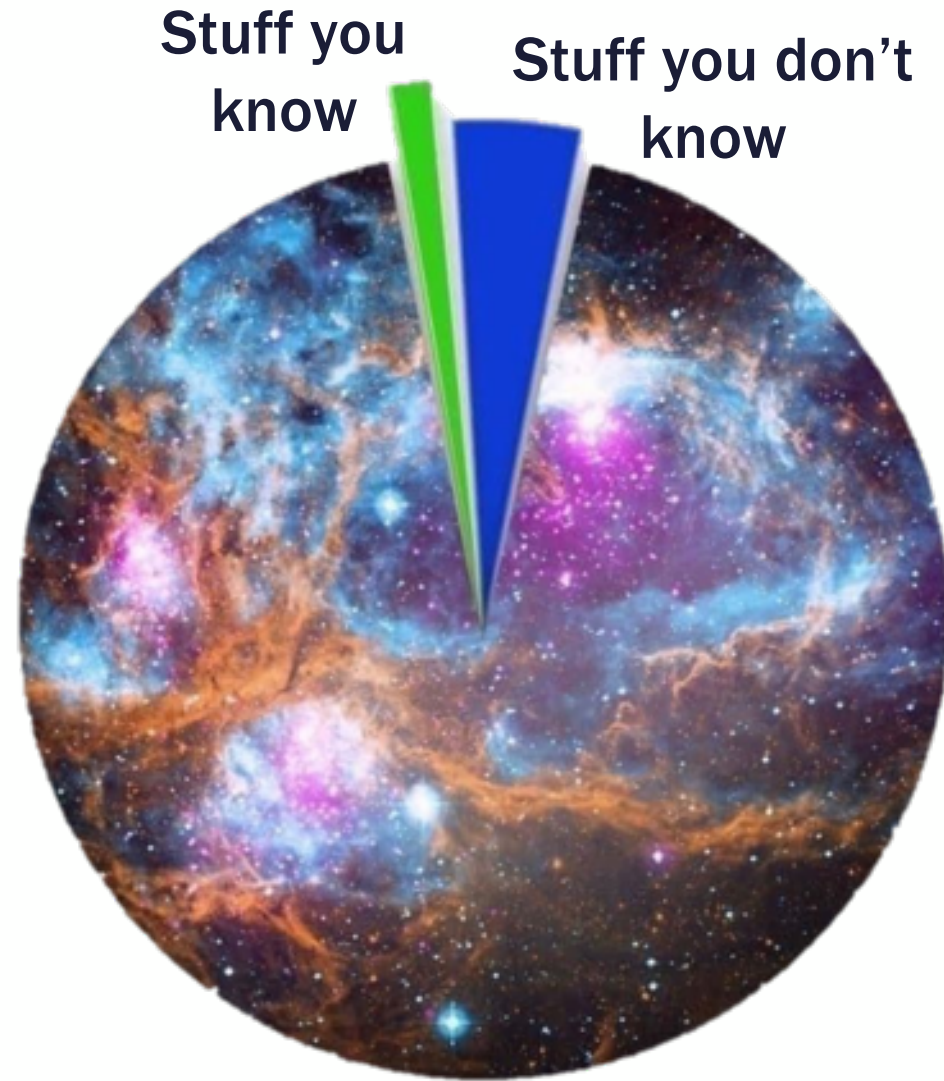




THE JOURNEY OF WAAM3D

Dr Filomeno Martina
9th November 2023



YOU HAVE AN IDEA

Is it a solution to a problem

Or a solution looking for a problem?

PROBLEM

SOLUTION

DEFENSIBILITY

START FROM THE END

What does success look like?

Plan until the end

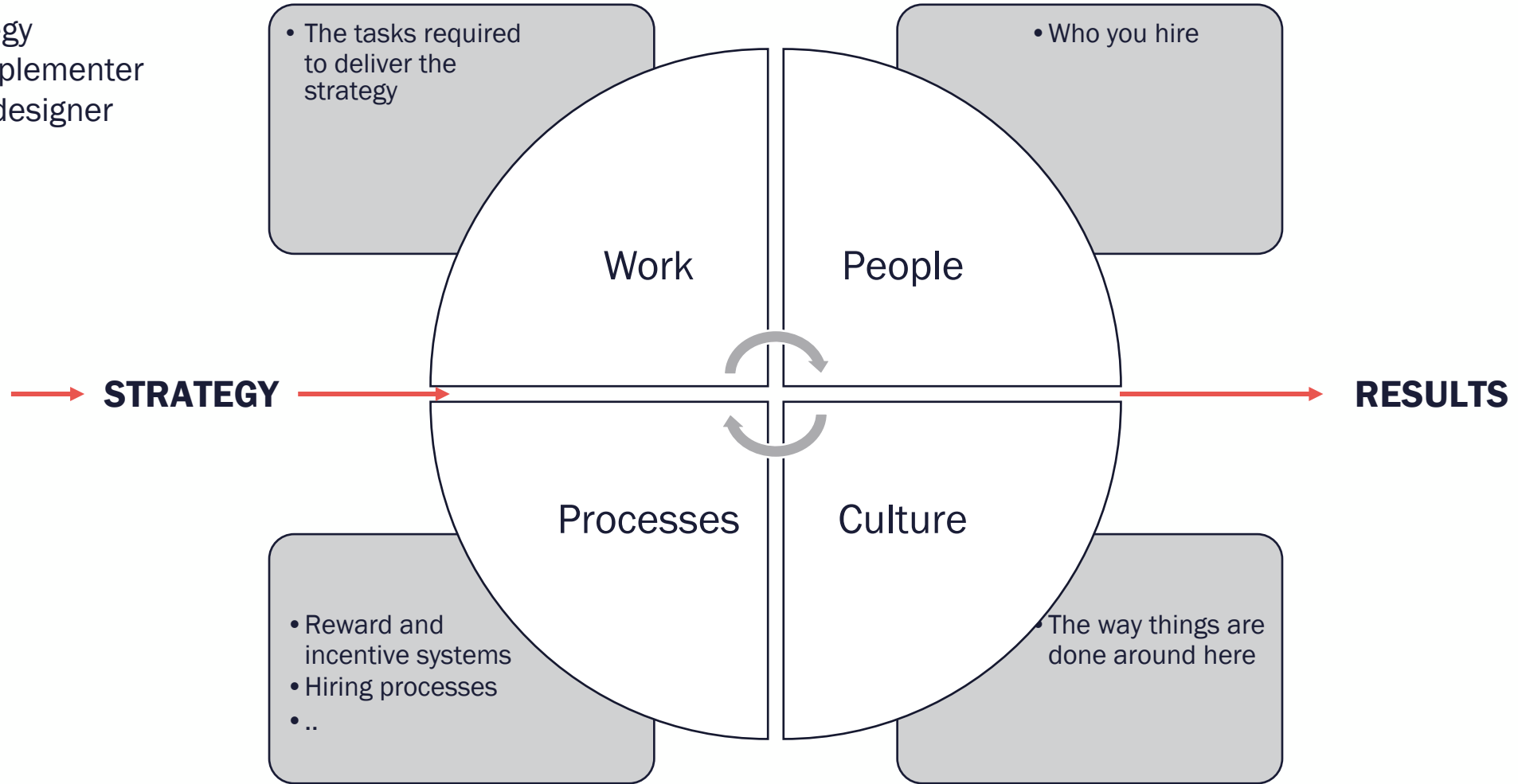
Exit strategies

Choose the right partner(s)

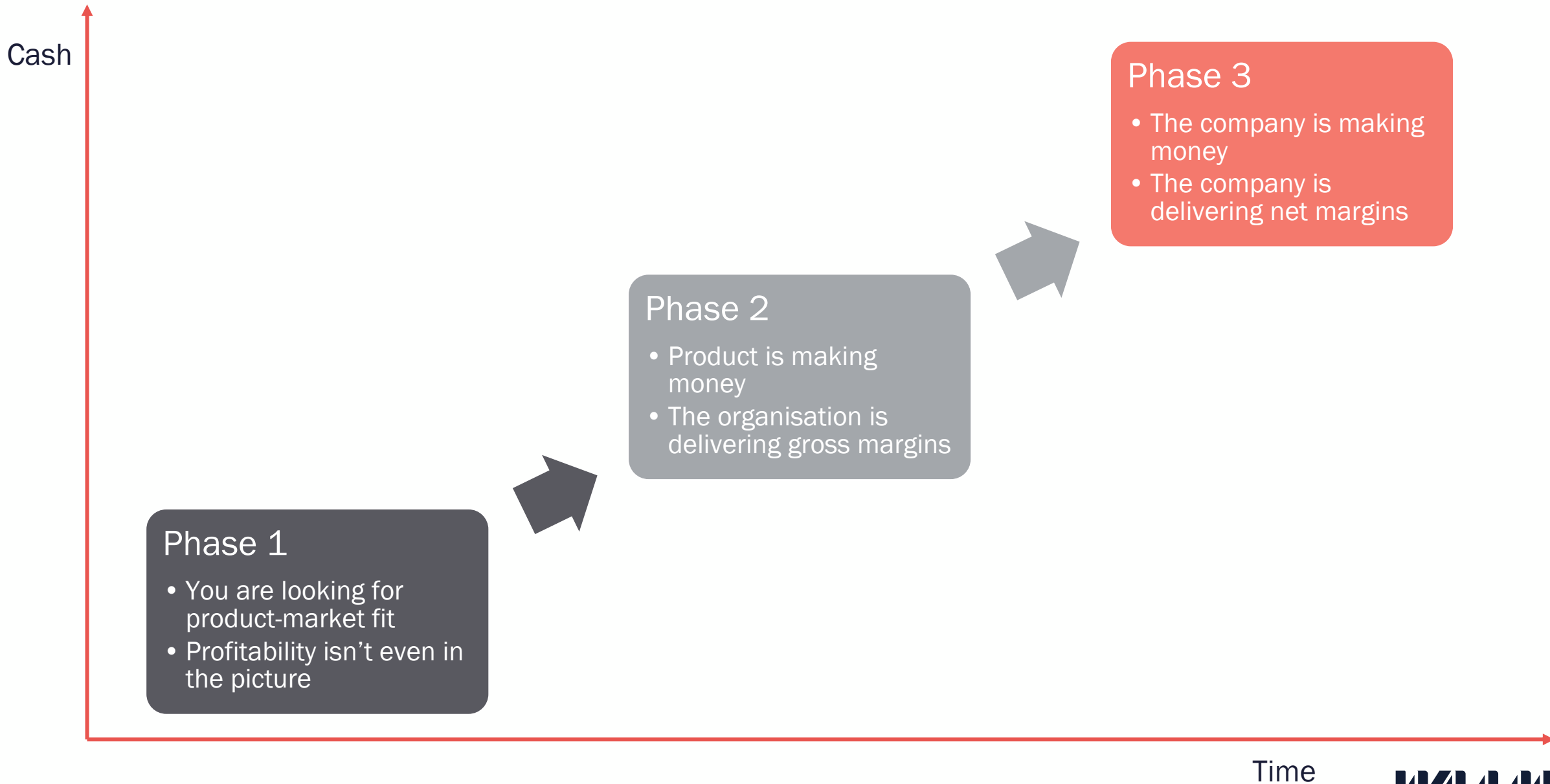
YOU ARE THE ARCHITECT

Before: strategy
executor / implementer
Now: overall designer

Environment
Resources
History



Nadler-Tushman
congruence model

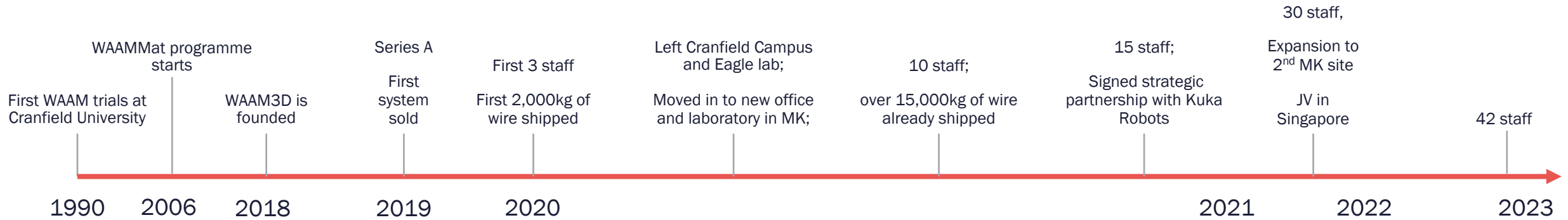


EMBRACE UNCERTAINTY

“The first responsibility of a leader is to define reality. The last is to say thank you. In between, the leader is a servant.”

Max de Pree

WAAM3D'S TIMELINE



ECOSYSTEM

- RoboWAAM SE**
 - Entry level
- RoboWAAM Advanced**
 - Best-in-class platform
- RoboWAAM XP**
 - Featuring new high productivity WAAM (11/2022)

WAAMCost

- Cost estimation
- Life Cycle Assessment

WAAMPlanner

- Slicer
- Multidimensional sectioner
- Tool path planner
- Post-processor
- Multi-material / process capability

WAAMKeys

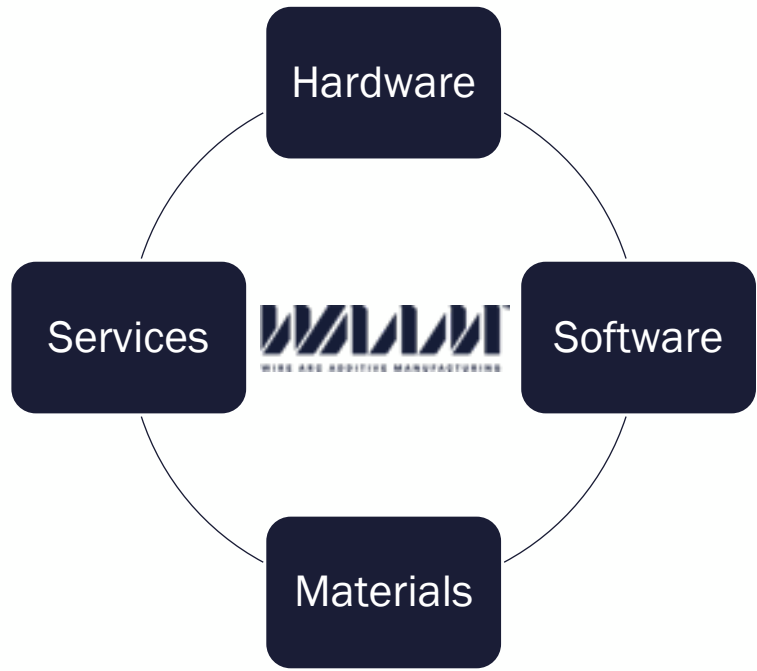
- Custom and / or automatic calculation of WAAM process parameters

WAAMSim

- Kinematic simulation
- Tool path plan visualisation
- Collision detection
- Debugger

WAAMCtrl

- Operator's dashboard
- Machine management
- Data logging
- Auditable quality file / report



Business case development

- Cost estimations
- Life Cycle Assessment

Training

- Foundational
- WAAM Operator
- WAAM Engineer
- Advanced techniques

Part building

- First-right-part
- Proof of concept
- Demonstration
- End-use

Special projects

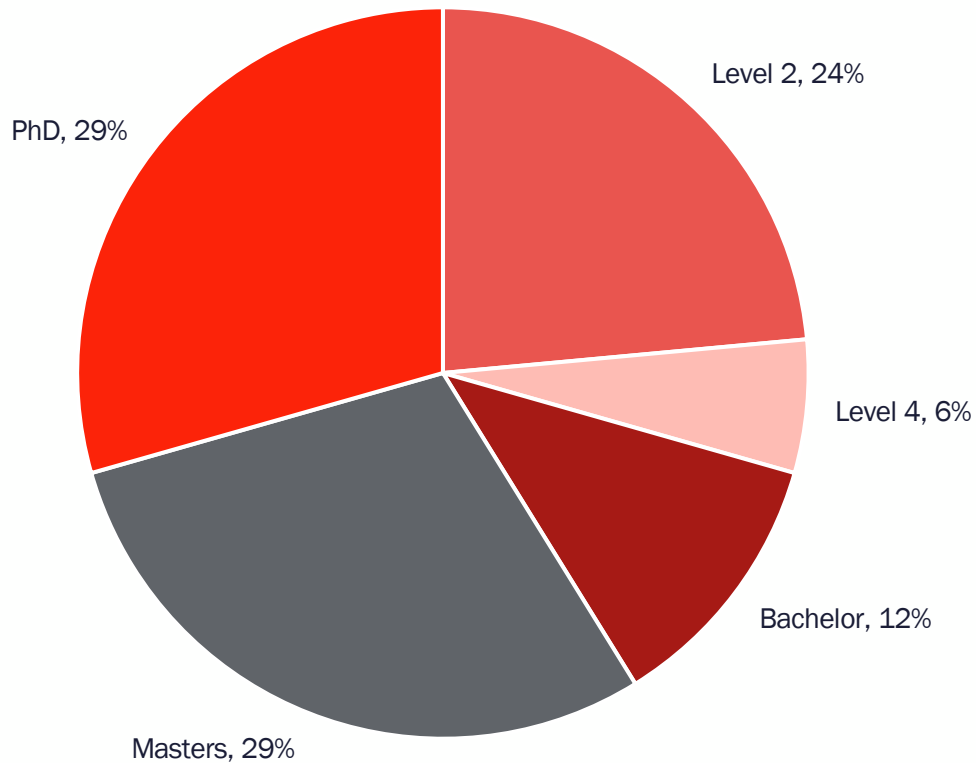
- Custom hardware
- New materials
- Next complexity challenges

Premium aluminium wire and rods

- 2319
- 4043
- 5183
- 5356
- Magnesium Scandium



WAAM3D'S SKILLED WORKFORCE

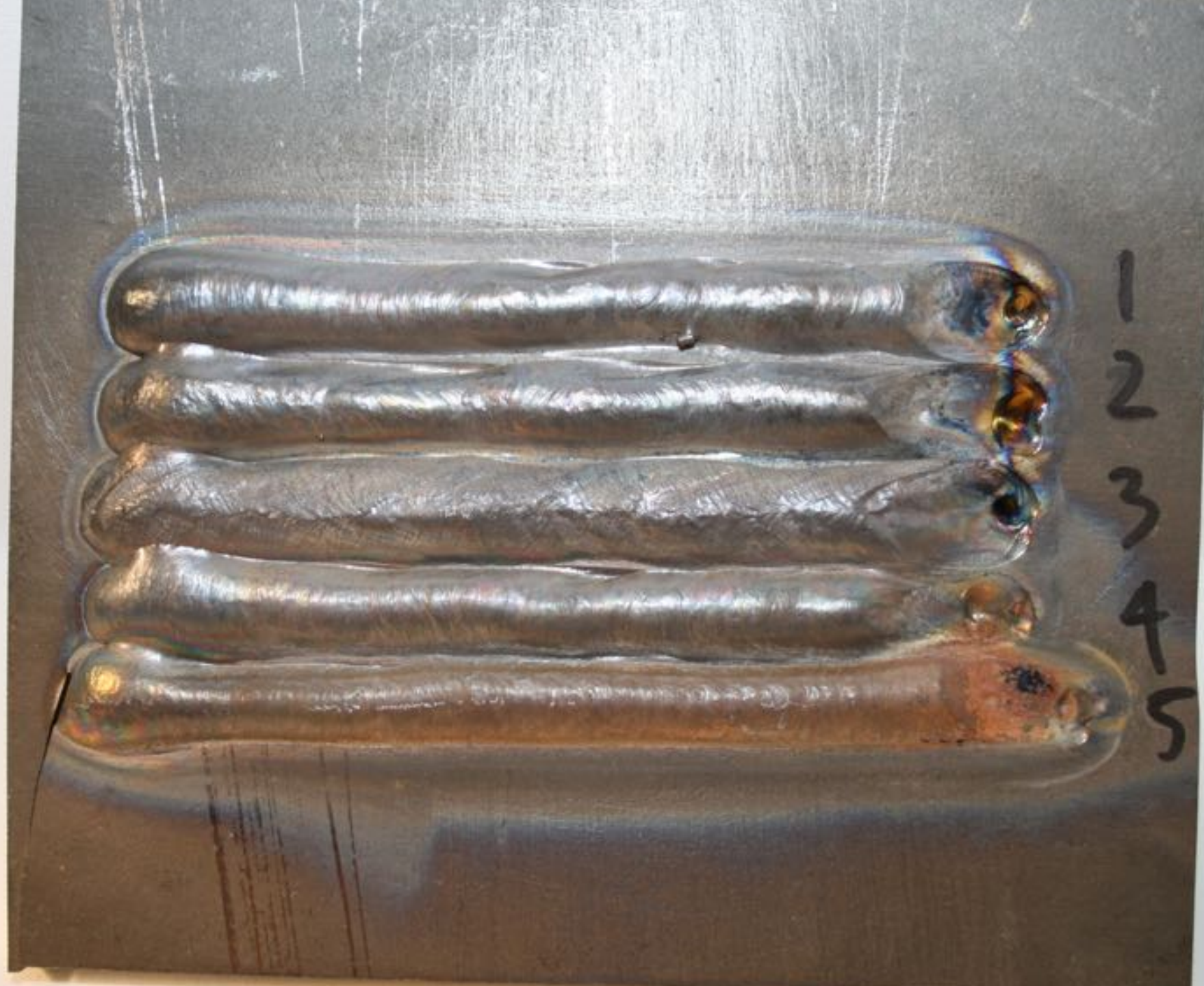


WAAM3D boasts a unique heritage in the field of WAAM, having spun-out of Cranfield University where the founders have been working on WAAM since 2006.

The founders have produced more than 275 papers, combined with an excess of 40 PhDs and 100 Masters theses supervised. They count over 32,000 academic citations in total.

The relationship with Cranfield University is still ongoing, and places WAAM3D and its industrial partners in the unique position to access more than 60 researchers in the WAAMMat consortium.

2010



2011



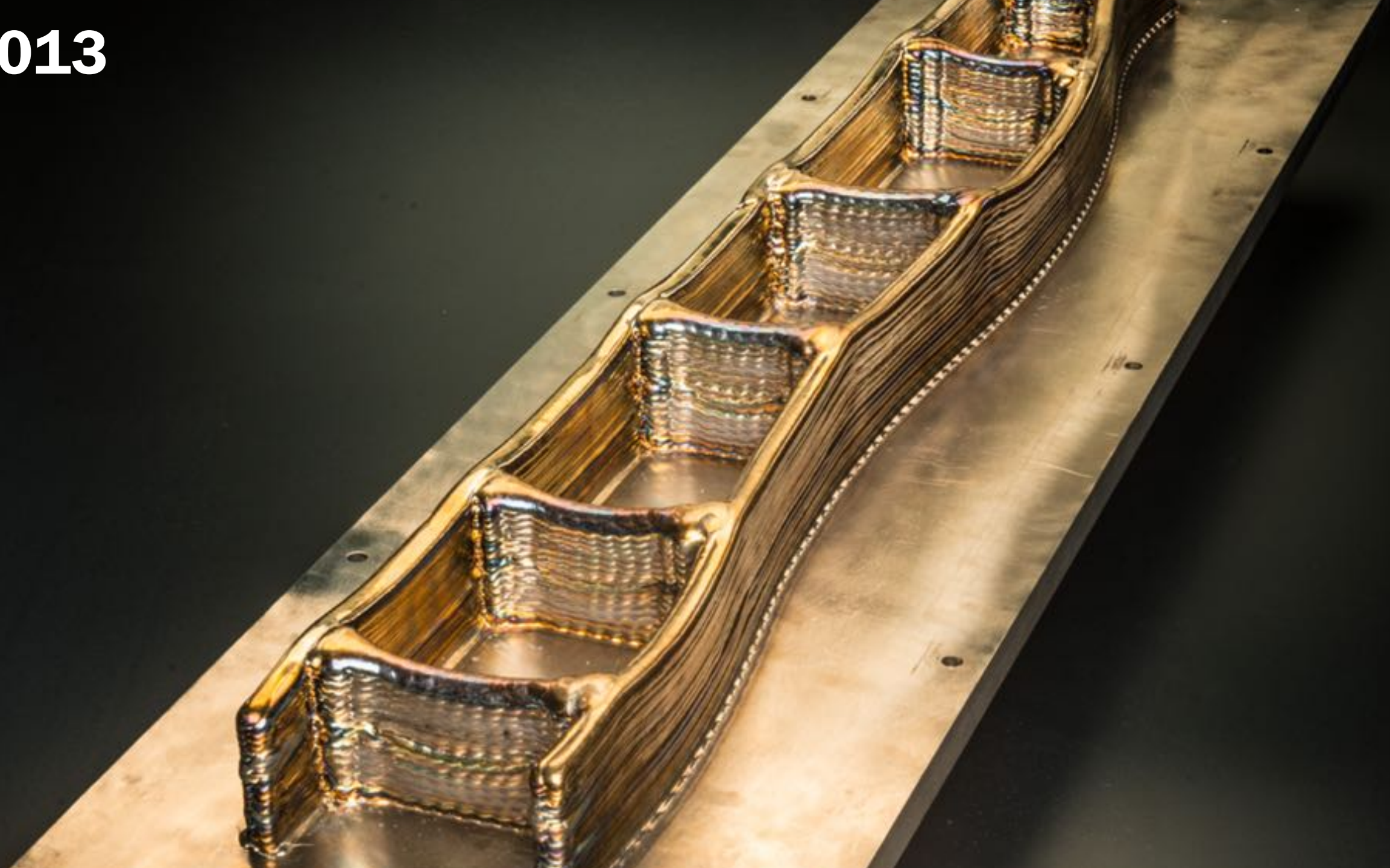








2013



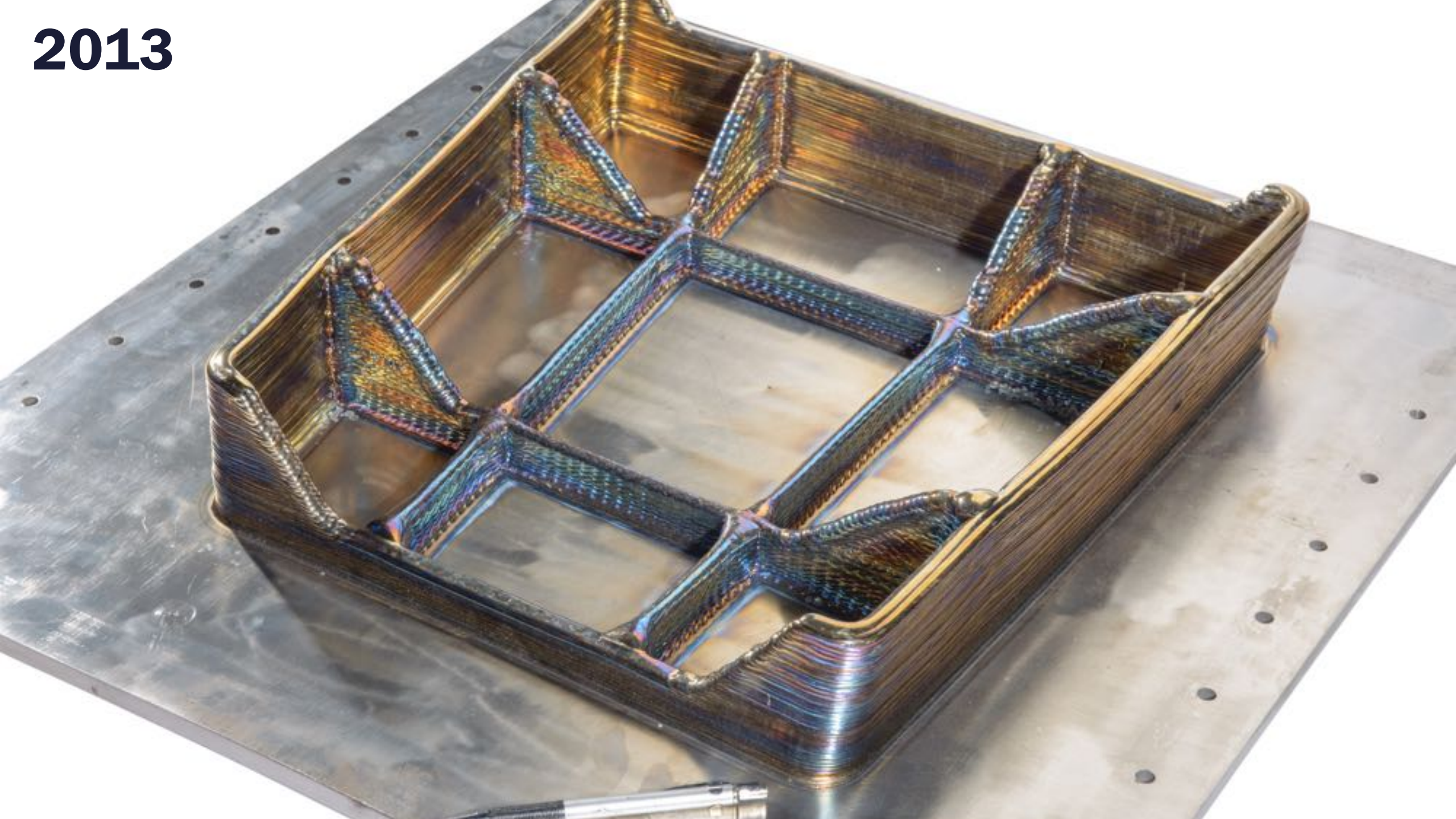
2013



2013



2013

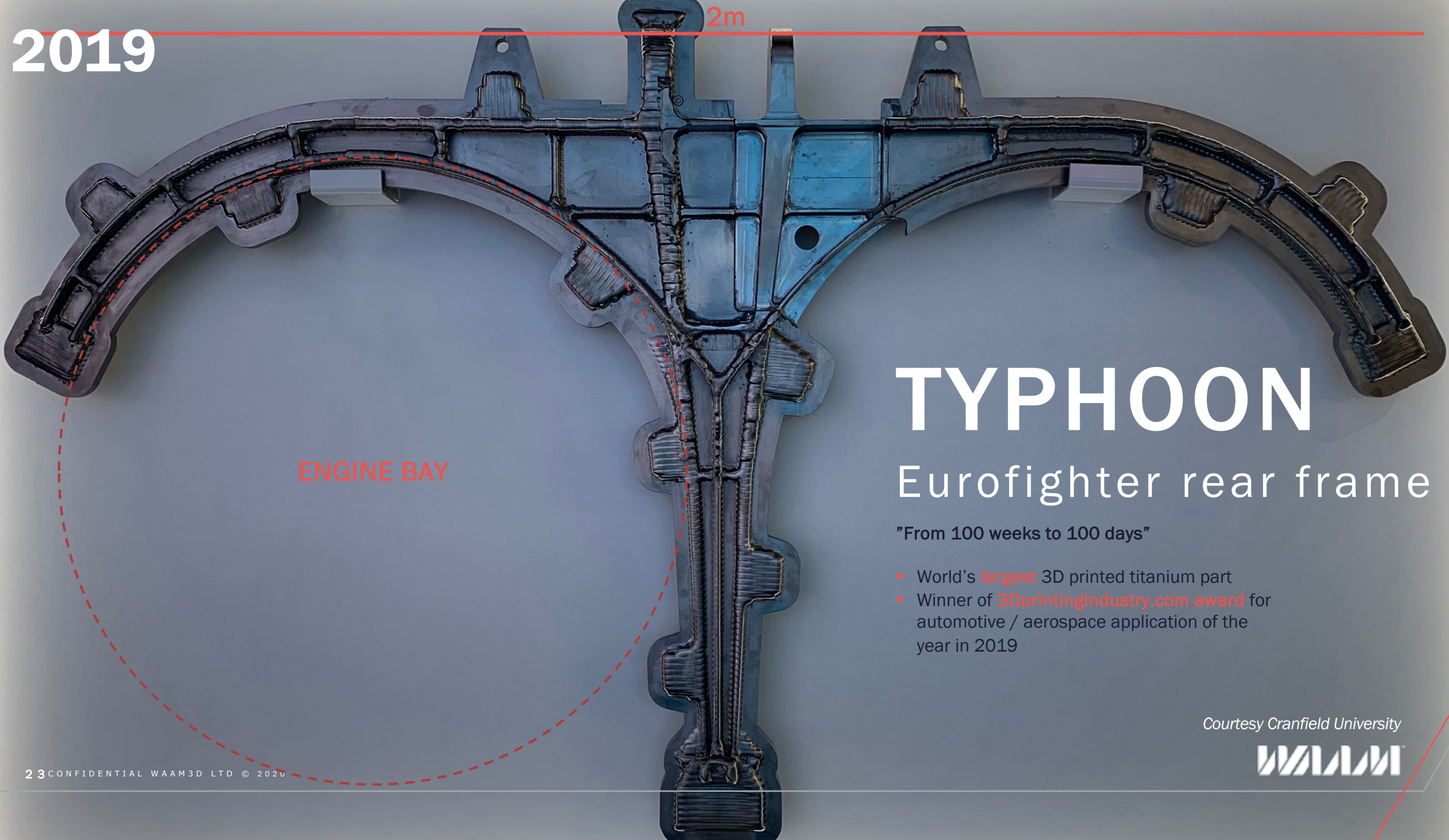


2018



2019

2m



ENGINE BAY

TYPHOON

Eurofighter rear frame

"From 100 weeks to 100 days"

- World's **largest** 3D printed titanium part
- Winner of **3Dprintingindustry.com award** for automotive / aerospace application of the year in 2019

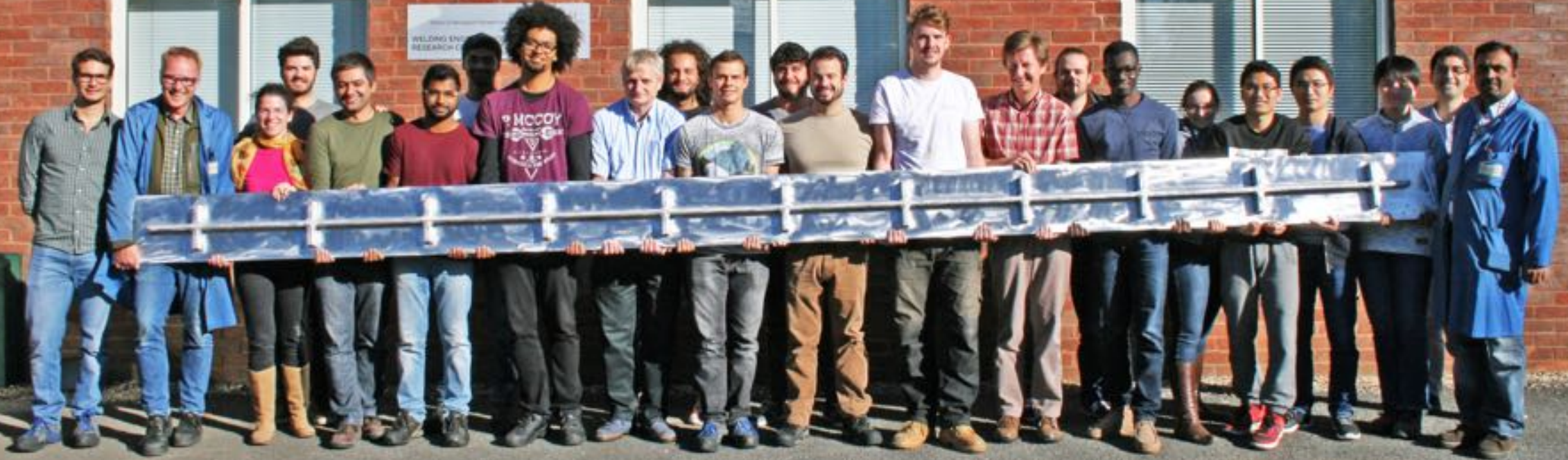
Courtesy Cranfield University



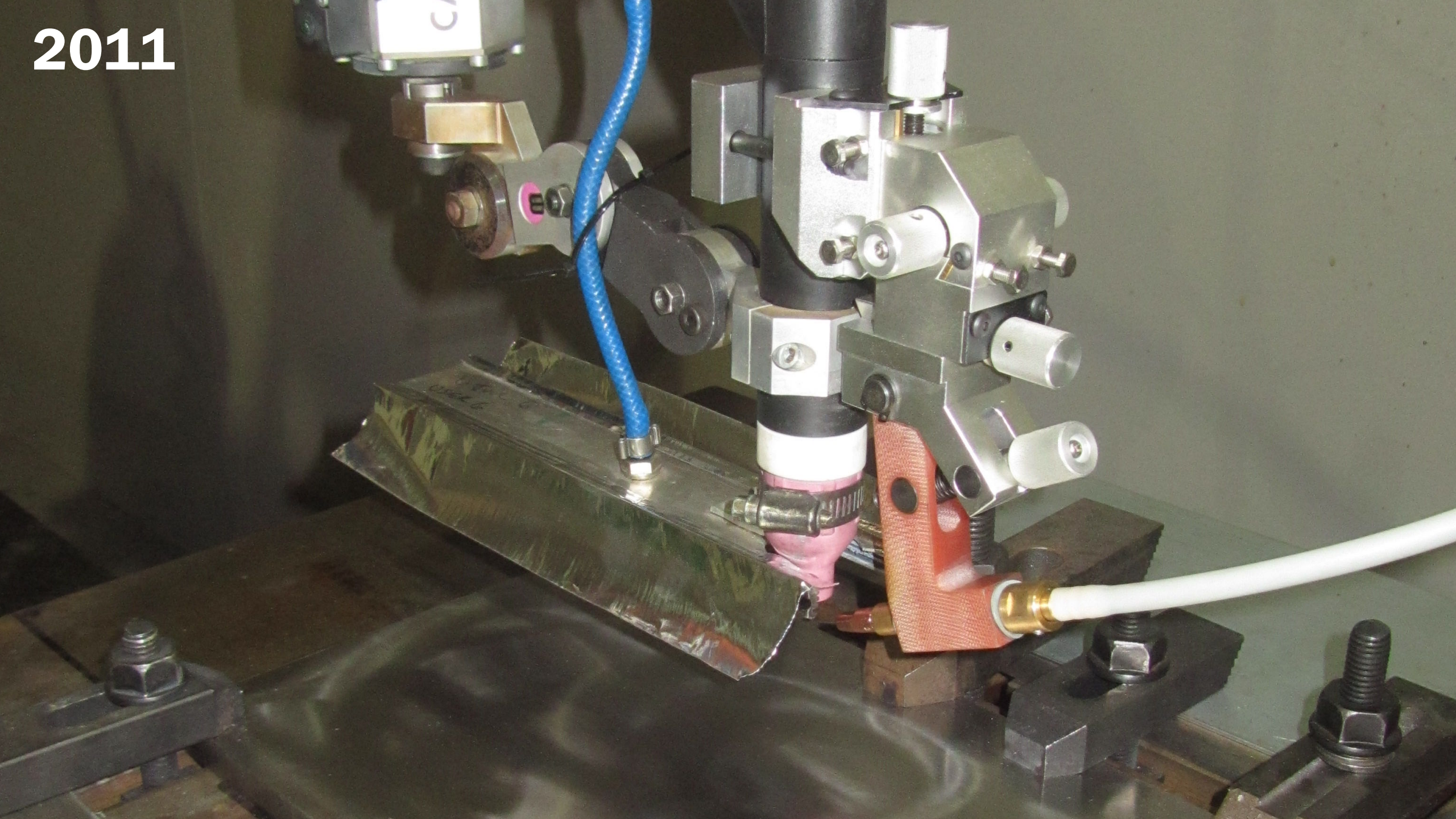
2014



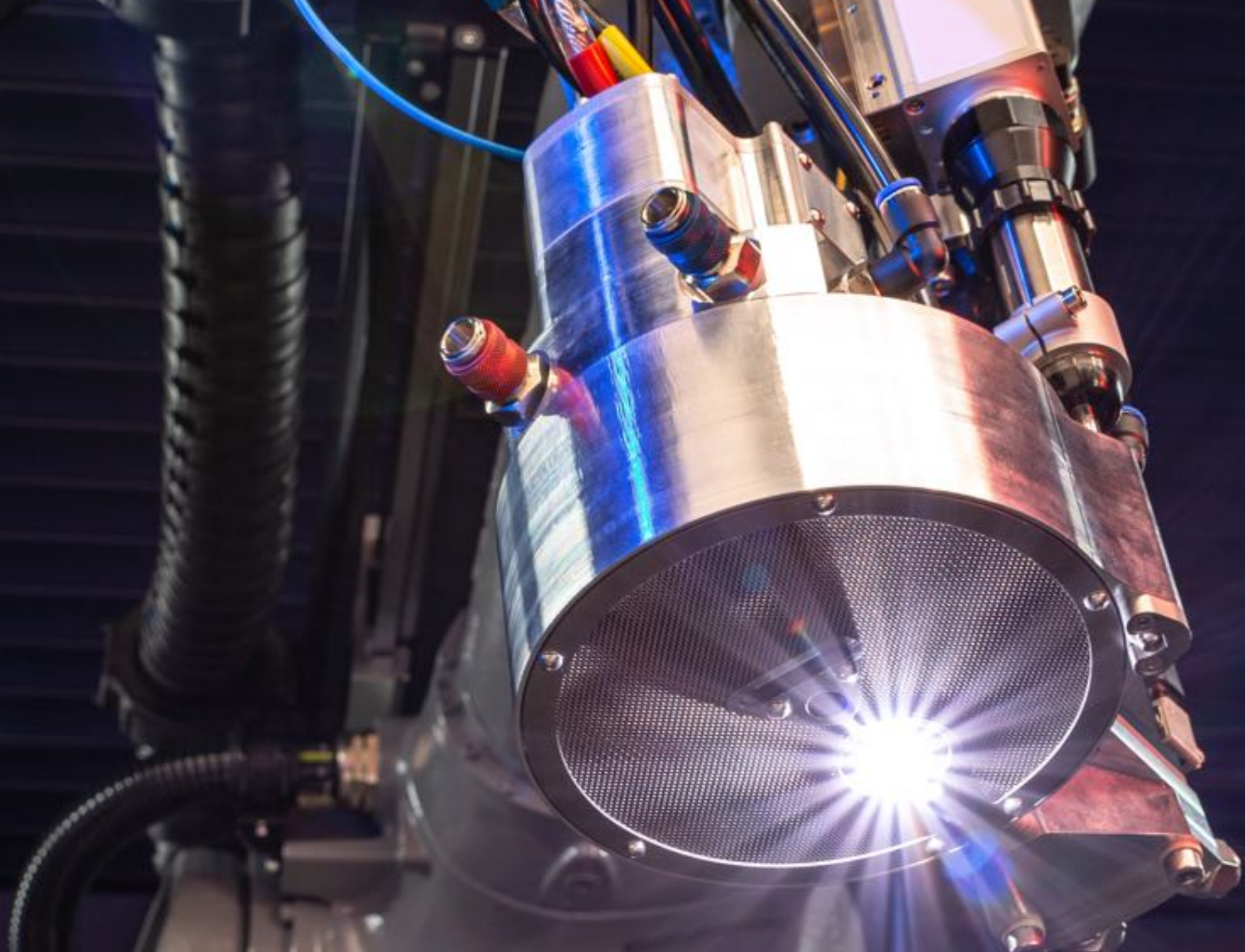
2016



2011



2023



2010



2022

ASSEMBLY
ROOM
THIS WAY >



2020



2022



2023



Main Screen

Connection Setting

Monitoring

Hardware

Data

Monitoring Screen for AC Plasma Power Source

Update Data from WAAM Ctrl System

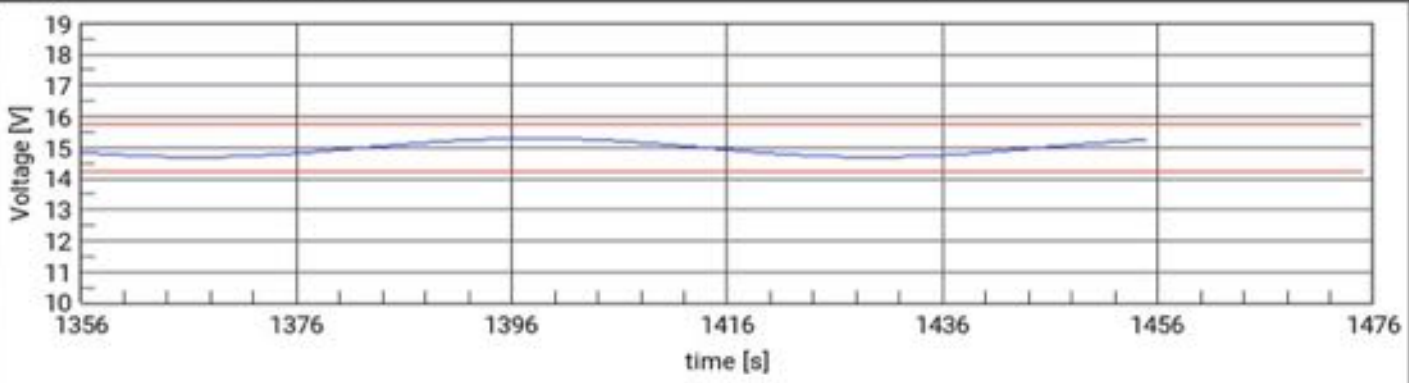
Start Pilot arc Power Source

Robot position

X 0 mm

Y 0 mm

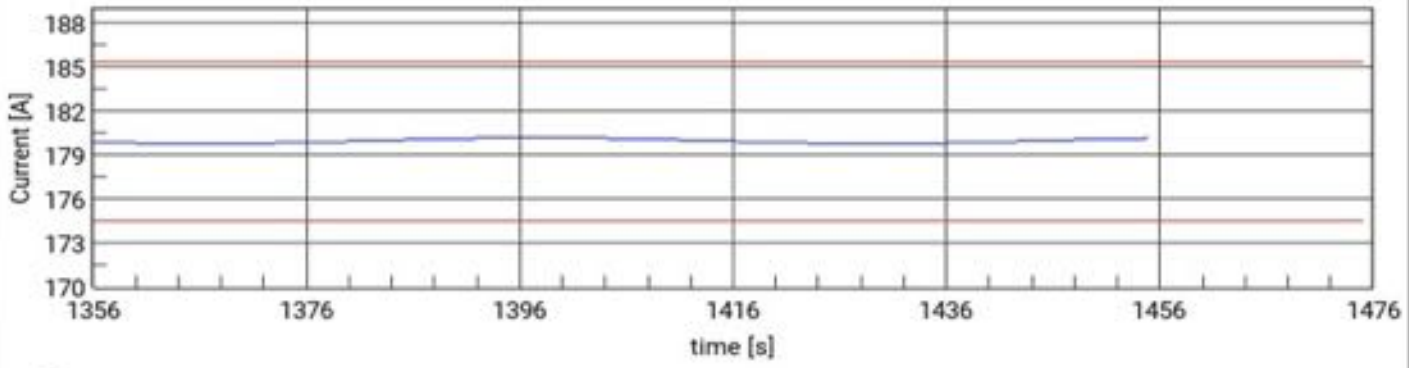
Z 0 mm



Voltage Alarm

15 Voltage

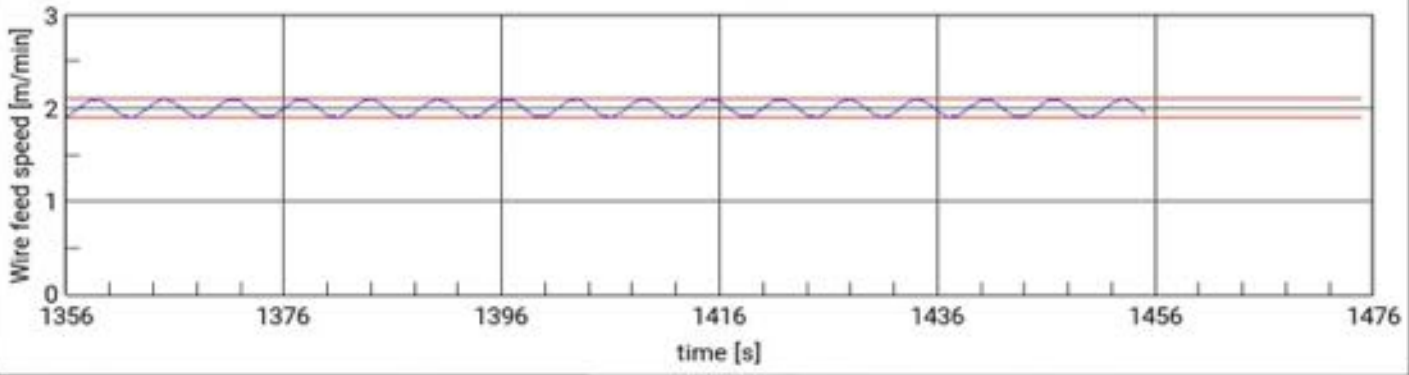
Voltage Real Value -1 V



Current Alarm

5 %

Current Set Value 180 A



Wire Feed Speed Alarm

3 %

Current Real Value -1 A

5 %

Wire Feed Speed Set Value 2 m/min

Wire Feed Speed Real Value -1 m/min

Recording print data... Mute Sounds Alarm & Event Log Export Data

Select event category Submit Event Add event notes...

ARC VOLTAGE Alarms

-7.5 -2.5 19.03 +2.5 +7.5

19.0 V

CURRENT Alarms

-6.0 -3.0 170.85 +3.0 +6.0

170.8 A

WIRE FEED SPEED Alarms

-2.0 -1.0 2.0 +1.0 +2.0

2.0 M / MIN

LAYER HEIGHT (ABS) Alarms

-0.40 -0.20 1.50 +0.20 +0.40

1.500 MM

WIRE POSITION CONTROL

Manual Control Automatic Control

5 MM

LEAD TEMPERATURE

168.98 OC

OXYGEN Alarms

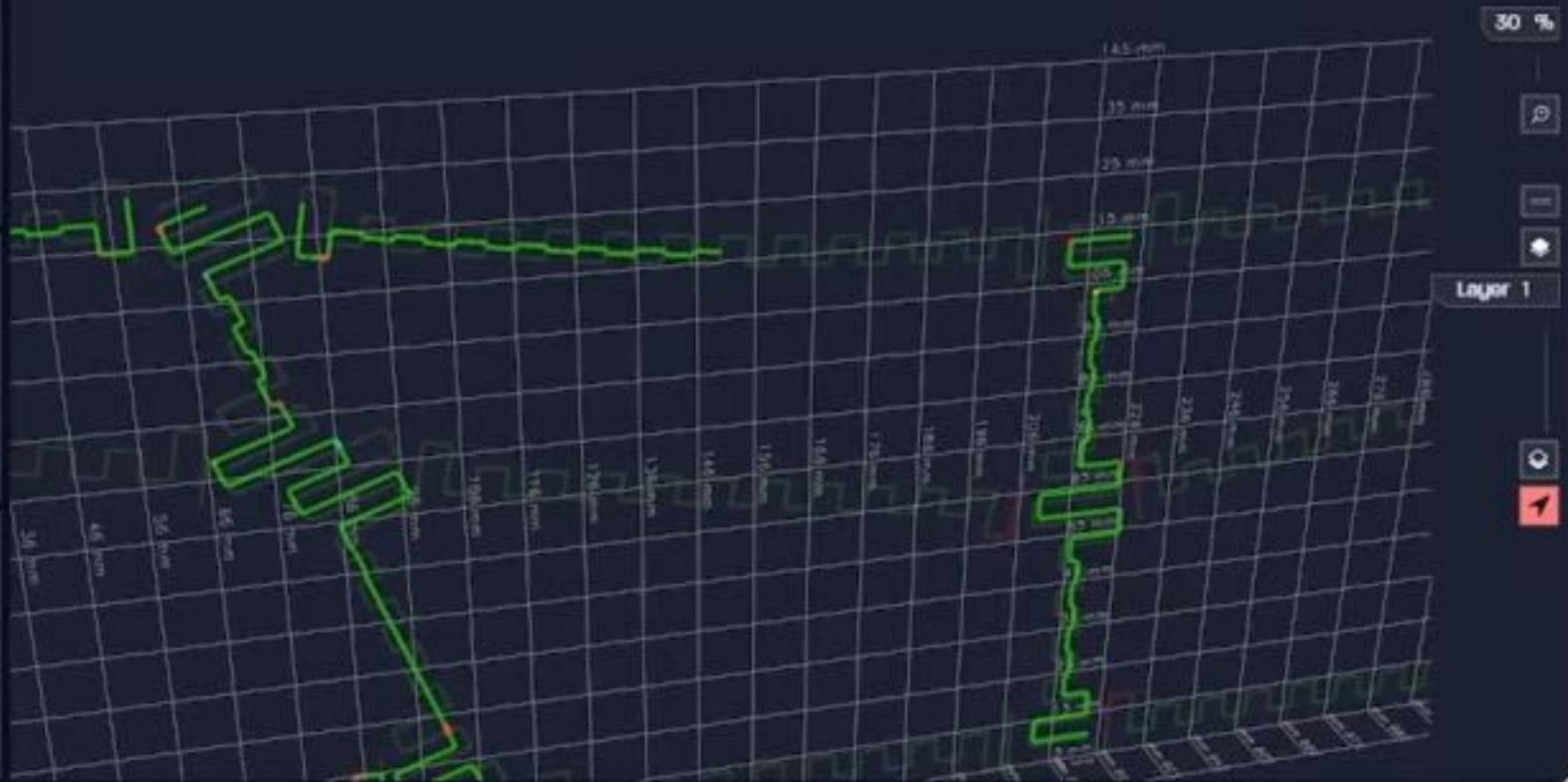
900 +12 +24

553 PPM

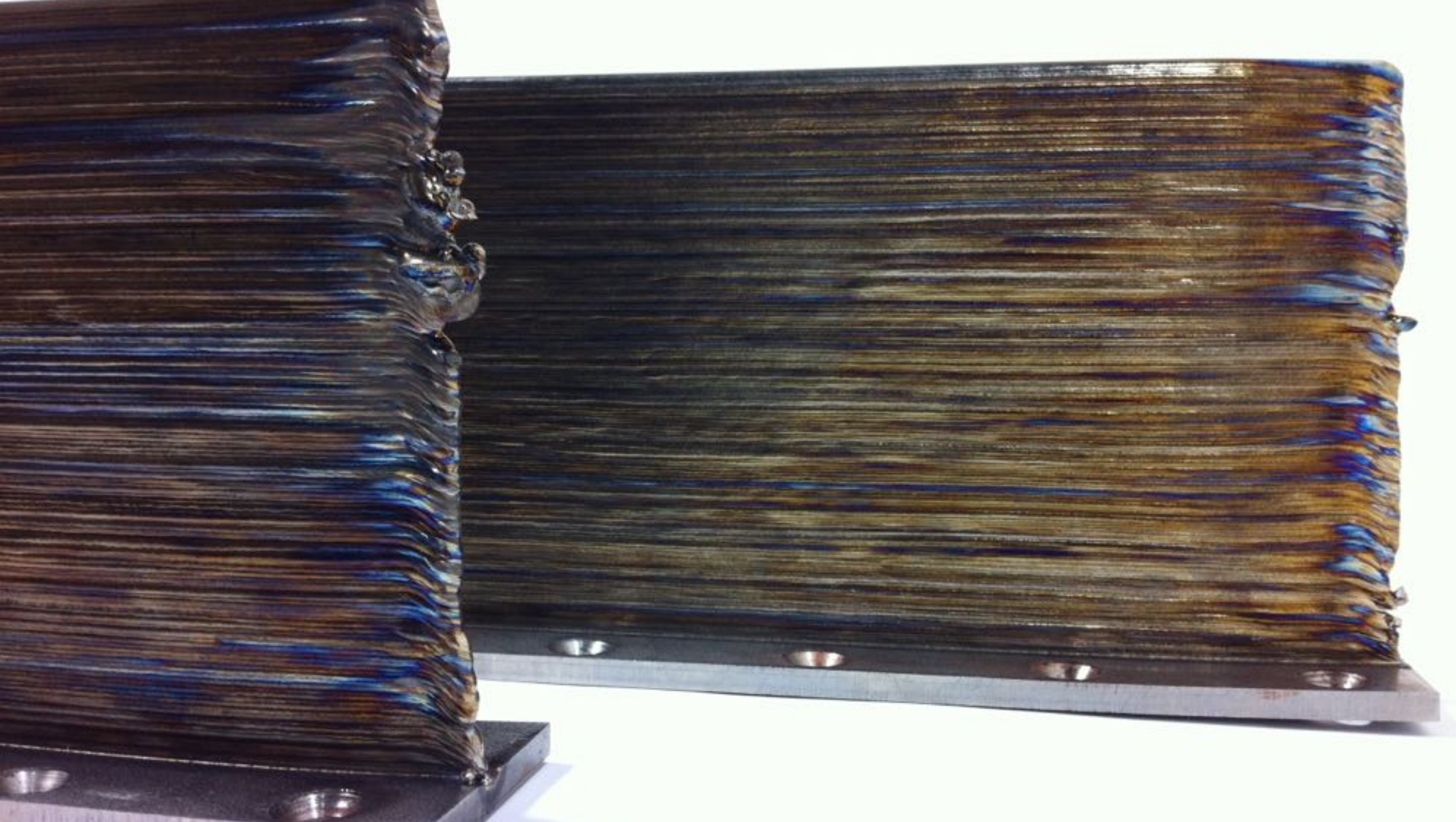
GAS FLOW

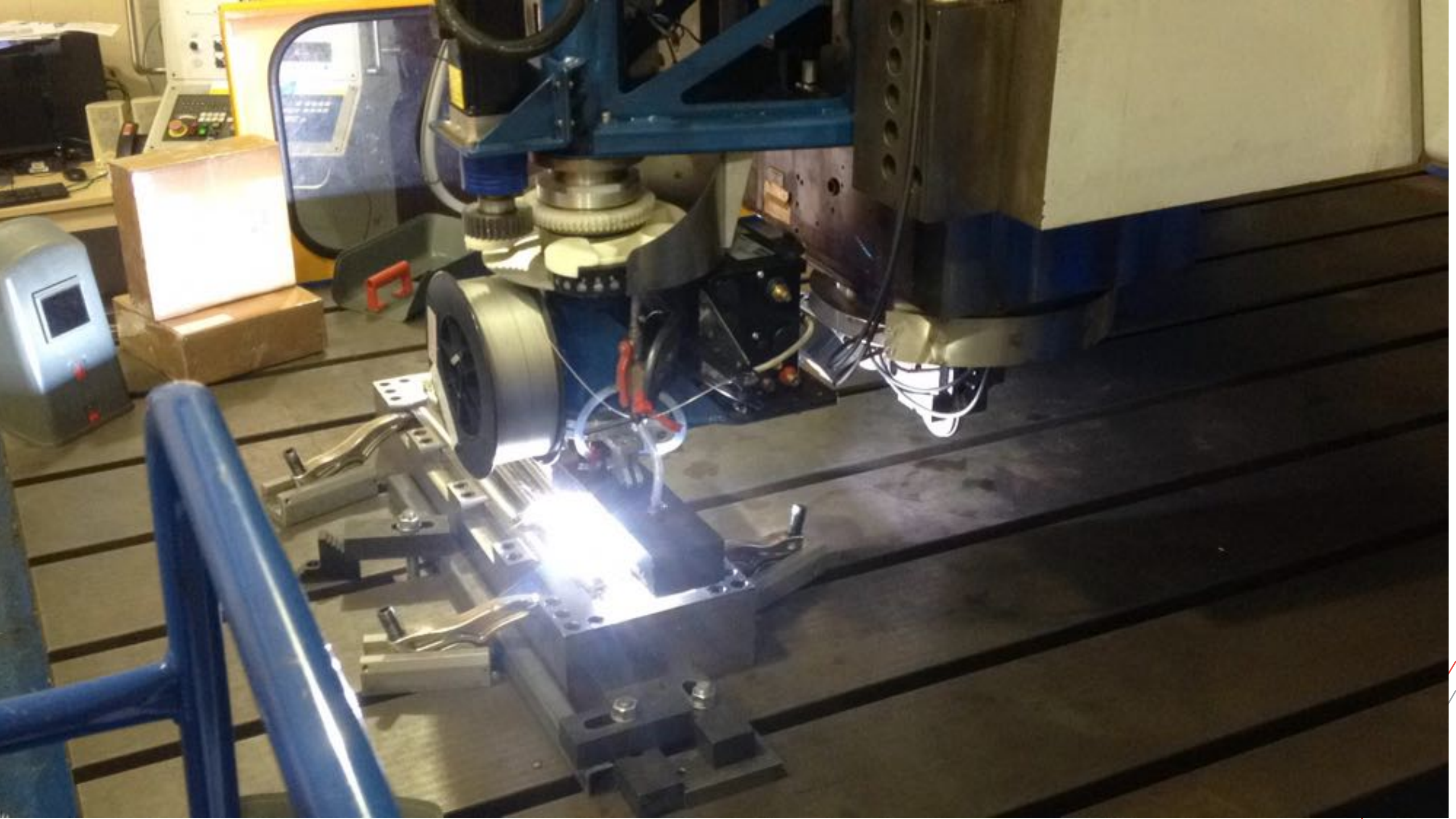
6.44 L / MIN

ARC VOLTAGE CURRENT WIRE FEED SPEED LEAD TEMP TRAIL TEMP LAYER HEIGHT XIRIS













For further information contact:

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