Joining Sub-Platform General Assembly

Presentation of ongoing EU Projects LAWENDEL & EXTRA-LASER

N. Huber, N. Kashaev, S. Riekehr

Institute of Materials Research, Materials Mechanics / ACE Centre

04.07.2014 / CDMA building, rue du Champ de Mars, 21 1050 – Bruxelles

Helmholtz-Zentrum Geesthacht
Zentrum für Material- und Küstenforschung

Laser beam welding of aircraft fuselage

AIRBUS

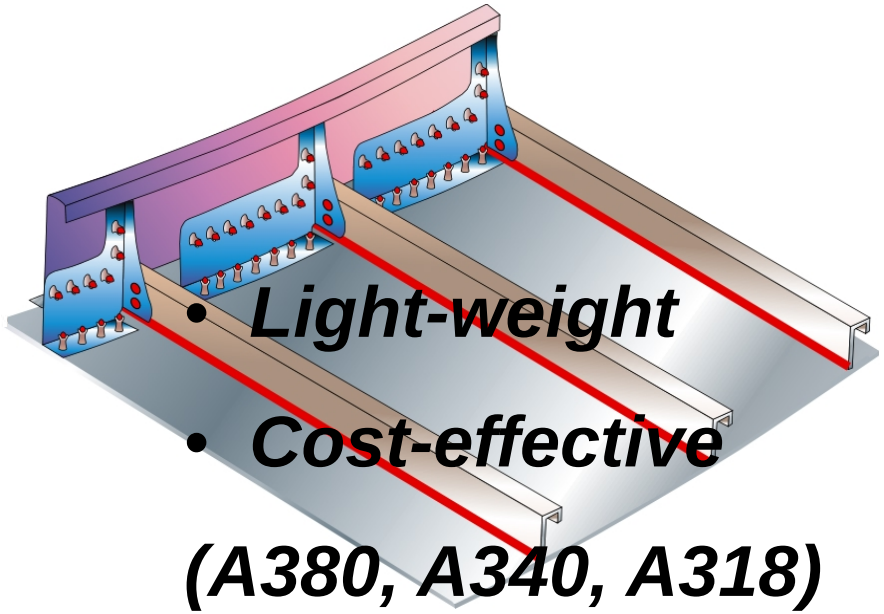
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State of the art: **Laser welded panels in compression regions of the fuselage**



Airbus source





- ***Light-weight***
- ***Cost-effective***

(A380, A340, A318)

Aim: **Development of LBW for AA2198/AA2196**

LAWENDEL Details

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Laser welding of newly developed Al-Li alloy / LAWENDEL

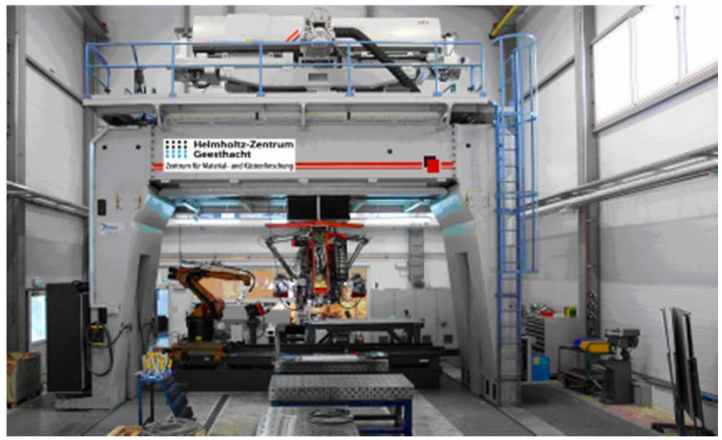
THEME [JTI-CS-2012-2-ECO-01-055]
[Laser welding of newly developed Al-Mg-Li alloy]

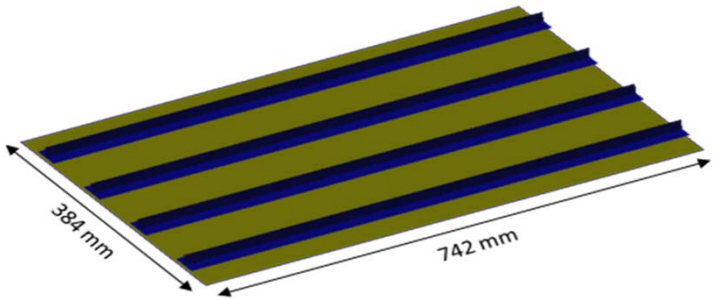
CLEANSKY

Project Coordinator: Helmholtz-Zentrum Geesthacht / HZG (Dr. N. Kashaev)
Project Partner: The University of Manchester / UMAN (Dr. J. Robson)
Topic Manager: Hellenic Aerospace Industry S.A. / HAI (Dr. A. Karanika)

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MANCHESTER 1824
The University of Manchester





Large Scale LBW Facility HZG



C.Schmidt/HZG

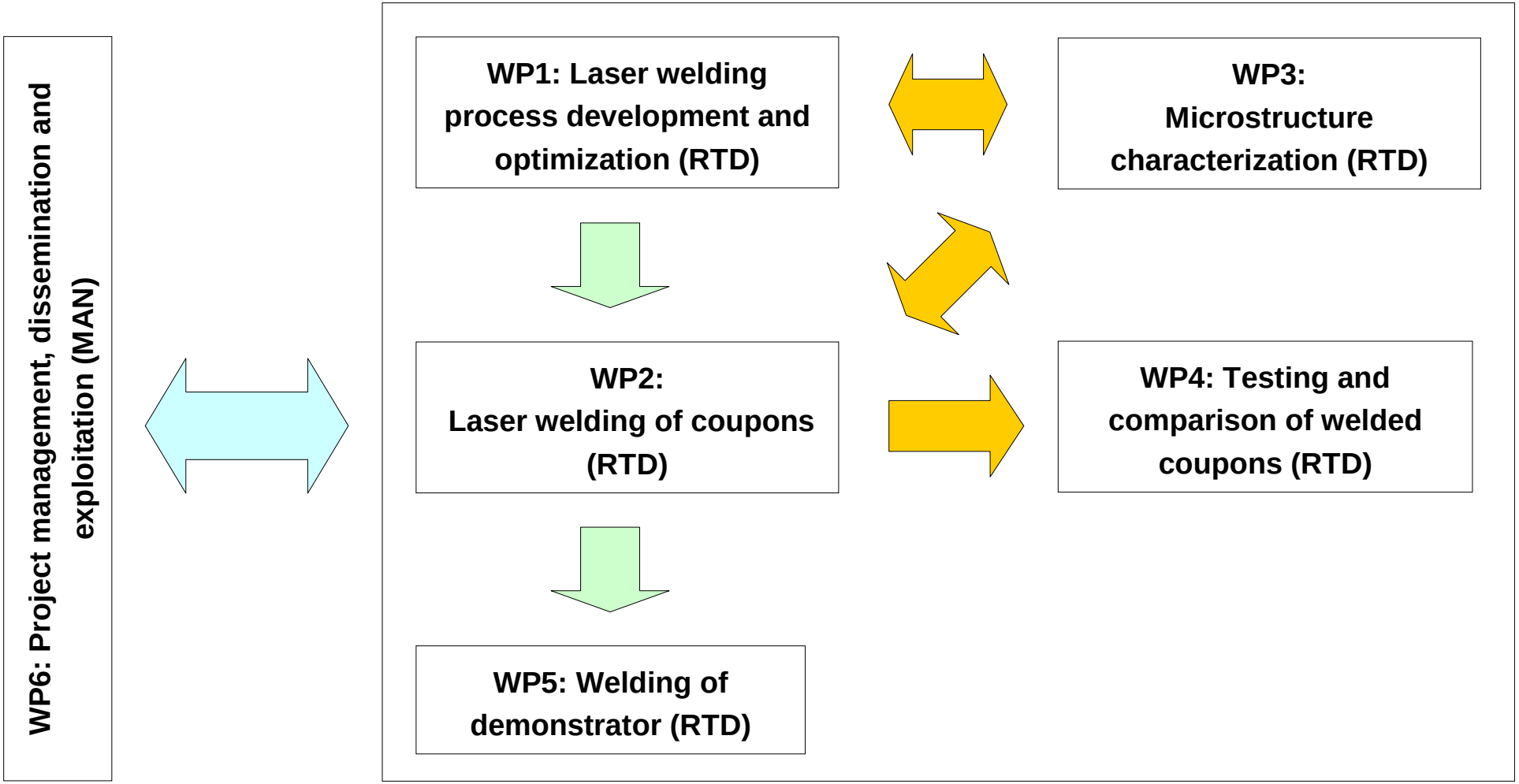
Capabilities of Large Scale LBW Facility

- Equipped with 2 x 3.5 kW CO2-lasers
- Working area up to 8.5 m x 3.5 m x 1 m
- Welding speed up to 12 m/min
- Movable processing head
- Two-sided welding
- Shielding gas supply

Recommended parameters for LBW (preliminary study HZG)

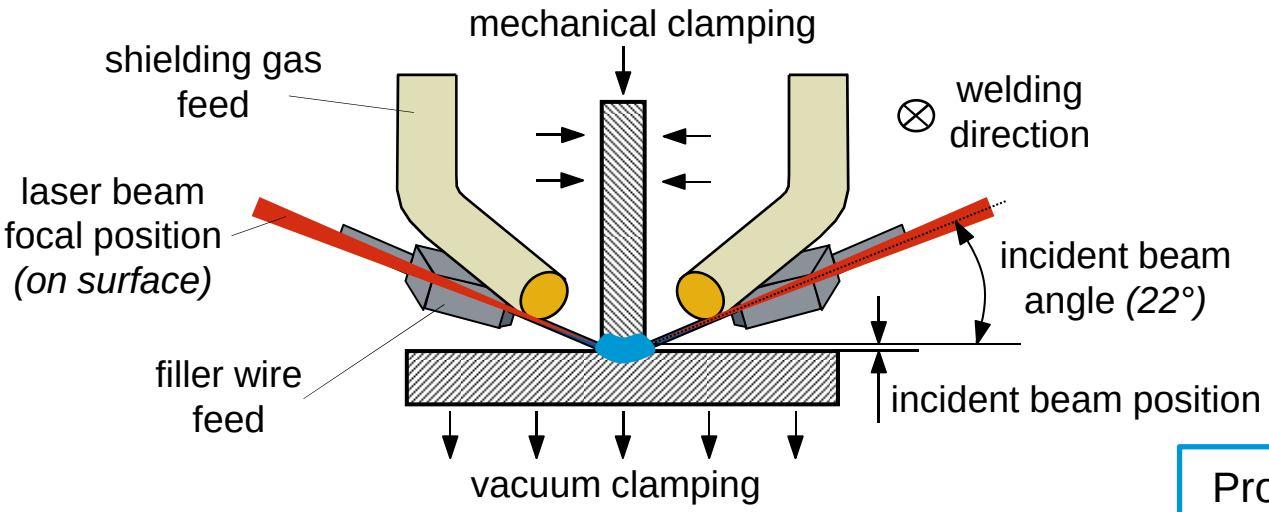
- Power of welding 1.68 kW
- Welding speed 5.8 m/min
- Speed of wire feeding 7.9 m/min
- Incident beam position 0.22 mm
- Contact pressure of the roller 1.6 bar

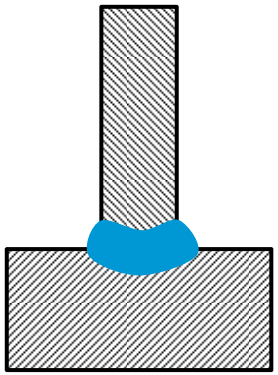
Flow chart of the project



Concepts for LBW of T-joints

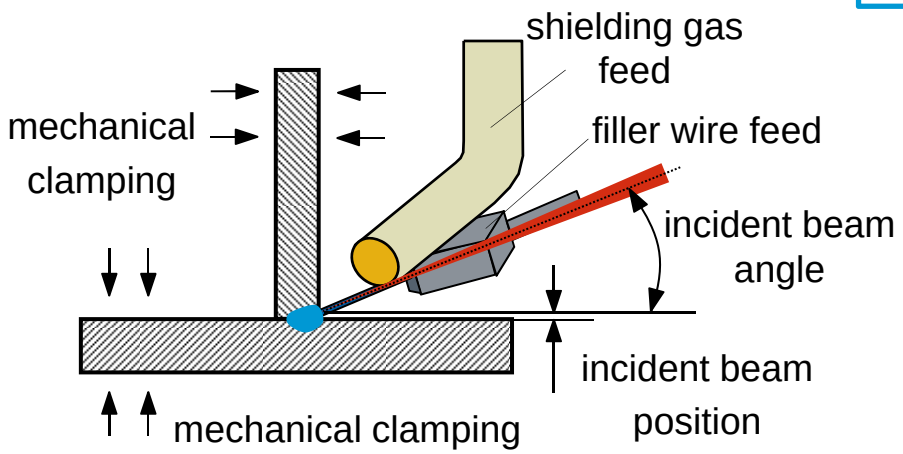
Two-sided Laser Beam Welding

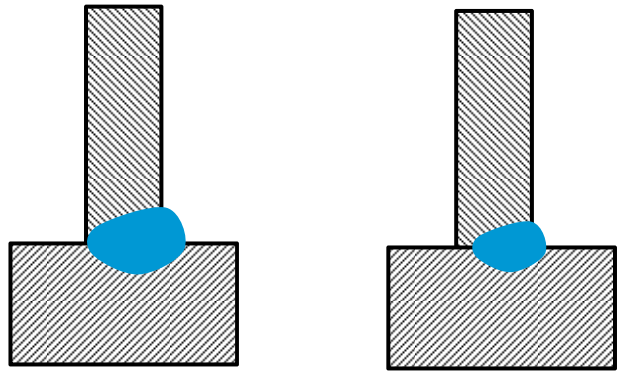




Productivity
Porosity
Performance

single-sided Laser Beam Welding

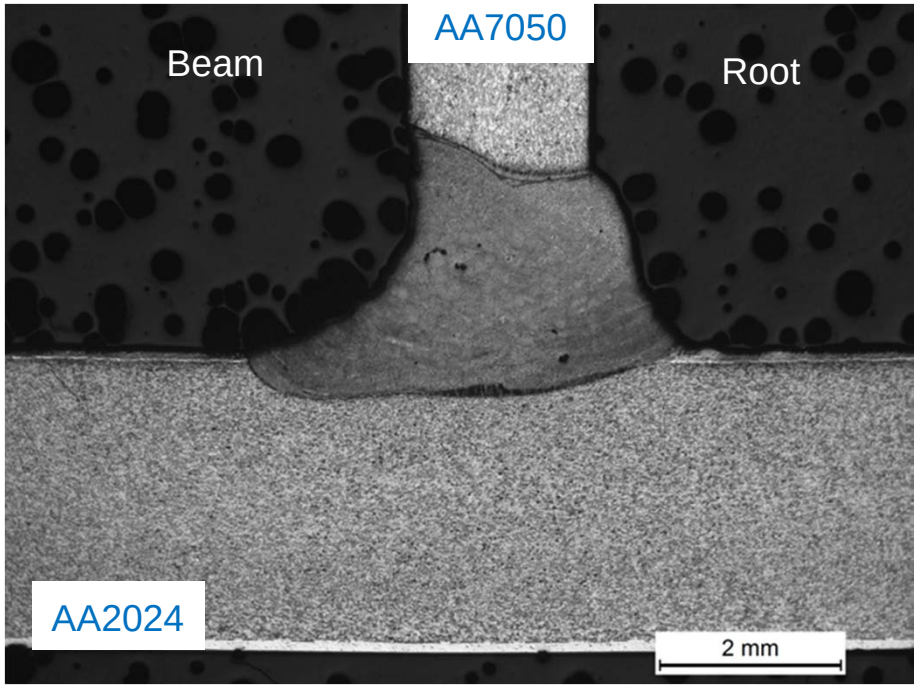




Preliminary results for single side LBW of T-joints AA2024 with AA7050

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V. Khomenko: Master Thesis HZG



LBW Parameters #2361	
Welding Power	8000 W
Welding speed	6000 mm/min
Welding wire	AA4047, 1.2mm
Wire speed	8000 mm/min
Welding angle:	15°
Beam position	+0.5mm
Focus	+8mm



Beam side



Root

EXTRA-LASER Details

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Extrapolation and technical and economic study of a laser beam welding technology / EXTRA-LASER

CLEANSKY

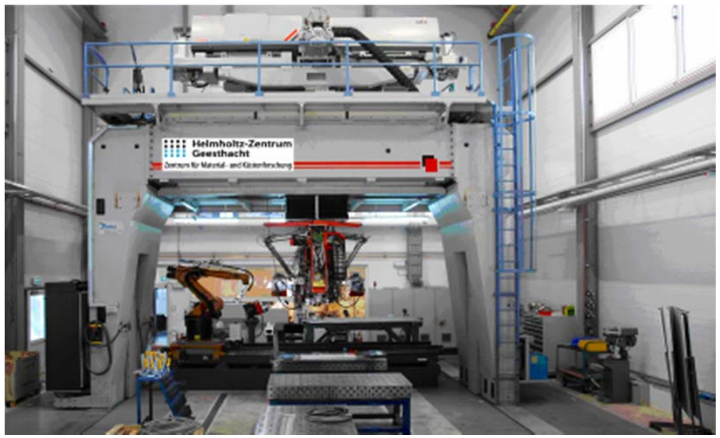
THEME [SP1-JTI-CS-2013-1-ECO-01-065]

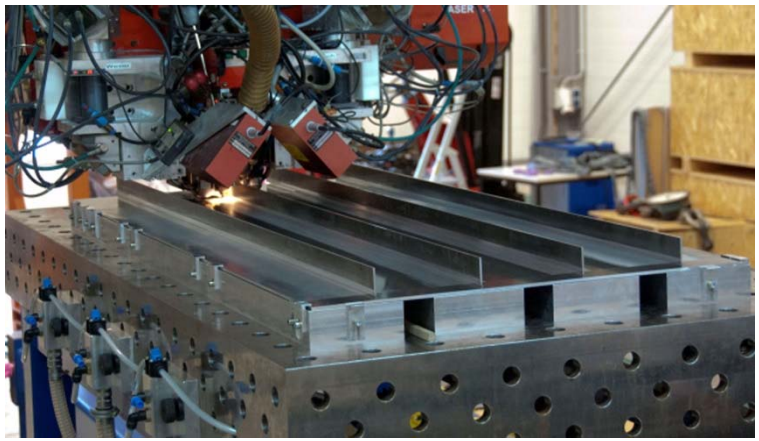
Project Coordinator: University of the Aegean-Research Unit / UAEGEAN (Prof. N. Alexopoulos)
Project Partner: Helmholtz-Zentrum Geesthacht / HZG (Dr. N. Kashaev)
Topic Manager: Hellenic Aerospace Industry S.A. / HAI (Dr. A. Karanika)

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Project value: 150 T€
Project duration: 01.10.2013 – 30.09.2014





Research Tasks (HZG)

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Task 2.1 LBW process description and manufacturing of butt welds (HZG)

Task 2.3 Benchmarking activity (HZG and UAegean)

Task 3.1 Technical evaluation (HZG)

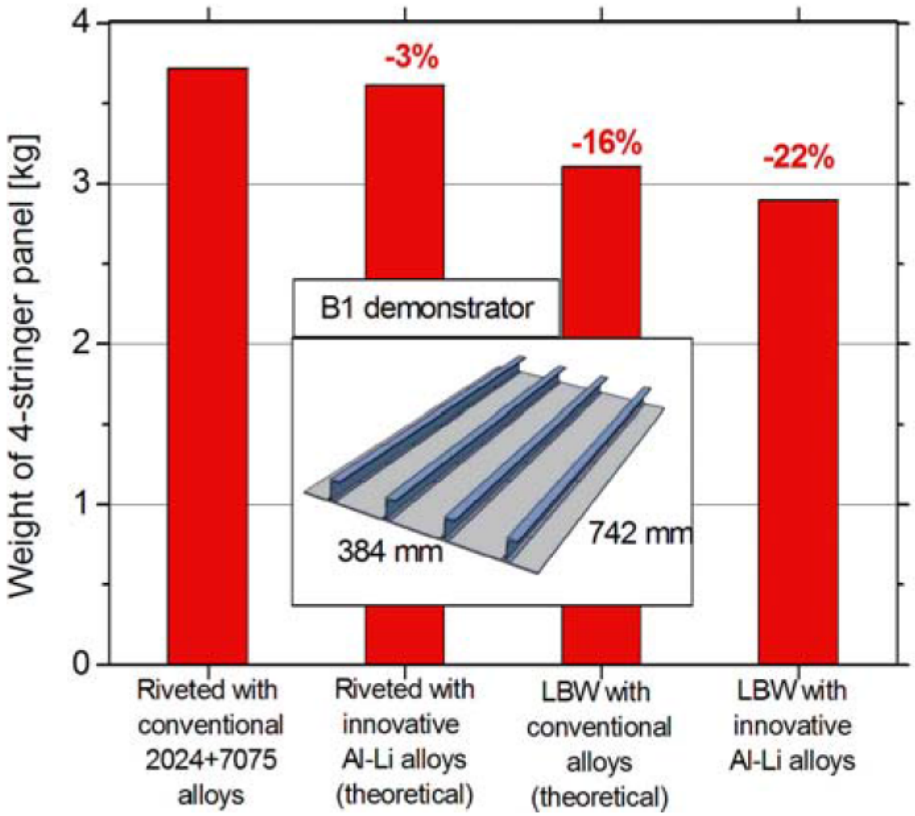
Task 3.2 Benchmarking of LBW systems, description and market research (HZG)

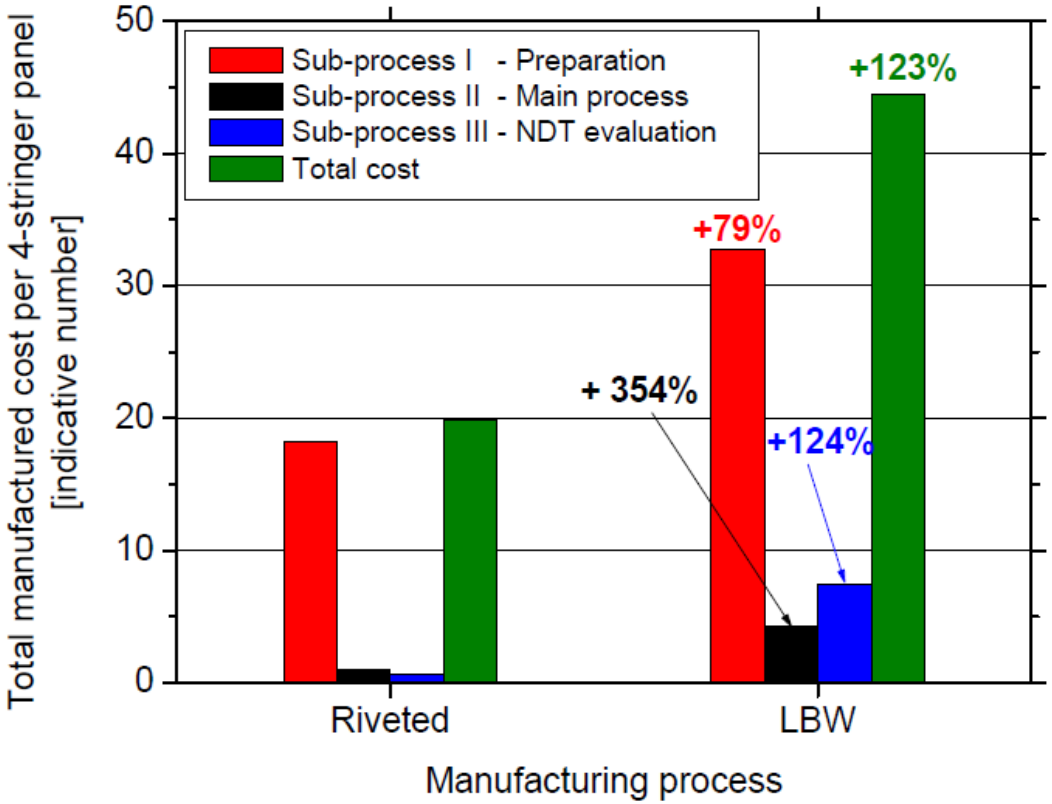
Task 4.2 Risk assessment evaluation (UAegean and HZG)

Task 4.3 Elaboration of manufacturing plan (HZG and UAegean)

Task 4.4 Development of process procedures (HZG)

Assessment of Weight vs. Manufacturing Costs





N. D. Alexopoulos et. al.: Towards integral aeronautical laser beam welded structures from Al-Li aluminium alloys; the trade offs between manufacturing costs and the environemtal footprint Paper presented at the „Greener Aviation 2014“

Preliminary Conclusions

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CLEANSKY

Laser Beam Welding of combinations AA 2024 / 7050

Potential in weight reduction is 15 % to 22 %

Manufacturing cost is currently increased by 23%

CO_2 footprint for riveting (95.5 kg) and LBW (97.6 kg) is comparable

Savings in manufacturing cost can be achieved by increase of production rate

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