PROJECT COORDINATOR

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CONSORTIUM

The 12 partners represent the complete research and innovation value chain in the space sector – from initial design to manufacture and environmental testing.

istec

UNIVERSITY OF BIRMINGHAM

tecnalia Inspiring Business

Trinity College Dublin
The University of Dublin

Università degli Studi di Napoli Federico II

DLR Deutsches Zentrum für Luft- und Raumfahrt

AIRBUS SAFRAN LAUNCHERS

AIRBUS

FINANCING & PROJECT MANAGEMENT

nanoker research
TAKING PROFIT FROM THE SMALL

HPS High Performance Structures Gestão e Engenharia Lda. PORTUGAL

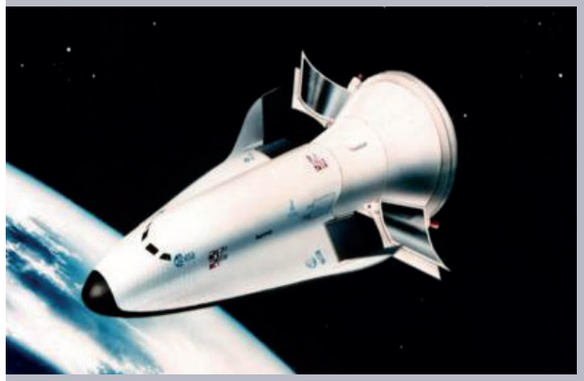
AVIO
ADVANCED VISION INTO ORBIT

WWW.C3HARME.EU

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESERACH AND INNOVATION PROGRAMME UNDER THE GRANT AGREEMENT N° 685594

C3HARME

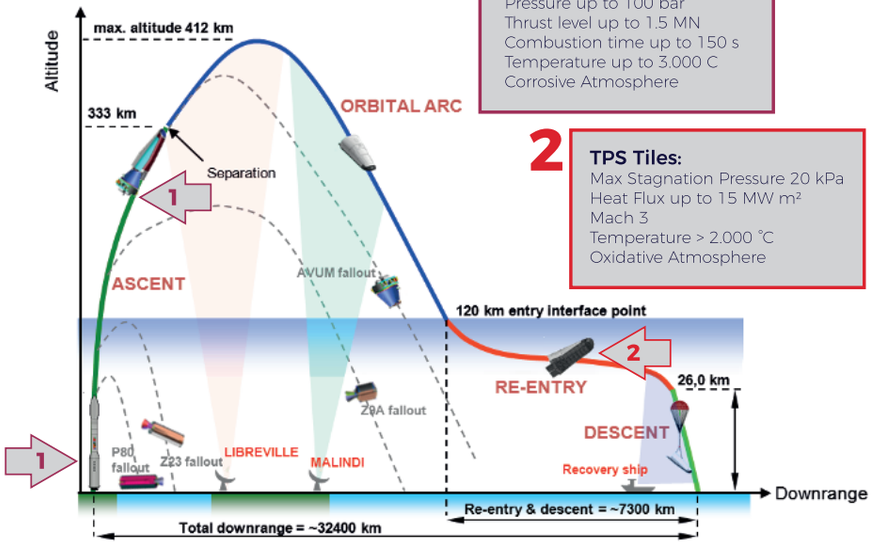
NEXT GENERATION CERAMIC COMPOSITES FOR COMBUSTION HARSH ENVIRONMENTS AND SPACE



BACKGROUND

As the aerospace industry advances towards hypersonic flight (Mach 5 or above – fast enough to travel from London to New York in under 1 hour), the quest for new, ground-breaking aircraft concepts has begun. High-speed aviation needs advanced materials that can survive extreme conditions.

TWO APPLICATIONS:



Copyright: ESA - IXV vehicle trajectory mission.

1 **Rocket Nozzle:**
Pressure up to 100 bar
Thrust level up to 1.5 MN
Combustion time up to 150 s
Temperature up to 3.000 C
Corrosive Atmosphere

2 **TPS Tiles:**
Max Stagnation Pressure 20 kPa
Heat Flux up to 15 MW m²
Mach 3
Temperature > 2.000 °C
Oxidative Atmosphere

The new materials might find applications in other fields with similar needs, such as combustion and nuclear environments (Generation IV fission and fusion reactors) or concentrating solar power systems.

C³HARME

The EU-funded project C³HARME aims to combine the best features of CMCs and UHTCs to design, develop, manufacture and test a new class of **Ultra High Temperature Ceramic Matrix Composite (UHTCMCs) with self-healing capabilities.**

The latter should arise from the in-situ formation of adherent and ultra-refractory oxide scales. The incorporation of nano-sized ceramic dopants in the material will further protect the oxide scale in severe conditions.

Ceramic **M**atrix **C**omposites			**H**igh **T**emperature **C**eramics
CONs	**PROs**	**PROs**	**CONs**
Moderate erosion resistance	Lightweight	High temperature strenght	No damage tolerance
Low oxidation resistance	Excellent damage and thermal shock tolerance	Extreme melting temperature	Low thermal shock resistance
Temperature limit		Self-healing ability	High specific weight

UHTCMCs