AMORIM TPS

Aerospace



Nature engineered for space

Advanced cork-based Thermal Protection Systems

AMORIM CORK SOLUTIONS

Cork, an exceptional raw material

Cork is the outer bark of the cork oak tree (Quercus suber L.), the 100% natural plant tissue covering the trunk and branches.

It consists of a honeycomb-like structure of microscopic cells filled with an air-like gas and coated mainly with suberin and lignin. One cubic centimeter of cork contains about 40 million cells.

Cork is also known as "nature's foam" due to its alveolar cellular structure. It has a closed-cell structure making it lightweight, airtight and watertight, resistant to acids, fuels and oils, and impervious to rot.

It is sustainably harvested by specialized professionals without damaging the trunk, thus enabling the tree to grow another layer of outer bark that, in time, will be re-harvested. Over the course of the cork oak tree's life, that lasts 200 years on average, the cork may be harvested around 17 times. This means that cork is not only a natural raw material, it is also renewable and recyclable.

"Cork is nature's foam, a foam with unique combination of properties."
in NASA Technical Reports Server



Cork cell microscopic view.

Elasticity

Flexibility, installation and process friendly

Vibration control

Impermeability to liquids and gases

Chemical resistance

Thermal resistance

Shock absorption

Resistance to fire and high temperatures

Product Range

Our aerospace product range has been engineered to meet different thermal and mechanical requirements. While sharing cork's inherent insulating and ablative properties, each grade offers a specific balance of density, strength and thermal performance for demanding aerospace applications.

Characteristics		P45	P50	P65
Cork particle size	mm	1/2	0,5/1	0,5/1
Sheet dimension	mm	1270x760	1270x760	950x650
	in.	50x30	50x30	37x25
Density @ 20° C (1)	Kg/m³	304–336	448–512	580–650
	lb/ft³	19–22	28–32	36.2–40.6
Tensile strength	psi	>125	>247	2.93
	MPa (2)	>0,86	>1,70	425
Elongation	% (2)	>30	>13	3
Thermal conductivity	Btu in/h ft²°F (3)	0,45	0,50	0.50
	W/m°K	0,06	0,07	0.07 (5)
Specific Heat	Btu/lb °F (4)	0,6	0,5	On going
	KJ/Kg/°K (4)	2,5	2,1	On going
Substrates to bond		Metal and Composite		

(1) ASTM F1315 (2) ASTM F152, Method B (3) ASTM C177 (4) ASTM C351 (5) indicative value Other sheet sizes may be available.

Molded P50

Molded P50 enables complex cork components to be manufactured in their final geometry, reducing machining and simplifying integration into aerospace structures. The result is a more efficient, repeatable and reliable Thermal Protection System solution for demanding applications.

Key benefits

- Faster installation and reduced labor.
- Lower machining requirements and material waste.
- Greater design freedom for complex geometries.
- Consistent quality and repeatable manufacturing.
- Tailored solutions for customer-specific applications.



Molded part



Application

Main advantages



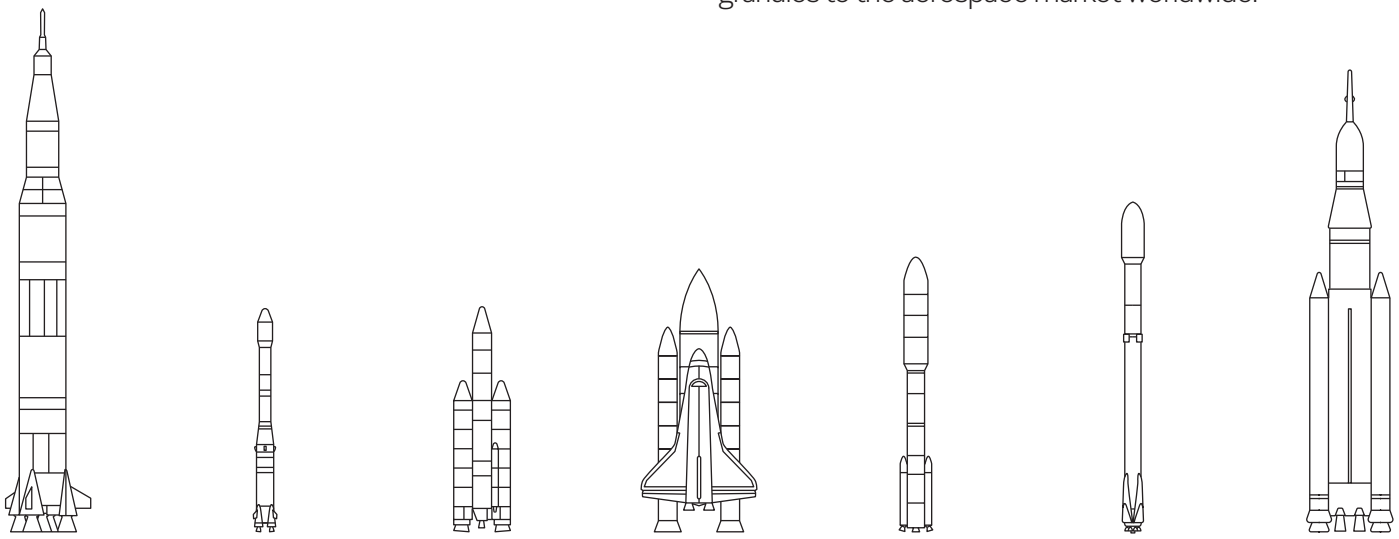
Process friendly
Easy to bond to most substrate materials using common adhesive systems, our materials can also be trimmed and machined with standard tools, without requiring specific protection equipment. They can be finished with dedicated coatings or varnishes and easily integrated into sandwich structures, including CFRP composites, without complex fitting techniques.

Custom materials
Made from cork granules agglomerated with specially formulated phenolic binders, our materials can be tailored to meet specific requirements, including fire resistance and anti-fungal properties. Sheet thickness can also be adapted to customer needs, while specially graded cork granules are available for integration into customers' own products.

Proven technology
Our materials have a proven track record in demanding aerospace applications, from ablative Thermal Protection Systems (TPS) for rockets and space probe entry heat shields to internal thermal insulation for hot structures. They are also used for impact protection against debris and in pyrotechnic solutions across a range of launch vehicles.

Success Records

Since the dawn of the space age, Amorim Cork Solutions has been supplying sheet materials or specially graded cork granules to the aerospace market worldwide.



1960's
Scout
Mercury Spacecraft
Gemini Spacecraft
Saturn V

1970's
Apollo
Ariane 1
Viking Landers

1980's
Ariane 2
Ariane 3
Titan III

1990's
Space Shuttle
Pegasus XL
Ttian IV
Ariane 4
Ariane 5

2000's
Mars Rovers
Delta IV
Beagle 2
Atlas III
Atlas V

2010's
Vega
Falcon 9
IXV Spacecraft

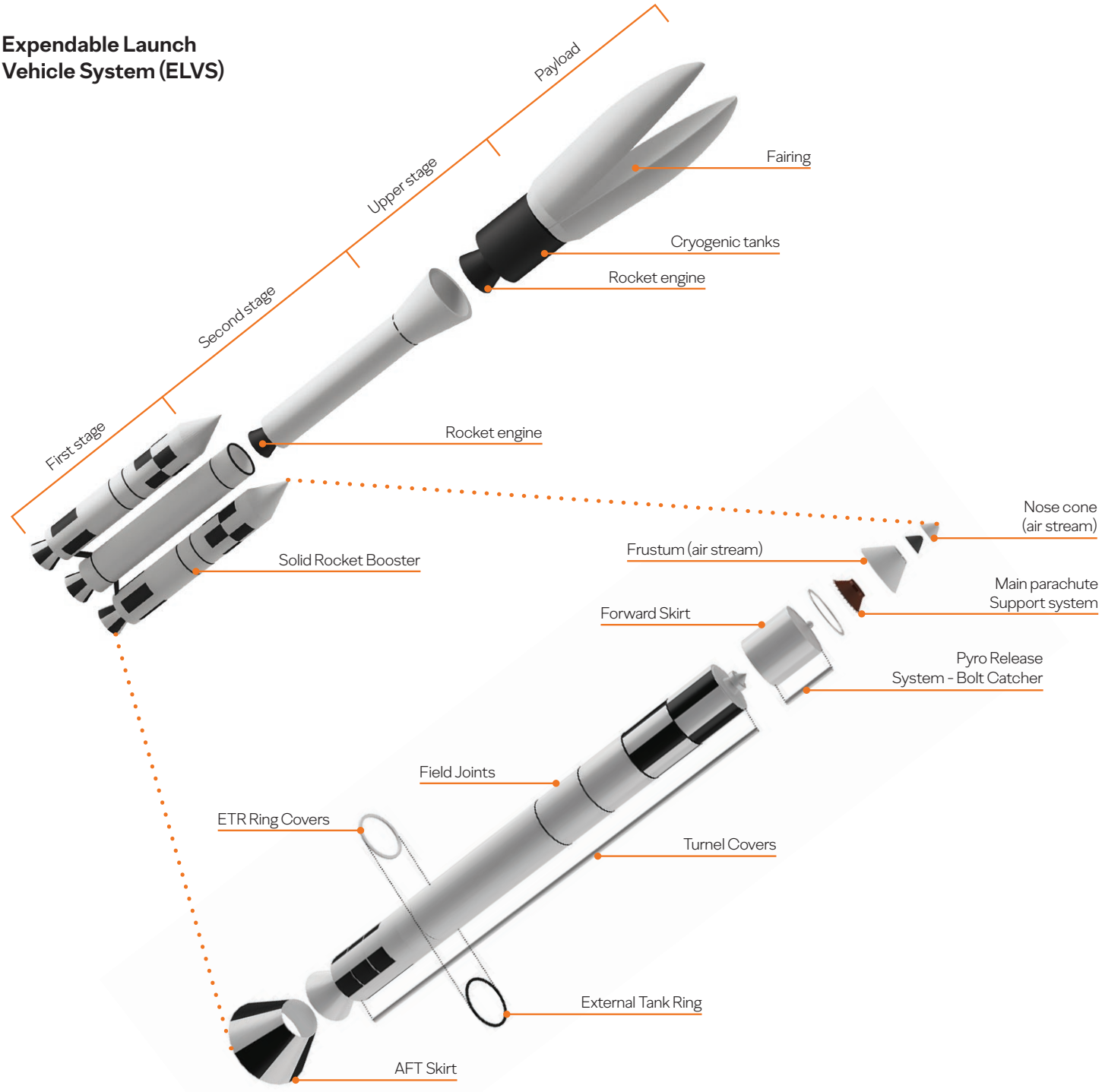
2020's
Artemis I
Artemis II
NURI
Ariane 6

Applications

Amorim TPS cork-based materials can be used in multiple thermal protection applications across launch vehicles and solid rocket boosters.

From fairings and cryogenic tanks to nozzle components, skirts, tunnel covers and nose cones, our engineered cork solutions help protect critical structures exposed to extreme thermal and mechanical environments.

Expendable Launch Vehicle System (ELVS)



Solid Rocket Booster (SRB)

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