

AUBERT&DUVAL



SUSTAINABLE SOLUTIONS FOR AEROSPACE HIGH INTEGRITY COMPONENTS



Aircraft	4 - 9
Structures	4 - 5
Landing gear	6 - 7
Engines	8 - 9
Helicopters	10 - 11
Bars	12 - 13
Sustainability	14 - 15
Powders	16 - 17
Future	18 - 19

AUBERT & DUVAL your reliable partner

Since 1907, Aubert & Duval has been working alongside its clients to design and innovate, tackling the challenges of the aerospace industry. With our expertise and dedication to excellence, we develop solutions that meet the technical and regulatory demands of this ever-evolving sector. In recent years, aware of the pressing global challenges, we have expanded our focus to address sustainability issues. We leverage our expertise to contribute to a more responsible aviation industry by developing innovative technologies and processes that combine high performance with environmental responsibility.

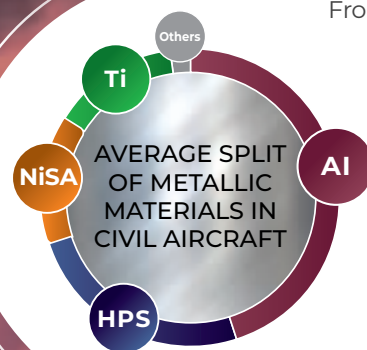
Solutions for tomorrow challenges

The aeronautical industry is facing many challenges: from building resilient supply chains to meet global aircraft demand, to optimizing maintenance costs and achieving the ambitious goal of net-zero emissions by 2050.

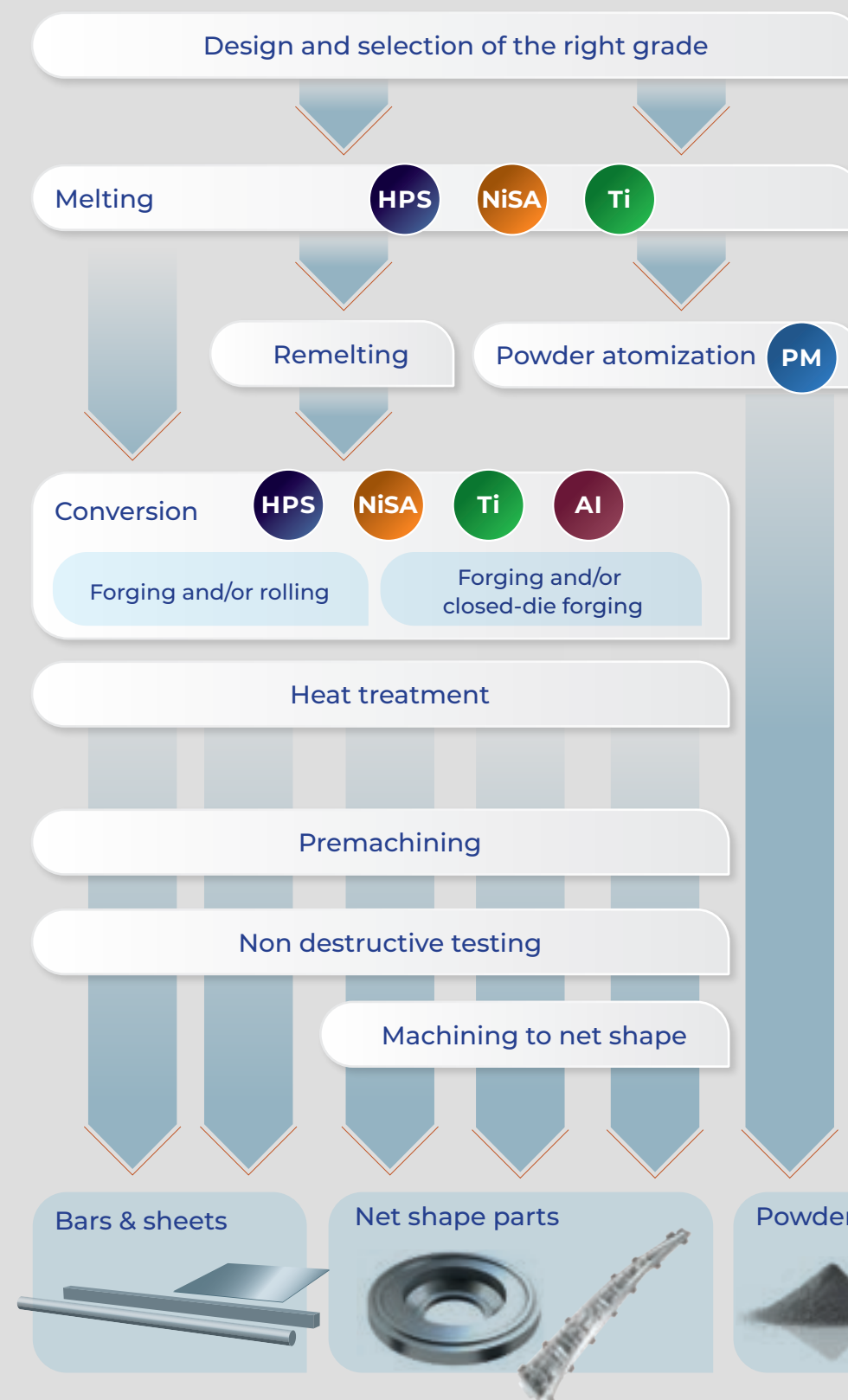
From these comes the necessity to work with our customers from conception to final delivery to choose the appropriate material and to optimize the design for all aircraft parts.

Aubert & Duval is a recognized actor in high performance steels, superalloys, titanium and aluminum. We design and develop advanced metallurgical solutions in the form of closed and open die forged parts, long products and metal powders for the most critical aircraft and helicopter parts in engines, airframe structures and landing gears.

Our metallurgical and industrial expertise is based on a unique, fully integrated set of processes and facilities from steel and alloy-making through to machined parts.



Process flow



Main materials

HPS High performance steels

A range of alloyed steels with tightly controlled characteristics offering optimum value for customers.

NiSA Nickel-based superalloys

A range of alloyed materials with specific resistance to very high temperatures and corrosion, the majority component being nickel.

Ti Titanium alloys

Pure or alloyed titanium, combining mechanical properties and corrosion resistance with light weight.

AI Aluminum alloys

Slightly alloyed aluminum, widely used in aircraft.

PM Metal powders

Steels and superalloys powders for additive manufacturing and aerospace parts.



Providing resistance at key locations

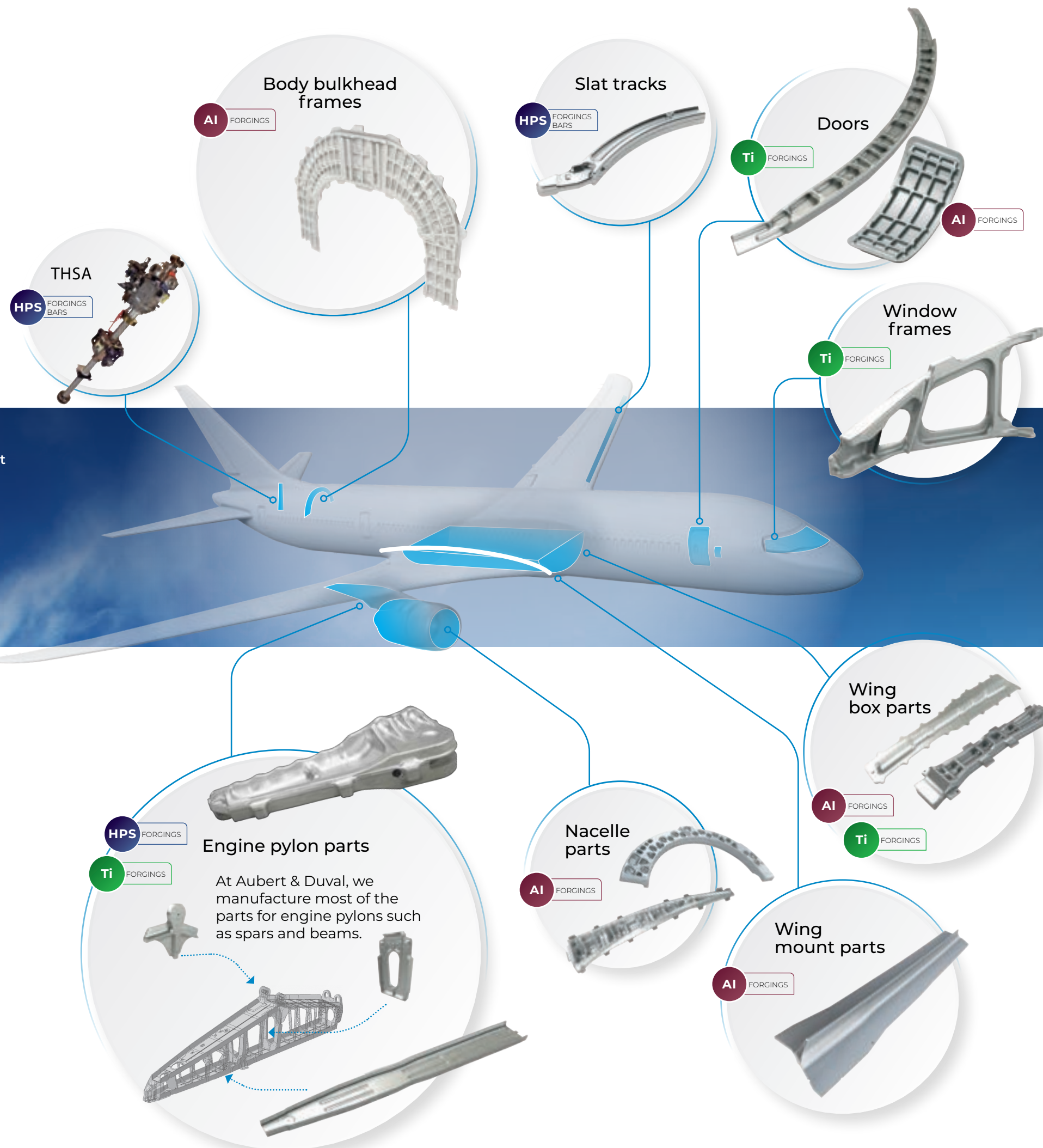
Aubert & Duval supports its clients throughout the development and industrialization of critical fuselage and wing components, ensuring exceptional resistance and performance from narrow to wide-body aircrafts, even in the most demanding conditions. We deliver both small and large-scale parts, with a sharp focus on critical components from advanced steels, titanium, aluminum alloys and superalloys.



Large portfolio of presses

Our large portfolio of presses, ranging from 1,200T to 65,000T, allows us to deliver a full range of closed-die forged parts from all metallic materials.

We also offer production possibilities in India via our joint-venture SQuAD.



Main materials

HPS High performance steels

Aubert & Duval grade	Common name
819AW	E35NCD16H
819B	35NCD16
CX13VDW	AMS 5719
FDMA	30NiCrMo16
Marval®13X	PH13-8Mo
Marval®18	Maraging 250
Marval®X12	AMS 5928
Marval®X12H	AMS 5935
MLX®17	AMS 5937
MLX®19	AMS 5955
MY19	Maraging 300
NC310YW	AMS 6499
NC40MW	4330
NC40SW	300M
X15U5W	15-5PH
X17U4	17-4PH

AI Aluminum alloys

2214
2219
2618
6061
7010
7050
7175
Airware®2050 (Al-Cu-Li)*

* Airware is a trademark owned by Constellium

Ti Titanium alloys

TA6V
TA6V ELI
Ti6242

Main data

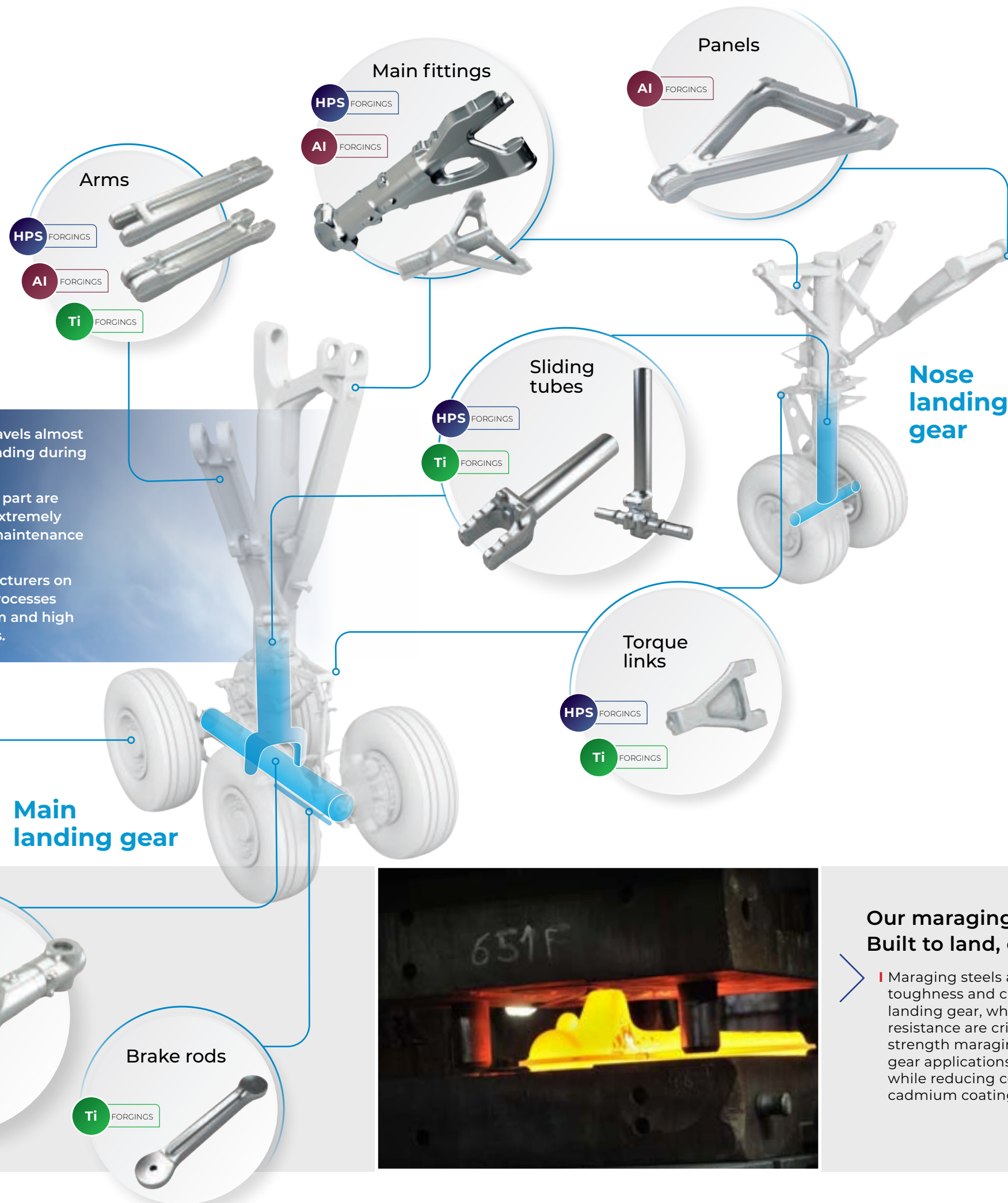
Closed-die forging parts:
 • From 500 g (1 lb) to 15 T (33 klbs)
 • Up to 8 m (314 in)

Selecting the most appropriate material

An aircraft landing gear carries over 500 tons, travels almost 500 000 km and absorbs the heavy shocks of landing during its life cycle.

Material choice and quality of each landing gear part are therefore of utmost importance to meet these extremely stringent requirements and also to reduce the maintenance cost of landing gear system.

Aubert & Duval works with landing gear manufacturers on design, simulation, 3D models and machining processes to ensure the optimal use of titanium, aluminium and high performance steels on critical landing gear parts.



Main materials

HPS

High performance steels

Aubert & Duval grade	Common name
819AW	E35NCD16H
819B	35NCD16
AD65N™	-
FADHW	E16NiCrMo13
GKH®YW	AMS 6481
Marval®13X	PH13-8Mo
MLX®17	AMS 5937
MLX®19	AMS 5955
NC310YW	-
NC40MW	4330
NC40SW	300M
X15U5W	15-5PH

AI

Aluminum alloys

- 7010
- 7050
- 7175

Ti

Titanium alloys

- TA6V
- Ti1023
- Ti5553

Main data

- Closed-die forging parts:
- From 500 g (1 lb) to 15 T (33 klbs)
 - Up to 8 m (314 in)

Our maraging stainless steels: Built to land, engineered to last.

Maraging steels are ultra-strong alloys known for their excellent toughness and crack resistance, making them ideal for aircraft landing gear, where high hardenability and high stress cracking resistance are critical. Our latest development, MLX®19 ultra-high strength maraging stainless steel is the ideal candidate for landing gear applications, offering exceptional hardness (1900 MPa) while reducing costs and enhancing durability - no toxic chrome cadmium coating is required.

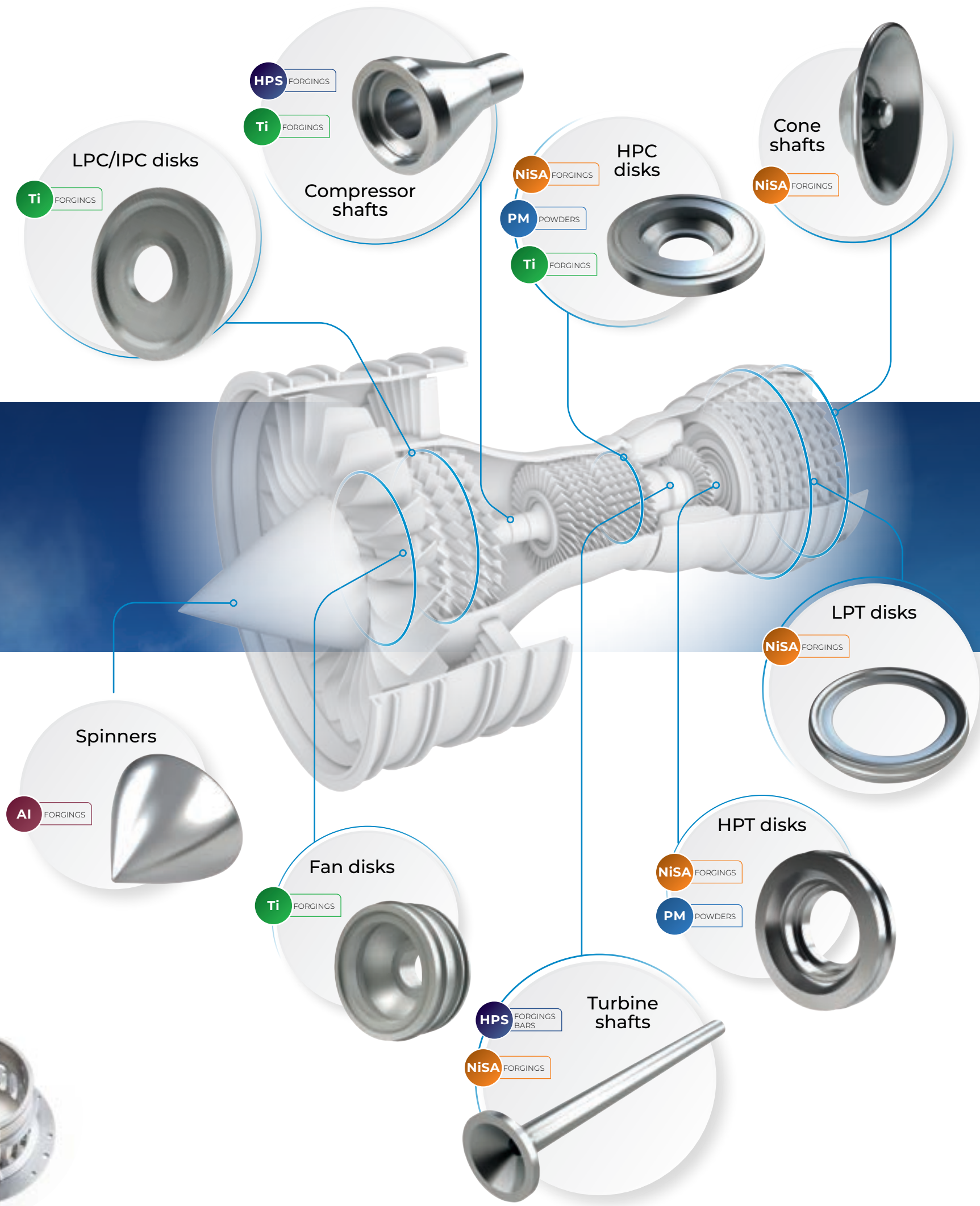
Next-generation engines driving future of aircraft

The next generation of engines will see significant improvements in efficiency. These improvements will be achieved by increasing fan size, operating at higher temperatures and redesigning the engine architecture. The performance of these new concepts will also depend on the right materials selection. Aubert & Duval collaborates with the OEMs from the R&D to the industrialization of different engine parts in order to achieve carbon neutrality of the aerospace industry in the coming decades.



Advanced steel solutions for high-stress transmission systems

With a proven track record in developing high-performance steels for transmission systems, we offer an extensive portfolio of carburising, nitriding and through-hardening grades. Engineered to withstand extreme mechanical stress, our advanced steels deliver exceptional durability and reliability, making them the ideal choice for demanding gear and bearing applications.



Main materials

HPS High performance steels

Aubert & Duval grade	Common name
AD65N™	-
GH4W	E40CrMoV12
Marval®18	Maraging 250
ML1014	GE1014
ML340	X23NiCoCrMoAl13-6-3
X13VDW	X12CrNiMoV12
X17U4	17-4PH
XN26TW	A286

Al Aluminum alloys

2618
7050

Ti Titanium alloys

TA6V
Ti17
Ti6242
Ti6246

NiSA Nickel-based superalloys

Aubert & Duval grade	Common name
AD730®	-
PER3	Waspaloy
PER5	Udimet500
PER718	Inco718
PER72	Udimet720
PER901	Inco901
René 65	-
Gatorized Waspaloy	-

PM Metal powders

Superalloy powders for aero engine rotating parts.

Main data

Closed-die forging parts:
• From 20 kgs (44 lbs) to 20 T (44 klbs)

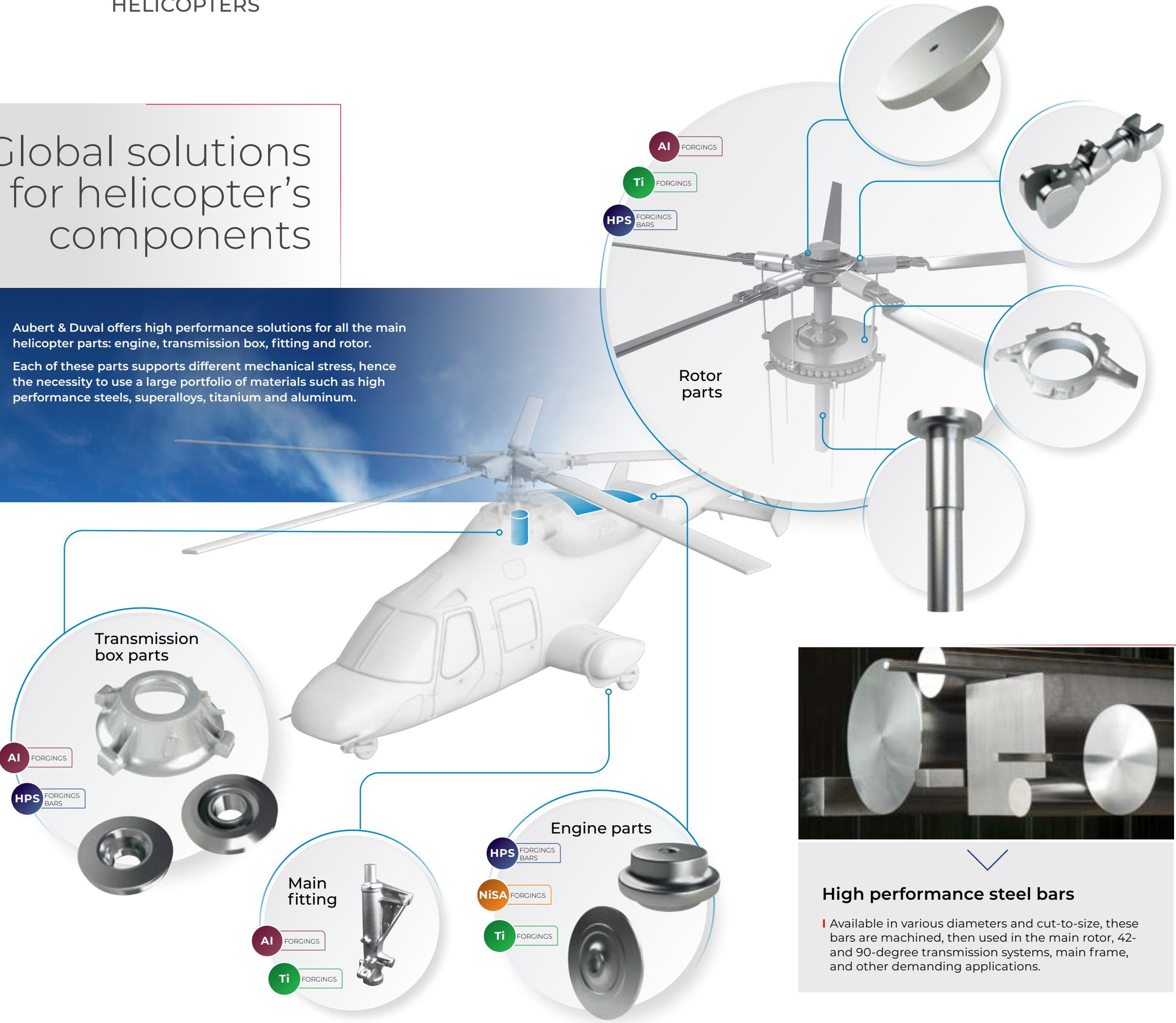
Max diameter for disks:
• 1,400 mm (55 in)

Max length for shafts:
• 4 m (157 in)

Global solutions for helicopter's components

Aubert & Duval offers high performance solutions for all the main helicopter parts: engine, transmission box, fitting and rotor.

Each of these parts supports different mechanical stress, hence the necessity to use a large portfolio of materials such as high performance steels, superalloys, titanium and aluminum.



High performance steel bars

Available in various diameters and cut-to-size, these bars are machined, then used in the main rotor, 42- and 90-degree transmission systems, main frame, and other demanding applications.

Main materials

HPS High performance steels	
Aubert & Duval grade	Common name
819AW	E35NCD16H
AD65N™	-
APX4	AISI 431
CX13VDW	AMS 5719
FDG®	AMS 6493
FND®	AMS 6495
GKH®YW	AMS 6481
GKP®YW	AMS 6497 - 6498
MARVAL®X12	AMS 5928
MLX®17	AMS 5937
MLX®19	AMS 5955
NC40M	AISI 4340
X15U5W	15-5PH
X17U4	17-4PH

AI Aluminum alloys	
7075	
7175	
Airware®2050 (Al-Cu-Li)*	
* Airware is a trademark owned by Constellium	

Ti Titanium alloys	
TA6V	
Ti1023	

NiSA Nickel-based superalloys	
Aubert & Duval grade	Common name
AD730®	-
PER72	Udimet720
PER718	Inco718

Main data

- Closed-die forging parts:
- From 20 kgs (44 lbs) to 20 T (44 klbs)
- Max diameter for disks:
- 1,400 mm (55 in)
- Max length for shafts:
- 4 m (157 in)

Integrated material solutions for critical aerospace applications

High performance steels

Structure

Aubert & Duval provides a wide range of high-performance steels, usable for the most critical structural parts. We have a recognized expertise in designing the maraging steels such as MLX®17/MLX®19 which show a perfect compromise between the mechanical strength (from 1700 to 1900MPa) and exceptional stress-corrosion cracking resistance.



Superalloys

We have a recognized and deep expertise and experience in the transformation of γ—γ' nickel-based superalloys. Our process knowledge allows us to offer parts for the most demanding applications and performance requirements, as requested notably for critical engine discs (fatigue properties, high temperature resistance...).

Our last development, AD730® nickel-based superalloy can withstands high temperatures (750°C/1382°F) while preserving strength, creep and fatigue resistance.



Our customers transform our bars

Transmission

The transmission's parts are exposed to different impacts such as contact and structure fatigue or corrosion, hence the necessity to be resistant and tough. Our bars are used for both, **motion and power transmission systems**:



Power

High power density and reliability are two main requirements that gears and shafts have to meet. Thanks to excellent properties of our grades such as FADHW, GKH®, FND™W, our customers can optimize their own use conditions such as bending and pitting performances, surface distress and also corrosion resistance (if requested).

Motion

Assuming that the main failure mode is surface distress, improving the reliability of bearings is a pivotal requirement. Depending on the conditions of use, our large product portfolio (RA50YW, 50NILYW, GKH®YW, CX13VDW, XD15NW®...) enables the improvement of many behaviors such as fatigue resistance, surface hardness, temperature resistance, compressive stress profile and corrosion resistance (if requested).

We are continuously innovating with new materials like AD65N™ and C65NiL™ to meet the evolving demands of critical systems, such as gear-driven turbobfans.



Titanium

Thanks to its fully integrated Titanium solution Aubert & Duval is present throughout the entire Titanium value chain:

- Circular economy from raw material through melting ingots and forging materials to recycling titanium scrap into new titanium ingots of aerospace quality.
- A simplified and controlled supply chain from or to finished parts.
- Supports our customers in the growing titanium ingots; produced from sponge or recycling.



Main materials

HPS

High performance steels

Aubert & Duval grade	Common name
50NiLYW	AMS 6278
819B	35NiCrMo16
AD65N™	-
FADC	9310
FADHW	E16NiCrMo13
FDG®	AMS 6493
FND®W	-
GH4	40CrMoV12
GKH®YW	AMS 6481
GKP®YW	AMS 6497 - 6498
MARVAL®18	MARAGING 250
ML18PQ	MARAGING 250
ML340	X23NiCoCrMoAl13-6-3
NC310YW	AMS6499
NC40SW	300M
RA50YW	M50
SCV®	15CDV6

Steels

Stainless Steels

APX®	431
APX®4	-
CX13VDW	AMS 5719
MARVAL®X12	AMS 5928
MARVAL®X12H	AMS5935
Marval®13X	PH13-8Mo
MLX®17	AMS 5937
MLX®19	AMS 5955
MLX®465	AMS 5936
NC40MW	AISI 4340
X13VD	JETHETE M152
X15U5W	15-5PH
X17U4	17-4PH
XD15NW®	AMS 5925
XDBD	440C
XN26TW	A286

NiSA

Nickel-based superalloys

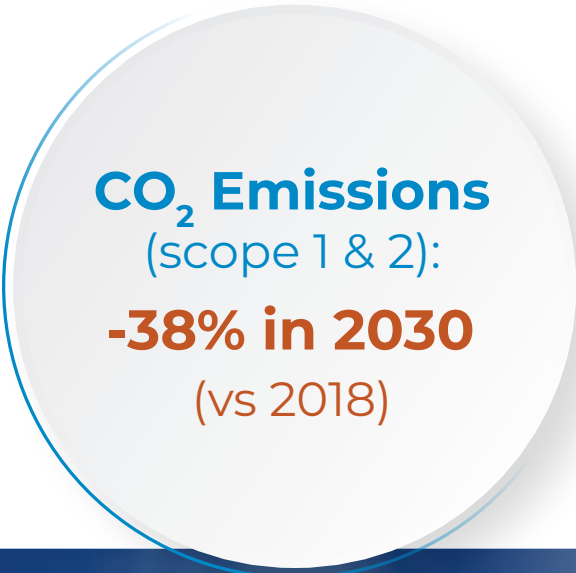
Aubert & Duval grade	Common name
AD730®	-
PER3	Waspaloy
PER625	Inco625
PER718	Inco718
PER72	Udimet720
PER75	Nimonic75
XSH	KC20WN

Ti

Titanium alloys

TA6V	
TA6V Eli	

Driving sustainable innovation together



To achieve the goal of net-zero emissions by 2050, the aerospace industry faces many challenges. We work closely with our customers to develop innovations that will enable us to achieve this common goal.

➤ **Selecting eco-friendly raw materials**

From the design stage, we select components that are sustainable and recyclable, while limiting the use of rare metals wherever possible. Furthermore, we engineer our products with their entire lifecycle in mind, ensuring low maintenance requirements and optimized end-of-life recyclability to reduce environmental impact.

Giving new life to valuable resources
Circular economy is one of our strategic pillars (our 2026 goals):



Drive energy efficiency & electrify furnaces
as our 1st decarbonization lever, all sites ISO50001 as a target



➤ **Developing the materials for a responsible future**

Sustainability drives our innovation from the design of alloys to the manufacturing of parts. We focus on reducing CO₂ emissions by developing materials that balance lightness and strength, withstand high temperatures, and enhance engine efficiency—ultimately contributing to lighter, more eco-efficient aircrafts.

➤ **Manufacturing excellence with responsibility**

We collaborate with our customers to minimize excess material from the industrialization stage of closed-die forging parts. This approach reduces waste, streamlines machining, and supports more sustainable, cost-effective manufacturing.

Meeting the greatest of AM challenges

With over 50 years of experience in powder metallurgy, Aubert & Duval has acquired a very thorough knowledge of design and optimization of metal powder alloys for additive manufacturing and other powder metallurgy processes.

Thanks to our mindset for continuous improvement, aerospace standards and our collaborative approach for technical support and R&D, we build long-standing partnerships with the leading manufacturers of critical aerospace parts. And we offer a unique range of innovative alloys designed for AM and use at high temperatures so as to increase performance and reduce carbon footprint.

Key features

- VIM gas atomization process with Ar or N gas
- Highly spherical powder morphology
- High stability and reproducibility
- Short leadtimes
- Batch size up to 1200 kg

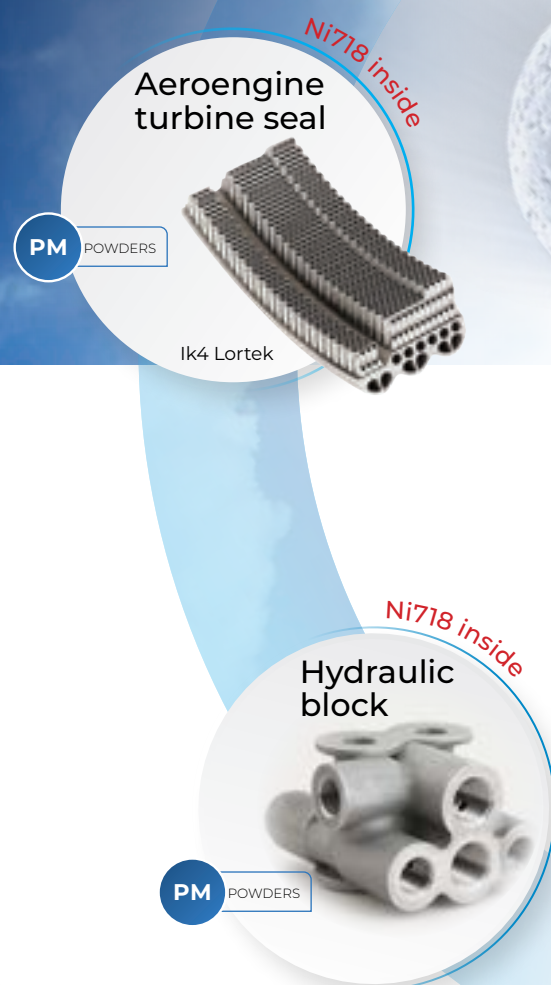
Quality and certifications

- EN 9100
- ISO 14001
- Aerospace customer accreditations

ABD®-1000AM

A high gamma prime Ni-based superalloy designed for additive manufacturing offering:

- A high temperature resistance up to 1000°C
- A high creep resistance close to cast Ni247 alloy
- An excellent oxidation resistance (Alumina forming alloy)



Alloys designed for AM for lighter and hotter components

Our production facilities



NiSA Nickel-based superalloys

Standard alloys	New high-temperature alloys
HX	AD730®
Ni247	ABD®-900AM *
Ni625	ABD®-1000AM *
Ni718	* In partnership with Alloyed
Ni738LC	
Other alloys on request	

Powder sizes

- Tailored particle size distributions
- Laser Powder Bed Fusion / LPBF:
 - 15-53 µm
- Electron beam Melting/EBM:
 - 45-106 µm
- Direct Energy Deposition/DED:
 - 45-90 µm
- Other tailored particle size distributions upon request

Powders for AM Technology

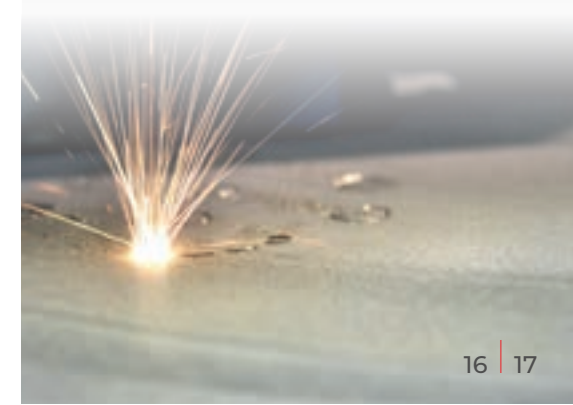
Metal powders are designed for the full range of processes:

Additive Manufacturing:

- Laser Powder Bed Fusion
- Electron Beam Melting
- Metal Binder Jetting
- Direct Energy Deposition

Other powder metallurgy processes:

- Cold Gas Spray
- Spark Plasma Sintering
- Hot Isostatic Pressing



Creating value through innovation

- Innovative products & increased value of legacy products.
- More sustainable processes to save material and costs.
- Use 4.0 Revolution to boost our innovation.
- Enhance high level of knowledge in metallurgy.
- R&D supported by academic partnerships

4%
of our added economic value invested in R&D

Scope of R&T Road Maps

Digital transformation

- Heating furnaces & quenching processes (simulation/3D Modeling)
- Digitalization of melting, conversion and NDT processes.
- AI based material and processes optimization

Technologies for production

- DED (Wire Additive manufacturing) maturation and hybridation for TA6V structural parts
- Gas Atomization yields & productivity
- Development of new low carbon technologies.
- Optimization of aerospace grades, Melting & Conversion route

Material engineering

- High Corrosion resistance PH steels (MLX[®]17, MLX[®]465, MLX[®]19)
- New Grades Design
- New Steel grades for transmissions
- New γ-γ' alloys forging (R65, AD730[®])
- Near Net shape TA6V closed-die forging for structural parts
- Using of AI for the development of digital alloy design models, reducing development time and the number of experimental trials

Manufacturing the future

Involved in the 4th industrial revolution and new emerging technologies, Aubert & Duval has set up a digital transformation plan, involving all factories and support functions.

This plan, named digitAlloys, covers 4 main areas:

digitAlloys data

To leverage data to its full potential, using artificial intelligence to:

- Deploy predictive maintenance
- Improve our processes
- Assist teams in their decision-making
- Improve failure analysis

digitAlloys manufacturing

To take advantage of a totally integrated industrial information system to optimize operations and supply chain, allowing for example:

- Documentation availability
- Production tracking with marking and automatic reading operations (data matrix, QR code)
- KPI calculation and broadcast
- Scheduling of shops with complex production flow. With OEE (overall equipment efficiency) optimization
- Optimization of energy consumption.

digitAlloys factory

To optimize our production process on the field, deploying technologies such as:

- 3D scan for automatic dimensional checks
- Teleoperated grinding robot
- Automated Guided Vehicle (AGV)

digitAlloys experience

We use also the new technologies such as additive manufacturing, augmented reality or different web applications for different, more specific projects.

Technical support: driving customer success

The primary goal is to give you the best possible advice in selecting suitable materials and effective manufacturing processes and heat treatments.

Their expertise covers the final properties delivered by:

- Materials
- Part design
- Heat treatments or thermo-mechanical treatments
- Manufacturing programs
- Machining
- Or even final treatments for various materials.

Through a broad-ranging portfolio of specialist skills developed through strong, deep partnerships with customers, our technical support teams are able to help every customer, regardless of the application. They are also qualified to assist in innovative projects by solving problems and delivering the best metallurgical solutions.

As we are aware of each customer's requirements, we offer continuous, immediate and straightforward service.

AUBERT & DUVAL



Design by  **irweego** www.irweego.com - Aubert & Duval - 06-2025
Photo credits: A. Chassin, Airbus, Shutterstock,
R. Seaman, SKF, THSA - Ratier Figeac

The information and the data presented herein are typical or average values and are not a guarantee of maximum or minimum values. Applications specifically suggested for material described herein are made solely for the purpose of illustration to enable the reader to make his own evaluation and are not intended as warranties, either express or implied, of fitness for these or other purposes. Aubert & Duval's liability shall not extend, under any circumstances, to the choice of the Product and its consequences.

www.aubertduval.com