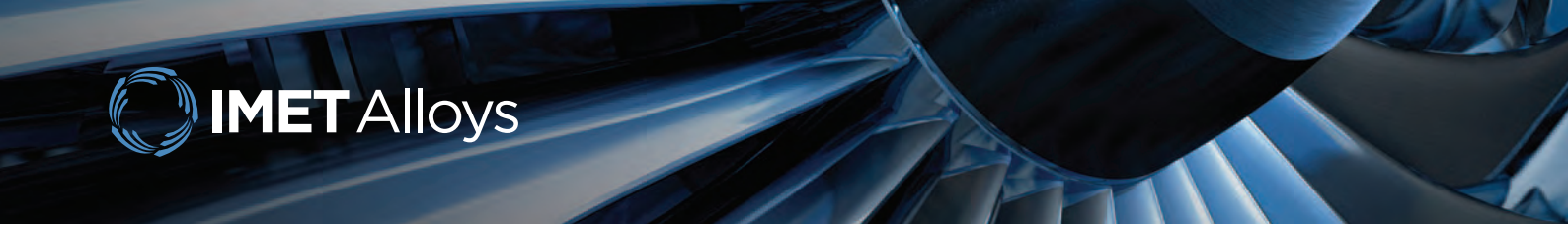
IMET Alloys

FIT TO FLY

How we're developing high-tech metal closed-loop supply chains that support a circular economy and help the aerospace industry build a green, sustainable and resilient future



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"Here is a way to tackle climate problems and resource problems at the same time: the circular economy's potential to achieve climate targets is significant, yet it is not recognised enough as a key solution."

Ida Auken, former Minister for the Environment, Denmark

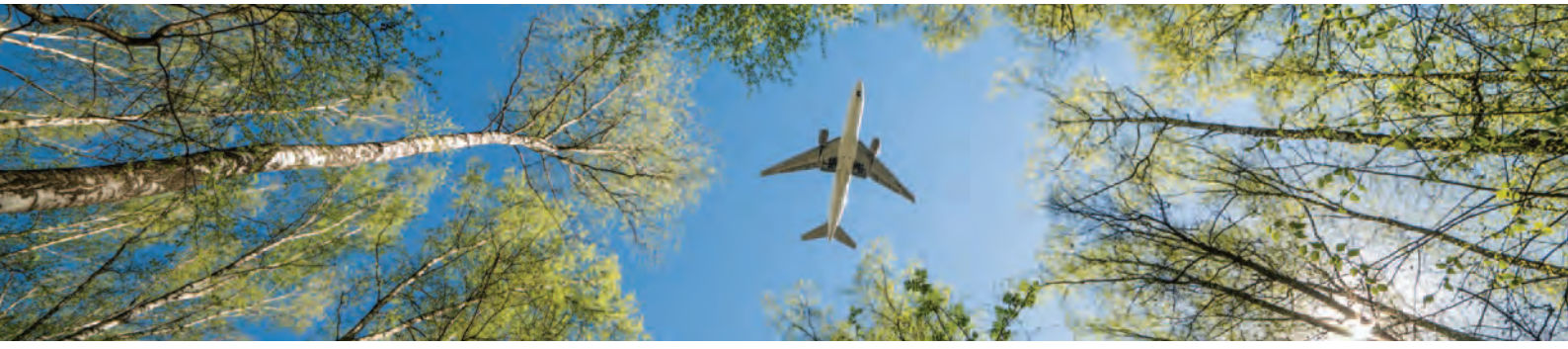
Introduction

The aerospace industry is under massive pressure as it recovers from the impact of the coronavirus pandemic and looks to secure a sustainable future. Not least, the industry is facing social and political pressure to reduce its impact on the environment and help meet international targets to reach net-zero emissions by at least 2050. Crucially, this transition to climate neutrality will replace our current reliance on fossil fuels with one on critical raw materials, many of which the aerospace industry depends on.

Growing competition for finite resources

Our enormous appetite for resources is putting extreme pressure on the planet. If we are to meet our climate targets, we must transform the way we use materials to make goods. To do this, we must move away from a take-make-waste model to one that designs out waste, keeps materials in use and separates growth from the consumption of finite resources.

This change is particularly significant for industries such as aerospace as they depend on raw materials which are difficult to substitute and primarily imported. Furthermore, as part of our rapid move to net zero, the electric vehicle and renewable energy industries are booming. Their fast growth means the aerospace industry faces increased competition for technology-critical metals and raw materials such as titanium, vanadium, niobium, cobalt and nickel, which all three industries use.

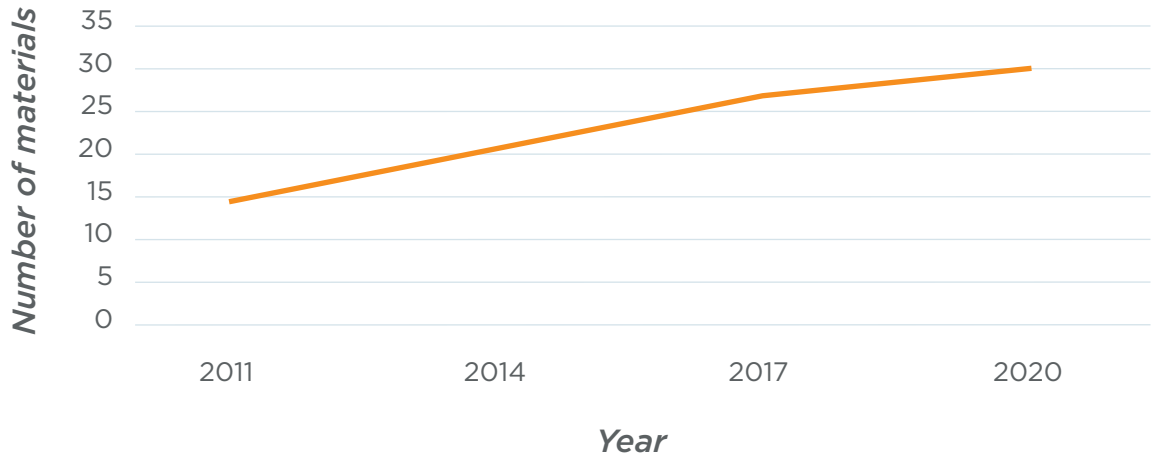


Ensuring a secure supply

Many regions rely on international markets to access critical raw materials as they don't produce them themselves. As a result, industries can struggle—and are forecasted to do so more in the future—to secure sustainable supplies of the technology-critical materials they need. For example, in 2011, the European Commission first published a list of critical raw materials: in the space of ten years this list has more than doubled in size, from 14 to 30 materials.

Materials on EU Critical Raw Material List

Includes materials critical to the aerospace industry such as titanium and vanadium



Creating a circular economy through closed-loop supply chains that retain and reuse materials is vital to secure sustainable access to these technology-critical materials.

"The circular economy is a solution framework that offers better growth while addressing the most pressing global challenges."

Dame Ellen MacArthur, Founder, Ellen MacArthur Foundation

What is a circular economy?

Circular economies are more than the simplistic recycling of resources. They aim to:

- Recover resources at their highest quality and value
- Keep them in circulation for longer
- Decouple economic growth from the consumption of finite resources, and
- Build economic, natural, and social capital.

Therefore, well-planned circular economies will help industries:

1. Reduce their dependency on critical raw materials
2. Strengthen their responsible sourcing and processing of raw materials, and
3. Reduce their exposure to volatile pricing and disruptions in their raw material supply chain.

A circular economy for the aerospace industry

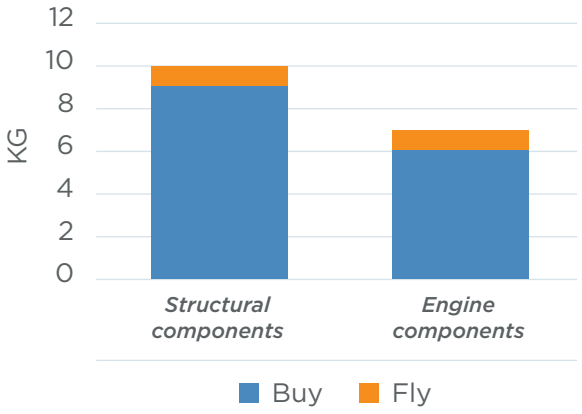
The aerospace industry is working hard to reduce its impact on the environment by developing lighter aircraft, more efficient engines, and alternative fuel sources. As such, it is in a prime position to benefit from a circular economy as it already demands material traceability and continues to innovate through new design, new manufacturing techniques and the use of ever more advanced materials, including new titanium and superalloys.

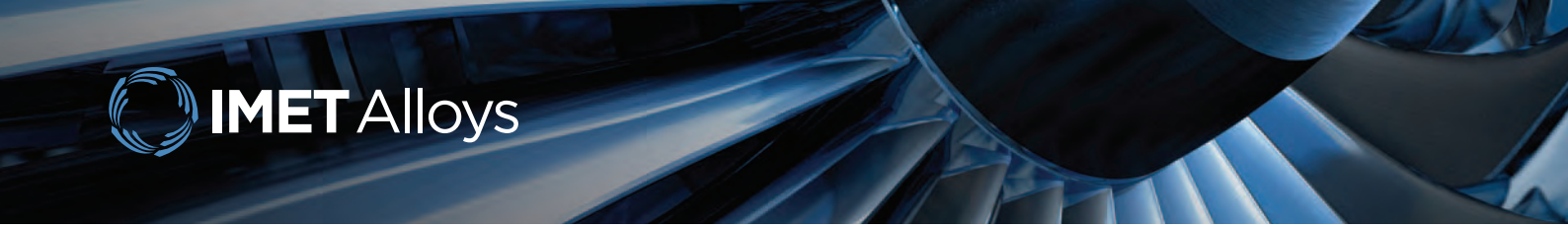
Reuse vs. recycle

When a material is reused, it is recovered at its highest quality and value. This means it can be used for its original purpose. As a result, manufacturers have less dependency on raw materials and less impact on the environment. By contrast, recycling suggests a loss of value as the material is being used for something different.

The aerospace industry has some work to do to realize the full value of its superalloy and titanium metals generated as scrap or waste (what we term 'revert') in the manufacturing of both structural and engine components. After all, the metal generated as a turning on a lathe or a flashing at a forge costs the manufacturer the same as the metal in a component that makes it into the air. Furthermore, the buy-to-fly ratio is staggering: for every kilo that makes it into the air, roughly 7 to 9 kilos is generated as revert.

Typical current superalloy and titanium buy to fly ratio





At IMET, we are working to change how superalloy and titanium revert is viewed within the manufacturing supply chain to fully recognize and capitalize on the sustainable commercial, strategic and environmental benefits this valuable material can deliver.

BENEFITS OF REVERT vs. VIRGIN or PRIME MATERIAL	
Commercial	Using revert generated within the manufacturing supply chain displaces the need to purchase virgin or prime material Revert material is often available at a discount to virgin or prime alternatives
Strategic	Reduces dependency on external supply chain and the associated risk of leverage Hedges against virgin or prime supply chain disruption
Environmental	Requires less energy to melt Requires less energy to process and prepare for remelting versus refining virgin ore Reduces the need to mine for virgin material

To underpin these benefits, we are encouraging the industry to adopt a new way of thinking supported by using a new vocabulary when talking about revert.

IMET Alloys: a new vocabulary to support a new way of thinking	
Revert	Not scrap, because: • Scrap has connotations of low value and waste • Revert can be used for its original purpose
Reuse	Not recycle, because: • Recycling suggests finding another use for by-product • Recycled products often are associated with lower quality
Virgin or Prime Material	Raw materials, e.g., carbonyl nickel, aluminothermic chrome, titanium sponge, etc.

"The aerospace industry has the tools and resources at its disposal to build a more resilient technology-critical metal supply chain. Better still, engaging these tools and resources are also key to help us rapidly transition to a net-zero economy."

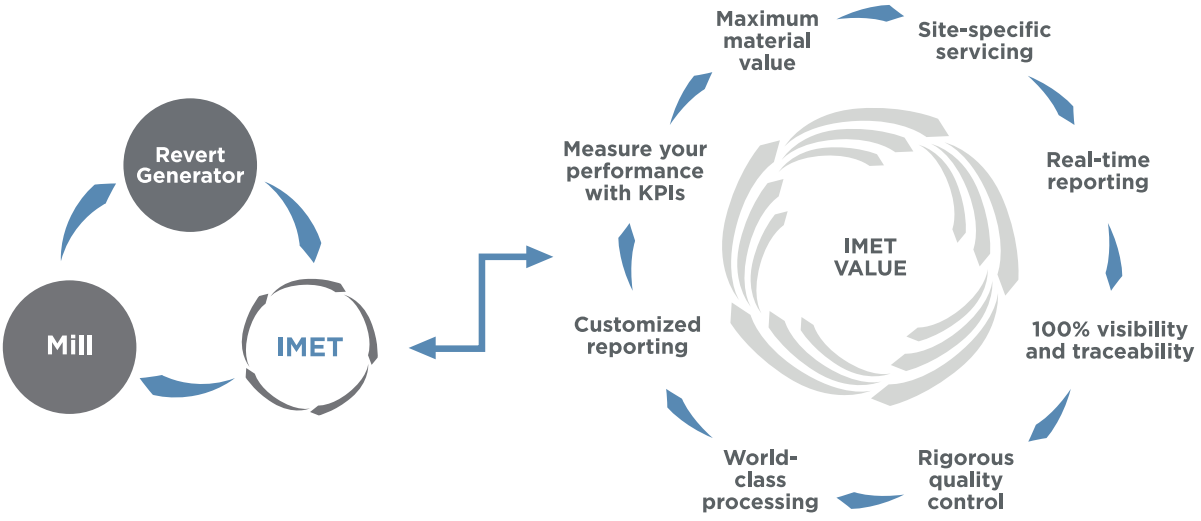
Ruaraidh Williamson, CEO IMET Alloys

How we're helping create a high-tech metals circular economy for the aerospace industry

IMET Alloys helps the aerospace industry manage its superalloy and titanium metals to keep them in the supply chain and reduce losses of technology-critical metals to lower technology melting applications where their true value is not fully realized.

Our innovative material tracking and supply chain management systems, zero-discharge cleaning technologies and advanced metals processing techniques ensure the most efficient circular flow and reuse of superalloy and titanium materials generated as a by-product within the manufacturing supply chain—what we call 'revert.' This helps to create a more secure and self-sufficient closed-loop supply chain and support the development of a circular economy.

The IMET closed-loop system: complete control of the materials flow

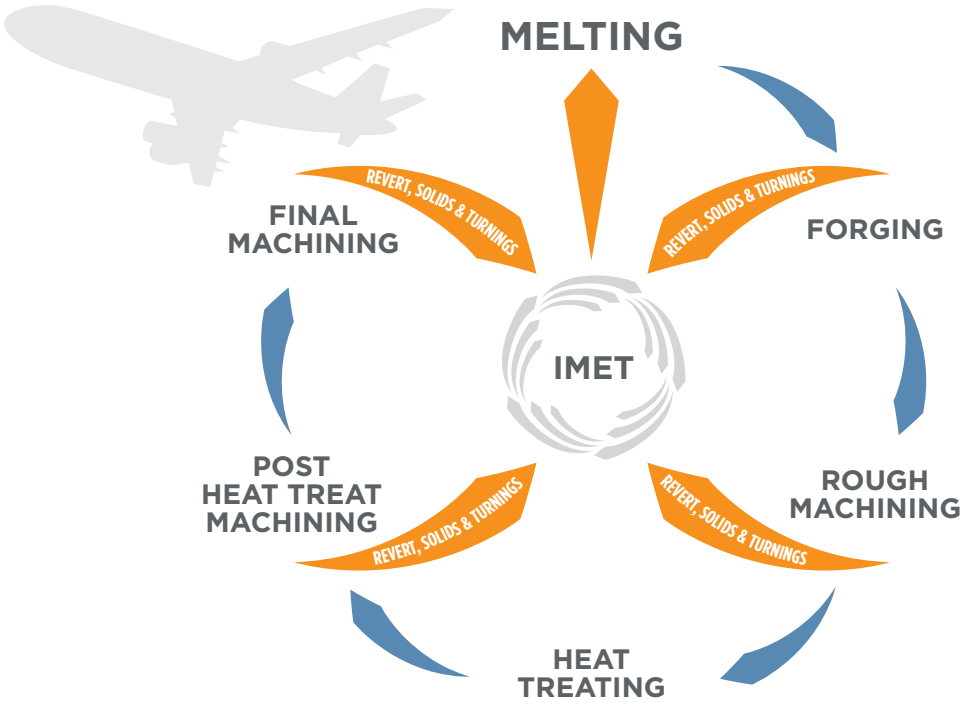


Designing out waste

IMET works throughout every aspect of the superalloy and titanium manufacturing supply chain. We believe it is possible to decouple economic growth from the unsustainable use of resources by improving how our industry manages, recovers and reuses its technology-critical metals.

We are actively pressing OEM's and melters to engage IMET in the developmental stages of new next-generation alloys so we can work together to create the most sustainable recovery and processing techniques. These advances will help the industry today and in the future by optimizing the reuse of its technology-critical materials and preventing the inadvertent development of new alloys which cannot be recovered for reuse.

IMET is key to realizing sustainable commercial, strategic and environmental benefits



Through our closed-loop supply chains, we help our partners:

- Spend less on raw materials
- Get maximum value from their titanium and superalloys
- Enjoy complete control of their materials flow
- Meet the aerospace industry's rigorous quality standards
- Reduce external dependency on raw material supply and the associated risk of leverage, and keep production costs down
- Create raw materials resilience and protect against supply chain disruption
- Cut down on the environmental impact of mining for raw materials

IMET Alloys

"Ensuring a stable climate for future generations is a vitally important challenge, but it is achievable."

Hon. James Shaw, New Zealand Minister for Climate Change

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