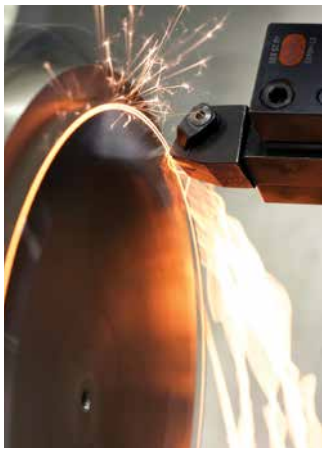
GIVING AEROSPACE TOOLMAKERS A COMPETITIVE EDGE

Since the 1970s Element Six has supplied high-performance supermaterials for use in aerospace precision machining and grinding applications. Today the company's capabilities extend to the machining of virtually all complex materials found in the main components of modern aircraft.

elementsix™
a De Beers Group Company

THE EVOLUTION OF TOOLS & MATERIALS

—— The quest for low weight and high performance



Aero-Dianamics AD-D3.

Polycrystalline diamond (PCD).

Polycrystalline Cubic Boron Nitride (PCBN).

ABN 900 the latest Cubic Boron Nitride (CBN) material from Element Six.

THE METALS AND ALLOYS THAT DRIVE PROGRESS

The most common metals in aircraft construction are aluminium, magnesium, titanium, steel and their alloys. Each metal and alloy presents a new challenge for the tool manufacturer, generating different forces, temperatures and requiring a consistently higher degree of dimensional accuracy. Element Six has pioneered the uses of synthetic diamond to succeed in this demanding performance environment.

A WIDE CHOICE OF MATERIALS FOR TOOL MAKERS

Element Six presents an array of supermaterials for tool manufacturers. The company pioneered the production of Polycrystalline Diamond (PCD). One reason why Element Six synthetic diamond is superior to others is the company's unrivalled ability to engineer the characteristics of the diamond – balancing wear resistance, with toughness and thermal stability for optimised machining performance. Other supermaterials in the Element Six portfolio include Polycrystalline Cubic Boron Nitride (PCBN), Single Crystal Diamond and Tungsten Carbide.

MACHINING CFRP AND PLASTICS

The latest generation of aircraft are built primarily from Carbon Fibre Reinforced Plastic Composites (CFRP). Among other major advantages for aircraft manufacturers, such as reduced weight and increased fuel economy, CFRP also permits the use of larger windows. So the challenge of milling and drilling acrylic windows takes on an increasing significance. Machining both CFRP and acrylic windows calls for exceptional tool performance, either cutting tough fibres cleanly or maintaining low operating temperatures in the other.

A COMPLETE PORTFOLIO FOR AEROSPACE

It all adds up to a complete portfolio of innovative advanced engineering abrasive materials to help toolmakers meet the challenges of machining in today's aerospace industry.

PROVEN AEROSPACE APPLICATIONS WITH DIAMOND

Element Six materials help shape, grind, drill and finish the principal component parts of a modern-day aircraft.

LANDING GEAR COMPONENT PARTS

Increasingly, titanium is becoming more prevalent in the construction of aircraft landing gear. The material presents extreme challenges in its machinability and there is an increasing demand for tooling solutions that can deliver productivity improvements.

Graphite with its inherent high abrasivity and relatively low weight is a natural choice for the friction material in braking systems. PCD tools manufactured using materials from Element Six routinely outperform coated and uncoated tungsten carbide in the machining of braking system components.

SHAPING AND DRILLING AIRFRAME PARTS

Whatever the combination of advanced aerospace materials used in the construction of an aircraft, from aluminium, titanium and steel alloy sheets to CFRP stacks, Element Six has the crucial tool materials required for fast and accurate machining with long tool life.

Metal Matrix Composites (MMC) are a regular choice for aircraft airframe structural components. However, the combination of abrasive silicon carbide (SiC) fibres or particles in the aluminium matrix materials makes them very difficult to machine. Element Six's PCD grades CTM302 and C30X and CVD single crystal diamond with their combination of superior wear resistance and strong edge toughness make them an ideal choice for milling and turning MMCs.

MACHINING MATERIALS AT THE HEART OF JET ENGINES

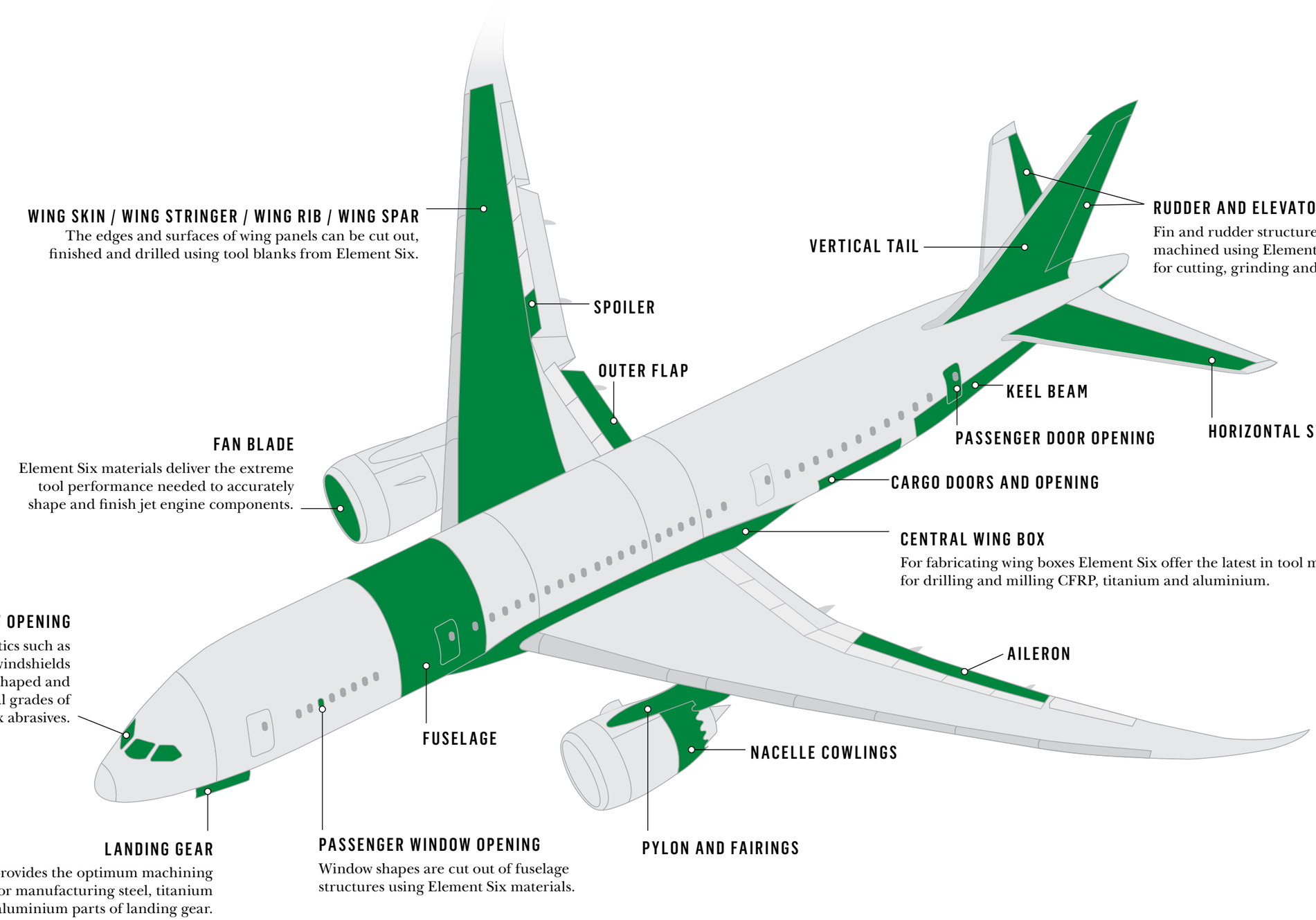
High temperature nickel based superalloys, are commonly used in the manufacture of components such as shafts and combustion casings in the modern jet engine. PCBN from Element Six is the first choice for these turning operations, where they typically show tool life increases from between 30% - 50% at 300% of the cutting speed of conventional tool materials.

Recent work has shown that under the right conditions, tools manufactured using Element Six's CTM302 can deliver tool life improvement up to 24 times more than conventional tungsten carbide, and at much higher machining speeds.

In grinding applications, such as fir tree grinding for turbine blade fixation using electroplated tools, the latest CBN material from Element Six, ABN900, is rapidly becoming the material of choice where it is outperforming competitor materials with its extended tool life.

Grinding titanium is an extremely challenging operation, however, PDA 311 & PDA 446 from Element Six can be used in vitrified bonds to grind the lower ductility titanium alloys.

THE ELEMENT SIX RANGE OF EXTREME PERFORMANCE ABRASIVE MATERIALS CAN BE USED IN THE EFFICIENT MACHINING OF MULTIPLE COMPLEX AIRCRAFT COMPONENT PARTS



Aerospace Capabilities

ELEMENT SIX: WORLD-CLASS RESOURCES

WORLDWIDE REACH

Element Six has a proud 60 year history of developing highly innovative products and creating step-changes in industrial performance. The company is driven by an on-going quest to push the boundaries of synthetic diamond innovation and to deliver industry-changing competitive advantage for customers.

WORLD CLASS GLOBAL INNOVATION CENTRE

Supporting this drive is our unique Global Innovation Centre, Oxford in the United Kingdom. Here, working together with customers, PCD and other supermaterial formulations can be created, tested and trialled in real-world conditions. This dramatically shortens the time to market for innovative tooling solutions, helping customers gain the maximum competitive advantage.

ELEMENT SIX GLOBAL REACH

Element Six operates worldwide with its head office registered in Luxembourg, and primary manufacturing facilities in China, Germany, Ireland, South Africa, US and the UK.

If you would like to know more about Element Six please visit our website at www.e6.com.

GLOBAL

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