

SHAPE IT

OSG Global Tooling Magazine

Second Edition 2016

TOPICS

- Rise to AMRC Tier 1
- The Battle Against Space Debris
- Global Customer Reports
- Product Pickup





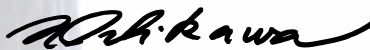
shaping your dreams for Aerospace

The number of parts required in the manufacturing of an aircraft is estimated to be around several million, with production typically conducted in small lots. In the aerospace sector, large corporations such as Boeing, Airbus, GE and Rolls-Royce are at the very top of the pyramid, supported by a supply chain made of medium and small sized enterprises (job shops).

Regardless of company size, customer communication is always at the heart of all OSG's effort. Our global team anticipates, listens and actively reacts to market needs by conducting face-to-face business. This human interaction not only builds trust, but is also the driving force behind product development. With our face-to-face sales policy, OSG is able to accurately identify the pain points of our clients to better develop solutions that fulfill those needs.

Aviation is a fast-growing market with strong demand for more air travel. An increasing number of people are flying, which creates heightened pressure to improve travel safety standards. Aerospace manufacturers are always in search of better materials and technologies to create faster, lighter, safer and more comfortable aircrafts for commercial aviation. At OSG, we too are constantly on the move, researching and developing new cutting tool solutions.

2016 is the year of IMTS and JIMTOF (two of the world's largest manufacturing technology exhibitions). This edition of SHAPE IT provides sneak previews of some of the new products and developments that we will be showcasing in Chicago and Tokyo. Aside from cutting tool manufacturing, OSG has also recently taken on a new mission to tackle space debris with partner Astroscale, Inc. I hope you enjoy reading through this Aerospace Edition of SHAPE IT and learning more about OSG's latest endeavors to contribute to a more sustainable space environment.



Norio Ishikawa
President of OSG Corporation

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Rise to AMRC Tier 1

Process support for advanced aircraft parts

For many years, OSG has supplied tools for use in the processing of aircraft parts in Japan, the United States, Canada, Brazil, Europe and other markets. We have built a reputation as a versatile supplier with wide-ranging expertise and experience in the area of tools that can process difficult-to-cut materials, such as CFRPs (carbon fiber reinforced plastics) and titanium oxides. We aim to enhance that reputation further by expanding our activities at the Advanced Manufacturing Research Centre (AMRC).







Advanced Manufacturing Research Centre (AMRC).
Photo Courtesy: AMRC

AMRC

Established as a partnership by the British Government, the University of Sheffield and private sector corporations such as Boeing, the Advanced Manufacturing Research Centre is the world's most advanced aerospace research facility. Its research activities encompass numerous fields, including basic materials research, as well as machining and casting of CFRPs, titanium and other materials. Over 80 companies are currently involved including Boeing, Rolls Royce, Airbus,

Spirit Aerospace and BAE Systems.

Promotion to AMRC Tier 1

Since joining the AMRC in September 2013, OSG has earned recognition for its advanced technology and ability to work on a wide range of projects. In June 2015, it was promoted to AMRC Tier 1. There are approximately 20 Tier 1 companies, the elite members of the AMRC, while another 60 companies are classed as general participants at the Tier 2 level. OSG is the only Japanese

cutting tool manufacturer to achieve Tier 1 status.

In addition to participation in the AMRC as a director, an OSG representative will also attend AMRC technical board meetings. OSG is determined to fulfill its role as a Tier 1 member by stationing engineers at the AMRC and proposing projects. We will also further refine our advanced technology through intensive participation in various projects.

Enhancing Our Reputation for Advanced Technology

CFRPs are used to reduce the weight of aircraft, such as the Boeing 787 and the Airbus A350. The types of CFRPs used and their processing properties vary according to their locations in aircraft. As a result, a wide range of tools is needed to process these materials optimally. OSG is building a solid presence within the AMRC, in part because of the need for its technology and experience for important projects relating to the processing of CFRPs and titanium. Another reason for OSG's excellent reputation is its self-sufficiency in all related areas, including materials, tool design and coatings. Promotion to Tier 1 has dramatically expanded our opportunities to demonstrate our capabilities in the aerospace sector. We will continue to contribute to the growth and success of the global aerospace industry by monitoring information about industry trends and applying that information to product development.



OSG Academy

The so-called "OSG Brain" where design, testing, production, training, and evaluation of the latest cutting tool technology take place, is located at the OSG Academy in Aichi, Japan. Home to over 40 of the latest CNC machining centers, along with OSG rapid prototype grinding machines, many of the industry's most advanced aerospace tools are developed at this facility.

The OSG Advantage

OSG has a comprehensive offering of diamond-coated routers for all composite milling and trimming needs. Along with routers, a diverse line of drilling products are also available, providing solutions for the various composite laminates and stack drilling challenges. All of OSG's aerospace tooling features metallurgy and cutting geometries to help increase productivity, reliability and tool life while reducing machining time and scrap. OSG also offers a patented ultra-fine diamond coating, which is a prerequisite when machining composites and provides a definitive advantage over other competitor diamond coated products.





IDEA OSG 1

IDEA OSG 1 Mission

OSG sponsors satellite mission to tackle space debris

To create a more sustainable space environment and to further expand the horizons of the manufacturing industry, OSG has partnered with Astroscale, a Singapore-based startup, to construct the world's very first in-situ microsatellite "IDEA (In-situ Debris Environmental Awareness) OSG 1" to contribute to the global effort of cataloging small-size orbital debris and to improve future manned and un-manned space missions' safety.

SPACE DEBRIS

Space debris is a combination of man-made objects such as rocket upper bodies, non-functioning satellites, metal fragments, and more. It is a general term that refers to failed space objects, as well as debris resulting from galactic explosions and collisions. Including small objects under 10 cm in size, there are an estimated 5.8 trillion pieces of debris circulating in orbit around the earth.

Most of the active satellites are situated at the Low Earth Orbit (LEO) region, and it is where most of the space debris is found. Space debris with sizes over 1 cm is tracked by international space agencies to provide advance warning to spacecraft and satellites for necessary maneuver in case of a potential collision. Over 100 million pieces of space debris under the size of 1 cm, however, are not currently being monitored. Space debris travel at high speeds in excess of 7 km per second and can cause severe

damage upon collision with satellites and space stations. At such speeds, even debris at the size of 1 cm can carry the same amount of force as a standard passenger car on earth, according to Astroscale CEO Nobu Okada. Micro-debris has the potential to inflict lethal damage to satellites, and yet neither its distribution nor quantities are fully known. Because of this, a better understanding of small-size debris as well as tracking is required.

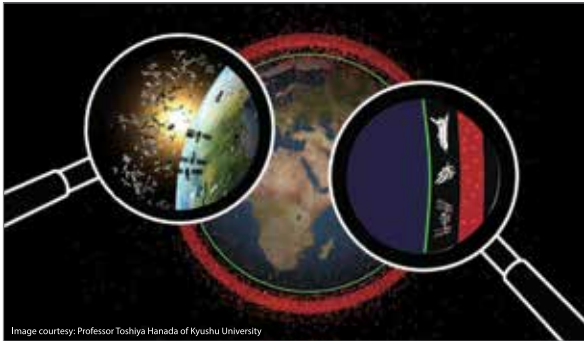


Image courtesy: Professor Toshiya Hanada of Kyushu University



Top Left: It is estimated that there are over 5 trillion pieces of space debris orbiting around the earth, much of which have been man made during space development.

Bottom Left: OSG Corporation's application engineer Yasuhito Fujii prepares for the machining of the IDEA OSG 1 satellite's flange ring.

Top Right: A press conference was held in Toyohashi, Aichi, Japan to kickoff the IDEA OSG 1 mission.

Bottom Right: Based in Singapore, AstroScale CEO Nobu Okada travels around the world to campaign for the sustainability of outer space.

IDEA OSG 1

As a first step to confronting the increasing threats of space debris, IDEA OSG 1 was developed by AstroScale based on a concept model designed at the laboratory of Professor Toshiya Hanada at Kyushu University, Japan. IDEA OSG 1 is a 20 kg microsatellite that will collect key information characterizing small-size debris from 100µm or larger in the LEO's most congested areas.

IDEA OSG 1 measures 38 cm x 38 cm x 60 cm (15 inch x 15 inch x 23.6 inch) and is equipped with two film penetration-type micro-debris sensors known as "Space Debris Monitors (SDM)." Each of the monitors has a measurement surface area of approximately 1,000 cm² that detects impacts of micro-debris in quasi-real-time. Approximately 3,300 conductors 50 µm wide are printed on the polyimide film of the SDM

sensor unit at 100 µm intervals. Micro-debris resulting from collisions will be absorbed by the IDEA OSG 1 through the sensors. This data will be collected and analyzed to help complete the mapping of small-size orbital debris to prepare for the next stage of debris removal.



Engineer Profile:

Yasuhito Fujii

OSG Corporation Application Engineer
End Mill Product Development Division

"The machining of the flange ring is challenging from the perspective of balance. The more material being cut from the product, the less rigid it becomes. Deformation may also occur as the product is removed from the jig and would throw off the overall accuracy of the part, leading to it being rejected. Due to these challenges, the choices of tooling, jig design and processing methods are utmost critical. The satellite flange ring was a challenging project, but the process has given me a great deal of inspiration for future product development."

SPACE DEBRIS

ASTROSCALE

Space debris issue is a social problem caused 100% by mankind, unlike global environmental problems such as climate change. The growing number of space debris is threat to the vital satellites orbiting around the earth.

WHAT

Space debris are made of man-made objects such as rocket upper bodies, non-functioning satellites, metal fragments etc.

20,000 ~ 22,000
OBJECTS



10 cm

1,000,000
or more OBJECTS



1 cm

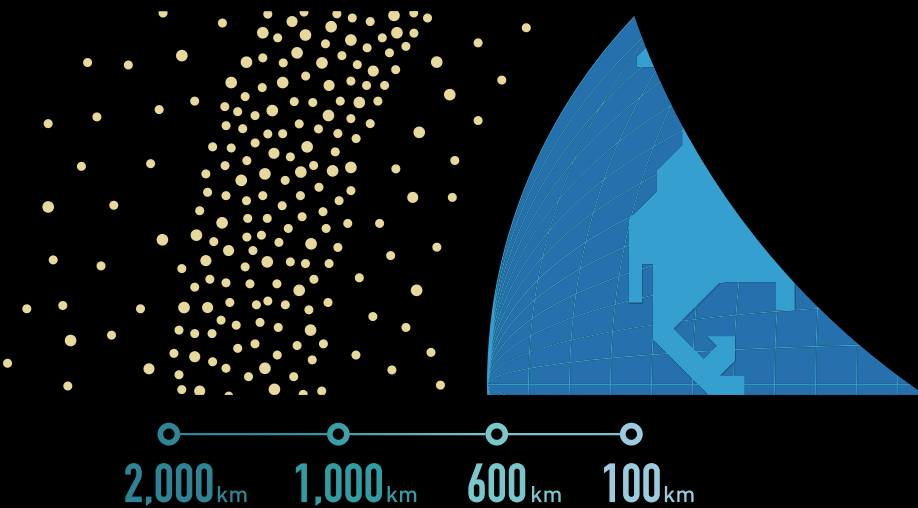
100,000,000
OBJECTS



There are currently more than 20,000 large trackable space debris orbiting Earth, along with estimated hundreds of thousands more untraceable ones.

WHERE

Most of the active satellites are situated at LEO (low earth orbit, 800-2000km) and it is where most of the space debris is found.



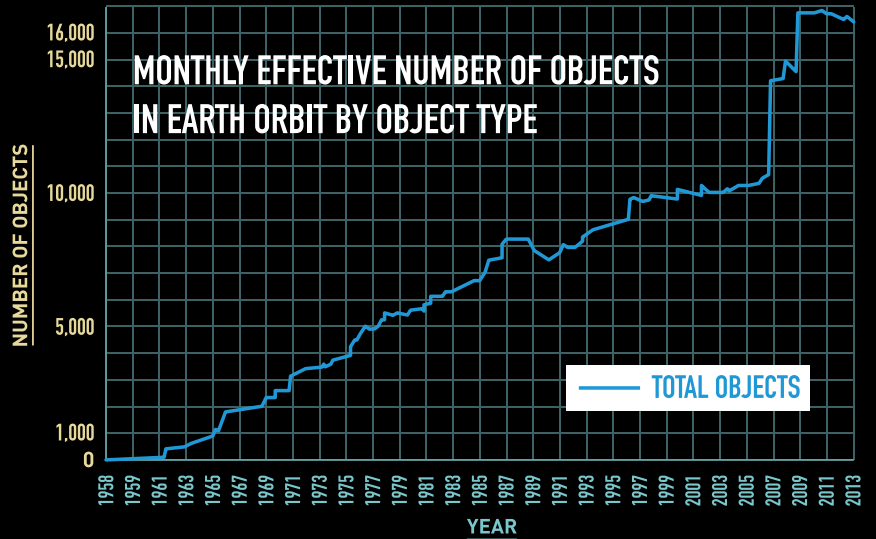
Low Earth Orbit



ASTRO SCALE ASTROSCALE PTE. LTD.
Sources: NASA, US Space Surveillance

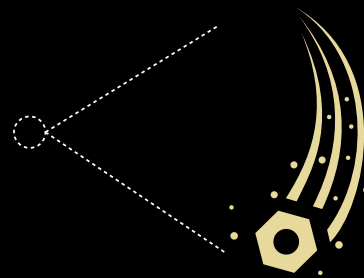
WHEN

The severity of the space debris issue is aggravating as collisional chain reactions increases debris population at an increasing rate; outpacing the natural rate of orbital decay into our atmosphere.



HOW

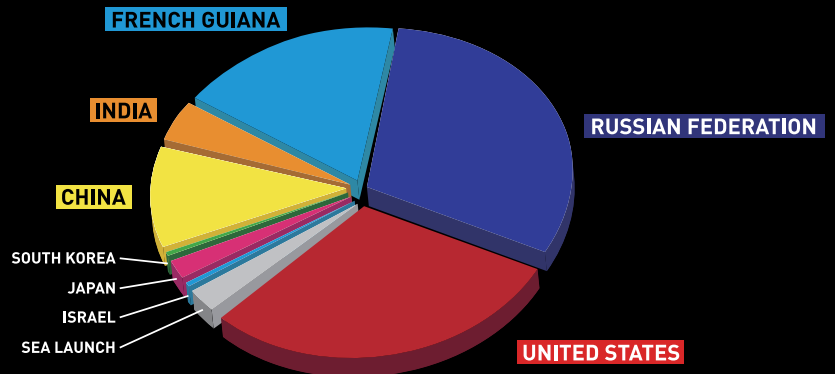
Space debris are orbiting around the earth up to 8km per second, that is 20 times faster than the speed of bullets.



8 km per second

WHO

Since 1957, 7757 satellites have been launched to the space. Below is the breakdown of satellite launches by sites.



MANUFACTURING FOR SPACE

In the course of space exploration, mankind has created rockets, satellites and space stations, but the debris resulting from putting these innovations into space is now a large stumbling block for future development. Moreover, this problem has become increasingly serious, and it is now understood to be an impending, grave danger to items that have become essential to our everyday lives, such as weather forecasting, GPS and other services provided by satellites. It has always been the goal and desire of OSG to use manufacturing to contribute to a society that betters the lives of people around the world. OSG has taken a deep interest in global environmental issues and was genuinely shocked when it came to understand the magnitude of the issues posed by space debris.

Since its founding, OSG has continuously strived to serve as an organization that contributes to the happiness of not only its customers, but to global society as a whole — a hope represented by its tagline “shaping your dreams.” In this current endeavor, the desire of Nobu Okada of Astroscale, the research staff and all those engaged in directly confronting the “issue of space debris” made a powerful impression. OSG decided to sponsor this project, motivated by the ability to contribute to this monumental challenge facing Astroscale.

As IDEA OSG 1’s main sponsor, OSG also provides technical support on the manufacturing of the satellite. The flange ring of the satellite (which detaches the satellite from the rocket) is being manufactured at OSG’s Global Technology Center in Aichi, Japan. Eighteen types of cutting tools have been used in the machining of the flange ring. As it is connected to the rocket body, precision and balance are most critical. Machining accuracy was inspected throughout the manufacturing process to ensure the highest quality possible.

For many years, OSG has been actively contributing to global manufacturing industries including automotive, aerospace, die/mold, energy, construction and many others. In support of Astroscale and its promotion of the IDEA OSG 1 mission, OSG strives to utilize its know-how to protect the environment beyond earth, and in doing so, shape our future generation’s dreams for space. ✨







Shaping Composite Wings

BNC router eliminates delamination and uncut fibers

Hakan Erdogan, OSG Turkey



Above: The Z spars are produced in a sophisticated five-axis FOG precision milling machine. TAI's NC Engineering Leader Mr. Onur Bahtiyar oversees the production of the composite wing spars.

Left: OSG's DIA-BNC diamond coated router for composite trimming.

Company Profile

TUSAS-Turkish Aerospace Industries, Inc.
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An aircraft's structure is the result of numerous assembled parts, such as the engines, fuselage, wings, tail, landing gear, just to name a few. Many of these components are made of titanium, advanced aluminum alloys and composites. In recent years, in order to achieve greater fuel efficiency and reduce operational cost, aircraft manufacturers have placed greater focus toward applying carbon fiber reinforced plastics (CFRP), a light, durable and

corrosion-free material, into aircraft designs.

In the case of the Airbus A350, both the fuselage and wing structures are made primarily of CFRP. According to Airbus, approximately 70 percent of the A350 airframe is made of composite material structures, titanium and advanced aluminum alloys. Composites alone account for 53 percent.



Z-shape spars that TAI has been manufacturing since 2012.



The Z spars are produced in a sophisticated five-axis FOG precision milling machine.



The end cut of OSG's DIA-BNC router.

The manufacturing process of a CFRP wing panel typically involves multiple steps – molding, tape layout, stringer integration, vacuum bagging, curing, non-destructive inspection, machining and assembly, and painting. Machining tools play a key role towards the end of the manufacturing process. With safety in jeopardy, precision and quality are utmost critical.

Located in Ankara, Turkey, the TUSAS-Turkish Aerospace Industries (TAI) has been manufacturing the A350 aileron spars, a.k.a. the backbone of the aileron, since 2012. TAI specializes in the design, development, manufacturing and integration of space systems throughout Turkey. Its Ankara production plant covers approximately 5 million square meters with an industrial facility of 230,000 square meters. The site is equipped with some of the most advanced, high technology machinery that enables parts manufacturing, aircraft assembly, flight tests and delivery for the military and commercial aviation markets.

The composite wing spar that TAI produces measure 5.5m in length and

0.5m in width. Four of the Z-shaped spars make up one set of ailerons. A total of 64 sets of ailerons are manufactured per year. A profile tolerance of +/- 0.5mm around the entire edge of the part is required. The Z spars are produced in a sophisticated five-axis FOG precision milling machine.

Throughout the manufacturing process, TAI had experienced delamination and uncut fibers at the cutting edge, which is unacceptable for the part. Delamination is the splitting of a laminate into layers and can occur at a single hole edge or at both hole openings during milling. A diamond coated 12.7mm diameter compression router was used for the roughing operation with unsatisfactory tool life.

After attending a machining and training conference offered by OSG Turkey, TAI witnessed the performance of OSG's DIA-BNC router versus other manufacturers' routers.

The DIA-BNC is a patented diamond coated fine nicked router designed to excel in high feed CFRP roughing and finishing, and it can be applied to

both thick and thin laminates. With extremely low cutting forces and flute management, tool life can be greatly extended.

"The OSG nicked router is very special since it has all the versatile characteristics," said Onur Bahtiyar, NC Engineering Leader at TAI. "Its ability to side mill and slot, as well as having multiple cutting edges on the flute length is unlike the compression style tool. OSG's diamond coating is also the best I have seen."

Running the DIA-BNC at the same slot milling cutting condition of S 6,000 rpm, Vf 1,250mm/m with flood coolant and shrink fit holder (short and long type), no delamination and uncut fibers are observed after machining unlike what was seen previously.

"Switching to OSG's nicked router enabled us to improve surface quality," said Bahtiyar. "The elimination of delamination is providing us a cost savings of €17,920 per year." ✨



Dream Flight

OSG diamond coating shields tooling from wear in composites

Vis Huang, OSG Shanghai



Company Profile

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The Boeing 787 Dreamliner entered commercial service on October 26, 2011, with launch customer All Nippon Airways. By June 15, 2014, the 787 Dreamliner had already flown more than 100,000 times and had carried more than 20 million passengers all over the world. If you have taken the 787 Dreamliner to some places you dreamed of, we thank you for your support!

Today, more than 350 787 Dreamliners are flying to destinations around the globe, with more on the way. The tremendous success of the Boeing 787

Dreamliner is based on its excellent flight performance and low-operating cost. The long-range, mid-size wide-body, twin-engine 787 Dreamliner can carry a maximum of 290 passengers and travel as far as 15,750km, which is about a third of the way around the Earth. It is also Boeing's most fuel-efficient airliner, which is the result of being the first aircraft to implement composite materials as the primary material in the airframe. Boeing listed its materials by weight as 50 percent composite, 20 percent aluminum, 15 percent titanium, 10 percent steel and 5 percent others.

According to Boeing, the lightweight construction had contributed to the 787 Dreamliner's ability to cut down on fuel consumption by 20 percent versus previous models, which can decrease the emission of greenhouse gases to our environment.

In China, Boeing Tianjin Composites Co., Ltd (BTC), a joint venture of The Boeing Company and Aviation Industry Corporation of China (AVIC), produces

components for all of Boeing's in-production commercial airplanes, including the 787. Based in Tianjin, China, BTC is equipped with some of the most advanced aero composite material production machines and laboratories. It is dedicated to the manufacturing of aerospace composite parts for primary structure, secondary structure and interiors parts of commercial aircrafts. As an industry leading tool manufacturer, OSG provides cutting tools to the aerospace industry, including BTC's 787 program.

Composites are used on the 787 Dreamliner's fuselage, wings, tail, doors and the interior. Composites are corrosion-resistant, stiff and strong material composed of mixtures of fiber. They have three times the tensile strength than steel, yet their density is half of aluminum alloy and is only a fifth of the weight of steel. These characteristics make composite materials very popular in the aerospace industry.

Machining composites often involves a high degree of difficulty because of their multilayer properties. High material strength may also lead to shorter tool life. In addition, poor hole quality is commonly present in aerospace applications because of a condition called delamination, which is

the splitting of a laminate into layers. As the aviation industry holds high quality and safety standards, these conditions are unacceptable and manufacturing requires proper tooling that can do the job right – on the first try.

Composites are corrosion-resistant, stiff and strong material composed of mixtures of fiber. They have three times the tensile strength than steel, yet their density is half of aluminum alloy and is only a fifth of the weight of steel.

All of OSG's composite tooling features metallurgy and cutting geometries to help increase productivity, reliability and tool life while

reducing machining time and scrap. OSG also offers a patented ultra-fine diamond coating, which is a prerequisite when machining composites and provides a definitive advantage over other manufacturers' diamond coated products.

OSG's patented ultra-fine diamond coating has a maximum diamond grain size diameter of 2 μm. This strictly controlled diameter allows our coating

to be super smooth and tools to remain extremely sharp. OSG also manufactures all diamond products in-house with absolute control. The end result is a diamond coated product in which tool life can be consistently predicted, rather than having to endure premature diamond delamination issues.

In China, OSG has the recognition of AVIC, which can be translated to having recognition from Chinese aerospace manufacturers. OSG is not only a company that simply provides tools, but also supports the daily lives of people around the world. Maybe you are not aware of our presence, but we do work diligently to contribute to society and to shaping your dream flight. ✨



Top Left: OSG ultra-fine diamond coating.
 Bottom Left: Competitor diamond coating (industry standard).
 Top Right: OSG ultra-fine diamond coating with small grain size.
 Bottom Right: Diamond delamination (note: large grain size).



Takeoff for New Heights

PSE cutter boosts milling efficiency by over 200%

Haron Garcia, OSG Royco



Paradigm Precision's production facility in Guaymas, Mexico. Photo courtesy: Paradigm Precision

Company Profile

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Aircraft, trains, ships and electrical generators all have one thing in common – they are powered by gas turbines. A gas turbine, also referred to as a combustion turbine, functions by converting chemical energy of fuel into mechanical energy for rotary movement. The spinning motion of the turbine drives a generator that transforms the energy into electricity, providing power.

The design of the gas turbine is customized based on purpose so that the most desirable energy form can be maximized. The manufacturing of gas turbines for the aviation industry commonly involves the processing of high hardness materials and tight tolerance requirements.

At Paradigm Precision's manufacturing facility in Guaymas, Mexico, the production of aerospace gas turbine components takes place on a daily basis. Headquartered in Stuart, Florida, USA, Paradigm Precision is a manufacturer of complex fabrication and precision machined components for gas turbine engines. Its core capabilities include

laser services, airflow measurement, thermal coatings, electrical discharge machining and precision machining for the aerospace, land-based power generation and marine markets. The company operates 12 locations, spanning seven countries, with more than 1,900 employees. Paradigm Precision's Guaymas, Mexico operation offers capabilities to machine

components up to 6 feet in diameter, 3-, 4- and 5-axis milling, turning and wire EDM machines, and it specializes in the production of struts / bridges,

fan case, compressor housing and split cases.

OSG was approached by Paradigm Precision's engineering staff regarding the machining of a turbine component in Rene 41 (40 HRC) with a manufacturing volume of approximately 1,700 parts per month. At the time of the discussion, Paradigm Precision has been working on the part for about two months on their HAAS horizontal machining center and was looking to further reduce cycle time. The size of each Rene 41 plate is 70mm x 203mm x

“The PSE was able to complete face milling and side milling on the part with a perfect finish. Moreover, cycle time was reduced by almost 3 times...”

Cutting Conditions

OSG

Vc= 44 m/min
n= 185 rpm
ap= 1.5 mm
ae= 76.2 mm
F= 0.8 mm/rev
fz= 0.1 mm/z
Z= 8
Cycle time: 82 sec.

Competitor Tool

Vc= 40 m/min
n= 205 rpm
ap= 0.75 mm
ae= 76.2 mm
F= 0.3 mm/rev
fz= 0.04 mm/z
Z= 8
Cycle Time: 240 sec.





Turbine component plate in Rene 41 (40 HRC) with a dimension of 70mm x 203mm x 25.4mm.



Face milling of the Rene 41 plate in Paradigm Precision's HAAS horizontal machining center using blasomill oil as coolant.

25.4mm with a tolerance requirement of +/- 0.3mm. Due to the tight tolerances and hardness of the material, Paradigm Precision had to face mill in two steps with another manufacturer's tool. This process required approximately four minutes of cycle time. Paradigm Precision at the time already worked with OSG drills and taps for machining exotic materials and decided to seek new solutions for its milling needs as well.

After a detailed evaluation of the application, a 3-inch diameter OSG Phoenix shoulder cutter end mill PSE

(EDP 7801213) with 8 XC5040 inserts (EDP 7816056) were suggested. The PSE is a versatile indexable series designed to excel in a variety of cutting conditions. With its high precision insert and unique insert form, chips are broken into small pieces, enabling the tool to perform side milling, slotting, ramping and helical milling efficiently.

The PSE was able to complete face milling and side milling on the part with a perfect finish. Moreover, cycle time was reduced by almost 3 times from 240 seconds to only 82 seconds using blasomill oil as coolant on their HAAS

horizontal machining center. With significant cycle time reduction, Paradigm Precision is now able to process 34 parts per hour versus 12 parts per hour. Operator hours have also been greatly reduced to 2.5 hours versus the original 7 hours. Being able to save more than 4 hours of production time a day and productivity improvement of over 200%, Paradigm Precision is ready to takeoff for new heights. ✨

EXOPRO® AERO-BNC

Diamond coated router for
composite trimming

The AERO-BNC is a patented diamond coated fine nicked router designed for carbon fiber composite trimming. The router features patented cutting geometry and OSG diamond coating to eliminate uncut fibers and delamination, which are common machining problems of composites. The AERO-BNC excels in high feed roughing and finishing and can be applied to both thick and thin laminates. With extremely low cutting force and flute management, tool life can be greatly extended.

EXOPRO® AERO-HBC

Diamond coated herringbone router for high feed milling and finishing in thick laminates

The AERO-HBC is a herringbone style router for high feed rates and excellent surface finishes in difficult to cut fibers, honeycomb sandwich materials and uniquely shaped parts. The flagging of material is a predominant problem during the machining of honeycomb structures. The AERO-HBC features a compression cutting design to reduce the tendency of flagging. This router is engineered to excel in unique geometry parts, specifically when the fiber orientation changes dramatically.



EXOPRO® AERO-LHX

Diamond coated low helix drill
for composites

The AERO-LHX is a diamond coated drill designed for tough laminates. It eliminates uncut fibers and delamination in applications where other drills are unable to properly cut fibers. The drill features a triple angle geometry to reduce push-out exit delamination and a low helix design to provide a sharper cutting edge to shear tough fibers. Combined with OSG's patented diamond coating, the AERO-LHX is able to achieve excellent performance in tough and unidirectional composites.

OSG PHOENIX® PFB

High precision indexable finish
ballnose end mill

The OSG Phoenix PFB is an indexable ball end mill ideal for 3-D finishing operations where precision and surface finish are critical. It features very high insert radius precision ($\pm 6 \mu\text{m}$) to enable superior milling surface finish. The PFB's spiral cutting edge enables excellent strength and sharpness. Its PVD coated grades are most suitable for milling mold materials for composites. The PFB's shank is available in steel or carbide. The carbide shank is designed to inhibit chattering and to increase both precision and tool life, and the steel shank is targeted for superior cost performance when working with shorter projection lengths.



OSG Becomes Official Sponsor of New Space Mission to Tackle Space Debris



OSG Corporation held a press conference on December 15, 2015 at the Hotel Arc Riche Toyohashi, Aichi, Japan to announce its sponsorship with Astroscale, a Singapore-based private space company founded in 2013, on the world's very first in-situ micro satellite "IDEA OSG 1" to collect and monitor data on sub-millimeter sized debris in the Low Earth Orbit (LEO) region in real-time.

The mission of the "IDEA OSG 1" sponsorship aims to contribute to the sustainable use of the space environment by actively developing solutions to prevent space debris. OSG's corporate tagline "shaping your dreams" summarizes its passion

for new challenges and commitment to help clients accomplish their goals. With the new "IDEA OSG 1" mission, OSG strives to utilize its know-how and resources to protect the environment beyond earth, shaping the future generation's dreams for space exploration. ✨



Above: The IDEA OSG 1 press conference was held at the Hotel Arc Riche Toyohashi in Aichi, Japan with the attendance of over 50 guests. A special panel discussion also took place with members including former astronaut Naoko Yamazaki, Kyushu University's Professor Hanada, as well as renowned Broadway and Kabuki director Amon Miyamoto.



Left: OSG Corporation's President Norio Ishikawa and Astroscale's CEO Nobu Okada announce the IDEA OSG 1's mission during the December 15, 2015 press conference.

OSG Invests in New Carbide Material Factory



Top: A conceptualized image of Nihon Hard Material's new factory in Kyushu.

Bottom: OSG's Oike Factory located in Toyokawa, Aichi, Japan. New carbide end mills and drills are manufactured in this facility.

OSG maintains absolute control over every aspect of its manufacturing capabilities. OSG products are produced in-house – from the production of tool material, to the creation of tool geometry, to the development of its own proprietary coatings.

Tool material, which attributes to hardness and toughness, is one of the three vital elements in the manufacturing of superior cutting tools. OSG has been developing and manufacturing its raw materials with Nihon Hard Material (NHM), a subsidiary company of the OSG group, since 1990.

In order to respond to the increasing carbide product demand from the aerospace and automotive industries, OSG is investing 3 billion yen in NHM to construct a new factory in Takeo City in Saga Prefecture of Kyushu, Japan, near NHM's main manufacturing facility. The new factory is scheduled to be in full production by the fall of 2016.

In addition to expanding the production capacity of raw materials, OSG is also investing over 1 billion yen to enhance the carbide end mill and drill production capacity of its Oike Factory in Toyokawa City of Aichi Prefecture. ✖

OSG Acquires Cutting Tool Manufacturers Desgranges and AMAMCO

OSG has acquired Desgranges Holding S.A.S. of France in late 2015 and AMAMCO Tool of the United States in April 2016. Established in 1946, Desgranges is a manufacturer of standard and special cutting tools, and supplies to major French contractors in civil and military aviation, automotive and high-tech related sectors. Established in 1972, AMAMCO of Duncan, SC, USA specializes in the manufacturing of carbide cutting tools for major aerospace, automotive and medical customers. Through these new acquisitions, OSG will further facilitate market growth in the aerospace industry worldwide. ✖



OSG Around the World

Employee Interview with Todd Surritte

OSG Corporation was founded in 1938, more than 77 years ago. Today OSG holds the No. 1 position in the Japanese cutting tool market as well as a top-ranking position globally, with a production, sales and technical network spanning 29 countries. Our commitment to innovation, services, total solutions and out-of-the-box thinking has contributed to our immense success today. However, without our employees, none of it would be possible. We truly believe that our employees are one of the greatest assets of the company. In this section, we will introduce our team members from around the world.



Upper Left: Todd and his colleagues at the OSG USA corporate office in Glendale Heights, Ill.



Top: The AERO-BNC router designed for milling composites is manufactured at OSG USA's Bensenville production facility. Bottom Left: Todd is a long standing member of the P.R.I.D.E committee.

Tell us about your work & experience in the aerospace industry:

I have a Bachelor of Science in Aerospace Engineering from the University of Notre Dame, so I learned about airplanes while I was in college. When I became Area Sales Manager in the Northeast Region back in 2000, I called on many aerospace companies. Back then, we did not have as many CFRP applications like we do today, so OSG mainly sold taps to those customers. Today, I'm Vice President of Operation overseeing our Bensenville manufacturing plant at OSG USA. We

have 135 employees and over 50 CNC grinding machines producing 75,000 to 100,000 pieces of carbide products every month. We also regrind drills and other products for our customers at this facility. I am proud to say that OSG has some of the most high tech tools in the industry for Aerospace. We have come a long way since 2000 and are looking forward to leading the way in the future.

What is unique about the US division at OSG?

OSG USA has a culture called PRIDE which stands for, people, respect,

integrity, development, and excellence. We also have a Triple O philosophy of Outservice, Outsmart and Outfun.

How do you spend time on your day off?

On my days off, I enjoy spending time with my children. I have two boys, ages 3 and 8, and a daughter who is 11 years old. They play soccer, baseball, and softball, so we are constantly going to practices or games. When I get some free time, I like to play a round of golf with some friends.

What is your favorite OSG aerospace tool?

My favorite OSG aerospace tool is the EXOPRO® AERO-BNC (List 2061), a fine nicked router specifically designed for composite trimming. I like this tool because we make it here in Bensenville, Ill., and it is one of the best tools for CFRP in the whole aerospace market.



Left: The EXOPRO® AERO-BNC is a diamond-coated router designed for milling CFRP and other composites.



OSG USA's manufacturing facility in Bensenville, Ill..

Todd Surritte

Company Location: OSG USA

Position: Vice President

Joined OSG: 1994

Motto: "There is no I in team"





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Did you know?

Approximately 150 million pieces of debris (larger than 1mm) are orbiting the earth at the speed of 7~8km/sec at an altitude of 400~1,000km. This space debris increases the potential danger to the International Space Station and other spacecraft with humans aboard.

Visit www.ideaosg1.com to learn more about the threat of space debris and the IDEA OSG 1 mission.



*Image courtesy of
Astroscale.*

