

Alcoa Fastening Systems



Aerospace Products

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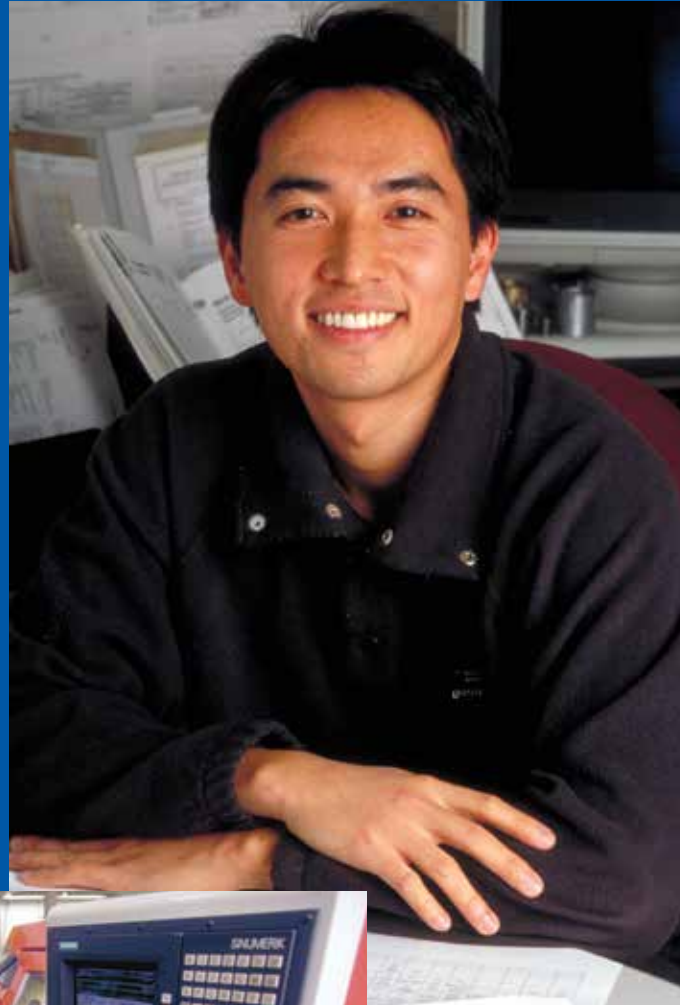
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Born from many of the most famous and long-standing brands in the aerospace fastener industry, **Alcoa Fastening Systems** has grown into the clear industry leader in product design, manufacturing know-how, and in providing the greatest variety and volume of products for the increasingly challenging aerospace industry.

Many companies claim to “create value”. Alcoa Fastening Systems delivers it by working passionately to understand our customers’ needs and offering best-in-class solutions. Our fastening systems provide improved joint fatigue performance, reduced assembly cost / time, improved life-cycle costs, increased reusability, and reduced weight in all aerospace materials and designs.

Alcoa Fastening Systems is committed to the future of the aerospace industry with industry-leading investments in technology and process improvements to continue to design and produce the best possible fastening systems. We are also proud of our global investment in new markets and new manufacturing operations around the world.

Alcoa Fastening Systems’ Aerospace Division has more than 5,700 dedicated fastener experts, in 22 manufacturing operations and 4 distribution / logistics centers in 8 countries, working to gain your trust and your business. Whatever the country or language, our goals are the same: customer value and customer satisfaction. You will be surprised by just how much we can do for you.

We encourage you to visit www.alcoafasteners.com to learn more about Alcoa Fastening Systems and our products. You’ll be glad you made the connection.



BLIND BOLTS

Alcoa Fastening Systems' line of blind bolts combines simplicity with convenient and fast installation. Blind bolts are ideally suited for use in structures where access is limited. However, their high-strength and ease of use make them a great alternative to threaded systems in many different applications. The breadth of our product line, which is available in both unified and metric sizes and our decades of experience make us the industry leader in aerospace blind bolt design and manufacture.

The **Accu-Lok® blind fastening system** is designed specifically for use in composite structures. It provides a large blind side upset that distributes the through-thickness clamping force of a joint over a large bearing area. The large blind side upset enables the fastener to exert a very high clamping force to the structure without damaging the composite material. The Accu-Lok® II and Accu-Lok® IIa blind fasteners are available with the Dryv-Cap™ non-threaded installation system. The Dryv-Cap™ disposable driver positively engages the driving recess in the fastener and eliminates the wear associated with conventional drivers.



The **Ergo-Tech® blind fastening system** is designed for both metallic and composite structures. It is available in shear and tension head configurations. Its corebolt breaks flush with the top of the sleeve every time. The one-piece sleeve configuration and no threads in bearing result in high structural integrity and high-retained clamp-up. Lightweight ergonomic tools are available to install the system. The Ergo-Tech® fastener is also ideal for robotic installation.

The **Visu-Lok® blind bolt** is designed specifically for use in metallic structures. It provides versatility and security for numerous applications and assures the highest shear, tensile, fatigue, and self-locking capabilities. When installed, it forms a solid, blind side head, with guaranteed minimum pre-load levels. The **Visu-Lok® II fastener**



utilizes a disposable hex drive nut which remains on the discarded pintail following installation, and eliminates cam-out conditions for the operator.

The **MS blind bolt** is designed for both metallic and composite structures. It is a high-strength, vibration-resistant, cost-effective fastener designed to meet the most challenging blind applications. This family of blind bolts has been used successfully in many critical areas such as engine inlets and leading edge applications.

The **Ti-Matic® blind bolt** has all of the benefits of the MS blind bolt with the added advantage of being lightweight due to its use of titanium materials. The large bulb that is formed during installation makes this fastener ideal for use in composite structures.

The **UAB™ blind bolt** builds on the proven reliability and performance of the MS blind bolt by simplifying the installation process. One tool installs three different diameters, reducing tooling costs and facilitating robotic installation. The installed fastener provides greater spindle flushness for improved aerodynamic performance and cosmetic appearance. In addition, the blind side bulb of the fastener is enhanced to provide additional grip overlap and improved performance on sloped surfaces.

BLIND RIVETS



Alcoa Fastening Systems offers a wide variety of high performance blind rivets. Blind rivets are ideally suited for use in structures where access is limited. However, their reliability and ease of use make them a great alternative to solid rivets in many different applications. Alcoa Fastening Systems' heritage exceeds over 70 years in providing a large selection of high performance blind rivets that are the fasteners of choice for countless applications.

The **UNIMATIC® blind rivet** system is a general purpose blind rivet for aerospace applications. The bulbed blind head, mechanically-locked spindle and

unique hole-filling features provide higher reliability and strength than comparable blind rivets. This system meets or exceeds all of the rigorous design and performance requirements detailed in NAS1900, NAS1919, and NAS1921 specifications. The simplified single-action installation of these blind rivets permits the use of lightweight, reliable installation tools. The all-aluminum version of this system provides extremely lightweight high performance, while the Monel® alloy and stainless steel versions of this system provide high strength performance even at elevated temperatures, as well as superb corrosion resistance.

The **HuckMAX® blind rivet** system is a general purpose blind fastening system that combines important features of structural integrity and installation convenience. The system meets or exceeds all applicable requirements of industry specifications NAS1686 and NAS1687. In addition to high performance, the design of the HuckMAX® blind rivet system is such that only one tool is needed to install any diameter. This reduces the cost of assembly, and makes this fastener ideal for repair and



modification use as well as new designs. A variety of materials and headstyles make this blind rivet suitable for almost every application.

Huck-Clinch® blind rivets are precision-made aerospace fasteners produced to the requirements of MIL-R-7885 and NAS1686 procurement standards. The internal, integral lock makes them ideal fasteners for high-vibration, FOD critical applications. The enhanced hole-fill and sheet take-up capabilities of these fasteners provide superior ultimate and fatigue strength for the most demanding blind rivet applications. Like the HuckMAX® blind rivet system, one tool installs all diameters.

FLUID PRODUCTS

With a commitment to excellence and over 50 years of acquired experience, Alcoa Fastening Systems has earned its reputation as a supplier of top-quality fluid products. Our parts are used in many of today's fixed and rotary-wing commercial and military aircraft, engines, auxiliary power units, and tracked vehicles. Most of our fluid products are available in unified and metric sizes, and are manufactured from materials such as titanium, corrosion-resistant steel, low alloy steel, aluminum alloy, and Inconel® alloy. Tools are available for hole preparation, installation, and removal in support of our wide range of fluid products.

Ring Locked fluid boss adapters are designed with a captive locking that secures the adapter to the boss and prevents loosening or backing-off under severe vibration, temperature cycling,



or B-nut installation and removal. While considered semi-permanent, the adapters can quickly and easily be removed and replaced. Due to their small envelope, these adapters are significantly lighter than hex unions, resulting in weight reduction of the hydraulic package system. Standard tube-end configurations consist of beam seal, flared, and flareless. Variations of the standard design include reducers, expanders, port plugs, and solids.

Ring Locked fluid boss inserts are used in initial designs or to repair damaged ports. These products are able to provide high-strength surfaces in which unions are installed. A separate locking secures the insert to the boss, thus preventing loosening or backing-off under severe vibration, temperature cycling, or fitting installation and removal.

Standard fittings are used throughout the military and commercial aerospace markets. **Straight and shaped fittings** are available in a variety of configurations with both **37° flared** and **24° flareless** tube-ends. Other tube-end configurations include ball-nose, o-ring seal, pipe, bump, and weldable. Port plugs, sleeves, nuts, bushings, caps, and ferrules are available to complement all port configurations. Shaped products include 45° and 90° elbows, tees, crosses, swivels, and other unique configurations that meet special customer needs.

Conical or metallic seals effectively prevent leakage in critical applications. They eliminate potential problems caused by nicks, scratches, imperfect sealing surfaces or misalignment, as well as non-concentric conditions. The seals are easy to install and are effective in sealing light gases under extreme temperature and pressure conditions. Conical seals are designed to mate with 37° flared and flareless tube-end configurations.

Alcoa Fastening Systems also designs and manufactures a variety of **special fluid products** that meet specific customer design challenges. Some of these products include the characteristic "Ring-locked" principle. Other products such as **low profile 90° swivel boss adapter, ripple damper, bulkhead, and Klutch-Klip™ fitting** have been developed over the years.



INSERTS AND STUDS

Alcoa Fastening Systems has over 50 years of practical experience in the making of threaded inserts and studs, and offers the broadest selection available to serve the needs of the aerospace, industrial and automotive markets.

Alcoa Fastening Systems inserts and studs are available in both unified and metric sizes, and meet a variety of international standards. The parts are manufactured using a wide variety of materials including corrosion and heat-resistant steels, carbon and alloy steels, titanium, and Inconel® alloys. These high quality fasteners have become industry standards and individualized solutions to unique design problems. In addition, we offer tools for hole preparation, installation, and removal of our wide range of inserts and stud products.

KEENSERTS® inserts and studs are designed to provide high resistance to torque-out and pull-out loads. Pre-assembled keys are driven down through the threads of the parent material to mechanically lock the fasteners into place. The inserts are available with free-running threads or with various types of locking devices including deformed threads, Vespel® insert, and beam lock. The studs provide a nut-end thread designed to transfer high axial loads into weak base materials. The stud or keyed end is installed into the parent material, thus eliminating the need for removing or replacing a bolt.



Kelox® inserts and studs are high-performance threaded products that typically require smaller diameter installation holes than other solid bushing inserts and studs. This translates into overall reduced boss sizes and weight savings. The Kelox® fasteners incorporate a pair of self-broaching keys joined by an integral ring that facilitates the driving of the keys into the structure.

Ring Locked inserts and studs have superior torsional resistance in both hard and soft parent materials. Inserts are available with locking and non-locking threads.

Slimsert™ inserts have a thin cross section, which is ideal for installation into applications requiring minimum boss configurations. This allows for reduced casting weight while adding strength. The upper end of the insert is swaged into the counterbore wall of the parent material and locks it into place.

Delron® inserts are used primarily to provide a hard mounting point in sandwich structure panels. Structural type inserts offer maximum shear and column strength by gripping and supporting the face sheets from within the core area of the sandwich panel. Potted-in inserts are mounted through a single hole in the panel and resist shear and tension through a knurled flange on the body where potting compound flows.



INSTALLATION AND REMOVAL TOOLS

As the leader in aerospace fasteners, Alcoa Fastening Systems strives to fulfill all of our customers' needs. Those needs don't cease with the purchase of the right fastener. Once a part is chosen, it must be installed, utilized and possibly removed. To support our many fastener designs, which are engineered with usability in mind, Alcoa Fastening Systems provides a full line of installation tools, removal tools and inspection gages.

We are known for having the widest selection of ergonomically-designed manual, pneumatic, DC electric, and cordless tools.

Alcoa Fastening Systems is proud of its lineup of fastening tools for **Eddie-Bolt®2**, **Aero-Lite®**, **Ergo-Tech®**, **Hi-Lok®**, **Veri-Lite®**, **Visu-Lok®**, **KEENSERTS®**, **Rosan®**, and **Mark IV™ fasteners** and of its torque-controlled tools. These fastening systems include designs for every possible application.



Standard tools are available in pistol grip and 17° and 90° versions with offset attachments to increase usability. Each system features light, medium, and heavy-duty versions to install the smallest to the largest fasteners.

With its **Lease and Tool Management Programs**, Alcoa Fastening Systems offers customers the possibility of out-sourcing their tool maintenance and purchasing requirements. A tool

service technician can be placed on site to provide superior service.

For the installation of **blind rivets and blind bolts**, including The **HuckMax®**, **HUCK-CLINCH® blind rivets**, and other brands of blind fasteners, an extensive line of **pneudraulic and hydraulic tools** is available.

Lockbolt installation tools are also offered in both **pneudraulic and hydraulic models** to provide accurate installation of a variety of lockbolt brands and sizes.

No one knows assembly better than Alcoa Fastening Systems. For speed, accuracy, reliability, productivity, ergonomics, efficiency, and durability, you can depend on us. Custom, automated fastening systems make short work of difficult labor-intensive tasks, while specialty-access hand tools are the perfect complement to virtually any assembly need.



LATCHING SYSTEMS AND RELATED MECHANISMS

The premier manufacturer of latching mechanisms and avionics hold-down devices, Alcoa Fastening Systems brings its customers the in-depth experience of many years of working with major aerospace and industrial companies.

Structural latch assemblies are used in applications requiring elevated static and dynamic load-carrying capability for larger structures where ease of access for passenger entry, cargo loading, or maintenance is required. **Hook latches and keeper assemblies** offer high reliability and quick access when mounted onto engine fan cowls, fairings or thrust reverser structures. Low profile latches provide ease of closure and can be used in limited access areas. **Adjustable hook latches** are used in restricted envelopes where an adjustable keeper cannot be installed. The adjustment property offers quick rigging of the latch. **Rotary latches**, available in rotary cam or hook actuated versions, can be operated using standard tools.

Access door mechanisms provide ease of entry into frequently accessed panels, doors and hatches. **Pressure relief door latches** provide controlled, pressurization-sensitive release loads for engine cowls, fairings and thrust reverser doors. **Push-button latches** are available in both one and two-push button designs. The simplified "button" release offers ease of manual operation, facilitating



activation if maintenance is performed while wearing heavy gloves. **Clamps** are used for the installation and maintenance of wire bundles, hoses, tubing, cable, and conduits.

Pawl latches are designed to secure hinged panels and small doors. The pawl engages the frame structure through the axial rotation of an actuator that turns a wire-form or solid arm pawl. **Camloc® tension latches** are used to install light to heavy-duty hinged doors, panels, and structures. **Hinges** are utilized on a variety of door and panel applications.



Electronics latching mechanisms consist of a broad range of products serving the needs of the electronics industry. **Chassis latches** are offered in a wide variety of styles and strengths. Many are used for removable electronic drawers and can seat multiple-pin connectors or RFI gaskets. **Hold-down devices** are designed to secure avionics boxes and modules in a variety of aerospace applications. **Self-compensating injector/ejector levers** provide consistent self-compensation for circuit board installation tolerances. With minimal finger pressure, multiple-pin or fiber-optic connections can be seated with controlled forces ranging from 20 to 80 pounds.



Wedg-Tite™ retainers securely fasten printed circuit boards while providing heat transfer paths. Constructed for reliability, the Wedg-Tite™ retainer has a stop nut to prevent accidental disassembly and a spring element which prevents wedge segments from rotating in the unlocked position. A unique built-in torque limiter is available for accurate, controlled force installation without the use of a torque wrench and is ideal for use in high-vibration environments.

Latch handle systems are comprised of various types of mechanisms and provide a means of activating latch systems where access to, or visual contact of the latch mechanism, is limited.



Flush handle assemblies are used for cargo, APU or emergency door access. **Remotely operated latching systems** are designed for fan cowl, engine fairing and thrust reverser systems. **Multiple-pin latch assemblies** are used to stow removable or hinged door panels in interior or exterior applications.

Specializing in **custom latching devices** designed to optimize performance for specific applications, Alcoa Fastening Systems provides a complete, integrated design and product package. Our latch experts can develop solutions to your most critical and complex design problems. In addition, Alcoa Fastening Systems manufactures and assembles complete **structural assemblies** integrating our latches, hinges, and other fasteners for customers requiring complete fabrication of their end-item structural assembly.



NUTS

Alcoa Fastening Systems' legacy, since the 1930s, has been that of a worldwide industry leader in the development of precision locknuts. Among its many firsts are the all-metal, lightweight self-locking nut, and the **K-Fast™ system** for high-speed installation. Alcoa Fastening Systems offers a variety of configurations and materials for virtually any application, in both unified and metric sizes. The parts are manufactured to the most rigorous standards and meet or exceed the requirements of military, industry and customer specifications such as AS, ASNA, BAC, DIN, EN, ISO, MS, NA, NAS, and NSA.

A variety of lock designs are available including crimped upper threads for all-metal nuts and the **Nylstop®** nylon insert. The **Flat Beam™** and **MHT™ lock designs** incorporate six flexible flat beams, which maintain prevailing torque on the mating bolt 10 to 15 times longer than conventional all-metal locknuts, and increase resistance to loosening caused by vibration.



Precision-formed **wrenchable nuts** offer tremendous versatility in design and functionality. Configurations are hexagon, double hexagon, castellated, and spline. Additionally, a unique line of lightweight and high-strength titanium airframe nuts has been developed for composite applications.

Bearing locknuts are used to secure landing gears, airframe structures, bearings, gearboxes, power transmissions, and other turbomachinery applications. Configurations include prevailing



torque locknuts available with either a metallic or non-metallic locking feature. Another style includes the use of an engaging keyway on the shaft to provide a positive locking feature.

K-Fast™ nuts are the most widely used fasteners of their kind in both commercial and military airframe construction. These high-strength, vibration-resistant, self-locking fasteners provide fast, reliable, and repetitive installations with tools offered by Alcoa Fastening Systems. Configurations include hexagon, double hexagon, and 8-spline.



Anchor nuts are extremely practical for a broad range of material fastening applications. They are especially useful in blind applications or where an attached nut facilitates maintenance.

Shank nuts are used primarily in hot spots and are ideal for jet and rocket engine flange assemblies, such as exhaust manifolds, afterburners, and turbo pump turbine flanges.

Barrel nuts are high-strength, self-locking nuts that are provided for use with bolts of tensile strength up to 260 KSI, in locations where wrenching space is

virtually nonexistent, such as in a round hole of a forging or beam.

Clinch and stake nuts are designed for thin panels, narrow flanges and blind applications where hex nuts would be inaccessible for wrenching, or where conditions prevent the installation of an anchor nut in thin sheets of material.



Rivetless nutplates eliminate the need to retain nutplates with rivets, thus reducing weight and manufacturing costs. There is an added benefit of increased fatigue performance since the stress concentration associated with the rivet holes is eliminated. One design, the **Simfast™ rivetless nutplate**, is a multi-piece fastener that incorporates a replaceable nut element, and is used in both engine and airframe applications.

Gang channels are designed for applications that require multiple anchor-type nuts. They enable rapid assembly and disassembly of access panels.

MU2000™ composite plate nuts and gang channels are specialized, lightweight fasteners that are manufactured with composite materials and meet the requirements of structural aircraft applications. They help reduce weight, enhance lightning strike integrity, provide galvanic corrosion protection, and reduce the radar cross section of the structure.



PANEL FASTENERS

Alcoa Fastening Systems has built its reputation through a commitment to provide ingenious solutions to complex fastening requirements. Its renowned line of quick and easy access products, available in both unified and metric sizes, includes what have become industry standards.

Ultimate reliability in high-performance aircraft is achieved with the **Mark IV™ structural panel fastener**. Quick operation is assured through multiple lead threads and exceptionally high reusability is achieved with the Flat Beam™ locking feature that provides a 1,500 seated life cycle. A lightweight titanium version combines a 40% weight savings with equivalent mechanical performance.

High strength, quick operation, an encapsulated receptacle and an exceptionally high life cycle make **LiveLock™ structural panel fasteners** the optimal choice for high performance aircraft and electronic applications. The spring loaded ratchet design ensures positive locking action and vibration resistance without relying on prevailing torque. Additionally, the LiveLock™ panel fastener's multiple lead thread permits rapid installation and removal.

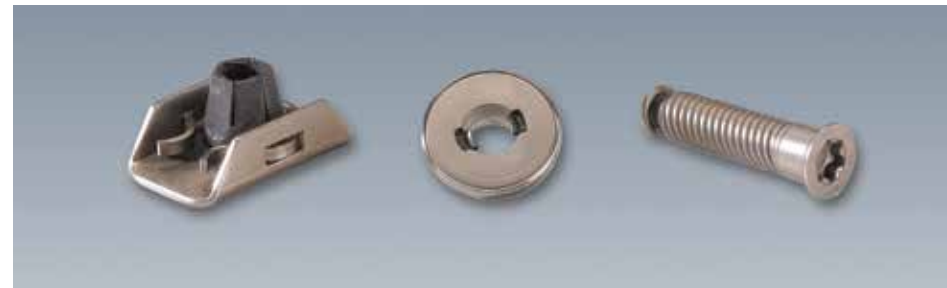
Combining structural soundness and accessibility, **Milson® structural panel fasteners** are in use on many aerospace applications. The Milson® system is one

of the only structural panel fasteners that feature variable length sleevebolts and receptacles, allowing single "dash number" sleevebolts or receptacles to be used on a given structure.

The **TriMil™ fastening system** eliminates problems associated with the self-locking or prevailing torque feature of other similar fasteners. In addition, its positively-locked retaining ring secures the sleevebolt to the cover when it is opened, eliminating the potential for FOD and ensuring reliable operation. Consequently, TriMil™ fasteners help avoid maintenance problems and aircraft safety concerns.

The **QR™ fastening system** is lightweight, has a small envelope, and is quick operating. Most versions lock and unlock in two turns.

The **FC43° panel fastener** is a self captivating structural panel fastener that incorporates a grommet and uses a full shank solid bolt for increased shear and tensile properties, especially



in the .1900 to .2500 inch diameters. The grommet makes this an ideal choice in composite applications, where pull-through, or delamination, is a concern. The stud bolt can be single or multiple lead threaded, and can be combined with the Flat Beam™ locking feature for exceptionally high reusability.

Designed to provide perfect alignment of chassis and plug-in modules of electronic equipment, **Eccentrix™ adjustable shear alignment pins** pro-

tect against damaging shock, shear loads and chassis warpage. The pins transfer shear loads from the chassis to the rack ahead of sensitive components which could otherwise be damaged. Easily adjusted with standard tools, Eccentrix™ pins eliminate the need for costly precision hole location and heavy precision slides, resulting in weight and cost savings.



Alcoa Fastening Systems supplies a wide variety of **captive screws** for any type of application where it is important that the attachment screw for a panel stays with that panel. Numerous head styles, recesses, sizes, configurations, and materials offer options that fulfill the requirements of any captive screw application. Fully-retracting captive screws automatically retract flush with the panel when released from mating threads, which allows equipment to be removed or installed without the possibility of jamming or damage.

Turn-Loc® captive screws are especially suited for front panel applications where easy fingertip operation is needed. The stainless or anodized aluminum finish, and the knurled knob, make this the perfect choice for good panel design and ease of access. They are available as fully or partially retracting versions in fixed or floating installations. Turn-Loc® fasteners are also available in low and high profile assemblies.

Alcoa Fastening Systems' range of **1/4-Turn fasteners** offers secure locking and quick unlocking with a simple 90° rotation of the stud, allowing for convenient and reliable servicing within high-reuse environments. These fasten-

ing systems provide excellent resistance to loosening from vibration and unlike threaded fasteners, 1/4-Turn fasteners do not rely on the elasticity of the joint and fastener materials for preload.

Grommets and hole-liners are used in non-metallic and soft or thin metallic structures. The precision thin-wall sleeves are flared, bonded or riveted to the structure and protect the parent material from damage due to fastener reuse and hole misalignment.



PIN FASTENING SYSTEMS

Alcoa Fastening Systems' pin fastening systems product line stands as one of the most widely known and respected in the aerospace industry. We are experienced in utilizing a variety of materials including titanium, alloy steel, and corrosion-resistant steel, and to produce these parts in both unified and metric sizes. Incorporating design principles of simplicity and utility, the end user is empowered to do more with less. Alcoa Fastening Systems also offers the required installation tools.

The **Eddie-Bolt® 2 fastening system** provides a permanent, structural, high-performance fastening solution for varied aerospace applications. Unlike conventional threaded systems, its unique free-running Eddie-Bolt® 2 nut design greatly simplifies installation. For installation in clearance fit holes or with sealant, the Spline-Lok® recess provides a higher reaction torque than the more conventional hex recess, further simplifying installation and reducing rework while improving tool life. When a predetermined preload is reached, the lobes on the Eddie-Bolt® 2 nut are deformed into and across the flutes on the Eddie-Bolt® 2 pin, creating a positive mechanical thread lock with no frangible parts that can cause foreign object damage. The system provides superior vibration resistance and high strength levels, while offering a weight savings over other systems.

Self-locking **K-Fast™** nuts are designed for use on Hi-Lok®, HI-TIGUE®, Veri-Lite®, and Aero-Lite® pins. Tools, also available



from Alcoa Fastening Systems, feature precise preload control for automatic installation and help provide the airframe industry with high-speed efficiency and cost effectiveness in production. The low-profile K-Fast™ nut allows for easy installation in limited access areas.

The unique design of the threads on the **Aero-Lite®** and **Veri-Lite® fastening systems** allow the overall length of the pin to be reduced while maintaining the same grip capability and strength level as those of the Hi-Lok® system it is based on. This enhancement reduces the weight of these systems by as much as 15% for applications where weight is critical.

The **Flite-Tite® fastening system** is designed specifically for composite skin applications where electrical conductivity is paramount, such as in applications subject to lightning strikes. The Flite-Tite® system uses a stainless steel or titanium sleeve to develop an interference fit without composite delamination, and provides the grounding needed through the structure. The system is available either with a titanium pin and nut for lightest weight, or with an Inconel® alloy 718 pin and nut for highest strength and temperature resistance.



The **Hi-Lok® two-part fastening system** delivers high-fatigue resistance without sacrificing strength in an efficient, dependable, all-purpose fastening system. Installation in difficult access conditions is no problem with Hi-Lok® fasteners and a wide range of sizes and material combinations make it a versatile solution for many assembly problems.

In situations where a controlled interference fit is needed, **HI-TIGUE® fasteners** offer all of the benefits of the Hi-Lok® system along with a unique bead design that enhances the fatigue performance of the structure.



BOLTS AND SCREWS

The bolts and screws manufactured by Alcoa Fastening Systems meet or exceed the most exacting requirements of the aerospace industry. Alcoa Fastening Systems' designers and manufacturing engineers provide the accumulated knowledge and experience necessary to develop bolts in materials such as alloy steel, corrosion-resistant steel, Inconel® 718 alloy, Waspaloy, titanium, and other super alloys. From micro-screws (1.6mm in diameter) to bolts up to 1-1/4 inch in diameter, and in lengths up to 14 inches, this vast product range is available in both unified and metric sizes.

Alcoa Fastening Systems' technical, metallurgical, and manufacturing skills are applied to produce **high-strength bolts, studs, double-ended studs and tie-rod bolts**. This talent serves to match the kind of structural materials and finishes used on present-day airframes and engines with fasteners of absolute reliability and superior strength. Depending on choice, considerable weight savings, superior corrosion resistance, and high strength-to-weight ratios may be gained. Configurations include **hex, 12-point, hook,**



D-head, slab head and spline head. Styles include **self-retaining** and **self-wrenching**. **Custom designs** are also available to meet our customers' exacting requirements.

The selection of recess drives available on Alcoa Fastening Systems' externally threaded products is comprehensive. The popular **cruciform-ribbed drive** with its cam-out resistant features is just the beginning. The **offset cruciform recess** provides torque-tight, tamperproof screws or bolts. The slanted three-wing design of the **tri-slot recess** ensures reliable insertion at above average torque, and for optimum security, only



the mating tri-slot driver can remove the fastener. The **Torx®** and **Torx Plus®** **recesses** provide reduced risk of both recess damage during installation, and damage to the structure when fasteners are removed. The conical **Hi-Torque recess** assures positive alignment of tool and recess at the beginning of installation, and is ideally suited to handle the stresses of hostile environments.



LOCKBOLT FASTENING SYSTEMS

The development of the first lockbolt fastener was pioneered in the mid 1940s. Since that revolutionary design, which greatly simplified the assembly of structures, Alcoa Fastening Systems has led the way with innovative designs that have been instrumental in improving structural integrity and reducing manufacturing costs around the world. Products are available in both unified and metric sizes. Installation tool systems are also offered.

NAS lockbolts are available in a number of materials and configurations designed to meet the most demanding application requirements. The collar, swaged into the lock grooves of the pin, forms a high-strength, vibration-resistant joint.

The **GP™** and **LGP® lockbolt** families improved on the NAS lockbolt family by optimizing the lock groove design. This optimization makes the GP™ and LGP® lockbolt systems significantly lighter than comparable threaded fastening systems.

The **HUCKCOMP® lockbolt** is a high-strength, lightweight fastener intended for use in composite material applications. The flanged titanium collar enhances joint integrity by spreading a high clamp load over a large area, thereby reducing the bearing stress applied to the composite material.

The **HUCKTITE® lockbolt** system has four features that are especially needed in composite structure joints: decreased



water absorption, improved fuel tightness, and enhanced fatigue performance and electrical continuity. These features make it the system of choice in the most demanding composite applications.

The **LHP™ lockbolt** has all of the benefits of the HUCKCOMP® lockbolt fastener with the added benefits of higher temperature performance and enhanced fatigue strength. These benefits are the result of the unique lock groove configuration and collar design of this system.

The **XPL® lockbolt** is the latest addition to the Alcoa Fastening Systems lockbolt family. With a grip range that is more than twice that of other systems, each part number can be used in more than twice the applications. This means fewer part numbers to inventory. The wide selection of materials and diameters make the XPL® fastener the most versatile lockbolt system ever.

The **Flite-Tite® sleeved-threaded lockbolt** is designed specifically for composite skin applications where electrical conductivity is paramount, such as in applications subject to lightning strikes. The Flite-Tite® system uses a stainless steel or titanium sleeve



to develop an interference fit without composite delamination, and provides the grounding needed through the structure. With a titanium pin and titanium collar, the Flite-Tite® system provides high performance with the lowest possible weight.

SPECIALTY PRODUCTS

Alcoa Fastening Systems has over 50 years of engineering, manufacturing and R&D experience to continually create variations of existing styles of fasteners and related components, as well as to address emerging needs for custom or special parts. In this regard, Alcoa Fastening Systems can provide concurrent design services, computer generated 3D solid models, and finite element analysis to help develop the exact solution to specific customer requirements.

A wide range of materials is utilized including brass, aluminum, alloy steels, corrosion-resistant steels, titanium, Inconel® alloys, Waspaloy, and super alloys. Products can be made in either unified or metric sizes.

The **E-M™ stud** is an electrical grounding stud that was developed in response to customer requests for an improved method of installing grounding terminals. The result is a timesaving fastener that is easily installed in a loose tolerance drilled hole, from one side of the work.

Our **spherical bearings and rod ends** are designed and produced to withstand high loads, high temperature environments, vibration, and corrosion. Many types of bearings are available,

ranging from the unique loader slot and loader slot rod end bearings, to split ball and split race. These bearings and rod ends are used in all types of aircraft applications such as nose and main landing gears, engine mounts, flight control surfaces, doors, etc.

Expandable Diameter Fasteners (EDF) use tapered sleeves or bushings that, when activated, expand to create a tight fit in a hole. The sleeves can be activated by various means, including the use of a nut or bolt for torque, or other mechanisms such as a wrap around cam handle. These fasteners provide a rigid structural joint. The radial tightness minimizes vibration and cyclic fatigue loads, and helps resist shock loads. EDFs are available in a variety of materials and finishes for extreme corrosive or high temperature environments.



The **Asp® fastening system** provides a simplified method of fastening composite, honeycomb, metallic, or other materials that are sensitive to fastener clamp-up or installation force conditions. Clamping force can be infinitely adjustable within maximum recommended torque limits and no further load is applied during installation. The Asp® fastener has a positive mechanical lock for use in vibration and FOD critical installations. It installs quickly and easily, thus eliminating the need for potting, bushings, inserts, or stepped hole preparation.

Other specialty products include shear, tie and brake bolts; thrust reverser and leading edge slat pins; adjusters; bushings; washers; nuts; inserts; and fluid fittings – as well as many other types of parts.

PRODUCTION TOOLING

With its Mairoll® brand, Alcoa Fastening Systems has been manufacturing the highest quality production tooling in the industry for more than 30 years. Offering a complete line of tooling products and services, including **flat and cylindrical dies, header tooling, thread die regrind, and cut-down services**, Alcoa Fastening Systems' Mairoll® is the supplier of choice for today's demanding aerospace and commercial user.

Thread dies feature Super M-42 material, which is vacuum heat-treated and tempered for maximum toughness and durability. This provides the longest possible thread rolling life. All dies are synchronized and center-matched to reduce variability in set-ups. Alcoa Fastening Systems' Mairoll® manufactures all standard, controlled major, and modified thread forms to meet customer needs. Custom form requirements can also be met. Precise and accurate thread forms assure the customer quality parts that meet or exceed today's stringent aerospace and commercial quality standards.

The **header tooling** line includes punches, hammers, and stamps in assorted sizes. Alcoa Fastening Systems' Mairoll® features a complete line of punches, including cruciform, cruciform-ribbed, offset cruciform, offset cruciform-ribbed, tri-slot, and many others. The tooling is manufactured from a variety of materials such as M-2, M-42, and various carbide grades. Tooling can be custom designed and manufactured to suit customer needs.



AEROSPACE PRODUCTS LOCATIONS

Manufacturing

- Acuña, Mexico
- Carson, CA
*Bolts, Pins, Collars, Lockbolts
Huck*
- City of Industry, CA
*Bolts, Pins, Screws
Screwcorp, Voi-Shan*
- Fullerton, CA
*Nuts, Fluid Products, Installation Tools,
Engine Bolts, Production Tooling
Kaynar, K-Fast, Mairoll, Rosán, Voi-Shan*
- Hildesheim, Germany
*Bolts, Pins, Screws
Screwcorp, Voi-shan*
- Kelkheim, Germany
*Inserts, Latching Mechanisms, Panel Fasteners
Camloc, Tridair*
- Kingston, NY
*Installation Tools
Huck*
- Leicester, UK
*Bolts, Tie-Rod Bolts
North Bridge*
- Casablanca, Morocco
Machined Parts, Tooling
- Montbrison, France
*Bushings, Fluid Products, Nuts, Specialty
Products
SNEP*
- Nemesvamos, Hungary
Nut Blanks, Industrial Inserts
- Newbury Park, CA
*Nuts, Engine Bolts
Republic, Van Petty*
- Redditch, UK
*Bolts, Lockbolts
Linread*
- Saint-Cosme, France
*Nuts, Machined Parts
Simmonds*

- Sylmar, CA
*Bearings, Bolts, Studs, Specialty Products
Valley-Todeco*
- Suzhou, China
*Pins, Lockbolts, Panel Fasteners
Huck, Camloc*
- Torrance, CA
*Blind Fasteners, Collars, Inserts & Studs,
Latching Mechanisms, Panel Fasteners
Camloc, RAM, Voi-shan, Tridair, Rosán,
Delron, Microdot*
- Toulouse, France
*Bolts, Screws, Specialty Products
Mecaero*
- Tucson, AZ
*Blind Bolts, Blind Rivets, Panel Fasteners
Huck, Deutsch*
- Us, France
*Lockbolt Pins, Threaded Fasteners
Huck*

Sales

- Arlington, TX
- Cergy, France
- Hamburg, Germany
- Leesburg, VA
- Leicester, UK
- Takatsuki City, Japan
- Torrance, CA
- Toulouse, France

Distribution / Logistics

- Aichach, Germany
- Cergy, France
- Waigaoqiao, China
- Simi Valley, CA

Headquarters

- Torrance, CA - Worldwide
- Rueil-Malmaison, France - Europe

**Alcoa
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