

MAF **MONOGRAM**
AEROSPACE
FASTENERS

a TRIMAS company

Over 115 Years of Leadership
in Fastener Technology

“Providing our customers
with a total commitment
to operational excellence
in product quality and services”



With over 115 years of service to the fastener industry, Monogram Aerospace Fasteners has established itself as the recognized leader in blind bolt technology in the aerospace industry. Headquartered in Los Angeles, California, Monogram serves the world's markets through a network of dedicated sales professionals and authorized distributors.

Innovation

Bringing problem solving products to market is nothing new at Monogram. Our **Visu-Lok®** fastener pioneered blind bolt technology, and for well over a quarter century has remained an integral part of aircraft assembly. With the advent of composite aircraft structures came new fastener challenges. Again, Monogram led the way with a blind fastener design that achieved consistent high preload without the risk of composite delamination. Today **Composi-Lok®** is approved on virtually all composite airframe programs throughout the world and the new **Composi-Lok3**, in keeping with Monogram's commitment to a lower installed cost design philosophy, is shavefree, providing the performance and reliability of our ComposiLok with the added benefits of a flush break. Unique in the industry is Monogram's **Radial-Lok®** blind bolt. Offering 360° radial expansion throughout the fastener grip, its design properties are unmatched by any other blind bolt. The revolutionary **OSI-Boit®** is a direct replacement for solid shank pin and collar systems. The innovative design of this high strength fastener for primary structure delivers strength with the added advantages of simple one-sided installation and a flush break-off for installed cost savings in both metal and composite structure. And now the new **Ti-OSI®** delivers all these advantages in a weight saving configuration. Our latest innovation is another industry first. The **Mechani-Lok™** teams a mechanical lock, large blind upset, absolutely flush break and 95 KSI shear strength and joins the OSI in our growing suite of high strength fasteners for primary structure. Our Visu-Lok, Composi-Lok, Radial-Lok and OSI fastening systems are all easily adapted for robotic installation by incorporating Monogram's ingenious **Double Cylindrical Drive Nut Concept**. This patented design significantly reduces tooling requirements while achieving additional cost savings through trouble-free installation. Monogram remains committed to its leadership role as the premier manufacturer of innovative fasteners, delivering lower installed cost solutions to the aerospace industry and is currently developing other problem solving solutions to meet tomorrow's aerospace challenges.

Unrivaled Quality

“Providing our customers with a total commitment to operational excellence in product quality and services” is not just our Quality Policy Statement; it is a philosophy embraced by the whole Monogram team. Our focus on Six Sigma, Kaizen, Design of Experiment, Lean Practices and a relentless company-wide pursuit of continuous improvement combine to yield products of unrivaled quality.

Technical Support

A hallmark of Monogram's success, technical support continues to be a key element of our customer focus. No matter what is required, from a simple part number cross reference to around the clock on-site product support, Monogram has the resources and dedication to resolve your problem.

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OSI-BOLT® Ti-OSI® - NEW!

Unique High strength fasteners for primary structure specifically designed as a direct replacement for solid shank pin and collar systems

Features

- Directly interchangeable with standard and oversize pin and collar systems
- Interference fit capabilities (.006" in aluminum and .003" in steel)
- 95 and 112 KSI Shear systems
- Always breaks flush; no corebolt shaving required
- Full 1/16" (.0625) grip accommodations
- Robotically compatible using Monogram's patented double cylindrical drive system
- High resistance to vibration



NEW! MECHANI-LOK™

Lightweight 95 KSI blind bolt with mechanical locking feature for primary structure

Features

- Mechanically locked – acceptable for installation forward of engine air inlets
- Can replace pin & collar systems in many applications
- 95 KSI shear strength
- High preload retention – 50% of tensile strength
- Absolutely flush break-off – no shaving or filling
- Disposable drive nut facilitates installation and eliminates "cam-outs"
- Compatible with robotic installation

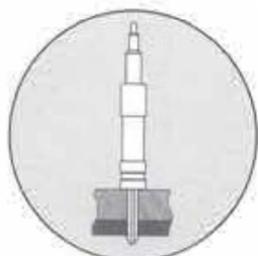


Cylindrical Body

Temporary blind fastener for use in composite and metallic structures

Features

- Easy installation
- 40% time savings in installation and removal efficiency
- Ideal for robotic applications
- Simplified patented installation tooling
- Spring loaded versions available for sealant applications
- No tool to fastener orientation problems
- Pressure sealing versions available



Other Temporary Fasteners

Clamps, template fasteners, drilling aids, plier operated fasteners and more

Features

- Wide range of fastening methods
- Lightweight
- Imperial or metric sizes
- Specials
- Reusable
- Durable
- Simple to use



Installation Tooling

Wide range of hand and power installation tooling for use with Monogram products

Features

- Manually operated tooling
- Pneumatic motors
- Special applications



CMX - NEW!

New mandrel style fastener uses the same tooling as the popular cylindrical CBX series

Features

- Large contact area
- Positive four-wire alignment





NEW! COMPOSI-LOK[®] 3

All the performance and reliability of Monogram's Compositi-Lok now with a flush break-off

Features

- Same mechanical properties
- Same large blind upset
- Same high preloads
- Compositi-Lok3 is shave free

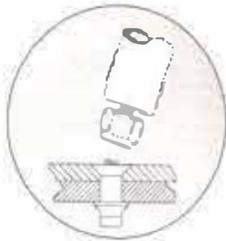


Compositi-Lok II[®]

High strength blind bolt for composite and metallic materials.

Features

- Large blind side upset
- Lightweight
- Visual locking feature
- Controlled clamp-up
- Lower total installed costs
- Simplified long life tooling
- Fuel tight sealing capability

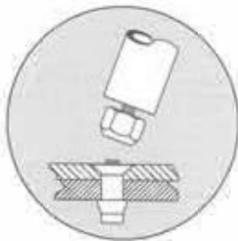


Visu-Lok II[®]

High strength blind bolt for use in metallic structures

Features

- High clamp-up
- Self-locking
- Self-inspecting
- Lower total installed costs
- Use of existing NAS1675 tooling
- Wide range of materials, grip lengths, diameters and head styles



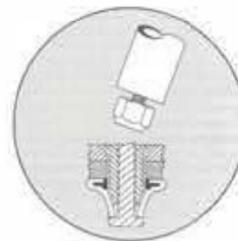
Hundreds of fastener configurations — one common tool

Radial-Lok[®]

High strength, hole filling fastener for use in composite and metallic structures

Features

- Radial expansion of up to .005"
- High clamp-up
- Highly resistant to vibration
- Available 3/16" to 3/8" diameters
- Tighter joints
- .100" grip accommodations
- Clearance fit before installation

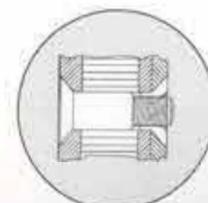


MAF[®]

Adjustable preload fastener for soft core and composite materials

Features

- Adjustable clamp-up
- Positive mechanical lock
- Ideal for vibration applications
- Multiple head style combinations
- Available in three materials



COREBOLT SHAVER & MILLER Precision Finishing Tools



Corebolt Shaver (MAPS-01) Unique tool for shaving corebolt break-offs that must meet flushness requirements

Features

- 30,000 rpm promotes swift corebolt "slicing"
- Lightweight
- One handed operation
- Cutting depth increments of .001"
- Precision set up with use of new depth adjustment gage

Corebolt Miller (MAPM SERIES)

Corebolt trimming unit for precise cutting and flushing requirements

Features

- Ideal for milling corebolts on recessed fasteners
- Operates with any drill motor
- .001" cutting increments
- Locating nibs on nose piece help prevent drifting while cutting
- Compact design fits in the palm of your hand
- Facilitates "below flush" corebolt finishing



Fastener Removal Kit



For Visu-Lok, Composi-Lok, OSI & Radial-Lok fasteners

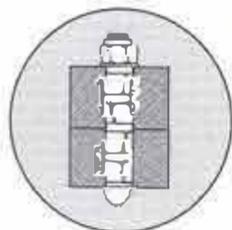
Features

- Precision fixturing
- Fastener removal without damaging existing hold
- Removes all head styles
- Vacuum centering pad to ensure centerline cutting
- Trouble-free setup
- Portable

Adjustable Bushing Manually operated radial expansion fasteners

Features

- Ideal for vibration applications
- Removes structural play
- Provides accurate alignment
- Permits quick release fastening
- Allows for blind fastening
- Provides interference fits with commercial hole tolerances





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MECHANICALLY LOCKED BLIND BOLT

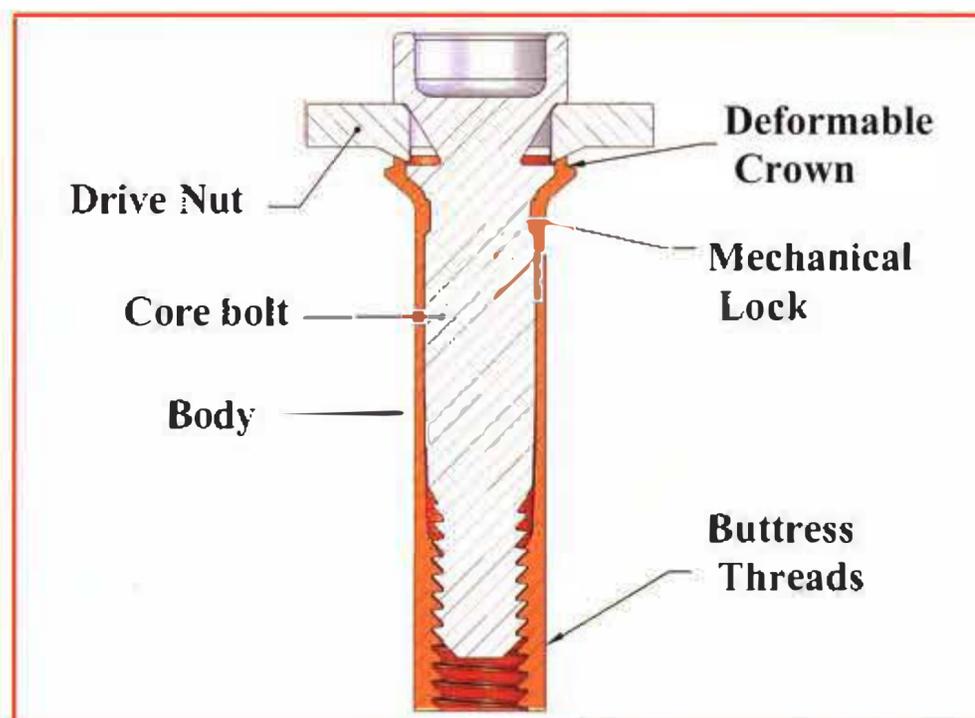
Another FIRST from MONOGRAM AEROSPACE FASTENERS



Mechani-Lok™ 95 KSI BLIND BOLT for PRIMARY STRUCTURE

Los Angeles, CA - June 2007: The Mechani-Lok (MLA-Series) blind bolt is a new addition to Monogram's growing suite of high strength fasteners for primary structure. The MLA is a two-piece, 95 ksi shear strength bolt designed for installation in both laminated composites and high-strength metal alloys. The A-286 CRES body and Ti-6-6-2 titanium alloy core bolt are mechanically locked together during assembly at the factory and cannot separate in service. Upon installation, the tail of the body forms a large blind side upset against the tail side panel surface to mechanically lock the assembly to the structure. Preload is retained because the core bolt is set by torsion, avoiding the recoil of pull-type blind bolts. The installed flushness of $+0.000"/\pm 0.010"$ eliminates the need for post-installation shaving and filling. Installation is assisted by means of a disposable drive nut, eliminating the operator or worn tooling as a source of installation errors.

The Mechani-Lok was initially designed to incorporate the advantage of a mechanical lock with the advantages of high preload retention, large blind upset and ease of installation already present in Monogram's blind fastening line. These characteristics, in addition to MLA's light weight and shallow blind side protrusion in comparison to other structural fasteners, make the MLA ideally suited to the new A350, A380 and B787 platforms as well as potential military applications. The suitability for composites, aerodynamic flushness, and easy adaptation to robotic installation make this fastener an ideal replacement for current pull-type blind bolts and pin & collar fasteners such as lock bolts, Hi-Lites® and Eddie Bolts®.

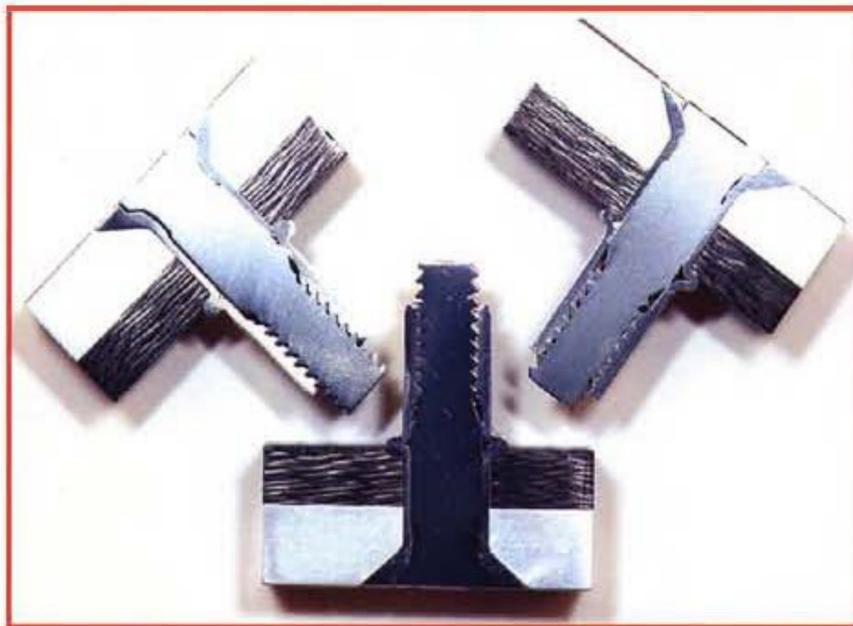




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FEATURES

- Mechanically Locked → Acceptable for installation forward of engine air inlets
- 95 KSI Shear Strength
- High Preload Retention (>50% of Tensile Strength)
- Absolutely flush break-off → no shaving or filling
- Disposable drive nut facilitates installation & eliminates “cam-outs”
- Compatible with Robotic Installation
- Can replace pin & collar systems in many applications



Mechani-Lok™

95 KSI BLIND BOLT for PRIMARY STRUCTURE

US Patents Applied For and Pending

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(Hi-Lite is a registered trademark of Hi-Shear Corporation. Eddie-Bolt is a registered trademark of Alcoa Fastening Systems.)

MONOGRAM AEROSPACE FASTENERS - HIGH STRENGTH BOLT COMPARISON

| Fastener (Titanium Nut Component Part Number Reference) | Materials (1) | Nominal Shank Dia. (Inches) | Available Oversize | Grip Range (Inches) | Grip Overlap | Rated Shear Strength | Double Shear (pounds) | Tensile Strength (pounds) | Preload (pounds) | Footprint (Inches) | Blind Side Protrusion | Back Side Max Slope | Flush Pin Break - Head Recesses | Interference Fit | Structural Material | Installed Weight | Ease of Installation | * Robot Ready** |
|--|---|-----------------------------|--|---------------------|----------------|---|---|---|--|---|-----------------------|---------------------|---|---|-----------------------|-----------------------|---|--|
|  View-Lok 110 PLT5170-06-08 | NUT BODY & SCREW 6-4 Titanium SLEEVE Stainless | 1990 1970 | 1st (1/64) and 2nd (1/32) | .063 | None | 75 M61 | 4,000 minimum required - 5,300 typical | 1,400 minimum required - 1,600 typical | 280 minimum required (20% of min UTS) - 1,200 typical | .300 maximum allowed - .290 typical | .286" | 7° | Shaving required - Recesses  | Yes. Close to blank ground shank - Interference to .0035" | Metal | 4.55 lbs. per 1000 | One-sided access - drive-nut simplified | Yes With Patented Double Cylindrical Drive (DCD) Technology |
|  Composi-Lok 110 MBF2112-06-500 | NUT BODY 6-4 Titanium SCREW & SLEEVE Stainless | 1995 1970 | -07 (7/32") -09 (9/32") -11 (11/32") | .050 | None | 75 M61 | 4,600 minimum required - 5,200 typical | 1,400 minimum required - 1,900 typical | 560 minimum required (40% of min UTS) - 1,000 typical | .300 minimum required - .315 typical | .350" | 7° | Shaving required - Recesses  | No | Metal or Composite | 6.45 lbs. per 1000 | One-sided access - drive-nut simplified | Yes. With Patented Double Cylindrical Drive (DCD) Technology |
|  Composi-Lok 310 MBF2312-06-500 | NUT BODY 6-4 Titanium SCREW & SLEEVE Stainless | 1996 1970 | -07 (7/32") -09 (9/32") -11 (11/32") | .050 | None | 75 KSI | 4,600 minimum required (2) - (2) | 1,400 minimum required (2) - (2) | 560 minimum required (40% of min UTS) (2) - (2) | .300 minimum required (2) - (2) | .420" | 7° | Flush Break - Recesses  | No | Metal or Composite | 7.37 lbs. per 1000 | One-sided access - drive-nut simplified | Yes With Patented Double Cylindrical Drive (DCD) Technology |
|  Radial-Lok 110 MRL3212-06-500 | NUT BODY 6-4 Titanium SCREW Inconel SLEEVE Stainless | 1970 | -07 (7/32") -09 (9/32") -11 (11/32") | .100 | None | 75 KSI | 4,800 minimum required - 5,300 typical | 1,600 minimum required - 2,300 typical | 700 minimum required - 1,000 typical | .290 minimum required - .310 typical | .500" | 7° | Shaving required - Recesses  | Yes. Up to .006" via unique radial expansion during installation | Metal or Composite | 6.55 lbs. per 1000 | One-sided access - drive-nut simplified | Yes. With Patented Double Cylindrical Drive (DCD) Technology |
|  Ti-OSI Bolt 110 BG2082-06-08 | BODY 6-4 Titanium COREBOLT 6-6-2 Titanium SLEEVE Stainless | 1895 1885 | X (1/64) and Y (1/32") | .063 | +010" -010" | 95 M61 (No Unmated in bearing) | 5,300 minimum required - 6,000 typical | 1,800 minimum required - 2,400 typical (Meets spec requirements of HL11 with HE 79 Aluminum Collar) | 800 minimum required (50% of min UTS) - 1,200 typical | .290 minimum required - .305 typical | .750" | 7° | Flush +/- .010" - Recesses  | Yes. Up to .006" In aluminum | Metal or Composite | 5.62 lbs. Per 1000 | One-sided access - drive-nut simplified | Yes. With Patented Double Cylindrical Drive (DCD) Technology |

(1) Additional material combinations, head styles, and diameters available - Contact Monogram Aerospace Fasteners Ph: (323) 722-4760 Fax: (323) 721-1851 Web: www.monogram-aerospace.com

(2) Typical values are anticipated to be equal to those of Composi-Lok II

* Monogram's OSI-Bolt is designed as a direct replacement for solid shank pin and collar systems; its shear, tensile and preload properties meet or exceed those of its pin and collar counterparts