Product Overview
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Special Sandwiched Structure Fasteners
Threaded Bolts

12-POINT HEAD

HEX HEAD

FLUSH HEAD/RECESS DRIVE
The 12-Point Head Threaded Bolt

12-Point (or Double Hex) Head Bolts

- Designed to be used for high load tensile applications. The 12-point head allows the bolt to be torqued at high values to the desired joint preload, without damage to the head. Manufactured from high strength material to provide minimum tensile strength values of 160KSI, 180KSI, and 220KSI.

- Sample parts:
  - MS9750 (Double Hex/Extended Washer)
  - MS9759 (Double Hex/Extended Washer)
  - MS14163 (Spline Drive)
  - MS14181 (Spline Drive)
  - MS21134 (Spline Drive)
  - MS21250 (12-Point/Extended Washer)

- Sample parts:
  - BACB30MR (12-Point/Extended Washer)
  - BACB30PN (12-Point/Extended Washer)
  - BACB30US (12-Point/Extended Washer)
  - BACB30UU (12-Point/No Washer)
The Hex Head Threaded Bolt

- **Hex Head Bolts**
  - Designed for general purpose applications. Manufactured from high strength material to provide a minimum tensile strength value of 160KSI.
  - Sample parts:
    - NAS673 – NAS678
    - NAS6203 – NAS6220
    - NAS6303 – NAS6320
    - NAS6403 – NAS6420
    - NAS6603 – NAS6620
    - NAS6703 – NAS6720
    - NAS6803 – NAS6820

- Sample parts:
  - BACB30LJ
  - BACB30LM
  - BACB30NM
  - BACB30NR
The Flush Head/Recess Drive Threaded Bolt

• **Flush Head/Recess Drive Bolts**
  – Designed for general purpose applications. Manufactured from high strength material to provide a minimum tensile strength value of 160KSI.

  – Sample parts:
    • NAS1580 (Offset Cruciform Recess)
    • NAS1581 (Offset Cruciform Recess)
    • NAS4304 – NAS4316 (Tri-Slot Recess)
    • NAS4603 – NAS4616 (Tri-Slot Recess)
    • NAS4903 – NAS4916 (Tri-Slot Recess)
    • NAS7303 – NAS7316 (Offset Cruciform Recess)
    • NAS7603 – NAS7616 (Offset Cruciform Recess)
    • NAS8703 – NAS8716 (Phillips® Recess)

  – Sample parts:
    • BACB30NN (Phillips® Recess)
Threaded Pins

- HI-LOK®
- HI-TIGUE®
- VERI-LITE®
- AERO-LITE®
- S-PIN (GRIMM PIN)
- TAPER-LOK®
- HUCKRIMP® & NUT
- EDDIE-BOLT® 2 & NUT
The Hi-Lok® Threaded Pin

• **Hi-Lok® Pins**
  - The Hi-Lok® pin is one component of the simple two-part fastener system engineered to control the applied torque. The controlled preload improves the fatigue life of the structure. The pin may be installed in an interference fit or clearance fit hole and is held stationary while the Hi-Lok® collar is rotated. At the designated torque level, the hex portion of the collar breaks free.
The Hi-Tigue® Threaded Pin

- **Hi-Tigue® Pins**
  
  The Hi-Tigue® pin is a modified Hi-Lok® pin with an additional subtle bead on the transition radius of the fastener. This design improves the fatigue life and overall performance of the fastened structure. The pins are pressed into interference fit holes. The pin is held stationary while the Hi-Tigue® collar is rotated. At the designated torque level, the hex portion of the collar breaks free.
The Veri-Lite® Threaded Pin

- **Veri-Lite® Pins**
  - The Veri-Lite® pin is a modified Hi-Lok® pin designed to decrease weight and envelope. The Veri-Lite® system achieves full performance, along with the reduced weight. It is the reduction in thread transition of the Veri-Lite® pin, in combination with the the reduction in counterbore depth and overall height of the collar, which adds to the substantial weight savings. The pin may be installed in an interference fit or clearance fit hole and is held stationary while the Veri-Lite® collar is rotated. At the designated torque level, the hex portion of the collar breaks free.
The Aero-Lite® Threaded Pin

- **Aero-Lite® Pins**
  - The Aero-Lite® pin is a modified Hi-Lok® pin designed to decrease weight and envelope. The Aero-Lite® system achieves full performance, along with the reduced weight. It is the reduction in thread transition of the Aero-Lite® pin, in combination with the reduction in counterbore depth and overall height of the collar, which adds to the substantial weight savings. The pin may be installed in an interference fit or clearance fit hole and is held stationary while the collar is rotated. At the designated torque level, the hex portion of the collar breaks free.
The S-Pin (Grimm Pin) Threaded Pin

- **S-Pin (Grimm Pin)**
  - Threaded fastening system which utilizes interference fit (no broach hole) for installation of pin and nut.
  - S4931917 100° Flush Crown Head (6AL-4V Titanium)
  - S4931918 Close Tolerance Protruding Head (6AL-4V Titanium)
  - S4931919 100° Flush Crown Shear Head (6AL-4V Titanium)
  - S4931920 Protruding Head (6AL-4V Titanium)

Developed in 1970
The Taper-Lok® Threaded Pin

- **Taper-Lok® Pins**
  - Advanced concept fastening system that improves the fatigue life of aerospace structure. It is an integrated fastening system comprised of a tapered, conical-shank fastener, a precision tapered hole, and uniformly controlled interference preloading. The static preload, radial compression, and peripheral tension induced by the interference fit effectively reduces stress amplitude to proportionately enhance the fatigue life.

*Developed in 1960*
The Huckrimp® Fastening System

- **Huckrimp® Fastening System**
  - The Huckrimp® Fastening System is a unique method of locking the nut on a threaded pin and providing preload to a joint. The system produces superior vibration resistance and very closely controlled joint preloads. The preloads can be controlled from 20% - 90% of yield, as required.
  - The nut locking and joint preload is obtained by cold working the Krimpnut with a crimp tool after the nut has been installed on a Krimpin. This crimping action flows nut material into the pin threads and serrations which provide a positive nut locking. The crimping action also flows nut material toward the sheet line which produces pin preloads and joint clamp force.

- Sample Part Numbers
  - KS100-AC Krimpin
  - KSP-AC Krimpin
  - KN-3AC Krimpnut
  - NAS4450 Krimpin
  - NAS4445 Krimpnut

*Developed in 1967*
The Huckrimp® Fastening System

1. Krimpnut® threaded onto the Krimpin®
2. Installation tool placed on the Krimpnut®, integral stop automatically positions crimp jaws
3. Installation tool is actuated and the crimp jaws are impressed into the Krimpnut®
4. A conventional “go / no-go” Huckrimp® inspection gage may be used to check for proper crimping
The Eddie-Bolt® 2 Fastening System

- **Eddie-Bolt® 2 Fastening System**
  - The design incorporates a fluted pin and matching nut with lobes which provides a positive lock, free-running threads on the nut, and no frangible parts. This system affords automatic preload, no F.O.D., easy installation, minimum tool change, no required torque control, and allows for visual inspection.

  - The Eddie-Bolt® 2 Fastening System is comprised of three components:
    - The Eddie-Pin™ which is recognizable by its five flutes, equally spaced on a portion of the thread area.
    - The Eddie-Nut™ which is distinguishable by three prominent, equally spaced lobes.
    - The Eddie-Bolt® 2 tooling.
Collars

HI-LOK®
HI-TIGUE®
VERI-LITE®

SPIN-LOK®
The Hi-Lok® Collar

- **Hi-Lok® Collars**
  - The Hi-Lok® collar is one component of the simple two-part fastener system engineered to control the applied torque. The controlled preload improves the fatigue life of the structure. The pin is held stationary while the Hi-Lok® collar is rotated. At the designated torque level, the hex portion of the collar breaks free.
The Hi-Tigue® Collar

• **Hi-Tigue® Collars**
  
  The Hi-Tigue® collar is part of a two part system where the Hi-Tigue® pin has an additional subtle bead on the transition radius of the fastener. This design improves the fatigue life and overall performance of the fastened structure. The pins are pressed into interference fit holes. The pin is held stationary while the Hi-Tigue® collar is rotated. At the designated torque level, the hex portion of the collar breaks free.
The Veri-Lite® Collar

- **Veri-Lite® Collars**
  - The Veri-Lite® collar is a modified Hi-Lok® collar designed to decrease weight and envelope. It is the reduction in counterbore depth and overall height of the collar, which adds to the substantial weight savings.
The Spin-Lok® Collar

• Spin-Lok® Collars
  – Free running nut developed to eliminate “spinners”. Thread lock is generated near end of assembly cycle causing collar material to be deformed into the threads of the pin forming a “solid circle” lock.

  – Available in following configurations:
    • A-286 CRES
    • 3AL-2.5V Titanium
    • Frangible or non-frangible
    • Shear, shear/tension, tension applications

  – Metallic and composite structure applications.

  – Product is still in manufacturing verification stage.

(Non-frangible version shown)

Developed in 1997
The Spin-Lok® Collar

1. Pin installed in hole
2. Collar threaded on pin
3. Hex key inserted, collar lock formation begins
4. Locking gap closed, collar installation complete

SPIN-LOK® Collar Installation Sequence on Composite Structure (Non-frangible Version Shown)
The Anchor (Plate) Nut

- **Anchor (Plate) Nuts**
  - Each nut contains one or more mounting lugs projecting from the base of the threaded body. The mounting lugs may be riveted, screwed, or welded to the structure.
  
  - Each nut provides permanent attachment for threaded fasteners in inaccessible or blind locations and assures positive positioning of the mating bolt.
  
  - Available in non-floating (fixed) or floating configurations.
The Rivetless Nut Plate Fastening System

- **Rivetless Nut Plate Fastening System**
  - Originally developed for aluminum material applications.
  - Available in following configurations:
    - Standard Floating Nut Plate
    - Variable Nut Height Nut Plate
    - High Temperature Nut Plate
    - All CRES Nut Plate
    - Self-Sealing Nut Plate
    - Low Profile Self-Sealing Nut Plate
    - Standard Fixed Nut Plate

*(FF6010 shown)*

*Developed in 1966*
The Rivetless Nut Plate Fastening System

Rivetless Nut Plate Installation Sequence
The Barrel Nut

- **Barrel Nuts**
  - High strength, self-locking nuts designed for use with high strength bolts of tensile strength up to 240 KSI.
  
  - Used in locations where wrenching space is not available for regular nuts, such as round mounting holes of a forging or a fitting. The use of barrel nuts eliminate the need for threads in structure, making them suitable for tension joints.
  
  - Available in non-floating (fixed) and floating configurations.

*Spring clip purchased separately*
The Bearing Locknut

- **Bearing Locknuts**
  - Bearing locknuts provide a positive rotational lock between bearing shaft and locknut wherever vibration is a factor, or where precise torque setting must be held.

  - The locknut uses a thin round nut in combination with a tab lock washer, and can be self-locking or non-locking. The nut has external slots for spanner wrenching.

  - Another configuration is a one-piece thin nut with a built-in nylon or Vespel® insert.
• **Castellated Nuts**
  - Standard hex nuts with slots milled across the face. They can be used for general purpose fastening, or can be adapted to locking features by inserting a cotter pin or safety wire through the slots of the nut and the drilled hole through the threads of the bolt.
  - Available in non-locking or self-locking configurations.

*Cotter pin purchased separately*
The Clinch (Press-Lock) & Stake Nut

- **Clinch (Press-Lock) & Stake Nuts**
  - Designed for blind applications where hex nuts would be inaccessible for wrenching, or where conditions prevent the installation of an anchor nut.
  
  - The solid, threaded nuts are pressed into round holes in soft sheet metal. The nuts have a reduced diameter section and serrated or slotted ring which, combined with cold flow of displaced metal, locks the nut in place.
  
  - Available in many configurations, including hex, round, fixed, or floating styles.
The Double Hex (12-Point) Nut

- **Double Hex (12-Point) Nuts**
  - Double hexagon (also known as 12-point) nuts are used in tension applications where 125 KSI to 300 KSI nuts are required.
  
  - Available in various dimensions, material, finish, strength, weight, and temperature limits.

  - Available in non-locking or self-locking configurations. The self-locking nuts are either one-piece, all-metal with deformed upper threads (crimp), or have a nylon or Vespel® locking insert. Also available in self-sealing configuration.
The Flatbeam™ Locknut

- **Flatbeam™ Locknuts**
  - Designed to provide up to 250 seated cycles – more than 10 to 15 times the cycle life of standard nuts. These locknuts considerably extend bolt life while reducing maintenance costs. The design utilizes six flexible flat beams to provide critical prevailing torque on the bolt threads. Permanent deformation of the beams is prevented because each beam is flat, allowing them to return to their normal position after each installation and removal cycle.

  - Available in hex nut, double-hex nut, barrel nut, and one-lug or two-lug anchor nut configurations.
The Gang Channel

- **Gang Channels**
  - Single-unit assemblies designed for applications that require multiple anchor type, self-locking nuts. They enable rapid assembly and disassembly of structure sections.
  
  - Available in straight and radiused versions, in a variety of width, length, radius, and nut spacing specified by the customer. Non-floating (fixed), floating, self-sealing dome, self-aligning, shielded, high-reusability, or deep-counterbored nuts are channeled, and can be permanent or replaceable.
Mu2000™ Composite Gang Channel

- **Mu2000™ Composite Fasteners-Anchor Nuts & Gang Channels**
  - Designed for use in structural applications in aircraft manufactured from composite materials. The fasteners help reduce radar visibility, enhance lightning strike integrity, and provide galvanic corrosion protection.

  - Available in gang channel and plate nut configurations, with a combination of composite and metallic components. The composite baskets and channels are manufactured from carbon fiber composite materials. The nuts are made from corrosion resistant steel.
The Hex (6-Point) Nut

- **Hex (6-Point) Nuts**
  - Hex (also known as 6-point) nuts are used in shear applications where up to 160 KSI nuts are required.
  - Available in various dimensions, material, finish, strength, weight, and temperature limits.
  - Available in non-locking or self-locking configurations. The self-locking nuts are either one-piece, all-metal with deformed upper threads (crimp), or have a nylon or Vespel® locking insert. Also, available in self-sealing and/or self-aligning.
The K-Fast® Nut

- **K-Fast® Nuts**
  - K-Fast® nuts are high strength, vibration-resistant, self-locking fasteners that offer fast, reliable, and repetitive installations with K-Fast® tools. Both are part of the K-Fast® Fastening System, which includes the most comprehensive array of high-speed installation tools available.

  - Available in lightweight, hexagon, double hexagon, 8-spline configurations. Self-sealing and self-aligning nuts, also available.
The Self-Locking Union (Pipe) Nut

- **Self-Locking Union (Pipe) Nuts**
  - Self-locking design to eliminate the use of a lock wire
  - Up to 30 cycles reuse
  - Lightweight

Access hole to insert wire
The Shank Nut

• Shank Nuts
  – Designed to endure enormous stresses and extreme temperature. They are primarily used in hot spots on jet and rocket engines. The design of the shank nuts provide three desirable features: self-locking, self-retaining, and self-wrenching.

  – Available in D-shape, trapezoidal shape, bent tab, and slab sided configurations.
The Simfast™ Nut

• **Simfast™ Nuts**
  
  – Designed to offer up to 20% weight savings over standard anchor nuts. This rivetless anchor nut also reduces installation time by up to 60%. A small offset hole is drilled in the structure to receive a tab, or tubular post, which resists the rotational torque load during installation.

  – Available in replaceable and non-replaceable nut elements, self-sealing dome configurations, or with a polyurethane cap that traps installation debris.
The Spiralock® Nut

- **Spiralock® Nuts**
  - This special thread form increases the fatigue life of nuts by equalizing the distribution of stress.
  - Available in following configurations: hexagon nuts, double hexagon nuts, anchor nuts, gang channel nuts, and barrel nuts.
Screws

NAS

BAC
Lockbolts & Collars

NAS

LGP®

HUCKCOMP®

GP®

HUCKTITE®

LHP™

XPL™
The Lockbolt Fastening System

- **Pull Type Lockbolts**
  - Titanium, 95 ksi shear strength.
  - Collars available in several materials & configurations.
  - Best structural durability.
    - Sheet take-up, pre-load, interference or clearance fit capability
  - Lightest weight.
  - Fuel and weather tight.
  - Electrical grounding with HUCKTITE® sleeve option.
  - Metallic and composite structure applications.
  - Fastest manual installation.
  - User friendly; minimal rework, never any “spinners”.
  - Visual inspection “at a glance”.
  - Industry standard in commercial transports.
The Lockbolt Fastening System

LGP® with 2024-T42 Aluminum Coining/Sealing Collar Installation Sequence on Metallic Structure
The Lockbolt Fastening System

LGP® with Aluminum Collar Installation Sequence on Metallic Structure
The Lockbolt Fastening System

- **Stump Type Lockbolts**
  - Automation installation.
    - Machine clamps structure.
    - Machine drills and countersinks hole.
    - Machine applies sealant & inserts the stump pin.
    - Machine swages the collar in place.
    - Machine relocates to the next fastener position.
  - Best structural durability.
    - Sheet take-up, pre-load, interference or clearance fit capability.
  - Lightest weight.
  - Fuel and weather tight.
  - Metallic and composite structure applications.
  - User friendly; minimal rework, never any “spinners”.
  - Visual inspection “at a glance”.
  - Industry standard in commercial transports.
The NAS Lockbolt Fastening System

- **NAS Lockbolt Fastening System (HUCKBOLT®)**
  - Developed for high strength metallic applications.
  - Compatible with the following collar material:
    - 2024, 2219, or 6061 Aluminum
    - C1006, C1008, C1213, C1215, or B1113 Carbon Steel
    - A-286 CRES
    - Monel
  - The shear pin features 2 lock grooves and the tension features 4 lock grooves.

*Developed in 1957 (Updated 1944 Version)*
The GP® Lockbolt Fastening System

- **GP® Groove Proportioned Lockbolt Fastening System**
  - Developed for use in both interference fit and clearance fit high strength metallic applications.
  - Compatible with the following collar material:
    - 2024-T42 or 2024-T73 Aluminum
  - The pin features 8 or 10 lock grooves.

*Developed in 1976*
The LGP® Lockbolt Fastening System

- **LGP® Lightweight Groove Proportioned Lockbolt Fastening System**
  - Developed as a lightweight fastening system for high strength metallic applications. It is cost-effective aerospace fastening which can reduce aircraft weight and fastener installation time.
  - Compatible with the following collar material:
    - 2024-T42 Aluminum
    - A-286 CRES
    - CP Titanium
    - Monel (400 Series)
  - The pin features 5 lock grooves.

*Developed in 1980*
The HUCKCOMP® Lockbolt Fastening System

- **HUCKCOMP® Lockbolt Fastening System**
  - Developed for composite applications based on the successful LGP® Lockbolt design.
  - Compatible with the following collar materials:
    - CP Titanium (flanged collar)
    - 2024-T42 Aluminum (coining/sealing collar) (for metallic backup structure)
  - The pin features 6 lock grooves to accommodate the CP titanium flanged collar.

*Developed in 1981*
The HUCKCOMP® Lockbolt Fastening System

1. Tool engages lockbolt pintail

2. Gap closes, collar swage begins

3. Swage process complete

4. Pintail fractures at the break notch

5. Tool anvil reverses off swaged collar

6. Installation complete

HUCKCOMP® with CP Titanium Flanged Collar Installation Sequence on Composite Structure
The HUCKCOMP® Lockbolt Fastening System

1. Tool engages lockbolt pintail
2. Gap closes, collar swage begins
3. Swage process complete
4. Pintail fracture at the break notch
5. Tool anvil reverses off swaged collar
6. Installation complete

HUCKCOMP® with 2024-T42 Aluminum Coining/Sealing Collar Installation Sequence on Metallic Backup Structure
The HUCKTITE® Lockbolt Fastening System

- **HUCKTITE® Lockbolt Fastening System**
  - Sleeved lockbolt designed for composite applications which allows interference fit (.0010”/.0053”) without the risk of composite delamination.
  - Provides forced contact between fastener and graphite fibers for electrical ground.
  - Compatible with the following collar materials:
    - CP Titanium (flanged collar)
  - The pin features 6 lock grooves to accommodate the CP titanium flanged collar.

*Developed in 1984*
The HUCKTITE® Lockbolt Fastening System

HUCKTITE® with CP Titanium Flanged Collar Installation Sequence on Composite Structure
The LHP™ Lockbolt Fastening System

- **LHP™ Lightweight High Performance Lockbolt Fastening System**
  - Developed for stronger composite properties and improved elevated stability.
  - Compatible with the following collar material:
    - 3AL-2.5V Titanium (flanged collar)
  - The pin features 6 lock grooves with a groove configuration to develop conjunction with the 3Al-2.5V improved elevated over CP titanium.

*Developed in 1994*
The XPL™ Lockbolt Fastening System

- **XPL™ Extended Performance Lockbolt Fastening System**
  - Newest version of Huck Lockbolts developed to provide improved mechanical performance.
  - Compatible with the following collar materials:
    - 2024-T42 Aluminum
    - 3Al-2.5V Titanium
    - CP Titanium
    - A-286 CRES
  - The pin features 6, 7, or 8 lock grooves with redesigned groove configuration to develop full strength in conjunction with various materials.

*Developed in 2001*
Blind Bolts

VISU-LOK®

TAU BOLT

ACCU-LOK™

XISP

MS

TI-MATIC®

UAB™
The VISU-LOK® Blind Bolt Fastening System

• **VISU-LOK® Blind Bolts**
  – Developed for metallic structure applications. The design provides high shear, tensile, fatigue, and self-locking capabilities. Unlike conventional nut and bolt combinations, the Visu-Lok® blind bolt can be completely installed, and fully verified, from one side of the structure. When installed, the Visu-Lok® forms a solid, blind side head, with minimum preload levels guaranteed.
  – Manufactured in 1/16” increments with an operational grip range of 0.062”.
  – Configurations include Visu-Lok II® which utilizes a disposable drive nut and a tapered version ideally suited for extreme or severe fatigue applications.
The VISU-LOK® Blind Bolt Fastening System

- VISU-LOK® Blind Bolts
  - Anatomy (Visu-Lok® shown)

  ![VISU-LOK® Blind Bolt Diagram]

  - Core bolt
  - Break neck
  - Nut
  - Sleeve

  (Mechanically indented for self-locking feature)
The VISU-LOK® Blind Bolt Fastening System

VISU-LOK® Blind Bolt Installation Sequence in Metallic Structure
The ACCU-LOK™ Blind Bolt Fastening System

• **ACCU-LOK™ Blind Bolts**
  – Developed to compete with Composi-Lok® fastener for composite material applications where access is limited to one side of the structure. The design combines high joint preload with a large diameter footprint on the blind side. The large footprint enables distribution of the joint preload over a larger area, thus virtually eliminating the possibility of delaminating the composite structure.
  – Configurations include the Accu-Lok II™ and the Accu-Lok IIa™, which are available with the Dryv-Cap™ non-threaded installation system. The Dryv-Cap™ is essentially a disposable driver, which positively engages the driving recess in the fastener.

*Developed in 2001*
The ACCU-LOK™ Blind Bolt Fastening System

- ACCU-LOK™ Blind Bolts
  - Anatomy (Accu-Lok II™ shown)

(Mechanically indented for self-locking feature)
The ACCU-LOK™ Blind Bolt Fastening System
The TAU Bolt Fastening System

• **TAU Bolts**
  – Developed for severe vibratory applications in metallic structure as a blind lockbolt. It is an oversized blind bolt designed to provide high clamp up in a clearance fit hole.

  – The Tau blind bolt can be positively inspected by examining the manufactured head on the accessible side of the structure.

  – Available in following configurations:
    • 4130 Alloy Steel sleeve & 8740 Alloy Steel pin
The TAU Bolt Fastening System

1. Factory assembled Tau Bolt is inserted in hole.
2. Installation tool is applied, sheets are pulled together, and blind head forms.
3. Collar is swaged into the pin lock grooves.
4. Collar swaged, and fastener is permanently driven. Pintail is broken and ejected.

**Tau Bolt Installation Sequence**
The XISP Blind Bolt Fastening System

- **XISP Blind Bolts**
  - Developed for titanium applications. The design provides an interference fit.
  
  - Available in following configurations:
    - A-286 CRES sleeve & 8740 Alloy Steel pin
    - 100° flush head, 100° (MS24694) flush head, & protruding head
  
  - Sample part numbers
    - X-ISP100-EU09-08
    - XISP509-EU09-08
    - XISPP-EU09-08

*Developed in 1981*
The MS Blind Bolt Fastening System

• **MS Blind Bolts**
  – Developed for metallic applications and can be used with composite structure.
  – Available in following configurations:
    • A-286 CRES sleeve & pin (MS21140/41)
    • Alloy Steel sleeve & pin (MS90353/54)
    • 100° flush head & protruding head
  – Ideal for thin or thick structure due to generous footprint in “band annealed” area.
The MS Blind Bolt Fastening System

- **MS Blind Bolts**
  - Anatomy (UB100-EU/T shown)

![Diagram of MS Blind Bolt Fastening System]

- **Pin** (A-286 or Alloy Steel)
- **Sleeve** (A-286 CRES or Alloy Steel)
- **Optional drive washer**
- **Pull grooves**
- **Lock ring**
- **Lock groove**
- **Break neck**
The MS Blind Bolt Fastening System

“Single Action Shear Flange” Style  (Alloy Steel)
• NASM90353S(  )(  ) shown for -05, -06
• NASM90353-(  )(  ) shown for -08, -10, -12, -14, -16

“Single Action Shear Cap” Style  (Typically A-286)
• NASM21140S(  )(  ) shown for -04, -05, -06
• NASM21140-(  )(  ) shown for -08, -10, -12

“Single Action With Drive Washer” Style (Unimatic)
• NASM21140U(  )(  )W shown for -04 thru -12
• NASM90353U(  )(  )W shown for -05 thru -16

“Single Action W/O Drive Washer” Style (Unimatic)
• NASM21140U(  )(  ) shown for -04 thru -12
• NASM90353U(  )(  ) shown for -05 thru -16

“Double Action” Style
• NASM21140-(  )(  ) shown for -05 & -06
• NASM90353-(  )(  ) shown for -05 & -06

NOTE: All mechanical properties are equivalent. Only difference is installation procedure.
The MS Blind Bolt Fastening System

Nose Anvil

Lock Ring

Single Action Shear Flange Installation Sequence
(Alloy Steel Parts Due to Lock Ring Material Integration)
The MS Blind Bolt Fastening System

Nose Anvil

Lock Ring

Single Action Shear Cap Installation Sequence
(A-286 CRES or Alloy Steel Parts to Maintain Lock Ring Compatible Material Integration)
The MS Blind Bolt Fastening System

1. Bolt installed clearance fit
2. Spindle pulled – bulb forms away from sheet
3. Bulb formation – sheet take-up
4. Spindle stopped – bulb formed, lock ring engaged
5. Spindle breaks flush – installation complete

Bulb formed
Lock ring engaged
Flush spindle break

MS Blind Bolt Unimatic® With Washer Installation Sequence
The TI-MATIC® Blind Bolt Fastening System

• **TI-MATIC® Blind Bolts**
  
  – Developed for composite applications.

  – Available in following configurations:
    
    • CP Titanium sleeve & Beta C pin (for lightest weight application)
    
    • A-286 CRES sleeve & Beta C pin (for highest strength application)
    
    • 100° flush head, 130° shear flush head, & protruding head

  – Metallic and composite structure applications.

  – Ideal for thin or thick structure due to generous footprint in “band annealed” area.

*Developed in 1984*
The TI-MATIC® Blind Bolt Fastening System

- TI-MATIC® Blind Bolts
  - Anatomy (UB100-EV/MV shown)

- Pin (Beta C titanium)
- Optional drive washer
- Lock ring
- Pull grooves
- Lock groove
- Break neck
- Sleeve (CP titanium or A-286 CRES)
The TI-MATIC® Blind Bolt Fastening System

TI-MATIC® Blind Bolt Installation Sequence

1. Bolt installed clearance fit
2. Spindle pulled – bulb forms away from sheet
3. Bulb formation – sheet take-up
4. Spindle stopped – bulb formed, lock ring engaged
5. Spindle breaks flush – installation complete

Bulb formed
Lock ring engaged
Flush spindle break
The UAB™ Blind Bolt Fastening System

- **UAB™ Blind Bolts**
  - Developed for composite applications based on the successful TI-MATIC® blind bolt design. Provides improvement in spindle flushness, grip overlap capability, increased footprint; along with single tooling and robot capability.

  - Available in following configurations:
    - CP Titanium sleeve & Beta C pin (for lightest weight application)
    - A-286 CRES sleeve & pin (for highest strength application)
    - 100° flush head, 130° shear flush head, & protruding head

- Metallic and composite structure applications.

*Developed in 2001*
The UAB™ Blind Bolt Fastening System

- **UAB™ Blind Bolts**
  - Anatomy (UAB100-EU/MV shown)

  Pull grooves of -05, -06, & -08 diameters have same 1/32” pitch for installation by one Huck tool.

  - Drive washer
  - Lock ring
  - Break neck
  - Pin (Beta C titanium or A-286 CRES)
  - Sleeve (CP titanium or A-286 CRES)
Blind Rivets

CKL

NAS1900

HUCK-CLINCH®

HUCKMAX®
The CKL Blind Rivet Fastening System

- **CKL (Conical Keystone Lock) Blind Rivets**
  - Invented and developed by Louis C. Huck at the request of the U.S. Army Air Force, during World War II, for a blind rivet that would have better blind head bearing area for their aluminum sheets and dimpled holes, higher shear and tensile strengths, and a positive mechanical lock. The spindle breaks breaks off flush reducing rework.

  - Available in the following configurations:
    - 5056 Aluminum sleeve & 2024 Aluminum spindle
    - 100° flush head & protruding Brazier head
    - Reduced grip range

  - Applicable for use with fiberglass and plastic assemblies.

*Developed in 1944*
The NAS1900 Blind Rivet Fastening System

- **NAS1900 Blind Rivets**
  - Developed for aluminum structure. Design provides highest strength to weight ratio with improved spindle break.
  - Available in following configurations:
    - 5056 Aluminum sleeve & 2024 Aluminum spindle (for lightest weight application)
    - A-286 CRES sleeve & spindle (for highest strength & high temp application)
    - Monel sleeve & A-286 CRES spindle (for corrosion resistance application)
    - 100º flush head & protruding head
  - Metallic and composite structure applications.

*Developed in 1972*
The NAS1900 Blind Rivet Fastening System

- **NAS1900 Blind Rivets**
  - Anatomy (NAS1921 shown)

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**Diagram:**
- Spindle (2024 aluminum or A-286 CRES)
- Pull grooves
- Optional drive washer
- Lock ring
- Break neck
- Lock groove
- Retention splines
- Sleeve (5056 aluminum, A-286 CRES, or Monel)
- Expansion land on pin for hole fill
The NAS1900 Blind Rivet Fastening System

“Single Action” Style (Unimatic 3-Piece)
• NAS1921( )S( ) shown for –04, -05, -06, -08
• SMLS100-( )-( ) shown for –04, -05, -06, -08

“Single Action” Style (Unimatic 4-Piece)
• NAS1921( )S( )U shown for –04, -05, -06, -08
• SMLS100-( )-( )U shown for –04, -05, -06, -08

“Double Action” Style
• NAS1921( )-( ) shown for –04, -05, -06, -08*
• MLS100-( )-( ) shown for –04, -05, -06, -08*

*Monel & A-286 –08 diameter fasteners only are made with shear caps.

NOTE: All mechanical properties are equivalent. Only difference is installation procedure.

NOTE: All –04, -05, & -06 diameter single action (Unimatic 4-Piece) fasteners can be installed with one tool & nose assembly.
The NAS1900 Blind Rivet Fastening System

NAS1900 Blind Rivet Installation Sequence

1. Rivet installed clearance fit
2. Spindle pulled – forcing hole fill
3. Bulb formation – sheet take-up
4. Spindle stopped – bulb formed, lock ring engaged
5. Spindle breaks flush – installation complete

Bulb formed
Lock ring engaged
Flush spindle break
The HUCK-CLINCH® Blind Rivet Fastening System

• **HUCK-CLINCH® Blind Rivets**
  – Developed for aluminum structure. Design provides positive hole fill with improved spindle retention with internal solid circle lock.
  
  – Available in following configurations:
    • 5056 Aluminum sleeve & A-286 CRES spindle
    • 5056 Aluminum sleeve & 8740 Alloy Steel spindle
    • 100° flush head
    • 100° flush shear head
    • Protruding head
    • Unisink head

  – Metallic structure applications.

*Developed in 1990*
The HUCK-CLINCH® Blind Rivet Fastening System

- **HUCK-CLINCH® Blind Rivets**
  - Anatomy (HC3212 shown)

- **Components**
  - Spindle (A-286 CRES or 8740 Alloy Steel)
  - Drive washer
  - Retention splines
  - Sleeve (5056 Aluminum)
  - Grip adjuster
  - Lock groove
  - Pull grooves
  - Break neck
The HUCK-CLINCH® Blind Rivet Fastening System

1. Rivet installed clearance fit & spindle pulled, formation of bulb begins.

2. Sleeve expands, forcing hole fill & material forced into lock groove.

3. Spindle stopped – bulb formed, lock developed.


HUCK-CLINCH® Blind Rivet Installation Sequence
The HUCKMAX® Blind Rivet Fastening System

• **HUCKMAX® Blind Rivets**
  – Developed for aluminum structure. Designed to be directly interchangeable with CherryMAX® and ALLMAX® blind rivets with similar part numbers.
  – Available in following configurations:
    • 5056 Aluminum sleeve & A-286 CRES spindle
    • 5056 Aluminum sleeve & 8740 Alloy Steel spindle
    • Monel sleeve & A-286 CRES spindle (for corrosion resistance application)
    • 100º flush head
    • 100º flush shear head
    • Protruding head

  – Metallic structure applications.

*Developed in 1998*
The HUCKMAX® Blind Rivet Fastening System

- **HUCKMAX® Blind Rivets**
  - Anatomy (HR3212 shown)

- **Spindle**
  - (A-286 CRES or 8740 Alloy Steel)

- **Drive washer**

- **Lock ring**
  - (visible after installation)

- **Pull grooves**

- **Retention splines**

- **Break neck**

- **Expander**

- **Sleeve**
  - (5056 aluminum or Monel)

- **Expansion land on pin for hole fill**
The HUCKMAX® Blind Rivet Fastening System

1. Rivet installed clearance fit

2. Spindle pulled – formation of blind head begins

3. Blind head forms, sheet take-up, & mechanical lock forms

4. Spindle stopped – blind head formed, lock ring engaged

5. Spindle breaks flush – installation complete

Blind head formed

Lock developed

Flush spindle break

HUCKMAX® blind rivet installation sequence
Panel Fasteners

LIVE LOCK®

MARK IV™

CAPTIVE SCREWS

QR™

¼-TURN (CAMLOC ®)

HUCK Z-L

ECCENTRIX™ PINS

TURN-LOC®
The Live Lock® Panel Fastener

- **Live Lock® Panel Fasteners**
  - Designed to provide a high strength joint, quick operation and an exceptionally high cycle life for use on high performance aircraft, electronic, and avionics applications. Comprised of a stud nut and receptacle, the system provides a low prevailing installation and removal torque, yet offers high vibration resistance.

  - Various configurations have been developed to meet specific customer requirements.
The Mark IV™ Panel Fastener

- **Mark IV™ Panel Fasteners**
  - Designed to incorporate the Flatbeam™ lock design for superior vibration resistance. This feature also extends the locking capability to up to 1,500 seated cycles. Multiple lead thread configurations are available to facilitate quick operation for reduced down time. Due to its unique design, this fastener can accommodate a large variation in grip.

  - Various configurations include plug type, hold-out type, and twist-on type. All available with a radial-slot, hex or Torx® recess.
The QR™ Panel Fastener

- **QR™ Panel Fasteners**
  - Designed to be a lightweight, small envelope, and quick operating fastening system. Most versions lock and unlock in less than two turns. The stud is positively retained.
  
  - Both flush and protruding head styles are available with various drive configurations.
  
  - Utilizes 10-32 Quad Lead threads.
The ¼-Turn (Camloc) Panel Fastener

- ¼-Turn (Camloc) Panel Fasteners
  - Designed to offer the quickest operating high re-use, mechanical fastening system available. They securely lock and disengage with a simple 90° action.
  
  - This product line has the broadest product offering of any panel fastening systems.
The Captive Screw Panel Fastener

- **Captive Screw Panel Fasteners**
  - Designed to provide a fastening system with a retractable screw which allows equipment to be removed and installed without the possibility of jamming, damage, or loss of the screws.
  
  - Various configurations include snap ring type, crimp ring type, swage type, nut retainer type, and snap-in type.
The Captive Screw Panel Fastener

- **Captive Screw Panel Fasteners**
  - Developed for areas of frequent removal for access. CRES sleeve (grommet) protects composite structure against erosion wear resulting from frequent removal.

  - Available in following configurations:
    - Sleeve
      - 304 CRES
    - Screw
      - 6AL-4V Titanium
      - A-286 or 302 CRES

- Metallic and composite structure applications.

- Designs for special customer requirements with variety of specials available.
The Captive Screw Panel Fastener

Captive screw assembly installed on composite structure
(7900 series version shown)
The Turn-Loc® Panel Fastener

• Turn-Loc® Panel Fasteners
  – The spring-loaded design is available in fully or partially retracting versions in fixed or floating installations. These captive screws prevent jacking during the removal of the panel. The attractive stainless or anodized aluminum finish makes them especially suitable for front panel applications and the knurled knob permits easy fingertip operation.

  – Various configurations include low profile, high profile, & .031” float.
The Huck Z-L Panel Fastener

- **Huck Z-L Stressed Panel Fasteners**
  - Designed for applications requiring extremely high load-carrying capabilities coupled with ease of access. The unique serrated mating surfaces lock the nut to the stud no matter where the stud stops turning. The quadruple lead threads give full take up in 1 1/3 turns.

  - Available also in miniature and captivated configurations.
The Eccentrix™ Adjustable Shear Alignment Pin

- Eccentrix™ Adjustable Shear Alignment Pin
  - Designed to provide perfect alignment of chassis and plug-in modules of electronic equipment. The pins protect 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.

  - Available with various options for size, materials, and finishes. For applications where the pin must be inserted into thin or soft panel materials or where large shear loads are present, mating high-strength receptacles are available.
Inserts & Studs

EM STUD®

PERMA-THREAD®

KEENSERTS®

KELOX®

RING LOCKED®

SLIMSERT®
The EM Stud®

• **EM Stud®**
  - Designed as a blind fastening system for grounding terminal purposes and lightweight structural attachments. The fastener is placed into a pre-drilled, loose tolerance hole from one side of the structure. Standard “pull-tools” are used to exert an axial load until the stem separates. Once installed, the grounding stud is immediately ready for the attachment of one or more grounding straps. The grounding stud makes full contact with, and expands the cylindrical hole surface to achieve a positive electrical contact and firm mechanical attachment.
  - A variation of the EM Stud® includes a double-ended configuration featuring a threaded shank on both sides of the structure.
The Perma-Thread® Insert

• **Perma-Thread® Inserts**
  - Manufactured from wire with a diamond-shaped cross section that creates a precision screw thread. Designed to be slightly oversized in diameter, they compress as they are inserted into the prepared hole to achieve maximum surface contact with the parent thread. Each coil automatically adjusts to create maximum contact with the mating thread member.

  - Various configurations include self-locking or free-running thread forms and choice of coarse or fine threads. A complete line of unified and metric products is available.
The Kelox® Insert & Stud

- **Kelox® Inserts & Studs**
  
  - Designed to provide high resistance to pull-out and torque-out loads. To secure the Kelox® fastener into a structure, a pair of self-broaching keys, joined by an integral ring have been incorporated into the design. A temporary locking ring is supplied to ensure the installation depth of the fastener is properly achieved at the time of assembly.

  - Various configurations include both unified and metric products.
The Ring Locked Insert & Stud

- **Ring Locked Inserts & Studs**
  - Designed to provide superior torsional resistance in both hard and soft parent materials. The internal serration of the lockring engages with a mating serration on the fastener. Upon installation, the lockring’s external serration is driven into the parent material, preventing any rotational movement.

  - Various insert configurations include blind, hydraulic, solid, and captive lockrings. Various stud configurations include size-on-size, pin types, hydraulic, terminal, full shank, etc.
The Slimsert® Insert

- **Slimsert® Inserts**
  - Designed to have a thin cross-section, which allows for installation into applications requiring minimum boss configurations. The inserts lock into place by swaging the upper end of the insert into the counterbore wall of the parent material.

  - Various configurations include high temperature applications, spark plug configuration, and blind threaded inserts.
Latches & Mechanisms

ACCESS DOOR MECHANISMS & Hinges

HYDRAULIC SNUBBER ASSEMBLIES

LATCH HANDLE SYSTEMS

STRUCTURAL LATCHES
RAM® Products
(Rexnord Aerospace Mechanisms)

- RAM Latch Usage Diagram
Hook Latches and Keepers
TL10000(0) Series

- Designed to offer high reliability and quick access when mounted onto engine fan cowls or thrust reverser structures.
- Handle free travel.
- Tool or manual operation.
- Over-center toggle lock.
- Adjustable hook latches available.
- Low-profile latches for restricted envelopes.
- Used with keeper eyebolts or assemblies.
RAM® Products

- **Tension/Shear Latches**
  
  TL11000 & TL17000 Series
  
  - Designed to secure light, medium, and heavy duty hinged doors, panels, and structures. These latches incorporate an over-center lock mechanism to provide a positive lock and resistance to opening under adverse operating conditions.

  - Lowest depth of any tension latch.
  - Trigger release is hand or tool activated.
  - Adjustable at mold line with the handle open.
  - Shear loads are carried along the door abutment.
  - Tension loads up to 7,000 lbs.
  - Shear loads between 1,800 – 4,000 lbs.
RAM® Products

• **Rotary Latches**
  TL12000 Series
    – Designed to be operated using standard tools. The corresponding keeper assemblies are adjustable to provide ease of installation, rigging, and maintenance. These latches provide exceptional take-up capability and can be used in multiple load applications.
    – Minimum skin cutout for access.
    – High strength to weight ratio.
    – Operate with standard hex key tools.
    – Positive visual open/close indicator.
RAM® Products

• **Shear Pin Latches**
  TL16000 & TL20000 Series
  – Designed to stow removable or hinged door panels. The low profile design of the multiple pin latch allows for installation into panels of less than 1 inch in thickness. These pin latches are available in upper and lower handle versions to allow for actuation of the latch and removal of the panel from above or below the panel, as required.
  – Over-center locking.
  – Hand or tool actuated trigger release.
  – Single or double shear
    (double shear recommended)
  – Multiple-pin assemblies available.
**Flush Handle Latches**  
**TL21000 Series**

- Designed to provide a means of activating unique remote latch and pin operating systems. The flush handle latch assemblies are used for cargo door access. The pop-up handle is easy to operate and offers ease of actuation and stowage.

- Flush mounted on flat or contoured installations.
- Handle pops out when trigger is activated.
- Pressure sealed.
- Exterior and interior handles optional.
**RAM® Products**

- **Button Latches**
  - TL18000 Series

  - Designed to offer ease of manual operation, facilitating activation when maintenance is performed while hands are not free or when wearing heavy gloves.
  - Numerous button and bolt offsets available.
  - Adjustable bolts compensate for door frame tolerances.
  - Button serves as a flag when the latch is open.
  - Gasket materials can vary depending on the environment for the latch.
  - No special tools needed – hand or simple tool actuated.
RAM® Products

• Pressure Relief Latches
  TL22000 Series
  – Designed as a safety latch with pre-set load limits for venting over pressurization through controlled panels or doors.
  – Can act as a safety latch and as an access door latch.
  – No special tools required for operation – screwdriver actuation most typical.
  – Loads are 100% factory set and tested.
  – Variable door and frame thickness apply depending on the application.
**RAM® Products**

- **Snubber Assemblies**  
  **TL23000 Series**  
  - Designed as dampening devices for radome and tailcone applications. The hydraulic fluid-filled cylinder provides for dual speed operation in the opening and closing direction.

  - Limited use on DC-10, KC-10, & MD-11 programs.
RAM® Products

- **Hinge Assemblies**
  
  TL26000 Series
  
  - Designed for use on a variety of door and panel applications. Gooseneck hinges are used for pressure relief doors and for smaller applications, such as fuel access doors. Double acting hinges provide additional clearance for restricted areas, where full exposure of the door cavity is required.
  
  - Gooseneck hinges available in sheet metal or machined versions.
  
  - Up to 180 degrees rotation with double-acting hinges.
RAM® Products

- **Wedge-Tite PCB Retainers**
  - **53S Series (load limiting) & 54S Series**
    - Used to retain and to provide thermal transfer path for PCB and military SEM-E modules. The actuation screw separates the wedge segments applying an outward pressure to the circuit card frame, thus generating clamping forces to retain the circuit card.
    - Various lengths and widths available.
    - 3 and 5 segment wedges available.
    - Load limits for 53S–series 3 segment wedge:
      - 90 to 300 lbs.
    - Load limits for 53S–series 5 segment wedge:
      - 125 to 300 lbs.
• **Injector-Ejector PCB Levers**  
  *20E, 40E, 50E, 60E Series*  
  – Designed to provide consistent self-compensation for circuit board tolerances. With only a few pounds of finger pressure, the levers can exert up to 80 lbs. of force, enabling the seating of multiple pin or fiber optic connections.

  – Developed for use in stringent F-22 Raptor environments.
  – Levers offer controlled insertion forces depending on the type of connectors in the module (Bendix, Liquid flow-through or fiber optic)
  – Used to insert and extract PCB’s or SEM-E modules.
RAM® Products

• **Hold-Down Devices**

  **HD11000 & CA12000 Series**
  - Designed to retain navigation, communications and entertainment modules. Hand and tool operated designs are available.
  - HD11000 and some CA12000 series offer load-limiting clutch to prevent over-torquing.
  - CA12000 series used primarily for military applications: (MS14108 and MIL-F-85731 compliant).
RAM® Products

- **Chassis Latches**
  21L, 40L, 61L and 72L Series
  - Designed to hold down removable electronic drawers.
  - Can be used as handles in addition to stow and retract devices.
  - Used with a variety of adjustable and non-adjustable keepers (fork assemblies).
  - Some 61L series are NAS1637 compliant
Fluid Fittings

- CONICAL SEALS
- RING LOCKED FLUID BOSS ADAPTERS
- RING LOCKED FLUID BOSS INSERTS
- STANDARD SHAPED FITTINGS
- STANDARD STRAIGHT FITTINGS
- SPECIAL FITTINGS
The Conical Seal

- **Conical Seals**
  - Designed to prevent leakage in critical applications. Metallic seals eliminate potential problems caused by nicks, scratches or misalignment, as well as non-concentric conditions. Conical seals are effective in sealing light gases under extreme temperature and pressure conditions.

  - The majority of metallic conical seals are designed to mate with the standard 37° flared tube end configuration. Other variations designed to seal flareless connections are also available.
The Ring Locked Fluid Boss Adapter

- **Ring Locked Fluid Boss Adapters**
  - Designed with captive lockring which 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, if required. Due to their small envelope, the adapters are significantly lighter than “hex unions”, resulting in a substantial weight reduction of the hydraulic package or system.
  - Various configurations include beam seal, flared, flareless, reducers, expanders, etc.
  - Used in high temperature, high strength, and high vibration applications.
The Ring Locked Fluid Boss Insert

- **Ring Locked Fluid Boss Inserts**
  - Developed to provide a high-strength mating surface in which standard “AN”, “AS”, and “MS” unions can be installed. A separate lockring secures the boss, thus preventing loosening or backing-off under severe vibration, temperature cycling or fitting installation and removal.

  - Various configurations include oversize replacement inserts, solid type and specials that meet specific customer needs, as well as a complete line of metric boss inserts.

  - Used in high temperature, high strength, and high vibration applications.
The Standard Shaped Fluid Fitting

- **Standard Shaped Fittings**
  - Full line of 45°, 75°, and 90° elbows, tees, crosses, 90° swivels, and unique configurations than meet the specific design criteria of our customers.
  - A complete line of metric shaped fittings is available.
  - Used in low pressure, low temperature, and low vibration applications.
The Standard Straight Fluid Fitting

- **Standard Straight Fittings**
  - Wide variety of standard fittings used throughout the military and commercial aerospace markets. New qualifications underway for numerous flareless parts in a variety of materials and sizes.

  - A complete line of metric straight fittings is available.

  - Used in low pressure, low temperature, and low vibration applications.
The Special Fluid Fitting

- **Special Fittings**
  - Numerous special fluid products have been designed and manufactured to meet the varying market requirements of our customers. Some of the more unique products include a low profile 90° swivel boss adapter, a ripple damper, and a Klutch-Klip, which is an inexpensive method of preventing rotation of a B-nut.

  - Various configurations include beam seal, flared, flareless, ball-nose and weldable tube ends, etc.
Special Sandwiched Structure Fasteners

ASP®

DELRON®
The ASP® Fastening System

- **ASP® Fastening System**
  - Originally developed for double flush and aluminum honeycomb material application.
  - Available in following configurations:
    - A-286 CRES
    - 6Al-4V Titanium
    - 8740 Alloy Steel
    - 100° flush shear or tension head
    - Protruding shear or tension head
    - All combinations of head styles for pins and sleeves. (Flush sleeves - tension head only)
  - Designed for honeycomb structure; however, compatible with foam sandwich structure and latest generation carbon composite materials, as well as, solid joints.

(2AspPF version shown)

*Developed in 1967*
The ASP® Fastening System

ASP® Installation Sequence on Composite Structure (2Asp509P Version Shown)

1. Pin component installed clearance fit
2. Sleeve component threaded on pin
3. Torque controlled tool tightens sleeve
4. Lock collar placed on pin
5. Lock collar swaged into pin splines & sleeve pocket
6. Pintail breaks off
The Delron® Insert

• **Delron® Inserts**
  – Designed to provide a hard mounting point in “sandwich structure” which consists of top and bottom face sheets attached to a low-density core material. Sandwich structure cannot carry concentrated loads due to the minimal strength of the face sheets.
  
  – Various configurations include structural type inserts consisting of a pre-assembled body and sleeve combination, and potted-in inserts which are mounted through a single hole in the panel.