

# GULFSTREAM IV

## STRUCTURAL REPAIR MANUAL

### FASTENER PREPARATION AND INSTALLATION — REPAIRS

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#### 1. Composite Fasteners and Fastener Hole — Treatment

##### A. Preparation

##### CONSUMABLES

Sealant ..... MIL-S-81733  
Primer, 2012 or 3012 ..... Courtaulds 515X333 / 910X350  
Primer ..... Deft 44-GN-11 or 44-GN-57

**NOTE:** Primers 2012 or 3012 are equivalent.

##### B. Procedure

- (1) Graphite panel installed on graphite panel or graphite structural component.
  - (a) Remove fasteners, if loose.
  - (b) On countersinks and in holes, apply primer and let dry.
  - (c) On countersinks and in holes, apply primer and let dry. See Original Finishes, 51-20-00, General.
  - (d) Install removable steel or titanium fasteners dry.
  - (e) Install permanent fasteners with wet primer or sealant.

**NOTE:** Finish 3012 primer may be used if water reduction of primer is omitted.
- (2) Graphite panel installed on aluminum structure or aluminum repair plates on graphite panels
  - (a) Remove fasteners, if loose.
  - (b) On countersinks and in holes, apply primer and allow to dry.
  - (c) Apply faying surface sealant on mating surfaces.
  - (d) Install fasteners wet with sealant.
  - (e) Fillet seal protruding fastener heads and nuts / washers.
- (3) Aramid, fiberglass or graphite panels, installed in any combination.
  - (a) Remove fasteners, if loose.

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- (b) On countersinks and in holes in graphite, apply primer and allow to dry.
- (c) Install removable fasteners wet with primer.

**NOTE:** Finish 3012 primer may be used if water reduction of primer is omitted.

- (d) Install permanent fasteners wet with 2012 primer.

### 2. Hole Preparation Specification — Metallic and Composite Structure Fasteners

#### A. Drilling and Fastener Installation Requirements for Metallic Structure

- (1) Code N in approved number code below shall be specified for holes used with protruding head fasteners in sheet thickness less than 0.050 (all materials). For steel and titanium structure in this category where other than solid rivets are used, flat washer ( AN960 or MS15795 ) shall be specified to provide the required clearance for fastener fillet radii.
- (2) All high strength 12 point bolts, and internal wrenching bolts (MS20004 and MS20024), require the specification of flat countersink washer under bolt head in lieu of edge break, (code N in approved number code shall be specified in such cases).
- (3) Figure 201, the following applies to the diameter code:
  - (a) The letter following the minimum hole diameter denotes the hole tolerance and maximum hole surface roughness.

DIAMETER CODE LETTER	A	C	E	G	J
Hole Tolerance	0.002	0.003	0.004	0.005	0.006
Maximum Surface Roughness -(RMS)	125				

**NOTE:** Axial grooves (less than 45° with respect to axis of hole ) are not acceptable in hole surface visible to the unaided eye on material over 200 ksi tensile strength.

- (4) Approved Number Code:

- (a) Example number - 51-30-22 <sup>1 2</sup>

- <sup>1</sup> - Denotes hole minimum diameter, hole tolerance, and surface roughness. Obtain diameter code from Figure 201
- <sup>2</sup> - Denotes edge break requirement
- E - Edge Break
- N - No Edge Break

- (b) When table indicates "\_\_\_\_\_".

- (c) When a washer under the protruding head of a bolt is specified in a repair.

- (d) When hole is in structure underneath a removable panel or cover.

- (e) Example callouts:

1 51-30-22-070GN

– 0.070 - 0.075 hole for flush head or protruding head 1/16 diameter solid rivet, surface roughness 125 RMS, no edge break.

2 51-30-22-129CE

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- 0.129-0.132 hole for flush head or protruding head 1/8 diameter blind rivet. Surface roughness 125 RMS. Hole edge break.

### 3 51-30-22-193GN

- 0.1935 - 0.1985 hole for flush head or protruding head 3/16 diameter. Solid rivet, surface roughness 125 RMS, no edge break.

### 4 51-30-22-250CE

- 0.250 - 0.253 for flush or protruding head 1/4 diameter hi-lok, bolt, screw and lockbolt, surface roughness 125 RMS max, hole edge break.

- (5) Carbide or diamond coated twist drills and countersinking cutters are the preferred tools for machining composites. Tools made of high speed steel are acceptable, however the tools must be inspected for sharpness and damage after each operation. See Table 201 for ranking tooling material in order of application (abrasive resistance) and cost.
- (6) Drills having a point angle of 135° are preferred, however the standard 118° point angle is acceptable. See Figure 204 for graphic definition of point angle.
- (7) Depending on the fastener used, countersinks will either be 100° or 130°. See Table 202 for countersink angle for various flush head fasteners used in Gulfstream composite structures.
- (8) All drilling and reaming shall be performed dry. A vacuum system is required to remove dust and chips.
- (9) When graphite or graphite / fiberglass is joined with a metallic material, drilling shall start from the graphite side unless otherwise directed by Gulfstream Technical Operations.
- (10) The maximum recommended speed, surface feet per minute (SFPM) and feed, Inch Per Revolution (IPR) for automatic controlled equipment shall be as specified in Table 203.
  - (a) Convert SFPM to RPM with following formula:

$$\text{SFPM} / 0.262 \times \text{diameter} = \text{RPM}$$

- (11) For hand feed drilling and reaming operations the following guidelines in Table 204 are maximum recommend values.
- (12) Cadmium plated fasteners are not acceptable for use with graphite materials nor are they to be used in fuel cells unless overcoated with sealant.
- (13) Titanium fasteners are to be used in removable graphite panels.
- (14) Titanium is the recommended fastener material. Materials such as Monel, A-286, 15-5PH and 17- 7PH steels can be used providing fastener is installed wet with Pro seal 890, equivalent sealer or primer. See Sealing of Surfaces for Aerodynamic Smoothness, 51-14-00, Repair, Epoxy Primer Coating - Preparation and Application (Including Finish 2012), 51-07-10, Repair or Aerodynamic Sealant Compound, 51-21-00, Repair.
- (15) CRES "C" material washers applied wet with either approved primer, Pro seal 890 or equivalent sealer when a washer is required to be in direct contact with graphite material. See Epoxy Primer Coating - Preparation and Application (Including Finish 2012), 51-07-10, Repair, Aerodynamic Sealant Compound, 51-21-00, Repair or Sealing of Surfaces for Aerodynamic Smoothness, 51-14-00, Repair.

### B. Acceptable Limits for Drilled Holes in Composite Material

- (1) A drilled (nonreamed) hole is acceptable providing it meets the following requirements:
  - (a) Hole has smooth finish with no visible burned areas and meets the specified diameter.

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- (b) Hole shall be within  $\pm 2$  degrees and countersink within  $\pm 1$  degree of being perpendicular with surface.
  - (c) Any exit delaminations shall be removed by lightly abrading surface with 180 or finer grit silicon carbide or emery paper. Abrasion shall not penetrate the top ply.
  - (d) Frayed and chip areas shall not exceed the limits. See Table 205 and Figure 206.
  - (e) Chamfer or relief radius for protruding or flush head fasteners shall conform to Table 206 and Figure 205.
- (2) Hand reaming a hole is permissible providing the finished hole meets the requirements for accepting nonreamed holes. See Step 2.B.(1). A maximum of 0.005 inch on the diameter shall be removed on one reamer pass.
- (3) Hole Diameters for Approved Blind and Solid Rivets Used in Composite Materials:
- (a) Hole diameters to be per Table 207.
  - (b) Blind rivets that penetrate and terminate in a honeycomb bonded assembly shall be installed as follows:
    - 1 Drill through discrepant facesheet and core only to a depth that will allow fastener head to seat prior to pulling fastener.
    - 2 Fill hole with either edge filling adhesive Type 1 or 2 prior to installing fastener.
    - 3 Install fastener prior to adhesive cure.
  - (c) Solid rivets shall be installed by squeezing only.  
**NOTE:** Bucking is prohibited.
- (4) Hole Diameters for Hi-Loks and Lockbolts in Composite Material:
- (a) Hole diameters are to be per Table 208.
- (5) Installation Limits for Permanent Fasteners:
- (a) A 0.004 inch gap under one side of a protruding head fastener or swage collar and a 0.002 inch gap under one side of a flush head and countersink on internal surfaces will be acceptable providing the following limits are not exceeded.
    - 1 Gap must involve less than 1/3 of fastener head.
    - 2 Less than 10% of fastener head or collars in fastener pattern are involved.
    - 3 No two fasteners are together.
    - 4 No exposed shank under the fastener head or collar.
  - (b) No gap shall be allowed between flush head fastener and the countersink on air passage surface.
  - (c) Flush head fasteners shall be flush within +0.005 / -0.002 of air passage.
  - (d) Unless otherwise specified, washers of appropriate material shall be used under all nuts and torque off collars.
- (6) Installation Limits for Removable Fasteners
- (a) Except where nutplates are used, the head of a fastener shall be seated prior to installation of nut.

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(b) A 0.004 inch gap under one side of a protruding head fastener and a 0.002 inch gap under one side of a flush head and countersink on internal surfaces will be acceptable providing the follow limits are not exceeded.

- 1 Gap must involve less than 1/3 of fastener head.
- 2 The shank will not be exposed under the fastener head or nut.
- 3 Less than 10% of fastener head or collars in fastener pattern are involved.
- 4 No two fasteners are together.

**NOTE:** No gap shall be allowed between flush head fastener and the countersink on the air passage surface.

(c) Flush head fasteners shall be flush within +0.005 / -0.002 of air passage.

(d) Unless nutplates are used or it is otherwise specified, washers of appropriate material shall be used under all nuts.

(7) Repair of Oversized Holes and Fastener Substitutions:

(a) See appropriate repair section for repair guidelines, limitations and torque values. See Alkaline Cleaning of Ferrous and Nonferrous Alloys, 51-21-00, Repair and Cleaning and Descaling of Titanium and Titanium Alloys, 51-21-00, Repair.

**Table 201: Drill Bits**

MATERIAL TYPE	APPLICATION	COST
H.S.S.	Limited / Light Duty	Low
Cobalt	General - Medium Duty	Moderate
Carbide	Limited - Heavy Duty	Moderate
Diamond	Extra Heavy Duty	High

**Table 202: Composite Structures Fasteners**

FASTENER TYPE	FASTENER DESIGNATION	COUNTERSINK ANGLE (DEGREES)
Blind and Solid Rivets	NAS 1921M NAS 1200U	100
Hi-Loks and Lockbolts	All HL series	100
Comp-Tite, Composilok Blind Bolts	CT420 MBF2113	130
Thread Bolts	82563T3 SC5006	130

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FASTENER TYPE	FASTENER DESIGNATION	COUNTERSINK ANGLE (DEGREES)
Lightweight Lockbolts	HLGPL9SC	130

**Table 203: Automatic Controlled Equipment Drill Speeds**

MATERIAL	DRILL DIAMETER	SPEED (SFPM)	FEED (IPR)
Graphite	1/8 - 3/16	300	0.003
Fiberglass	1/8 - 3/16	400	0.003
Graphite / Fiberglass	7/32 - 1/4	400	0.003

**Table 204: Hand Feed Drill Speeds**

MATERIAL	DRILL DIAMETER	SPEED (SFPM)	FEED	SPECIAL NOTES
Graphite	1/8 - 3/16	2000		
Fiberglass	1/8 - 3/16	2000	(1)	(2)(3)
Graphite / Fiberglass	7/32 - 1/4	500		

<sup>(1)</sup> When hand drilling the feed rate should be light; the weight of the air motor plus a light hand force shall be sufficient. Upon exit of drill, relax feed rate to prevent pull through.

<sup>(2)</sup> Backup material is required on the exit side of each hole, unless access is not available.

<sup>(3)</sup> Hand feed drilling and reaming of unidirectional tape material is prohibited.

**Table 205: Fray and Chip Limits**

CONDITION	INDIVIDUAL LIMITS	MAXIMUM ALLOWED AREA
Chipped or Frayed	Chipped or frayed 0.010 inch beyond hole and / or countersink surface wall or extend more than 0.070 inch beyond the hole or countersink periphery on adjoining surface.	Total frayed and chipped areas shall not exceed 25 percent of the hole or countersink surface.

**Table 206: Chamfer or Relief Radius Limits**

FASTENER TYPE AND DIAMETER RANGE (INCH)	CHAMFER OR RELIEF RADIUS (INCH)
1/8 Rivet	0.020 - 0.030

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FASTENER TYPE AND DIAMETER RANGE (INCH)	CHAMFER OR RELIEF RADIUS (INCH)
5/32 - 3/16 Blind Bolt	0.015 - 0.025
5/32 - 3/16 Hi-Lok and Treaded Bolt	0.030 - 0.040
5/32 - 3/16 Lockbolt, Comp-Tite, Composilok	0.030 - 0.040

**Table 207: Drill Size / Hole Diameter**

FASTENER DIAMETER	HOLE DIAMETER	DRILL SIZE
1/8	0.132 - 0.136	No. 29
5/32	0.164 - 0.167	No. 19
3/16	0.196 - 0.199	No. 9

**Table 208: Hole Diameters for Hi-Loks and Lockbolts**

FASTENER DIAMETER	HOLE DIAMETER
5/32	0.164 - 0.167
3/16	0.190 - 0.193
1/4	0.250 - 0.253

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DIA CODE	HOLE DIA	EDGE BREAK CONDITIONS						FASTENER (REF ONLY)
		PROTRUDING HEAD				FLUSH HEAD		
		Chamfer (Max) 90° X Dia	Radius with 160° CSK		Radius with 100° CSK		DADIUS	
Min / Max Rad.	CSK DIA		Min / Max Rad.	CSK DIA				
070G	0.070-0.075	-	-	-	-	-	-	1 / 16 Dia Solid Rivets
089G	0.089-0.094	-	-	-	-	-	-	No. 2 Screws
098G	0.098-0.103	-	-	-	-	-	-	3 / 32 Dia Solid Rivets and Blind Rivets For Plate Nut Attach
116G	0.116-0.121	-	-	-	-	-	-	No. 4 Bolts and Screw
1285G	0.1285- 0.1335	-	-	-	-	-	-	1 / 8 Dia Solid Rivet
129C	0.129-0.132	0.155	0.015 / 0.025	0.179	0.010 / 0.025	0.159	0.010 / 0.025	1 / 8 Dia Blind Rivet
144G	0.144-0.149	-	-	-	-	-	-	No. 6 Bolts and Screw
156C	0.156-0.159	0.182	0.015 / 0.025	0.206	0.010 / 0.025	0.186	0.010 / 0.025	No. 4 Thread Dia Unsealed Rivnut
160E	0.160-0.164	0.186	0.015 / 0.025	0.210	0.010 / 0.025	0.190	0.010 / 0.025	5 / 32 Blind Rivets
161G	0.161-0.166	-	-	-	-	-	-	5 / 32 Solid Rivets
164C	0.164-0.167	0.190	0.020 / 0.030	0.224	0.015 / 0.030	0.204		5 / 32 Dia Hi-Loks, Huck Bolts, Blind Bolts, Lock Bolts, No. 8 Bolts/Screws (Structural)
165C	0.165-0.168	0.190	0.020 / 0.030	0.224	0.015 / 0.030	0.204	0.015 / 0.030	5 / 32 Dia (Visu-lok)
170C	0.170-0.173	0.216	0.025 / 0.035	0.240	0.015 / 0.030	0.220	0.015 / 0.030	No. 4 Thread Dia Hi-Sher Blind Bolts and Nuts
171G	0.171-0.176	-	-	-	-	-	-	No. 8 Bolts and Screws (Non-Structural)
190A	0.190-0.192	0.226	0.020 / 0.030	0.250	0.020 / 0.035	0.230	0.020 / 0.035	3 / 16 Dia Interference Fit Hi-Tigues and Cherrybucks

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Hole Preparation Specification - Fastener; Metallic Structure  
Figure 201 (Sheet 1 of 5)

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DIA CODE	HOLE DIA	EDGE BREAK CONDITIONS						FASTENER (REF ONLY)
		PROTRUDING HEAD					FLUSH HEAD	
		Chamfer (Max) 90° XDia	Radius with 160° CSK		Radius with 100° CSK		DADIUS	
			Min / Max Rad.	CSK DIA	Min / Max Rad.	CSK DIA		
190C	0.190-0.193	0.226	0.020 / 0.030	0.250	0.020 / 0.035	0.230	0.020 / 0.035	3 / 16 Dia Hi-Loks Bolts Screws. Lockbolts (Structural)
190C1	0.190-0.193	0.216	0.015 / 0.025	0.239	0.010 / 0.025	0.220	0.010 / 0.025	No. 6 Thd Dia Unsealed Rivnuts
192E	0.192-0.196	0.218	0.015 / 0.025	0.242	0.010 / 0.025	0.222	0.010 / 0.025	3 / 16 Dia Blind Rivet
1935G	0.1935- 0.1985	-	-	-	-	-	-	3 / 16 Dia Solid Rivet
197E	0.197-0.201	0.243		0.267	0.015 / 0.035	0.247	0.015 / 0.035	No. 5 Thd Dia Hi-Shear Blind Bolts and Nuts
197G	0.197-0.202	-	-	-	-	-	-	3 / 16 Dia Bolts and Screws (Non-Structural)
199C	0.199-0.202	0.235	0.020 / 0.030	0.259	0.015 / 0.030	0.239	0.015 / 0.030	3 / 16 Dia Blind Bolts and Visu-Locks
219C	0.219-0.222	-	-	-	-	-	0.010 / 0.025	No. 6 Thd Dia Hi-Shear Blind Nuts
222C	0.222-0.225	0.248	0.015 / 0.025	0.272	0.010 / 0.025	0.252	0.020 / 0.035	No. 8 Thd Dia Unsealed Rivnuts
250A	0.250-0.252	0.286	0.020 / 0.030	0.310	0.020 / 0.035	0.290	0.020 / 0.035	1 / 4 Dia Interference Fit Hi-Tigues and Cherry Bucks
250C	0.250-0.253	0.286	0.020 / 0.030	0.310	0.020 / 0.035	0.290	0.020 / 0.035	1 / 4 Dia Hi-Loks, Bolts, Screws, Lockbolts (Structural)
251C	0.251-0.254	0.277	0.015 / 0.025	0.310	0.010 / 0.025	0.281	0.010 / 0.025	No. 10 Thd Dia Unsealed Rivnuts
257G	0.257-0.262	-	-	-	-	-	-	1 / 4 Dia Solid Rivets, Bolts, Screws (Non-Structural)

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Hole Preparation Specification - Fastener; Metallic Structure  
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DIA CODE	HOLE DIA	EDGE BREAK CONDITIONS						FASTENER (REF ONLY)
		PROTRUDING HEAD					FLUSH HEAD	
		Chamfer (Max) 90°XDia	Radius with 160° CSK		Radius with 100° CSK		RADIUS	
Min / Max Rad.	CSK DIA		Min / Max Rad.	CSK DIA				
258J	0.258-0.264	0.304	0.025 / 0.035	0.328	0.015 / 0.030	0.308	0.015 / 0.030	No. 8 Thd Dia Hi-Shear Blind Bolts and Nuts
260C	0.260-0.263	0.296	0.020 / 0.030	0.330	0.015 / 0.030	0.310	0.015 / 0.030	1 / 4 Dia Blind Bolts and Visu-Locks
3125A	0.3125-0.3145	0.359	0.025 / 0.035	0.383	0.030 / 0.045	0.363	0.030 / 0.045	5 / 16 Dia Interference Fit hi-Tigues and Cherrybucks
3125C	0.3125-0.3155	0.359	0.025 / 0.035	0.383	0.030 / 0.045	0.363	0.030 / 0.045	5 / 16 Dia Hi-Loks, Bolts, Srew, Blind Bolts, Llockbolts, Visu-Locks (Structural)
313J	0.313-0.319	-	-	-	-	-	0.015 / 0.030	No. 10 Thd Dia Hi-Shear Blind Nuts
316G	0.316-0.321	-	-	-	-	-	-	5 / 16 Dia Solid Rivets
320G	0.320-0.325	-	-	-	-	-	-	5 / 16 Dia Bolts and Screws (Non-Structural)
333C1	0.333-0.336	-	-	-	-	-	-	1 / 4 Thd Dia Sealed Rivnut
333C	0.333-0.336	0.359	0.015 / 0.025	0.383	0.010 / 0.025	0.363	0.010 / 0.025	1 / 4 Thd Dia Unsealed Rivnut
339J	0.339-0.345	0.385	0.025 / 0.035	0.409	0.015 / 0.030	0.389	0.015 / 0.030	No. 12 Thd Dia Hi-Shear Blind Bolts and Nuts
375A	0.375-0.377	0.421	0.025 / 0.035	0.445	0.030 / 0.045	0.425	0.030 / 0.045	3 / 8 Dia Interference Hi-Tigues and Cherrybucks
375C	0.375-0.378	0.421	0.025 / 0.035	0.445	0.030 / 0.045	0.425	0.030 / 0.045	3 / 8 Dia Hi-loks, Bolts, Screw, Blind Bolts, Lockbolts, Visu-Locks (Structural)

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DIA CODE	HOLE DIA	EDGE BREAK CONDITIONS						FASTENER (REF ONLY)
		PROTRUDING HEAD					FLUSH HEAD	
		Chamfer (Max) 90° X Dia	Radius with 160° CSK		Radius with 100° CSK		RADIUS	
			Min / Max Rad.	CSK DIA	Min / Max Rad.	CSK DIA		
382G	0.382-0.387	-	-	-	-	-	-	3 / 8 Dia Bolts and Screws (Non-Structural)
391J	0.391-0.397	0.437	0.025 / 0.035	0.461	0.015 / 0.030	0.441	0.015 / 0.030	1 / 4 Thd Dia Hi-Shear Blind Bolts and Nuts
4375A	0.4375- 0.4395	0.484	0.025 / 0.035	0.508	0.040 / 0.055	0.488	0.040 / 0.055	7 / 16 Dia Interference Hi-Tigues and Cherrybucks
4375C	0.4375- 0.4405	0.484	0.025 / 0.035	0.508	0.040 / 0.055	0.488	0.040 / 0.055	7 / 16 Dia Hi-loks, Bolts, Screw, Blind Bolts, Lockbolts, Visu-Locks (Structural)
445G	0.445-0.450	-	-	-	-	-	-	7 / 16 Dia Bolts and Screws (Non-Structural)
469J	0.469-0.475	0.515	0.025 / 0.035	0.539	0.015 / 0.030	0.519	0.015 / 0.030	1 / 4 Thd Dia Hi-Shear Blind Bolts and Nuts
500A	0.500-0.502	0.546	0.025 / 0.035	0.570	0.040 / 0.055	0.550	0.040 / 0.055	1 / 2 Dia Interference Hi-Tigues and Cherrybucks
500C	0.500-0.503	0.546	0.025 / 0.035	0.570	0.040 / 0.055	0.550	0.040 / 0.055	1 / 2 Dia Hi-Loks, Bolts, Blind Bolts
507G	0.507-0.512	-	-	-	-	-	-	1 / 2 Dia Bolts and Screws (Non-Structural)
531J	0.531-0.537	0.577	0.025 / 0.035	0.601	0.015 / 0.030	0.581	0.015 / 0.030	3 / 8 Thd Dia Hi-Shear Blind Bolts and Nuts
5625C	0.5625- 0.5655	-	-	-	-	-	0.015 / 0.030	9 / 16 Dia Bolts and Shear Head Only (Structural)
577J	0.577-0.583	-	-	-	-	-	-	9 / 16 Dia Bolts

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DIA CODE	HOLE DIA	EDGE BREAK CONDITIONS					FASTENER (REF ONLY)	
		PROTRUDING HEAD				FLUSH HEAD		
		Chamfer (Max) 90°XDia	Radius with 160° CSK		Radius with 100° CSK			RADIUS
Min / Max Rad.	CSK DIA		Min / Max Rad.	CSK DIA				
593J	0.593-0.599	-	-	-	-	-	0.010 / 0.025	7 / 16 Thd Dia Hi-Shear Blind Nuts
625A	0.625-0.627	0.691	0.035 / 0.045	0.715	0.040 / 0.055	0.695	0.040 / 0.055	5 / 8 Dia Interference Fit Hi-Tigues
625C	0.625-0.628	0.691	0.035 / 0.045	0.715	0.040 / 0.055	0.695	0.040 / 0.055	5 / 8 Dia Hi-Loks and Bolts (Structural)
656J	0.656-0.662	-	-	-	-	-	0.010 / 0.025	1 / 2 Thd Dia Hi-Shear Blind Nuts
750C	0.750-0.753	0.826	0.040 / 0.050	0.950	0.040 / 0.055	0.930	0.040 / 0.055	3 / 4 Dia Hi-Loks and Bolts (Structural)
875C	0.875-0.878	0.961	0.045 / 0.055	0.985	-	-	-	7 / 8 Dia Bolts (Structural)
1.000C	1.000-1.003	1.106	0.055 / 0.065	1.120	-	-	-	1 Dia Bolts (Structural)

33620C00

Hole Preparation Specification - Fastener; Metallic Structure  
Figure 201 (Sheet 5 of 5)

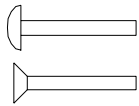

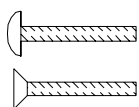
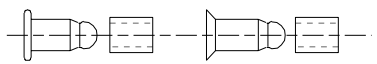
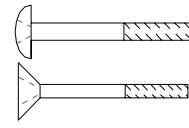
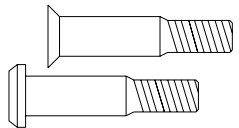
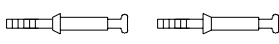
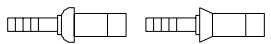
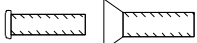

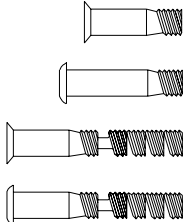

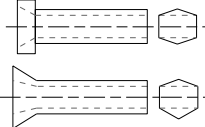
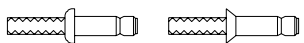
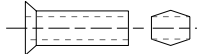
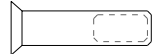
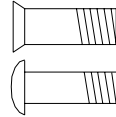
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# GULFSTREAM IV

## STRUCTURAL REPAIR MANUAL

### FASTENER TYPES

ILLUS. NUMBER	DESCRIPTION	ILLUS. NUMBER	DESCRIPTION
1	SOLID RIVETS 	10	CHERRYBUCKS BI-METALLIC TITANIUM 
2	FULLY THREADED BOLTS AND SCREWS 	11	HI-SHEAR RIVETS 
3	BOLTS AND SCREWS 	12	HI-LOKS 
4	BLIND RIVETS 	13	BLIND BOLTS 
5	RIVNUTS OPEN END  CLOSED END 	14	LOCKBOLTS 
6	FOR ADDITIONAL HOLE PREPARATION FOR SEALED RIVNUTS (GAN512-B AND GAN512E) SEE GAH11H SEALED RIVNUTS (GAN512F) (GAN512DV) 		
7	HI-SHEAR BLIND BOLTS AND NUTS 	15	VISU-LOCKS 
8	HI-SHEAR BLIND NUTS 	16	SHEAR HEAD BOLTS 
9	HIGH-TIQUES 		

### HOLE PREPARATION SPECIFICATION - FASTENER; METALLIC STRUCTURE

29392C00

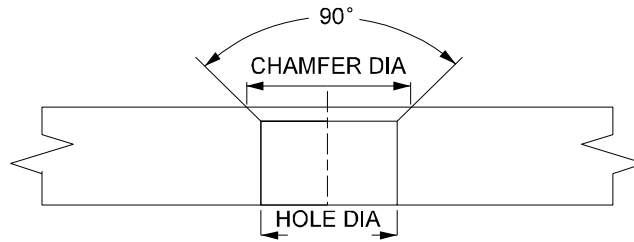
Fastener Types  
Figure 202

**51-42-00**

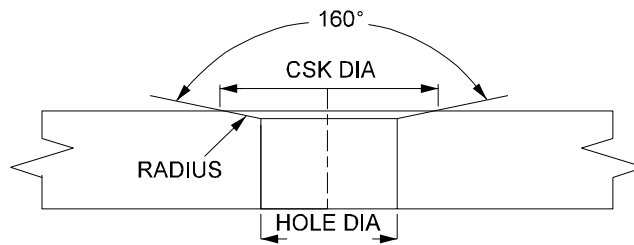
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# GULFSTREAM IV

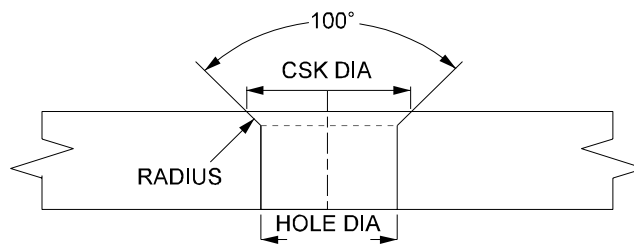
## STRUCTURAL REPAIR MANUAL



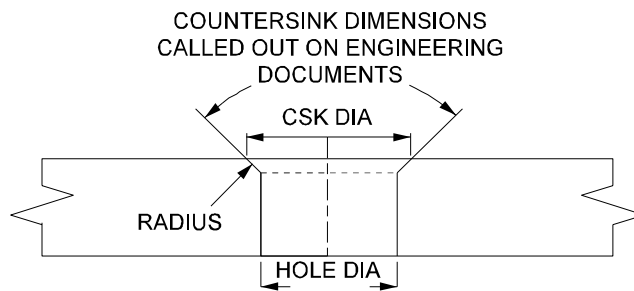
PROTRUDING HEAD (CHAMFER 90° x DIA)



PROTRUDING HEAD (RADIUS WITH 160° CSK)



PROTRUDING HEAD (RADIUS WITH 100° CSK)



FLUSH HEAD (RADIUS)

### EDGE BREAK CONFIGURATIONS

29393C00

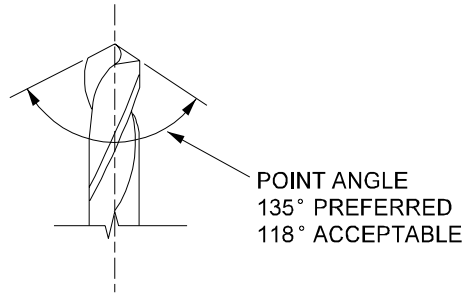
Edge Break Configurations  
Figure 203

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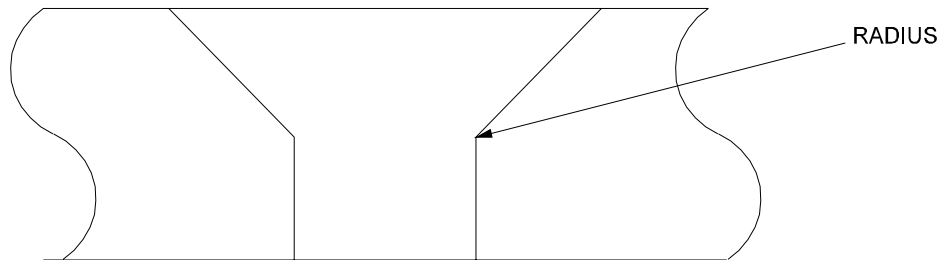
# GULFSTREAM IV

## STRUCTURAL REPAIR MANUAL



29394C00

Drill Point Angle  
Figure 204



33706C00

Hole Prep Chamfer / Radius  
Figure 205 (Sheet 1 of 2)

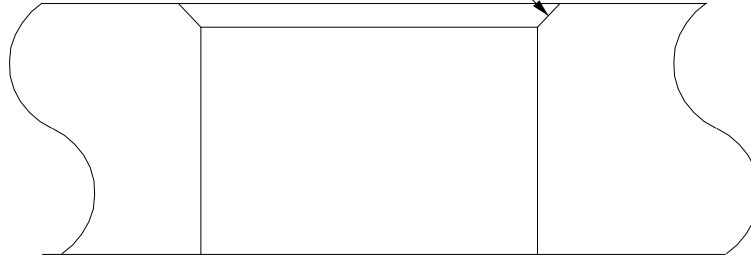
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## STRUCTURAL REPAIR MANUAL

CHAMFER (45°) OR RADIUS



29626C00

Hole Prep Chamfer / Radius  
Figure 205 (Sheet 2 of 2)

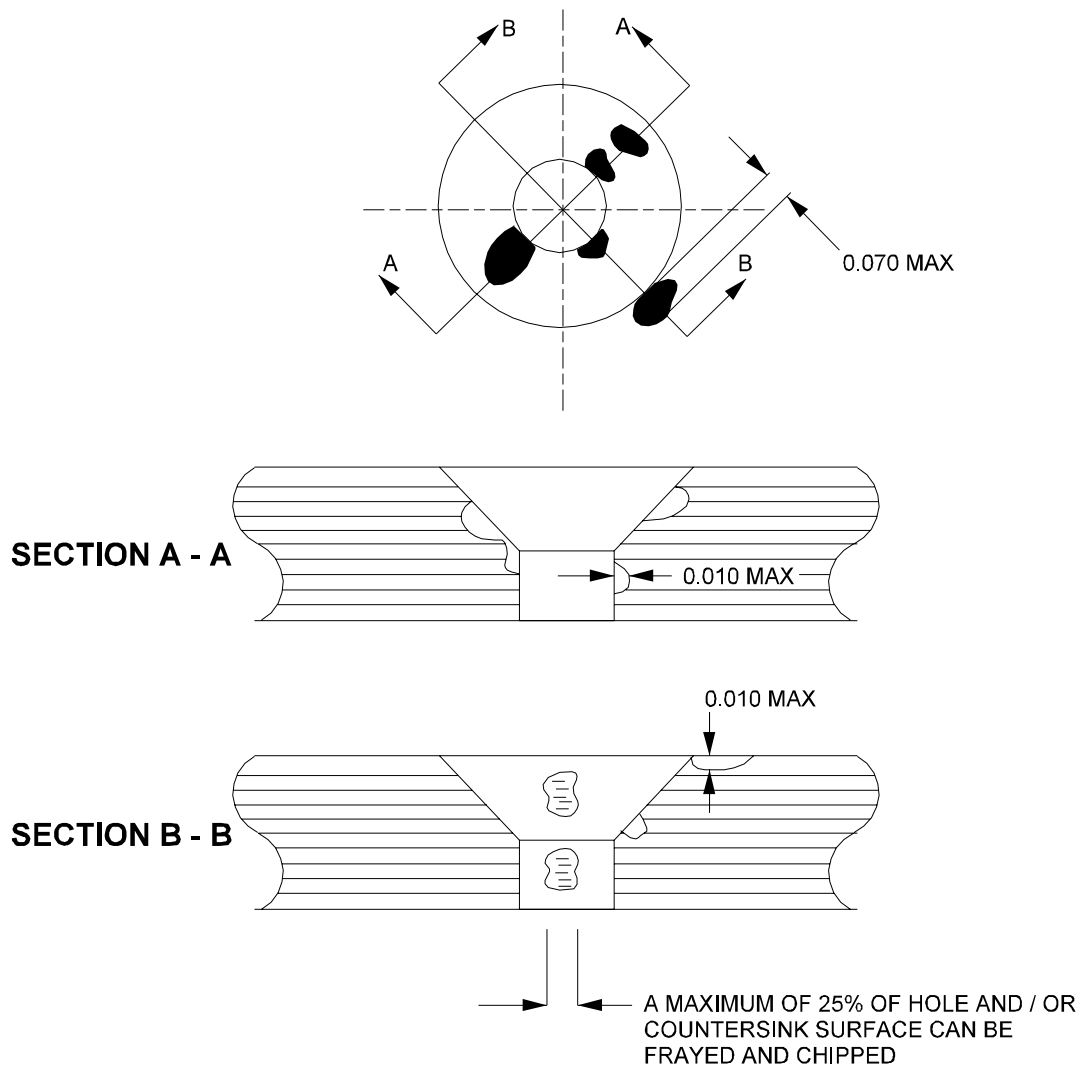
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# GULFSTREAM IV

## STRUCTURAL REPAIR MANUAL



29625C00

Hole Prep  
Figure 206

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**GULFSTREAM IV**  
**STRUCTURAL REPAIR MANUAL**

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