SEALANTS

1. DESCRIPTION

This section contains information which defines the proper usage, storage, shelf life, and application of sealants used on the airplane. Sealant is used to prevent the spread of fire or flames from the engine compartment to the airplane, prevent air leakage, prevent fastener corrosion, prevent water or dust intrusion, and to prevent fluid leakage. The following sealants are recommended by Cirrus Design Corporation.

A. Approved Sealants

The sealants shown in the referenced figure, when applied properly, have been approved by Cirrus Design for use in specified applications. These sealants are available from a variety of manufacturers and packaged in a variety of fashions - in bulk, in kits, and in premixed form. (See Figure 20-101)

CAUTION: Always observe the manufacturer’s recommendations for the product being used.

B. Shelf Life

Shelf life refers to the period of time (usually from the date of manufacture) in which the sealant is usable. Shelf life is dependent on proper storage temperature and environmental factors, such as humidity and exposure to sunlight. Always observe the manufacturer’s instructions for recommended use, storage, and testing of over-aged sealant.

C. Storage Criteria

All sealants must be stored under controlled temperature conditions to achieve maximum shelf life. Unmixed sealants should be stored at a controlled temperature of between 40°F (4.5°C) and 80°F (26.5°C). Never store sealants where the temperature exceeds 95°F or falls below 40°F. Unmixed sealants stored at temperatures exceeding 80°F (26.5°C) should be used within five weeks. All sealants should be used on a “first in, first out” basis.

Note: Containers must be tightly closed prior to placing them in the proper storage environment. Sealants must be stored as recommended by the manufacturer. Mixed sealants subjected to refrigerated storage may exhibit altered application life. Mark all material containers clearly with a “use by” date, consisting of the year and month.

(1) Refrigerated Storage - Mixed Sealants

When desired, store mixed sealants under refrigeration. Use of a quick-freeze technique is recommended to minimize the amount of application life that would be lost in a slower cooling procedure. To quick-freeze mixed sealant, immerse the filled cartridges in a slurry of dry ice and alcohol for 10 minutes.

(2) Thawing of Frozen Sealant

Frozen sealant is normally thawed by exposure to ambient temperature for 20 to 30 minutes. However, the rate of thawing may be accelerated by immersion in warm water, 120°F (49°C) maximum, for approximately 10 minutes. Sealants are subject to excessive slumping when heated to temperatures above 80°F (26.5°C). For best results, thawing time should be adjusted to give an extruded or thawed sealant temperature 60 - 80°F (15.5°C - 26.5°C). The time consumed by freezing and thawing operations reduce application life by approximately 30 minutes.

Further reduction in application life may result from duration and temperature during storage. It is recommended that all aspects of mixing, freezing, and thawing be considered before mixing and freezing material with less than one hour application life.

Note: Thawed sealant must not be re-frozen. All sealants must extrude freely before application to any surface. Adhesion may be lowered by condensation of moisture if the sealant is not thawed to an extruded temperature of at least 60°F
<table>
<thead>
<tr>
<th>Type</th>
<th>P/N or Spec.</th>
<th>Manufacture</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTV Silicone Sealant (high temperature)</td>
<td>RTV 736</td>
<td>Dow Corning</td>
<td>Non composite structure (firewall fitting).</td>
</tr>
<tr>
<td>Brushable Sealant</td>
<td>MIL-S-8802 Type 2 Class A*</td>
<td>Goal</td>
<td>Fuel tank repair surface seal.</td>
</tr>
<tr>
<td></td>
<td>GC408A</td>
<td>CPS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>890A</td>
<td>3M</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EC1675A</td>
<td>Chem Seal Flame Master</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CS3204 C1.A</td>
<td>PRC Aerospace Sealants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PR1440A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extrusion Gun Sealant</td>
<td>MIL-S-8802 Type 2 Class B or</td>
<td>Chem Seal - Flame Master</td>
<td>Fillet, faying surface, and injection seal in fuel tanks. Install and seal</td>
</tr>
<tr>
<td></td>
<td>AMS3277 Type 2 Class B*</td>
<td>Goal</td>
<td>windows. Seal fuel system enclosure in cabin.</td>
</tr>
<tr>
<td></td>
<td>CS3204 C1.B</td>
<td>PRC Aerospace Sealants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GC408B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P/S 890B</td>
<td>PRC Aerospace Sealants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PR1440B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EC1675B</td>
<td>3M</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AC-240B</td>
<td>Dynamold Aerospace</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMS-S-83318 Class B*</td>
<td>3M</td>
<td>Access panel sealant.</td>
</tr>
<tr>
<td></td>
<td>AC-250B</td>
<td>PRC Aerospace Sealants</td>
<td></td>
</tr>
<tr>
<td></td>
<td>P/S 860B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firewall Sealant</td>
<td>MIL-S-38249 Type 1</td>
<td>PRC Aerospace Sealants</td>
<td>Perimeter seal firewall. Fuel flow transmitter assembly.</td>
</tr>
<tr>
<td></td>
<td>P/S 700 or P/R 812 Sealant</td>
<td>Glendale, CA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AMS 3374</td>
<td>D Aircraft Products, Inc.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dapco 2200 Sealant</td>
<td>Anaheim, CA</td>
<td></td>
</tr>
<tr>
<td>Thread Sealant</td>
<td>565</td>
<td>Loctite</td>
<td>To obtain a leak-free seal on non-fuel system metallic pipe threads</td>
</tr>
<tr>
<td>Latex Sealant</td>
<td>051135-06580</td>
<td>3M</td>
<td>General exterior fillet &amp; faying surface sealing.</td>
</tr>
<tr>
<td></td>
<td>C850A 151-8273</td>
<td>Sherwin Williams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1518281</td>
<td>Sherwin Williams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>08361</td>
<td>Sherwin Williams</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1518299 0920-A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* When ordering MIL-S-8802 or AMS-S-83318 sealants make sure that an appropriate work life is specified. Work life is specified by adding the desired work life in the product dash number after the Class designation, e.g. A-1/2, A-2, B-1/2, B-2, etc.

Figure 20-101
Approved Sealants
D. Sealant Properties (See Figure 20-102)

(1) Application Time / Work Life
Application time refers to the time a mixed compound remains at a consistency suitable for application. After this point, the sealant does not "wet" properly and may fail in adhesion (sealant "rolls up" ahead of the sealing gun or "draws up" behind the gun). Application times shown in Figure 20-1 are based upon an ambient temperature of 77°F (25°C) and a relative humidity of 50%. For fuel tank sealants, every 20°F (10.6°C) rise in temperature halves application time and every 20°F (10.6°C) decline in temperature doubles application time. High humidity during the mixing process will shorten application time.

(2) Tack-Free Time
Tack-free time is the time that a sealant requires to cure sufficiently to not stick to standard polyethylene film when the film is pressed into the sealant.

(3) Cure Time
The time required to sufficiently cure applied sealant depends upon the ambient temperature and relative humidity. Always observe the manufacturer's recommendations for cure. Low humidity will extend the cure time. Optimum cure for most sealants will be obtained at 77°F (25°C) and 50% relative humidity. A high state of cure is developed after 14 days at this temperature and humidity. Cure may be hastened by applying heat up to 130°F. For fuel tank sealants, every 20°F (10.6°C) rise in temperature halves cure time and every 20°F (10.6°C) decline in temperature doubles cure time. Fuel tank sealant is considered to be sufficiently cured for pressure test when sealant is tack free, does not pit when firmly pressed, and feels firm to the touch (Rex Durometer reading of approximately 30 A).
### Typical Sealant Properties

<table>
<thead>
<tr>
<th>Sealant</th>
<th>Work Life (Hours)</th>
<th>Tack Free (Hours)</th>
<th>Testable Cure Time (Hours)</th>
<th>Standard Cure Time (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIL-S-8802 A-1/2</td>
<td>1/2</td>
<td>&lt;10</td>
<td>36</td>
<td>14</td>
</tr>
<tr>
<td>MIL-S-8802 A-2</td>
<td>2</td>
<td>&lt;30</td>
<td>60</td>
<td>14</td>
</tr>
<tr>
<td>MIL-S-8802 B-1/2</td>
<td>1/2</td>
<td>&lt;10</td>
<td>24</td>
<td>14</td>
</tr>
<tr>
<td>MIL-S-8802 B-1</td>
<td>1</td>
<td>&lt;16</td>
<td>40</td>
<td>14</td>
</tr>
<tr>
<td>MIL-S-8802 B-2</td>
<td>2</td>
<td>&lt;20</td>
<td>48</td>
<td>14</td>
</tr>
<tr>
<td>MIL-S-38249</td>
<td>2</td>
<td>&lt;4</td>
<td>48</td>
<td>14</td>
</tr>
</tbody>
</table>

Above data based upon 77°F (25°C) and 50% relative humidity. Results can vary due to temperature, humidity, and mix proportions. Testable cure time based upon a Rex Durometer reading of at least 30A to 35 A.
E. Types of Seals

1. Fillet Seals (See Figure 20-103)
   Fillet sealing is the application of a bead of extrudable sealant to seams, joints, and intersecting planes or surfaces. Fillet seals are used in the integral fuel tank along the intersection of the wing skin ribs, along the intersection of the wing skin and the spar and aft shear web, around fasteners and fittings protruding into the tank. Fillet seals are also used around the firewall perimeter, and other places where weather, fume, or dust intrusion must be prevented and to seal wetted areas. Fillet seals are accomplished using extrudable sealants in an extrusion cartridge, tube, or spatula. Fillet seals may be tooled to improve appearance, fill voids and remove bubbles. A satisfactory fillet seal is indicated when the fillet overlaps the seam by the required dimension, is smooth in appearance, adheres to both sides of the seam, and is free of voids, bubbles, and overlaps. Fillet seals may be tooled immediately after application to achieve the seal.

2. Faying Surface Seals (See Figure 20-104)
   Faying surface seals are used between surfaces where an absolute seal cannot be obtained by sealing around fasteners or by applying fillet seals. A faying surface seal around a fastener prevents fuel or liquids from reaching the fastener thread or shaft. The faying surface seal does not completely seal the fastener which must also be sealed. Faying surface seals are used during the manufacture of the airplane to seal areas that are difficult or impossible to seal after assembly. Faying surface seals may be applied by brushing on sealant or using and extrusion cartridge, tube, or spreading the sealant using a spatula. A satisfactory faying surface seal is indicated when a small amount of sealant is extruded on both sides of the joint after assembly of the faying surfaces.

3. Injection Seals (See Figure 20-104)
   Injection seals are used to fill holes, joggles, channels and other voids. Injection seals may be applied to provide continuity where fillet seals are interrupted by structure. Injection sealing forces air out of a cavity and fills the vacated space with sealant. Injection seals are accomplished by injecting the area with an extrudable sealant through an extrusion cartridge or a tube.

4. Brush Seals
   Brush sealing is used in the fuel tank to reseal surface areas after a structural repair to the wing exterior skins. The wet area inside the tank must be sanded, cleaned and free of all dust and contaminants. The sealant is applied using a stiff-bristle brush to the repair and surrounding area.
F. Method of Application

Sealants may be applied with a brush, a roller, an extrusion gun, or with a spatula. Extrusion guns are available as either hand operated or pneumatic powered. Some extrudable sealants are also available in squeezable tubes. Each application method has advantages in particular situations.

(1) Brush Application
A stiff-bristle brush (not nylon) is used to apply the sealant to the surface to be sealed. Brushed on sealant application may be used for faying surface sealing, fastener sealing, and surface sealing.

(2) Roller Application
Faying surface and brushable sealant may be applied using a roller. For some applications where a thin even coat of sealant is to applied, a roller is the preferred method of application.

(3) Extrusion Application
Fillet and faying surface seals may be applied with an extrusion gun. Injection seals must be applied using an injection gun. Some extrusion guns are available with a variety of nozzles for various applications. Nozzle tips may be shaped as required by the mechanic to provide a bead of sealant with the shape and dimensions for the specific seal.

(4) Spatula Application
A spatula is used to spread sealant material for faying surface and fillet seals. Normally, a spatula cannot be used to provide an injection seal. Small repair fillet seals may be applied with a spatula if an extrusion gun is not available or will not fit in the area to be sealed. Spatulas may be manufactured by the mechanic to tool fillet seals applied with an extrusion gun to fill voids, even the bead, and/or to remove bubbles.
Figure 20-103
Fillet Sealing

Note: Gap must be filled not bridged.

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Effectivity:
All

15 Jun 2010
INJECTION SE Sealing

Injection is complete when sealant emerges from opposing side.

Sufficient seal evidenced by small amount of sealant extruded around entire edge.

Cover entire faying surface with sealant.

Faying Surface Sealing

Figure 20-104
Injection & Faying Surface Sealing
2. MAINTENANCE PRACTICES

A. Preparation for Sealing

(1) General Procedure

(a) Acquire necessary tools, equipment, and supplies.

<table>
<thead>
<tr>
<th>Description</th>
<th>P/N or Spec.</th>
<th>Supplier</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sealant Removal and Cutting Tools</td>
<td></td>
<td>Locally manufacture</td>
<td>Remove sealant.</td>
</tr>
<tr>
<td>Pipe Cleaners</td>
<td></td>
<td>Any Source</td>
<td>Remove sealant in injectable gaps.</td>
</tr>
<tr>
<td>Bristle Brush (non-nylon)</td>
<td></td>
<td>Any Source</td>
<td>Clean up.</td>
</tr>
<tr>
<td>Sandpaper, Aluminum Oxide</td>
<td>200 grit</td>
<td>Any Source</td>
<td>Prep composite surfaces.</td>
</tr>
<tr>
<td>Cotton cloth (clean, lint free)</td>
<td></td>
<td>Any Source</td>
<td>Surface cleaning.</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td>99% or higher purity</td>
<td>Any Source</td>
<td>Surface clean acrylic windows or composite materials.</td>
</tr>
<tr>
<td>Acetone</td>
<td>ASTM D-329</td>
<td>Any Source</td>
<td>Surface clean composite materials.</td>
</tr>
<tr>
<td>Protective Gloves</td>
<td></td>
<td>Any Source</td>
<td>Protect hands from chemicals.</td>
</tr>
<tr>
<td>Goggles</td>
<td></td>
<td>Any Source</td>
<td>Protect eyes from chemicals.</td>
</tr>
</tbody>
</table>

(b) Determine if structural repair is required. *(Refer to 51-10)*

(c) If repair is required, repair structure in accordance the standard structural repair practices. *(Refer to 51-70)*

(d) Examine seal in suspect area and determine the seal level and seal plane in adjacent structure.

**Note:** The seal plane is the boundary plane through any assembly of structural items that presents a continuous barrier to the flow of liquids or gases.

(e) Identify the type of sealant used in the area of the defect.

**CAUTION:** Do not interchange sealing compounds. Best results are obtained by using the sealant compound originally applied to make repairs.

(f) Determine the type of seal (faying surface, fillet, injection, or brushed) required for the repair.

(g) Use sealant cutting tools to remove or notch the sealant in the defective area. Sufficient sealant must be removed to produce a solid, intact seal on each side of the affected area.

CAUTION: Do not interchange sealing compounds. Best results are obtained by using the sealant compound originally applied to make repairs.
CAUTION: Cutting tools must be made only from non-ferrous materials that are softer than the surrounding structure. Use hardwood or acrylic tools for composite structure and polyethylene, polypropylene, or Teflon around acrylic windows.

(h) Examine rework area for clean cuts, adequate notching, and for access. All loose pieces of sealant in the repair area must be removed. If required, the area can be lightly sanded or brushed briskly with a stiff-bristle brush to remove sealant.

CAUTION: Use caution not to sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for composite repair.

(i) Solvent clean area to be sealed. (Refer to 20-30)

B. Mixing Sealants

WARNING: Keep all sealants away from open flames or other sources of ignition.

Mix and use sealants only in areas with adequate ventilation.

Wear protective gloves when handling sealants and cleaned parts. Do not use protective hand creams as they can contaminate the sealant.

Avoid skin contact. If contact occurs, wash area thoroughly with soap and water.

Wear goggles for eye protection. If accidental eye contact with sealant, sealant components, or cleaning solvent occurs, immediately flush eyes with large quantities of water and report to a doctor for further examination and/or treatment.

CAUTION: The expiration date is stamped on each sealant container, never use expired sealant.

Do not stir air into mixture, if air bubbles appear, they must be removed. Mixing containers must be clean and free of all contaminates.

All equipment used in mixing sealant must be clean and dust free to avoid contamination of sealant. Clean equipment immediately after use.

Note: Proper mixing and correct proportions are extremely important to obtain optimum results. Always observe sealant manufacturer’s recommendations for mixing sealant.

(1) Materials

(a) Acquire necessary tools, equipment, and supplies.

<table>
<thead>
<tr>
<th>Description</th>
<th>P/N or Spec.</th>
<th>Supplier</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean, Wax Free Container</td>
<td>-</td>
<td>Any Source</td>
<td>Hand mix sealant.</td>
</tr>
<tr>
<td>Spatula</td>
<td>-</td>
<td>Any Source</td>
<td>Hand mix sealant.</td>
</tr>
<tr>
<td>Scales, Accuracy ± 2%</td>
<td>-</td>
<td>Any Source</td>
<td>Proportion sealant.</td>
</tr>
<tr>
<td>Rotary Mixer</td>
<td>1384</td>
<td>Semco Application Systems PRC-DeSoto Intl Inc. Glendale, CA</td>
<td>Mix sealant.</td>
</tr>
</tbody>
</table>
(2) Hand Mixing Mil-S-38249, Type I Firewall Sealant
   (a) Weigh the amount of base material desired into a clean, wax free container. Mix in accordance to the noted ratios.
      • For P/S 700 sealant, add accelerator to the base material at the ratio of 2.5 parts by weight of accelerator to 100 parts by weight of the base. Application life of P/S 700 is 2 hours when used at 75°F (24°C).
      • For PR-812 firewall sealant, add accelerator to the base material at a ratio of 2.5 parts by weight of accelerator to 100 parts by weight of the base. Application life of PR-812 is 8 hours when used at 75°F (24°C).
   (b) Stir as required to thoroughly mix the two components. After thorough and proper mixing, the mixed sealant shall be uniform in color and viscosity.

   Note: Be sure to scrape the sides and bottom of the container in order to include all the base material in the mixture and to ensure uniform blending. Scrape mixing paddle on container sides periodically to ensure all material, including that on paddle, is mixed.

   The MIL-S-38249 firewall sealant has a one year storage life when stored at temperatures below 80°F (26.5°C) in their original unopened containers.

(3) Hand Mixing Mil-S-8802, Type II, Class A Brushable Fuel Tank Sealant
   Sealant is furnished in premeasured and proportioned kits. If the entire kit is not needed they can be proportioned by combining ten parts of the base compound with one part accelerator (by weight). Use an accurate scale when mixing base and accelerator.
   (a) Stir the accelerator to absorb all floating liquid before it is mixed with the sealant. The accelerator can then be poured into the container of sealant for mixing, otherwise, a wax-free container must be used.
   (b) Thoroughly stir accelerator in its container until even consistency is obtained.
   (c) Slowly stir accelerator into the base compound and thoroughly mix for approximately 7 to 10 minutes.

   Note: Be sure to scrape the sides and bottom of the container in order to include all the compound in the mixture and to ensure uniform blending. Scrape mixing paddle on container sides periodically to ensure all material, including that on paddle, is mixed.

(4) Alternate Mixing Procedure for Mil-S-8802, Type II, Class A Brushable Sealant
   (a) As an alternate procedure, a custom quantity may be mixed by weighing into a clean, wax-free container. Weigh the correct amount of base and accelerator immediately prior to mixing.
Note: The scales and weighing procedure must be controlled within 2% to insure good quality. A standard gallon-capacity paint shaker (1350 vibrations/minute) may be used to mix all kit sizes. Full containers should not be mixed on a paint shaker.

(b) Add accelerator to the base compound, replace lid, and vibrate 3-1/2 minutes to 5 minutes in an upright position.
(c) Remove container, open, and scrape down the sides with a spatula or putty knife. Replace lid and vibrate in an inverted position for 3-1/2 to 5 minutes.
(d) Use sealant or freeze for storage as required.

(5) Mixing of Mil-S-8802, Type II, Class B Extrusion Gun Sealant
Sealant is furnished in premeasured and proportioned kits and in two-part cartridges. If the two-part cartridges are used a special extrusion gun may be required to apply sealant. If a premeasured kit is used and the entire kit is not needed, the sealant can be proportioned by combining ten parts of the base compound with one part accelerator (by weight). Use an accurate scale when mixing base and accelerator. Extrusion gun sealant supplied in proportioned kits may be hand mixed as follows when suitable mechanical pressure mixers are not available.

CAUTION: Mixing must not be performed in a paint shaker. Slow hand mixing is recommended. The compound may be mixed by a slow-speed mechanical mixer. A high-speed mechanical mixer will generate internal heat and reduce application life.

(a) Stir the accelerator to absorb all floating liquid before it is mixed with the sealant. The accelerator can then be poured into the container of sealant for mixing, otherwise, a wax-free container must be used.
(b) Thoroughly stir accelerator in its container until even consistency is obtained.
(c) Slowly stir accelerator into the base compound and thoroughly mix for approximately 7 to 10 minutes.

Note: Be sure to scrape the sides and bottom of the container in order to include all the compound in the mixture and to ensure uniform blending. Scrape mixing paddle on container sides periodically to ensure all material, including that on paddle, is mixed.

(d) Fill new cartridge with mixed sealant and apply or freeze for storage as required.

C. Application of Sealants
(1) General Procedure
(a) Acquire necessary tools, equipment, and supplies.

<table>
<thead>
<tr>
<th>Description</th>
<th>P/N or Spec.</th>
<th>Supplier</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl Alcohol 99% or higher purity</td>
<td>Any Source</td>
<td>Solvent cleaning.</td>
<td></td>
</tr>
<tr>
<td>Acetone ASTM D-329</td>
<td>Any Source</td>
<td>Solvent cleaning.</td>
<td></td>
</tr>
<tr>
<td>Parting Agent (silicone-free automotive wax)</td>
<td>Any Source</td>
<td>Prevent sealant from adhering to parts.</td>
<td></td>
</tr>
<tr>
<td>Cotton cloth (clean, white, lint free)</td>
<td>Any Source</td>
<td>Surface cleaning.</td>
<td></td>
</tr>
</tbody>
</table>
(b) Lightly sand any composite areas to be sealed with 200 grit sandpaper.

**CAUTION:** Use caution not to sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for repair.

(c) Remove metal and composite chips, shavings, and lint using stiff bristle brushes or vacuum.

(d) Solvent clean all surfaces using acetone or isopropyl alcohol. (Refer to 20-30)

**WARNING:** Keep all sealants away from open flames or other sources of ignition.

Mix and use sealants only in areas with adequate ventilation.

Wear protective gloves when handling sealants and cleaned parts. Do not use protective hand creams as they can contaminate the sealant.

Avoid skin contact. If contact occurs, wash area thoroughly with soap and water.
Wear goggles for eye protection. If accidental eye contact with sealant, sealant components, or cleaning solvent occurs, immediately flush eyes with large quantities of water and report to a doctor for further examination and/or treatment.

(e) Mix sealant as required.
(f) Apply sealant using the appropriate sealing techniques. (Refer to 20-10)
(g) Allow sealant to cure before handling.

D. Sealing Techniques

(1) Repairing Faying Surface Seal
The faying surface is the overlapping area of the adjoining surfaces. Faying surface sealing is accomplished by applying sealant to one mating part before assembly. Sufficient sealant must be applied so it will squeeze out completely around the joint when the parts are fastened together. In order to accomplish an adequate seal in an efficient manner, the following sealing and cleaning procedures must be performed as specified. Examples of faying surface seals are at the firewall attachment of the hot air valve and window installation.

(a) Disassemble components from structure to be sealed.
(b) If not already accomplished remove all sealant from faying surfaces with cutting tools and suitable hardwood or plastic scrapers as described in paragraph A. - “Preparation for Sealing.”
(c) Refinish damaged surface.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(d) Solvent clean surfaces to be sealed. (Refer to 20-30)

CAUTION: Do not apply parting agent over paints, primers, or on acrylics. Parting agents will lift paints and most primers and will craze acrylics. Epoxy primers are unaffected by parting agent.

(e) Removable seals shall be applied with the use of a parting agent. For fuel tank access plates, apply parting agent to both surfaces. In all other cases, apply parting agent to one surface only. When parting agent is dry to the touch, the parts may be faying surface sealed and assembled.

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60°F (15.5°C) or to a structure that is below 60°F (15.5°C). Sealed structures must be handled with care and should never be moved until sealant has achieved a tack-free surface. Pressure testing, if required, must never be performed, until all sealant has cured.

(f) Using an extrusion gun, roller, or spatula, apply sealant to one mating surface. Spread sealant over entire faying surface.
(g) Place parts in assembly position and install fasteners within the sealant work life.

Note: Sufficient sealant shall have been applied so that the space between the faying surfaces is completely filled with sealant and a small amount of sealant is extruded continuously along the joint.
(h) Fair out extruded sealant to leave a smooth fillet along joint.
(i) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.
(j) Allow sealant to cure.

(2) Repairing Injection Seal

Injection seals are used to fill holes, joggles, channels and other voids. Injection seals may be applied to provide continuity where fillet seals are interrupted by structure. Injection sealing forces air out of a cavity and fills the vacated space with sealant. Injection seals are accomplished by injecting the area with an extrudable sealant through an extrusion cartridge or a tube. An example of an injection seal is the seal applied in the fuel tank where the joggle at the end of a rib intersects the wing skin interior and the spar or shear web.

(a) If not already accomplished remove all sealant from damaged seal with cutting tools and suitable hardwood or plastic scrapers as described in paragraph A (Preparation for Sealing).

Note: The injection channel must be cleared all the way through as trapped air will prevent complete filling of the channel. A pipe cleaner or hooked wire may be used to clear sealant debris from inside the seal channel.

(b) Refinish damaged surface.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(c) Solvent clean joints to be sealed. Remove all solvent residue and thoroughly dry area. (Refer to 20-30)

CAUTION: Ensure that extrusion gun cartridge has sufficient sealant to make a complete seal with one injection without any break. Stopping and starting an injection seal will cause air to be entrapped in the seal and is cause for rework.

Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60°F (15.5°C) or to a structure that is below 60°F (15.5°C). Sealed structures must be handled with care and should never be moved until sealant has achieved a tack-free surface. Pressure testing, if required, must never be performed, until all sealant has cured.

(d) Apply injection seal by injecting cavity with sealant from one end until sealant emerges from the other.
(e) Remove excess sealant with a fairing tool and smooth ends of seal.
(f) Fair out extruded sealant to leave a smooth fillet along joint.
(g) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.
(h) Allow seal to cure.

(3) Repairing Fillet Seal

Fillet seals are used in the integral fuel tank along the intersection of the wing skin ribs, along the intersection of the wing skin and the spar and aft shear web, around fasteners and fitting protruding into the tank. Fillet seals are also used around the firewall perimeter, and other places...
where weather, fume, or dust intrusion must be prevented and to seal wetted areas. Fillet seals produce a smooth junction. All joints, joggles, voids, and fasteners in wet areas must be fillet sealed. Fillets laid on intersecting joints must be joined together to produce a continuous seal.

(a) If not already accomplished, remove all sealant from damaged seal with cutting tools and suitable scrapers as described in paragraph A. - “Preparation for Sealing.”

Note: The injection channel must be cleared all the way through as trapped air will prevent complete filling of the channel. A pipe cleaner or hooked wire may be used to clear sealant debris from inside the seal channel.

(b) Refinish damaged surface.

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Note: The channel must be cleared all the way through as trapped air will prevent complete filling of the channel. A pipe cleaner or hooked wire may be used to clear sealant debris from inside the seal channel.

(c) Solvent clean channel to be sealed using pipe cleaners. The channel should be cleaned at least twice and all residue removed. Dry channel using pipe cleaners.

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60°F (15.5°C) or to a structure that is below 60°F (15.5°C). Handle sealed structures carefully and do not move until sealant is tack-free. Pressure testing, if required, must never be performed, until all sealant has cured. Sealant must never be applied after usable application time.

(d) Use the extrusion gun to lay a bead along joint. Point the extrusion gun into the seam and maintain it nearly perpendicular to the line of travel. A bead of sealant shall precede the extrusion gun nozzle tip. and work out all entrapped air with a small paddle.

Note: Sealant must be applied so that it provides an airtight seal. Ensure that folds, laps, and entrapped air are not created during sealing. The fillet can be moved slightly to ensure that the highest portion of the fillet is over the edge of the structure.

(e) A fillet may be applied in two or more applications. A small fillet should be applied first and allowed to partially cure, followed by a second application of sealant sufficient to form the final fillet. The final fillet must be smooth and should have the dimensions as specified.

CAUTION: Lubrication in any form shall not be used to assist in smoothing the fillet.

(f) Work out all entrapped air and remove excess sealant with a fairing tool. Fair out extruded sealant to leave a smooth fillet along joint and at ends. The tool should be pressed against the sealant and moved parallel to the bead.

(g) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(h) Allow seal to cure

(4) Fastener Sealing in Wet and Non-Wet Areas (See Figure 20-105)
The following procedure is used primarily for sealing bolts, nuts, and domed nutplates in wet areas with MIL-S-8802 Class B fuel tank sealant. However, this procedure is also applicable to bolt sealing with RTV 736 sealant in non-wet areas, such as the firewall.
(a) If not already accomplished remove all sealant from damaged seal with cutting tools and suitable hardwood or plastic scrapers as described in paragraph A. - “Preparation for Sealing.”
(b) Ensure that fastener is properly installed and torqued.

**CAUTION:** After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(c) Solvent clean area to be sealed. The fastener and surrounding area should be cleaned at least twice and all residue removed. *(Refer to 20-30)*

**CAUTION:** Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60°F (15.5°C) or to a structure that is below 60°F (15.5°C). Handle sealed structures carefully and do not move until sealant is tack free. Pressure testing, if required, must never be performed, until all sealant has cured. Sealant must never be applied after usable application time.

(d) Use extrusion gun or spatula to apply sealant around the base and over the fastener. If necessary, the sealant may be worked with a tool so that the sealant has a minimum thickness as specified.

**Note:** Sealant must be applied so that it provides an airtight seal. Ensure that folds, laps, and entrapped air are not created during the process. The fillet can be moved slightly to insure that the highest portion of the fillet is over the edge of the structure.

(e) Work out all entrapped air and remove excess sealant with a fairing tool.
(f) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.
(g) Allow seal to cure.
NOTE
⚠ Optional to cover nut, thread or bolt with sealant. Keep sealant thickness to a minimum: however, it is permissible to have more than 0.06" minimum thickness.
⚠ Eliminate any visible voids or bubble areas around the base of the fastener.

Figure 20-105
Fastener Sealing
(5) Tube Fitting Seals in Fuel Tank Bulkheads (See Figure 20-106)

Bulkhead tube fittings installed in fuel tank bulkheads with the bulkhead nut on the wet side of the bulkhead, shall be sealed by applying sealant to the threaded area of the fitting prior to installing the bulkhead nut and O-ring. Bulkhead fittings which are installed with the nut on the dry side of the tank bulkhead shall be fillet sealed only.

(a) If not already accomplished remove all sealant from damaged seal with cutting tools and suitable hardwood or plastic scrapers as described in paragraph A. - “Preparation for Sealing.”

CAUTION: After thoroughly cleaning surfaces to be sealed, wear clean, white, cotton gloves to prevent contaminating the surfaces to be sealed.

Use care in selecting solvent. Do not use acetone to clean acrylic. Use only isopropyl alcohol for solvent cleaning acrylic surfaces.

(b) Solvent clean area and fitting to be sealed. The fastener and surrounding area should be cleaned at least twice and all residue removed. (Refer to 20-30)

(c) Apply a small amount of sealant on fitting threads before installing nut. Ensure that bulkhead fitting is properly installed with O-ring and nut is on wet side of bulkhead and nut is properly torqued.

CAUTION: Sealant which does not wet properly or which is difficult to extrude from the sealing gun must be discarded. Sealant should never be applied at temperatures below 60°F (15.5°C) or to a structure that is below 60°F (15.5°C). Sealed structures must be handled with care and should never be moved until sealant has achieved a tack-free surface. Pressure testing, if required, must never be performed, until all sealant has cured. Sealant must never be applied after usable application time.

Note: Application time is the period in which the sealant can be satisfactorily applied. After this point, the material does not “wet” properly and may fail in adhesion (sealant “rolls up” ahead of the sealing gun or “draws up” behind the gun).

(d) Use extrusion gun or spatula to apply sealant around the base and over the nut on the wet side. If necessary, the sealant may be worked with a tool so that the sealant has a minimum thickness as specified.

Note: Sealant must be applied so that it provides an airtight seal. Care must be exercised so that folds, laps, and entrapped air are not created during the process. All air bubbles must be worked out of the sealant. The fillet can be moved slightly to insure that the highest portion of the fillet is over the edge of the structure.

(e) Work out all entrapped air and remove excess sealant with a fairing tool.

(f) Inspect seal for poor adhesion and evidence of air bubbles. Evidence of air bubbles is cause to rework the seal.

(g) Allow seal to cure.
Figure 20-106
Bulkhead Fitting Seal
(6) Cable Pass-Through (See Figure 20-107)

**Serials 22-0002 thru 22-1601, 22-1603 thru 22-1820, 22-1822 thru 22-1839, 22-1841 thru 22-1862:** The hot air valve control cable, alternate air control cable, mixture control cable, throttle control cable, and governor control cables all pass-through the firewall.

**Serials 22-1602, 22-1821, 22-1840, 22-1863 & subs, 22T-0001 & subs:** The alternate air control cable, mixture control cable, throttle control cable, and (Non-Turbo Serials 22-only) governor control cables all pass-through the firewall.

When any of these cables are removed, the cable pass-through must be properly fillet sealed to ensure an airtight seal.

(a) Acquire necessary tools, equipment, and supplies.

<table>
<thead>
<tr>
<th>Description</th>
<th>P/N or Spec.</th>
<th>Supplier</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Scraper</td>
<td>-</td>
<td>Any Source</td>
<td>Remove sealant.</td>
</tr>
<tr>
<td>Isopropyl Alcohol</td>
<td>99% or higher purity</td>
<td>Any Source</td>
<td>Solvent clean cable pass-through and firewall.</td>
</tr>
<tr>
<td>1/8&quot; Fiberfrax Paper</td>
<td>970J or TON0146</td>
<td>UniFrax Corporation Niagara Falls, NY 14305 716-278-3800</td>
<td>Firewall insulation.</td>
</tr>
<tr>
<td>High Temperature Silicone Sealant</td>
<td>RTV 736</td>
<td>Dow Corning Corporation Midland, MI 48686-0994 989-496-4400</td>
<td>Sealant.</td>
</tr>
</tbody>
</table>

(b) Remove all old sealant from cable pass-through and firewall.
(c) Tighten nuts and washers securing cable pass-through to firewall.
(d) Using isopropyl alcohol, solvent clean cable pass-through and firewall. *(Refer to 20-30)*
(e) Wrap Fiberfrax paper around portion of control cable that passes through firewall so a tight fit exists between control cable and cable pass-through.

**CAUTION:** When routing control cable, ensure cable does not interfere with airplane control rigging, wires, or hoses.

(f) Route and secure control cable.
(g) Fillet seal and cover entire cable pass-through on both sides of firewall with high temperature silicone sealant. *(Refer to 20-10)*
(h) Allow sealant to cure.
NOTE
Eliminate visible voids or bubble areas around base of fastener.

LEGEND
1. Control Cable
2. Cable Pass-Through
3. Fiberfrax Paper
4. Sealant
5. Fiber Washer
6. Washer
7. Nut

Figure 20-107
Cable Pass-Through Sealing
Reseal Integral Fuel Tank After a Structural Repair

The fuel tank was manufactured with a resin coating on all skin surfaces of the tank with injection and fillet seals using MIL-S-8802 Class B extrudable sealant along all bond lines and at all penetrations for tubing, fuel filler, and fuel level float. After a repair has been made to the composite structure of the fuel tank, it will be necessary to reseal the tank in the area of the repair.

Access covers are faying surface sealed with MIL-S-8802 Class B sealant with parting agent applied to both faying surfaces as described under D.1. - "Faying Surface Seals."

Repairing seals at joggles at rib-spar intersections and along bond lines will be accomplished using MIL-S-8802 Class B extrudable sealant in accordance with D.2. - "Repairing an Injection Seal, and D.3. - "Repairing a Fillet Seal."

Repairs to bulkhead penetrations will be accomplished using MIL-S-8802 Class B sealant in accordance with D.5. - "Repairing Tube Fitting Seals in Fuel Tank Bulkheads."

Repairs to seals around fasteners in the fuel tank will be accomplished using MIL-S-8802 Class B sealant in accordance with D.4. - "Fastener Sealing in Wet and Non-Wet Areas."

Repairs to the surface of the wing structure will be made from the outside and the inside wing surfacers must be resealed using MIL-S-8802 Class A brushable sealant using the following procedure:

(a) Preclean all surfaces using acetone or isopropyl alcohol solvent. (Refer to 20-30)
(b) Lightly sand the repaired area and adjacent area with 200 grit sandpaper.
   
   **CAUTION:** Use caution not to sand through resin coat exposing fibers. Sanding through the resin coat and exposing fibers will be cause for composite repair.

(c) Remove metal and composite chips, shavings, and lint using stiff bristle brushes and vacuum.
(d) Solvent clean all surfaces using acetone or isopropyl alcohol. Thoroughly dry surfaces and remove all residue. (Refer to 20-30)

**WARNING:** Keep all sealants away from open flames or other sources of ignition.

- Mix and use sealants only in areas with adequate ventilation.
- Wear protective gloves when handling sealants and cleaned parts. Do not use protective hand creams as they can contaminate the sealant.
- Avoid skin contact. If contact occurs, wash area thoroughly with soap and water.

(e) Wear goggles for eye protection. If accidental eye contact with sealant, sealant components, or cleaning solvent occurs, immediately flush eyes with large quantities of water and report to a doctor for further examination and/or treatment.
(f) Mix sealant as required.
(g) Apply a coat of MIL-S-8802 Class A sealant to the prepared area. Apply sealant with a brush, stroking in two directions to thoroughly coat the area with sealant 5 to 15 mils thick (0.005 to 0.015 inch). Small areas, drips, or runs in excess of the 15 mils (0.015 inch) are acceptable in isolated cases. No greater than 10% of the area being coated shall exceed the maximum thickness.
(h) Allow sealant to cure.
Intentionally Left Blank