

INCH-POUND

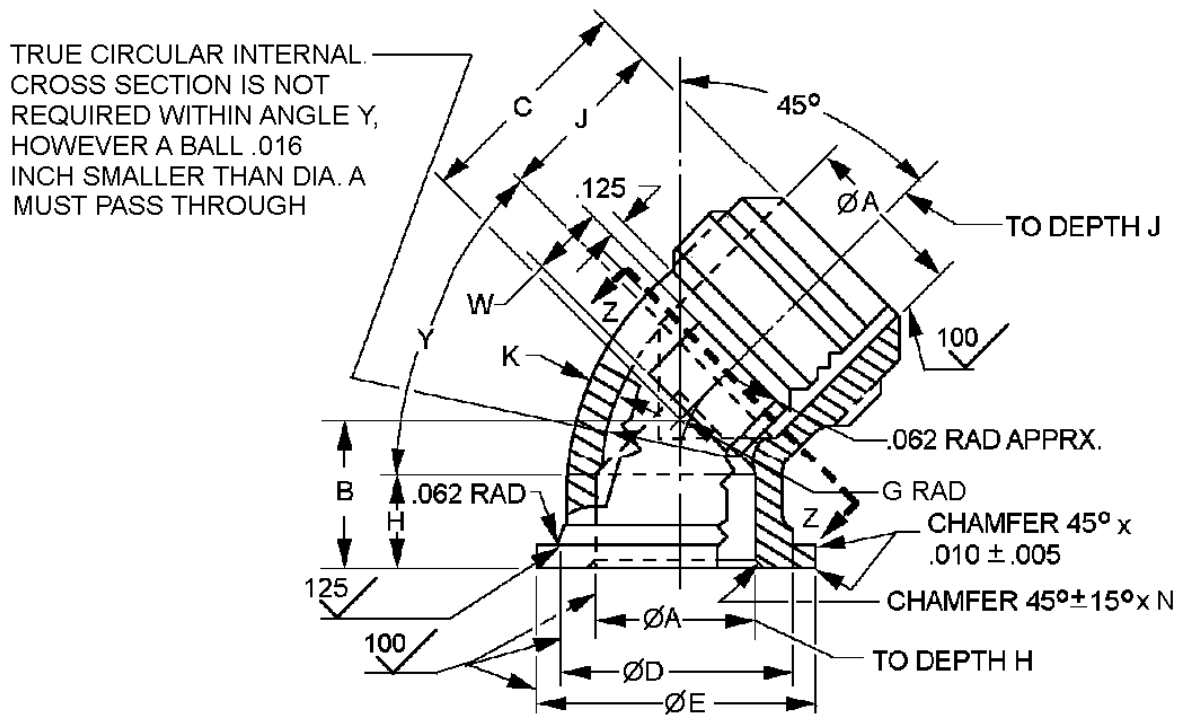
MS20761C  
w/AMENDMENT 1  
1 September 2016  
SUPERSEDING  
MS20761C  
20 April 2016

## DETAIL SPECIFICATION SHEET

## ELBOW, FLARED TUBE, FLANGED, SWIVEL, 45 DEGREE

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and SAE-AS4875.

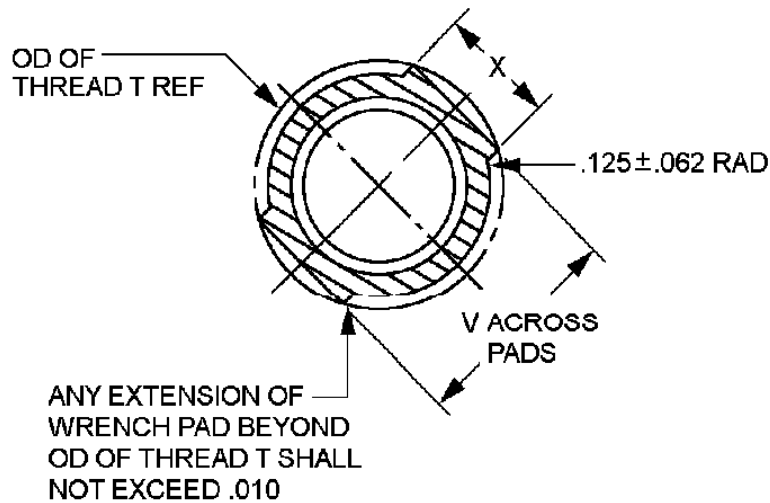
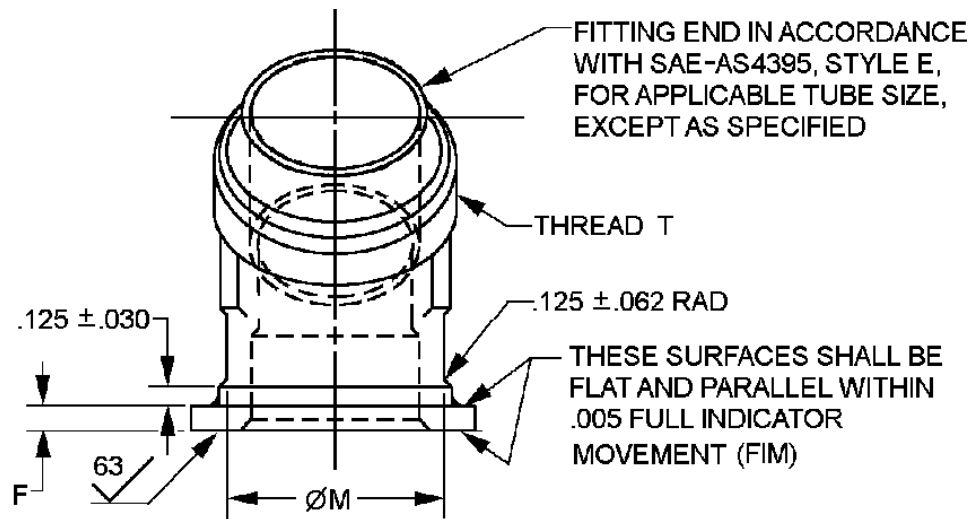


| Inches | mm   |
|--------|------|
| .005   | 0.13 |
| .010   | 0.25 |
| .016   | 0.41 |
| .062   | 1.57 |
| .125   | 3.18 |

FIGURE 1. Elbow, flanged 45°.



MS20761C  
w/AMENDMENT 1



SECTION Z-Z

| Inches | mm   |
|--------|------|
| .005   | 0.13 |
| .010   | 0.25 |
| .030   | 0.76 |
| .062   | 1.57 |
| .125   | 3.18 |

FIGURE 1. Elbow, flanged 45° - Continued.

MS20761C  
w/AMENDMENT 1

| Size   | Tube OD | Thread T<br>SAE-AS4395 | A dia.<br>± .003<br>(see note 4) | B<br>+.047<br>-.000 | C<br>+.047<br>-.000 | D dia.<br>+.000<br>-.005<br>(see note 4) | E dia.<br>+.000<br>-.005<br>(see note 4) | F<br>+.000<br>-.005 | G<br>Radius<br>ref. |
|--------|---------|------------------------|----------------------------------|---------------------|---------------------|--|--|---------------------|---------------------|
| -12    | .750    | 1.0625-12UN-3A         | .609                             | .812                | 1.312               | .938                                     | 1.250                                    | .156                | .594                |
| -12-16 |         |                        |                                  |                     |                     |  | 1.500                                    |                     |                     |
| -16    | 1.000   | 1.3125-12UN-3A         | .844                             | .875                | 1.375               | 1.188                                    | 1.844                                    |                     | .719                |
| -20    | 1.250   | 1.6250-12N-3A          | 1.078                            | 1.000               | 1.500               | 1.500                                    | 1.844                                    | .188                | .875                |
| -20-24 |         |                        |                                  | 1.062               |                     |  | 2.125                                    |                     |                     |
| -24    | 1.500   | 1.8750-12N-3A          | 1.312                            | 1.094               | 1.750               | 1.750                                    | 2.125                                    |                     | 1.000               |
| -32    | 2.000   | 2.500-12UN-3A          | 1.781                            | 1.281               | 2.125               | 2.375                                    | 2.750                                    |                     | 1.312               |
| -40    | 2.500   | 3.000-12UN-3A          | 2.281                            | 1.469               | 2.000               | 2.875                                    | 3.281                                    |                     | 1.562               |
| -48    | 3.000   | 3.500-12UN-3A          | 2.781                            | 1.562               | 2.250               | 3.375                                    | 3.781                                    |                     | 1.812               |

| Size   | H<br>+.047<br>-.000 | J              | K    |      | M<br>±.015 | N<br>dia. | V<br>±.015 | W<br>Approx. | X<br>Approx. | Y<br>±.015 |
|--------|---------------------|----------------|------|------|------------|-----------|------------|--------------|--------------|------------|
|        |                     | +.047<br>-.000 | Min  | Max  |            |           |            |              |              |            |
| -12    | .562                | 1.062          | .125 | .164 | .922       | .669      | .891       | .438         | .562         | .724       |
| -12-16 |                     |                | .141 | .176 | 1.172      | .904      | 1.156      | .500         | .625         | .771       |
| -16    |                     |                |      |      |            |           |            |              |              |            |
| -20    | .625                | 1.156          | .156 | .221 | 1.484      | 1.138     | 1.438      |              | .750         | .818       |
| -20-24 | .688                |                |      |      |            |           |            |              |              |            |
| -24    |                     |                |      |      |            |           |            |              |              |            |
| -32    | .750                | 1.562          | .203 | .322 | 2.359      | 1.841     | 2.250      | .750         | .938         | 1.193      |
| -40    | .812                | 1.344          | .234 | .333 | 2.859      | 2.341     | 2.812      | .875         | 1.000        | .969       |
| -48    |                     | 1.500          | .250 | .344 | 3.359      | 2.841     | 3.344      | 1.000        |              | 1.047      |

| Inches | mm   | Inches | mm    | Inches | mm    | Inches | mm    | Inches | mm    |
|--------|------|--------|-------|--------|-------|--------|-------|--------|-------|
| .003   | 0.08 | .250   | 6.35  | .844   | 21.44 | 1.344  | 34.14 | 2.281  | 57.94 |
| .005   | 0.13 | .322   | 8.18  | .875   | 22.23 | 1.372  | 34.85 | 2.341  | 59.46 |
| .010   | 0.25 | .333   | 8.46  | .891   | 22.63 | 1.375  | 34.93 | 2.359  | 59.92 |
| .015   | 0.38 | .344   | 8.74  | .904   | 22.96 | 1.047  | 26.59 | 2.375  | 60.33 |
| .016   | 0.41 | .438   | 11.13 | .922   | 23.42 | 1.062  | 26.97 | 2.500  | 63.50 |
| .030   | 0.76 | .500   | 12.70 | .938   | 23.83 | 1.078  | 27.38 | 2.750  | 69.85 |
| .047   | 1.19 | .562   | 14.27 | .943   | 23.95 | 1.500  | 38.10 | 2.781  | 70.64 |
| .062   | 1.57 | .594   | 15.09 | .969   | 24.61 | 1.562  | 39.67 | 2.812  | 71.42 |
| .125   | 3.18 | .609   | 15.47 | 1.000  | 25.40 | 1.718  | 43.64 | 2.841  | 72.16 |
| .141   | 3.58 | .625   | 15.88 | 1.094  | 27.79 | 1.734  | 44.04 | 2.859  | 72.62 |
| .156   | 3.96 | .669   | 16.99 | 1.138  | 28.91 | 1.750  | 44.45 | 2.875  | 73.03 |
| .164   | 4.17 | .688   | 17.48 | 1.156  | 29.36 | 1.781  | 45.24 | 3.000  | 76.20 |
| .172   | 4.37 | .719   | 18.26 | 1.172  | 29.77 | 1.812  | 46.02 | 3.281  | 83.34 |
| .176   | 4.47 | .724   | 18.39 | 1.188  | 30.18 | 1.841  | 46.76 | 3.344  | 84.94 |
| .188   | 4.78 | .750   | 19.05 | 1.193  | 30.30 | 1.844  | 46.84 | 3.359  | 85.32 |
| .203   | 5.16 | .771   | 19.58 | 1.250  | 31.75 | 2.000  | 50.80 | 3.375  | 85.73 |
| .221   | 5.61 | .812   | 20.62 | 1.281  | 32.54 | 2.125  | 53.98 | 3.781  | 96.04 |
| .234   | 5.94 | .818   | 20.78 | 1.312  | 33.32 | 2.250  | 57.15 |        |       |

FIGURE 1. Elbow, flanged 45° - Continued.

MS20761C  
w/AMENDMENT 1

NOTES:

1. Dimensions are in inches.
2. Metric equivalents are given for information only.
3. Dimensioning and tolerancing are in accordance with ASME Y14.5. Unless otherwise specified, tolerance decimals  $\pm .005$  inch (0.13 mm) and angles  $\pm 0.5^\circ$ .
4. Diameters A, D, and E shall be concentric with each other within  $\pm .010$  inch (0.25 mm) FIM.
5. Unless otherwise specified surface roughness shall not exceed 100  $\mu$ -inches (2.54  $\mu$ m) Ra in accordance with ASME B46.1. Angular tool marks up to 63  $\mu$ -inches (1.6  $\mu$ m) Ra will be allowed.
6. Reduction by forging draft angle of  $7^\circ$  is permissible.
7. Internal flow passage around bend shall be smooth and free from projections. Break all sharp edges and remove all hanging burrs and slivers which might become dislodged during use.

FIGURE 1. Elbow, flanged  $45^\circ$  - Continued.

REQUIREMENTS:

Dimensions and configuration: See figure 1.

For nominal use on fuel and oil systems.

Sizes -40 and -48 are not to be used unless approved by the program office.

For tube sizes through 1 inch (25.4 mm): Maximum operating temperature 275°F (135°C), maximum pressure 1500 psi (10.3 MPa).

For tube sizes exceeding 1 inch (25.4 mm): Maximum operating temperature 275°F (135°C), maximum pressure 500 psi (3.4 MPa).

Unless otherwise specified, materials shall be in accordance with SAE-AS4875.

Porosity test. Finished castings shall not leak when subjected to 100 psi (0.7 MPa) air pressure and submerged in water for 3 minutes minimum.

The connector flange to hose shall not exceed the weight limits specified in table I.

TABLE I. Weight limits. 1/

| Size   | Weight Max<br>lbs (gram) |             |            |
|--------|--------------------------|-------------|------------|
|        | Al Alloy                 | Steel       | Ti         |
| -12    | .09 (41)                 | .25 (113)   | .15 (68)   |
| -12-16 | .11 (50)                 | .31 (141)   | .18 (82)   |
| -16    | .13 (59)                 | .36 (163)   | .21 (95)   |
| -20    | .23 (104)                | .64 (290)   | .38 (172)  |
| -20-24 | .26 (118)                | .73 (331)   | .43 (195)  |
| -24    | .33 (150)                | .92 (417)   | .55 (249)  |
| -32    | .70 (318)                | 1.96 (889)  | 1.16 (526) |
| -40    | .90 (408)                | 2.52 (1143) | 1.49 (676) |
| -48    | 1.20 (544)               | 3.36 (1524) | 1.98 (898) |

1/ Metric equivalents given for information only.

MS20761C  
w/AMENDMENT 1

Material and size designators shall be in accordance with table II.

TABLE II. Material and size designators. 1/

| Size number | Size number with letter material designator |                                    |                          |                    |                    |                    |          |
|-------------|---|------------------------------------|--------------------------|--------------------|--------------------|--------------------|----------|
|             | Steel (Blank)                               | Aluminum Alloy <u>2/</u> <u>3/</u> | Aluminum alloy <u>4/</u> | CRES 304 <u>5/</u> | CRES 316 <u>5/</u> | CRES 321 <u>5/</u> | Titanium |
| 12          | -12   | -D12                               | -W12                     | -J12               | -K12               | -R12               | -T12     |
| 12-16       | -12-16                                      | -D12-16                            | -W12-16                  | -J12-16            | -K2-16             | -R12-16            | -T12-16  |
| 16          | -16   | -D16                               | -W16                     | -J16               | -K16               | -R16               | -T16     |
| 20          | -20   | -D20                               | -W20                     | -J20               | -K20               | -R20               | -T20     |
| 20-24       | -20-24                                      | -D20-24                            | -W20-24                  | -J20-24            | -K20-24            | -R20-24            | -T20-24  |
| 24          | -24   | -D24                               | -W24                     | -J24               | -K24               | -R24               | -T24     |
| 32          | -32   | -D32                               | -W32                     | -J32               | -K32               | -R32               | -T32     |
| 40          | -40   | -D40                               | -W40                     | -J40               | -K40               | -R40               | -T40     |
| 48          | -48   | -D48                               | -W48                     | -J48               | -K48               | -R48               | -T48     |

1/ Material designators are in accordance with SAE-AS4875 the procurement specification.

2/ Aluminum alloys 2014/2024 code D are inactive for new design, use aluminum alloy 7075 code W aluminum for new design.

3/ Optional material: aluminum alloy casting 2014-T6 in accordance with SAE-AMS-QQ-A-367 or SAE-AMS4134 or aluminum casting alloy 356 or A356 in accordance with ASTM B108/B108M.

4/ Optional material: aluminum alloy casting 7075-T73 in accordance with (SAE-AMS-QQ-A-367 or SAE-AMS4124).

5/ Corrosion resistant steel (CRES).

Finish. Finishes shall be as specified in table III. All platings shall be capable of meeting a minimum of 96 hours salt spray test in accordance with ASTM B117. The fittings shall show no evidence of corrosion after 96 hours of salt spray. Fluid passages, other openings and internal threads shall not be subject to the plating thickness requirement and may have bare areas provided they are protected with a light film of oil.

MS20761C  
w/AMENDMENT 1

TABLE III. Elbow finish code. 1/

| Finish code | Material   | Plating finish   |
|-------------|--|--|
| Blank       | Steel  | Cadmium plating in accordance with SAE-AMS-C-81562, type II, class 2 or SAE-AMS-QQ-P-416, type II, class 2. dye black <u>1/</u>                |
|             | Aluminum <u>2/</u>   | Anodize in accordance with MIL-A-8625, type II.  |
|             | CRES   | No additional finish. Passivation in accordance with SAE-AMS2700, method 1, type 6 or 7.   |
|             | Titanium <u>3/</u>   | Fluoride phosphate in accordance with SAE-AMS2486.   |
| A           | Steel  | Zinc-Aluminum in accordance with ASTM F1136/F1136M, grade 3, NC.   |
| D           | Aluminum <u>2/</u>   | Chemical conversion coating in accordance with NAVAIR trivalent chromium pretreatment (TCP) in accordance with MIL-DTL-5541 type II, Class 1A. |
| DA          | Aluminum <u>2/</u>   | Chemical conversion coating in accordance with, MIL-DTL-5541, type II, class 3.  |
| G           | Steel  | Zinc plating with colorless passivate in accordance with ASTM B633, type V, Fe/Zn 25.  |
| H           | Steel  | Zinc phosphate finish in accordance MIL-DTL-16232 type Z, class 4. <u>4/</u>   |
| J           | Steel  | Zinc plating in accordance with ASTM B633; type II or III, Fe/Zn 12, or ASTM B695, type II, class 12.  |
| R           | Steel  | Zinc plating in accordance with ASTM B633; type VI, Fe/Zn 12.  |
| T           | Titanium <u>3/</u>   | Anodized in accordance with SAE-AMS2488, type 2.   |
| V           | Steel  | Zinc-nickel in accordance with SAE-AMS2417, type 2, grade B. <u>5/</u>   |
| W           | Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875 | Anodize in accordance with MIL-A-8625, type II, class 2  |
| WC          | Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875 | Chemical conversion coating in accordance with, MIL-DTL-5541, type II, class 3.  |
| WD          | Aluminum alloy 7075-T73 or T7352 <u>6/</u> in accordance with SAE-AS4875 | Anodize in accordance with MIL-A-8625, type 2.   |
| Z           | Steel  | Zinc may be any zinc plating's from PIN codes H, J, R, V. <u>7/</u>  |
| ZN          | Steel  | Zinc may be any zinc plating from PIN codes H, J, R, V with a colored chromate coating <u>7/</u>   |

1/ Cadmium shall not be used in oxygen or potable water systems.

2/ Aluminum alloys 2014 and 2024 shall be dyed light blue.

3/ Titanium shall not be used in oxygen systems. A pretreatment, a modification of the fluoride treatment, or a post treatment shall be applied so the final color of the fittings shall be similar to FED-STD-595 colors 36076 through 36293.

4/ Hexavalent chromium free. Finish shall be ROHS compliant.

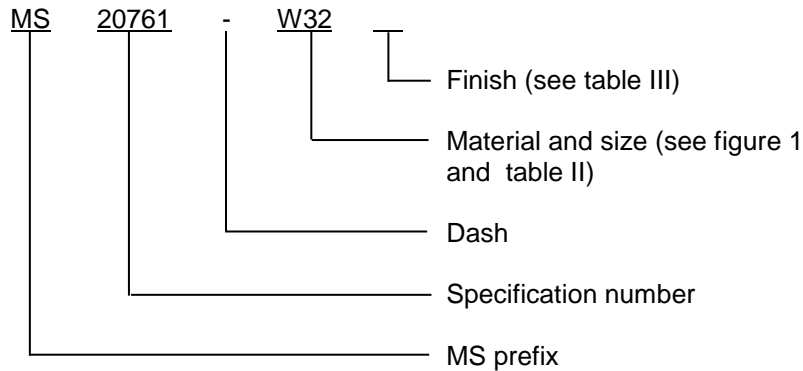
5/ The zinc-nickel alloy plate shall contain 12% to 16% nickel. The coating thickness shall be 315μ inches (8μm) minimum coating thickness.

6/ Unless otherwise specified aluminum alloy 7075 shall be dyed brown.

7/ Not for use in Aircraft.

# MS20761C w/AMENDMENT 1

Part or Identifying Number (PIN): The PIN consists of prefix "MS" the specification sheet number, a letter for material and size code and a blank or letter for finish. Unassigned PIN's shall not be used.



Example of PIN: MS20761-W32 is a 45° elbow, 7075 aluminum alloy, 2.000 inch (50.80 mm) tube diameter, and 2.750 (69.85 mm) flange, anodize in accordance with MIL-A-8625, type II dyed brown.

Marking. The complete PIN shall be permanently marked on an unfinished surface.

Guidance on use of alternative parts with less hazardous or nonhazardous materials. This specification provides for a number of alternative plating materials via the PIN. Users should select the PIN with the least hazardous material that meets the form, fit and function requirements of their application.

Supersession data: Aluminum alloys 2014 and 2024 "D" designator is inactive for new design. For new design use aluminum alloy 7075 "W" designator.

Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Referenced documents. In addition to SAE-AS4875, this document references the following:

|                   |                   |                  |
|-------------------|-------------------|------------------|
| FED-STD-595/36076 | FED-STD-595/36280 | SAE-AMS-C-81562  |
| FED-STD-595/36081 | FED-STD-595/36293 | SAE-AMS-QQ-A-367 |
| FED-STD-595/36099 | MIL-A-8625        | SAE-AMS-QQ-P-416 |
| FED-STD-595/36118 | MIL-DTL-5541      | SAE-AMS2417      |
| FED-STD-595/36134 | MIL-DTL-16232     | SAE-AMS2486      |
| FED-STD-595/36152 | ASME B46.1        | SAE-AMS2488      |
| FED-STD-595/36170 | ASME Y14.5        | SAE-AMS2700      |
| FED-STD-595/36173 | ASTM B108/B108M   | SAE-AMS4124      |
| FED-STD-595/36176 | ASTM B117         | SAE-AMS4134      |
| FED-STD-595/36231 | ASTM B633         | SAE-AS4395       |
| FED-STD-595/36251 | ASTM B695         | SAE-AS4875       |
| FED-STD-595/36270 | ASTM F1136/F1136M |                  |

MS20761C  
w/AMENDMENT 1

CONCLUDING MATERIAL

Custodians:

Army - AV  
Navy - AS  
Air Force - 99  
DLA - CC

Preparing activity:

DLA - CC

(Project 4730-2016-065)

Review activities:

Army - AR, MI  
Navy - MC, SA  
Air Force - 71

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.