PART 4 - ULTRASONIC

LANDING GEAR - NOSE

1. Purpose

   A. Service experience shows that there is a possibility of cracks occurring in outer cylinder, in radius between upper pulley bracket support boss and right trunnion arm. This surface wave technique is recommended for detecting cracks in this area.

   B. Optional Inspections

      (1) The above described area may be inspected by either fluorescent penetrant inspection or surface eddy current inspection as an option to the ultrasonic surface wave technique.

2. Equipment

   A. Any ultrasonic equipment which meets requirements of this procedure can be used.

      (1) Transducer

         (a) 2.25-mc/s, surface wave transducer, with 1/2-inch diameter crystal.

      (2) Standard test block, fabricated as foll ws:

         (a) Fabricate 4 x 12 inch block from 1/4-inch aluminum plate.

         (b) Drill 1/10-inch diameter hole on longitudinal centerline of block, 2 inches from one end.

      (3) Couplant. Light oil or grease is satisfactory.

3. Preparation For Inspection

   A. Clean inspection area thoroughly to ensure good contact between transducer and surface.

   B. Smooth out nicks in surface which may interfere with sound beam.

   C. Coat inspection area liberally with couplant.

Nose Landing Gear Outer Cylinder
Figure 1 (Sheet 1)

4. Instrument Calibration

   A. Set frequency of instrument at 2.25 mc/s.

   B. Connect transducer to instrument. Place transducer on test block so as to direct sound beam toward hole.

   C. Move transducer back and forth to obtain maximum signal response from hole.

   D. Identify position of maximum response on oscilloscope. Hold transducer in this position.

   E. Adjust sensitivity of instrument until vertical response indication on oscilloscope is approximately 50 percent of saturation.

5. Inspection Procedure

   A. Place transducer on cylinder so that sound beam is directed toward radius at base of trunnion arm.

   B. Move transducer in a vertical direction so as to scan entire radius.

   C. Verify any crack indication by wiping oil away from in front of transducer. Buildup of oil can cause a false indication. Verify any true indication by removing paint from area and checking by visual or other means.

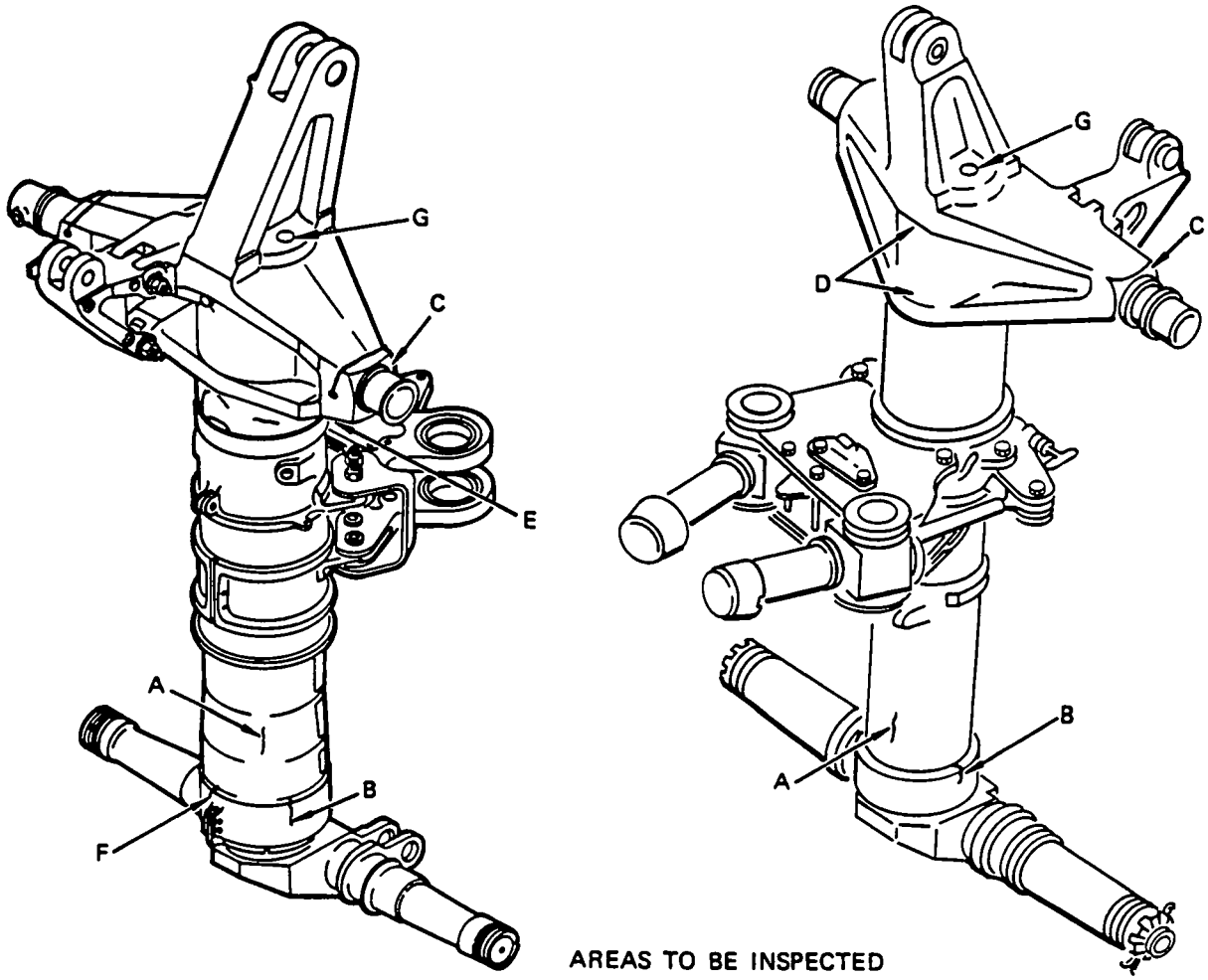
EFFECTIVITY
MODEL: 707 SERVICE BULLETIN REFERENCE: 3218

PART 4 - ULTRASONIC

LANDING GEAR - NOSE GEAR

1. Purpose

   A. Service experience shows that it is possible for stress corrosion cracks to occur in several places in the nose landing gear outer cylinder. Possible problem areas are shown in detail I.



AREAS TO BE INSPECTED
DETAIL I

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 1)

2. Inspection Procedure for Areas A and B

A. Purpose

(1) To detect longitudinal cracks in the inside diameter surface of the outer cylinder.

B. Equipment

(1) Any ultrasonic flaw detection instrument that will satisfy the instrument calibration requirements.

(2) Transducer positioning fixture shown in Detail II.

(3) Transducer – 0.25-inch diameter, 5 MHz, in a 0.375-inch diameter case.

(4) Make the reference standard shown in Detail III or make a reference standard from a scrap outer cylinder (if available) as shown in Detail IV.

C. Preparation for Inspection

(1) Remove any loose paint and smooth out any surface nicks or rough areas by polishing lightly with fine grit abrasive cloth.

(2) Clean area to be inspected to remove old grease, dirt, grit, or other foreign material.

(3) Coat inspection area with couplant.

D. Calibration

(1) Coat reference standard with couplant.

(2) Place transducer shoe on the standard and locate the ultrasonic signal from the 0.125-inch deep notch or the keyway notch.

(3) Position the defect signal in the approximate center of the instrument scope.

(4) Adjust the instrument amplitude to give approximately an 80% signal from the 0.125-inch notch or the keyway notch.

E. Inspection

(1) Inspect all the accessible portions of the cylinder below the towing collar area.

NOTE: Inspection should be concentrated at, but not limited to, the forging flash plane at the right and left-hand sides of the cylinder.

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 2)

(2) It is important to note that nose gear cylinders that have not been modified contain an internal keyway on each side. The ultrasonic procedure should detect this keyway. The dimensions and location of the keyway are shown in detail IV.

3. Inspection Procedure for Area C

A. Purpose

(1) To detect cracks in the horizontal and vertical plane of the trunnion bore in the trunnion area. (Cracks generally initiate in the inside diameter surface under the sleeve, or at the sleeve retention hole and progress outwards.)

B. Equipment

(1) Any pulse-echo instrument that will satisfy the performance requirements of this procedure is satisfactory.

(2) Transducer - 0.25-inch diameter, 5 MHz, in a 0.375-inch diameter case

C. Preparation for Inspection

(1) Remove any loose paint and smooth out any surface nicks or rough areas by polishing lightly with fine grit abrasive cloth.

(2) Clean area to be inspected to remove old grease, dirt, grit, or other foreign material.

(3) Coat inspection area with couplant.

D. Calibration - Longitudinal Wave Scan

(1) Place the transducer directly on top of the trunnion arm and in a position to obtain a signal from the side of the trunnion sleeve retention hole. Adjust the signal amplitude to approximately 80%.

E. Inspection

(1) Place the transducer on top of the trunnion arm and scan inboard and outboard of the sleeve retention hole to detect cracks that may originate on the inside diameter surface of the trunnion bore. Scan both the forward and aft sides of the trunnion bores on both left and right trunnion arms (detail V).

(2) With the transducer on the aft side of the trunnion arm, repeat the scan for cracks in the vertical plane.

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 3)

4. Inspection Procedure for Area D

A. Purpose

(1) To detect circumferential cracks in the upper 7.0 inches of the inside diameter surface of the outer cylinder (cracks originate on the forward ID surface and generally propagate forward).

B. Equipment

(1) Any pulse-echo instrument that will satisfy the performance requirements is satisfactory.

(2) Transducer - 0.25-inch diameter, 5 MHz, in a 0.375-inch diameter case.

(3) Transducer positioning fixture shown in detail VI.

NOTE: The transducer and positioning fixture specified produce a 45-degree shear wave in the aluminum part. Any 45-degree shear wave transducer assembly that will satisfy the requirements of this procedure is suitable for this inspection.

(4) Reference standard shown in detail VII. Make from a scrap outer cylinder if available.

C. Preparation for Inspection

(1) Remove any loose paint and smooth out any surface nicks or rough areas by polishing lightly with fine grit abrasive cloth.

(2) Clean areas to be inspected to remove old grease, dirt, grit, or other foreign material.

(3) Coat inspection area with couplant.

D. Calibration - shear wave scan.

(1) Coat reference standard with couplant.

(2) Position the shear wave transducer shoe on the side of the reference standard opposite to the notch (detail VII).

(3) Adjust instrument amplitude to give approximately 60% response from the notch.

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 4)

E. Inspection

(1) Inspect the 7.0-inch region at the top of the dome (detail VIII). The transducer should be moved in an up and down direction as cracks are expected to be circumferential on the inside diameter surface.

NOTE: Due to the interference fit between the internal sleeve and the cylinder wall, some sound energy is transmitted into the steel sleeve and an indication may be obtained from the upper end of the steel sleeve. Indications from the sleeve can generally be distinguished from defect indications by carefully observing the indicated metal travel on the instrument and comparing this with the indicated metal travel obtained from the reference standard. The top of the steel sleeve is 38 5/8 inches from the bottom of the outer cylinder. Outer cylinders with steel sleeves may be identified by comparing the schroeder valves. The flange on the schroeder valve on a sleeved cylinder has two deep notches located 180 degrees apart.

5. Inspection Procedure for Area E

A. Eddy current inspection is recommended to detect cracks in the armpit areas between the cylinder and the trunnion arms. Inspect using the procedure described in Part 6, 51-00-00, Fig. 4.

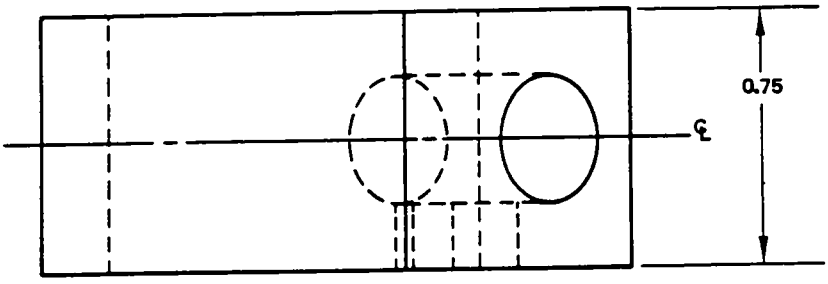
6. Inspection Procedure for Area F

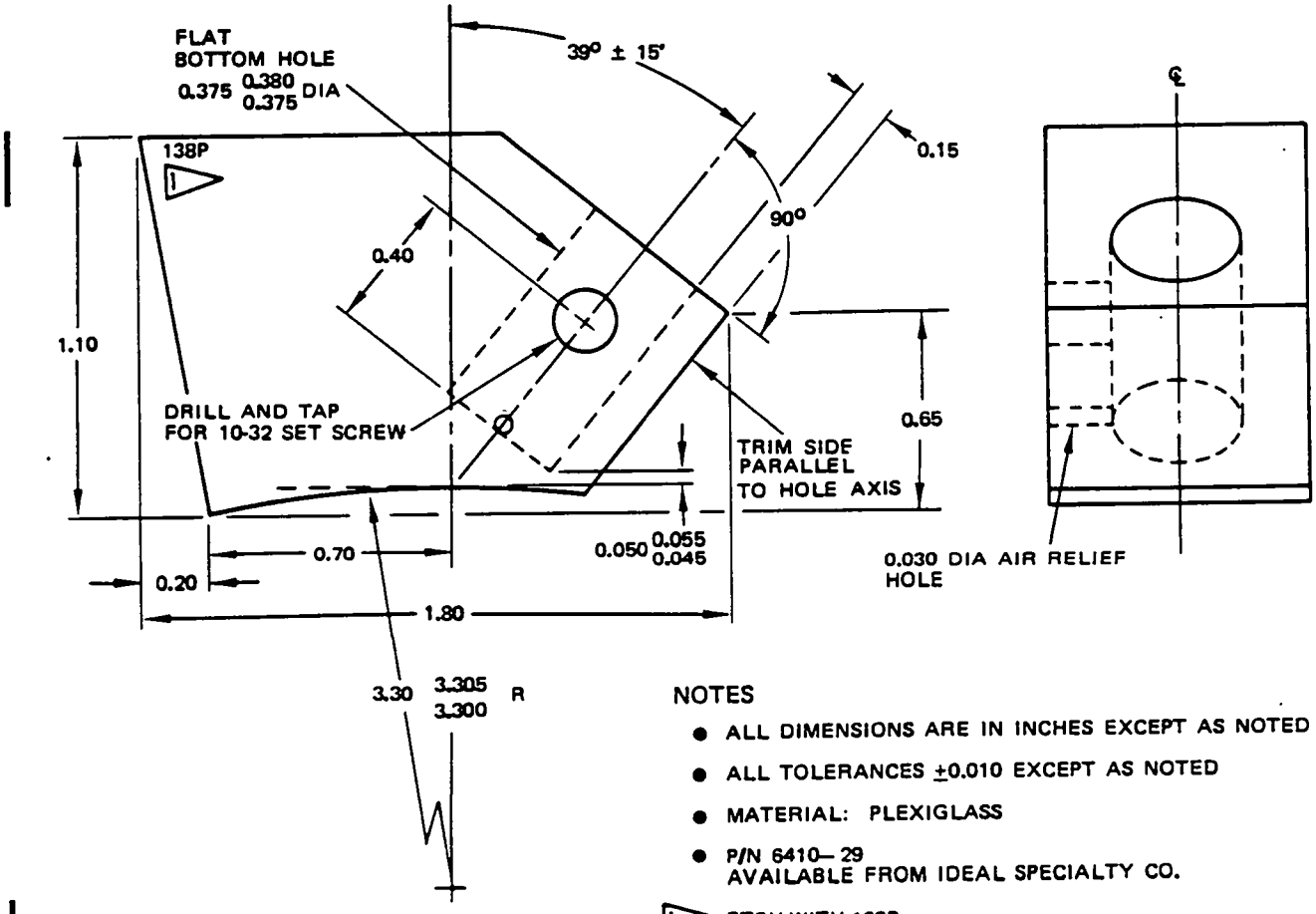
A. Eddy current inspection is recommended to detect stress corrosion cracks in or extending from the external keyway. Inspect using the procedure described in Part 6, 51-00-00, Fig. 4.

7. Inspection Procedure for Area G

A. Eddy current inspection is recommended to detect stress corrosion cracks at the quench holes (heat treat gas escape holes). Inspect using the procedure described in Part 6, 32-20-07, Fig. 1.

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 5)





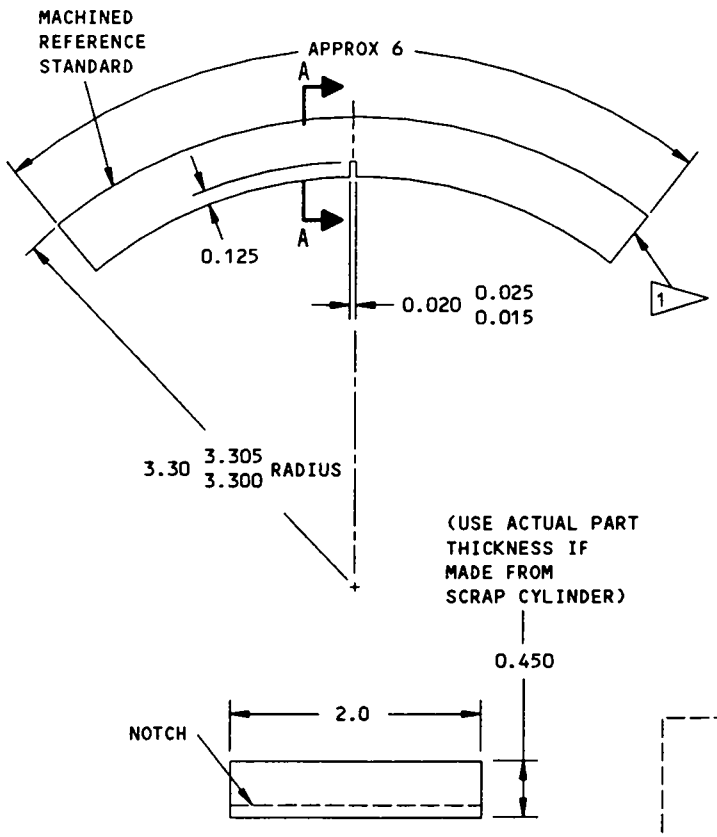
NOTES

- ALL DIMENSIONS ARE IN INCHES EXCEPT AS NOTED
- ALL TOLERANCES ±0.010 EXCEPT AS NOTED
- MATERIAL: PLEXIGLASS
- P/N 6410–29
  AVAILABLE FROM IDEAL SPECIALTY CO.

1 ETCH WITH 138P

TRANSDUCER POSITIONING FIXTURE
DETAIL II

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 6)

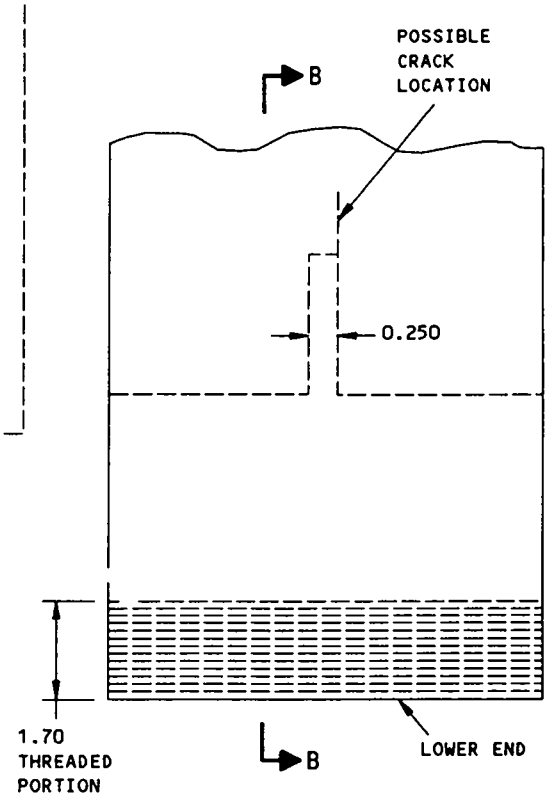


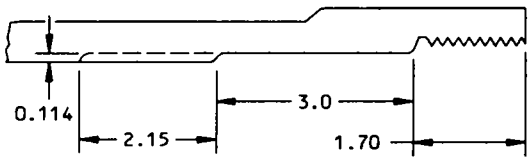
A-A
(ROTATED)

REFERENCE STANDARD
DETAIL III

OPTIONAL OUTER CYLINDER PIECE

THIS VIEW SHOWS AN OUTER CYLINDER PIECE USED AS A REFERENCE STANDARD. DO THE CALIBRATION ON THE KEYWAY NOTCH. IF THE OUTER CYLINDER PIECE DOES NOT HAVE A KEYWAY, THEN PUT IN A NOTCH ALMOST THE SAME AS THE NOTCH IN THE MACHINED REFERENCE STANDARD BUT 1 TO 2.5 INCHES LONG.





B-B
(ROTATED)

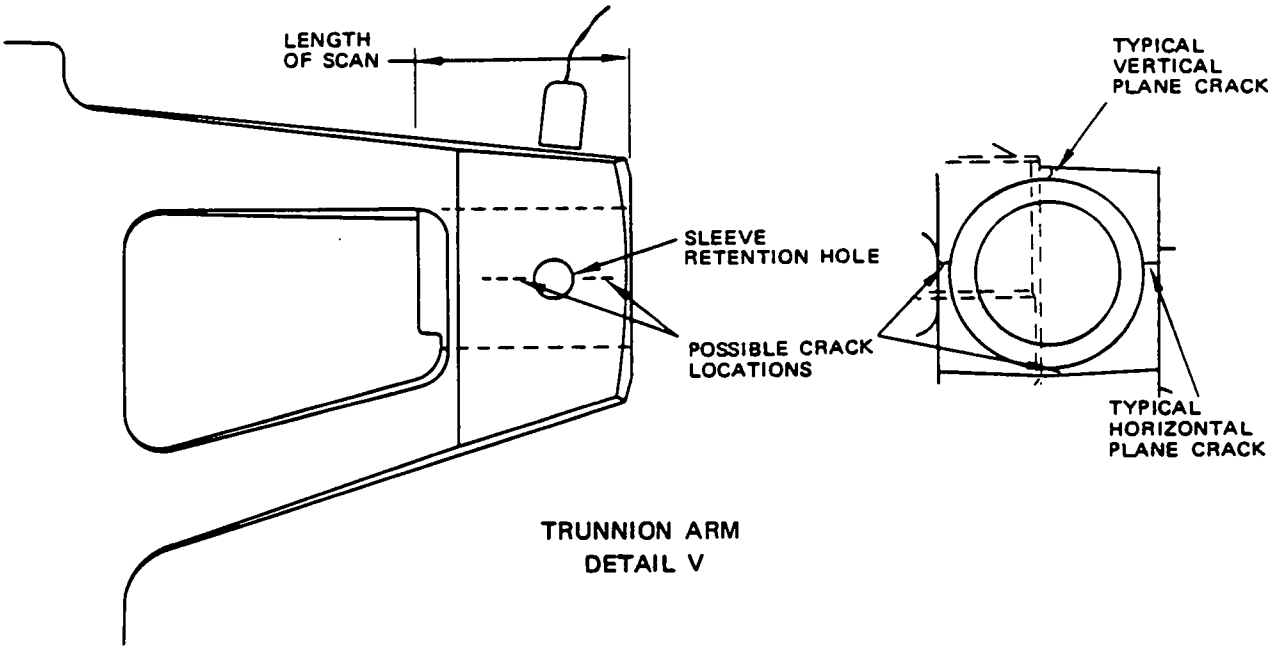
KEYWAY POSITION IN UNMODIFIED CYLINDERS
DETAIL IV

NOTES

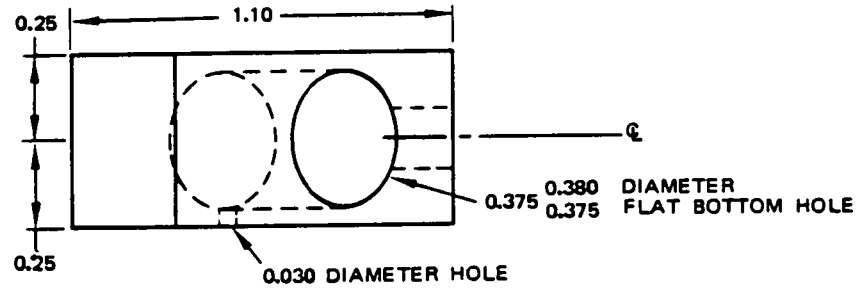
- P/N 6411-9
  AVAILABLE FROM IDEAL SPECIALITY CO.
  2531 E. INDEPENDENCE ST.
  TULSA, OKLAHOMA 74110
- MATERIAL: 7079-T6, 7075-T6 OR MAKE FROM SCRAP OUTER CYLINDER
- ALL DIMENSIONS ARE IN INCHES.

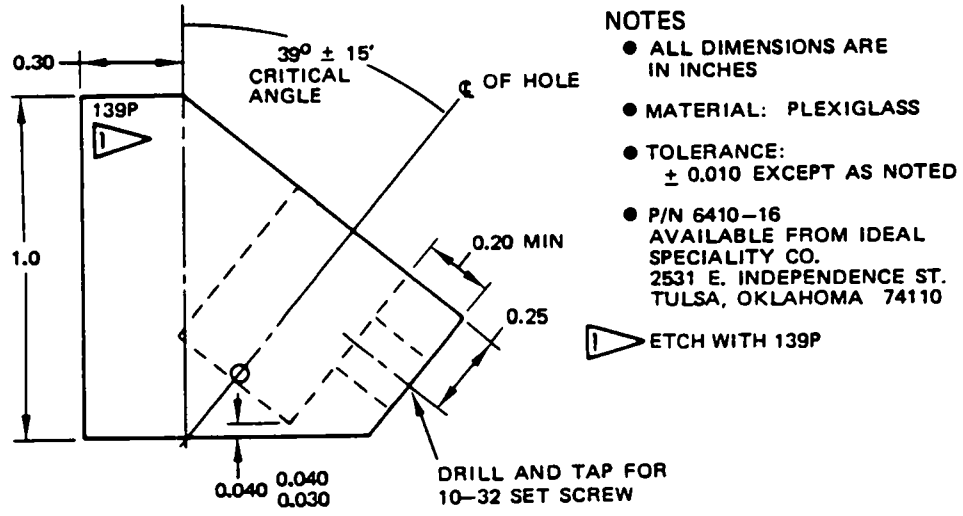
1 ETCH OR STEEL STAMP WITH 138.

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 7)



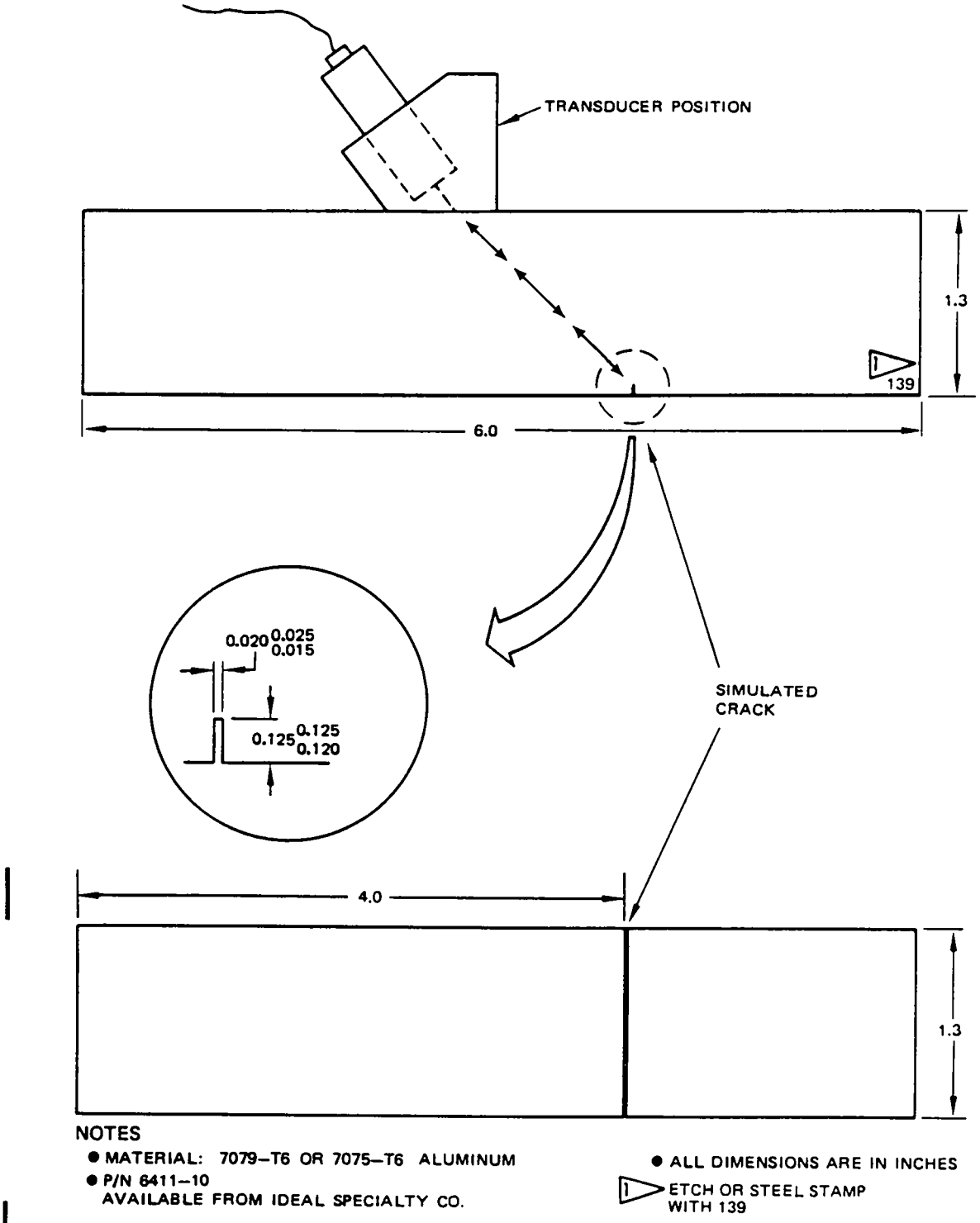
TRUNNION ARM
DETAIL V





SHEAR WAVE TRANSDUCER POSITIONING FIXTURE
DETAIL VI

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 8)

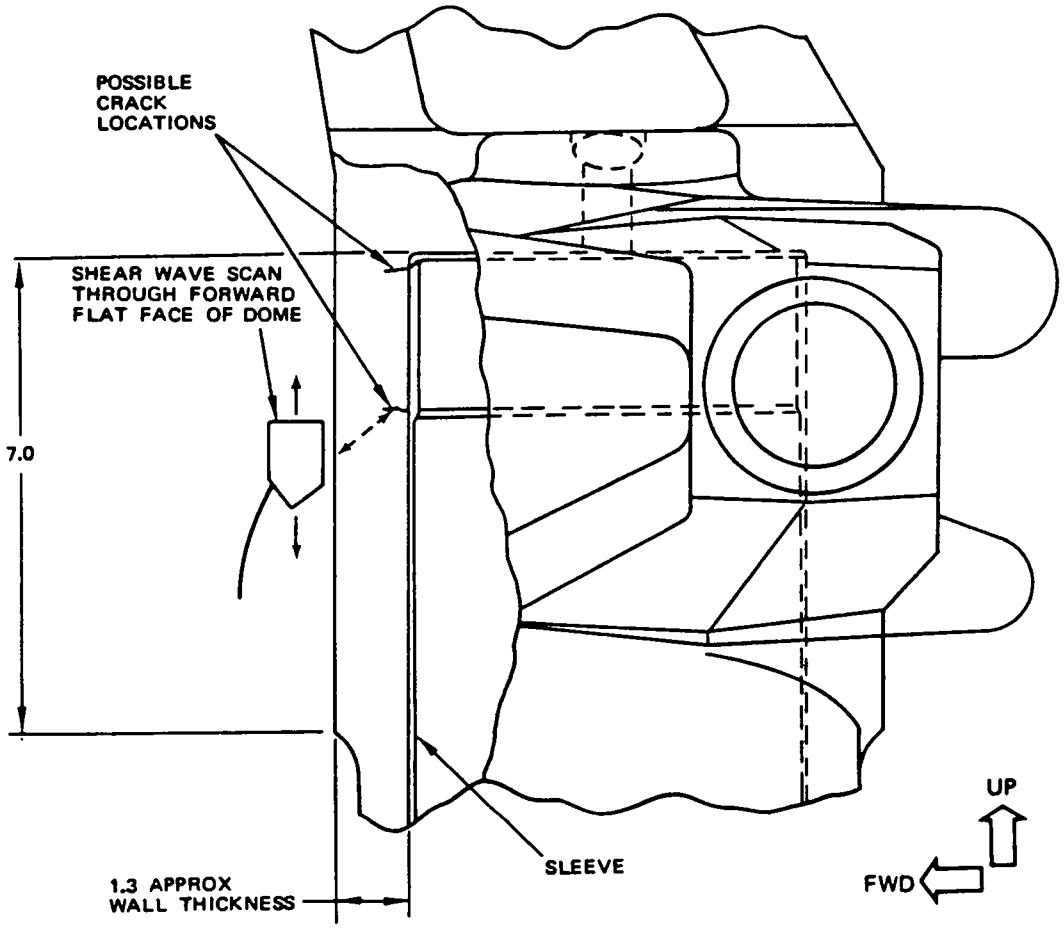


NOTES

- MATERIAL: 7079–T6 OR 7075–T6 ALUMINUM
- P/N 6411–10 AVAILABLE FROM IDEAL SPECIALTY CO.
- ALL DIMENSIONS ARE IN INCHES
- 1 ETCH OR STEEL STAMP WITH 139

REFERENCE STANDARD–CIRCUMFERENTIAL CRACKS
DETAIL VII

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 9)



SIDE VIEW OF UPPER PORTION OF OUTER CYLINDER
DETAIL VIII

Nose Landing Gear Outer Cylinder
Figure 2 (Sheet 10)