

AD-A063 504

NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA
AMBULATOR FOR PARAPLEGICS: ENGINEERING DRAWINGS.(U)
NOV 78 R A GARRET, J WIER
NOSC/TD-208

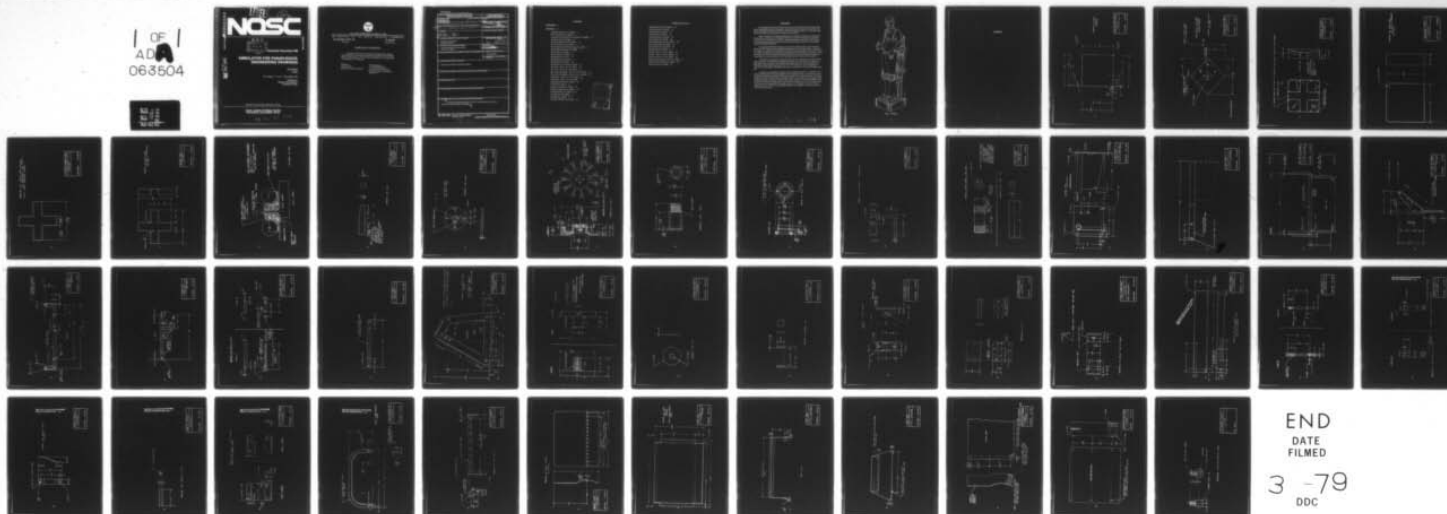
F/G 6/12

UNCLASSIFIED

NL

1 OF 1
AD
063504

NOSC



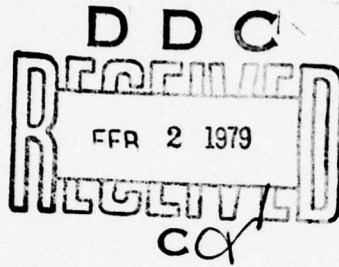
NOSC TD 208 **AD A 063504**

LEVEL 11

125C

NOSC

NOSC TD 208



Technical Document 208

AMBULATOR FOR PARAPLEGICS: ENGINEERING DRAWINGS

RA Garrett
J Weir

Final Report: 17 June - 1 November 1978

Prepared for
Veterans Administration
Prosthetics Center

Approved for public release; distribution unlimited.

NAVAL OCEAN SYSTEMS CENTER
SAN DIEGO, CALIFORNIA 92152

79 01 30 073

DDC FILE COPY.



NAVAL OCEAN SYSTEMS CENTER, SAN DIEGO, CA 92162

AN ACTIVITY OF THE NAVAL MATERIAL COMMAND

RR GAVAZZI, CAPT, USN

Commander

HL BLOOD

Technical Director

ADMINISTRATIVE INFORMATION

The work in this document was sponsored by the Veterans Administration Prosthetics Center and was performed under NOSC work unit CE09. Work was done between 17 June 1976 and 1 November 1977. The document was reviewed by W. T. Rasmussen.

Released by
J. SILVA, Head
Man-System Interaction Division

Under authority of
J. H. MAYNARD, Head
Command Control-Electronic
Warfare Systems and Technology
Department

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER <u>14</u> <u>NOSC/ID-208</u>	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER <u>9</u>
4. TITLE (and Subtitle) <u>AMBULATOR FOR PARAPLEGICS: ENGINEERING DRAWINGS</u>		5. DATE OF REPORT & PERIOD COVERED Final Report 17 Jun 1976 - 1 Nov 1978
7. AUTHOR(s) <u>10</u> <u>R. A. Garret</u> <u>J. Wier</u>		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Naval Ocean Systems Center San Diego, CA 92152		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS Veterans Administration Prosthetics Center New York, NY 10001		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS CE09 <u>12</u> <u>52p.</u>
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE <u>11</u> 1 November 1978
		13. NUMBER OF PAGES
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release: distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The ambulator discussed in this report is one part of a three-phase plan to develop an integrated transportation system for paraplegics. 		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

393 159

507

CONTENTS

DISCUSSION... 3

DRAWINGS... 5

Ambulator Base Cover, No. A0010... 6
Motor Mount Plate, No. A0020... 7
Ambulator Part Orientation and Assembly, No. A0030... 8
Ambulator Skirt, No. A0040... 9
Electronics Mount Plate, No. A0050... 10
Battery Mount Tray, No. A0060... 11
Bearing Assembly for Wheel Carriage, No. A0070... 12
Motor Shaft Replacement, No. A0080... 13
Coupler Plate, No. A0090... 14
Wheel Carriage, No. A0100... 15
Bearing Shaft, No. A0110... 16
Bearing Housing, No. A0120... 17
Axle Retainer, No. A0130... 18
Wheel Bushing - Axle Rod, No. A0140... 19
Riser Tube - Sheet 1 of 2, No. A0150... 20
Riser Tube - Sheet 2 of 2, No. A0160... 21
Knee Link Cross Member - Sheet 1 of 2, No. A0170... 22
Knee Link Cross Member - Sheet 2 of 2, No. A0180... 23
Lifting Link - Sheet 1 of 2, No. A0190... 24
Lifting Link - Sheet 2 of 2, No. A0200... 25
Adjustable Link Ends, No. A0210... 26
Top Link, No. A0220... 27
Backrest Link Plate, No. A0230... 28
Linkage Pin Assembly, No. A0240... 29
Linkage End Shim, No. A0250... 30
Jack Clevis Pin, No. A0260... 31
Foot Plate, No. A0270... 32
Jack Motor Spacer(s), No. A0280... 33

ACCESSION for	
NTIS	File Section ☒
DDC	Ref Section ☐
UNANNOUNCED	☐
JUST IN CASE	☐
BY	
DISTRIBUTION/AVAILABILITY CODES	
SPECIAL	
A	

CONTENTS (Continued)

Spring Support Base, No. A0290. . .	34
Armrest Channel, No. A0300. . .	35
Armrest Bolts, No. A0310. . .	36
Armrest Nuts, No. A0320. . .	37
Armrest Linkage, No. A0330. . .	38
Armrest Roller, No. A0340. . .	39
Knee Restraint Brackets, No. A0350. . .	40
Knee Restraint Bar, No. A0360. . .	41
Backrest Spreader, No. A0370. . .	42
Backrest Plate, No. A0380. . .	43
Seat Pan - Sheet 1 of 3, No. A0390. . .	44
Seat Pan - Sheet 2 of 3, No. A0400. . .	45
Seat Pan - Sheet 3 of 3, No. A0410. . .	46
Backrest Plate Upholstery Detail, No. A0420. . .	47
Ambulator Seat Cushion, No. A0430. . .	48
Actuator Clevis, No. A0440. . .	49

DISCUSSION

The ambulator discussed in this report is one part of a three-phase plan to develop an integrated transportation system for paraplegics. The development of the system is sponsored by the Veterans Administration Prosthetics Center (VAPC) and is being developed as a cooperative effort between the VAPC and the Naval Ocean Systems Center (NOSC).

Phase I consisted of the design and fabrication of a prototype ambulator (the drawings for this device are contained in the remainder of this report). Phase II is the design of a wheelchair which will accept the ambulator, forming the ambulator/wheelchair subsystem. Phase III will be concerned with the design of a street vehicle that will functionally accommodate the integrated ambulator/wheelchair subsystem.

The ambulator/wheelchair subsystem consists of two modules which can be separated to provide increased mobility for the paraplegic while supported in the upright position. The ambulator (figure 1) contains an erecting mechanism powered by an electric motor-driven jackscrew fixed to a small, stable platform. This provides the paraplegic with the capability to be raised into a fully erect position, and it also allows the ambulator to be detached from the wheelchair's mainframe. The occupant can then move away from the wheelchair and move about under his control.

The ambulator is self-powered and provides the user with a high degree of maneuverability. When returning to the wheelchair, an engagement mechanism on either side of the ambulator engages rollers on the wheelchair. This causes the wheelchair to return to the sitting position and raises the ambulator base several inches off the floor. The ambulator is then automatically re-attached to the wheelchair's mainframe and becomes an integral part of the main wheelchair assembly.

In addition to providing the paraplegic with the capability to stand or sit at will, it is felt that the ambulator will provide the paraplegic with better general health. It will allow him to load his skeleton periodically, providing the bone stress needed to reduce calcium washout. (The latter condition can result in loss of calcium, especially in the bones of the legs and pelvic region). Standing will also improve circulation and relieve those pressure areas which cause tissue breakdown and decubiti. The ambulator will also make it easier for the paraplegic to live in an environment where most functions are accomplished in an upright position, e.g., cooking at a range or working at a workbench or sink. However, the psychological benefit of the capability to converse at eye level may be the greatest benefit.

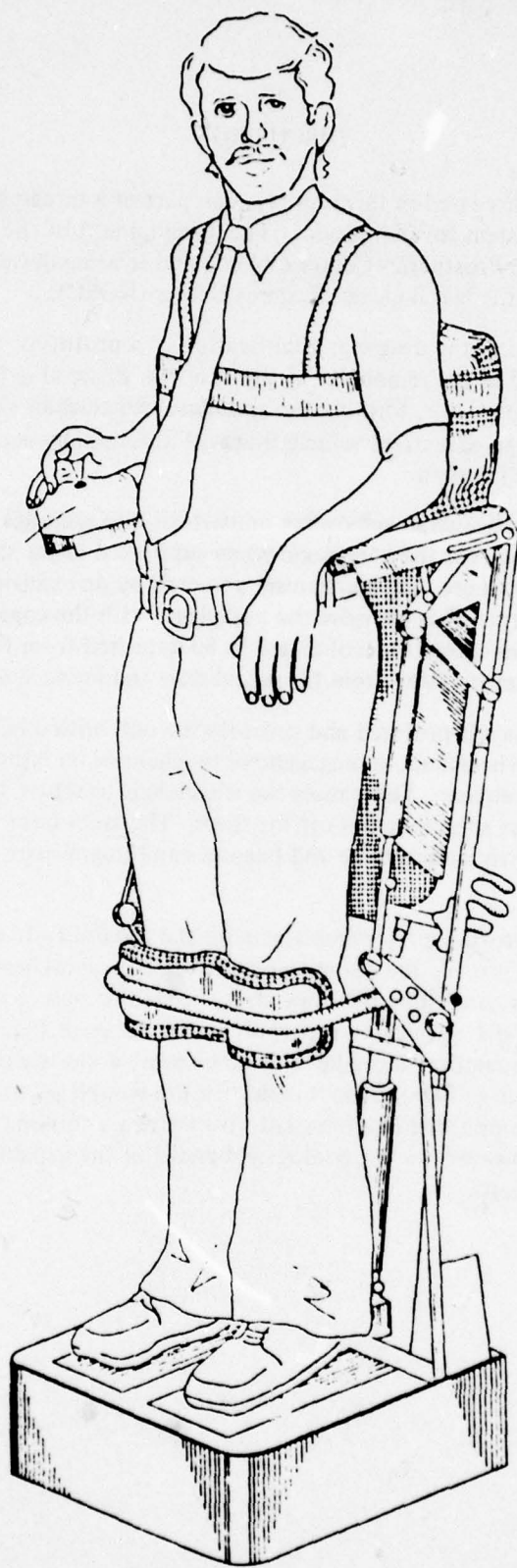
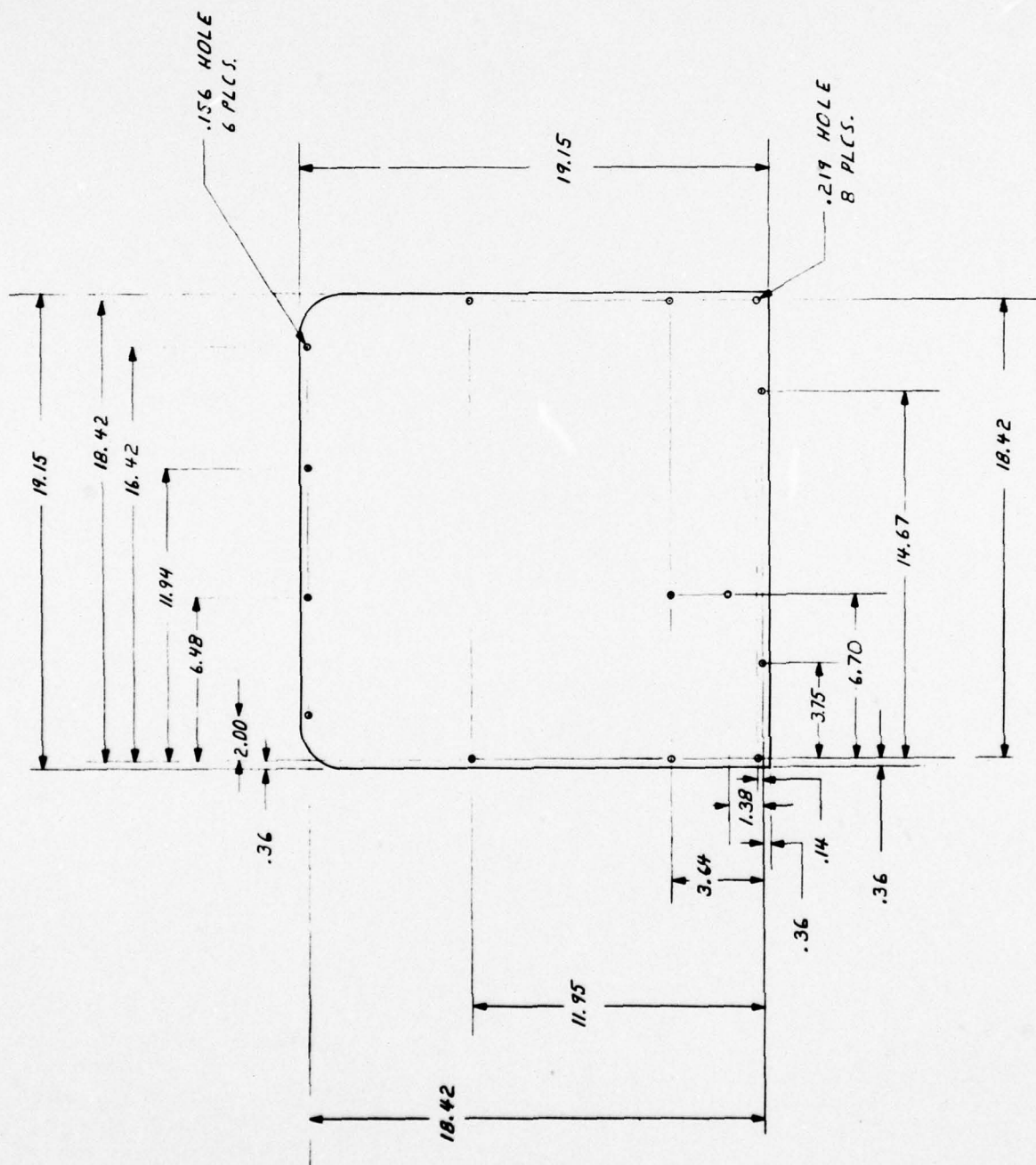


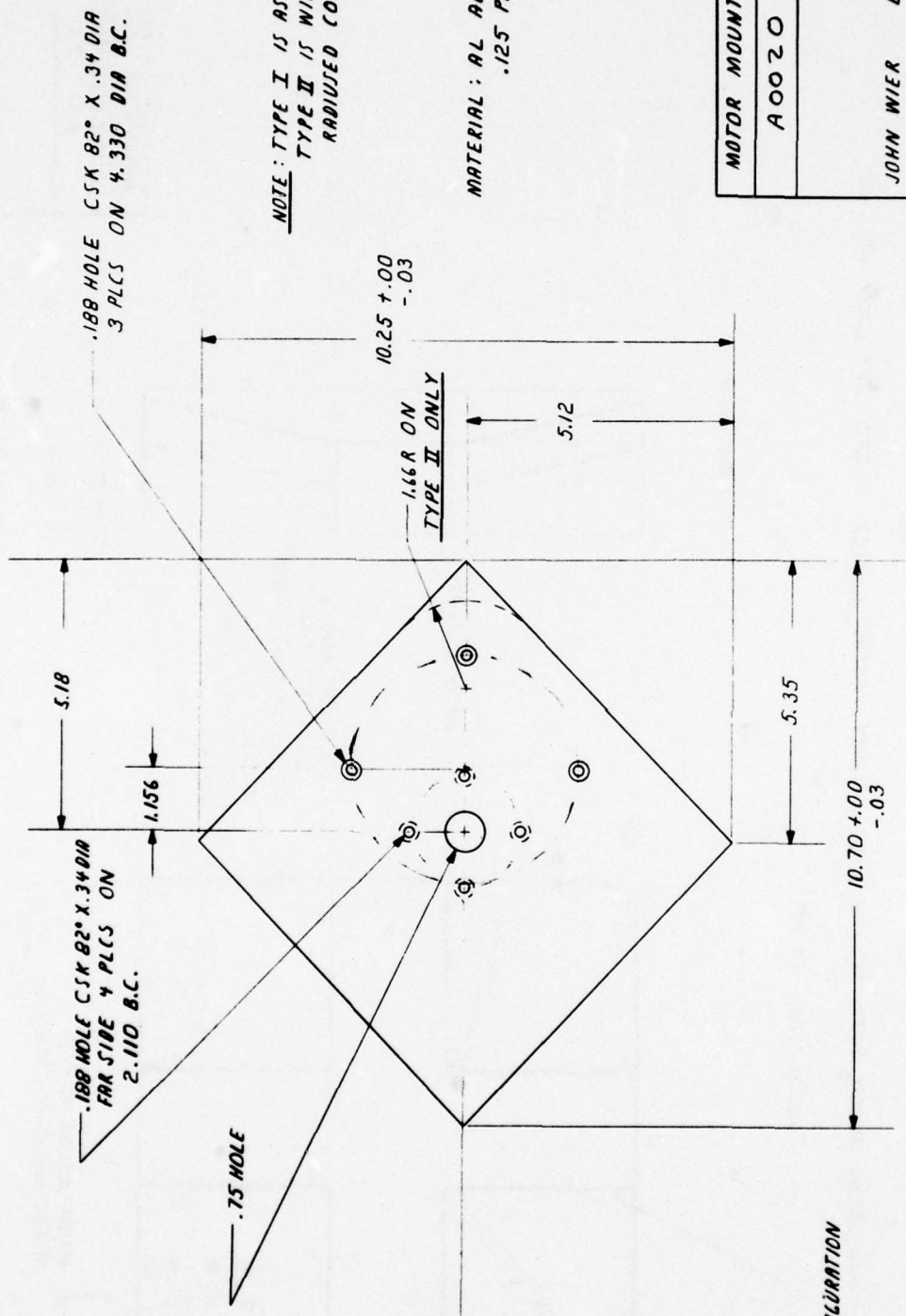
Figure 1. Ambulator.

DRAWINGS



MATERIAL: AL ALLOY
6061-T6
.09 THICK

AMBULATOR BASE COVER
A 0010
JOHN WIER
EXT 2772



NOTE: TYPE I IS AS SHOWN
TYPE II IS WITH ONE
RADIUSED CORNER.

MATERIAL: AL ALLOY 6061-T6
.125 PLATE

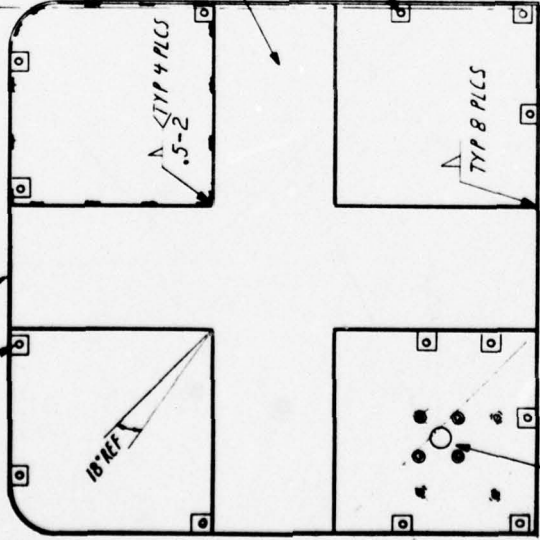
MOTOR MOUNT PLATE
A 0020
JOHN WIER EXT 7372

FOR 19.155 CONFIGURATION

—FLOATING ANCHOR NUTS 90° FOR 6-32 MACHINE SCREWS 6 PLCS LOCATE PER COVER DRAWING

AMBULATOR SKIRT

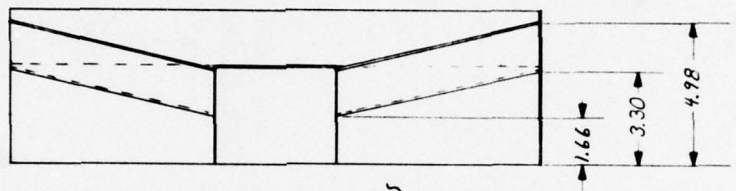
A



BATTERY TRAY

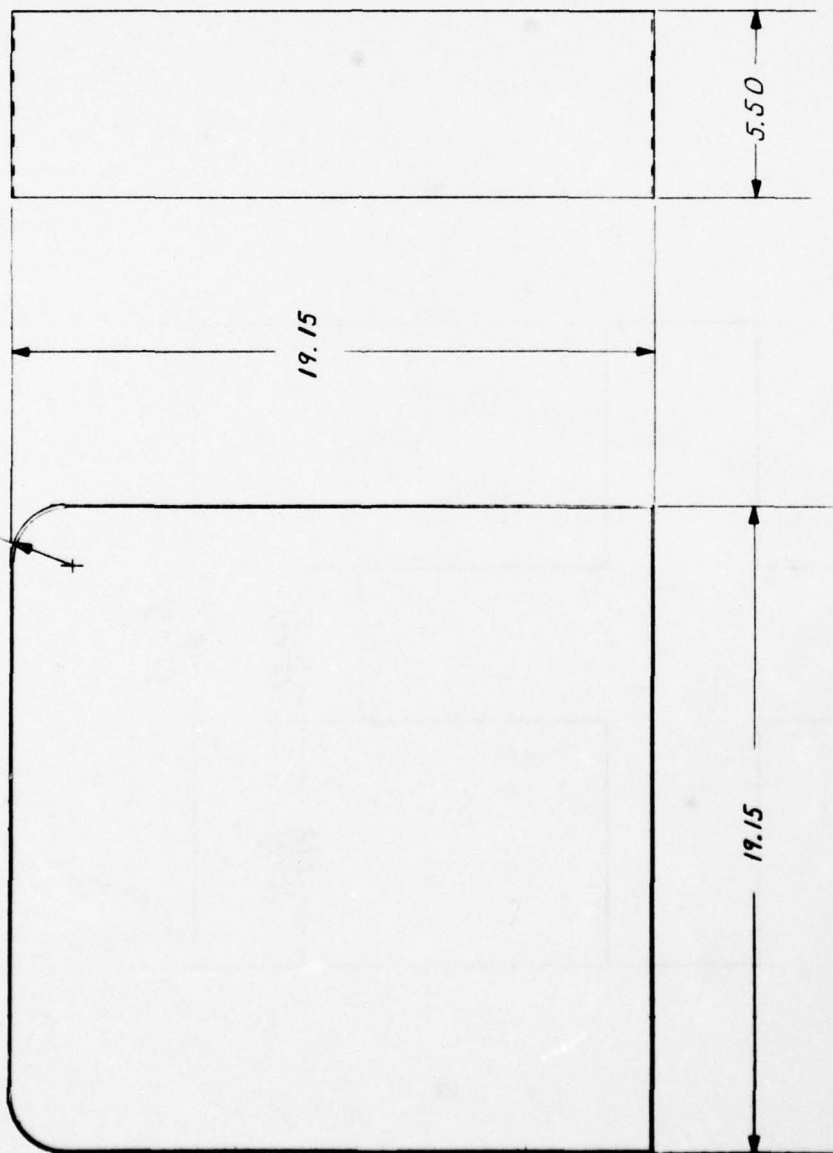
FLOATING ANCHOR NUTS 90° FOR 10-32 MACHINE SCREWS 8 PLCS LOCATE PER COVER DRAWING

SECTION A-A



AMBULATOR PART ORIENTATION AND ASSEMBLY
A 0 0 3 0
JOHN WIER EXT 7372

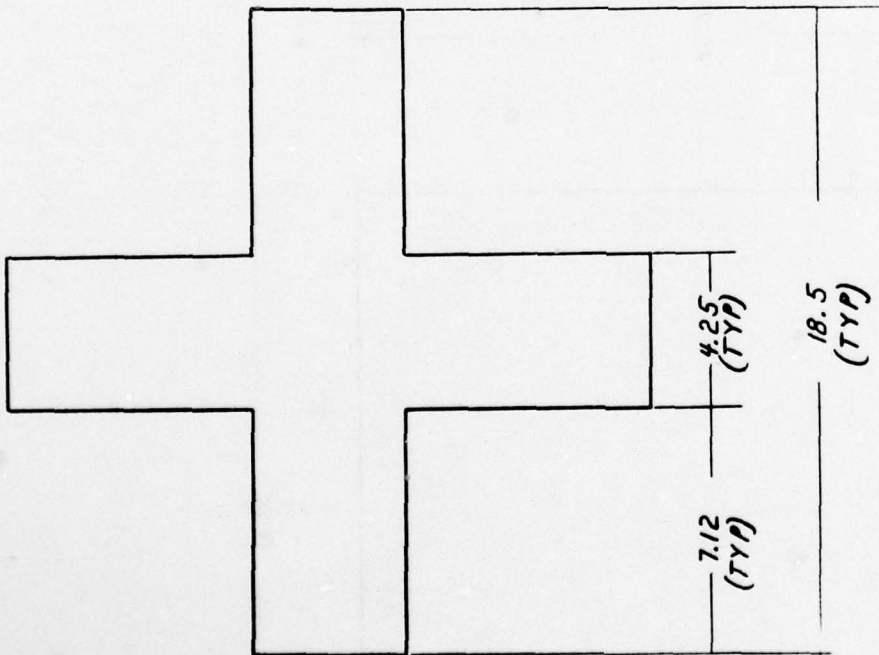
1.75 R 2 PLCS



MATERIAL: AL ALLOY 5052
OR 6061 AS AVAILABLE
.09 THICK

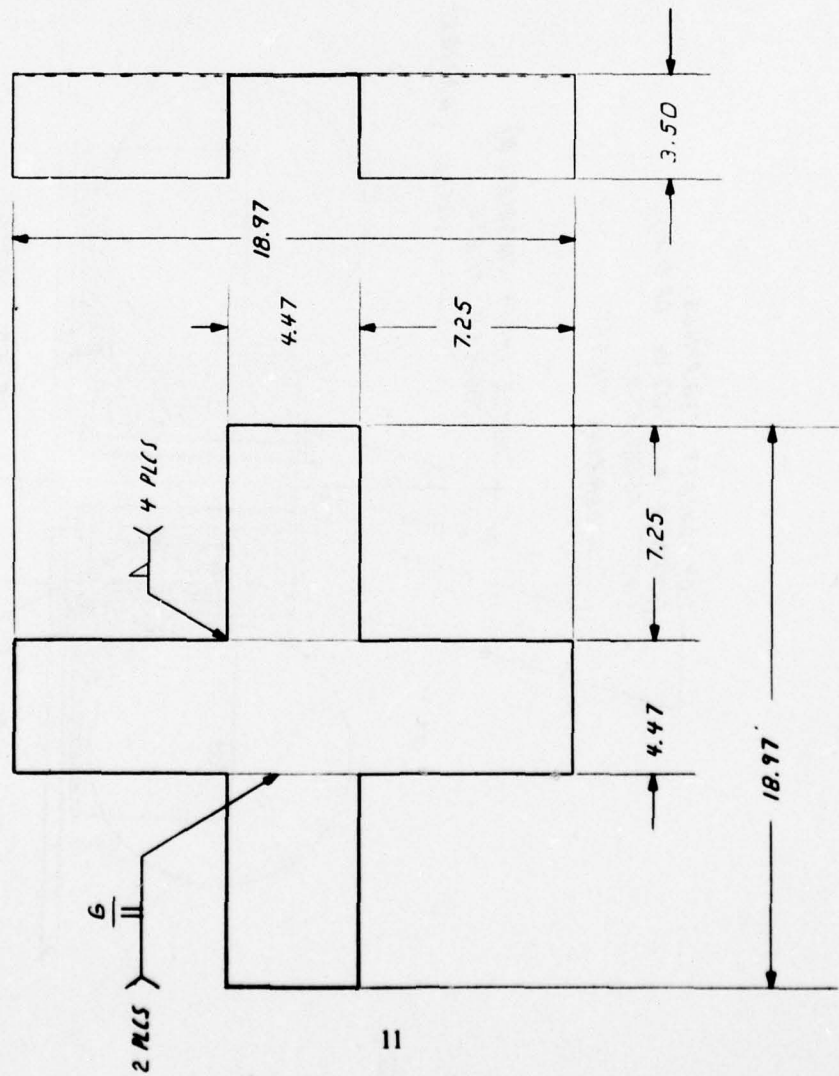
AMBULATOR SKIRT	
A0040	
JOHN WIER	EXT 7372

MATERIAL: AL ALLOY 5052 OR 6061
 AS AVAILABLE .06 THICK
 FINISH: HRRD ANODIZE, CLEAR



ELECTRONICS MOUNT PLATE	
A0050	
JOHN WIER	EXT 7372

MATERIAL: AL ALLOY 5052
OR 6061 AS AVAILABLE
.06 THICK



BATTERY TRAY
A0060
JOHN WIER ENT 7372

20° CONTACT BEARINGS
(FAFNIR # 7203W OR EQ.)
(NOT REQUIRED)

BEARING SHAFT

MOTOR SHAFT (MODIFIED)
COUPLER PLATE

WHEEL CARRIAGE

MOTOR MOUNT ACCESS HOLE

BEARING ASSEMBLY
FOR WHEEL CARRIAGE

DRIVE MOTOR

BEARING HOUSING

BEARING SPACER
RING
(DELETED)

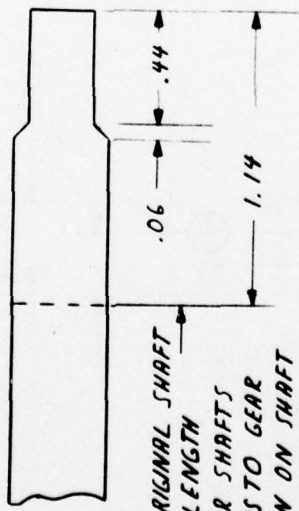
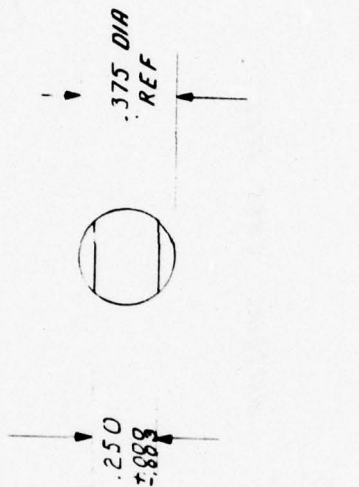
FULL SCALE

FOR ASSEMBLY REFERENCE

ONLY A 0070

NOTE: CROSSSECTIONS SHOWN ARE
NOT PER DRAWINGS.

JOHN WIER EXT 7372

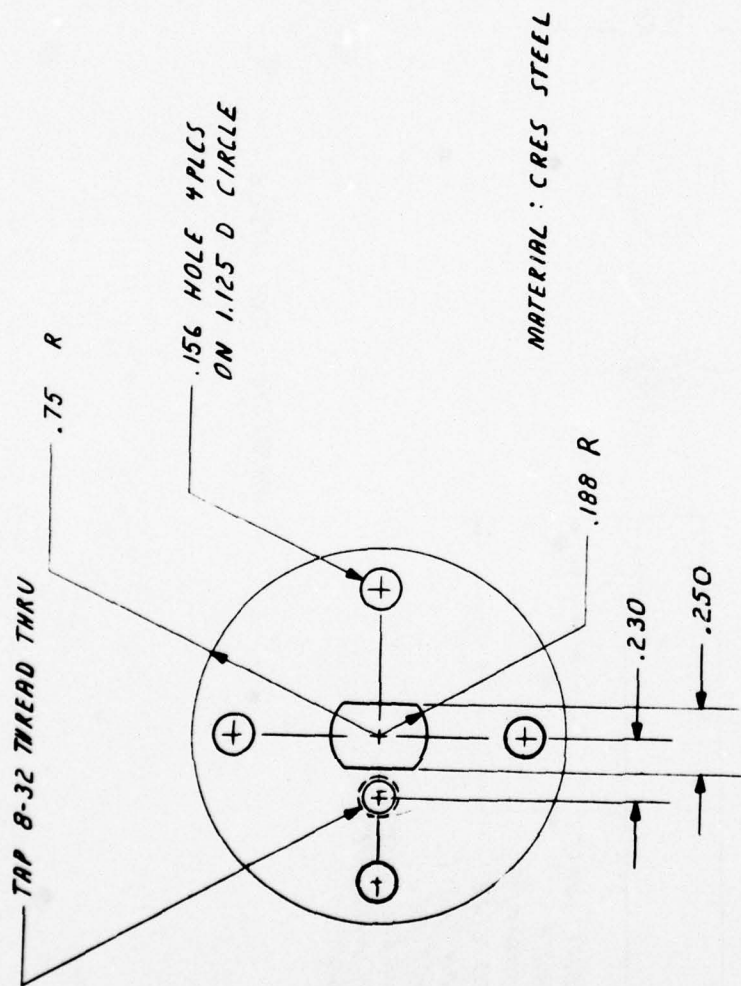


ORIGINAL SHAFT
LENGTH

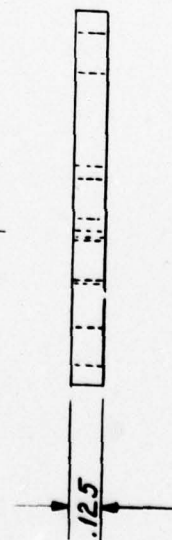
NOTE: MOTOR SHAFTS
VARY AS TO GEAR
LOCATION ON SHAFT
AND MAY NOT BE
INTERCHANGEABLE BETWEEN
MOTORS WITH DIFFERENT
GEAR RATIOS.

MATERIAL: TOOL STEEL

MOTOR SHAFT REPLACEMENT
A0080
JOHN WIER EXT 7372

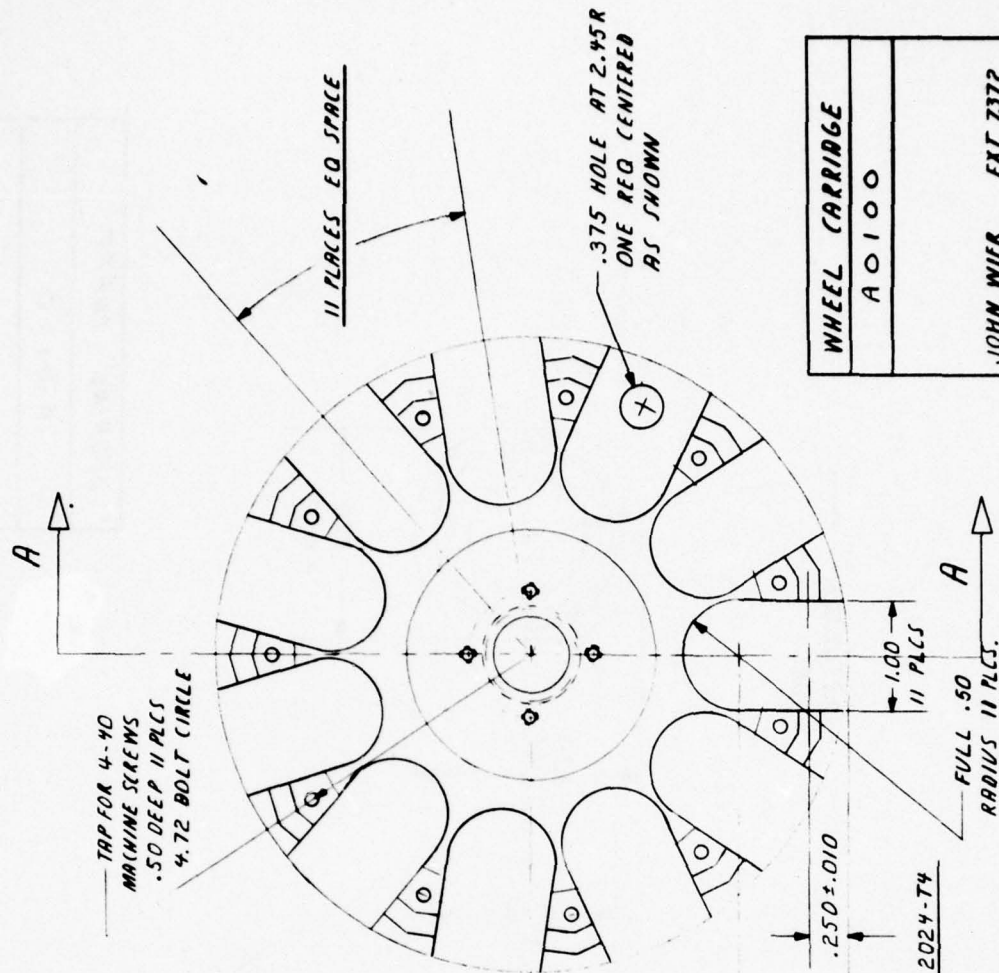
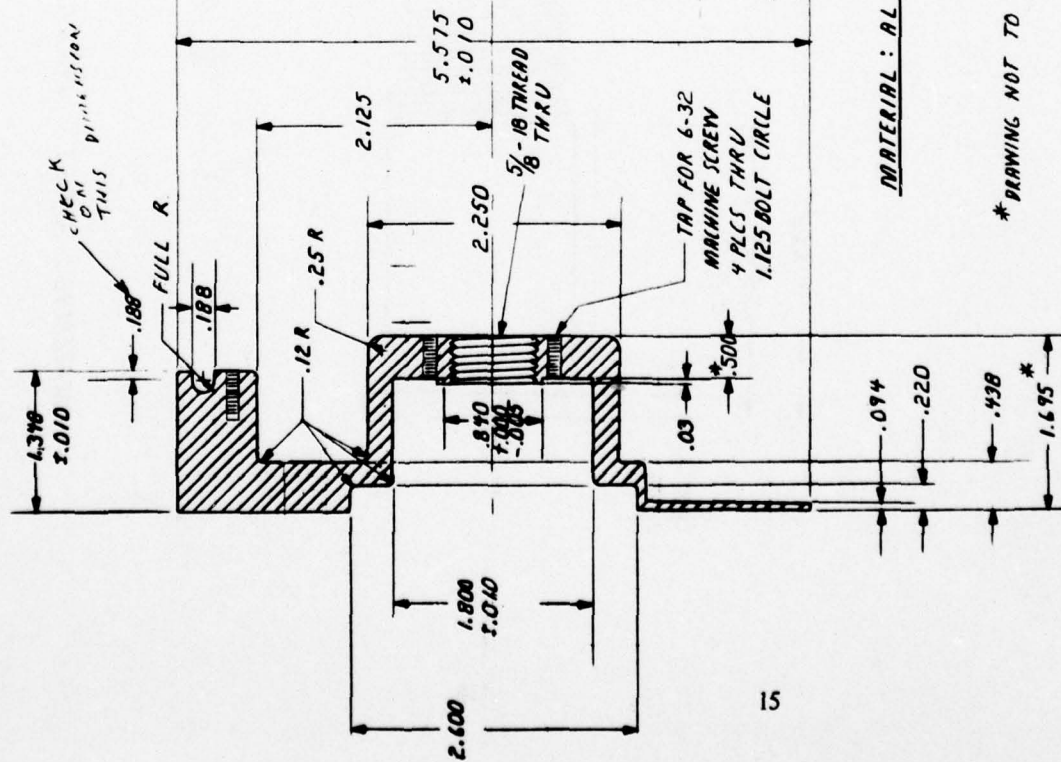


MATERIAL : CRES STEEL



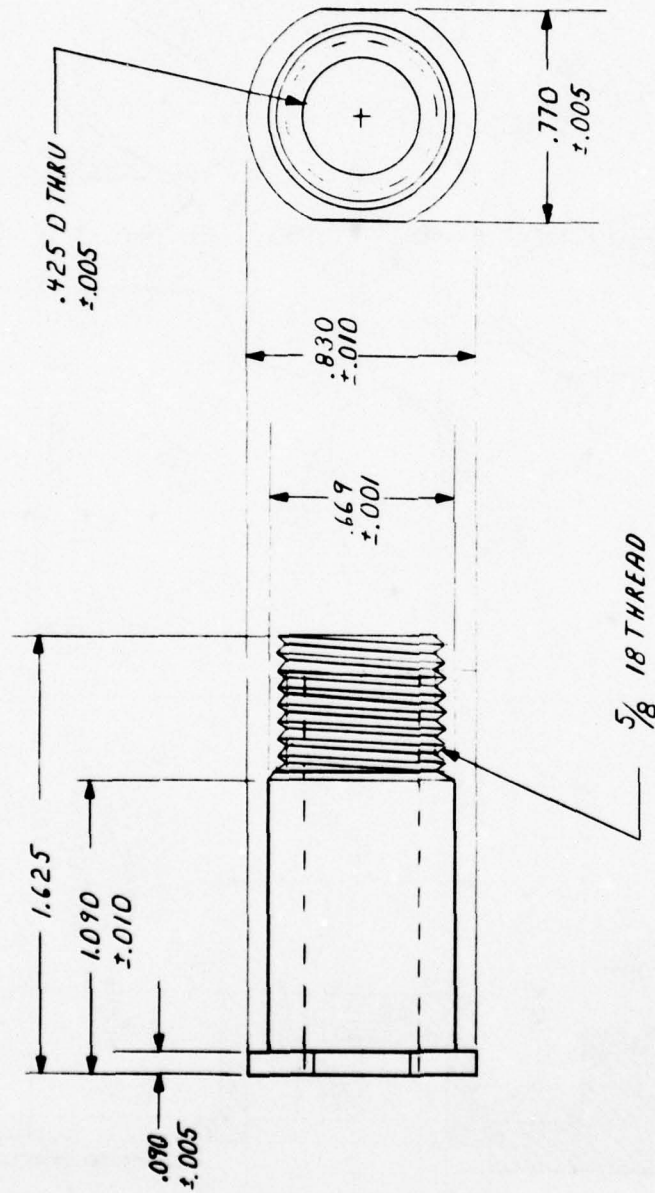
COUPLER PLATE	
A0090	
JOHN WIER	EXT 7372

SECTION A-A



WHEEL CARRIAGE
A0100
JOHN WIER EXT 7372

* DRAWING NOT TO SCALE

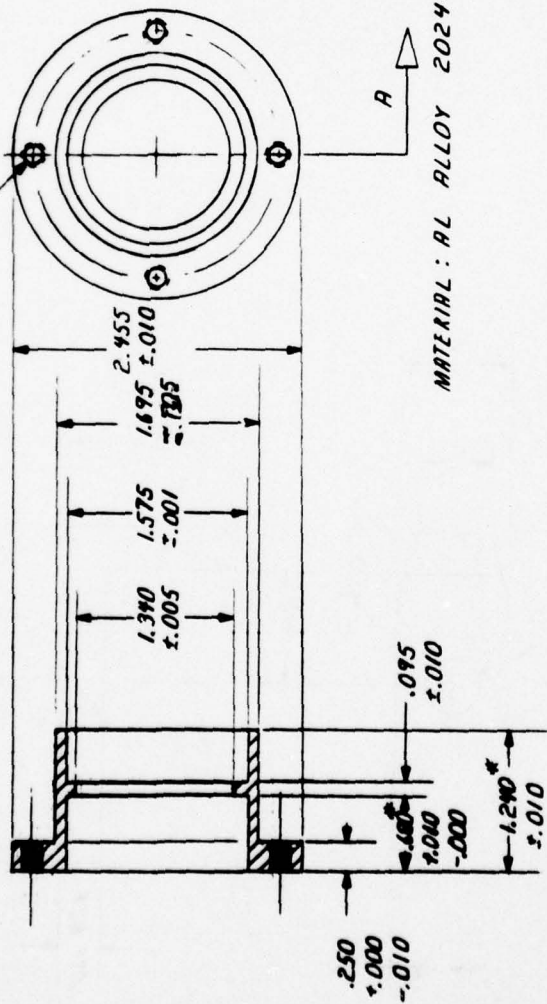


MATERIAL: CRES. STEEL

BEARING SHAFT
A0110
JOHN WIER EXT. 7372

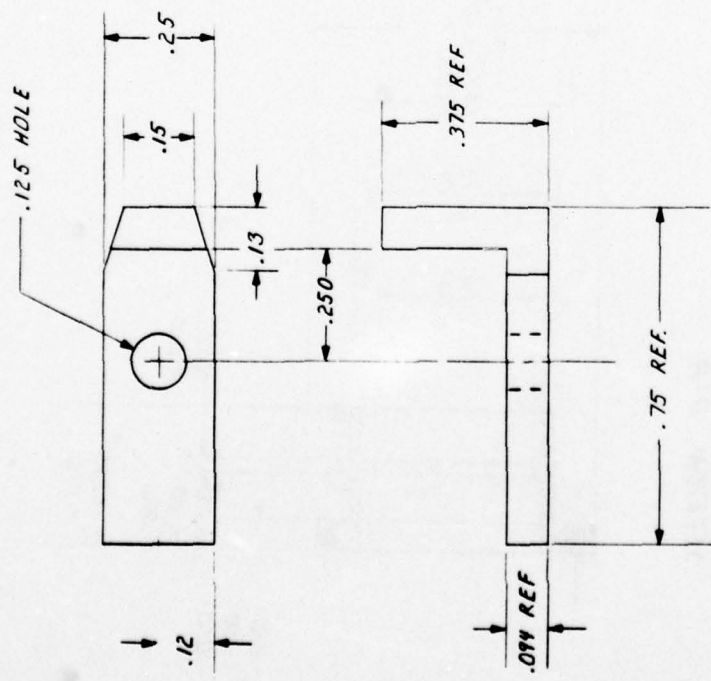
TAP FOR B-32 MACHINE SCREW
4 PLCS EQ SPACE ON 2.110 BOLT CIRCLE

SECTION A-A



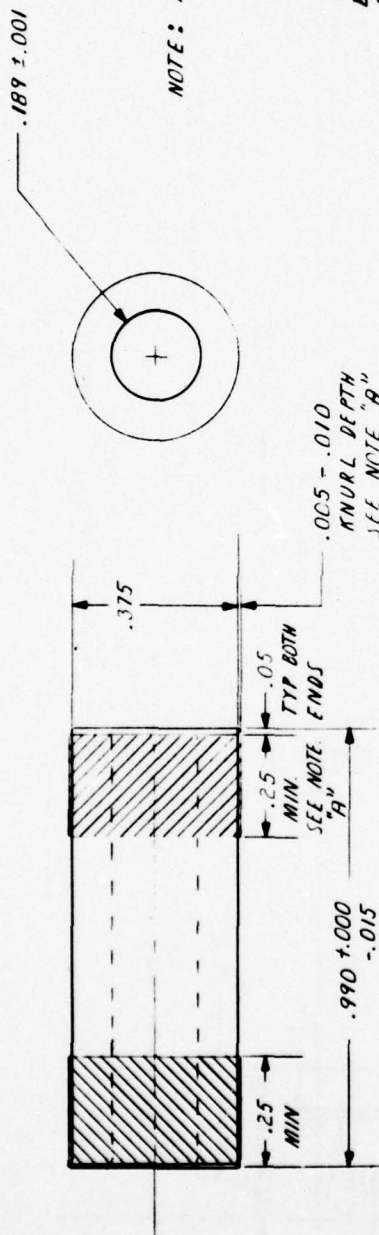
BEARING HOUSING
A0120
JOHN WIEL EAT 7372

MATERIAL : ALCOA ALUMINUM L SECTION # 1744

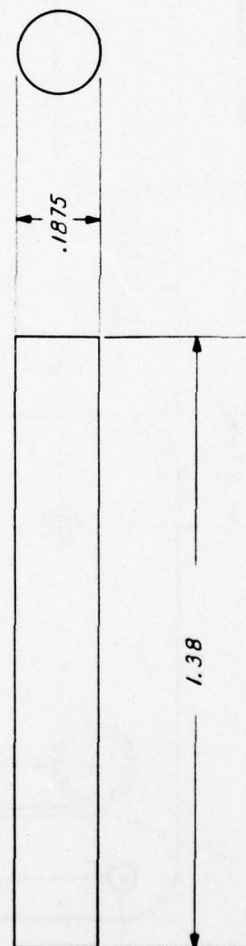


AXLE RETAINER
A0130
JOHN WIER EXT 7372

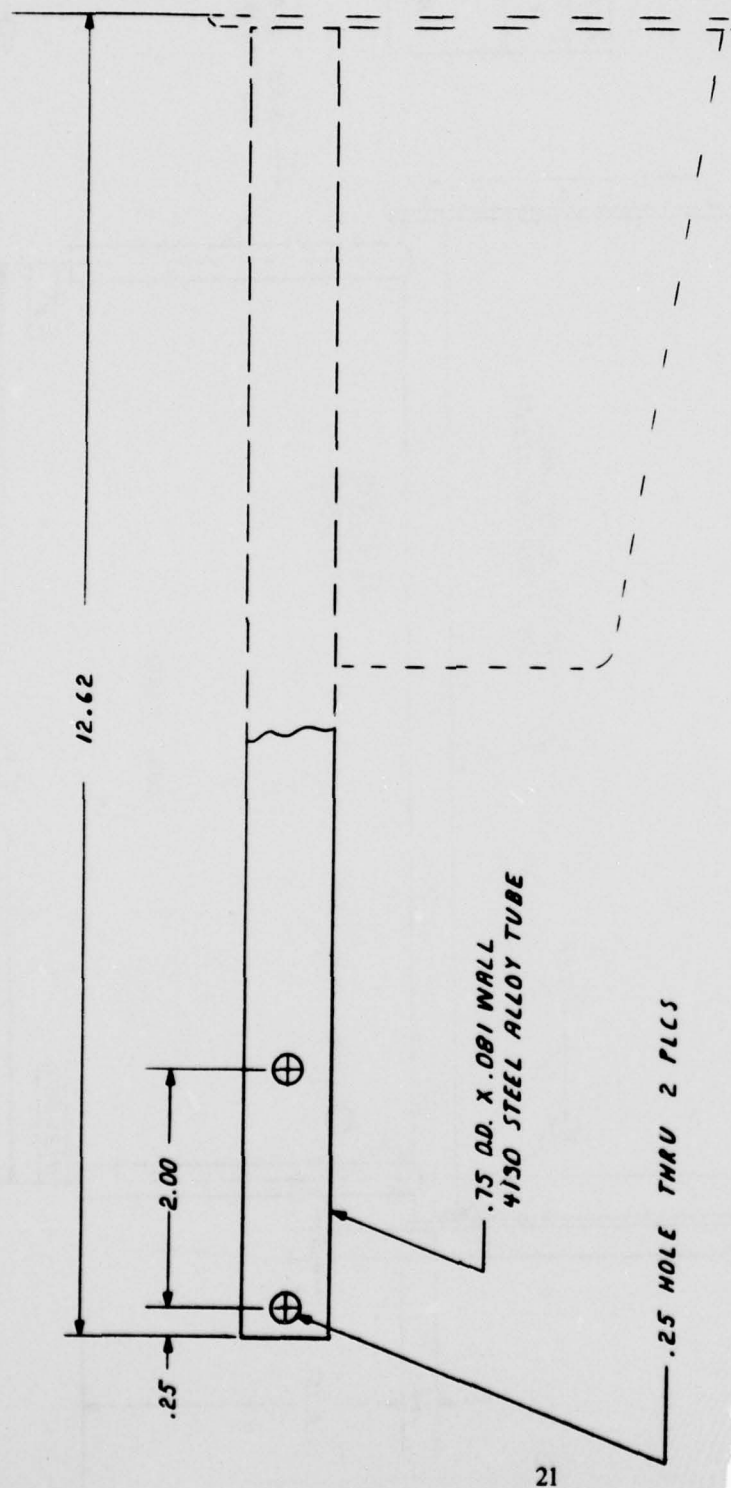
MATERIAL: BEARING BRONZE SAE 660



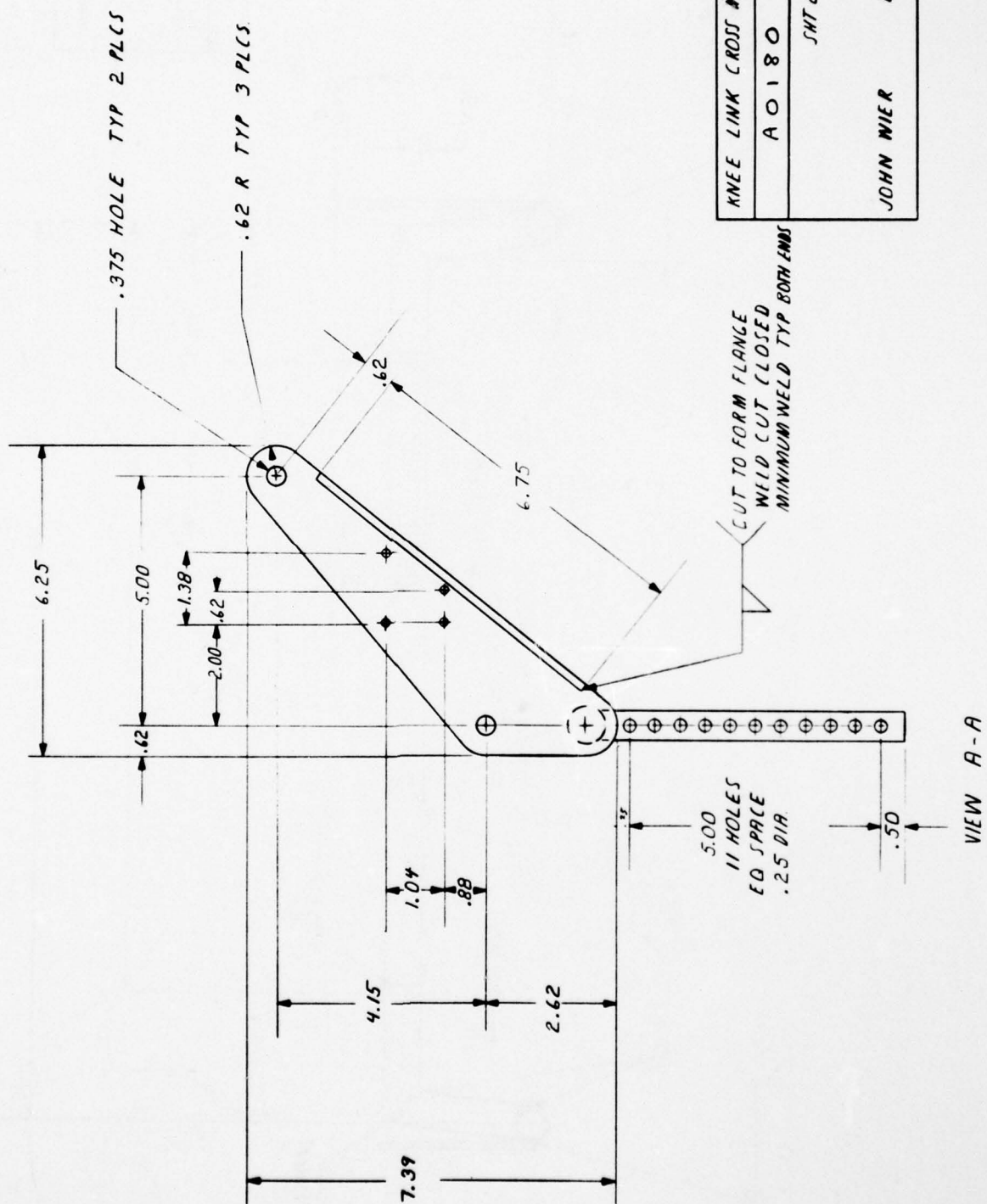
MATERIAL: CRES STEEL 303



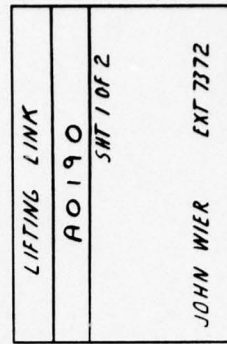
WHEEL BUSHING -
AXLE ROD
A0140
JOHN WIER EXT 7372



RISER TUBE	
A0160	SMT 2 OF 2
JOHN WIER	EXT 7372



KNEE LINK CROSS MEMBER
A 0180
SHT 2 OF 2
JOHN WIER
EXT 2372

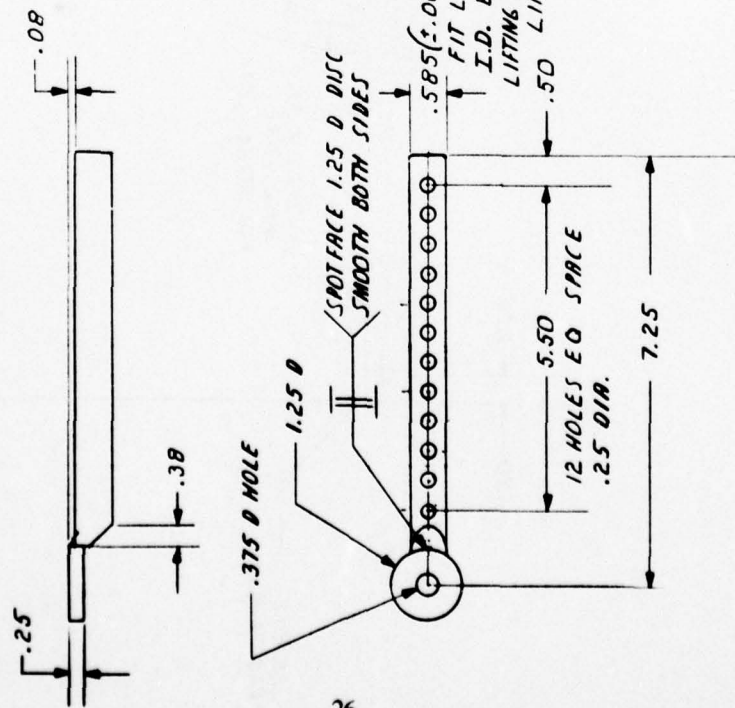




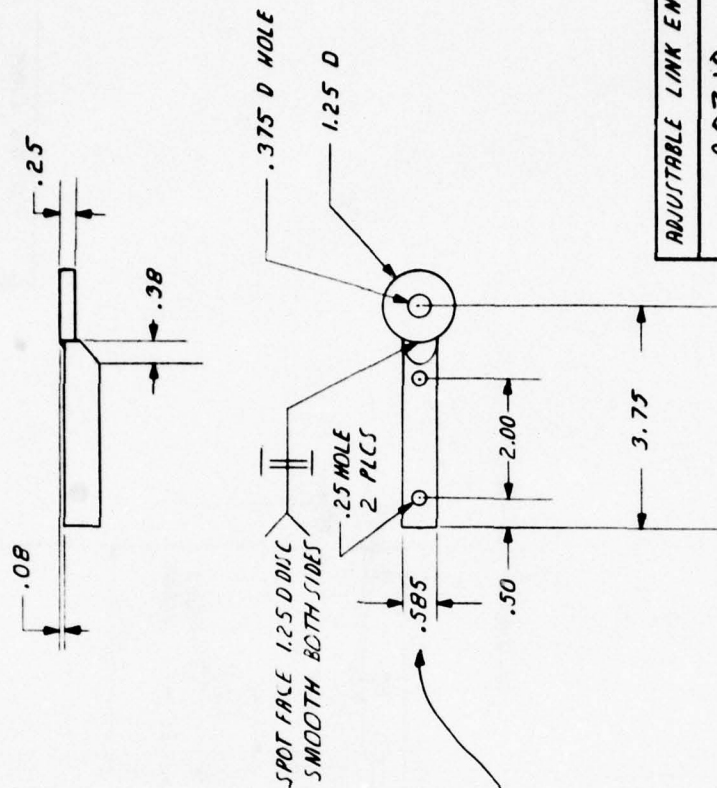
LIFTING LINK	
A0200	
SNT 2 OF 2	
JOHN WIER	EXT 7372

MATERIAL: 303 STAINLESS STEEL

TYPE A



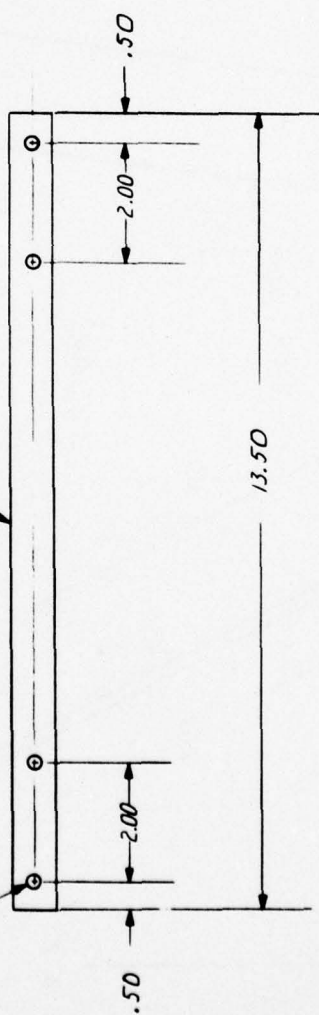
TYPE B



ADJUSTABLE LINK ENDS
A0210
JOHN WIER EXT 7372

.75 DIA X .081 WALL TUBE
4120 STEEL ALLOY

.25 HOLE 4 PLCS

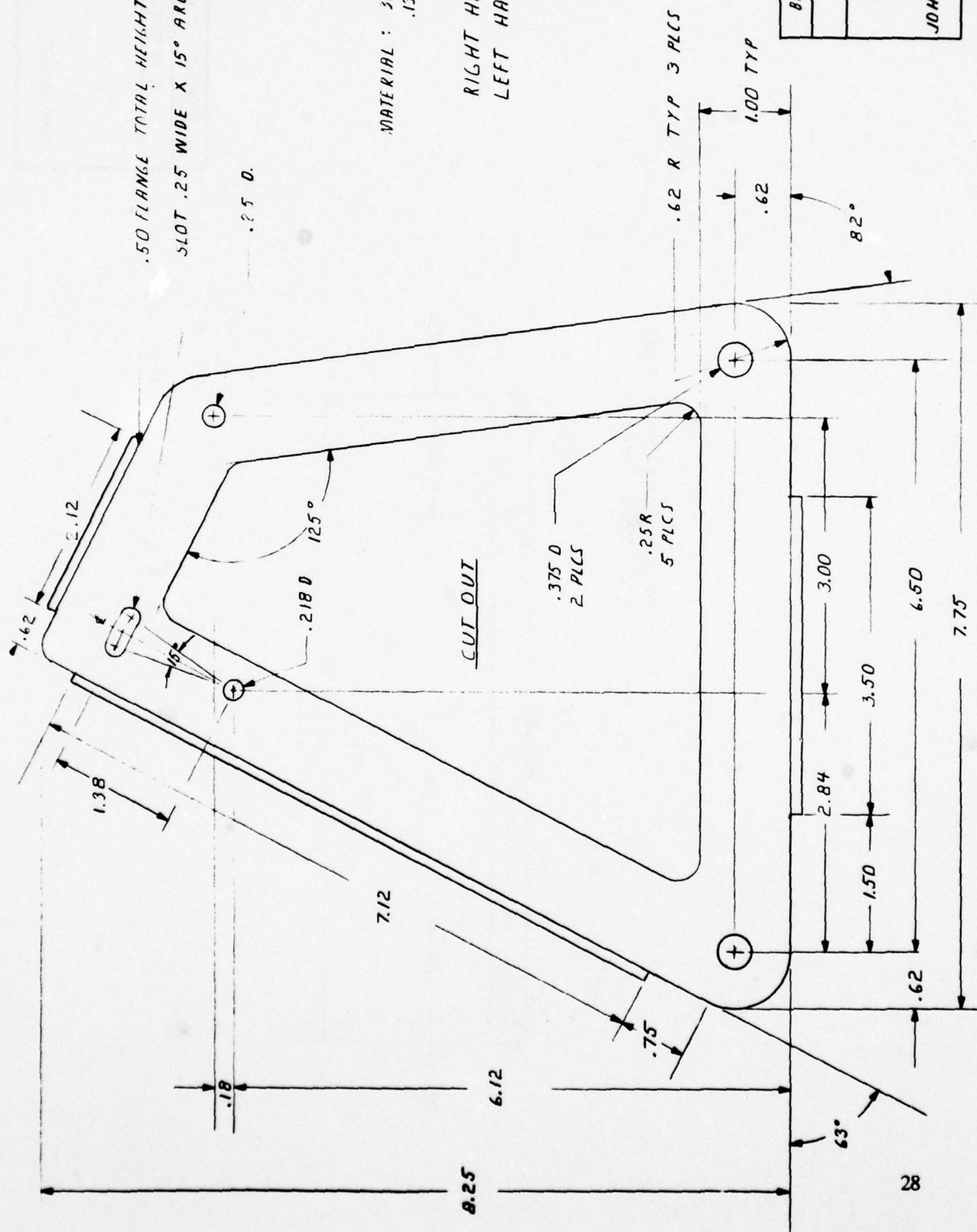


TOP LINK
A0220
JOHN WIER EXT 7372

.250.

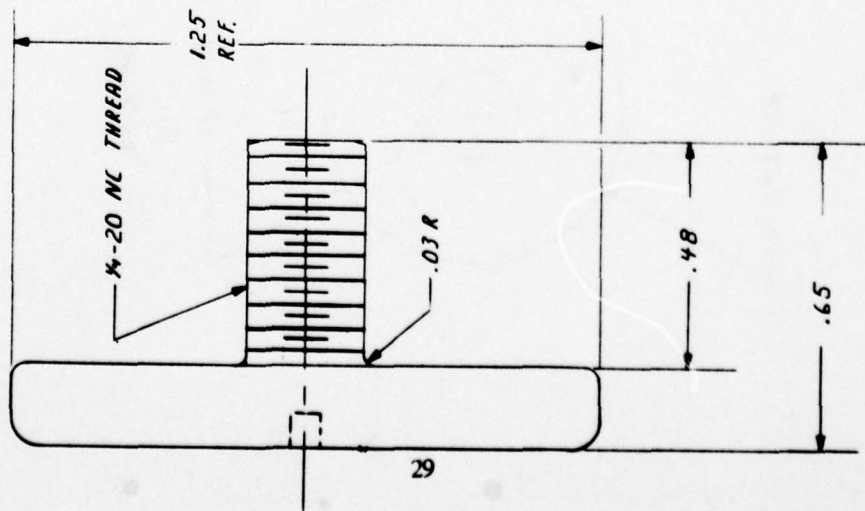
MATERIAL: 302 STAINLESS STEEL
.134 THICK

RIGHT HAND — SHOWN
LEFT HAND — FLANGES OPP SIDE

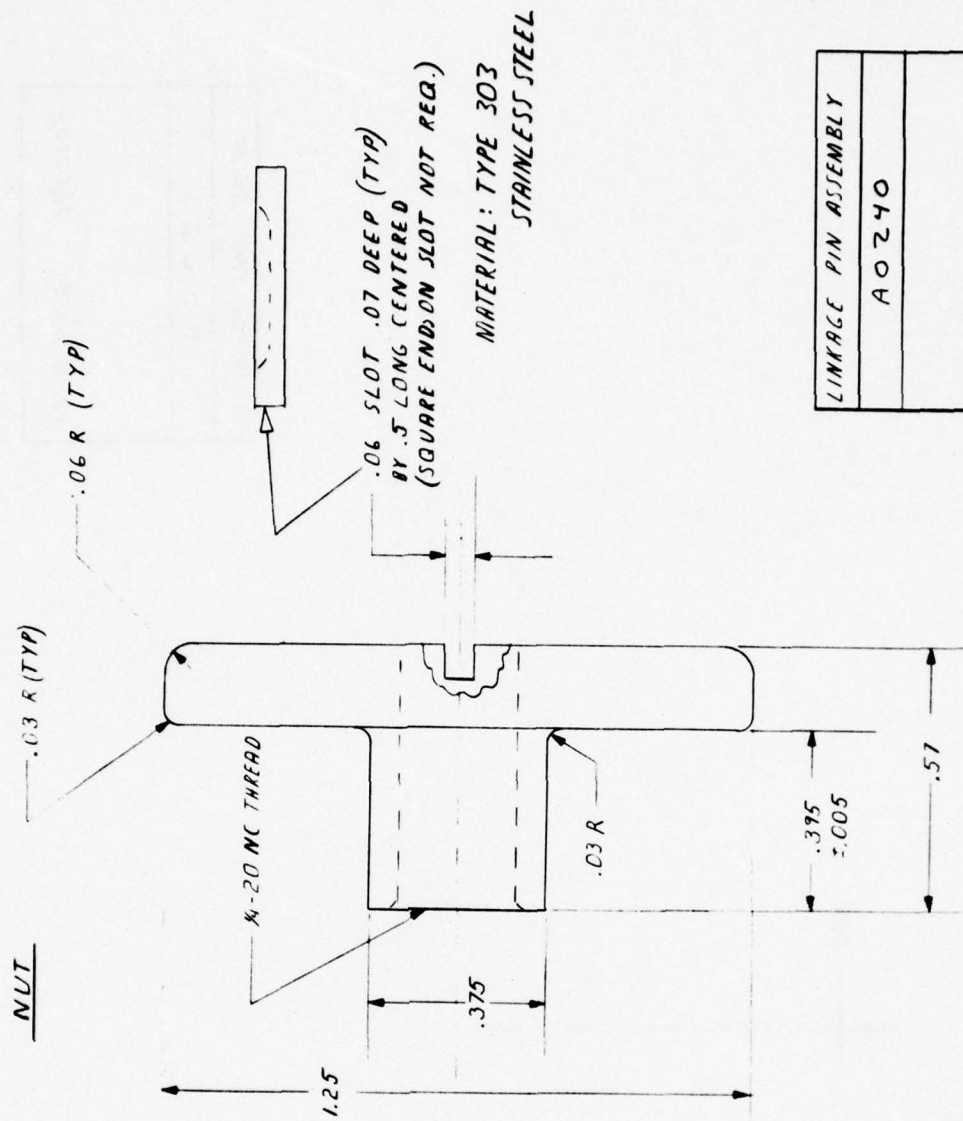


BACKREST LINK PLATE	
A0230	
	JOHN WIER EXT 7372

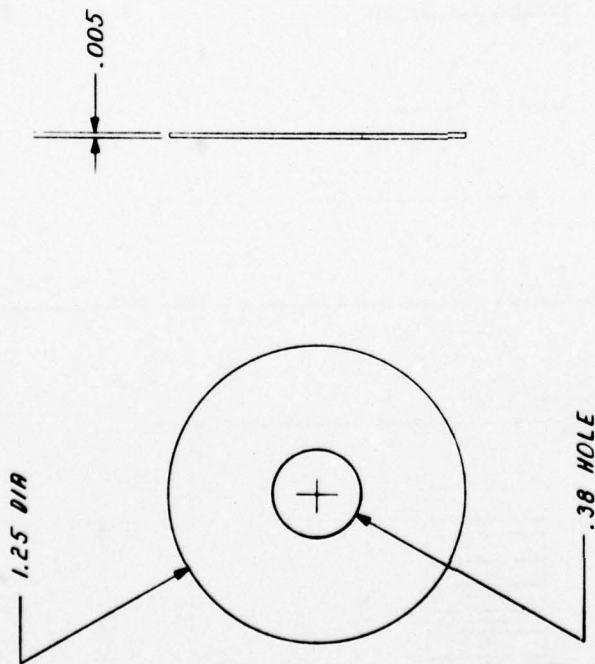
SCREW



NUT

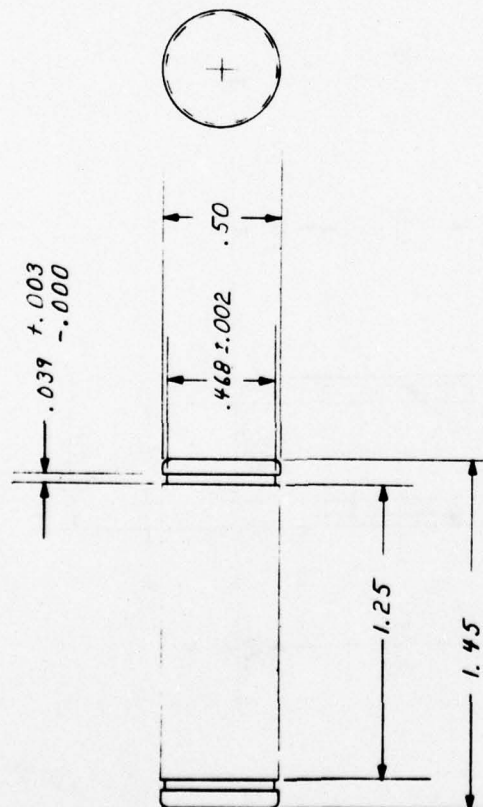


LINKAGE PIN ASSEMBLY
A0240
JOHN WIER EXT 7372



MATERIAL: CRES STL

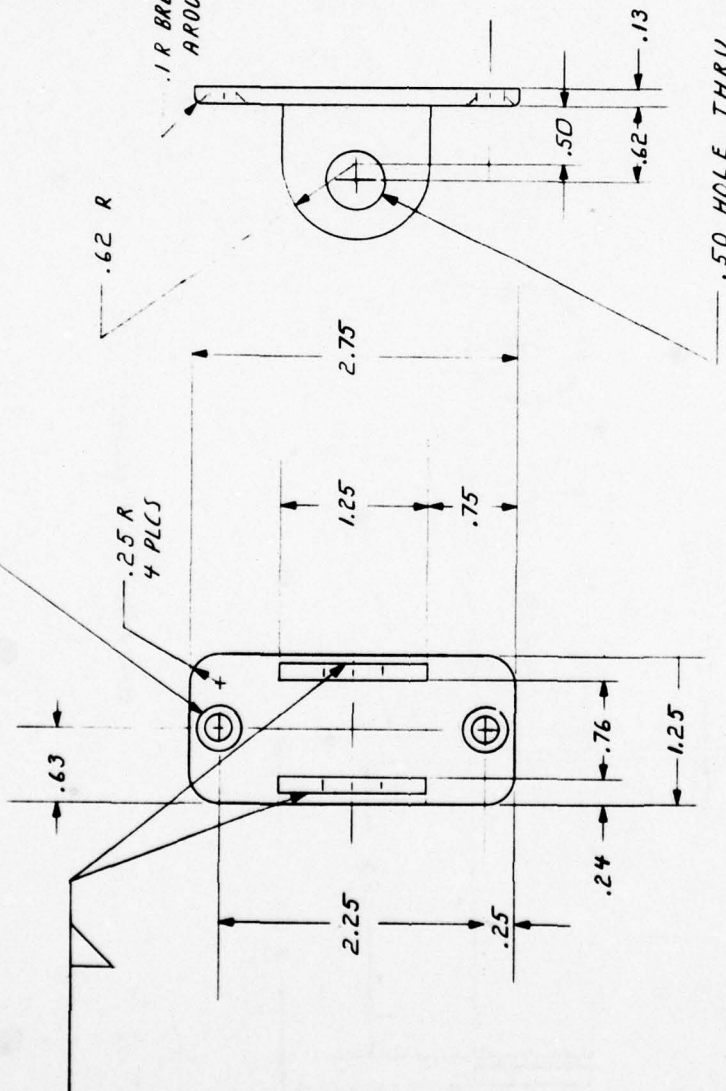
LINKAGE END SHIM
A0250
JOHN WIER EXT7372



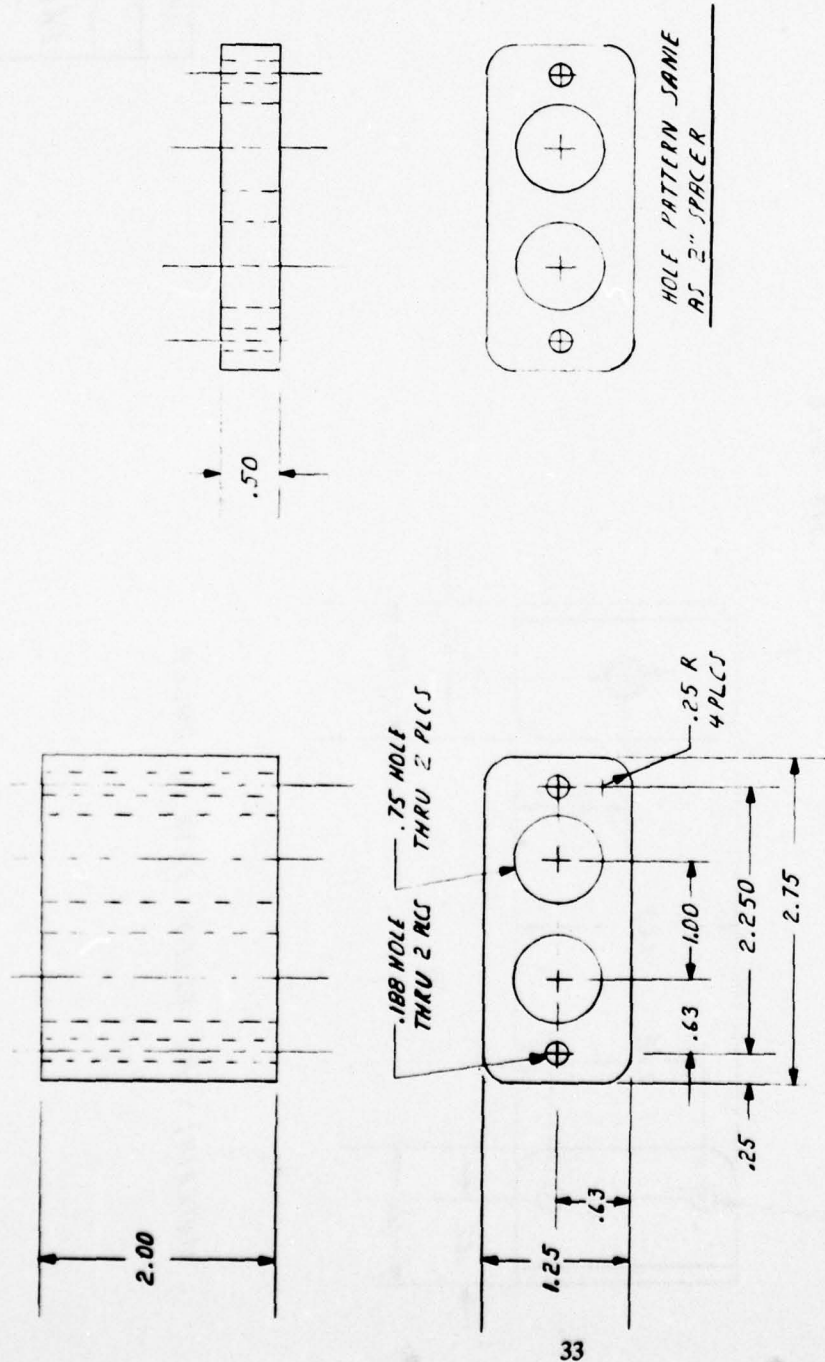
MATERIAL : 303 STAINLESS STL.

JACK CLEVIS PIN
A 0260
JOHN WIER EXT 7372

.203 HOLE CSK R2° .35 DIA.
2 PLCS



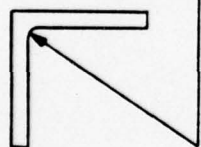
FOOT PLATE
A O 270
JOHN WIER EXT 7372



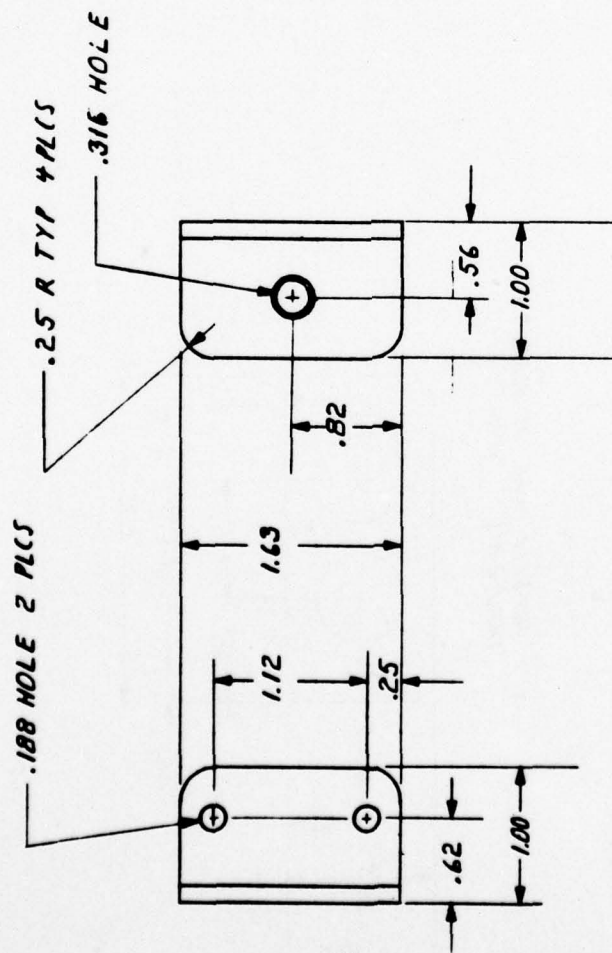
HOLE PATTERN SAME
AS 2" SPACER

MATERIAL: AL ALLOY

JACK MOTOR SPACER(S)	
A0280	
JOHN WIER	EAT 2372



RADIUS ANGLE IS PREFERRED BUT NOT REQ.

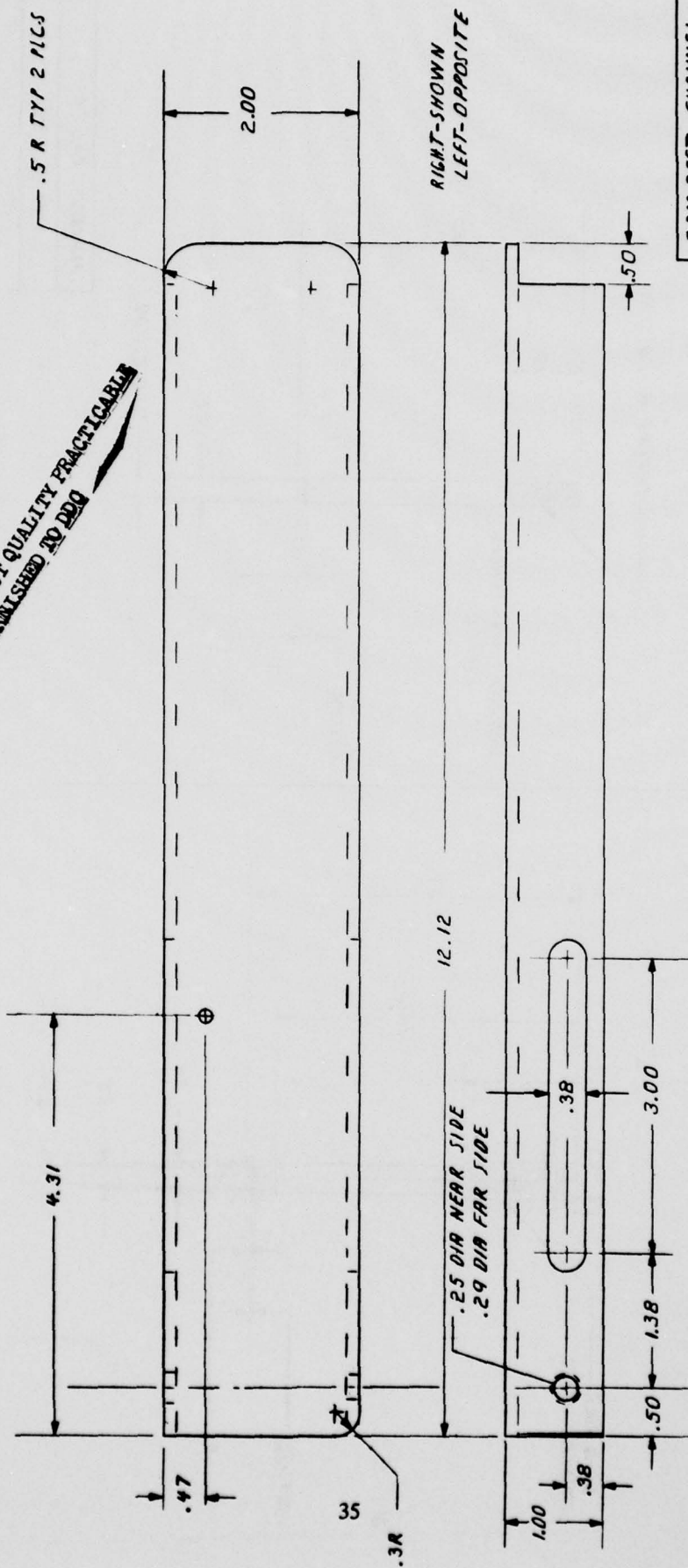


34

MATERIAL: AL ALLOY 1X1X.12 ANGLE

SPRING SUPPORT BASE
A 0 2 9 0
PRELIMINARY
JOHN WIER EXT 7372

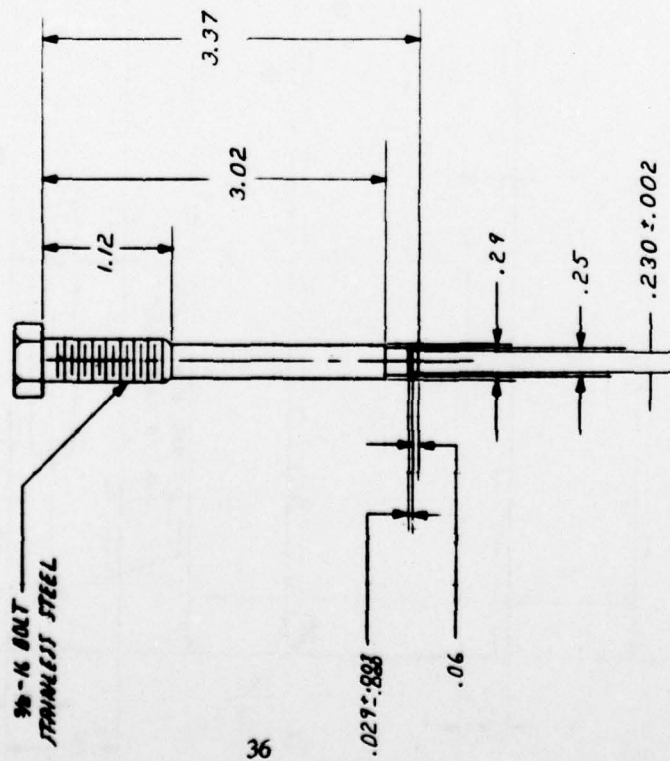
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDG



MATERIAL: AL ALLOY 6063-T5
ALCCA AL. EXTRUDED SHAPE
NO. 5527 OR EQUAL

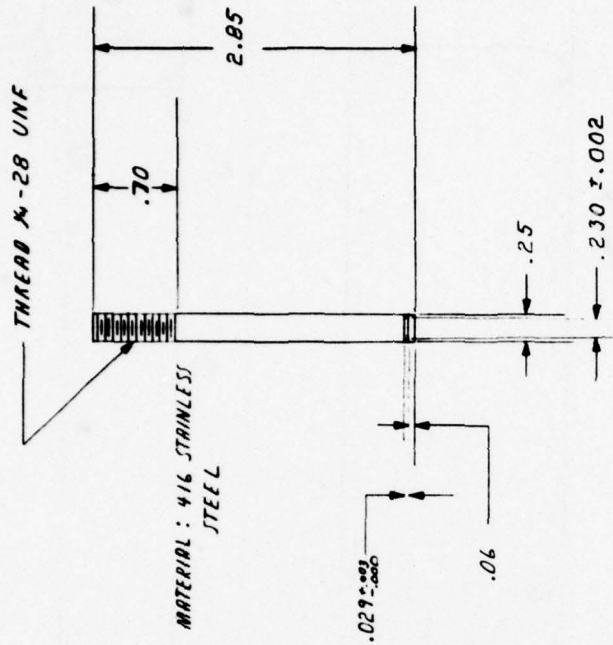
ARM REST CHANNEL
A0300
JOHN WIER EXT 7172

TYPE "A"



36

TYPE "B"

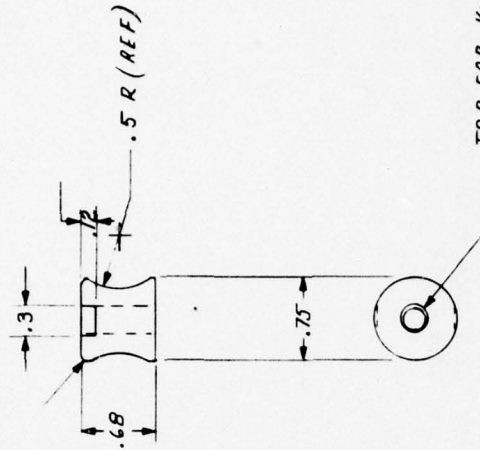


ARMIST BOLTS
A0310
JOHN WIER EXT 7372

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

TYPE "B"

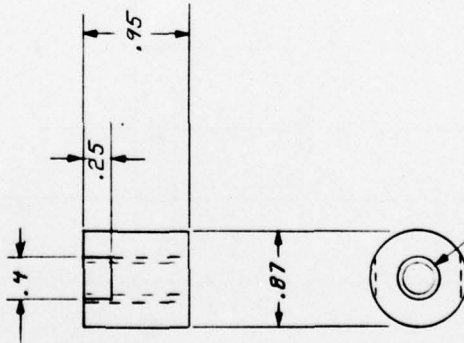
--- .06 R



MATERIAL: AL ALLOY 6061-T6 OR 2024-T4

ARMREST NUTS
A0320
JOHN WIER EXT 7372

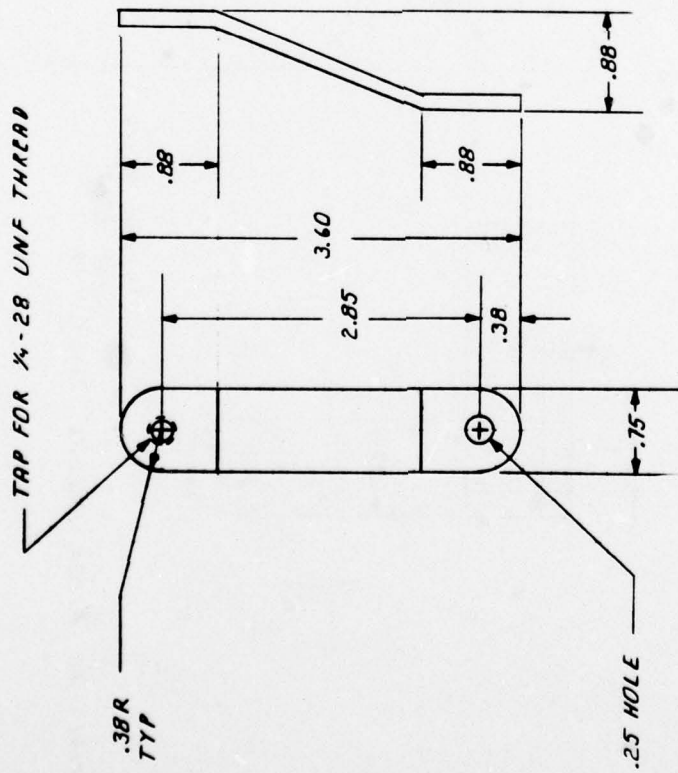
TYPE "A"



MATERIAL: AL ALLOY 6061-T6 OR 2024-T4

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

MATERIAL : 302 STAINLESS STEEL
.134 THICK

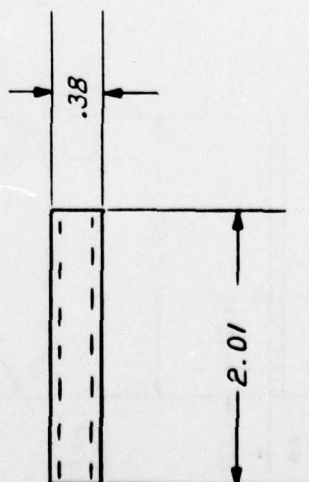


ARMREST LINKAGE
A0330
JOHN WIER EXT 7372

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDG

ARMREST ROLLER		
	A 0 3 4 0	
		JOHN WIER EXT 7372

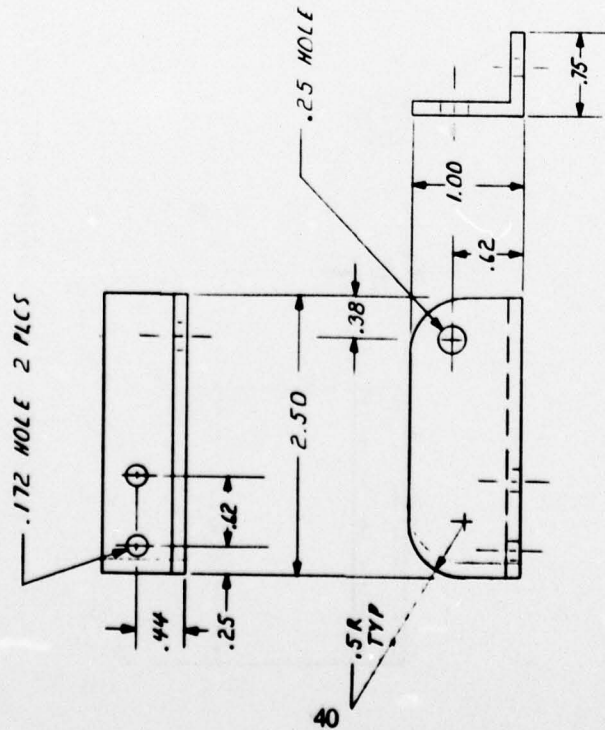
.25 HOLE THRU



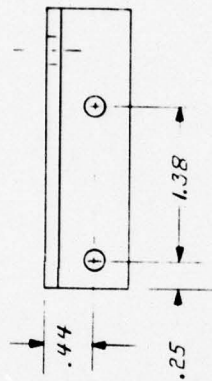
MATERIAL: 302 STAINLESS STEEL

MATERIAL: AL PLEDS 10.3.75 CR EQUAL
FINISH: HARD ANODIZE CLEAR

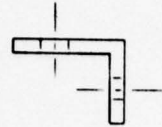
THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



RIGHT LOWER



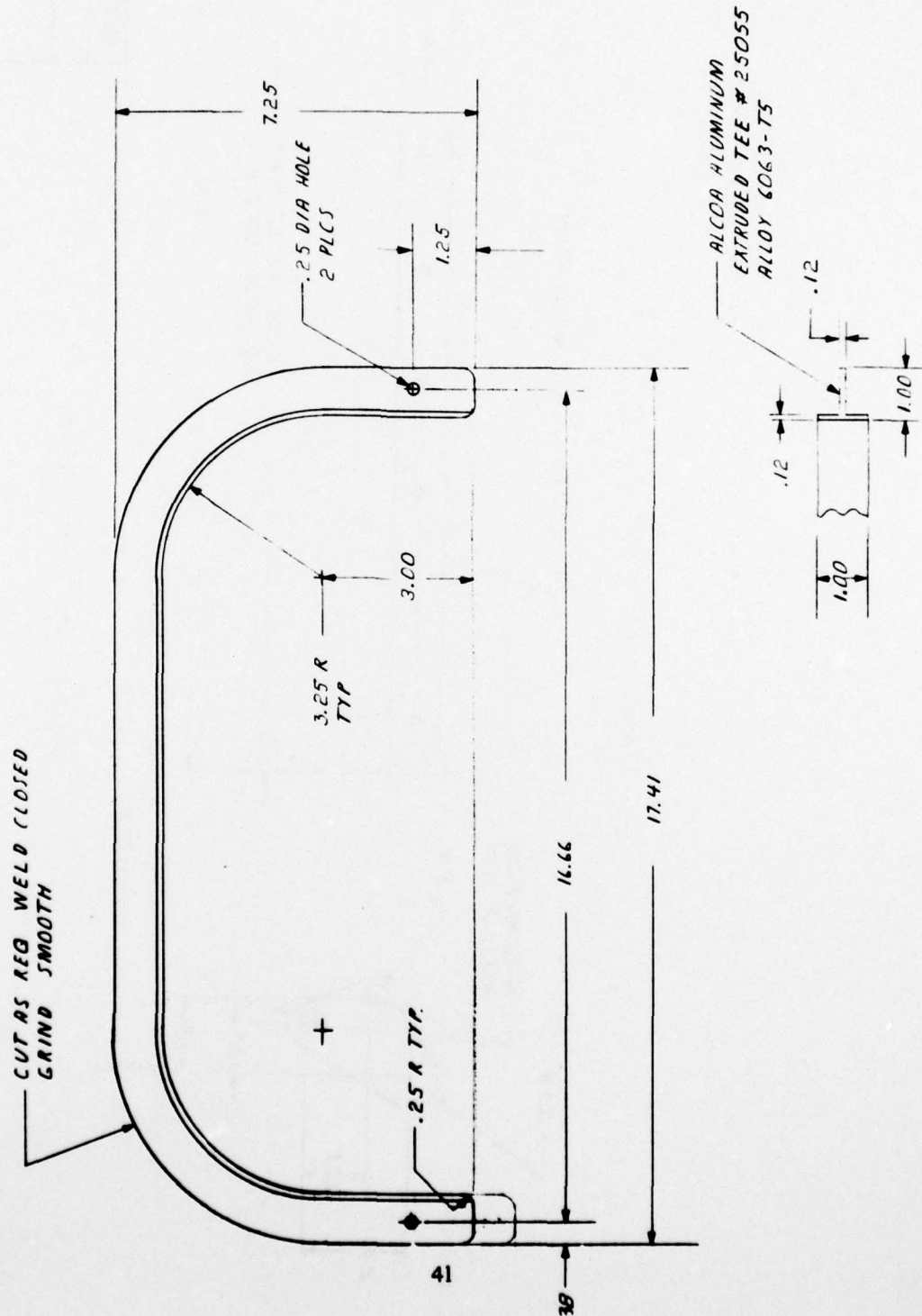
RIGHT UPPER

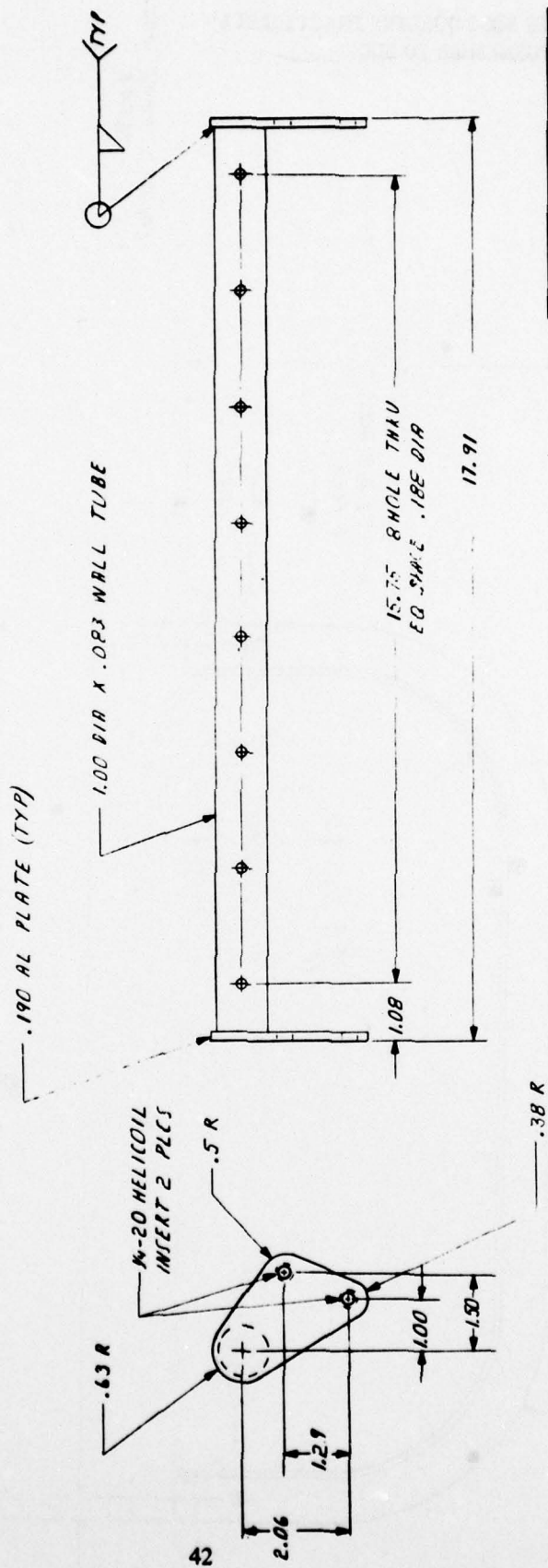


KNEE RESTRAINT BRACKET
A O 350
JOHN WIER EXT 7372

**FINISH: HARD ANODIZE
CLEAR**

WNEE RESTRAINT BAR
A0360
JOHN WIER EXT 7772

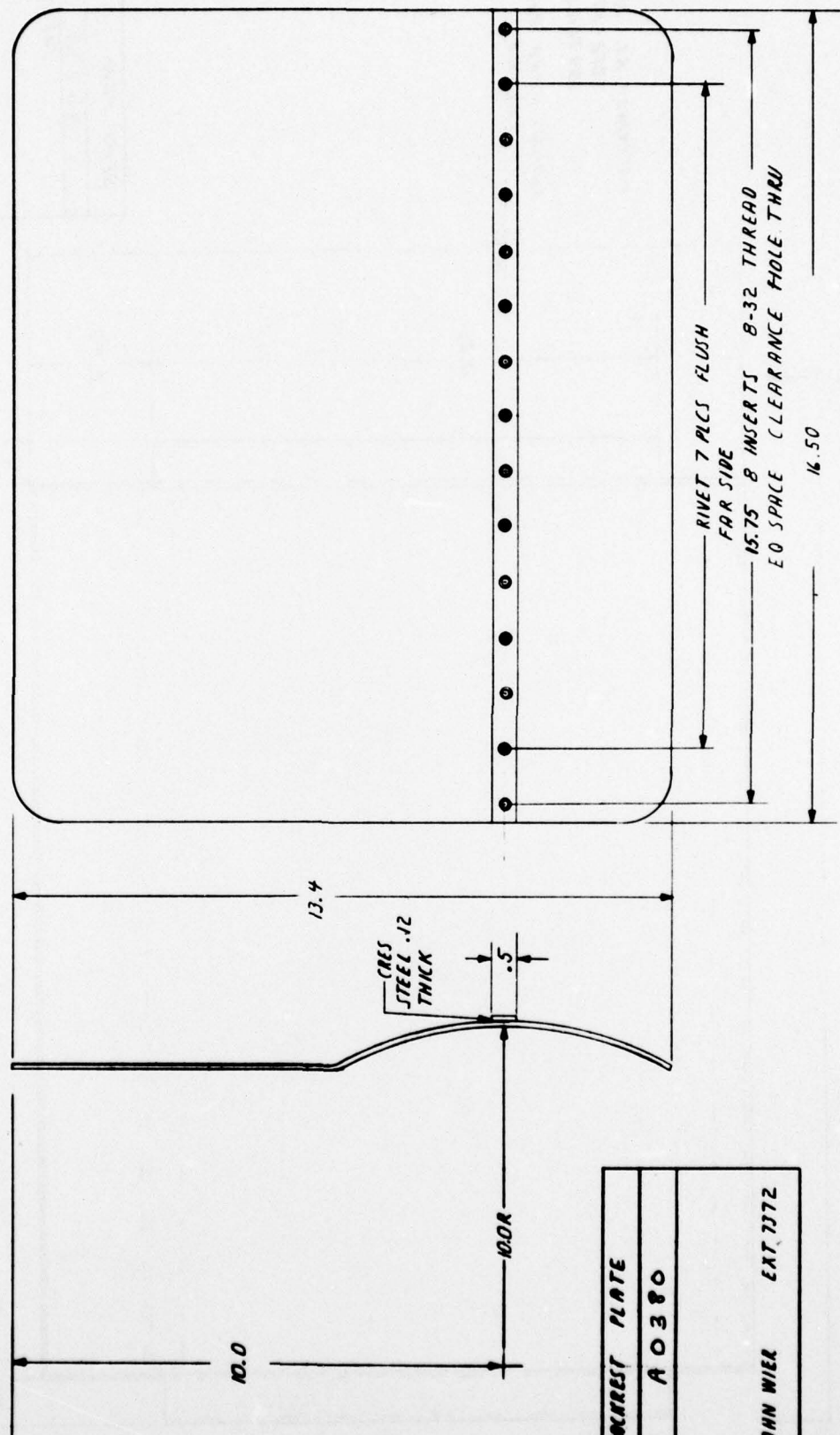




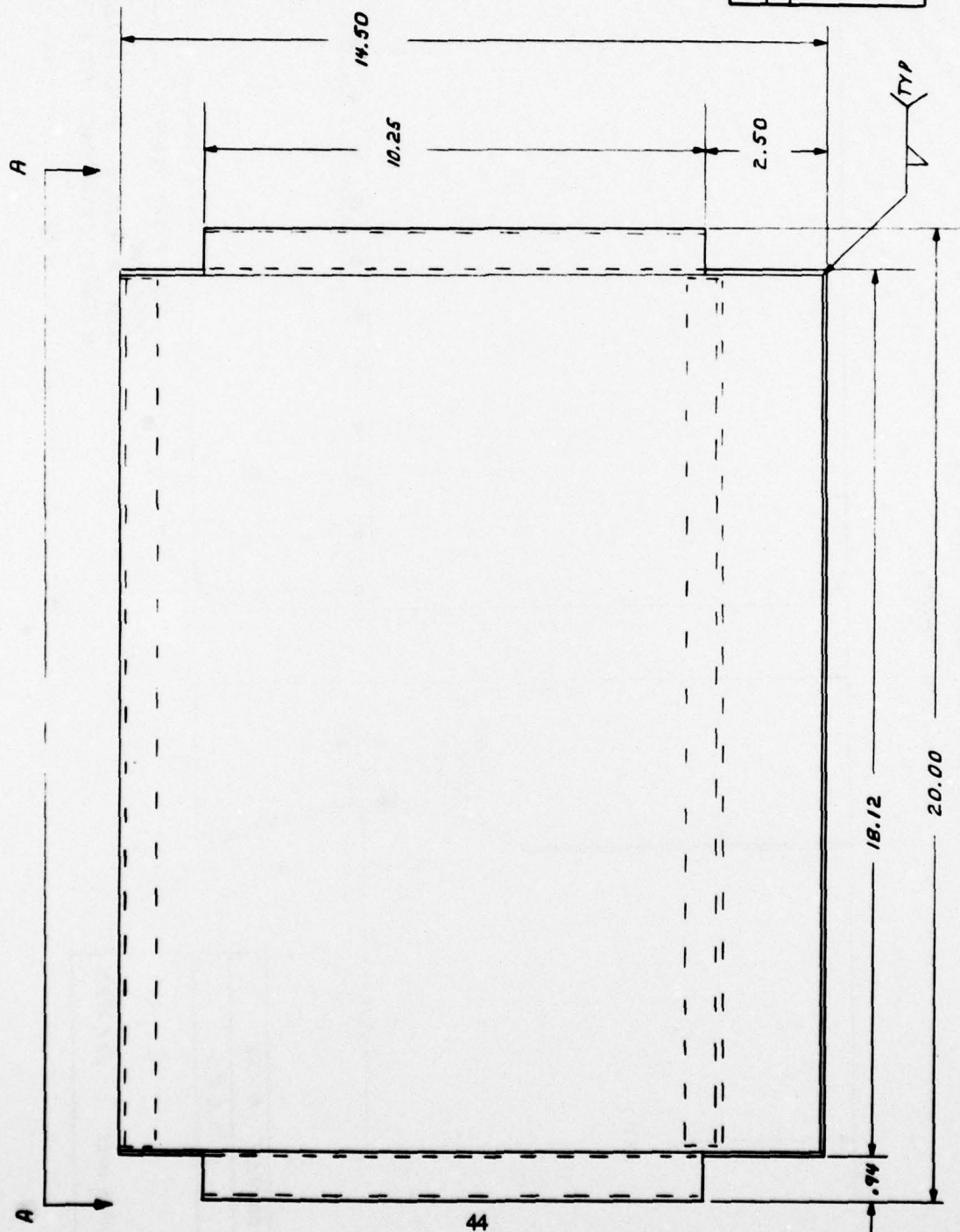
BACKREST SPREADER
A0370
JOHN WIER EXT 7372

MATERIAL AL ALLOY 6061-T6

MATERIAL: AL ALLOY 7075-T6
(.09 THICK)

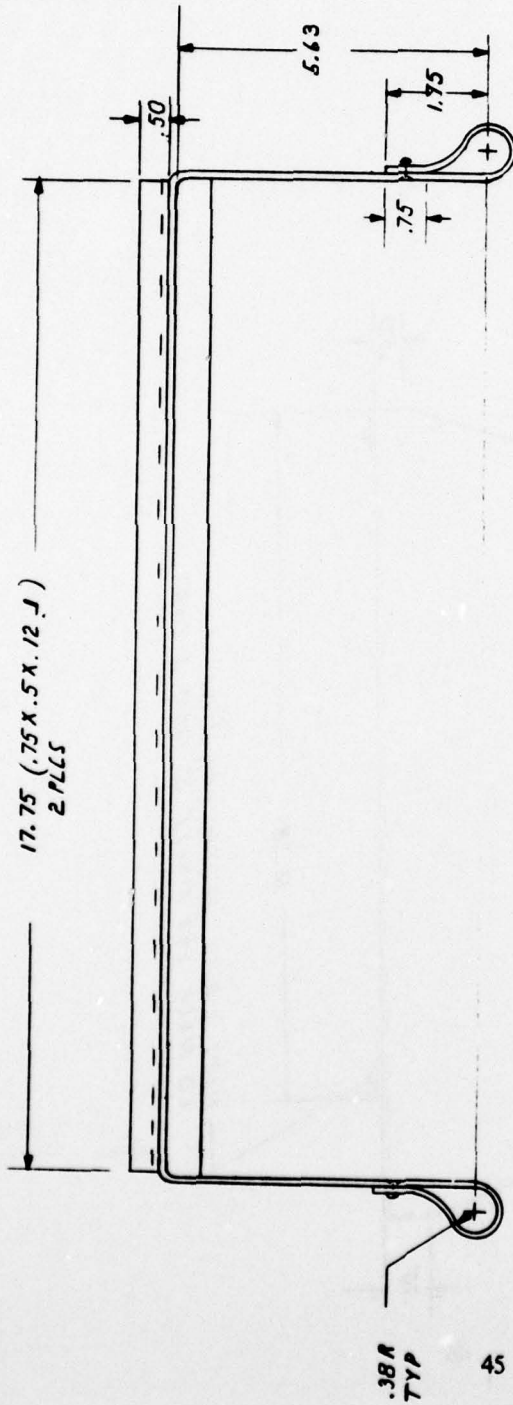


BRACKET PLATE	
A 0380	
JOHN WIER	EXT 1372

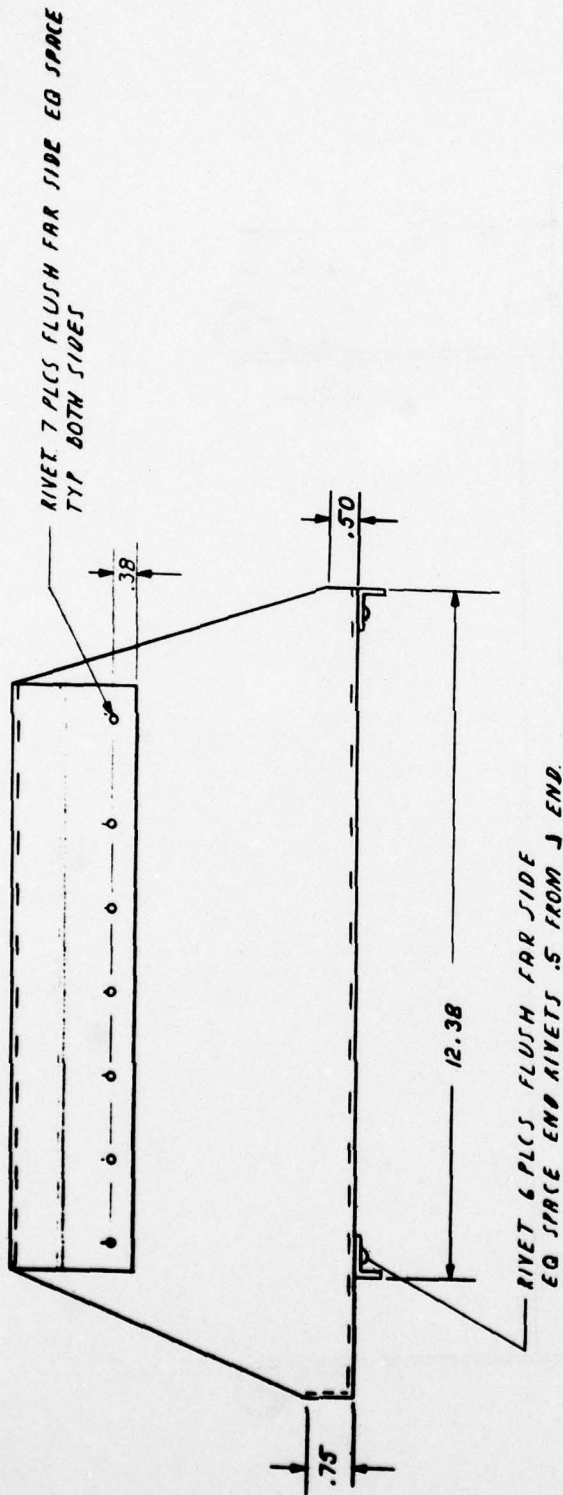


MATERIAL: AL ALLOY
5052-H34
.09 THICK
FINISH: HARD ANODIZE
CLEAR

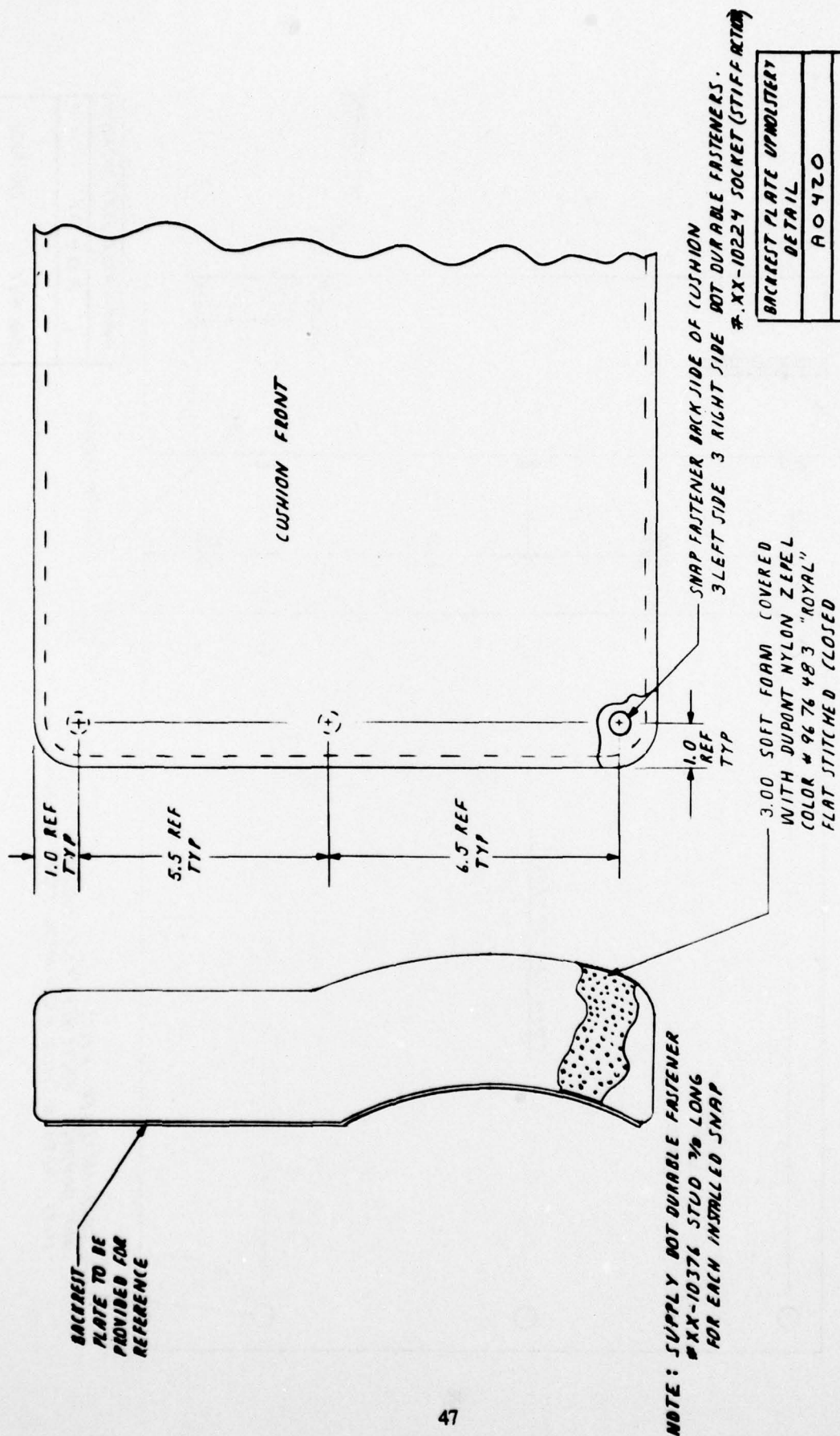
SEAT PAN	
A0390	JMT 10F3
JOHN WIER	EXT 7372



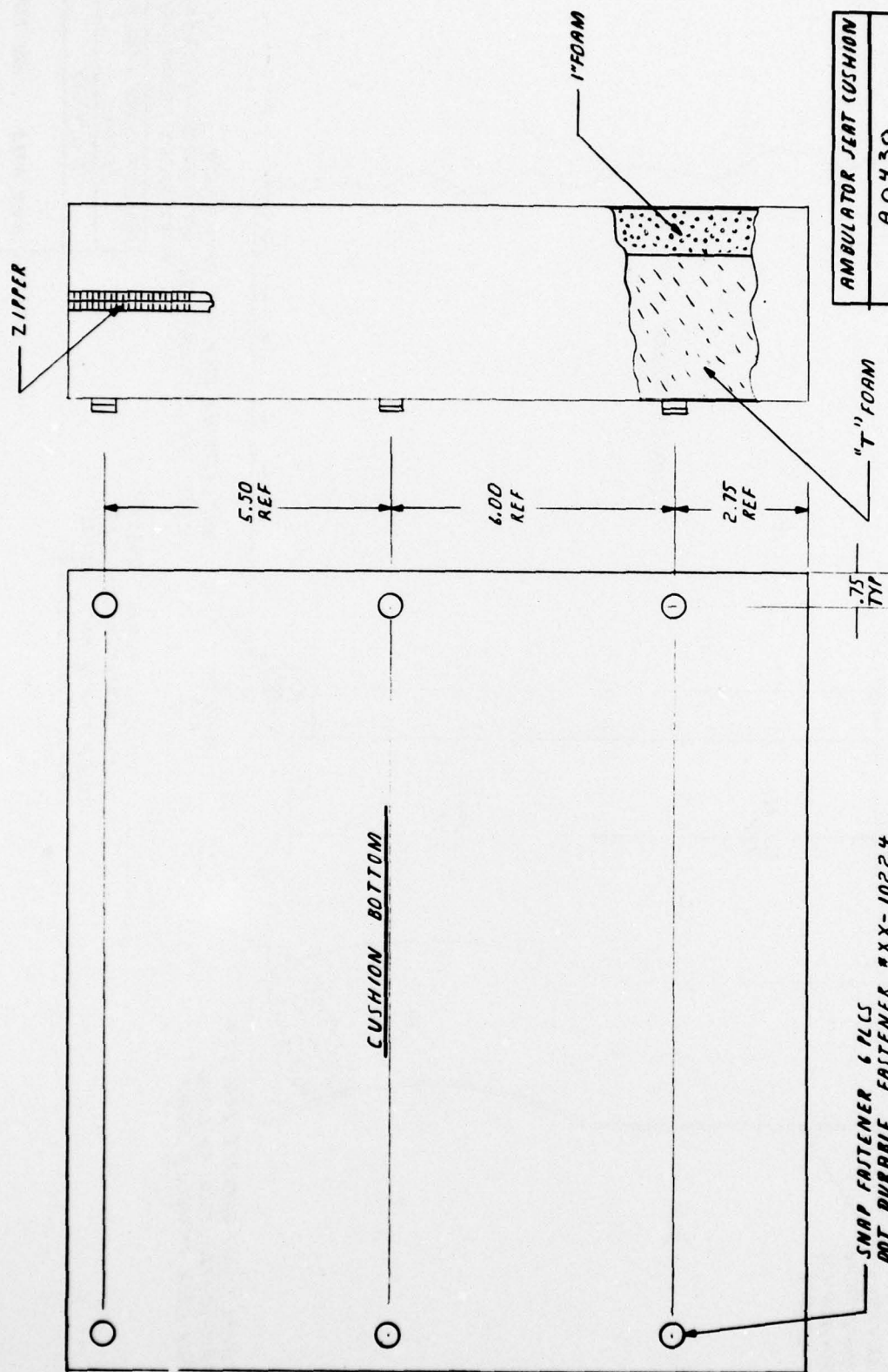
SEAT PAN	
A0400	SHT 2 OF 3
JOHN WIER	ENT 7772



SEAT PAN	
A0410	SMT 3 OF 3
JOHN WIER	EXT 7372

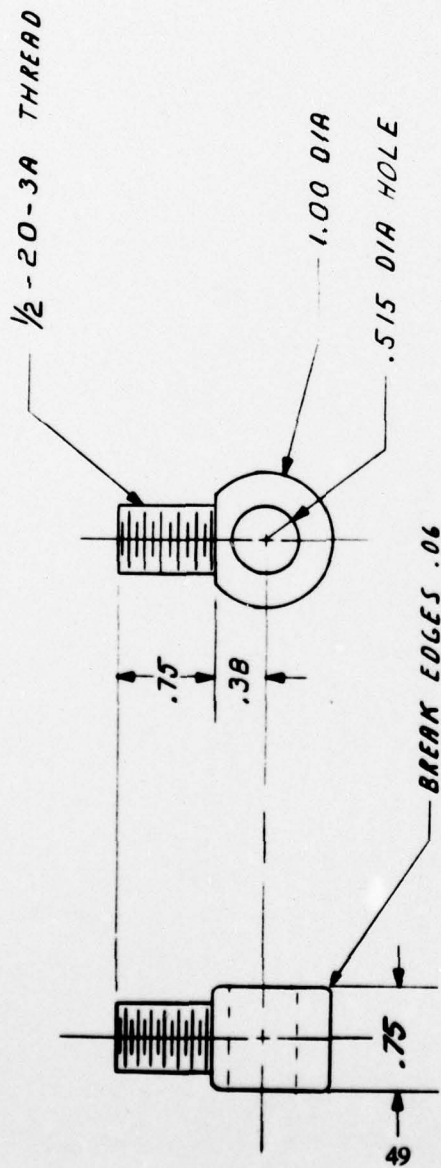


BACKREST PLATE UPOLISTERY DETAIL
AO420
JOHN WIER EXT 7372



AMBULATOR SEAT CUSHION
A 0430
JOHN WIER EXT 7372

SNAP FASTENER 6 PLCS
DOT DURABLE FASTENER #XX-10224
STIFF ACTION WITH #XX-10376 STVD 3/8 LONG



MATERIAL: 1018 COLD ROLLED STEEL

ACTUATOR CLEVIS
A0440
EXT 7372