Interface Control Document
Science Instrument Equipment to Counterweight Rack
SI_CWR_01

SOF-AR-ICD-SE03-2027

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Revision: B

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VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Science Instrument Equipment to Counterweight Rack ICD
SI_CWR_01

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Revision History

REV	DATE	DESCRIPTION	APPROVAL
A	12/16/2009	Based on a USRA document SSMOC-SCIN-ICD-1401-030523 (Initial release version), dated 5/23/2003, that was never baselined.	SPCB
B	4/18/2011	Renumbered sections, figures, and tables. Corrected pagination. Updated reference document list. Added recommended fasteners and properties table, C.G. of empty CWR, and reference to Ultimate Load Factors. Added information about items classified as SI payload, items included in CWR Installation, and SI equipment envelope. Revised allowable SI payload weight range per a classification change of Electronic Interface Channels from part of the CWR structure to SI payload. Replaced SI payload C.G. with populated CWR C.G. Corrected metric values for physical dimensions of CWR. Added SI Compliance Authority table. Document number changed from SCI-AR-ICD-SE03-2027 (SPCB controlled) to SOF-AR-ICD-SE03-2027 (PMB controlled) due to addition of SI Compliance Authority table.	PMB

Science Instrument Equipment to Counterweight Rack ICD
SI_CWR_01

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Science Instrument Equipment to Counterweight Rack ICD SI_CWR_01

1.0 SCOPE

The scope of this document describes the interface/design requirements and limitations for the Science Instrument (SI) electronics equipment that will be installed within the SI counterweight rack (CWR). The interface/design requirements and limitations include the following:

- Physical dimensions of the payload envelope.
- Payload weight and center of gravity limits.
- Maximum payload-to-rack interface loads.
- Payload attachment hardware requirements.
- Payload airworthiness (containment) requirement.
- Recommendations for mission assurance.

NOTE: Payload, as used in this document, refers to SI electronics and supplemental ballast weights, if required. See Section 3.1, Interface/Design Requirements.

1.1 Purpose

The purpose of this Interface Control Document (ICD) is to describe the interface requirements and design limitations for the Science Instrument (SI) equipment installation within the Counterweight Rack (CWR). The interface requirements include the physical dimensions of the CWR and the mounting arrangement of the SI equipment.

2.0 APPLICABLE DOCUMENTS

The data referenced in this ICD represents the latest version at the time of issuance of this ICD, unless otherwise stated, and forms a part of these requirements to the extent specified herein.

2.1 Order of Precedence

In the event of a conflict between the text of this ICD and the referenced cited herein, the text of this ICD takes precedence. Nothing in this ICD, however supersedes contractual requirements unless a specific exemption has been obtained. As appropriate, reference is made to other project documentation for use as guidance in developing the content of this ICD and as such forms a basis for requirements to the extent specified herein.

2.2 Required Documents

APP-DF-ICD-SE03-2006	ICD GLOBAL_ELECTRICAL, Ground Drawing Scheme for SI to TA
SCI-AR-DWG-SE02-2063	Counterweight Rack Assembly
SCI-AR-DWG-SE02-2064	Tube Front Horizontal

SCI-AR-DWG-SE02-2073	Interface Support Channel
SCI-AR-DWG-SE02-2074	Electronic Interface Channel
SOF-AR-SPE-SE01-2028	SOFIA Science Instrument System Specification
SOF-DA-ICD-SE03-036	ICD TA_SI_01, Cable Load Alleviator Device / Science Instrument Cable Interface
SOF-DA-ICD-SE03-051	ICD TA_SI_05, SI Equipment Rack / TA Counterweight Interface
SSMOC-SCIN-DWG-3200.00	Counterweight Rack Ballast Weights Assembly
SSMOC-SCIN-DWG-3200.01	Rack Ballast Weight

2.3 Other Related Documents

ANSI/EIA RS-310-C-77	Cabinets, Racks, Panels, and Associated Equipment
SE09-132	Counterweight Rack Stress Analysis
SOF-AR-ICD-SE03-2029	ICD MCCS_SI_05, Principal Investigator Patch Panel to Principal Investigator Equipment Rack(s) Interface

3.0 INTERFACE/DESIGN REQUIREMENTS

3.1 Physical

(a) Weight requirements are as follows:

- The total weight of a Counterweight Rack installation must be between 220 lbs (100 kg) and 330 lbs (150 kg) inclusive (as specified in SOF-DA-ICD-SE03-051, Section 3.1 f). The weight of the installation includes the empty CWR, SI payload, and associated CWR-to-CWP mounting hardware (e.g., struts, brackets, spacers, fasteners, etc.).
- The weight of an empty CWR is 83 lbs. The weight of the associated CWR-to-CWP mounting hardware is 14 lbs.
- Therefore, the total weight of the SI payload in the CWR shall be between 123 lbs (55.8 kg) and 233 lbs (105.7 kg) inclusive. SI payload in the CWR includes: SI equipment, SI mounting hardware, fasteners, cables that interface between payload equipment within the CWR, and any Electronic Interface Channels or ballast weights used.

(1.) If the total weight of SI equipment, SI mounting hardware and fasteners, SI cables that interface between payload equipment within the CWR, and any Electronic Interface Channels used is less than 123 lbs (55.8 kg), supplemental ballast weights shall be added to compensate at the very least to the 123 lb (55.8 kg) minimum. SSMOC-SCIN-DWG-3200.01, Section 7.0, Figure 5 (attached to this ICD) shows a single ballast weight and its dimensions. Each ballast weight weighs 10 lbs (4.6 kg). Ballast weights will be shipped to the PI by NASA upon request.

(2.) Eight Electronic Interface Channels are available for use by the PI for securing SI equipment to the cross-members of the CWR structure. This implementation method may be used to reduce loading on the electronic attachment flange of the CWR. Each electronic interface channel weighs 1 lb (453 g). Use and specific placement of Electronic Interface Channels is determined by the PI and/or NASA based on the configuration of SI equipment in the CWR.

(3.) If no SI electronics equipment is installed, then supplemental ballast weights in total between 123 lbs (55.8 kg) and 233 lbs (105.7 kg) will be installed into an empty CWR by NASA. SSMOC-SCIN-DWG-3200.00, Section 7.0, Figure 4 (attached to this ICD) shows a CWR configuration with ballast weights installed.

(b) The center of gravity of the populated rack (excluding CWR-to-CWP mounting hardware) shall be within the following envelope:

- In the u-direction, at a location 16.14 inch (410 mm) or less from the fwd surface of the CWP.
- In the v-direction, at a location +/- 2.5 inch (63.5 mm) centered about the CWR central plane.
- In the w-direction, at a location +/- 1 inch (25.4 mm) from 11.01” (279.9 mm) below the top of the CWR (top of the extrusion excluding the flange).

The C.G. envelope is referenced from a point located on the surface of the CWP and at the geometric center of the CWR structure in the v-w plane. The C.G. envelope is shown in Figure 3.1-1. The C.G. of the empty CWR in respect to this reference point is: u= 11.95 inches (303.53 mm), v= -0.12 inches (3.05 mm), w= -0.04 inches (1.02 mm).

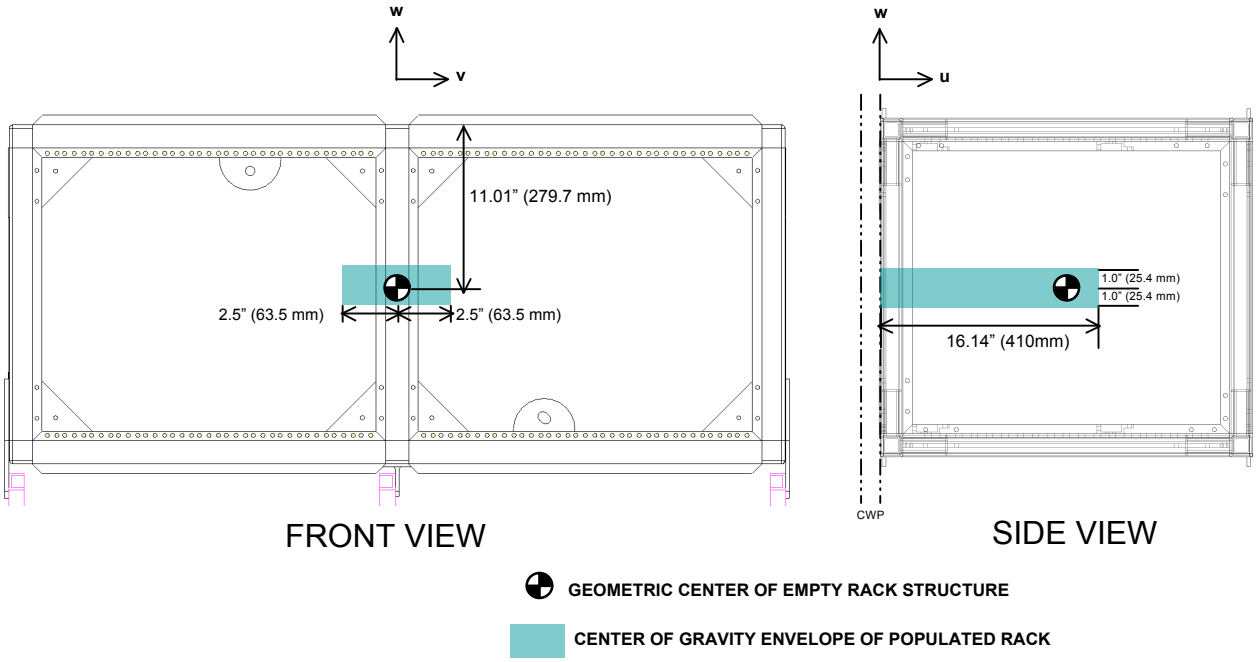

Figure 3.1-1, Center of Gravity Limits for Populated Rack

(c) The Counterweight Rack structure is designed as an open truss. An analysis shall be provided showing that each piece of SI equipment remains attached to the CWR under the emergency landing load conditions specified in the "Equipment mounted to Telescope Assembly" column of SOF-AR-SPE-SE01-2028, Table 3.5-1. This includes the SI-assembly attachment locations as well as the fastener hardware used. Analyses should show positive Margins of Safety (MS), based on the Ultimate Load Factors specified in SOF-AR-SPE-SE01-2028, Table 3.5-1. As the emergency landing load conditions are prescribed in terms of ultimate loads, it is not necessary to apply a Safety Factor for these analyses.

(d) The following Interface mounting component drawings are included as supplemental data in Section 7.0:

NOTES: (1) Interface mounting components are fabricated from 6061-T6 Alum extruded sections.

(2) For Drawings SCI-AR-DWG-SE02-2064 and -2073, the -2 Assembly refers to rebuilt modified rack units. The -3 Assembly refers to newly fabricated units.

- Tube, Front Horizontal (LE-3A extruded tube). Drawing # SCI-AR-DWG-SE02-2064, in Section 7.0, Figure 1.
- Channel, Interface Support (ALS extruded hat). Drawing # SCI-AR-DWG-SE0-2073, in Section 7.0, Figure 2.
- Channel, Electronic Interface (ALM extruded channel). Drawing # SCI-AR-DWG SE02-2074, in Section 7.0, Figure 3.

(e) All mounting points for electronics equipment include the following provisions:

- Electronic Interface Channel, adjustable to accommodate variable equipment depth. Use and specific placement of Electronic Interface Channels is determined by the PI and/or NASA based on the configuration of SI equipment in the CWR.
- Ø0.281" (7.1 mm) attachment holes.
- All SI payload attachment to the CWR shall use aircraft-certified fastener hardware. A list of recommended fastener hardware is provided in Table 3.1-1.

Table 3.1-1, CWR Fastener Recommendations

Hardware	**Part Number[1,2]**	**Type[3]**	**SI Teams using the hardware**
BOLT	NAS 603 or 4	Screw, Machine, Panhead, Full-threaded	
	NAS 623-3 or -4	Screw, Machine, Pan head, grip	
	NAS 1123 or 4	Screw, Machine, Flat filister head, grip	
	NAS 1143 or 4	Screw, Machine, Pan head, grip	
	NAS1153 or 4	Screw, Machine, Flat 100 deg, Flush head screw, Grip	
	NAS 1163 or 4	Screw, Self-locking, Flat 100 deg head, Grip	
	NAS 1351-3 or -4	Screw, Cap, Socket head, grip	
	NAS 1578*3 or 4	Bolt, Flat Pan head, Grip	
	NAS 1801-3 or -4	Screw, Hex head, Cruciform recess	
	NAS 6203 or 4	Bolt, Hex head	
	NAS 6303 or 4	Bolt, Hex head	FORCAST
	NAS 6603 or 4	Bolt, Hex head	
NUT	NASM 21042-3 or -4	Nut, 450°F, Reduced hex, Reduced height, Ring base, NON-CRES	
	NASM 21043-3 or -4	Nut, 450°F, Reduced hex, Reduced height, Ring base, CRES	FORCAST
	SL 210-3-4 or -4-4	Nut, Clip	FORCAST
	NAS 1033*3 or 4	Nut, Self-locking, Right angle	
	NASM 21051-3 or -4	Nut, Self-locking, One lug	
	NAS 679*3 or 4	Nut, Hexagon, Low height	
WASHERS	NAS 1149	Washer, Flat	
	NASM 970	Washer, Flat	FORCAST
	MS 14226	Washer	FORCAST
	NAS 620	Washer, Flat reduced diameter	

Hardware	Part Number[1,2]	Type[3]	SI Teams using the hardware
	MS 35338	Washer, Lock spring, Helical	

NOTES:

[1] The preferred fastener material has 160 ksi ultimate tensile strength, 95 ksi shear strength, and is corrosion resistant.

[2] #10-32 or ¼”-28 fasteners should be used for the attachment of SI equipment to the CWR.

[3] It is recommended that fasteners with sufficiently long grip length be used for attachment of SI equipment to the CWR to avoid fastener threads bearing in holes.

* This symbol represents a code letter for fastener material type.

(f) The Counterweight Rack has two sections that may be populated with SI equipment. Each section has an associated SI electronics equipment envelope, which is the available volume that SI equipment can occupy in each section of the CWR. Figure 3.1-2 and Figure 3.1-3 show the position of the CWR at a TA elevation of 90 degrees. Note that the envelope dimensions presented are slightly larger than the industry standards for electronic equipment per ANSI/EIA RS-310-C-77 to allow for slight clearances. SI equipment inside each section of the CWR shall not exceed the following SI electronics equipment envelope:

- 22” (558.8 mm) SI equipment depth (forward/aft, u-direction)
- 21.65” (549.9 mm) SI equipment height (left/right, v-direction)
- 17.75” (450.9 mm) SI equipment width (up/down, w-direction)

The envelope only applies to the portion of SI equipment that resides within the CWR (i.e., aft of the CWR electronics attachment flange and does not include equipment faceplates). The depth of installed SI equipment from the CWR electronics attachment flange must be no greater than 22” to ensure that no part of SI equipment will interfere with installation of the CWR. SI cables inside the CWR that exceed the SI electronics equipment envelope may be used as long as the cables do not interfere with installation of the CWR.

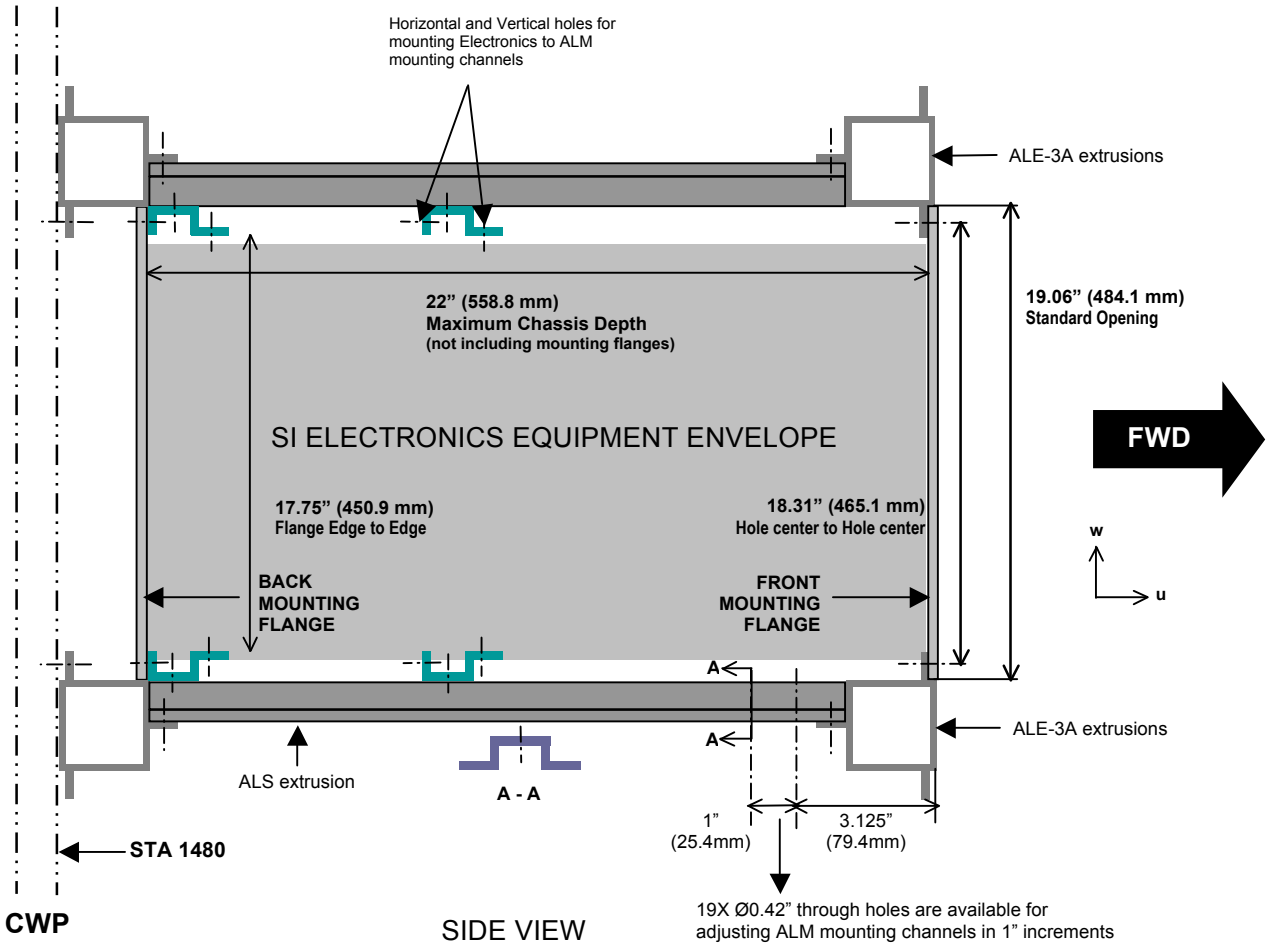

Figure 3.1-2, Side View of SI Electronics Equipment Envelope

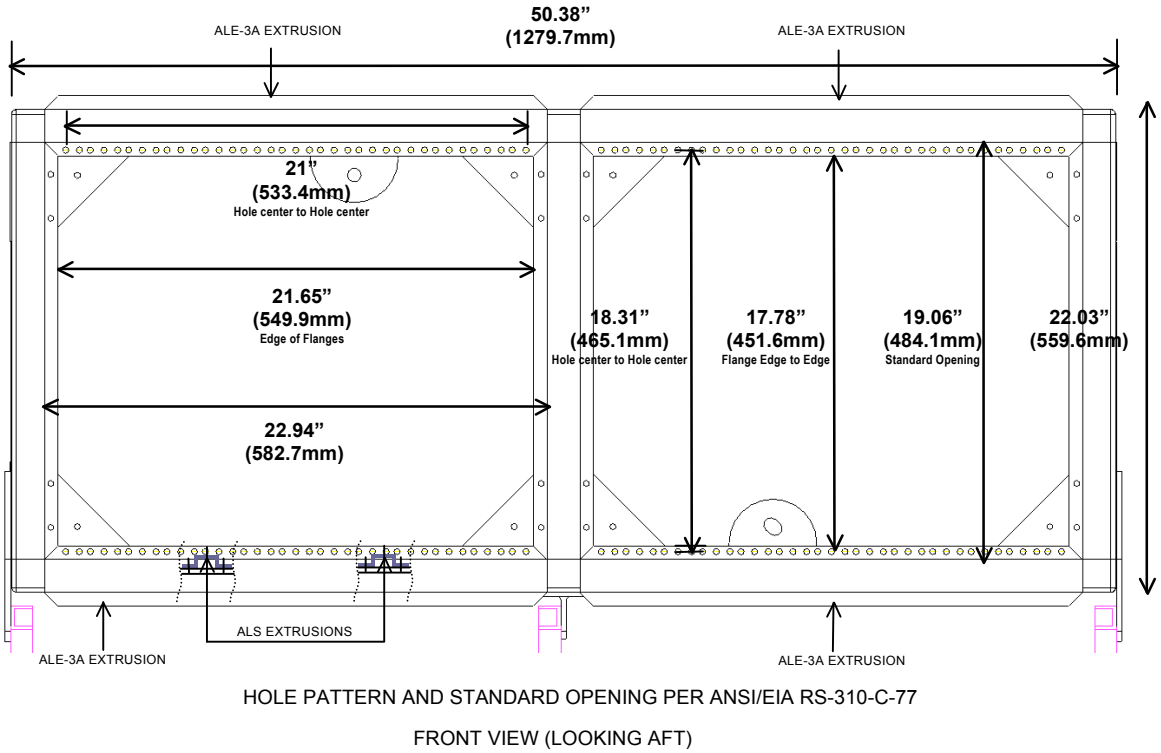

Figure 3.1-3, Front View of SI CWR with Interface Dimensions

3.2 Maximum Loads

(a) (deleted)

(b) Single attachment points of SI equipment on the CWR electronics attachment flange shall not exceed the following maximum loads:

- Shear Tearout and Bearing Failure on a CWR electronics attachment flange hole = 825 lbf (3670 N)
- Fwd/Aft Load on CWR electronics attachment flange = 500 lbf (2224 N)
- Moment on CWR electronics attachment flange = 180 in·lbf (20337.3 N·mm)

3.3 Electrical

(a) (deleted)

(b) A ground termination hole (0.191” dia.) is available on the LH outboard closure frame, lower aft corner gusset. See Figure 3.2-1.

(c) Refer to SOF-AR-SPE-SE01-2028, paragraphs 3.5.4.2 and 3.5.4.3, for grounding requirements between SI equipment chassis and the conductive CWR structure.

(d) (deleted)

(e) (deleted)

(f) (deleted)

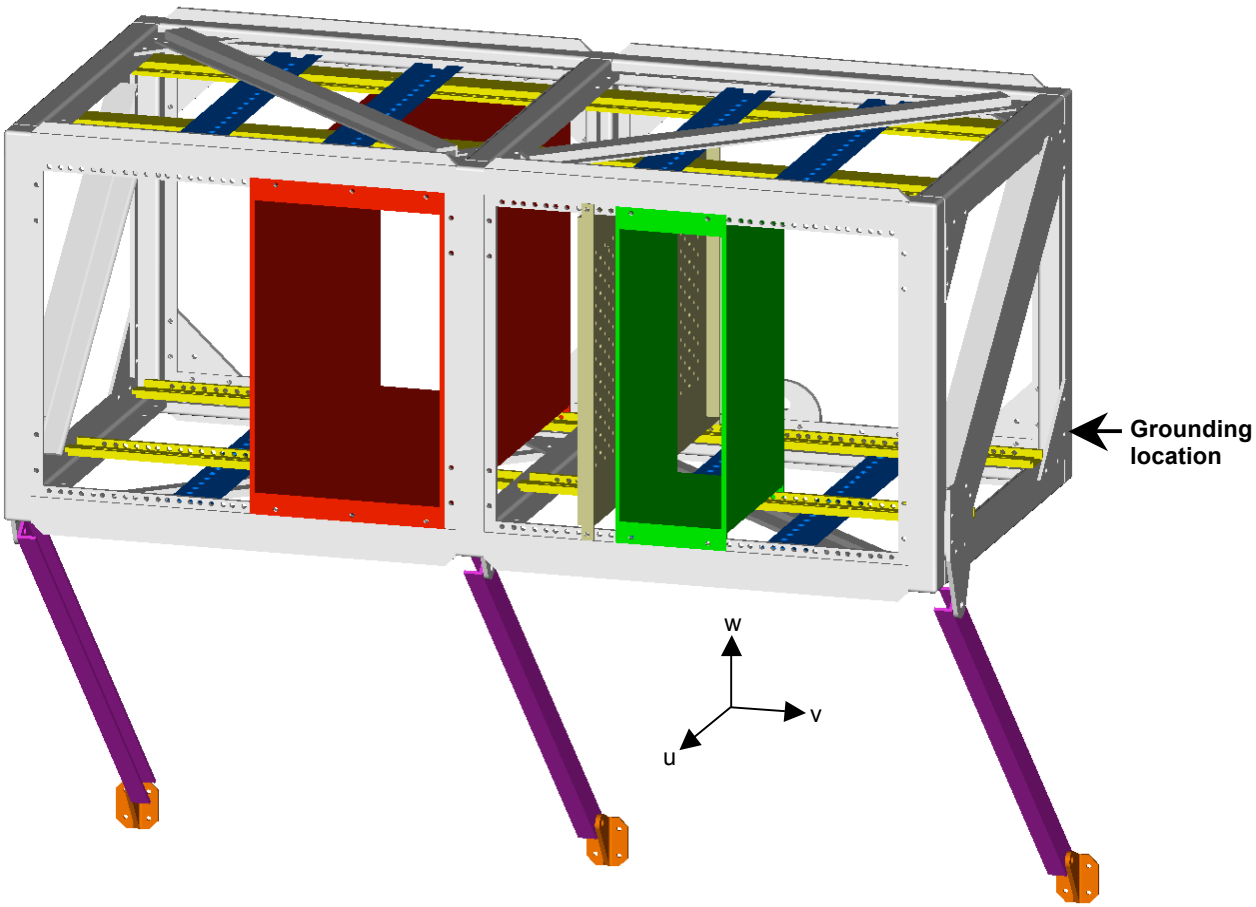

Figure 3.2-1, Isometric View of SI CWR Displaying Grounding Location and an Example of Equipment Mounting Scheme

3.4 Verification of Requirements

(deleted)

3.5 Structural Modifications

All modification of the CWR structure will require NASA approval. A proposed modification will be submitted to NASA that provides drawings and an analysis that shows the proposed modification does not affect airworthiness of the CWR.

4.0 RECOMMENDATIONS FOR MISSION ASSURANCE

(a) Use a minimum of four fasteners for attachment of individual SI equipment to the CWR for equipment with front panel height of 1U (1U = 1.75" = 44.5 mm) up to 5U. Use eight or more fasteners for equipment with front panel height of 6U or greater.

(b) Electronic modules installed within the CWR should possess a lowest natural frequency greater than 100 Hz so as not to significantly degrade the telescope structural dynamics and the resulting pointing stability performance.

5.0 ACRONYMS

C.G.	Center of Gravity
CWP	Counterweight Plate
CWR	Counterweight Rack
ICD	Interface Control Document
LH	Left-hand
NASA	National Aeronautics and Space Administration
PI	Principal Investigator
RH	Right-hand
SI	Science Instrument
SIAT	Science Instrument Airworthiness Team
SOFIA	Stratospheric Observatory For Infrared Astronomy
SSP SE&I	SOFIA Science Project Systems Engineering & Integration
TA	Telescope Assembly
U	Unit (Panel Height)
USRA	Universities Space Research Association
WI	Work Instruction

6.0 APPENDIX A

Table 6.1 lists the responsible NASA compliance authority for each verifiable SI requirement in this ICD. The Science Instrument Airworthiness Team (SIAT) is responsible for assessing SI compliance to all the airworthiness-related SI requirements contained in this ICD. SOFIA Science Project Systems Engineering and Integration (SSP SE&I) is responsible for assessing SI compliance to all other SI requirements in the ICD.

Table 6.1, Science Instrument Compliance Authority

Paragraph ID	Requirement	SI Compliance Authority
3.1 a	The total weight of the SI payload in the CWR shall be between 123 lbs (55.8 kg) and 233 lbs (105.7 kg) inclusive.	SIAT

Paragraph ID	Requirement	SI Compliance Authority
3.1 a	If the total weight of SI equipment, SI mounting hardware and fasteners, SI cables that interface between payload equipment within the CWR, and any Electronic Interface Channels used is less than 123 lbs (55.8 kg), supplemental ballast weights shall be added to compensate at the very least to the 123 lb (55.8 kg) minimum.	SIAT
3.1 b	The center of gravity of the populated rack (excluding CWR-to-CWP mounting hardware) shall be within the following envelope: • In the u-direction, at a location 16.14 inch (410 mm) or less from the fwd surface of the CWP. • In the v-direction, at a location +/- 2.5 inch (63.5 mm) centered about the CWR central plane. • In the w-direction, at a location +/- 1 inch (25.4 mm) from 11.01" (279.9 mm) below the top of the CWR (top of the extrusion excluding the flange).	SIAT
3.1 c	An analysis shall be provided showing that each piece of SI equipment remains attached to the CWR under the emergency landing load conditions specified in the "Equipment mounted to Telescope Assembly" column of SOF-AR-SPE-SE01-2028, Table 3.5-1.	SIAT
3.1 e	All SI payload attachment to the CWR shall use aircraft-certified fastener hardware.	SIAT
3.1 f	SI equipment inside each section of the CWR shall not exceed the following SI electronics equipment envelope: • 22" (558.8 mm) SI equipment depth (forward/aft, u-direction) • 21.65" (549.9 mm) SI equipment height (left/right, v-direction) • 17.75" (450.9 mm) SI equipment width (up/down, w-direction)	SSP SE&I
3.2 b	Single attachment points of SI equipment on the CWR electronics attachment flange shall not exceed the following maximum loads: • Shear Tearout and Bearing Failure on a CWR electronics attachment flange hole = 825 lbf (3670 N) • Fwd/Aft Load on CWR electronics attachment flange = 500 lbf (2224 N) • Moment on CWR electronics attachment flange = 180 in·lbf (20337.3 N·mm)	SIAT

7.0 APPENDIX B

Figure 1: SCI-AR-DWG-SE02-2064 (2 sheets), Tube Front Horizontal
Figure 2: SCI-AR-DWG-SE02-2073 (2 sheets), Interface Support Channel
Figure 3: SCI-AR-DWG-SE02-2074, Electronic Interface Channel
Figure 4: SSMOC-SCIN-DWG-3200.00, Counterweight Rack Ballast Weights Assembly
Figure 5: SSMOC-SCIN-DWG-3200.01, Rack Ballast Weight
Figure 6: NAS 623 (2 sheets), Screw, Aircraft, Pan Head, Phillips Recess, 160 ksi Alloy Steel

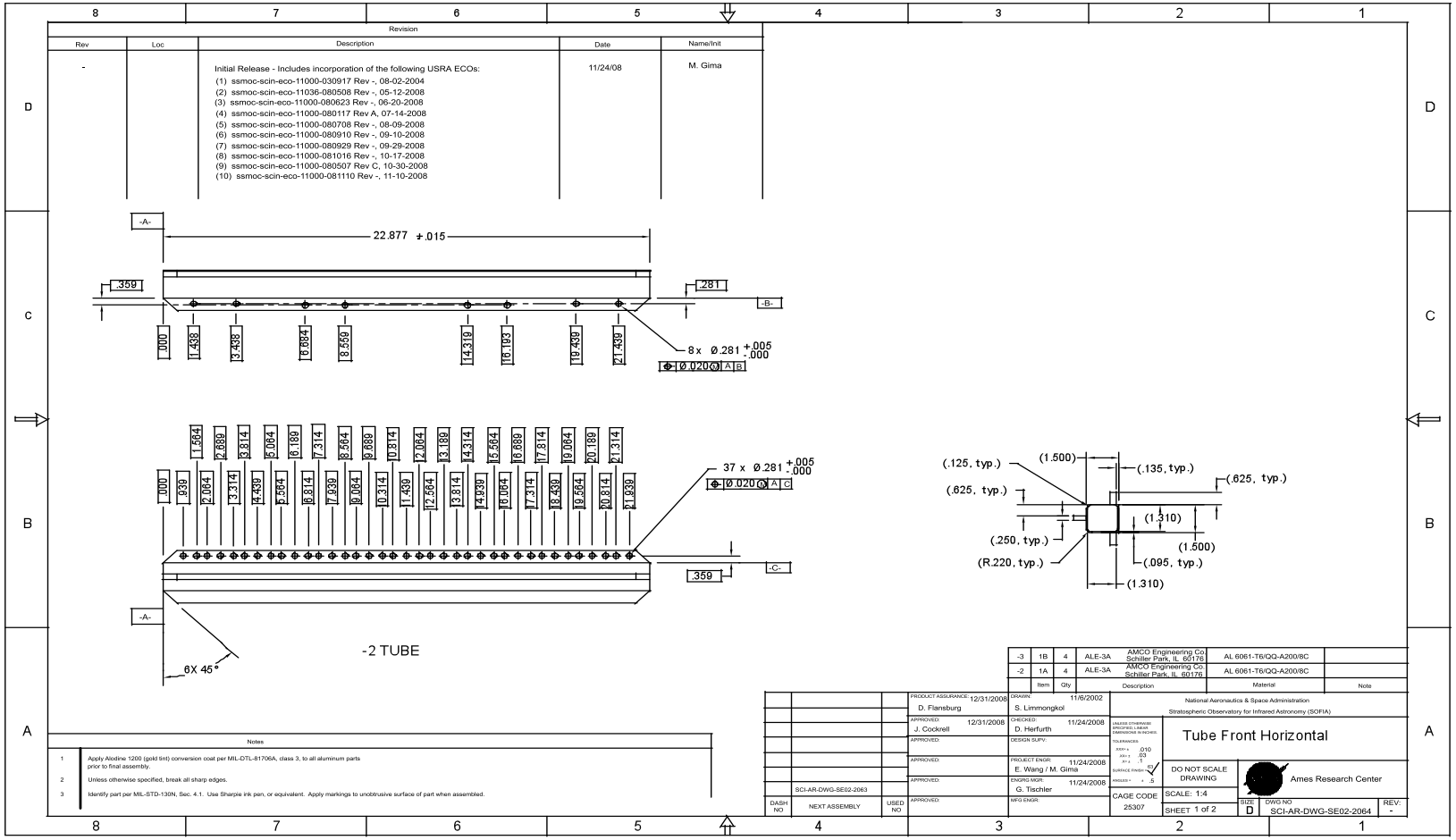

Figure 1 (Sheet 1 of 2)

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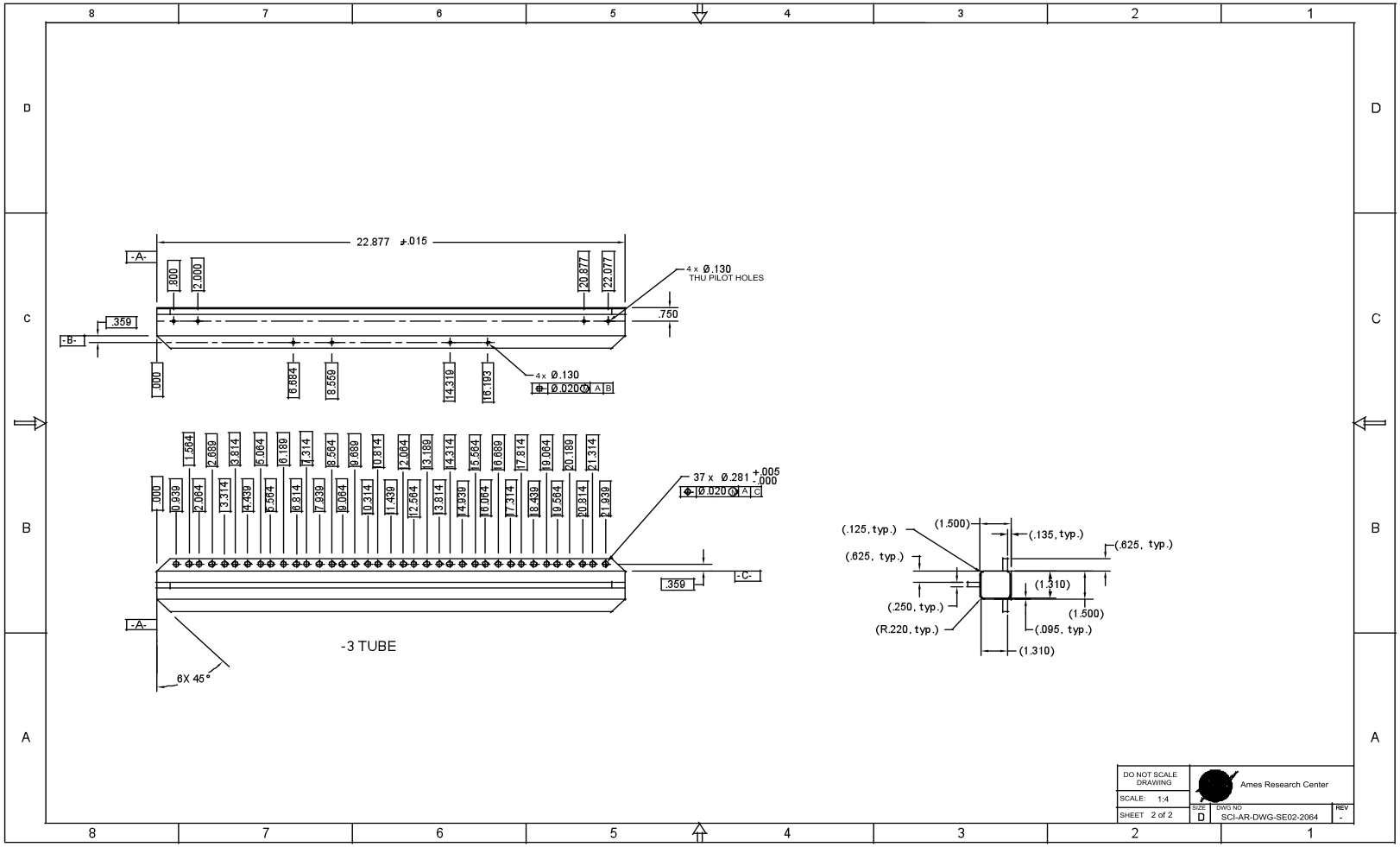

Figure 1 (Sheet 2 of 2)

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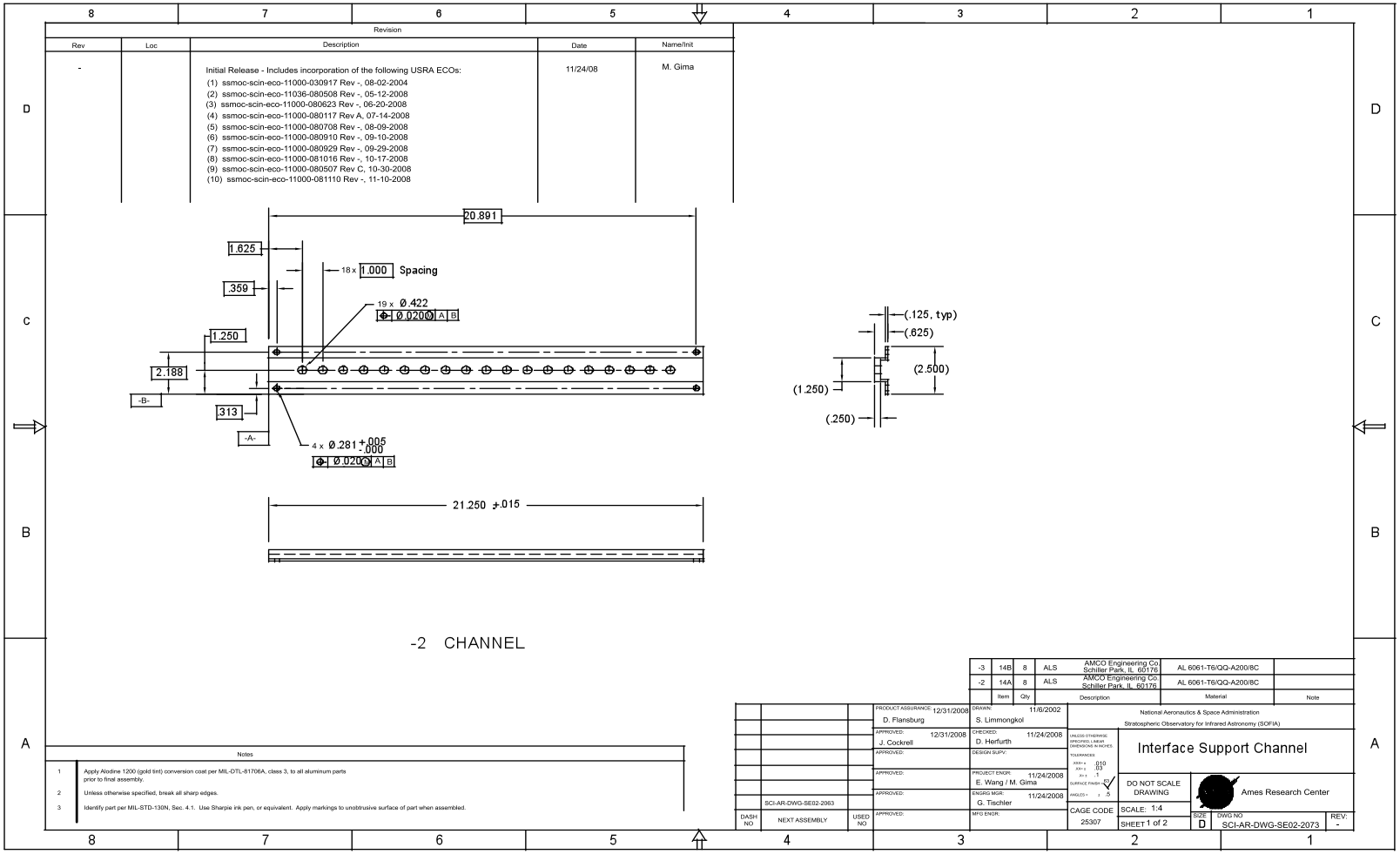

Figure 2 (Sheet 1 of 2)

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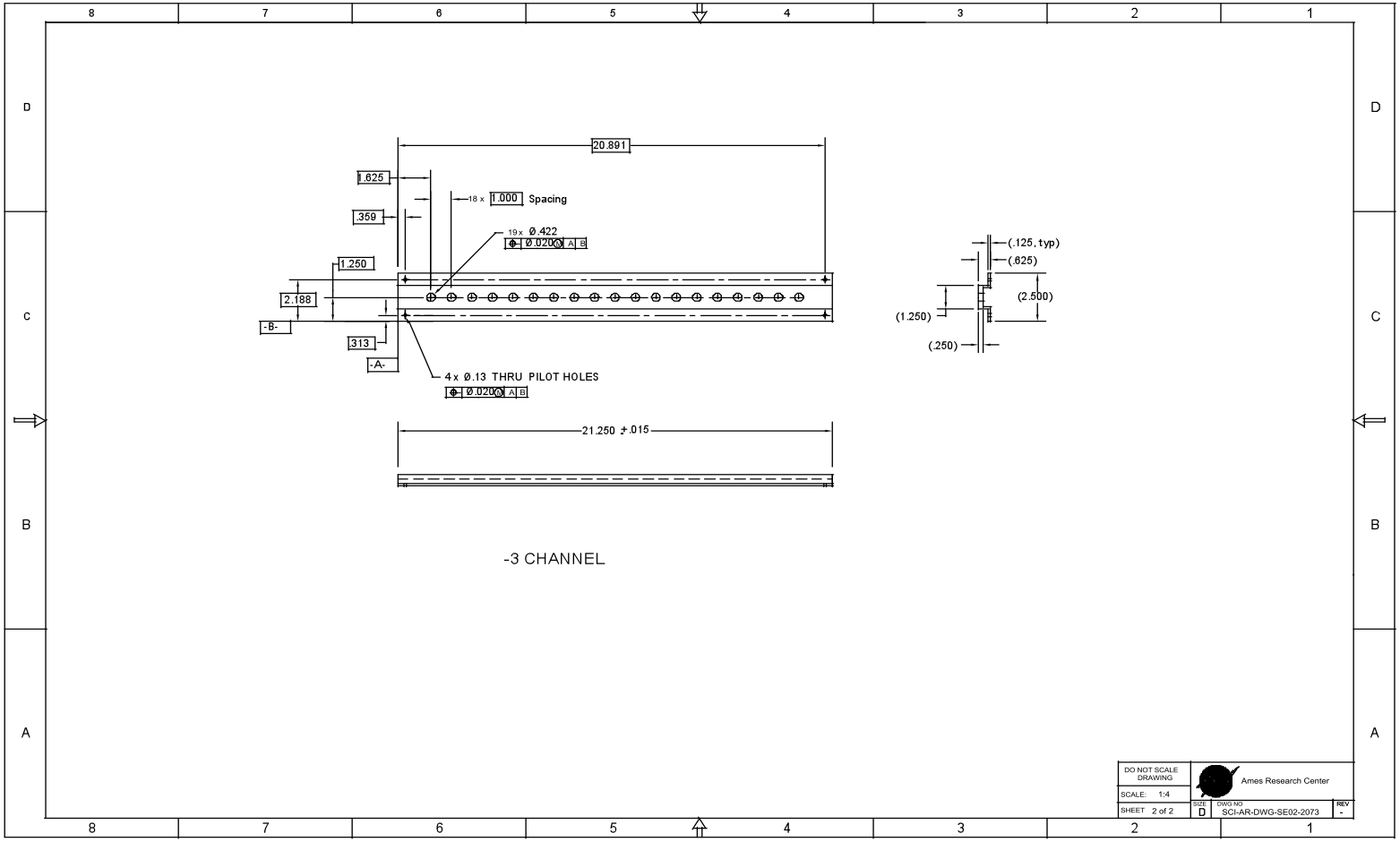

Figure 2 (Sheet 2 of 2)

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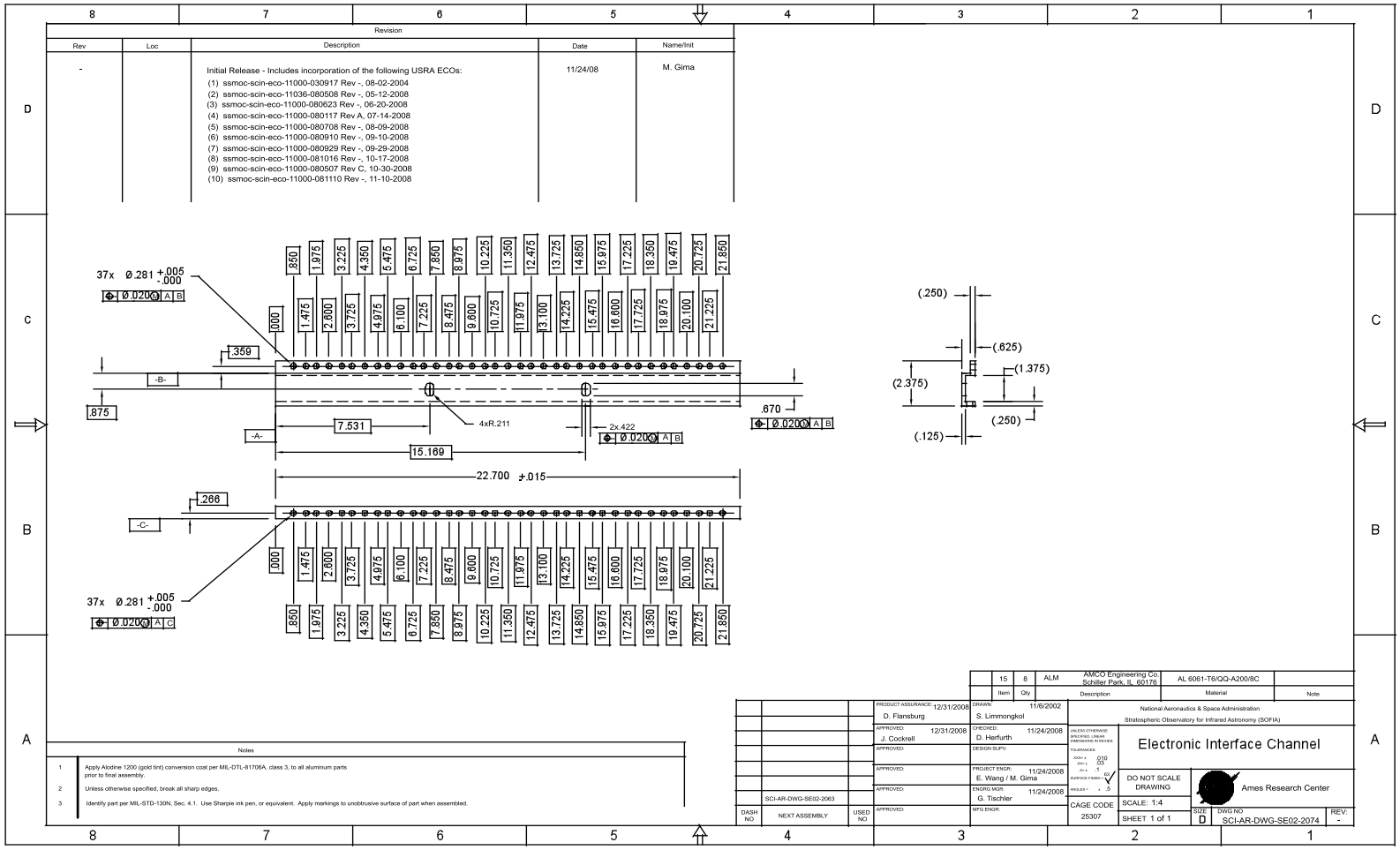

Figure 3

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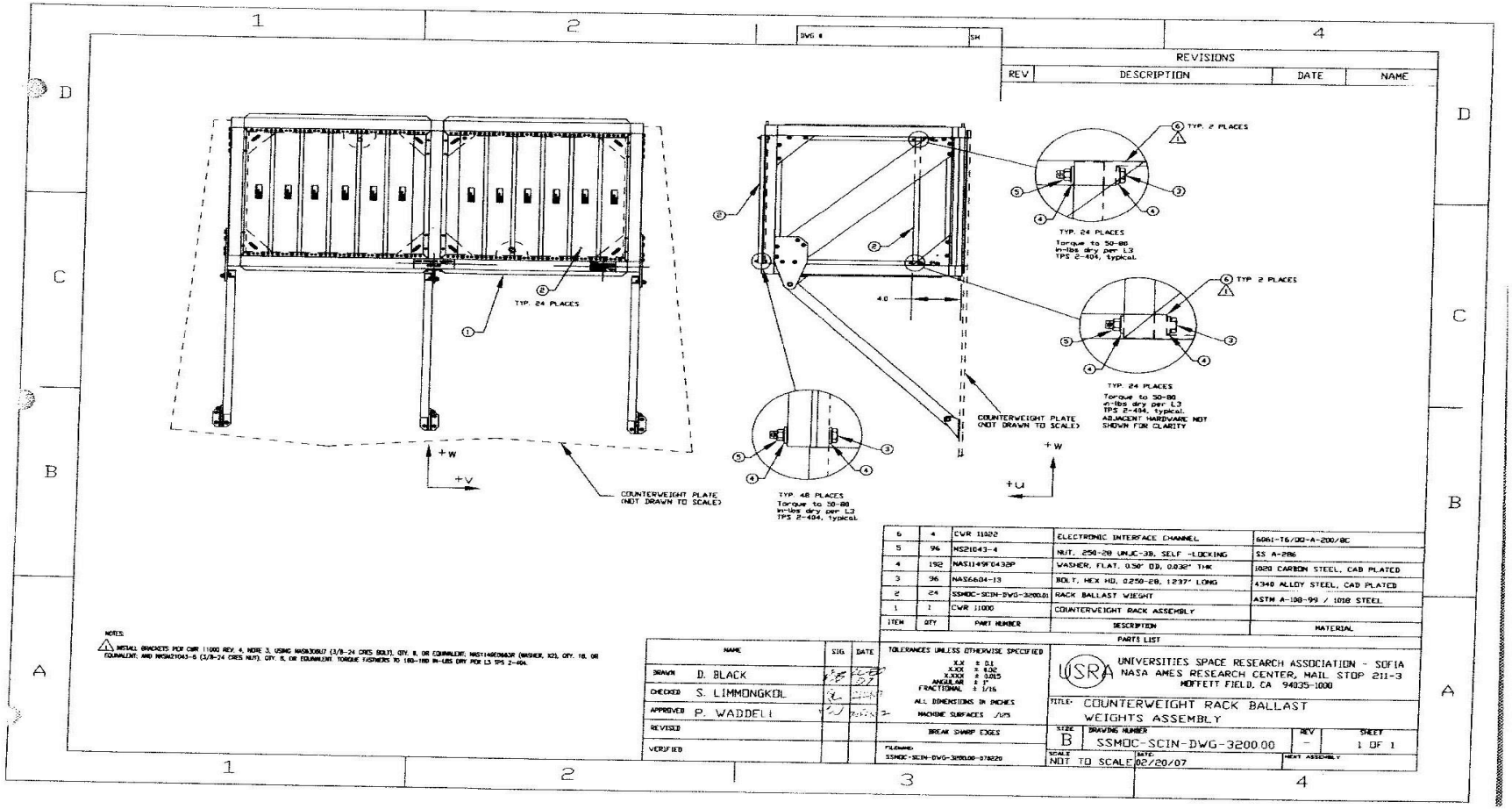

Figure 4

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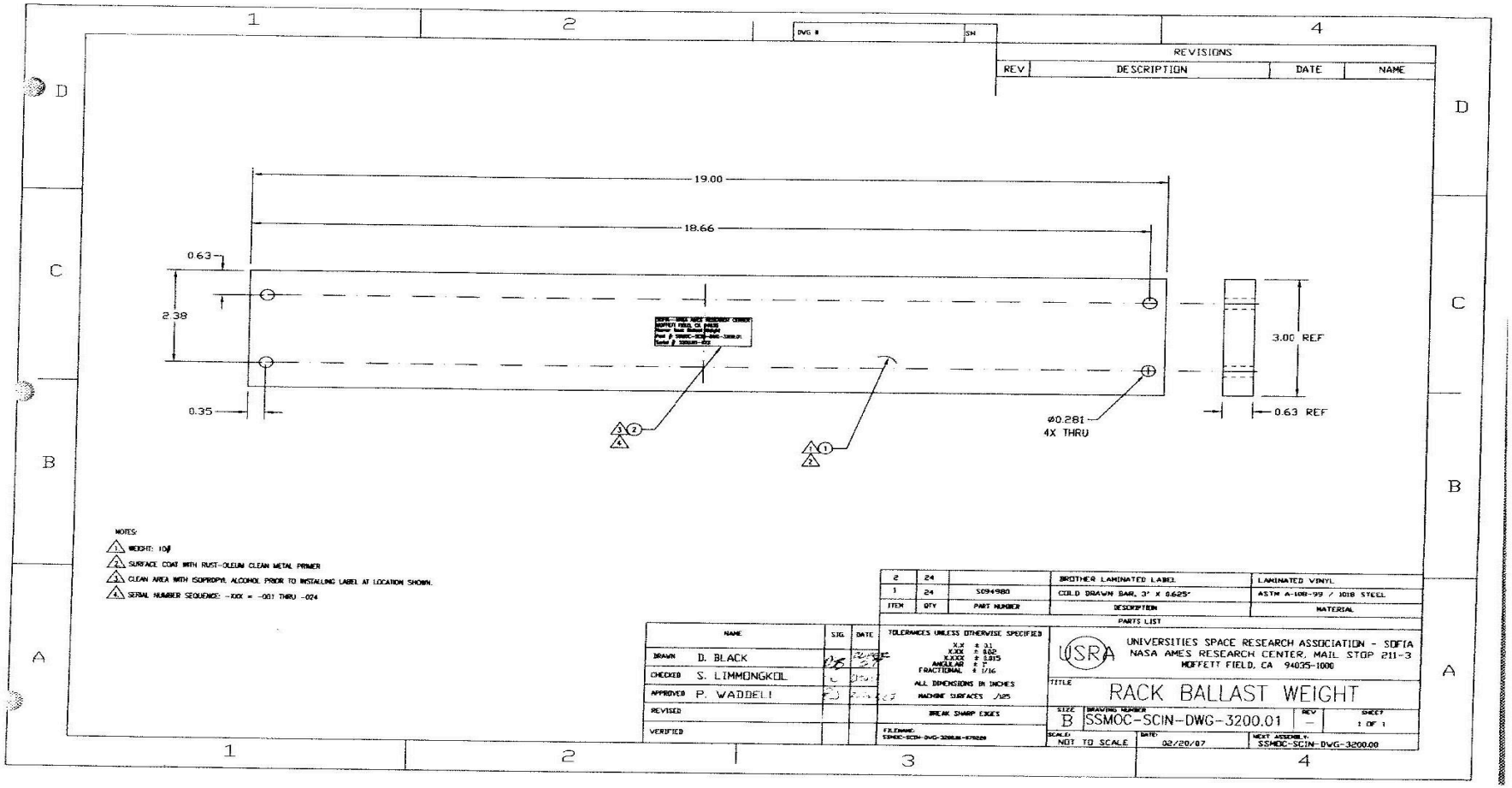

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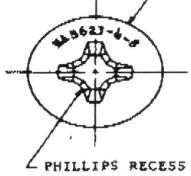
NATIONAL AEROSPACE STANDARD

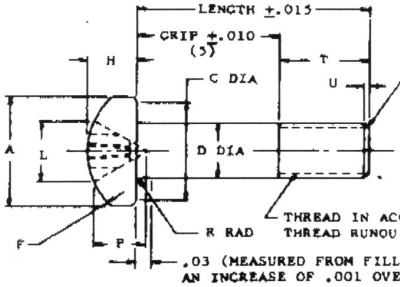
AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC., 1725 DE SALES STREET, N. W., WASHINGTON, D. C. 20036

FED SUP CLASS
5305

HEAD MARKING: BASIC PART NUMBER, APPLICABLE DASH NUMBERS AND MANUFACTURER'S TRADE MARK RAISED OR DEPRESSED .010 INCH MAXIMUM. LOCATION OPTIONAL. ON .1640 DIA SCREWS "NAS" MAY BE OMITTED ON HEAD.



PHILLIPS RECESS PER MS9006



END SHALL BE FLAT AND CHAMFERED. CHAMFER PLUS INCOMPLETE THREADS NOT TO EXCEED TWO THREAD PITCHES.

THREAD IN ACCORDANCE WITH MIL-S-8879
THREAD RUNOUT IN ACCORDANCE WITH MIL-B-7838

.03 (MEASURED FROM FILLET RADIUS TANGENCY POINT) AN INCREASE OF .001 OVER "D" DIAMETER PERMISSIBLE.

FIRST DASH NUMBER	THREAD	A DIA	C DIA MIN	D DIA	F RAD (REF)	H	L DIA	P MAX	R RAD	T (REF)	U (REF)
2	.1640-32 UNJC-3A	.322 .306	.289	.1635 .1610	.24	.115 .105	.179 .169	.127	.020 .010	.276	.016
3	.1900-32 UNJF-3A	.373 .357	.331	.1895 .1870	.28	.133 .122	.196 .186	.145	.020 .010	.276	.016
4	.2500-28 UNJF-3A	.492 .473	.424	.2495 .2470	.37	.175 .162	.278 .268	.192	.020 .010	.316	.018
(6) 5	.3125-24 UNJF-3A	.615 .594	.518	.3120 .3095	.53	.218 .203	.347 .337	.227	.020 .010	.375	.021
6	.3750-24 UNJF-3A	.740 .716	.611	.3745 .3720	.65	.261 .244	.390 .380	.266	.025 .015	.391	.021

FIRST DASH NUMBER	INSPECTION DATA					ULT TS LBS MIN
	X (2)	Y (2)	Z (3)	RECESS GAGE PENETRATION (4)		
				MAX	MIN	
2	.005	.0045	.0040	.094	.071	1740
3	.005	.0045	.0040	.110	.089	2490
4	.006	.0045	.0030	.141	.118	4320
5	.008	.0045	.0030	.170	.149	7240
6	.009	.0060	.0025	.210	.190	10950

MATERIAL: ALLOY STEEL - 4140 PER MIL-S-5626, 4340 PER MIL-S-5000 OR 8740 PER MIL-S-6049.

HEAT TREATMENT: 160,000-180,000 PSI ULTIMATE TENSILE STRENGTH IN ACCORDANCE WITH SPEC MIL-H-6875.

FINISH: CADMIUM PLATE IN ACCORDANCE WITH QQ-P-416, TYPE II, CLASS 2. TYPE I PLATE DESIGNATED BY "W" (SEE CODE). SCREWS WITH CLASS 3 PLATING AND WITH MIL-S-7742 THREADS MAY BE SUPPLIED UNTIL 30 APRIL 1976.

CODE: FIRST DASH NUMBER DESIGNATES NOMINAL DIAMETER (SEE TABLE ABOVE).
SECOND DASH NUMBER DESIGNATES GRIP AND LENGTH (SEE SHEET TWO).
"W" AFTER SECOND DASH NUMBER DESIGNATES TYPE I PLATING.

EXAMPLES OF PART NUMBERS:

NAS623-4-10 = .2500 INCH DIAMETER SCREW, .625 INCH GRIP, TYPE II PLATING.
NAS623-4-10W = .2500 INCH DIAMETER SCREW, .625 INCH GRIP, TYPE I PLATING.

NOTES: UNLESS OTHERWISE SPECIFIED;
1. DIMENSION IN INCHES.
2. CONCENTRICITY: "C" AND "D" DIAMETERS WITH "X" VALUES TIR.
"D" AND THREAD PITCH DIAMETER WITHIN "Y" VALUES TIR.
RECESS TO SHANK WITHIN .016 TIR THRU .250 INCH SIZE.
WITHIN .024 TIR ABOVE .250 INCH SIZE.
3. SHANK STRAIGHTNESS: WITHIN "Z" VALUES TIR PER INCH OF LENGTH.
4. RECESS GAGING IN ACCORDANCE WITH MILITARY STANDARD MS9006, CROSS RECESS AND GAGE DIMENSIONS - MACHINE, TAPPING AND WOOD SCREWS, LOW TORQUE.
5. GRIP LENGTH: FROM UNDERSIDE OF HEAD TO END OF FULL CYLINDRICAL PORTION OF SHANK.
6. SCREWS SHALL BE FREE FROM BURRS AND SHARP EDGES.

PROCUREMENT SPECIFICATION: NAS498. TENSION LOAD VALUES AS TABULATED ABOVE.
MAXIMUM MAJOR DIAMETER OF THREADS NEED NOT CONFORM TO PARAGRAPH E-1a OF NAS498.

LIST OF CURRENT SHEETS

SHEET	REV
1	6
2	2

CUSTODIAN: NATIONAL AEROSPACE STANDARDS COMMITTEE

PROCUREMENT SPECIFICATION	TITLE	CLASSIFICATION
NAS498	SCREW, MACHINE, AIRCRAFT, PAN HEAD, PHILLIPS RECESS, SHORT THREAD, 160,000 PSI ALLOY STEEL	STANDARD PART NAS 623 SHEET 1 OF 2

APPROVAL DATE Sept. 1956 REVISION (1) 15 April 1957 (2) 31 May 1957 (3) 31 Oct. 1961 (4) 15 April 1965 (5) 30 April 1970 (6) 20 AUG. 1981

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Figure 6 (Sheet 1 of 2)

NATIONAL AEROSPACE STANDARD

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC. 610 SHOREHAM BUILDING, WASHINGTON 5, D. C.

SECOND DASH NUMBER	GRIP	LENGTH				
		NAS 623-2	NAS 623-3	NAS 623-4	NAS 623-5	NAS 623-6
	.062	.338	.338	.378	.437	.453
2	.125	.401	.401	.44.	.500	.516
3	.188	.464	.464	.504	.563	.579
4	.250	.526	.526	.566	.625	.641
5	.312	.588	.588	.628	.687	.703
6	.375	.651	.651	.691	.750	.766
7	.438	.714	.714	.754	.813	.829
8	.500	.776	.776	.816	.875	.891
9	.562	.838	.838	.878	.937	.953
10	.625	.901	.901	.941	1.000	1.016
11	.688	.964	.964	1.004	1.063	1.079
12	.750	1.026	1.026	1.066	1.125	1.141
13	.812	1.088	1.088	1.128	1.187	1.203
14	.875	1.151	1.151	1.191	1.250	1.266
15	.938	1.214	1.214	1.254	1.313	1.329
16	1.000	1.276	1.276	1.316	1.375	1.391
17	1.062	1.338	1.338	1.378	1.437	1.453
18	1.125	1.401	1.401	1.441	1.500	1.516
19	1.188	1.464	1.464	1.504	1.563	1.579
20	1.250	1.526	1.526	1.566	1.625	1.641
21	1.312	1.588	1.588	1.628	1.687	1.703
22	1.375	1.651	1.651	1.691	1.750	1.766
23	1.438	1.714	1.714	1.754	1.813	1.829
24	1.500	1.776	1.776	1.816	1.875	1.891
25	1.562	1.838	1.838	1.878	1.937	1.953
26	1.625	1.901	1.901	1.941	2.000	2.016
27	1.688	1.964	1.964	2.004	2.063	2.079
28	1.750	2.026	2.026	2.066	2.125	2.141
29	1.812	2.088	2.088	2.128	2.187	2.203
30	1.875	2.151	2.151	2.191	2.250	2.266
31	1.938	2.214	2.214	2.254	2.313	2.329
32	2.000	2.276	2.276	2.316	2.375	2.391
34	2.125	2.401	2.401	2.441	2.500	2.516
36	2.250	2.526	2.526	2.566	2.625	2.641
38	2.375	2.651	2.651	2.691	2.750	2.766
40	2.500	2.776	2.776	2.816	2.875	2.891
42	2.625	2.901	2.901	2.941	3.000	3.016
44	2.750	3.026	3.026	3.066	3.125	3.141
46	2.875	3.151	3.151	3.191	3.250	3.266
48	3.000	3.276	3.276	3.316	3.375	3.391
50	3.125	3.401	3.401	3.441	3.500	3.516
52	3.250	3.526	3.526	3.566	3.625	3.641
54	3.375	3.651	3.651	3.691	3.750	3.766
56	3.500	3.776	3.776	3.816	3.875	3.891
58	3.625	3.901	3.901	3.941	4.000	4.016
60	3.750	4.026	4.026	4.066	4.125	4.141
62	3.875	4.151	4.151	4.191	4.250	4.266
64	4.000	4.276	4.276	4.316	4.375	4.391
66	4.125	4.401	4.401	4.441	4.500	4.516
68	4.250	4.526	4.526	4.566	4.625	4.641
70	4.375	4.651	4.651	4.691	4.750	4.766
72	4.500	4.776	4.776	4.816	4.875	4.891
74	4.625	4.901	4.901	4.941	5.000	5.016
76	4.750	5.026	5.026	5.066	5.125	5.141
78	4.875	5.151	5.151	5.191	5.250	5.266
80	5.000	5.276	5.276	5.316	5.375	5.391
82	5.125	5.401	5.401	5.441	5.500	5.516
84	5.250	5.526	5.526	5.566	5.625	5.641
86	5.375	5.651	5.651	5.691	5.750	5.766
88	5.500	5.776	5.776	5.816	5.875	5.891
90	5.625	5.901	5.901	5.941	6.000	6.016
92	5.750	6.026	6.026	6.066	6.125	6.141
94	5.875	6.151	6.151	6.191	6.250	6.266
96	6.000	6.276	6.276	6.316	6.375	6.391

SECOND DASH NUMBER INDICATES GRIP LENGTH IN .062 INCREMENTS. INTERMEDIATE OR LONGER LENGTHS MAY BE SPECIFIED BY USE OF WHOLE DASH NUMBERS ONLY.

(2) EDITORIALLY UPDATED

CUSTODIAN: NATIONAL AEROSPACE STANDARDS COMMITTEE

PROCUREMENT SPECIFICATION: NAS695

TITLE (2): SCREW, MACHINE — AIRCRAFT, PAN HEAD, PHILLIPS RECESS SHORT THREAD, 160,000 PSI ALLOY STEEL

CLASSIFICATION: STANDARD PART

NAS623

SHEET 2

APPROVAL DATE 15 SEPT 1956 REVISION (1) 15 APRIL 1957 (2) 31 Oct. 1961

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Figure 6 (Sheet 2 of 2)

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