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AFGL-TR-88-0326

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DESIGN OF SCIENTIFIC PAYLOADS AND COMPONENTS

Richard B. Gates

Wentworth Labs—

Wentworth Institute of Technology

550 Huntington Ave.

Boston, Massachusetts 02115

Final Report

December 1982 - June 1988

15 May 1989

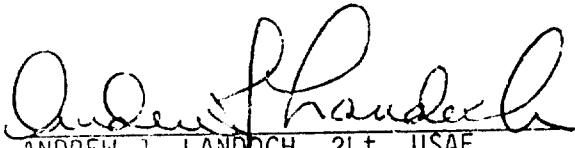
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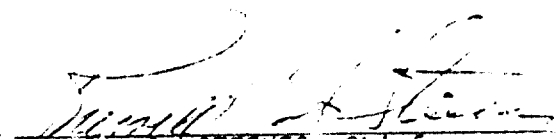
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UNITED STATES AIR FORCE
HANSCOM AFB, MASSACHUSETTS 01731-5000

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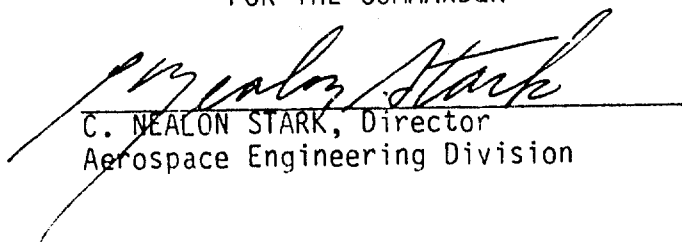
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"This technical report has been reviewed and is approved for publication"


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REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; Distribution unlimited		
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S) AFGL-TR-88-0326		
6a. NAME OF PERFORMING ORGANIZATION Wentworth Institute of Technology		6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION Air Force Geophysics Laboratory		
6c. ADDRESS (City, State, and ZIP Code) 550 Huntington Avenue Boston, MA 02115			7b. ADDRESS (City, State, and ZIP Code) Hanscom AFB Massachusetts 01731-5000		
8a. NAME OF FUNDING/SPONSORING ORGANIZATION		8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F19628-83-C-0014		
8c. ADDRESS (City, State, and ZIP Code)			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO. 63428F	PROJECT NO. 2698	TASK NO. 00
			WORK UNIT ACCESSION NO. AA		
11. TITLE (Include Security Classification) Design of Scientific Payloads and Components					
12. PERSONAL AUTHOR(S) Richard B. Gates					
13a. TYPE OF REPORT Final Report		13b. TIME COVERED FROM Dec 82 TO Jun 88		14. DATE OF REPORT (Year, Month, Day) 1989 May 15	
				15. PAGE COUNT 56	
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
			Sounding Rockets Balloon Launches		
			Payloads		
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Summarized in this report is the work performed under Contract F19628-83-C-0014, from December 1982 through June 1988. Efforts consisted of design and fabrication of one-of-a-kind payloads and instruments, field launch services, and refurbishment of recovered payloads and instruments.					
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL Andrew J. Landoch, 2Lt, USAF			22b. TELEPHONE (Include Area Code)		22c. OFFICE SYMBOL AFGL/LCI

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1.0 Introduction

Summarized in this report is the work performed under Contract F19628-83-C-0014 from December 1982 into June 1988. (An extension was granted on Modification P00052, November 3, 1987, making the period of work 66 months). Efforts consisted of design and fabrication of one-of-a-kind payloads and flight instruments, ground equipment, field launch services and refurbishment of recovered payloads and instruments.

1.1 Program Summary

Wentworth's primary task accomplished under Contract F19628-83-C-0014 was to provide design, engineering and fabrication support for AFGL toward the development of payloads for infrared measurements and other physical science experiments in space. Specific services provided included mechanical design and analysis of mechanical pieces and electro-mechanical devices, development of cost effective fabrication techniques, testing and field support of the hardware. Also provided were the design, fabrication, assembly, testing and integration of electronic devices including PCB's and their circuitry. Wentworth's long experience in payload support contributed to being a cost effective supplier of diverse services at close proximity to AFGL. The results of this

contract added to the existing success record and
expertise of Wentworth and enabled us to win the
succeeding contract with AFGL, F19628-88-C-0031.

2.0 Projects

An overview of forty projects that Wentworth participated in is presented in this section. Additional projects that Wentworth was involved in to a lesser degree are listed in 2.41.

The format by which these projects are reviewed is as follows:

Title - Acronym or project name.

() - Digitized code number for project from AFGL or 3 digit project number from WIT's Contract Reporting System.

Dates - Period of time during which work was performed by WIT.

Configuration/Mission - Launch vehicle, brief payload and mission description (when known).

Task Elements - Wentworth's level of effort in the project.

Summary - Results of Wentworth's efforts and launch date (if known).

- 2.1 Project BEAM (711) April 1983 - June 1985
 - 2.1.1 Configuration/Mission - An ITT small lens tracker and backup Ball Brothers star tracker mounted in a door accessible payload on a Castor Lance Sounding Rocket.
 - 2.1.2 Task Elements - Contract personnel designed and fabricated mechanical and electrical systems to package star trackers and associated instruments. Integration, testing and field support concluded with a launch in Natal, Brazil, June 18, 1985.
 - 2.1.3 Summary - Launch attempt failed due to faulty separation in second stage.
- 2.2 Project CIRRIIS April 1983 - June 1983
 - 2.2.1 Configuration/Mission - A cap remover for the CIRRIIS sensor was to be redesigned to improve reliability.
 - 2.2.2 Task Elements - Bearings and lens screw were redesigned and integrated.
 - 2.2.3 Summary - Mechanism tested successfully and delivered to AFGL.
- 2.3 Project ELC (A24.260) April 1983 - October 1983
 - 2.3.1 Configuration/Mission - Refurbishment and modification of ZIP I, an infrared sensor on all ARIES sounding rocket.
 - 2.3.2 Task/Elements - Contract personnel tested and re-equipped the payload components to prepare for another flight. Electronics maintenance section, rotation mechanism, and door latch were added or modified. Testing and integration were supported as well as field work at White Sands Missile Range, New Mexico. Launch was on October 25, 1983. Flight data examined, end of flight report generated.
 - 2.3.3 Summary - All WIT equipment worked successfully.
- 2.4 Project BCD Systems April 1983 - October 1983
 - 2.4.1 Configuration/Mission - Encoder Boxes to be carried by balloon launch.

- 2.4.2 Task Elements - Modify 5 PCM encoder electronic boxes.
- 2.4.3 Summary - Boxes, as modified, delivered to Hans Laping at AFGL.
- 2.5 Project BERT (A19.250-1) April 1983 - June 1985
 - 2.5.1 Configuration/Mission - A mother/daughter payload configuration (BERT/ERNIE) which was instrumented with experiments and side mounted booms and sensors for conducting electron beam tests on a Nike Black Brant.
 - 2.5.2 Task Elements - Contract personnel designed and fabricated mechanical and electrical systems for the five sections that made up BERT: Telemetry, Support SAADS, Mass Spectrometer and Electron Guns. Testing and field support was provided.
 - 2.5.3 Summary - All WIT equipment worked successfully. Launch was on June 15, 1985 from WSMR, New Mexico.
- 2.6 Project U.V. Measurements (755) April 1983 - Dec. 1983
 - 2.6.1 Configuration/Mission - A sounding rocket payload carrying a photometer was to be refurbished and flown on an Aerobee.
 - 2.6.2 Task Elements - Contract personnel fabricated a latch mechanism and can door, and refurbished other mechanisms from Project A04.902.
 - 2.6.3 Summary - Launch resulted on April 19, 1983, at WSMR. All WIT equipment worked successfully.
- 2.7 SPICE III April 1983 - September 1983
 - 2.7.1 Configuration/Mission - A reviously flown payload was returned to WIT.
 - 2.7.2 Task Elements - Evaluate future use of payload.
 - 2.7.3 Summary - Very little work in this time period.
- 2.8 LAIRTS (708) April 1983 - June 1985
 - 2.8.1 Configuration/Mission - An infrared sensor/tele-

scope to be flown on the shuttle, FY91. Featured cryogenic cooling, rigid structure requirements and extensive electronics.

2.8.2 Task Elements - Contract personnel performed extensive weight, structural, scheduling and design studies to perfect a workable advance infrared sensor and supporting hardware.

2.8.3 Summary - Design never reached hardware phase due to funding cutbacks.

2.9 High Vacuum Pump April 1983 - September 1984

2.9.1 Configuration/Mission - A Honeywell High vacuum pump was to be modified for field use.

2.9.2 Task Elements - Contract personnel designed and modified the pump to make it more portable.

2.9.3 Summary - The modifications worked satisfactorily.

2.10 Project BAFWIF April 1983

2.10.1 Configuration/Mission - Maintenance support elements were to be provided to a payload built by Utah State for a Black Brant.

2.10.2 Task Elements - Field support at Poker Flat, Alaska for launch preparations.

2.10.3 Summary - Successful launch on April 12, 1983.

2.11 Project SCOOP Payload April 1983 - September 1983

2.11.1 Configuration/Mission - Determination of usefulness of Army/LTV payload to AFGL.

2.11.2 Task Elements - Design of single axis sensor drive system and pressure checks of payload section.

2.11.3 Summary

2.12 Project A20.327 April 1983

2.12.1 Configuration/Mission - Unknown

2.12.2 Task Elements - Support AFGL through fabrication

of assorted parts.

- 2.12.3 Summary - Minimal participation by WIT in this project.

2.13 Project BAFWIF II (719) April 1983 - December 1986

- 2.13.1 Configuration/Mission - Maintenance Support

Elements were to be provided to a payload built by Utah State for a Black Brant. Launch was to be into aurora phenomena.

- 2.13.2 Task Elements - Modification of a used Black Brant nose cone and test and preparation of the separation, recovery and delta velocity cans. Integration and field support were provided at AFGL and Poker Flats, Alaska during winter of 85-86 and winter of 86-87.

- 2.13.3 Summary - Launch was never accomplished due to no aurora of a certain magnitude occurring the two years funded.

2.14 Project LDEF (710) July 1983 - September 1983

- 2.14.1 Configuration/Mission - LDEF (Long Duration Exposure Facility) was a structure on which many different experiments which depended on a passive exposure to space. AFGL's experiment investigated the effects of exposure to materials and coatings by energized particles delivery to orbit by shuttle.

- 2.14.2 Task Elements - Design & fabricate hardware, provide documentation for completed piece, deliver flight housings to Langley.

- 2.14.3 Summary - Launch was on April 4, 1984. Recovery has been delayed.

2.15 Langmuir Sensor Probes (721 & 734) Oct 1983 - Sept 1985

- 2.15.1 Configuration/Mission - These sensor probes and associated electronics were originally intended for the CRRES satellite. Later applications for the probes have been found for other upper atmosphere missions.

- 2.15.2 Task Elements - Staff personnel designed, and fabricated the electron density probes and

associated ground support interface systems and interface boxes.

- 2.15.3 Summary - Hardware was delivered to AFGL on time and functioning properly.

2.16 ELC II (A24.261) Oct 1983 - Sept 1984

- 2.16.1 Configuration/Mission ELC II was to be a refurbishment of ELC, an aries sounding rocket payload.
- 2.16.2 Task Elements - Design studies were done on strengthening joints and mechanisms.
- 2.16.3 Summary - Further funding for design and fabrication/refurbishment was not forthcoming.

2.17 HARP (724) (A40.401) Jan 1984 - Dec 1985

- 2.17.1 Configuration/Mission - HARP was to be a test of a Brazilian motor with the Passive Super Fluid Concept (PSFC) as payload and Space Vector's recovery section.
- 2.17.2 Task Elements - Design and fabrication by staff personnel of a payload skin and other associated parts of the experiment and telemetry.
- 2.17.3 Summary - The PSFC was not finished in time for the launch, therefore, a ballasted payload section was furnished to the mission and successfully launched in November 1985.

2.18 Balloon BA (729) January 1984 - June 1984

- 2.18.1 Configuration/Mission - Unknown
- 2.18.2 Task Elements - Staff personnel designed and fabricated 5 electronics boxes for Hans Laping.
- 2.18.3 Summary - Flight results are unknown.

2.19 Passive Super Fluid Concept (PSFC) (723) April 1984 - September 1986

- 2.19.1 Configuration/Mission - The PSFC was intended to prove the concept of manufacturing super critical Helium at 1.8K for sensor cooling on sounding rockets and LAIRTS.

- 2.19.2 Task Elements - WIT to support AFGL in the design and fabrication of all associated parts on the PSFC such as dewars, plumbing, pressure vessels, heat exchangers.
- 2.19.3 Summary - Effort was terminated due to lack of AFGL scientific guidance and cancellation of LAIRTS.
- 2.20 Digital Command System (732) April 1984 - December 1985
 - 2.20.1 Configuration/Mission - A system to run multiple commands on balloon payloads was required by Hans Laping of AFGL utilizing pulse code modulations.
 - 2.20.2 Task Elements - Staff personnel designed and built various electronics boxes and components.
 - 2.20.3 Summary - The original hardware and concepts were proven successfully on a flight and subsequent hardware was made for other missions.
- 2.21 CRRES (736) April 1984 - September 1985
 - 2.21.1 Configuration/Mission - Combined release and radiation effects satellites are intended to measure induced chemical modifications of the upper atmosphere.
 - 2.21.2 Task Elements - Staff personnel built to Analytyx specifications electronics and their support frames.
 - 2.21.3 Summary - Parts were supplied on time to AFGL and its sub-contractor, Analytyx.
- 2.22 Balloon AW (725) October 1984 - June 1986
 - 2.22.1 Configuration/Mission - A 36" diameter balloon payload.
 - 2.22.2 Task Elements - Staff personnel designed and built racks, frames, mounting frames, doors, stiffeners and a crash ring.
 - 2.22.3 Summary - Hardware delivered on time.
- 2.23 Stellar Scintillometer (748) Oct 1984 - Dec 1985

- 2.23.1 Configuration/Mission - Two scintillometers were to be made from an existing one for use on a Western U.S. ground based telescope.
- 2.23.2 Task Elements - Detail, from an existing part, new drawings and fabrication of two scintillometers.
- 2.23.3 Summary - Scintillometers were successfully tested on ground based equipment at Hanscom Air Force Base.
- 2.24 TAMP (750) January 1985 - December 1985
 - 2.24.1 Configuration/Mission - To package the Scoop Sensor in the SPICE or ELC Payload.
 - 2.24.2 Task Elements - Prepare design study and fabricate parts to accomodate sensor in payload.
 - 2.24.3 Summary - Funding prematurely halted construction of most parts.
- 2.25 Test Array (749) April 1985 - September 1985
 - 2.25.1 Configuration/Mission - Unknown
 - 2.25.2 Task Elements - Various electronics parts such as PCB's & boxes were designed and built.
 - 2.25.3 Summary - Hardware was delivered on time.
- 2.26 DMSP (752) April 1985 - September 1985
 - 2.26.1 Configuration/Mission - Unknown
 - 2.26.2 Task Elements - Design and fabrication of 5 electron electrometers.
 - 2.26.3 Summary - Hardware delivered.
- 2.27 Balloon Repackaging (753) April 1985 - December 1985
 - 2.27.1 Configuration/Mission - Balloon flight support equipment.
 - 2.27.2 Task Elements - Staff personnel designed and built a portable electronics frame.

- 2.27.3 Summary - Equipment delivered on time.
- 2.28 VIPER (754) July 1985 - March 1988
 - 2.28.1 Configuration/Mission - A visual photometric experiment packaged in GAS (Get Away Special) cannister for use on the shuttle.
 - 2.28.2 Task Elements - Staff personnel designed and built the mechanical structure, and electronic packages and circuitry for control, positioning, diagnostics.
 - 2.28.3 Summary - Delayed due to the shuttle's shutdown, flight is now scheduled for June 1989.
- 2.29 Plasma Studies (757) October 1985 - June 1988
 - 2.29.1 Configuration/Mission - Support of general plasma studies.
 - 2.29.2 Task Elements - Construction of additional sensor probes (721/734), their test equipment and handling hardware.
 - 2.29.3 Summary - Up to nine probes were fabricated along with supporting hardware.
- 2.30 ALPHAN (756) October 1985 - December 1986
 - 2.30.1 Configuration/Mission - Balloon launch
 - 2.30.2 Task Elements - Design and fabrication of flight electronics boards and boxes.
 - 2.30.3 Summary - Hardware delivered on time.
- 2.31 Ground Based Array (758) October 1985 - June 1987
 - 2.31.1 Configuration/Mission - To adapt a spectrometer to a ground based telescope at Wyoming State University.
 - 2.31.2 Tasks Elements - Layout the optics from a SSG design and fabricate all hardware (mirrors, benches, electronics) necessary.
 - 2.31.2 Summary - The adaptation was successfully completed.

2.32 EXCEDE III (760) October 1985 to June 1988

- 2.32.1 Configuration/Mission - A 38" diameter, 5000 lb aries payload with an electron gun section and an instrument section. To be launched from the Northern Range South at WSMR.
- 2.32.2 Task Elements - Original task was to design and build entire instrument section with doors, drive mechanisms, skin etc. The job was later changed to the design and subcontracting of the Aries Launch Platform Shelter (ALPS).
- 2.32.3 Summary - Letting out subcontract for ALPS scheduled for early calendar 89. Launch scheduled for April 1990.

2.33 DIGBE (761) January 1986 - June 1988

- 2.33.1 Configuration/Mission - A 21" diameter Aries payload with electro mechanical devices and infrared sensors designed to study interstellar clutter with a rotating out of line of flight sensor.
- 2.33.2 Task Element - Refurbish the ZIP payload for use on DIGBE mission.
- 2.33.3 Summary - Work was halted due to funding problems. No re-schedule of launch to date.

2.34 ECHO-7 (763) January 1987 - June 1988

- 2.34.1 Configuration/Mission - Research payload on Terrier Black Brant Rocket, designed to inject electron beams along earth's magnetosphere and analyze their return.
- 2.34.2 Task Elements - Design, fabricate and integrate payload accelerator and instrumentation.
- 2.34.3 Summary - Payload was successfully integrated and launched February 8, 1988 from Poker Flat Research Range, Alaska.

2.35 BEAR (764) January 1987 - June 1988

- 2.35.1 Configuration/Mission - A 44" diameter Aries payload designed to produce neutral particle beams in space and study their interaction.

- 2.35.2 Task Elements - Staff personnel designed and fabricated the telemetry/physics section with blow off doors, deck, and a non conducting boom for plasma studies.
- 2.35.3 Summary - TM/Physics can is currently undergoing test and integration. Launch is scheduled for April 1989.
- 2.36 RADC (751) July 1986 - June 1988
 - 2.36.1 Configuration/Mission - WIT is occasionally requested to support small tasks for Rome Air Development Center (RADC).
 - 2.36.2 Task Elements - Design and/or fabrication of various electronics hardware such as PCB's.
 - 2.36.3 Summary - Deliveries on time and satisfactory.
- 2.37 COLDR (768) July 1986 - June 1988
 - 2.37.1 Configuration/Mission - To measure the conductivity of the Lower D Register with a mass spectrometer on board a Nike Orion.
 - 2.37.2 Task Elements - Staff personnel designed, fabricated and tested the parachute recovery section, vehicle ignition system and despin system.
 - 2.37.3 Summary - Launch & mission were successful on August 15, 1987 from Wallops Island.
- 2.38 Mass Spect. Syst. (771) Jan 1987 - Sept 1987
 - 2.38.1 Configuration/Mission - Unknown
 - 2.38.2 Task Elements - Electronic parts such as PC boards, harnesses and boxes to be fabricated.
 - 2.38.3 Summary - Hardware was delivered.
- 2.39 ABLE (775) October 1987 - June 1988
 - 2.39.1 Configuration/Mission - Balloon launch
 - 2.39.2 Task Elements - Printed circuit boards were designed and built.

2.39.3 Summary - Hardware delivered on time.

2.40 IBSS (777) April 1987 - June 1988

2.40.1 Configuration/Mission - A shuttle borne experiment for an Infrared Background Sky Survey in conjunction with MBB.

2.40.2 Task Elements - Staff personnel designed and fabricated electronics boxes for transmitters, recorders and TV's and ground support equipment.

2.40.3 Summary - Hardware is currently in integration and test. Launch is scheduled for February 1990.

2.41 Lesser Projects

Wentworth participated in a lesser manner in some projects by supplying hardware or services to AFGL. Our effort was not enough to clarify the intent or finish of a project. Consequently, these projects are just listed below:

LASS II

BALLOON AX (726)

Main Elect. Box (733)

Data Acquisition System (747)

BERT II (A19.250-2)

SCRIBE 100 (766)

ALPHAN II (772)

XYBION VESSEL (776)

CHAMBER MODS (774)

CODES (746)

POLAR ARCS (762)

IMAGE PROCESSOR (767)

METEOR SCATT DATA (769)

CHEM MODEL (770)

GM TUBES (773)

COLDR 2 (778)

CHANGE III (779)

WENTWORTH LABS TECHNICAL STAFF

3.0 The value of experience should not be undervalued when rating an organization's capability to provide quality aerospace hardware and services at cost effective rates. The following individuals contributed to the projects as outlined in this report.

* Currently Active at WIT

<u>Name</u>	<u>Title</u>	<u>Yrs at WIT on Research Contracts</u>	<u>Total Research Exp. - years</u>	<u>Education</u>
* Benassi, Howard	Spvr. Instrumentation	30	30	AS
* Cabral, Rudolph	Instrument Maker	12	23	Cert.
* Fritzler, Frederic	Alternate Supervisor	36	36	Cert.
* Gambale, Alfonso	Instrument Maker	15	27	Cert.
* Larson, Jon	Machinist III	3	3	BS
* Molter, Otto	Master Model Maker	18	19	Cert
* Ortendahl, Walter	Master Machinist	21	30	Cert.
Charron, Robert	Spvr. Electronics	24	24	AS
* Campbell, Thomas	Electrical Engineer V	21	21	BS
* Cutter, George	Alternate Supervisor	28	28	BS
* Baratz, Milton	Elec Eng Tecjmocoam IV	20	20	Cert.
* DiMilla, Thomas	Elec Eng Technologist V	32	32	AS
* LeBeau, Michael	Elec Eng Technician II	3	3	AS
* Masse, William	Elec Eng Technician IV	5	5	AS
* Mundis, Paul	Elec Eng Technician V	23	40	AS
* Nardella, Daniel	Elec Eng Technologist V	28	28	AS
* Rodrigues, Timothy	Electrical Engineer	3	3	BS
* Smart, Lawrence	Elec Eng Technician V	21	21	Cert.
* Stromberg, Gustave	Elec Eng Technician V	18	30	AS

* LeBlanc, Edgar	Spvr. Mechanical	37	37	Cert.
* Cleveland, Frank	Mech. Tech. IV	35	35	Cert.
* Hartnett, Paul	Alternate Supervisor	28	28	AS
* Hurley, Patrick	Mech Eng Designer V	9	28	AS
* Lund, Ray	Mech Eng Designer V	6	25	AS
* Williams, Edward	Mech Equipment Specialist	5	5	AS
* Gates, Richard	P.I./Mechanical Engineer	3	19	BS

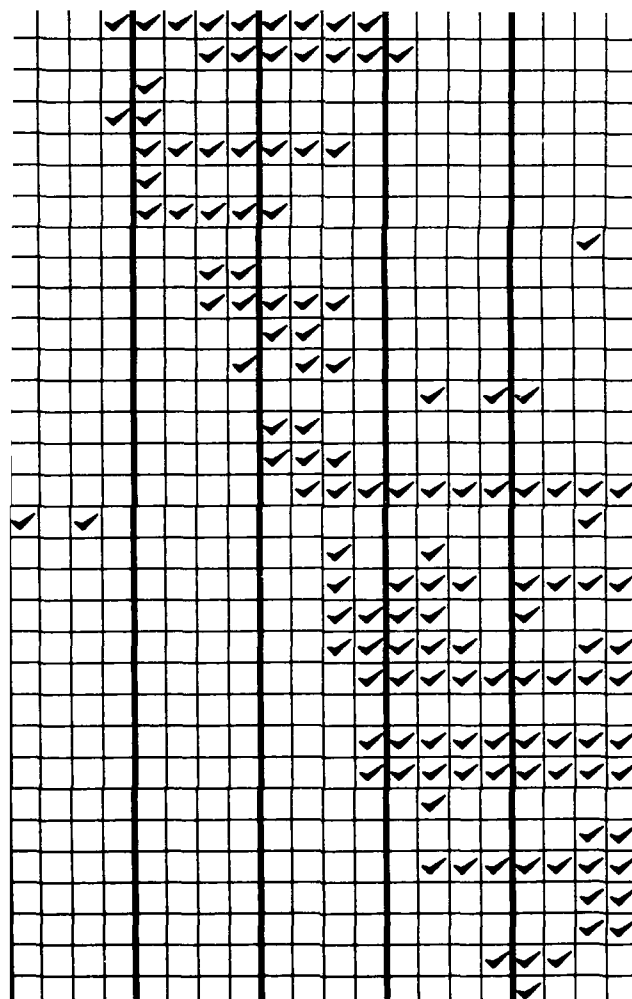
4.0 Activities by Quarter

Specific progress on individual tasks inside the projects outlined here is detailed in the Quarterly Reports submitted over the life of the contract. As a reference guide, the following chart is provided to allow easy access to those tasks by charting activity by quarter.

CALENDAR YEAR →		83	84	85	86	87	88															
QUARTERLY REPORT →		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
BAFNIF		✓	✓																			
BCD SYSTEMS		✓	✓	✓																		
CIRIS		✓	✓																			
HIGH VAC. PUMP		✓	✓	✓	✓	✓																
LASS II				✓																		
LDEF			✓	✓																		
SCOOP		✓	✓																			
SPICE III		✓	✓																			
BERT-I	A19.250-1	✓	✓	✓	✓	✓	✓	✓	✓													
BERT-II	A19.250-2	✓	✓	✓																		
ELC	A24.260							✓														
ELC II	A24.261			✓	✓		✓															
	A20.327	✓																				
708	LAIRTS	✓	✓	✓	✓	✓	✓	✓	✓													
711	BEAM	✓	✓	✓	✓	✓	✓	✓	✓													
716	BCD SYSTEM				✓																	
719	BAFWF II	✓							✓	✓	✓	✓	✓	✓		✓						
721-734	SENSOR PROBE		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
723	PSFC				✓		✓	✓	✓	✓	✓	✓	✓	✓	✓							
724	HARP			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							
725	BALLOON AW							✓	✓	✓	✓	✓	✓	✓								
726	BALLOON AX					✓																
729	BALLOON BA				✓	✓																
732	DIGITAL COMM. SYS.					✓	✓	✓	✓	✓	✓	✓										
733	MAIN ELECT. BOX					✓																
736	CRRES					✓	✓	✓	✓	✓												
746	CODES																					
747	DATA AQUISITION SYS.							✓	✓												✓	
748	STELLA SCINTILLOTEMER							✓	✓	✓	✓	✓										
749	TEST ARRAY									✓	✓											
750	TAMP								✓		✓	✓										
751	RADC																					
752	DMSP									✓	✓											
753	BALLOON REPACK									✓	✓	✓										
754	VIPER										✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
755	UV MEASUREMENTS	✓		✓																	✓	
756	ALPHAN											✓			✓							
757	PLASMA STUDIES											✓			✓							
758	GROUND BASE ARRAY											✓	✓	✓	✓				✓	✓	✓	✓
760	EXCEDE III											✓	✓	✓	✓						✓	✓
761	DIGBE												✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
762	POLAR ARCS																					
763	ECHO 7												✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
764	BEAR												✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
766	SCRIBE 100													✓								
767	IMAGE PROCESSOR																					
768	COLDR																				✓	✓
769	METEOR SCATT DATA																				✓	✓
770	CHEM MODEL																				✓	✓
771	MASS SPECT. SYS.																				✓	✓

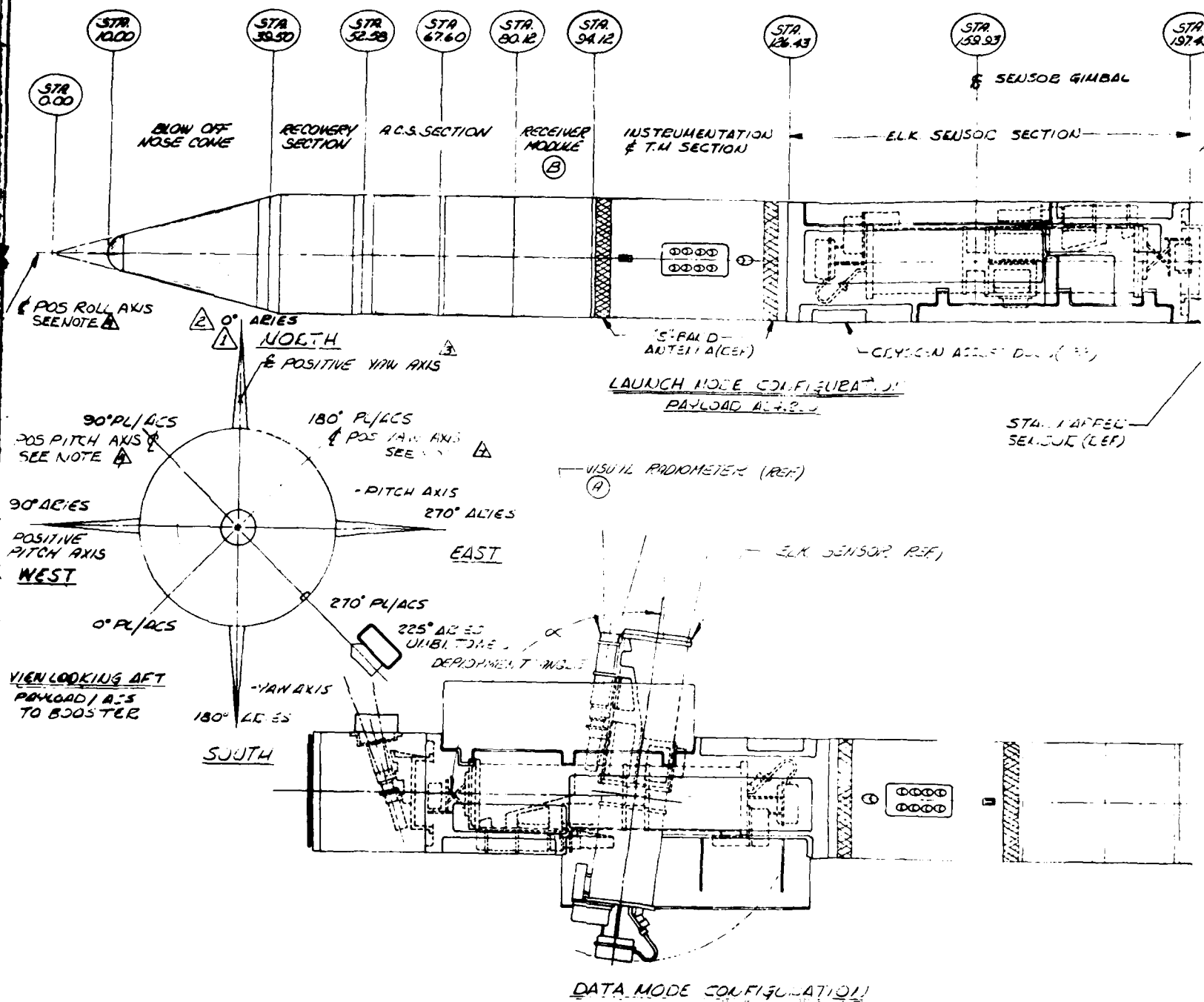
Activities
Under
F19628-83-C-0014
by Quarter

ACTIV.DWG



5.0 Selected Project Drawings

Contained in this section is a sampling of the engineering drawings produced during Contract F19628-83-C-0014.



- AXES DEFINITION FOR SEPARATED PAYLOAD
- AXES DEFINITION FOR BCS ONLY
- FIN #1 IS LOCATED 004° AZIMUTH PRIOR TO LAUNCH
- NUMERICAL ANGULAR LOCATIONS FOLLOWS SPACE VECTOR NOMENCLATURE
- NOTES:

B D-11770

REV	DESCRIPTION	DATE	BY
A	USUAL AND BAYE MODIFIED	1/18/73	PM
B	REC. MOD. SECTION REDESIGNED	1/18/73	PM

STA 159.93

SENSOR GIMBAL

STA 197.43

STA 213.93

STA 216.15

SEPARATION PLATE

STA 266.72

STA 270.85

STA 296.38

ELK SENSOR SECTION

STAR ASPECT SECTION

TRANSITION ASSEMBLY SECTION (REF)

CRYSTAL ACCESSORY (REF)

STAFFED SENSOR (REF)

S-BAND ANTENNA TAIL LINE 3 (REF)

ARIES MOTOR (REF)

3rd LINK TM (REF)

DOUBLE AIR BAG SEPARATION UNIT (REF)

22.75 DIA

POSITIVE ROLL DIRECTION

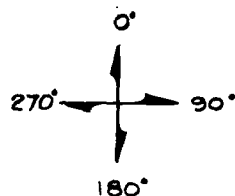
270° DIVE 90° SCALE

150°

VIEW LOOKING AFT

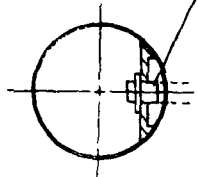
WENTWORTH INSTITUTE APC CONTRACT NO. -9103 SHEET NO. 2112 TOLERANCE UNLESS OTHERWISE NOTED DECIMAL: 1/16, 1/32, 1/64 ANGLES: ± 0.005 GREAT CIRCLE COORDS AND CURVES	P.J. HALLAETH L. J. HALLAETH SCALE 1/10 REVISION	DATE 1/18/73 NEXT MEET 1/18/73 CONFIRMATION DWG ELK PAYLOAD	REV 224-260 A-11773 AEROSPACE DEVELOPMENT DIVISION AIR FORCE GEOPHYSICS LABORATORY HARRIS AFB, TEXAS D-11770 B
--	---	--	---

△ LOOKING AFT →

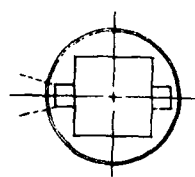


ORIENTATION

HUGHES
KIMBALL
CAPILLARITRON



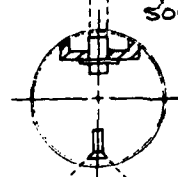
ELECTRON GUNS



MASS SPEC

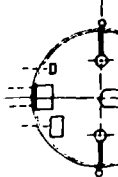
HI-RESEA
IRT.ESA

PLASMA
SOURCE

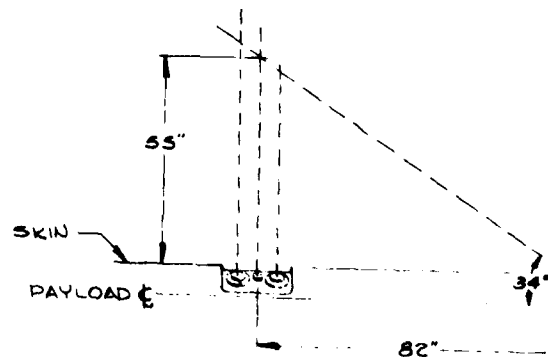
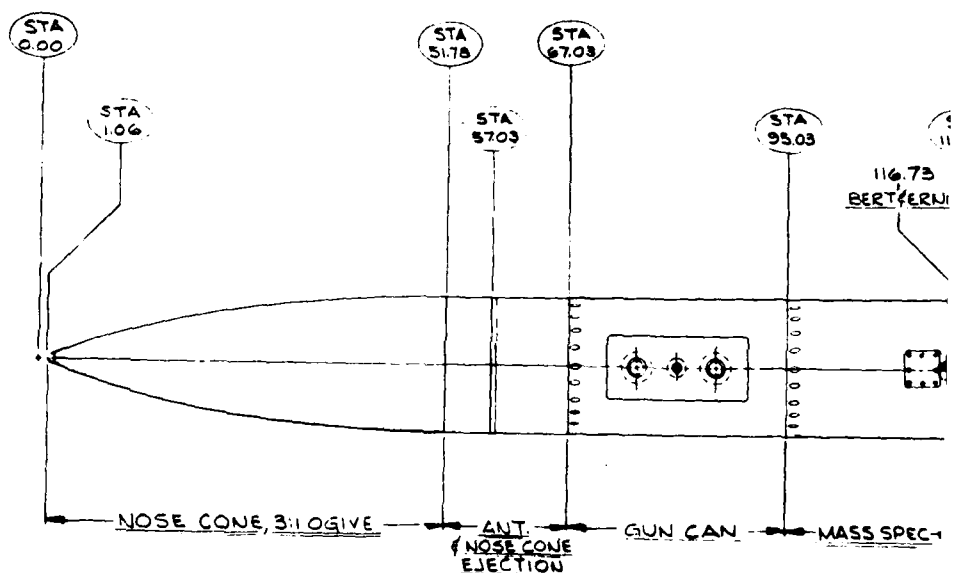
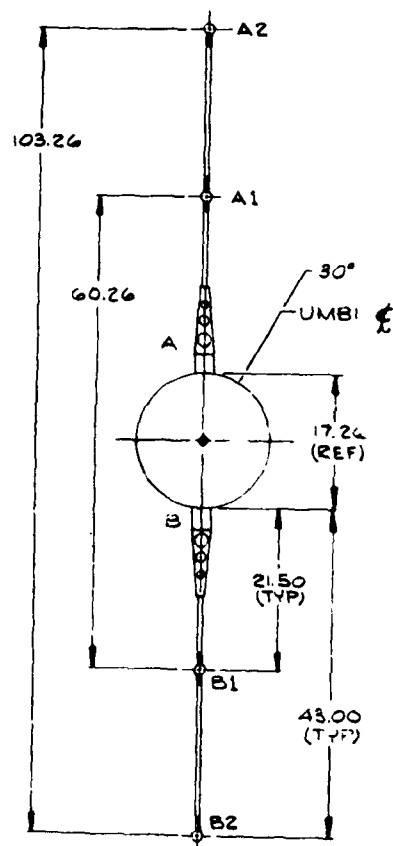


SAADS (A)

SPM
FC #2
TLP #2



SUPP

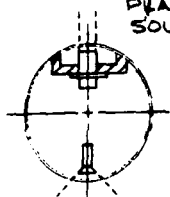


CAMERA-GUN GEOMETE

2. ♦ DENOTES EST. C.G.
1. TORQUE TENSION JOINTS @ 57 in-lbs

NOTES

-	PRELIMINARY RELEASE	WAF
A	GENERAL UPDATE	WAF
B	WRIGHT'S UPDATE RELEASE FOR FLIGHT	WAF



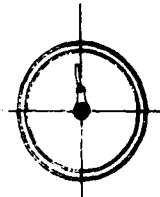
SADS

Diagram of a circular component, possibly a lens or a sensor, with a central horizontal slot. The component has several mounting points or pins around its perimeter. The text "FC" and "TLA" is visible in the upper right corner of the diagram.

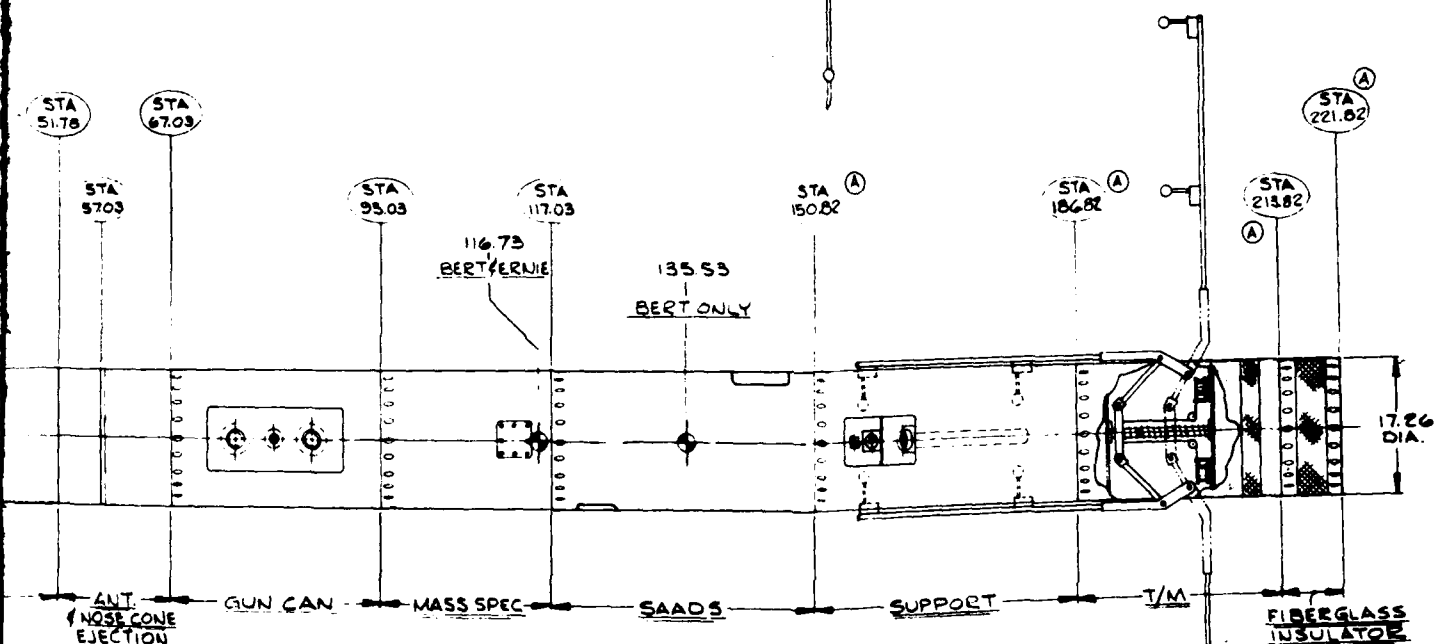
SUPPORT

T/M | CAN

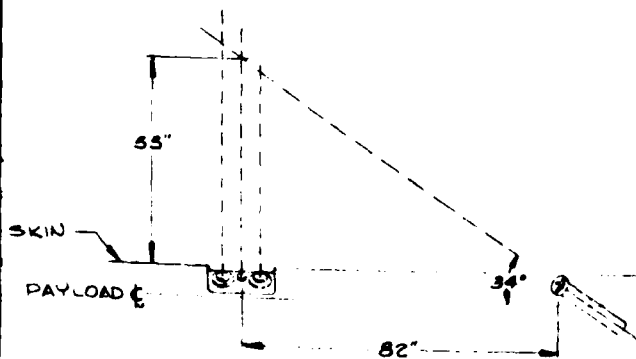
IS.V.M.



FIBERGLASS INSULATOR

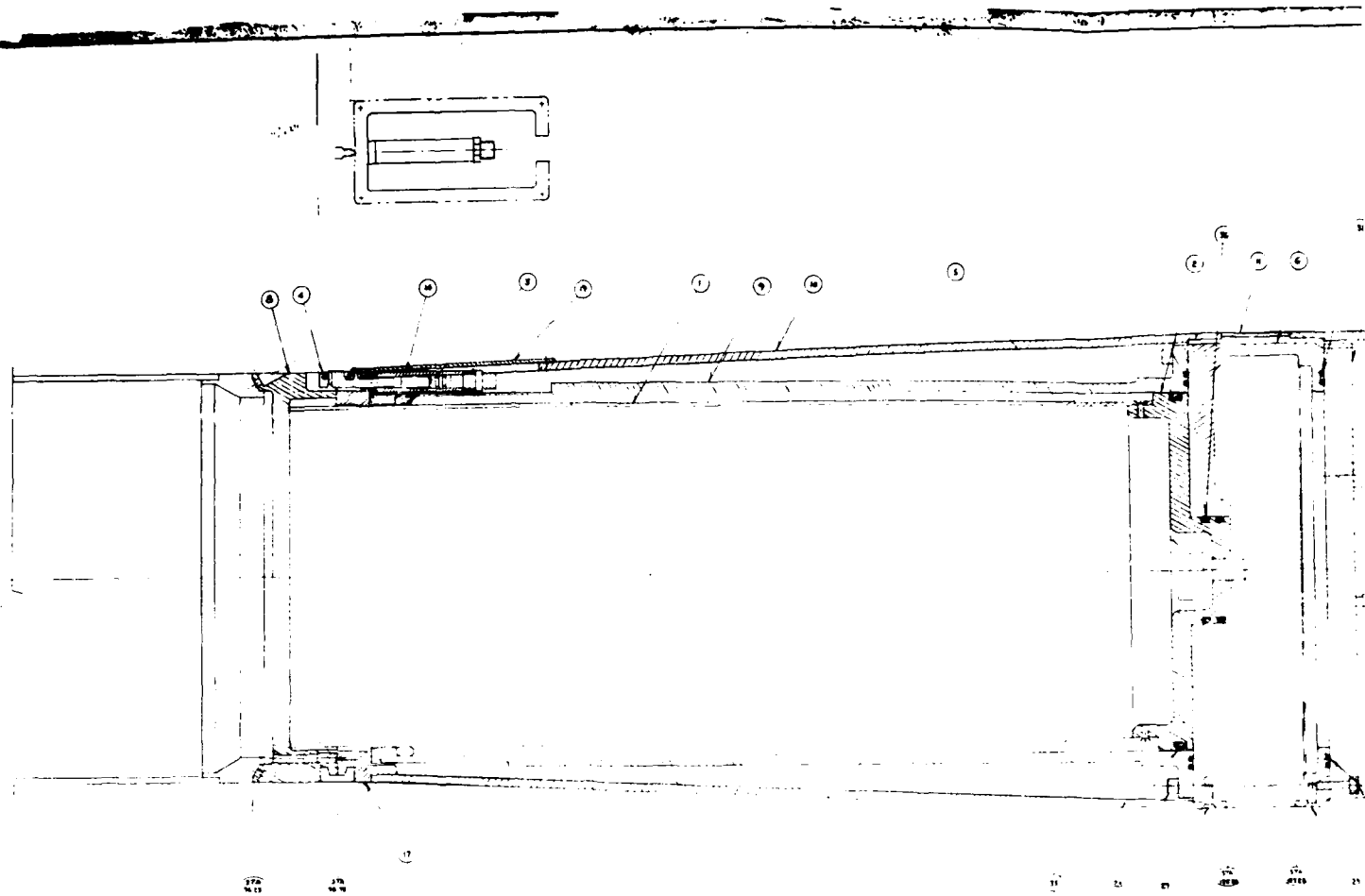


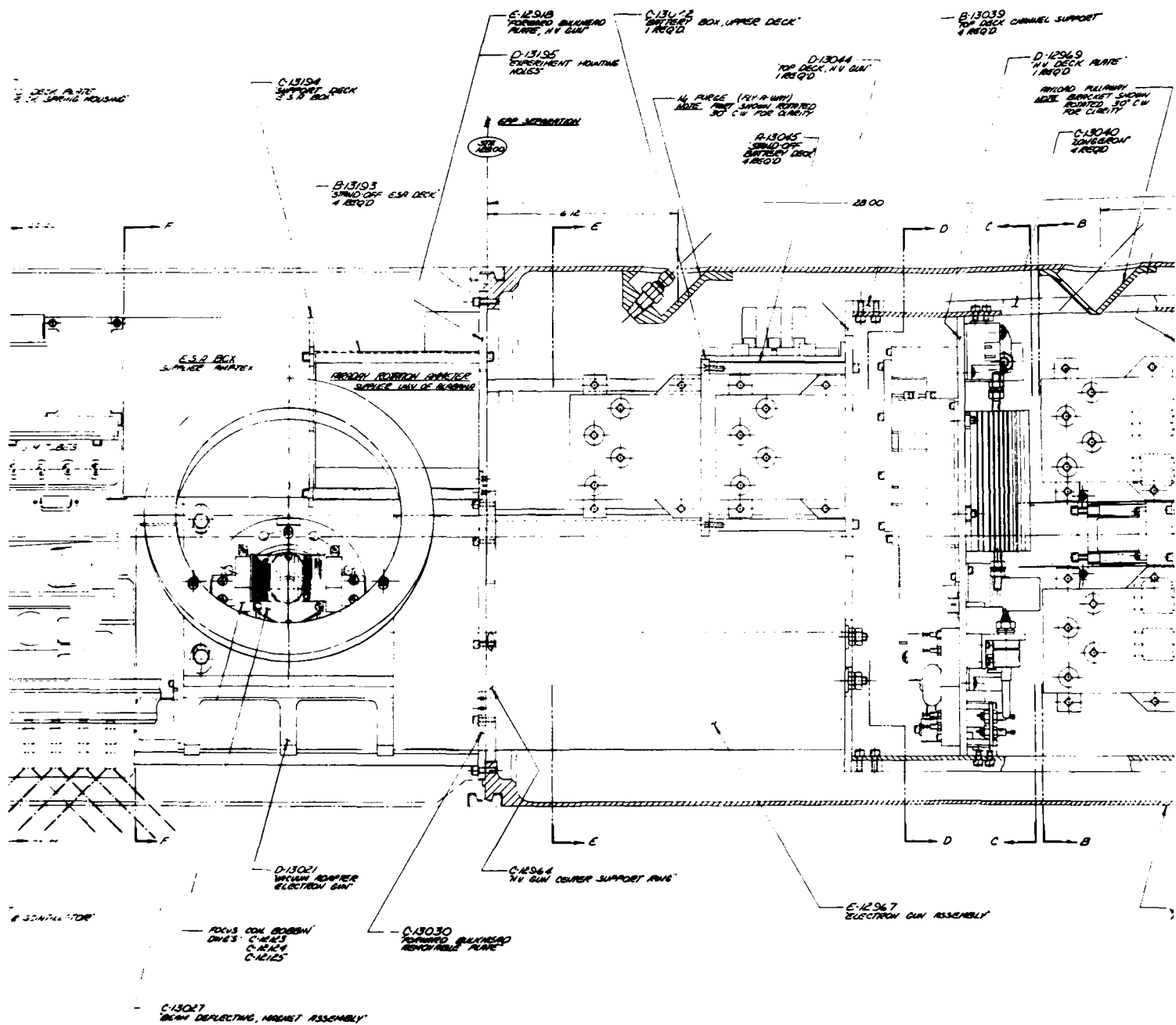
WEIGHT/SECT	lbs	
NOSE CONE (ERNIE)	157.5	(B)
B-GUNS	129.5	(B)
WASS SPEC	126.5	(A)
SAADS	101.5	(B)
SUPPORT	270	(A)
T/M		(B)
F/G INSULATOR	23	
IGNITER HSNG	70	(B)
FLIGHT SAFETY DEST.	500	(A)
		TOTAL

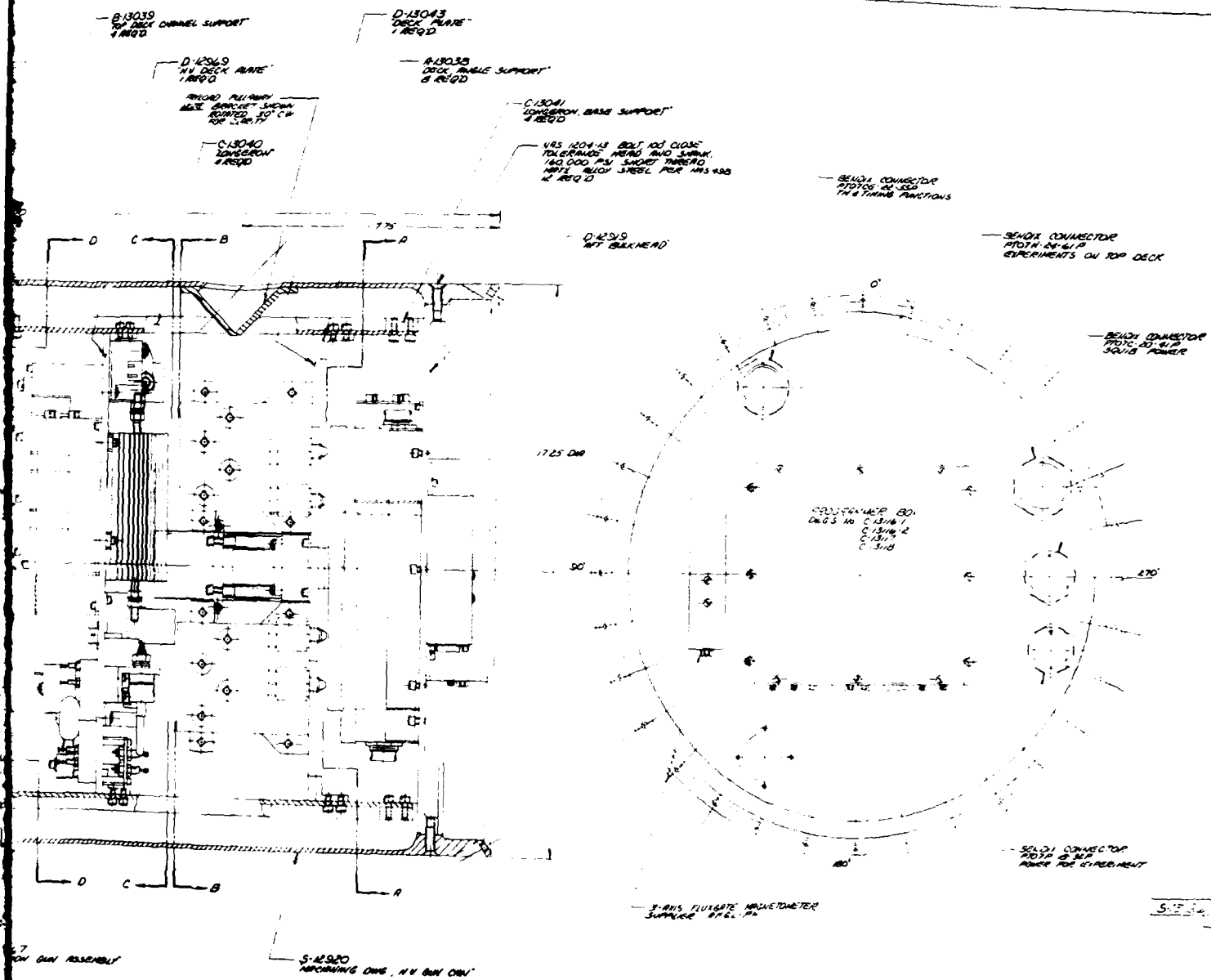


CAMERA-GUN GEOMETRY

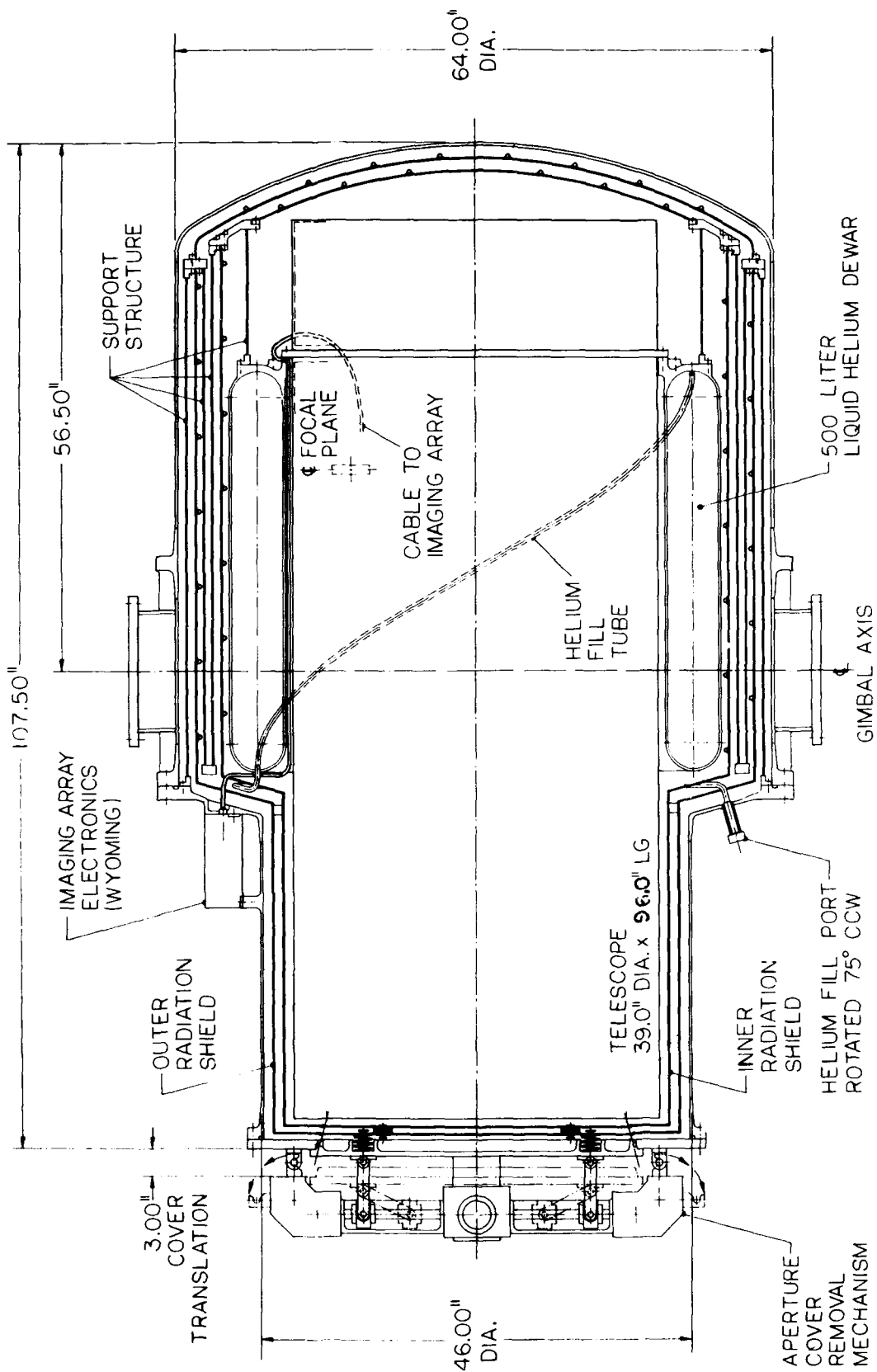
WENTWORTH INSTITUTE APO CONTRACT NO. -0014 ORDER, SA 015 TELEPHONE (WALLS OFFSHORE) CORDIAL 224 & 225 224 & 225 AIRMAIL & GPO ORDER, ORDER, ORDER & ORDER	E.LUND E.LUND Vio Vio	W.LYNCH MAR 94 NEXT ARMY CONFIGURATION DWG BERT 1 PAYLOAD	BEET 1 A1250 AIR FORCE GEOPHYSICS LABORATORY ORDER, SA, SA 015 D-12124 18
---	--------------------------------	--	---



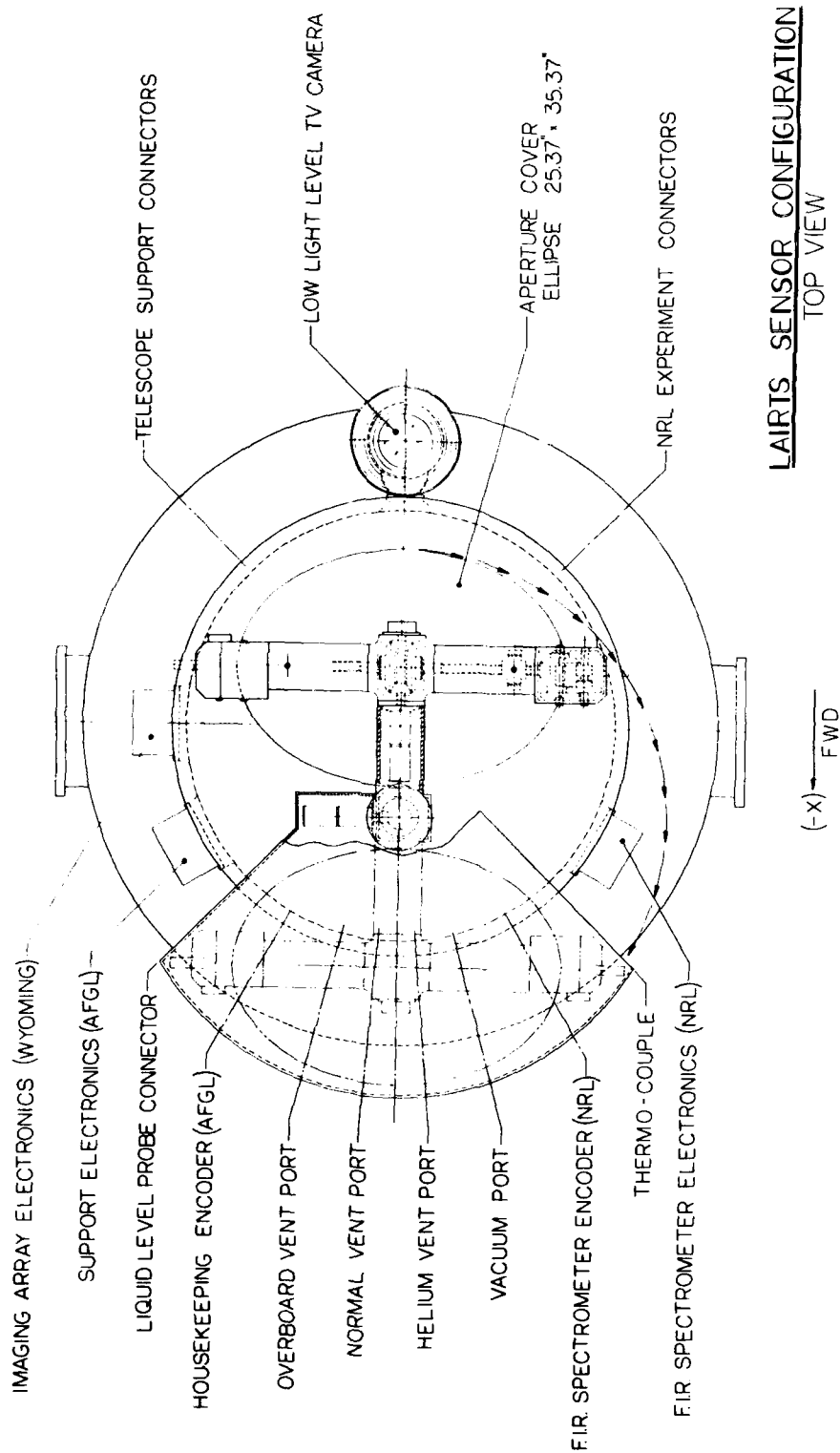




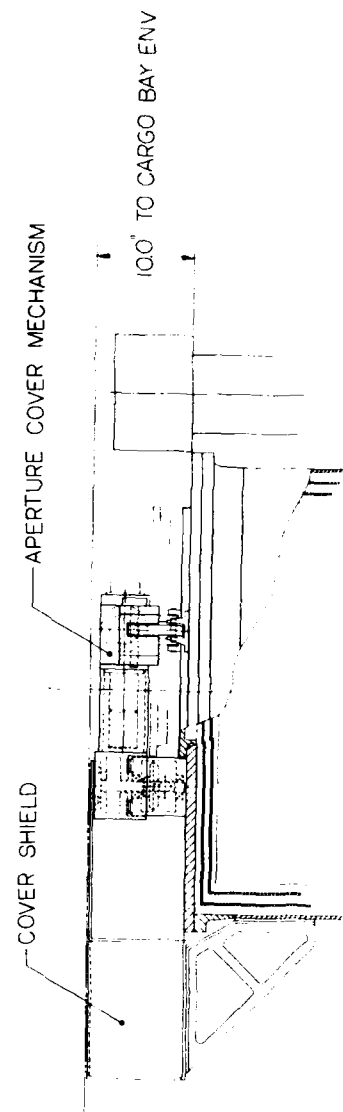
NO.	DESCRIPTION	REMARKS	DATE
1	RECEIVED	RECEIVED	5-13-66
2	RECEIVED	RECEIVED	5-13-66
3	RECEIVED	RECEIVED	5-13-66
4	RECEIVED	RECEIVED	5-13-66
5	RECEIVED	RECEIVED	5-13-66
6	RECEIVED	RECEIVED	5-13-66
7	RECEIVED	RECEIVED	5-13-66
8	RECEIVED	RECEIVED	5-13-66
9	RECEIVED	RECEIVED	5-13-66
10	RECEIVED	RECEIVED	5-13-66



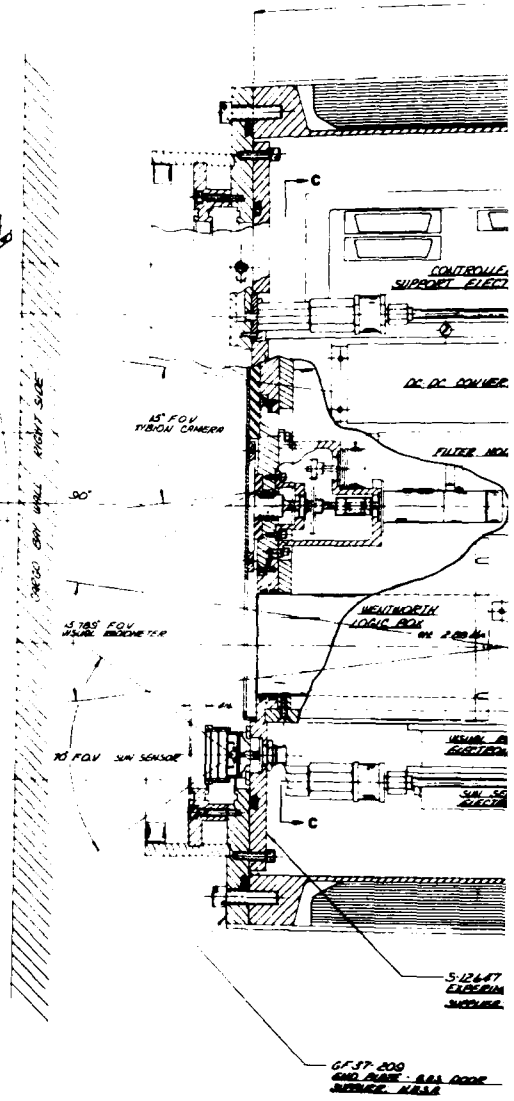
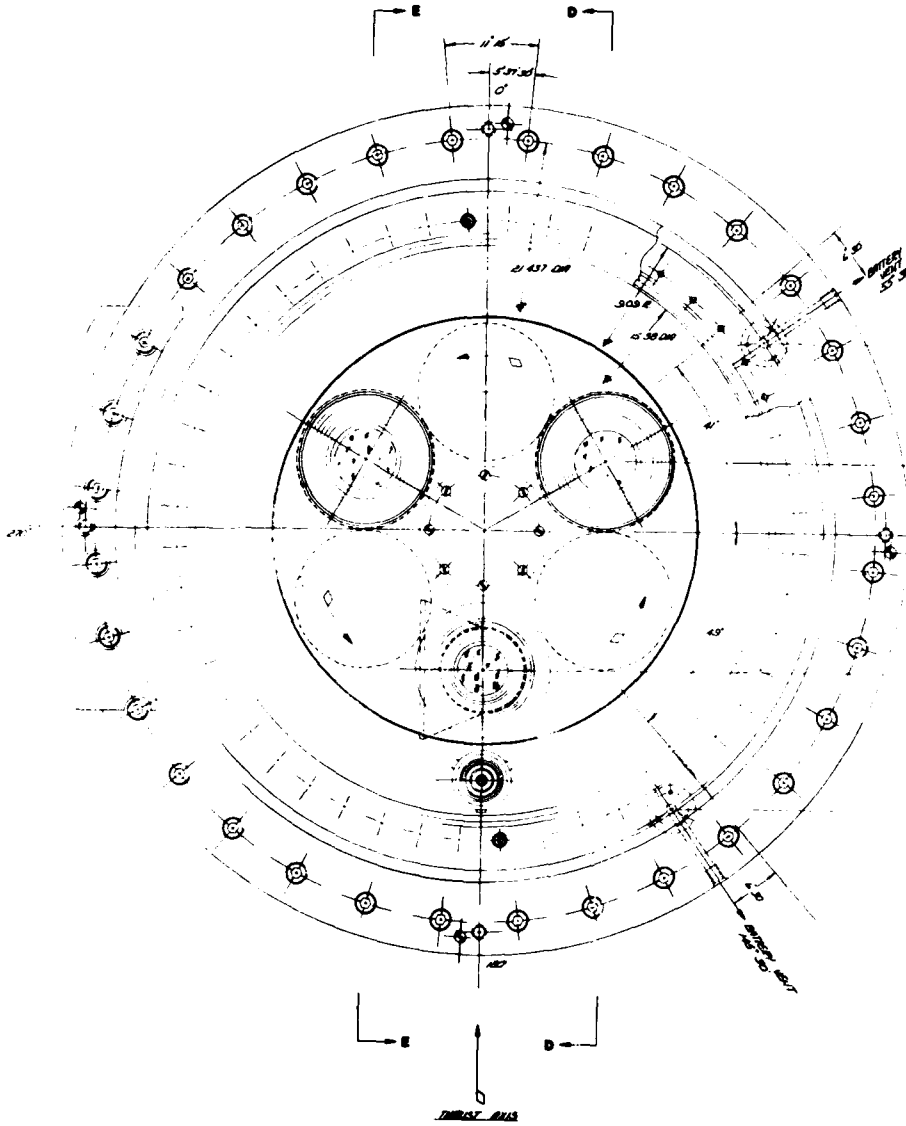
LAIRTS SENSOR - CUTAWAY CONFIGURATION



LAIRTS SENSOR CONFIGURATION
TOP VIEW

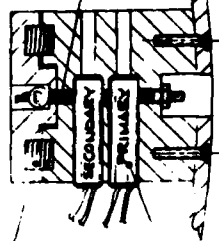


①



ST ST CABLE ASSY

BLOW-OFF
DOOR



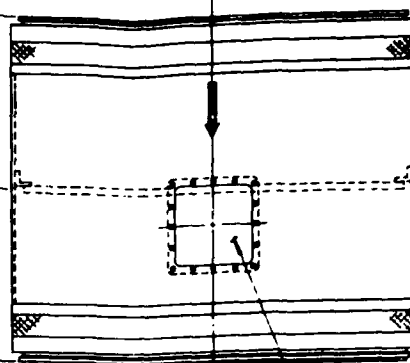
COMPRESSION
SPRINGS 2 REQ'D
CABLE CUTTER
HOLEX #8000
2 REQ'D

DOOR RELEASE DETAIL
SCALE: FULL TYP 4 PLCS

T/M
SECTION

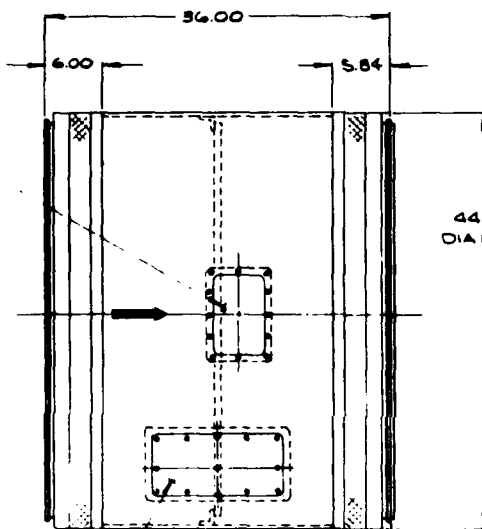
PHYSICS
SECTION

423.0



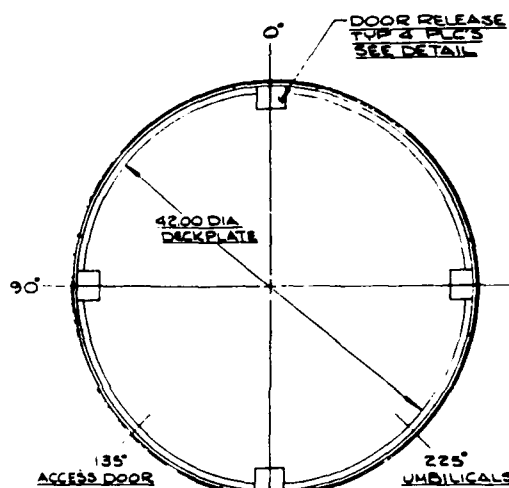
80" x 80" BLOW-OFF
PWR BOOM #1

100" x 50" BLOW-OFF DOOR
ESA EXPERIMENT



423.0

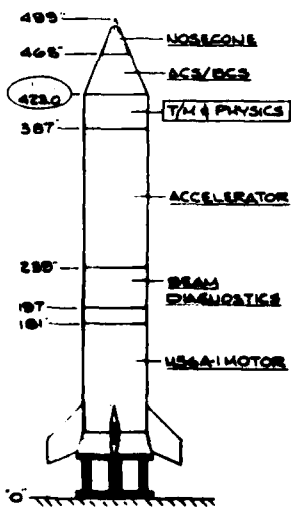
ACCESS DOOR
(90" x 14.0")



FWD
DWG

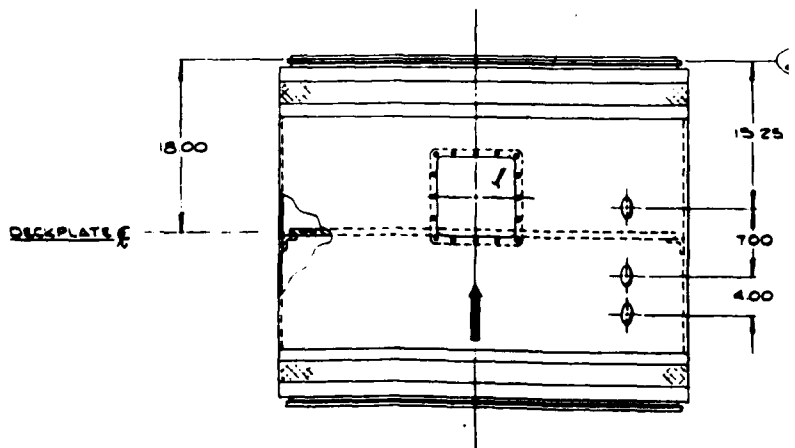
P2
A1

AA
VIEW LOOKING AFT

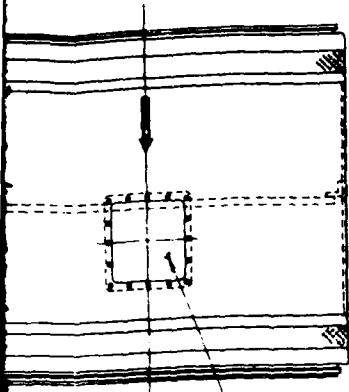


BEAM 1 CONFIGURATION

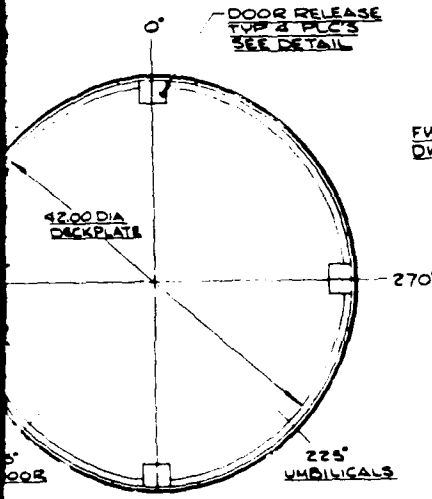
80" x 80" BLOW-OFF
PWR BOOM #2



E-12909



60'x60' BLOW-OFF DOOR
PWR BOOM #1



DOOR RELEASE
TOP & PLCS
SEE DETAIL

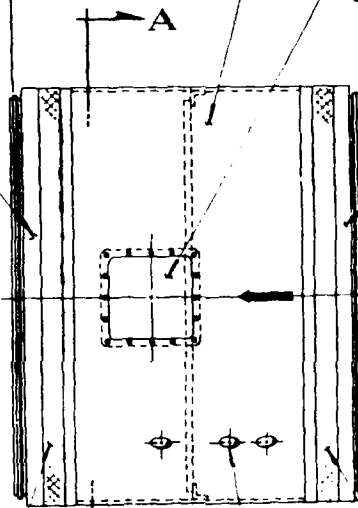
FWD JOINT
DWG #E-12857-1

423.0

SKIN WELDMENT
DWG #E-12853

10'x10' BLOW-OFF DOOR
H.I.V. BOOM

AFT JOINT
DWG #E-12857-2

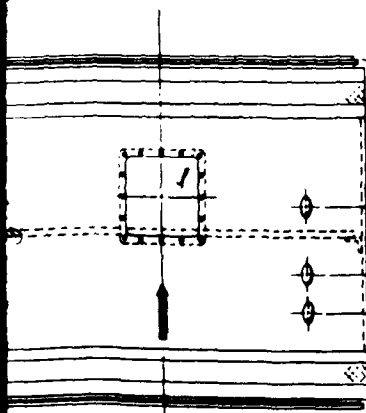


PSL'S BAND
ANTENNA (3.0W)

PSL'S BAND
ANTENNA (3.0W)

UMBILICAL
3 REQ'D

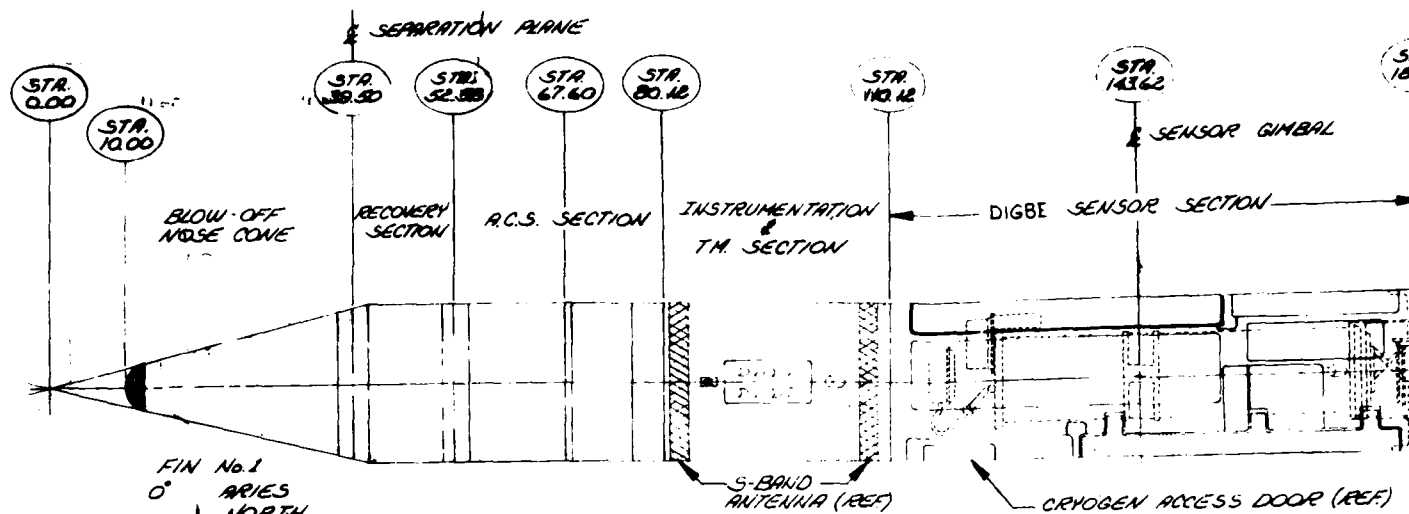
60'x60' BLOW-OFF DOOR
PWR BOOM #2



423.0

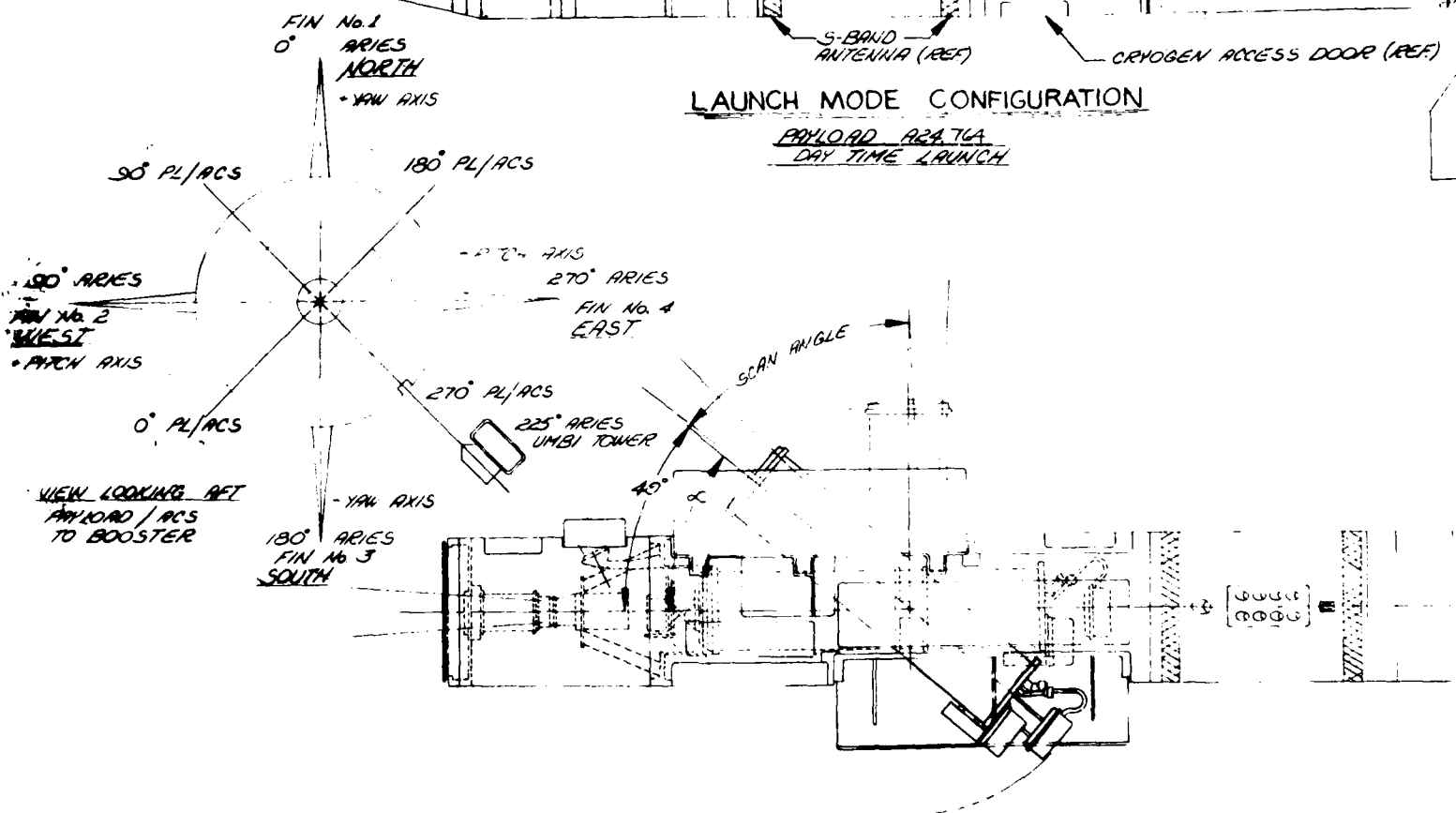
▲ DENOTES DIRECTION OF FLIGHT

INSTITUTE	R. LUND	R. JACOBSON	BLAR
APR	R. LUND	NEW ARMY	
CONTRACT NO. -0014			
DATE OF ORDER			
TELEPHONE (GIVE OFFICE)			
GENERAL	1/6		
DETAILS			
APPROVAL			
DATE ORDER MADE AND ORDER			
		T/4 PHYSICS SECTION CONFIGURATION	AIR FORCE GEOPHYSICS LABORATORY
			E-12909



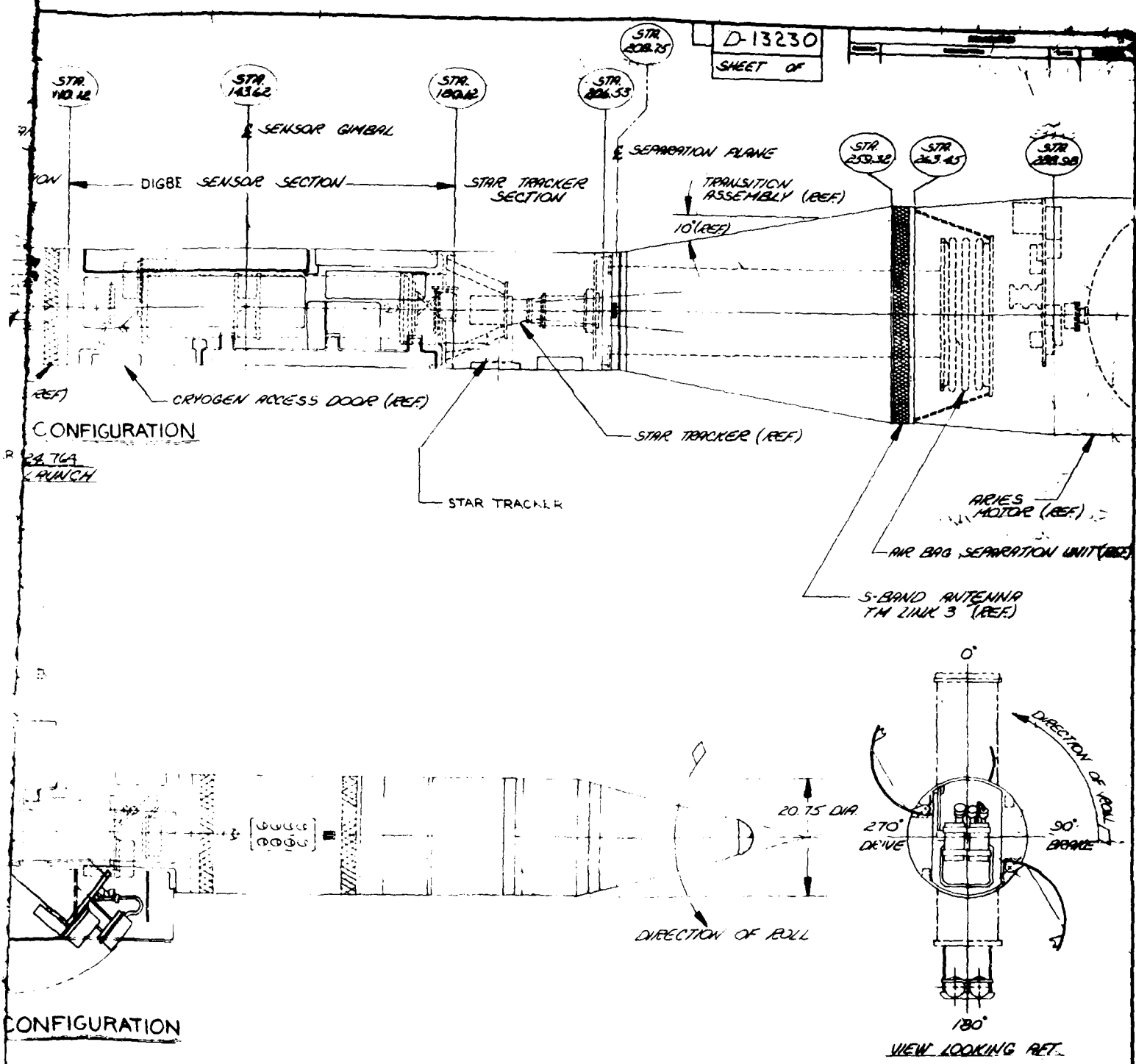
LAUNCH MODE CONFIGURATION

PAYLOAD ACATLA
DAY TIME LAUNCH



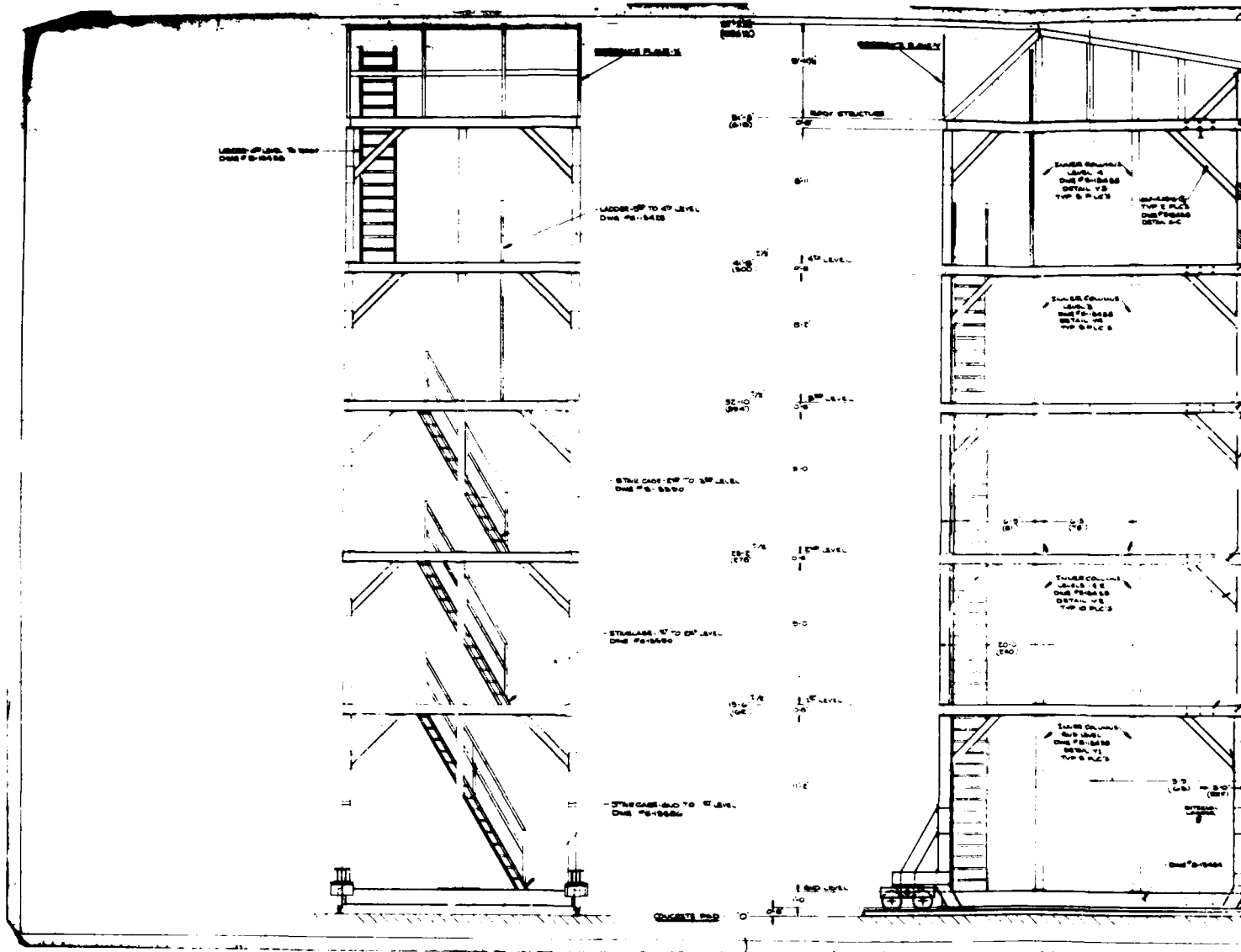
DATA MODE CONFIGURATION

1. FOR LIST OF SYSTEM SEGMENTS, SEE SHEET 2 OF 2.
NOTE:

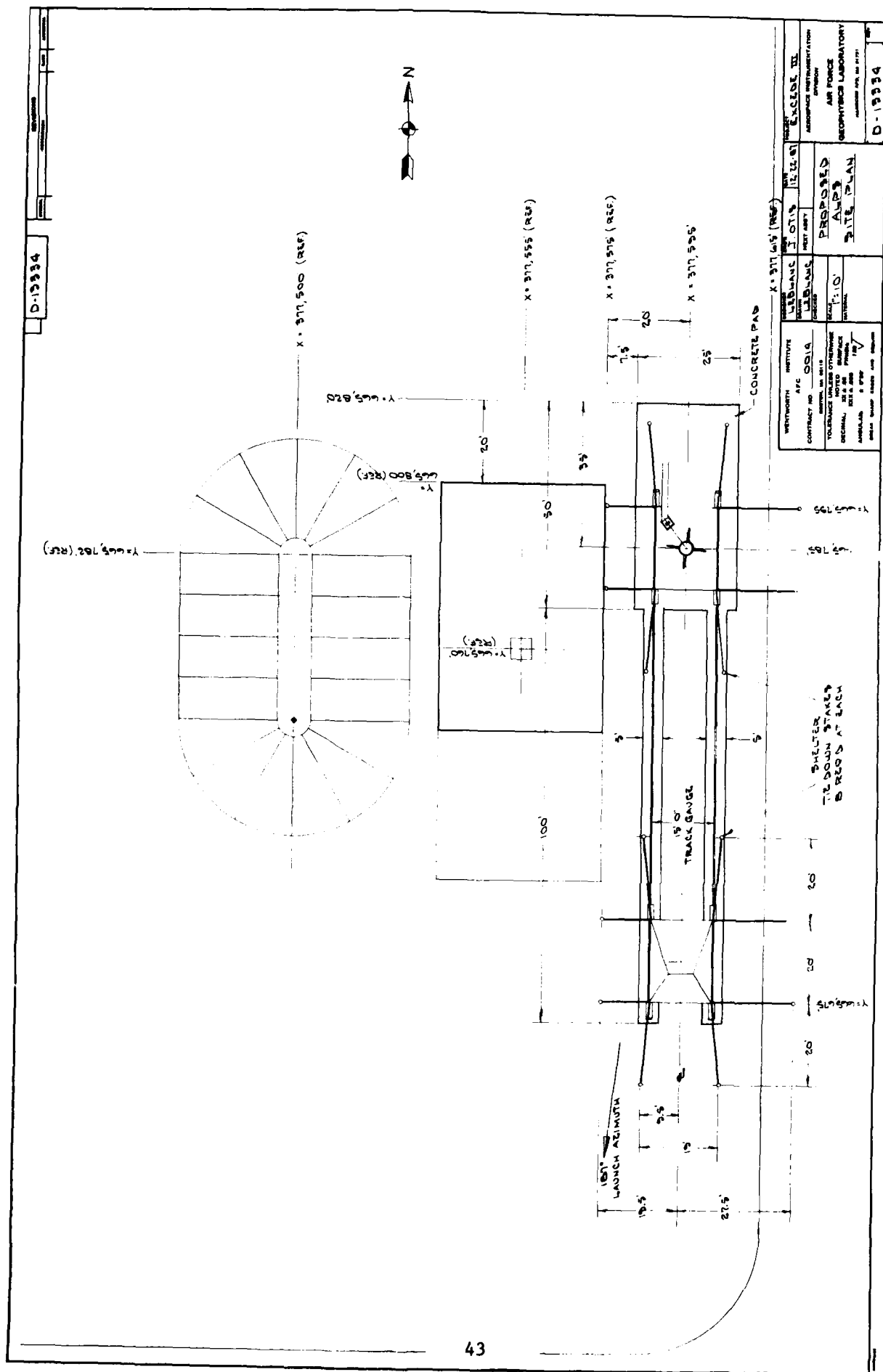


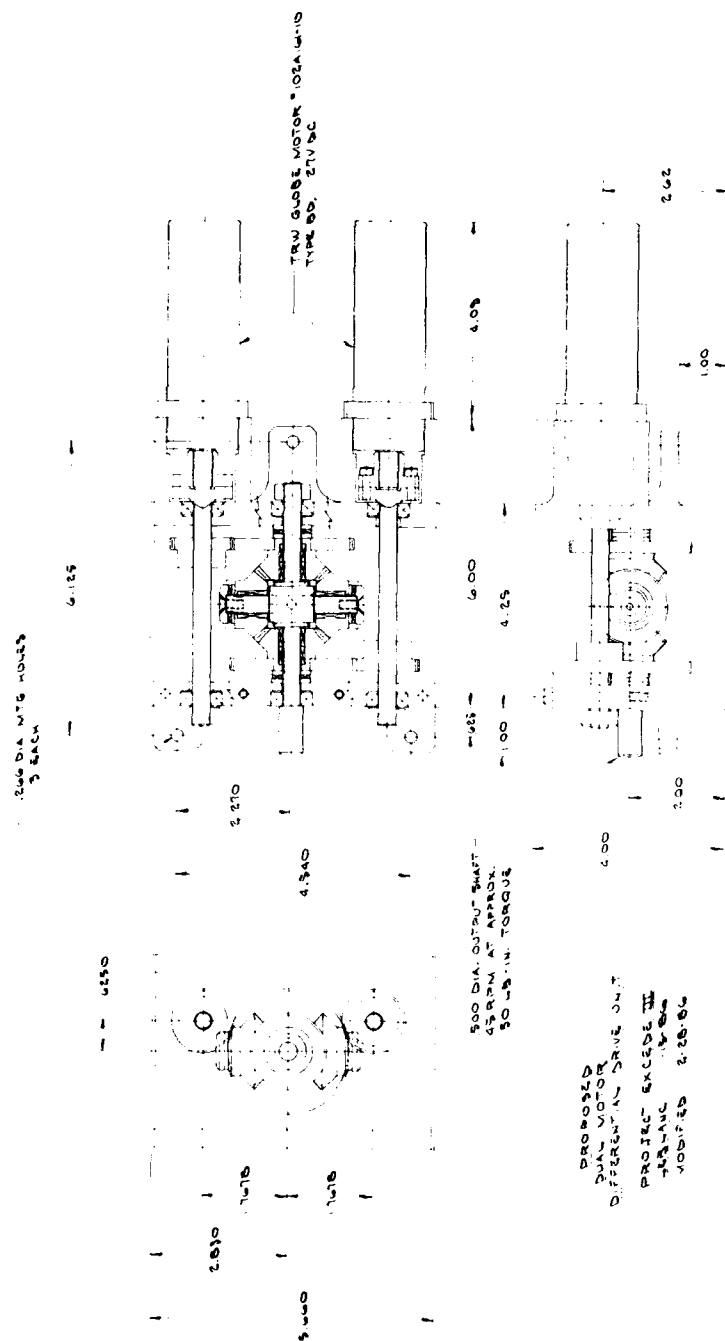
CONFIGURATION

WENTWORTH INSTITUTE	P. HARTNETT	10-21-87	DIGBE A-24-764
APC	P. HARTNETT	WEST ARMY	A-11333
CONTRACT NO. -0014	SCALE 1/10	CONFIGURATION	
DESIGN BY 0010	DATE	DWG.	
TOLERANCE UNLESS OTHERWISE	1/10	DIGBE PAYLOAD	
INDICATED BY SURFACE	1/10	D-13230	
INDICATED BY SURFACE	1/10		
ANGULAR ± 0.05	1/10		
OTHER GROUP CODE AND OTHER	1/10		







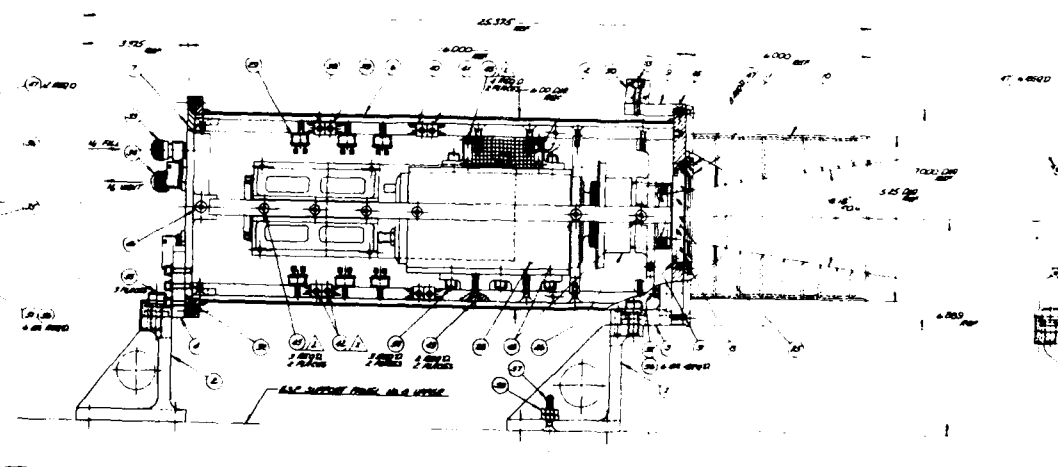
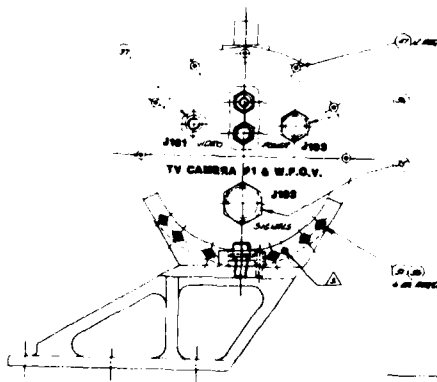
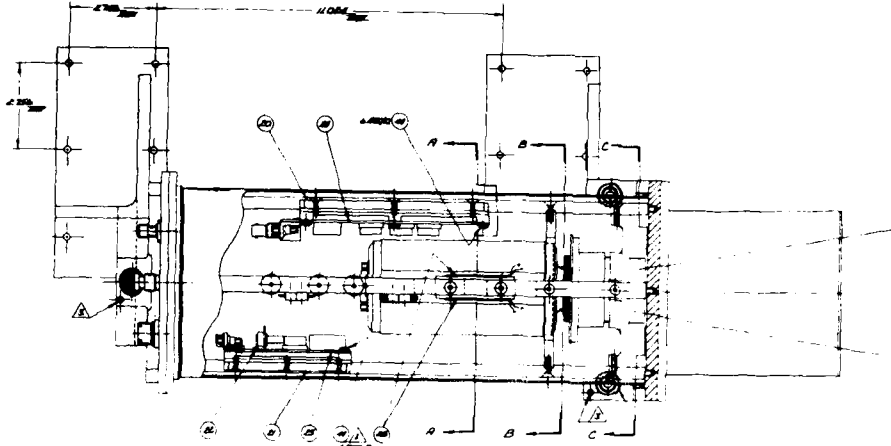


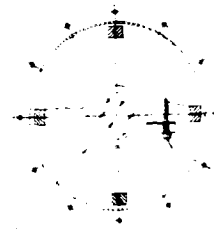
△ THE FOLLOWING LIST SHOWS "STORY" IN ORDER
OF RECORDING FOR REPRODUCIBLE PHOTOGRAPHY.

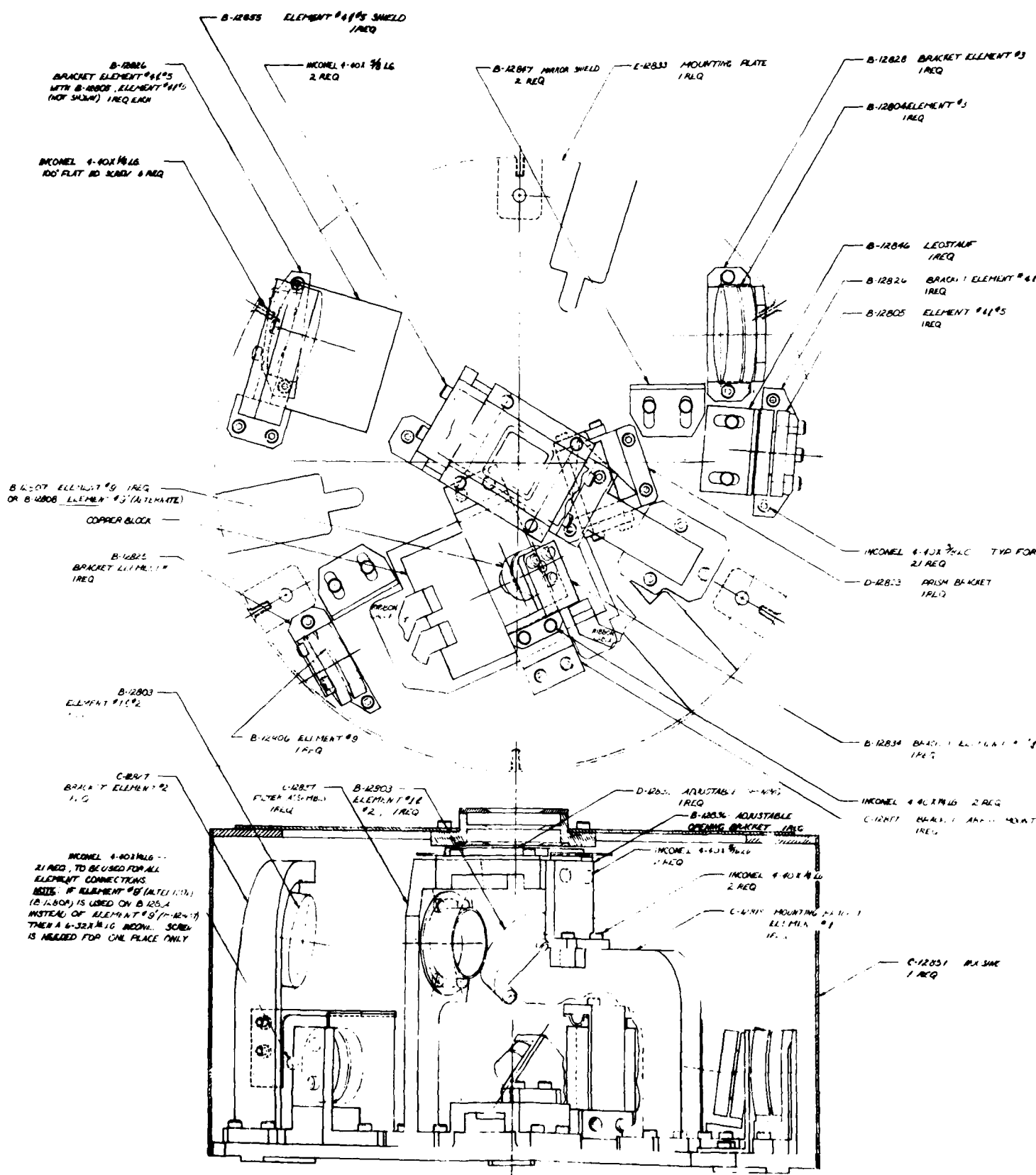
△ REPRODUCIBLE STORY FORM:

STORY # 01: 1" x 1" x 1"
STORY # 02: 1" x 1" x 1"
STORY # 03: 1" x 1" x 1"
STORY # 04: 1" x 1" x 1"
STORY # 05: 1" x 1" x 1"
STORY # 06: 1" x 1" x 1"
STORY # 07: 1" x 1" x 1"
STORY # 08: 1" x 1" x 1"
STORY # 09: 1" x 1" x 1"
STORY # 10: 1" x 1" x 1"

△ FROM THIS PLANNING FOR STORY 1 TO STORY 2, STORY 3 TO STORY 4,
STORY 5 TO STORY 7, STORY 8 AND 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.



[illegible]



E12496
MACHINING DWG
WELDMENT BOX BASE
REF

TUBE (A) R

TUBE (B) T

LIGHT FROM TELESCOPE

SECTION A-A

(5) 4 PLACES

(4) 2 PLACES

(19)

(4)

(15)

(3)

(4)

(3)

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(1) 2 PLACES

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E-12440

5 4 PLACES

11 2 PLACES

19

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43

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5 2 PLACES

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48	A-12501	2	LED HOLDER	ALUM
43	D-12444	1	MT MIRROR ASSEMBLY	SEE DWG
42	D-12444	1	LINEAR POSITION TRANSDUCER, COX, 4" TRAVEL	SEE DWG
41	D-12444	1	3.00" 1/2" PORE LENGTH, COX H.D., SPARE ST	SEE DWG
40	D-12444	1	3.00" 1/2" PORE LENGTH, COX H.D., SPARE ST	SEE DWG
39	S108-230	1	TRUNC RETAINING RING	SEE DWG
38	E1-3	1	PRECISION BALL BEARING, 3/16" ST, 1000-7	SEE DWG
37	B1115	1	OUT INAPPROPRIATE BEARING BEARING	SEE DWG

SUPPLIER

TUBE (A) R

TUBE (B) T

SUPPLIER

36	B1113	1	OUT INAPPROPRIATE BEARING BEARING	SEE DWG
35	21-4	4	CLOSED LINEAR BEARING PL SERIES	SEE DWG
34	A3-120	2	3.00" 1/2" PORE LENGTH, COX H.D., SPARE ST	SEE DWG
33	3-151	1	BRASS SPUR GEAR, 48DP, 18T, 10PD, 14PA	SEE DWG
32	3-151	1	BRASS SPUR GEAR, 48DP, 18T, 10PD, 14PA	SEE DWG
31	2602004	1	DRIVE MOTOR MODEL T 2 RPH	SEE DWG
30	D12419	2	PM HOUSING ASSEMBLY & DETAILS	SEE DWG
29	A12443	1	CAM PROFILE	ALUM
28	C12417	1	THREADED ADAPTER	ALUM
27	C12416	1	FRONT PANEL TELESCOPE	ALUM
26	C12415	1	MOTOR MOUNT	ALUM
25	C12414	1	CARRIAGE BLOCK	ALUM
24	C12413	1	ADJUSTABLE MIRROR HOLDER	ALUM
23	C12412	1	BASE PLATE FOR PM TUBES	ALUM
22	B12411	1	THREADED LOCKRING	ALUM
21	B12410	1	RETAINING RING	ALUM
20	B12409	1	THREADED RING	ALUM
19	B12407	1	REAR MIRROR HOLDER	ALUM
18	B12406	1	IDER BARCL "E" SHAFT GARDER	ALUM
17	1-2405	1	FRONT BAR SUPPORT	ALUM
16	B12404	1	REAR BAR SUPPORT	ALUM
15	B12403	1	CAM SHAFT BEARING BLOCK	ALUM
14	B12402	1	PM TUBE MOUNT REAR RING	ALUM
13	B12401	1	PM TUBE MOUNT FRONT RING	ALUM
12	B12400	1	FIRST APERTURE PLATE	ALUM
11	B12399	1	ASSEMBLY FIRST MIRROR MOUNT	SEE DWG
10	H12398	1	FIXED SPRING HOLDER	ALUM
9	H12397	1	CAM DRIVE SHAFT	SEE DWG
8	A12396	2	STOP	303 ST. ST
7	A12395	1	MOVING SPRING HOLDER	ALUM
6	A12394	2	POTENTIOMETER SHAFT CLAMP	ALUM
5	A12393	4	STAND OFF	ALUM
4	A12392	2	LINEAR BEARING RETAINER PLATE	ALUM
3	A12391	2	LINEAR BEARING SPACER	ALUM
2	A12390	1	POT SPACER	ALUM
1	A12389	1	MIRROR FILTER RETAINING PLATE	ALUM

ITEM	PART NO	QTY	DESCRIPTION	PROTS LIST
1	A-12501	2	LED HOLDER	ALUM
2	D-12444	1	MT MIRROR ASSEMBLY	SEE DWG
3	D-12444	1	LINEAR POSITION TRANSDUCER, COX, 4" TRAVEL	SEE DWG
4	D-12444	1	3.00" 1/2" PORE LENGTH, COX H.D., SPARE ST	SEE DWG
5	D-12444	1	3.00" 1/2" PORE LENGTH, COX H.D., SPARE ST	SEE DWG
6	S108-230	1	TRUNC RETAINING RING	SEE DWG
7	E1-3	1	PRECISION BALL BEARING, 3/16" ST, 1000-7	SEE DWG
8	B1115	1	OUT INAPPROPRIATE BEARING BEARING	SEE DWG
9	B1113	1	OUT INAPPROPRIATE BEARING BEARING	SEE DWG
10	21-4	4	CLOSED LINEAR BEARING PL SERIES	SEE DWG
11	A3-120	2	3.00" 1/2" PORE LENGTH, COX H.D., SPARE ST	SEE DWG
12	3-151	1	BRASS SPUR GEAR, 48DP, 18T, 10PD, 14PA	SEE DWG
13	3-151	1	BRASS SPUR GEAR, 48DP, 18T, 10PD, 14PA	SEE DWG
14	2602004	1	DRIVE MOTOR MODEL T 2 RPH	SEE DWG
15	D12419	2	PM HOUSING ASSEMBLY & DETAILS	SEE DWG
16	A12443	1	CAM PROFILE	ALUM
17	C12417	1	THREADED ADAPTER	ALUM
18	C12416	1	FRONT PANEL TELESCOPE	ALUM
19	C12415	1	MOTOR MOUNT	ALUM
20	C12414	1	CARRIAGE BLOCK	ALUM
21	C12413	1	ADJUSTABLE MIRROR HOLDER	ALUM
22	C12412	1	BASE PLATE FOR PM TUBES	ALUM
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38	A12395	1	MOVING SPRING HOLDER	ALUM
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40	A12393	4	STAND OFF	ALUM
41	A12392	2	LINEAR BEARING RETAINER PLATE	ALUM
42	A12391	2	LINEAR BEARING SPACER	ALUM
43	A12390	1	POT SPACER	ALUM
44	A12389	1	MIRROR FILTER RETAINING PLATE	ALUM