FILE COPY

T10/SNA --233

Technical Document Center

NUCLEAR DIVISION

C002-DS090267-F1

ENGINEERING DESIGN SHEET SPECIFICATION

PERFORMANCE/DESIGN AND
PRODUCT CONFIRMATION REQUIREMENTS

FOR

UPPER THRUST STRUCTURE

FORMING A PART OF
CEI NUMBER 090290A

PRELIMINARY PROPOSAL ISSUE

DATED 12-15-69

FOR REVIEW ONLY. DO NOT IMPLEMENT.

MASTER

AEROJET-GENERAL CORPORATION

SACRAMENTO, CALIFORNIA

TECHNICAL DOCUMENT CENTER
Nuclear Rocket Operations

DISTRIBUTION OF THIS DOCUMENT UNLIMITED

DOC. NO.

11-1963

AGCS 0120-48

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

AEROJET-GENERAL CORPORATION
CODE IDENT. NO. 05824

Data Item Identification
No. C002-DS090267-F1

Design Sheet
Component Specification No. DS-90267

Part I of Two Parts
Page - 1 of 7

PERFORMANCE/DESIGN AND QUALIFICATION REQUIREMENTS

for

UPPER THRUST STRUCTURE

Replace page(s) with the latest revised page(s) noted below. Revised paragraph(s) are identified with the latest revision letter (or number) in the margin.

REV LTR

Page DATE

No. ECP

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

DISTRIBUTION OF THIS DOCUMENT UNLIMITED

5

1. SCOPE

1.1 Scope.- This specification establishes the performance, design, test, and qualification requirements for equipment identified as the Upper Thrust Structure. It is a part of the subsystem described as the Thrust Structure Subsystem and is listed as a design critical component in detail specification EC-90152.

2. APPLICABLE DOCUMENTS

2.1 Aerojet-General Corporation Documents .- The following documents of the latest issue, from a part of this specification to the extent specified herein. In the event of conflict between documents referenced herein and other detailed content of Sections 3, 4, 5, and 10, the detailed requirements of Sections 3, 4, 5, and 10 shall be considered a superseding requirement.

SPECIFICATIONS

EC-90152	Thrust Structure Subsystem
CP-90290	Engine, NERVA, 75K, Full Flow

DRAWINGS

1136390	75K NERVA Flight Engine Full Flow Concept
---------	---

(Copies of above documents required by suppliers in connection with specific procurement functions should be obtained from the procuring activity.)

3. REQUIREMENTS

3.1 Performance.- Except as otherwise specified herein, performance requirements for this equipment shall be in accordance with EC-90152 of which this equipment is a part. The upper thrust structure shall be capable of performing as specified herein within the environmental conditions specified in 3.1.2.4.

3.1.1 Functional Characteristics.-

3.1.1.1 Transmit Engine Loads.- The Upper Thrust Structure shall be capable of transmitting engine thrust and/or inertia loads from the Gimbal Assembly Subsystem interfaces to the propellant tank thrust cone interface.

3.1.1.2 Transmit Gimballing Loads.- The Upper Thrust Structure shall be capable of transmitting loads produced through operation of the gimbal assembly subsystem.

3.1.2 Operability.-

3.1.2.1 Reliability.- The probability that this component shall successfully fulfill its operating requirements shall be a minimum of 0.999997.

3.1.2.2 Maintainability.-

3.1.2.2.1 Maintenance and Repair Cycles .- As specified in EC-90152.

3.1.2.2.2 Service and Access.- Capability at the stage interface of Upper Thrust Structure shall be provided for orientation and guiding the engine assembly during remote installation and removal within the test stand and/or remote attachment to the test stand.

3.1.2.3 Useful Life.- Same as EC-90152.

3.1.2.4 Environmental.- The Upper Thrust Structure shall be subjected to the natural environments specified in CP-90290 in addition to the following induced environments:

Specification No. DS-90267

- (a) Nuclear Radiation - See Table I.
- (b) Vibration, acceleration and shock - See Table II.
- (c) Acoustics - See Table II.

3.1.2.5 Transportability.-

3.1.2.5.1 Shipping.- As specified in EC-90152. In addition, the component shall be transportable as an individual component in any attitude by land, sea, or air shipment.

3.1.2.5.2 Handling.- As specified in EC-90152.

3.1.2.6 Human Performance.- Not applicable.

3.1.2.7 Safety.- As specified in EC-90152

3.2 CEI Definition.- Not applicable.

3.3 Design and Construction.- Except as otherwise specified herein, design and construction of this equipment shall be in accordance with 3.3 of EC-90152 of which this equipment is a part.

3.3.1 General Design.-

3.3.1.1 Configuration.- The Upper Thrust Structure external configuration shall conform to the envelope requirements of Drawing 1136390.

3.3.1.2 Structural Criteria.- As specified in EC-90152.

3.3.1.3 Physical Properties .- The weight of the Upper Thrust Structure when combined with the weights of the middle and lower thrust structure components and shield spacer shall not exceed the weight specified for the Thrust Structure Subsystem in EC-90152.

3.3.1.4 Structural Stiffness .- Structural stiffness of the Upper Thrust Structure when combined with the external shield, middle and lower thrust structures, and Gimbal Assembly Subsystem shall meet the requirements specified in EC-90152.

3.3.2 Selection of Specifications and Standards .- As specified in CP-90290.

3.3.3 Materials, Parts, and Processes .- As specified in CP-90290.

3.3.4 Standard and Commercial Parts .- As specified in CP-90290.

3.3.5 Moisture and Fungus Resistance.- As specified in CP-90290.

3.3.6 Corrosion and Metal Parts.- As specified in CP-90290.

3.3.7 Interchangeability and Replaceability .- As specified in CP-90290.

3.3.8 Workmanship.- As specified in CP-90290.

3.3.9 Electromagnetic Interference .- Not applicable.

3.3.10 Identification and Marking .- As specified in CP-90290.

3.3.11 Storage.- The Upper Thrust Structure shall be capable of performing as specified herein subsequent to storage while protected from the ground environmental conditions specified in 3.1.2.4 for a period not exceeding the ground storage life specified in 3.1.2.3.

TABLE I
INDUCED NUCLEAR RADIATION

Description	Location Sta R		Flight*		Ground Engine *	
			Gamma Kerma Rate Rads/Hr	Fast Neutron Flux n/cm ² -sec	Gamma Kerma Rate Rads/Hr	Fast Neutron Flux n/cm ² -sec
UTS/Linear Drive Mechansim Interface	0.6	41.2	1.5×10^6	8.1×10^{10}	2.9×10^6	1.2×10^{11}
UTS/Stage Interface	2.1	2.4	1.5×10^6	1.1×10^{11}	2.9×10^6	1.5×10^{11}
UTS	16.8	28.5	1.5×10^6	1.1×10^{11}	2.9×10^6	1.5×10^{11}
UTS/Gimbal Pivot Interface	16.8	3.3	1.8×10^6	1.3×10^{11}	3.2×10^6	1.7×10^{11}

*No external shield, unperturbed

TABLE II
INDUCED DYNAMICS ENVIRONMENT

<u>Mode</u>	<u>Acceleration, g's</u>		<u>Vibration, g's</u>		<u>Shock</u>	<u>Acoustic</u>
	<u>Axial</u>	<u>Lateral</u>	<u>Axial</u> <u>3 - 35 Hz</u>	<u>Lateral</u> <u>0.1 - 15 Hz</u>		
(a) Launch	5.2	± 1.0	± 2.25	± 1.5		As specified in CP-90290
(b) Operation						

Specification No. DS-90267