DATA ITEM DESCRIPTION

Form Approved
OMB No. 0704-0188

1. TITLE	2. IDENTIFICATION NUMBER
MATHEMATICAL MODEL FINITE ELEMENT STRUCTURE REPORT	DI-GDRQ-81256B

3. DESCRIPTION/PURPOSE

3.1 This information describes the data elements and the format of the finite element model structures. This data will be used to verify the contractor's structural analysis and design. This data is extremely valuable in assessing the contractor's results, for future studies and if modifications are to be made to the system being analyzed.

4. APPROVAL DATE *(YYMMDD)*	5. OFFICE OF PRIMARY RESPONSIBILITY (OPR)	6a. DTIC APPLICABLE	6b. GIDEP APPLICABLE
970124	F/WL-DOR	X	

7. APPLICATION/INTERRELATIONSHIP

7.1 This Data Item Description (DID) contains the content and format preparation instructions for the data product generated by the specific and discrete work task requirements as delineated in the contract.

7.2 This DID is applicable when analyses are carried out by the finite element method.

7.3 This DID is mandatory when DI-GDRQ-81257A is cited in the contract.

7.4 This DID supersedes DI-GDRQ-81256A.

(Continued on page 2)

8. APPROVAL LIMITATION	9a. APPLICABLE FORMS	9b. AMSC NUMBER
		F7232

10. PREPARATION INSTRUCTIONS

10.1 FORMAT. Contractor format is acceptable.

10.2 CONTENT. The data shall contain the following information:

10.2.1 Static analysis. Shall describe a stiffness representation, and when loading or inertial relief conditions are specified, a mass representation shall also be included. This mass representation shall include both structural and non-structural mass distributions. The static analysis finite element analysis shall describe:

(Continued on page 2)

11. DISTRIBUTION STATEMENT

DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

Block 7, Application/Interrelationship (Continued)

7.5 The address for Defense Technical Information Center (DTIC) submittals is:

DEFENSE TECHNICAL INFORMATION CENTER
8725 JOHN J. KINGMAN RD, SUITE 0944
FT BELVOIR VA 22060-6218

Block 10, Preparation Instructions (Continued)

10.2.1.1 Geometry. To include:

a. Grid point coordinates
b. Element types
c. Coordinate systems.

10.2.1.2 Element Properties. To Include:

a. Thicknesses
b. Cross-sectional areas
c. Moments of inertia's
d. Torsional constants.

10.2.1.3 Material Properties. To include:

a. Isotropic
b. Anisotropic
c. Fiber reinforced composites
d. Temperature dependent properties
e. Stress dependent properties
f. Thermal properties
g. Damping properties
h. Other properties as required for special problems.

10.2.1.4 Boundary conditions. To include:

a. Single point constraints
b. Multiple point constraints
c. Partitioning for reduction or substructuring.

Block 10, Preparation Instructions (Continued)

10.2.1.5 Loading. To include:

a. Static loads
b. Gravity loads
c. Thermal loads
d. Centrifugal loads
e. Other loading conditions as required for special simulations.

10.2.2 Dynamic analysis. This shall describe the geometry, element properties, material properties, and boundary conditions as described for the dynamic analysis. An accurate, nonstructural mass and damping representation shall be included. All dynamic reduction and model reduction information shall be detailed.

10.2.2.1 Normal modes analysis and complex eigenvalue analysis. This shall specify the method of eigenvalue analysis and the frequency (modes) range of interest.

10.2.2.2 Frequency response analysis. This shall specify the frequencies of interest.

10.2.2.3 Transient response analysis. This shall define the dynamic load as a function of time or as tabular values.

10.2.2.4 Random response analysis. This shall specify the statistical nature of the input and the statistical nature of the quantities of the output desired.

10.2.3 Aeroelastic analysis. This shall describe the mathematical models of the structure and the aerodynamics. The structure shall be represented by the Finite Element Models (FEM).

10.2.3.1 Structure analysis. This shall describe the following:

a. Mass: to include structural and nonstructural distributions.
b. Stiffness.
c. Damping.

10.2.3.2 Aerodynamic analysis. This shall describe the following:

a. Panel geometry or equivalent which covers all lifting surfaces including the control surfaces, the empennage (vertical and horizontal tails and canard surfaces).
b. Modeling of the fuselage slender body and interference panels data shall be included to represent the flowfield adequately.
c. The altitude (air density), mach number and other relevant aerodynamics parameters shall be specified.
d. The details of the aerodynamic theory and the limits of its validity shall be clearly defined
e. Data for the force and displacement transformations from the structural grid to the aerodynamic grid and from the aerodynamic grid to the structural grid shall be included.

f. The special techniques of the flutter analysis shall be defined in terms of the ranges of the aerodynamic parameters and shall be included for the aeroelastic analysis and for the efforts of the rigid body modes on the flutter model (body freedom flutter). The sensor actuator locations and their range of operations and limitations shall be included. A flight control system block diagram shall be included to show all transfer functions and gains using S-domain variables for analog systems or Z-domain variables for digital systems. The units of important parameters shall be specified.

10.2.4 Optimization analysis. This shall describe the following:

a. Definition of the objective function (structural weight typically).
b. Constraint functions.
c. Design variables.
d. Allowable values specified for all constraints shall be derived from the design criteria.
e. Relationship between design variables and their corresponding elements shall be identified and included.
f. The rationale for the design variable grouping or shape functions shall be explained when design variable linking is used.

10.2.5 Control analyses. This shall specify and describe the control law including:

a. The control feedback.
b. Sensor and actuator locations.
c. Block diagrams necessary for locations identification.
d. Additional points defined on the model for control response shall be clearly defined.