

**QCS-4**  
**AUGUST 2001**  
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**GENERAL DYNAMICS**  
**LAND SYSTEMS DIVISION**

**QUALITY TEST SPECIFICATION**

**QCS-4**

**FOR**

**FIRST ARTICLE APPROVAL**

**REQUIREMENTS FOR TESTING COMPONENTS**

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**GENERAL DYNAMICS  
LAND SYSTEMS DIVISION  
QCS-4  
FIRST ARTICLE TEST (F.A.T.)  
Requirements for Testing Components**

**1.0 DEFINITIONS**

1.1 Technical Data Package (TDP) Dimensional, material, process, environmental, inspections and performance requirements as specified by the drawing, Quality Assurance Requirement (QAR) / Quality Assurance Provision (QAP) document, GDLS specification and/or military / commercial specification.

1.2 First Article Sample A production component (s) submitted as being representative of a specific process using production tooling, equipment, methods, technique, standards, personnel and controls.

1.3 First Article Approval (F.A.A.) First Article Approval is defined as the approval of the requirements of 1.4, First Article Inspection (F.A.I.), and 1.5, First Article Test (F.A.T.).

1.4 First Article Inspection (F.A.I.) Verification that the First Article samples manufactured using the normal production process (planning, technical /work instructions, material processing systems and controls, tools, fixtures, test equipment and personnel proficiency) will produce a component in compliance with all TDP requirements (such as drawing dimensional characteristics, material content meet the physical and performance requirements of the TDP such as drawing dimensional characteristics, material content, process, capability and performance.

1.5 First Article Test (F.A.T.) Tests conducted to verify that the First Article samples meet the performance requirements of the TDP before, during and after all specified environmental and durability/endurance conditions.

1.5.1 Mini-F.A.T. Reduced scope F.A.T. which may be used to verify changes to process, material, location, sub-tier suppliers or design. Normally the test does not consume the component life and may be shipped upon test approval.

1.6 Test Plan The document developed by the vendor or subcontracted testing facility that will be utilized to test a component to the requirements specified in the TDP. The document shall contain all the applicable test setups, equipment, references to drawings, etc. required to provide sufficient information of the intended use of test equipment required when performing the testing of the components to the requirements of the TDP.

**2.0 APPLICABLE DOCUMENTS**

2.1 Government Documents

MIL-HBK-831	Preparation Of Test Reports
MIL-STD-45662	Calibration System Requirements

2.2 GDLS Documents

QCS 83-4 Supplier Requirements For Completion of First Article Inspection

### **3.0 GENERAL BID REQUIREMENTS AND OPTIONS**

The bidder shall include the following requirements, as a minimum, with the Request for Quote (RFQ):

#### **3.1 First Article Test Costs**

Individual costs for the entire First Article Test Program including hardware, fixtures, equipment, test procedure development, itemized cost by test parameter and test report preparation. These costs shall be quoted separately from cost of production hardware.

##### **3.1.1 Test Facilities**

Facilities to be utilized in performance of the First Article Test, if known at the time of the Request For Quote (RFQ) response, shall be identified in the quotation, giving the facility name, location, contact, and phone number. If the above information is not known at the time of the RFQ response, it shall be provided no later than 30 days after receipt of the F.A.T. requirement notification, by activation of a purchase order line item requiring final test report submission to GDLS.

##### **3.1.2 GDLS Bid Options**

It is GDLS' option to request or obtain competitive bids for the First Article Test and to have such test performed by another independent test laboratory. This bidding will be based on geographical location, scheduling, qualifications, and price. If competitive bids are requested, a list of approved laboratories will be provided. Should GDLS elect to remove testing from the assigned supplier paragraph 5.3 applies.

#### **3.2 Disposition of Fixtures and Equipment Procured for Test Conductance**

**3.2.1 Identification of Property** All test fixtures, and ancillary equipment (not otherwise required for production and/or acceptance test), purchased or charged to this contract will be identified and brass-tagged as the property of the United States Government, and shall be purchased under a separate GDLS tooling contract.

**3.2.2 Test Fixture and Equipment Maintenance/Calibration** Except as otherwise expressly provided under this document, the Contractor is responsible for the maintenance and calibration of all inspection and test equipment necessary to assure that supplies and services conform to contract requirements. Commercial, modified commercial, or supplier designed inspection or measuring set ups must be capable of repetitive measurements to an accuracy of 10 percent of the component tolerance. If this degree of accuracy cannot be obtained, contact Quality Test for disposition. Calibration of inspection and test equipment shall be in accordance with MIL-STD-45662. A log of instruments and equipment utilized during the entire test program shall be maintained and included within the final test report.

##### **3.2.3 Test Equipment Usage**

GDLS furnished test equipment shall be utilized solely for the tests specified in this contract unless written approval is provided by GDLS.

### 3.2.4 Test Fixture and Equipment Disposal

This equipment will be sent to GDLS at GDLS request, when it is no longer necessary for the test program.

## **4.0 TEST PLAN REVIEW AND FACILITY APPROVAL**

### 4.1 Test Plans

The supplier and/or test laboratory will write test plans. Questions on or requests for test plan formats should be forwarded to the Quality Engineering & Test department at the address/phone numbers shown below:

General Dynamics Land Systems  
38500 Mound Road  
Sterling Heights, MI 48310-3200  
Attn.: Quality Engineering & Test Dept., MZ 436-30-44

Telephone: (810) 825-4530 or 825-4424

FAX: (810) 825-7414 or 825-7148

#### 4.1.1 Test Plan Review

The supplier shall provide a written test plan to GDLS a minimum of thirty (30) days prior to the beginning of test. GDLS Quality Engineering and Test (QE&T) will review to provide exceptions and to ensure the required Scope of Work (SOW) is included within the test plan. GDLS QE&T will respond within two (2) weeks of receipt typically.

Upon final agreement, GDLS QE&T will provide notification to the supplier that the test plan is acceptable by GDLS for use (See Note 1). No formal Test Plan approval will be provided by GDLS.

#### **Note 1:**

The GDLS review does not exonerate the supplier of the responsibility of testing and complying with all the requirements of the applicable drawings and specifications.

## 4.2 Test Laboratory Approval

The GDLS Quality Test department will suggest laboratories upon request. It is solely the responsibility of the supplier to select an acceptable test laboratory that will provide the necessary service to test to the supplier supplied requirements.

### 4.2.1 Government Monitoring

Government representatives shall have the right to monitor any and all facets of the testing. Contracted laboratories must have Government delegation included in their purchase orders if so directed by the Government representative. A minimum of one (1) week notification of test start is to be provided to the Government representative to permit scheduling of monitoring activities.

## 4.3 Test Facility

GDLS Quality Test reserves the right to review and approve all test set-ups, equipment, laboratory procedures, and data sheets prior to start of testing.

4.3.1 Data Sheet Requirements Data sheets must consist of the specified **resultant values, disposition (passed / failed) and specification/QAR/QAP paragraph tested** unless otherwise authorized by GDLS Quality Test. Additionally, the data sheets for performance testing shall contain the following items:

- Part Name and Number
- Serial Number
- Date Of Test
- Test Start and Stop Time
- Name Of Environmental Test
- Test Parameter
- Actual Test Values
- Air Temperature
- Barometric Pressure
- Relative Humidity
- Technician/Engineer Signature
- DCAS stamp (if witnessed)
- GDLS stamp (if witnessed)

### 4.3.2 Automatic Test Equipment (ATE)

#### 4.3.2.1 ATE Validation

ATE equipment and/or software used to perform testing will be validated by GDLS prior to its incorporation in the test program. No change to the ATE hardware and/or software can be made without prior approval of GDLS. A revalidation of the changes made to either the software and/or hardware may be required by GDLS.

#### 4.3.2.2 ATE Software

ATE controlling software must be under the control of a configuration management system, which includes a document number, revision level, revision date, method of change documentation and change approval cycle. The software configuration level must be identified in the final test software report.

#### 4.3.2.3 ATE Data Printout

When actual values are not feasible, pass/fail entries shall be acceptable when accompanied by GDLS approved calibration/validation certifications which verifies the integrity of hardware and ATE software as it relates to all parameters under test, their specification limits, and resultant input/output values.

### **5.0 GENERAL SUPPLIER RESPONSIBILITIES**

#### 5.1 Purchase Orders for Testing

Should the supplier decide to perform all or part of these test requirements at an outside contracted laboratory, GDLS Quality Test will be notified and purchase order number(s) will be provided. The purchase order with the selected laboratory shall contain this document and any other pertinent GDLS contractual requirements to include government surveillance, when applicable, as part of its contractual language.

#### 5.2 Responsibility for Technical Requirements

The supplier is responsible to provide the laboratory with all the technical documentation required to perform the test, including but not limited to the test plan, drawings, specifications, QAPs, QARs, Engineering Change Proposals (ECP's), Change Requests (CR's), waivers and/or deviations.

#### 5.3 Laboratory Technical Support by Supplier

The supplier shall support these tests as required at any test facility utilized for these tests. The selection of an independent laboratory by GDLS does not relieve the supplier of any of its responsibility for his product's performance during these tests.

#### 5.4 Failure Analysis

The supplier has full responsibility for any failure analysis required on his components that fail tests.

### **6.0 TEST SAMPLE**

#### 6.1 Sample Selection

The local Government representative or GDLS will select the sample to be tested. The test samples will be selected from the first ten (10) production units manufactured unless otherwise specified by the GDLS purchase order or by Quality Test. Once the samples are selected for testing, no repair, adjustment, or modification is permitted without GDLS approval.

#### 6.2 First Article Inspection (F.A.I.)

A First Article Inspection must be successfully completed per GDLS QCS 83-4 prior to the start of F.A.T., unless otherwise authorized by GDLS Quality Test. The F.A.I. samples will be used for F.A.T. unless direction has been received from GDLS in writing.

#### 6.3 Disposition of Test Sample

Samples subjected to a F.A.T. are not usable as production hardware. They must be permanently identified (paint, stripe, etc.) and tagged "DO NOT USE". The supplier shall retain the tested hardware until after the test report approval and production contract completion, then request disposition in writing from GDLS. This hardware may not be disposed of unless so directed by GDLS.

##### 6.3.1 Mini-F.A.T

If a "MINI F.A.T." is performed, GDLS Quality Test will provide sample disposition to the supplier in writing.

### **7.0 TEST SCHEDULE AND START NOTIFICATION**

#### 7.1 Test Schedule

The schedule for performance of F.A.T. stated in the purchase order shall be followed unless otherwise approved by the GDLS Quality Test department. This schedule is based on the product delivery schedule and testing requirements specified in the product Technical Data Package (T.D.P.).

#### 7.2 Start Notification

The supplier and/or the laboratory performing the testing must notify the GDLS Quality Test Department a minimum of one (1) week prior to start of test.

### **8.0 TEST MONITORING**

#### 8.1 Visiting

GDLS and the Government reserve the right to visit the supplier's facility and/or test laboratory to monitor all or part of the required First Article Tests.

#### 8.2 Review of testing

Monitoring shall include, but not be limited to, reviewing test set-ups, monitoring the conductance of the test and review of/participation in failure analysis activities.



## **9.0 TEST INCIDENTS/FAILURES**

### 9.1 Definitions of Test Incidents/Failures

A test incident/failure shall be deemed to have occurred when it is noted that the test unit(s) do not conform within the specified limits of the QAR, QAP, or specification requirements, or it is observed that physical damage or deformation has occurred as a result of testing or other pre-test activities. GDLS reserves the right for final determination as to the occurrence of a test incident/failure.

### 9.2 Test Incident/Failure Notification

All incident/failures must be reported by telephone within 24 hours (1 working day) to GDLS Quality Test Department by the supplier and/or supplier's laboratory. Point of contact is included within the component test plan.

The telephone notification must be followed by written notification within 48 hours (2 working days).

### 9.3 Test/Hardware Disposition

After an incident/failure, the laboratory **shall not continue testing, disassemble the test set-up and/or sample** without GDLS Quality Test authorization. Phone contact must be maintained with the GDLS Quality Test Department for failure analysis and/or test restart.

### 9.4 Flash Report

A copy of the GDLS "Flash Report", initiated by Quality Test, will be forwarded to the supplier, reporting the status of the test incident, its effect on production hardware shipments as well as direction for failure analysis and retest/restart instructions as they become known. (See Attachment A [FLOW CHARTS FOR SUPPLIER RESPONSIBILITY FOLLOWING A TEST INCIDENT/FAILURE](#))

### 9.5 Supplier Failure Analysis

The supplier must submit a written failure analysis report outlining root cause, proposed corrective action and verification tests within two weeks of GDLS authorization to proceed with the failure analysis. The report format is at the supplier's option. This report requires GDLS Quality Test approval prior to Flash Report closeout,

9.5.1 During the failure analysis process, GDLS reserves the right to review/audit the supplier's facilities used in the manufacture/assembly of the components under test.

#### 9.5.2 Failure Analysis Method and Location

GDLS reserves the right to select the method and location of failure analysis.

#### 9.5.3 Supplier Responsibility

The supplier shall be responsible for all incident/failure close out actions, re-inspection, and retest when such test failure is deemed to be the supplier's responsibility (all activities that are non-T.D.P. related unless the supplier has control of the T.D.P.). These responsibilities will include, but not limited to:

- A. Test facility charges (i.e.. additional test, retest, etc.)
- B. Implementation of corrective action.
- C. Replacement of test samples if required.
- D. GDLS failure analysis on repeat test failures occurring after corrective action incorporation (i.e.. travel expenses, man-hours, etc.)

## **10.0 FINAL TEST REPORT**

### 10.1 Report Schedule

Test report preparation and data collection/organization must be concurrent with testing. Unless otherwise directed by GDLS Quality Test, two copies of the final test report is to be supplied to the GDLS Quality Test Department within fourteen (14) days after test completion.

### 10.2 Test Report Requirements

The test report must be in accordance with MIL-HBK-831 (See attachment "B" [TEST REPORT PREPARATION, CHECK LIST GUIDE](#)) and include the following information:

- A. Completed Test Report Configuration Summary Sheet (see attachment "B" [TEST REPORT PREPARATION, CHECK LIST GUIDE](#)), which identifies the revision level of the hardware and technical data package utilized for the test.
- B. Identification of the lot represented by the test when the FAT is utilized to satisfy a Control Test.
- C. List of test equipment utilized for all testing, including manufacturer/model, range, accuracy and calibration dates (last and next), as applicable.
- D. Specific data to document unit (test sample) performance before, during and after environmental exposure, where required. Actual data, which demonstrates conformance to the technical data package values and tolerances, is required. Recordings of "pass/fail" or "OK" without actual data are not acceptable, unless otherwise authorized by GDLS Quality Test (reference 4.3.2.3).
- E. Specific data to document and demonstrate environmental exposure in accordance with the technical data package requirements and tolerances.

1. Temperature/humidity environments - A legible, reproducible record (i.e., circular chart, strip chart, data logger recording) of time versus temperature for temperature environments, and time versus temperature and relative humidity level for humidity testing. Charts, recordings shall be annotated with the part name/number, date of test, point at which storage/operational tests start and complete, explanation of temperature/humidity profile anomalies and signature or stamp of test personnel.

2. Vibration Testing - Legible, reproducible logarithmic plots (i.e., "x-y" plotter or computer generated) of acceleration versus frequency, recorded from the input accelerometer, for at least one sweep in each axis (i.e., 5-500-5 hertz).

3. Shock Testing - Legible, reproducible recordings (photographs or computer generated plots) of calibration pulses and actual test sample pulses. Recordings of test sample pulses for one drop in each direction of each axis must be included in the report. The recordings must be of sufficient size and resolution to demonstrate compliance with the specified shock pulse tolerance envelope.

4. Salt Fog, chemical exposure, fungus, cleaning spray, sand and dust environments - The report shall contain sufficient detail to determine compliance with the specification requirements and the test levels and methods specified. When certification in lieu of an actual fungus test is permitted, the certification shall be supported by a previous fungus test performed on the same configuration part or by certification from component manufacturers using natural or synthetic materials.

F. Flash Reports, Failure Analysis reports and pertinent test program correspondence, as applicable.

G. A legible copy of the Ordnance drawing and equipment specification (i.e., Product Fabrication Specification, QAR/QAP, Military Standard) for the assembly tested. Also, legible copies of all applicable (subsequent) change documentation referenced in the purchase order (i.e., ECP's, M1A2 CR's, waivers, deviations).

H. A section/appendix for First Article Inspection documentation. This documentation shall include the GDLS Quality Material Report (QMR), the First Article Inspection Report (FAIR) form QCS-16 (including checklists) and any certifications required by the equipment specification.

### 10.3 Test Report Approval

GDLS Quality Test will approve or comment to the report content in writing. Upon agreement of the report content by the supplier/test laboratory and GDLS, GDLS will approve or submit the report for government approval, as appropriate. If government approval is required, formal approval should be forthcoming 30 days after receipt by the government.

### 10.4 Test Data Retention

Test data and records of the test performed by the supplier (laboratories) and the complete project file including all documentation shall be kept complete and available to GDLS and the Government for a period of five (5) years following the completion of the test program.

## **11. INVOICE PAYMENT**

11.1 Progress Payments. Progress payments for testing or hardware shipments may be withheld for undue delays, such as:

- A) Failure to start or complete testing per purchase order schedule.
- B) Overdue failure analysis response beyond 2 weeks.
- C) Overdue report submission or revision.

### 11.2 Final Invoice Payments

No invoices for First Article Test will be approved for payment until GDLS approves or receives final Government approval of the F.A.A. Invoices for First Article Tests must be submitted separately from other invoice costs.

## **12.0 TEST REQUIREMENT FULFILLMENT BY REPRESENTATIVE PARTS**

### 12.1 Identification of a Family of Parts

If the supplier produces more than one type of component which is subject to the same specification (i.e., wiring harness assemblies, tubes, fittings, etc.) and the manufacturing and assembly processes are similar for all types, then the requirement for component First Article may be satisfied on each type by subjecting one representative type to the required testing. The Government and GDLS reserves the right to select the type by part number, which shall be tested.

### 12.2 Representative Part Identification

The purchase order will designate parts that are represented by the representative part number. The test report for the tested part number shall also show those part numbers that it represents as defined by the purchase order. Any flash reports, waivers/deviations, corrective action reports, etc. shall reference those parts that were represented.

### 12.3 Test Failure on Representative Part

Any test failure on the representative type shall be considered to be a failure on all other types unless evidence, satisfactory to GDLS and the Government, is provided by the vendor that the failure is unique to the type tested.

## **13.0 CHANGE TO COMPONENT DESIGN, MATERIALS, MANUFACTURING PROCESS OR MANUFACTURING LOCATION AFTER FAT APPROVAL**

### 13.1 Hardware and/or Process Changes

Notwithstanding any other contractual requirements, if after the acceptance of the first production item, which by specification, QAR, or QAP requires First Article Approval, the supplier or his subcontractor(s) elects to change the design (if the supplier/subcontractor or his subcontractor(s) has design control of the item), materials, the manufacturing or assembly process, or the source of supply, the supplier shall perform, at the supplier's expense, another F.A.I. and F.A.T. in accordance with the applicable specifications, QAR or QAP prior to GDLS/Government acceptance of any items containing the new components. The supplier shall transmit all changes to GDLS with sufficient lead-time to allow for completion of F.A.A. prior to implementation so as not to adversely impact production deliveries. Information shall include reasons/rational for change and results of any testing conducted to validate performance of change to the TDP.

### 13.2 Relocation of Manufacturing Site

The supplier (subcontractor) or his subcontractor(s) may decide that their manufacturing site must be relocated. A location change notice must be submitted in writing with an explanation of the changes and the supplier's recommendation for F.A.A. re-testing that may be required. GDLS will inform the supplier, in writing, of their decision on F.A.A. testing required by the change. After agreement with GDLS, the supplier may then make the change.

#### 13.2.1 New Site Audit

The location change may necessitate an audit from GDLS personnel. The supplier may have to perform GDLS designated acceptance and/or F.A.A. testing to verify that the location change has not affected his product as specified by the technical documentation.

### 13.3 Retest Cost

The costs associated with any re-tests required as a result of any of the aforementioned changes and all associated costs and time required by GDLS personnel to verify/approve these test shall be borne by the suppliers (subcontractor) or their supplier / subcontractors.

### 13.4 Hardware Shipments

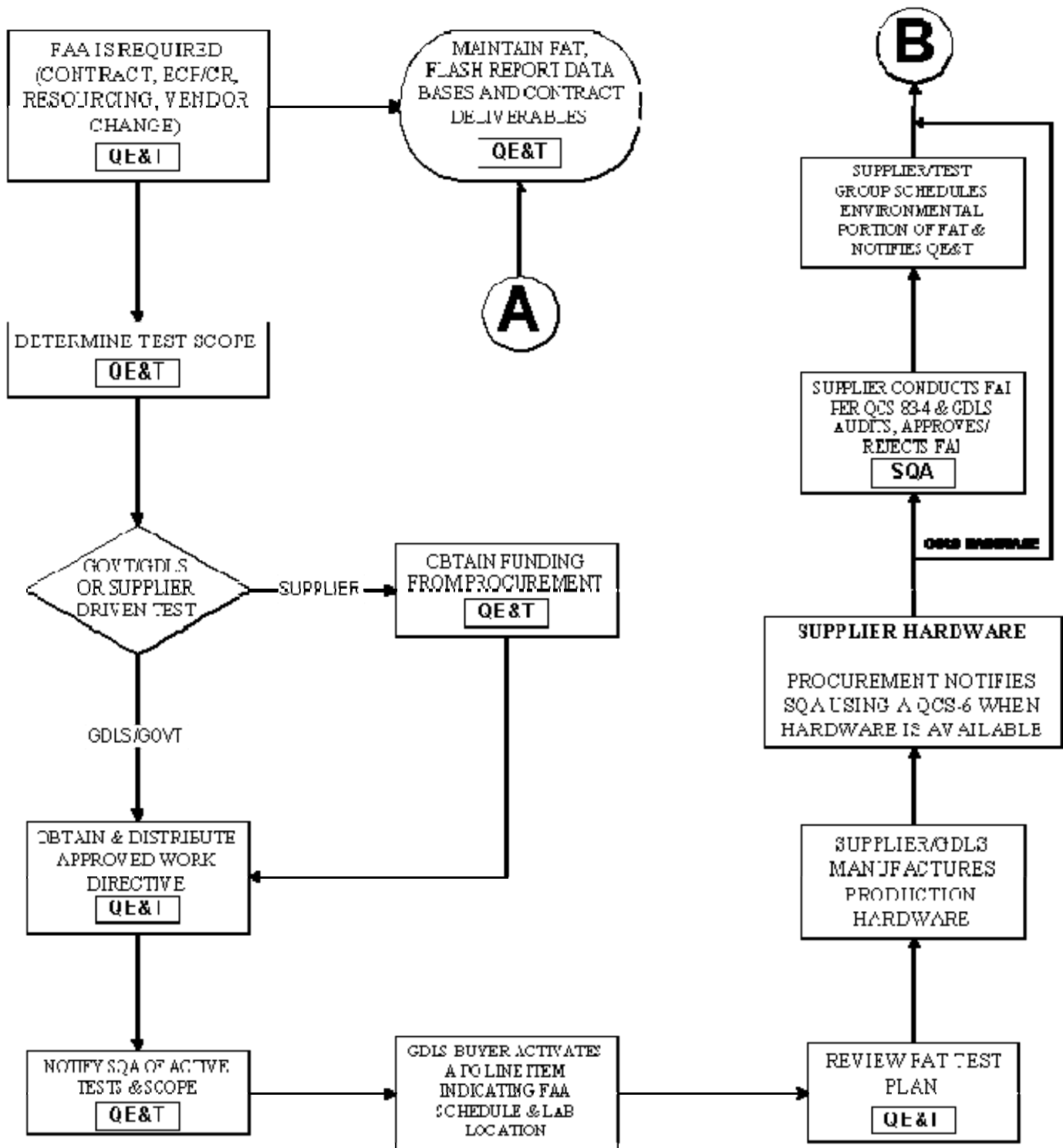
If any of the aforementioned changes are made, hardware cannot be shipped prior to F.A.A. completion and approval unless authorized in writing by GDLS.

### 13.5 Request for Waiver of Retest

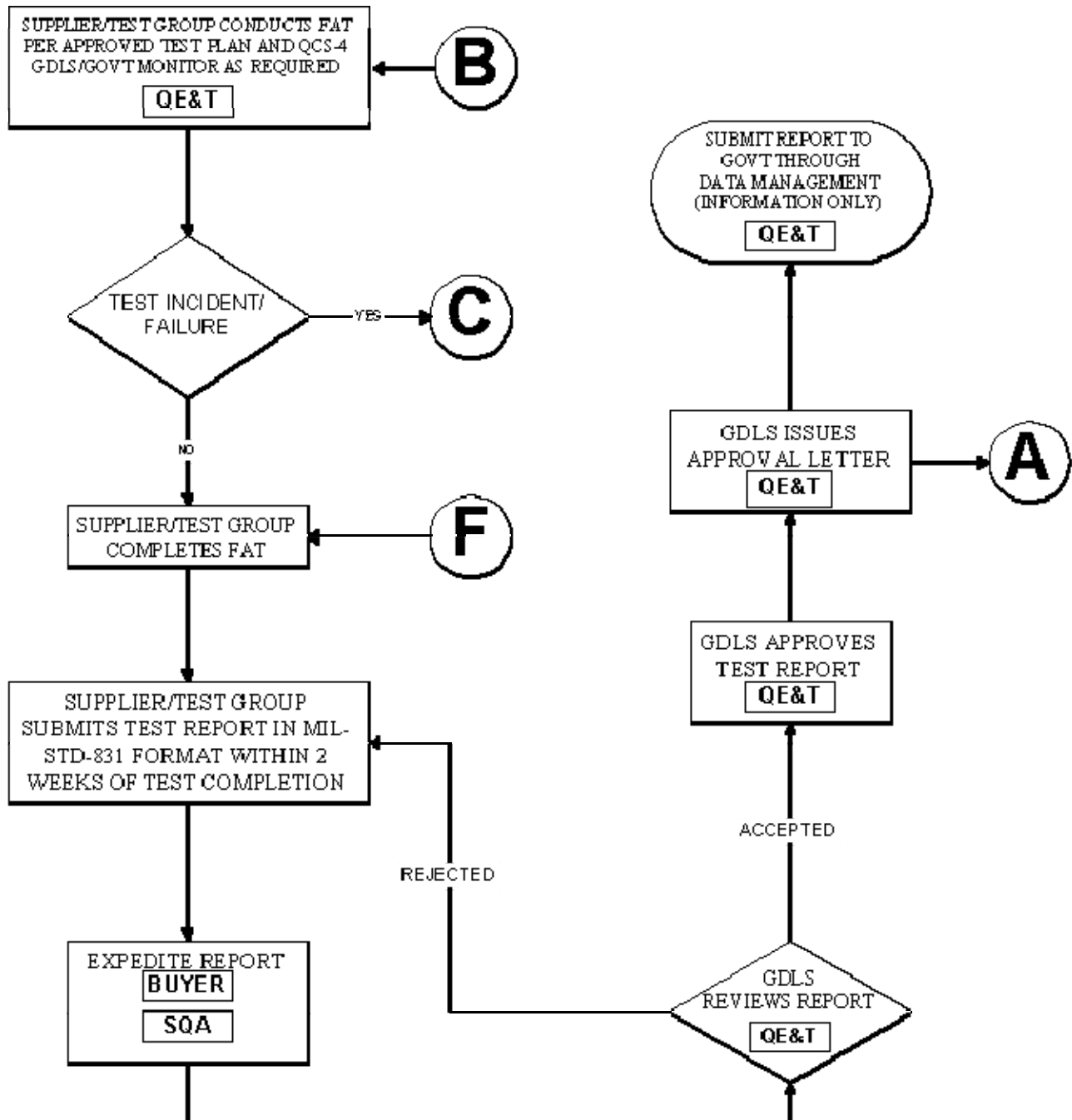
The supplier may request a waiver of the new First Article Approval or of specific test requirements. The request shall provide a detailed technical explanation as to why the change does not affect the performance and reliability of the component or why reduced scope testing is sufficient (e.g.; F.A.I., control test, high & low temperature only, etc.). The request must be submitted in a timely manner, so that production or delivery delays will not occur if GDLS or the Government disapproves the waiver.

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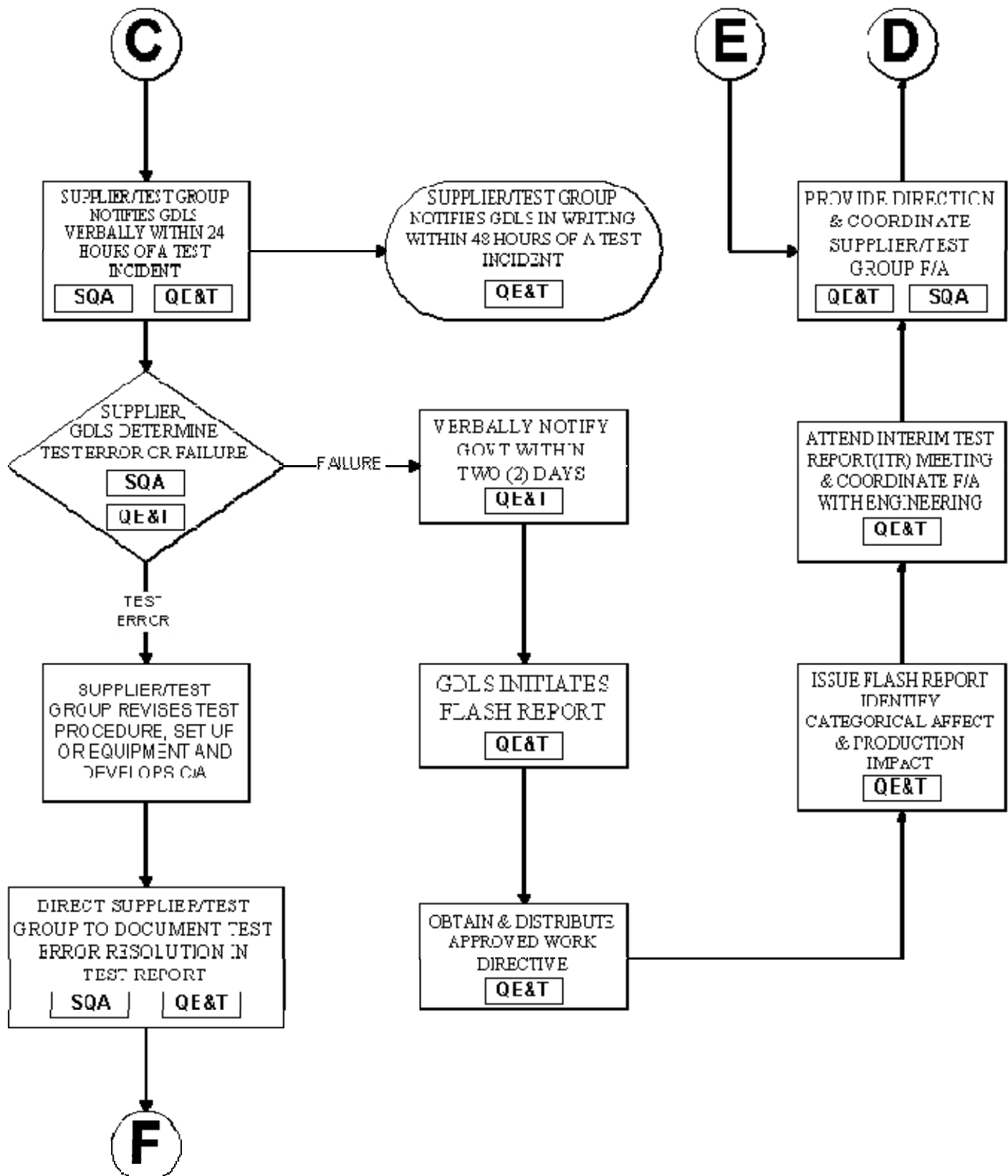
## FIRST ARTICLE APPROVAL (FAA) FLOW CHART



# FIRST ARTICLE APPROVAL (FAA) FLOW CHART

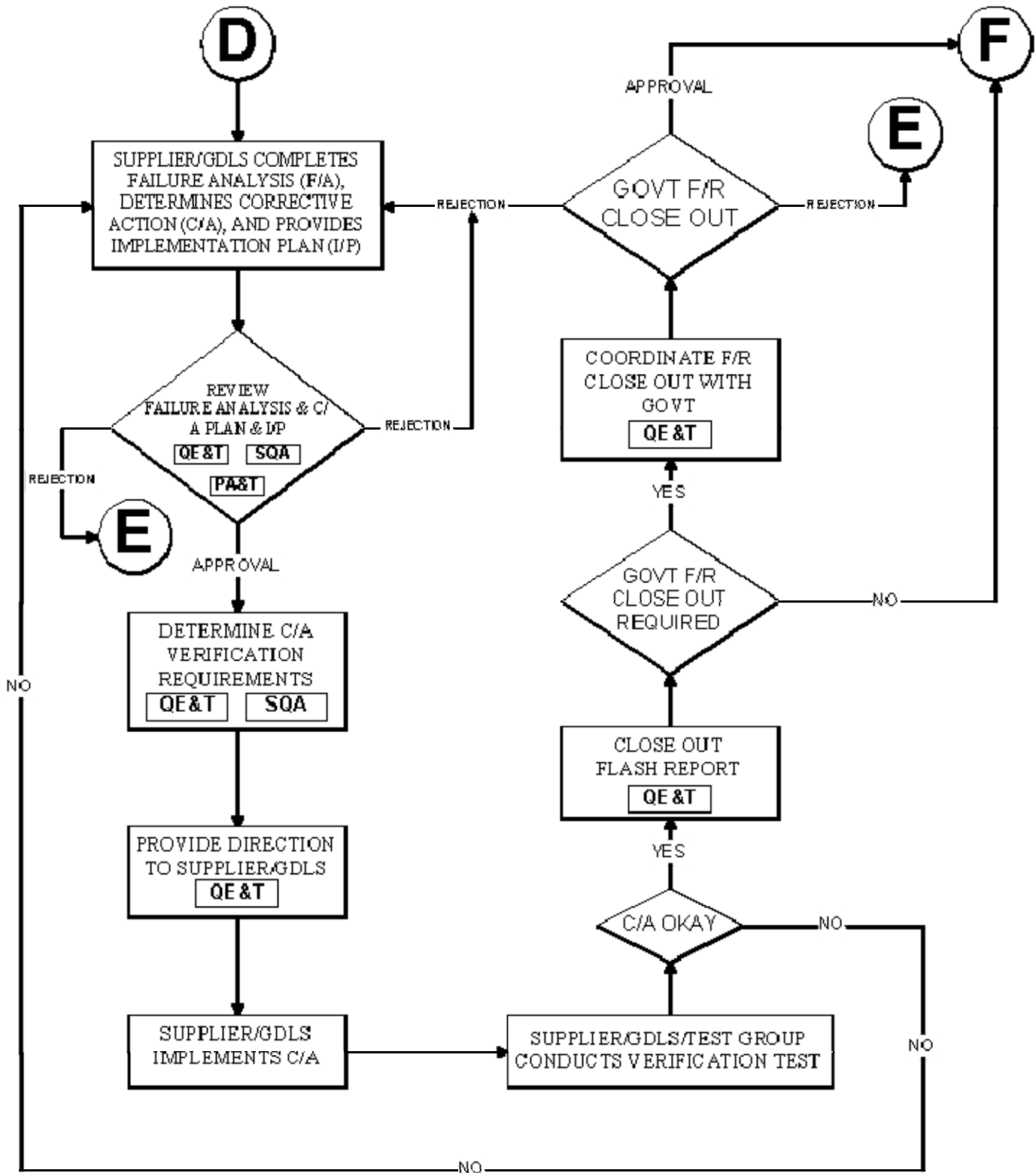


## FIRST ARTICLE APPROVAL (FAA) FLOW CHART





## FIRST ARTICLE APPROVAL (FAA) FLOW CHART



TEST REPORT PREPARATION EVALUATION PER MIL-HBK-831 GUIDE

PART NO. \_\_\_\_\_ PART NAME \_\_\_\_\_

TEST REPORT NO. \_\_\_\_\_

Note: Each report shall have, as a minimum, each of the elements as listed below

DETAIL REQUIREMENTS (5.0 OF MIL-HBK-831)

Format (5.1)  
Paper (5.2)  
Pagination (5.3)  
Page Size (5.3.1)  
Margins (5.3.1.1)  
Margins (5.3.1.1)  
Numbering (5.3.1.2)  
Binding (5.3.1.3)  
Illustration (5.4)  
Color Differentiation (5.4.1)  
Abbreviations (5.5)

REQUIRED ELEMENTS (5.6)

Title Page & Cover (5.6.1)  
Tabular Summary Sheet (5.6.2)  
Classified Reports (5.6.3.2)  
Table of Contents (5.6.4)  
Reason for Test (5.6.5)  
Description of Test Samples (5.6.6)  
Disposition of Test Specimens (5.6.7)  
Narrative Abstract, Conclusions & Recommendations (5.6.8)  
References (5.6.9)

MAIN BODY OF REPORT (5.6.10)

Factual Data (5.6.10.1)  
Description of Test Apparatus (5.6.10.1.1)  
Test Procedure (5.6.10.1.2)  
Results of test summations and analyses (5.6.10.1.3)  
Test Data (5.6.10.1.4)  
Test Apparatus Calibration Data  
List of all Failure Incidents, Failure Analysis, & Corrective Action  
Permanent Location of Test Files (Five Years)