OFFICE OF MANNED SPACE FLIGHT PROGRAM DIRECTIVE	M-D MA 1400.061 (Project)	DATE 18 APRIL 1967

APOLLO PROGRAM DIRECTIVE NO. 26
MA 009-026-1A

TO : DISTRIBUTION

FROM:

APOLLO PROGRAM DIRECTOR

SUBJECT: Preparation of Test and Checkout Plans and Procedures at KSC

I. PURPOSE

This Program Directive covers the preparation and control of test and checkout plans and procedures for the preparation and launch of Apollo-Saturn space vehicles at KSC.

II. SCOPE

This Directive defines the requirements, responsibilities and inter-center coordination necessary to the development, revision and execution of test and checkout plans and procedures for the preparation and launch of Apollo-Saturn space vehicles at KSC.

III. RESPONSIBILITY

The Directors of KSC, MSC, and MSFC are responsible for taking action as necessary to implement this Directive. Responsibilities assigned in this directive may be delegated except in instances where the delegation of responsibility shall be no lower than the level specified herein.

IV. TIME COMPLIANCE

This Directive is effective for all subsequent Apollo-Saturn missions except that the use of standardized names for KSC Test and Checkout Plans and Test and Checkout Procedures shall be effective for AS-205 and AS-503 and subsequent missions.

V. IMPLEMENTATION

A. The Manned Space Flight Centers shall prepare directives to implement the responsibilities assigned herein and submit copies to Apollo Program Director by May 15, 1967.

B. Any inter-center problem arising in the implementation of this Directive which cannot be resolved shall be brought to the immediate attention of the Apollo Program Director.

VI. GENERAL

A. Development organizations (MSFC and MSC) are responsible for defining specific test and checkout requirements that must be performed on flight vehicles at the factory prior to acceptance and at the launch site prior to flight. Test and checkout requirements to demonstrate the performance of ground support equipment provided by the development organization which is associated with factory acceptance and launch site preparation shall be included. The test and checkout requirements shall clearly define what is to be tested. Test methods, hardware configuration, test sequence and other constraints shall be identified to the extent necessary to assure attainment of test objectives, protect hardware from damage and provide for the safety of personnel.

B. The combined factory and launch site test and checkout requirements shall provide an integrated flow of testing. The objective of the integrated test flow shall be to permit verification of the functional performance of essential systems and their integration into the space vehicle without unnecessary repetition of factory level testing. To the extent practicable, the overall test flow shall permit correlation of data between factory and launch site testing for critical flight hardware components.

C. Development organizations are responsible for providing test specifications and criteria or limits including redline values and associated configuration constraints by which to judge acceptable performance of flight hardware and ground support equipment furnished by the development organization.

D. The development organizations use different titles and formats for Test and Checkout Requirements and Test Specification and Criteria documents. At the earliest time convenient without republishing existing documents these shall be renamed as the Test and Checkout Requirements Document and the Test and Checkout Specifications and Criteria Document. If desired, the later document may be included as a part of the Test and Checkout Requirements Document.

E. MSC and MSFC shall prepare and approve Test and Checkout Requirements and Test and Checkout Specifications and Criteria Documents for the flight vehicles and GSE which they develop. Approved documents shall be provided to the launch organization (KSC) no later than four months prior to delivery of flight vehicles to the Cape.

F. MSC is responsible for preparing flight crew procedures for use on launch day and during flight. These procedures and changes thereto shall be made available to KSC for use in preparing test and checkout procedures involving flight crew participation.

G. The above documentation provides the framework within which the launch organization prepares test and checkout plans for integrating all test activities at the launch site and develops detailed test and checkout procedures for each test.

VII. TEST AND CHECKOUT PLAN

A. A test and checkout plan shall be prepared by KSC. It shall provide an outline for accomplishing development center test and checkout requirements at the launch site and shall include any additional test requirements necessary to verify launch facility, Manned Space Flight Network and launch crew readiness or satisfy range and safety requirements.

B. The following information shall be included:

1. A flow plan designating the sequence of tests to be performed.

2. Identification of the facilities involved in the overall test flow.

3. Specific outlines for each test including the following:

   a. Test title and procedure number.

   b. Test objectives.

   c. Test location and facility.

   d. Test description in sufficient detail to define the procedure in outline form.

   e. Flight hardware and GSE configuration requirements.

   f. Software requirements. schedule

   g. ~~Significant~~ support requirements. are found in the KD/PSRD

   h. Identification of any hazardous operations.

   i. Safety requirements including any special equipment, personnel, procedures or training required for test.

   j. Identify organizations outside of KSC that will be involved.

   k. A cross reference to the development center test requirements where applicable.

4. A detailed list of deviations from development center test requirements.

VIII. TEST AND CHECKOUT PROCEDURES

A. Test and Checkout Procedures shall be prepared by KSC. A Test and Checkout Procedure shall define the detailed step-by-step sequence of events in a specific test and shall be generated for each test during preparation and launch of flight vehicles.

B. KSC and contractor responsibilities and interfaces in the preparation, revision and execution of Test and Checkout Procedures shall be clearly defined by a

KSC Management Instruction or other suitable document approved by the KSC Director.

C. MSC and MSFC may exercise an option to review Test and Checkout Procedures as deemed necessary. Any recommended changes shall be provided to KSC no later than 15 days prior to the start of the test.

D. MSC and MSFC shall establish a mechanism to process launch site recommended changes in factory testing.

E. The following guidelines shall be used in the preparation, revision and execution of KSC test and checkout procedures.

1. Factory or test site test and checkout procedures which have been approved by the development organization shall be used as a baseline in the development of Launch Site Test and Checkout Procedures. Whenever possible, Test and Checkout Procedures written for use in the factory will be modified for use at the launch site to fit unique facility requirements, safety considerations, integrated space vehicle test requirements and to meet objectives in the test and checkout plan.

2. MSC is required to deliver approved flight crew procedures to KSC at least 40 days prior to a test or checkout operation involving the flight crew (See paragraph 1X, B-2). Flight Crew Procedures as approved and published by MSC shall be used by KSC when applicable in preparing those test and checkout procedures involving the flight crew. In any cases where incompatibility between test and checkout procedures and flight crew procedures exists, KSC will obtain MSC approval of the Test and Checkout Procedure.

3. All Test and Checkout Procedures involving hazardous operations shall contain or provide specific reference to written instructions for identifying emergency situations, safing of hardware and implementing emergency actions required to evacuate or safeguard personnel and combat or limit the extent of the damage should an emergency arise.

4. Test and Checkout Procedures shall be standardized in regard to the following items.

a. Major policy and procedure matters regarding preparation, review, approval and change cycle.

b. Control, approval level and documentation of trouble shooting during the conduct of Test and Checkout Procedures.

c. Extent of quality control participation and sign off during execution of Test and Checkout Procedures.

d. Extent of safety and medical organization participation.

e. Recording and approval level for deviations encountered during implementation of Test and Checkout Procedures.

f. Policy concerning multiple effectivity of Test and Checkout Procedures.

g. Inclusion or exclusion of preparation steps in Test and Checkout Procedures.

h. Recording of OIS channels during execution of Test and Checkout Procedures.

i. Appropriate use of warning and caution notes.

5. Prior to publication of a test and checkout procedure it shall be approved by the KSC Safety Office for assurance that operations are compatible with applicable safety criteria and use appropriate safety personnel, techniques and equipment.

6. Test and checkout procedures involving human test subjects shall be coordinated with medical personnel for assurance that potential risks to the health of test subjects are minimized.

7. Test and Checkout Procedures shall be provided to the KSC Launch Vehicle or Spacecraft Quality Surveillance Division for review and use in preparing for participation in test and checkout operations.

8. Test and Checkout Procedures for tests involving flight crew participation shall have signature approval of MSC.

9. Approved Test and Checkout Procedures shall be distributed one month prior to the date of the test.

10. A Test and Checkout Procedure control system shall be established which places positive control over changes subsequent to the distribution of approved copies to the test team. Only those changes in spacecraft, launch vehicle or space vehicle test and checkout procedures which will improve safety or are mandatory because of late changes in hardware configuration shall be approved in the last seven calendar days before scheduled start of a test unless approved by the following organizational level for the tests indicated.

a. Launch Operations Manager

(1) Flight Readiness

(2) Countdown Demonstration

(3) Countdown

b. Test Supervisor

(1) CSM or LM altitude chamber tests in MSOB

(2) CSM or LM final integrated systems test in MSOB

(3) CSM or LM integrated test in VAB or on pad prior to mating with space vehicle

(4) L/V overall tests 1 and 2 in VAB or on pad

(5) S/V overall tests 1 and 2 in VAB or on pad

(6) S/C or L/V propellant loading on pad

(7) S/V simulated flight in VAB or on pad

(8) Pyrotechnic installation in VAB or on pad

11. Revisions to Test and Checkout Procedures shall be provided to test team members at least 48 hours in advance of the start of the test. Waivers to this requirement shall be approved at the organizational level established by the KSC Director except that this approval cannot be delegated lower than specified in VIII E-9 above for the tests indicated.

12. Prior to initiation of a test, briefings shall be conducted for all key members of the test team to review the sequence of test activities, the Test and Checkout Procedures and any hazardous operations or emergency procedures.

13. Prior to initiating a test, a review shall be made of all open work recorded against the hardware to be tested. A determination shall be made that the hardware (including GFE) is properly configured and that the Test and Checkout Procedure, Flight Crew Procedure and hardware are compatible. This determination shall be recorded and approved by KSC and contractor organizations involved in the test. The procedure for recording and the level of approval shall be as specified by the KSC Director. For spacecraft hardware tests involving flight crew participation, this determination shall have signature approval of MSC.

14. Approval to initiate non-hazardous tests shall be at the organizational level established by the KSC Director.

15. Approval to initiate any test involving a hazardous operation shall be at the organizational level established by the KSC Director in accordance with VIII E-9 above.

16. The Director, MSC, and the Director, MSFC, shall delegate the authority either to KSC or to the appropriate official of their own organizations to approve real time deviations to Test and Checkout Procedures involving compromise in test and checkout requirements.

17. Changes in flight hardware configuration, test and checkout requirements, or test and checkout specifications and criteria shall be approved by MSC and MSFC for the spacecraft and launch vehicle respectively.

18. The flight crew shall use Test and Checkout Procedures when participating in flight hardware tests at the launch site. Flight crews shall come under KSC control during the time they are actively participating in tests of flight vehicles except that the flight crew may take any action necessary for its safety.

19. Deficiencies encountered by the flight crew while participating in KSC tests shall be recorded and dispositioned using the same documentation system as that used by the test team.

20. KSC shall make an analysis of Test and Checkout Procedures deviations subsequent to completion of major tests for the purpose of reducing deviations in subsequent Test and Checkout Procedures.

21. Tests involving hazardous operations shall not be conducted unless communications are adequate to support emergency operations.

IX. CENTER RESPONSIBILITIES

A. MSFC and MSC are responsible for:

1. Preparing an appropriate document which assigns responsibility for functions and actions contained herein.

2. Establishing and maintaining test and checkout requirements, test and checkout specifications and criteria, and launch mission rules inputs which are necessary to assure test and checkout and flight readiness.

3. Providing signature approval on KSC test and checkout plans.

4. Approving deviations or waivers to test and checkout requirements, test and checkout specifications and criteria, and launch mission rules specified in IX A-2 above.

5. Participation in preparation, revision and execution of KSC Test and Checkout Procedures in accordance with Section VIII.

6. Assuring that adequate testing is being accomplished without unnecessary overlap and duplication.

7. Providing signature approval on KSC criteria for determining hazardous operations.

B. MSC is responsible for:

1. Advising KSC in writing of tests requiring flight crew and/or flight control personnel participation.

2. Providing approved flight crew procedures to KSC at least 40 days prior to a test or checkout operation involving the flight crew.

3. Providing signature approval on KSC Test and Checkout Procedures involving flight crew participation.

4. Providing signature approval on pre-test reviews of spacecraft hardware (including GFE) and Test and Checkout Procedure compatibility for those tests involving flight crew participation.

C. KSC is responsible for:

1. Preparing an appropriate document which assigns responsibility for functions and actions contained herein.

2. Developing test and checkout plans as defined in Section VII at least one month prior to delivery of flight hardware for each mission.

3. Securing MSC and MSFC signature approval on test and checkout plans and changes thereto before these documents are approved or implemented.

4. Preparing, revising and executing Test and Checkout Procedures in accordance with Section VIII.

5. Providing Test and Checkout Procedures to MSC and MSFC one month prior to the start of a test and assuring expeditious distribution of changes thereto.

6. Securing MSC signature approval on Test and Checkout Procedures and changes thereto and the pre-test reviews of spacecraft hardware and test and checkout procedure compatibility for those tests in which the flight crew has a requirement to participate.

7. Assuring that MSC flight crew and flight control personnel are integrated into the KSC test team for those tests in which they have a requirement to participate.

8. Developing criteria for determining hazardous operations and securing signature approval of MSC and MSFC.

9. Making final determination that Test and Checkout Procedures are adequate, safe and in accordance with development organizations test and checkout requirements, test and checkout specifications and criteria, flight crew procedures and launch mission rules.

10. Obtaining deviations and waivers from development organizations test and checkout requirements, test and checkout specifications and criteria and launch mission rules which will not be fulfilled.

Cross Reference Res Fac 11-1

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OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : A/Administrator

DATE: JUN 10 1968

FROM : M/Associate Administrator for Manned Space Flight

SUBJEC : Review of Apollo Program Directive - Preparation of Test and Checkout Plans and Procedures at KSC (APD #26)

At one of our recent Apollo reviews, you inquired as to how we ascertain the degree of compliance within our organization with a Program Directive. We have just completed a review at KSC that serves as an excellent example of one of the avenues open to management for such an assessment.

The review was conducted by a small team from the Test Directorate of the Apollo Program Office from April 1 to April 6 and April 11 and 12, at KSC. The review covered the procedure preparation, procedure revisions and deviations, and the completeness of the final data package. The attached document summarizes the review.

Procedure preparation in response to APD #26 is shown on page 13 for the spacecraft, page 21 for the launch vehicle and page 28 for the space vehicle. The results show compliance for the spacecraft and the launch vehicle except for one or two exceptions. The space vehicle does not, as a rule, meet the Program Directive requirements. However, as the space vehicle procedures must of necessity follow and incorporate the spacecraft and launch vehicle procedures, it is impractical to achieve the required release dates. Delayed release of the space vehicle procedures do not impact the checkout process and, therefore, are considered acceptable. The program directive is being revised accordingly.

The test anomalies and procedure deviations for the spacecraft (page 14 to 16) and the launch vehicle (page 22 to 24) show an extremely low rate of occurrence. For example, the total deviations for the CSM Integrated Systems Test K0005 (page 16) is only five percent of the total test steps. This is a very low deviation record.

KSC has not implemented a plan, as required by APD 26, to review and analyze launch vehicle and space vehicle TCP deviations subsequent to the completion of major tests in an attempt to reduce the total number of deviations on subsequent tests. A plan to accomplish this task for spacecraft has been implemented. KSC was requested to initiate

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a similar effort for the launch vehicle as soon as possible. KSC test and checkout requirement documents have not previously been available but are now in preparation. This document covers the equipment that is the responsibility of KSC. While test plans and test procedures are available for this equipment, a test and checkout requirements document is required and should be provided.

It was concluded as a result of this review (page 31), that the implementation of APD #26 had been carried out in a timely manner and that the results to date were satisfactory. The record compiled by KSC as demonstrated by the extremely low deviation record noted in the report is especially noteworthy. We plan to continue this type of review after CSM 101/AS-205 and CSM 103/AS-503.

If you should have any comments or if you would like additional information concerning this subject, we would be happy to respond.

George E. Mueller

Attachment as stated

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