



Dryden Organizational Procedure

Code R

Flight System Development Process

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Electronically approved by
Director, Engineering Directorate

1.0 PURPOSE OF DOCUMENT

The purpose of this document is to provide a baseline procedure for the development of all flight systems.

2.0 SCOPE & APPLICABILITY

This procedure shall be applied in full or appropriately tailored to all flight systems developed by Dryden Flight Research Center's Flight Systems Branch.[00124]

3.0 PROCEDURE OBJECTIVES

The objective is to develop a system that can deliver customer product, on time and on budget, that meets product/customer requirements and can be fielded with a high degree of confidence in safe and successful operation.

In the execution of this procedure, safety risks will be mitigated to an acceptable level.

This procedure provides that the system will be adequately documented. This will ensure that it can be reproduced, if necessary. Alternatively, if the system is to be modified, a clear understanding of the baseline system will exist upon which the modifications can be developed.

4.0 RELEVANT DOCUMENTS

4.1 Reference Documents

CIP	Center Implementation Plan
DCP-A-002	Handling of Unsolicited Proposals
DCP-P-005	Project Formulation And Approval
DCP-P-006	Objectives And Requirements Documents (ORD)
DCP-P-014	Small Flight Activity (SFA) Review And Authorization
DCP-R-002	Small Business Innovation Research (SBIR) Phase I & II

5.0 WAIVER AUTHORITY

Waivers will be granted at the discretion of the Flight Systems Branch Chief or designee.

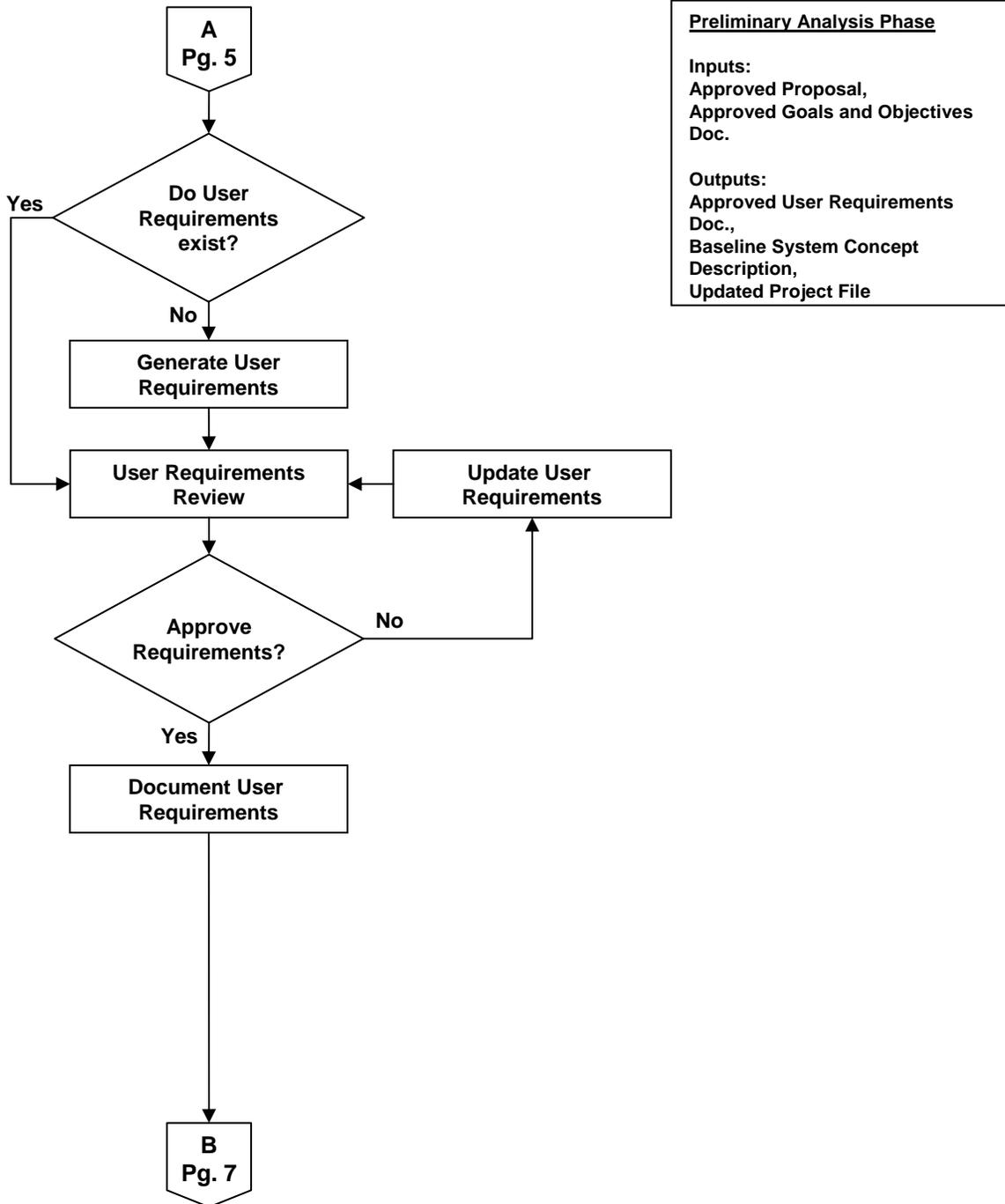
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6.0 ABBREVIATIONS, ACRONYMS, & DEFINITIONS

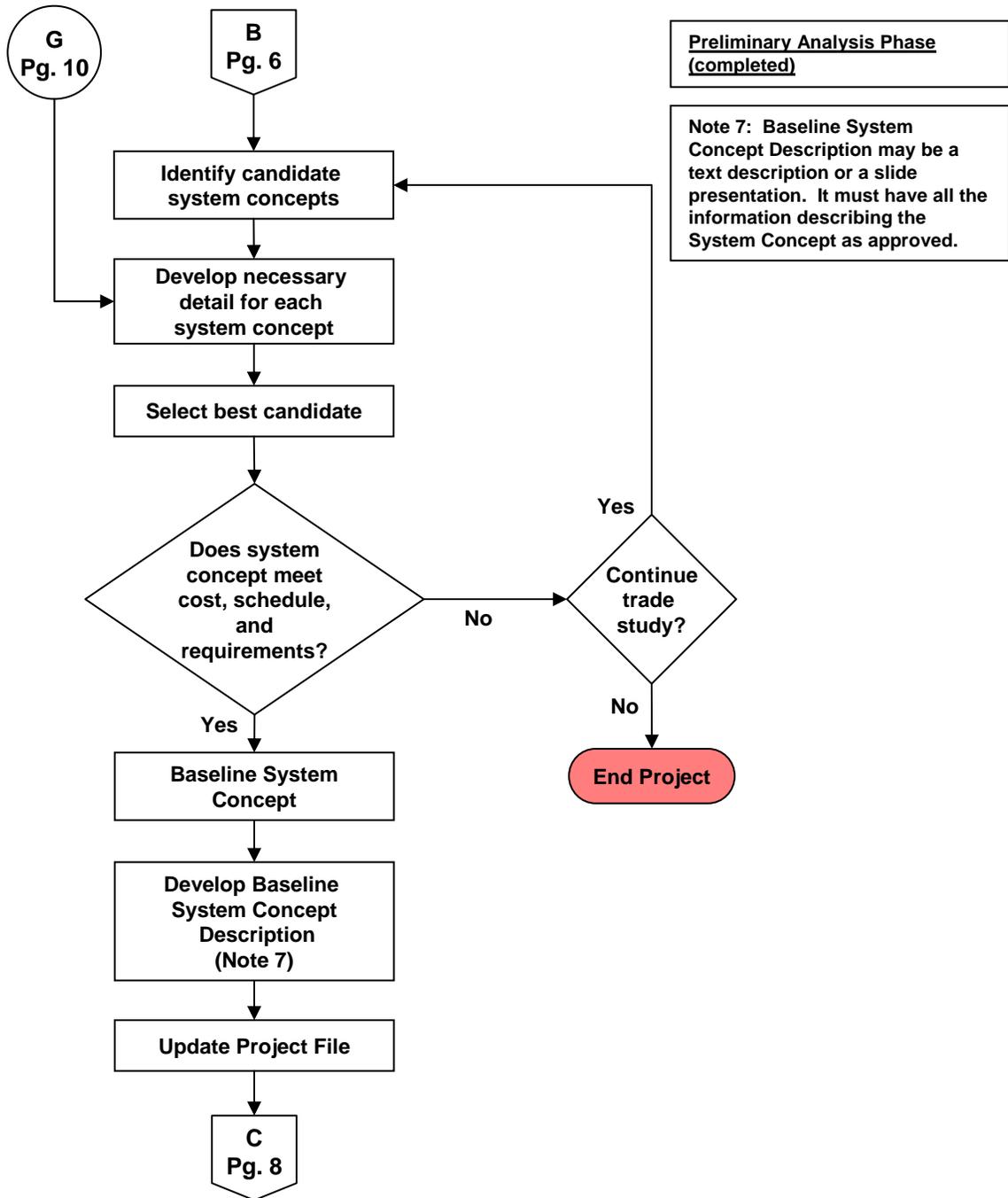
6.1 Abbreviations & Acronyms

AFSRB	Airworthiness and Flight Safety Review Board
CCB	Configuration Change Board
CDR	Critical Design Review
CI	Configuration Item
CM	Configuration Management
CST	Combined System Test
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FMEA	Failure Modes and Effects Analysis
FMECA	Failure Modes and Effects Criticality Analysis
FMET	Failure Modes and Effects Test
FOL	Flight Operating Limit
GVT	Ground Vibration Test
H/W	Hardware
HRT	Hanger Radiation Test
ICD	Interface Control Document
NLT	Not Later Than
OSHA	Occupational Safety and Health Administration
PDR	Preliminary Design Review
PHA	Preliminary Hazard Analysis
RFA	Request for Action
RFI	Request for Information
S/W	Software
SHA	System Hazard Analysis
SMI	Structure Mode Interaction
SRR	System Requirements Review
SSHA	Sub-System Hazard Analysis
STR	System Test Report
TRR	Test Readiness Review
WBS	Work Breakdown Structure

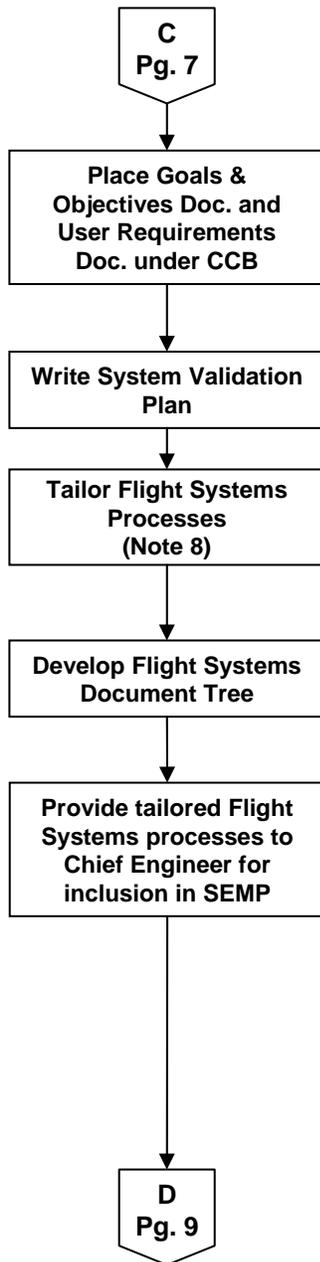
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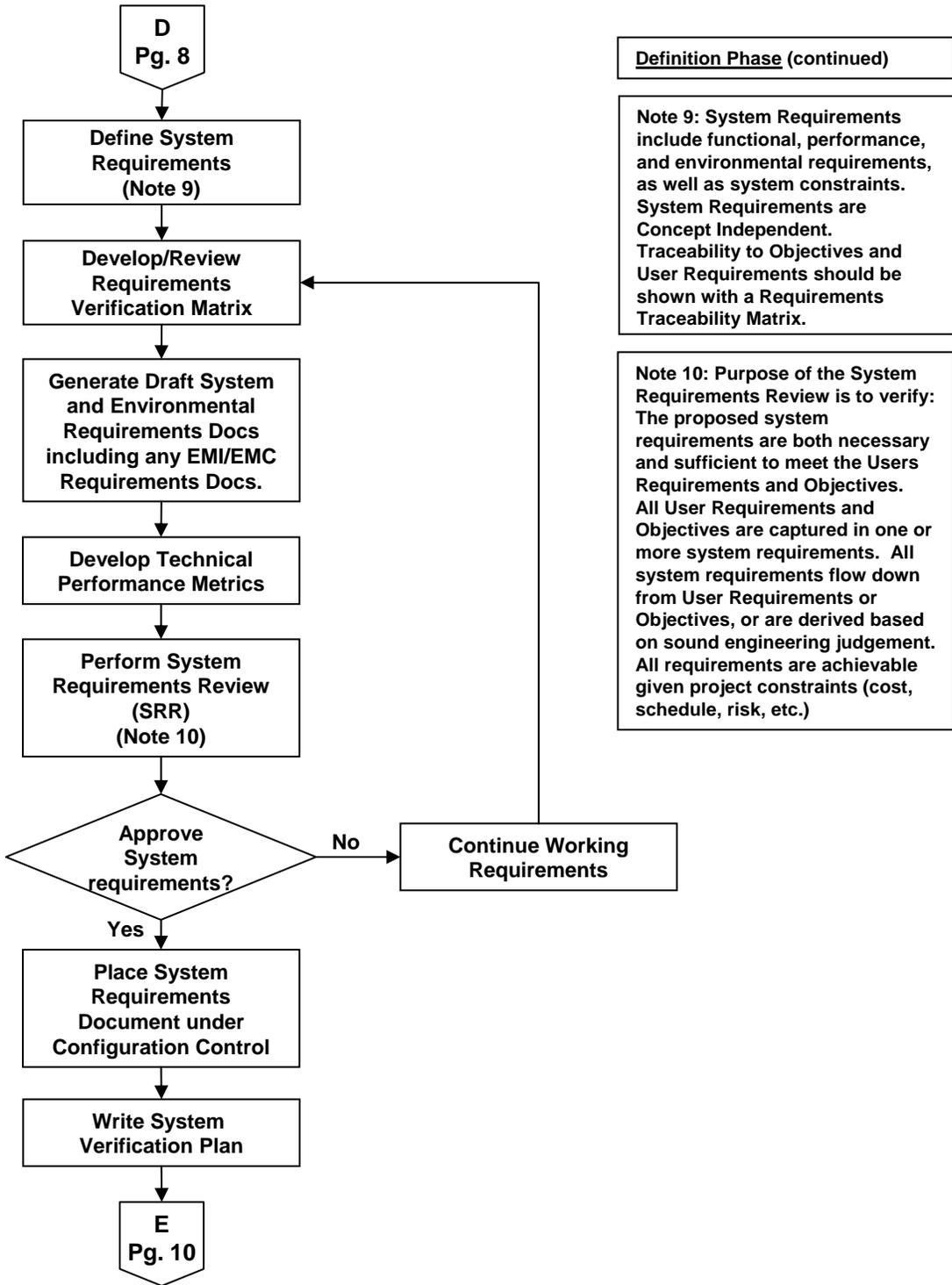


Definition Phase

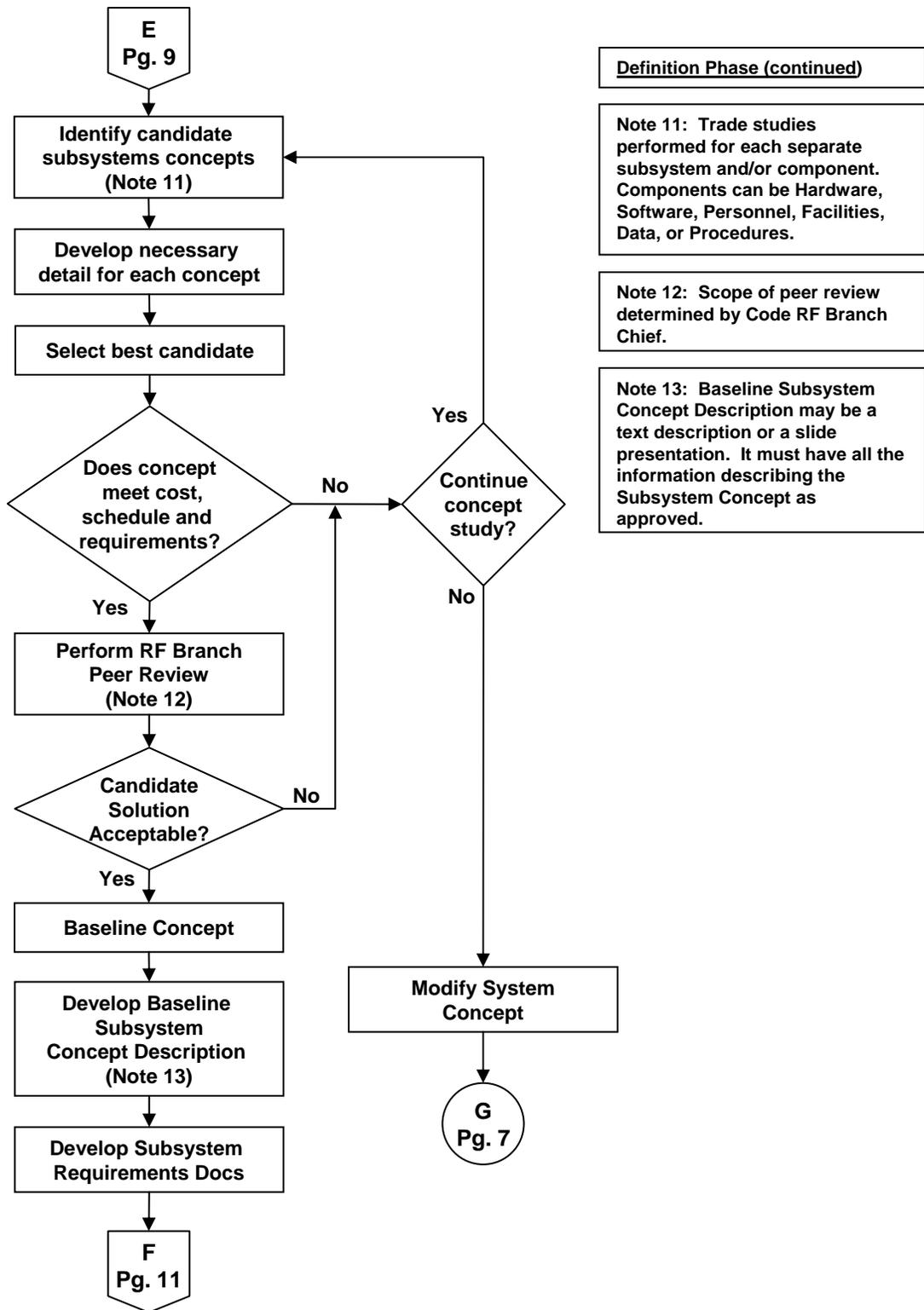
Inputs:
 Approved Goals and Objectives Doc.,
 Approved User Requirements Doc.,
 Baseline System Concept Description,
 Project Plan,
 Configuration Management Plan,
 System Safety Plan,
 Risk Mitigation Plan,
 Quality Assurance Plan,
 Procurement Plan,
 External Interface Requirements Specs.

Outputs:
 System Validation Plan,
 Tailored RF Process,
 Document Tree,
 Approved System Requirements Doc.,
 Requirements Verification Matrix,
 Environmental Requirements Doc.,
 EMI/EMC Requirements Doc.,
 Draft Technical Performance Metrics,
 System Verification Plan,
 Subsystem Requirements Docs.,
 Subsystem Verification Plans,
 Baseline Subsystem Concept Description Doc.,
 Configuration Item List,
 Draft CI ICDs,
 CI Requirements Documents,
 CI Verification Plans,
 System Integration Plan,
 Test Asset Requirements Doc.,
 WBS,
 Defined Milestones,
 Preliminary Hazard Analyses,
 Fault Trees,
 Failure Modes and Effects Analyses,
 Preliminary Flight Systems Instrumentation Requirements,
 Updated Project File

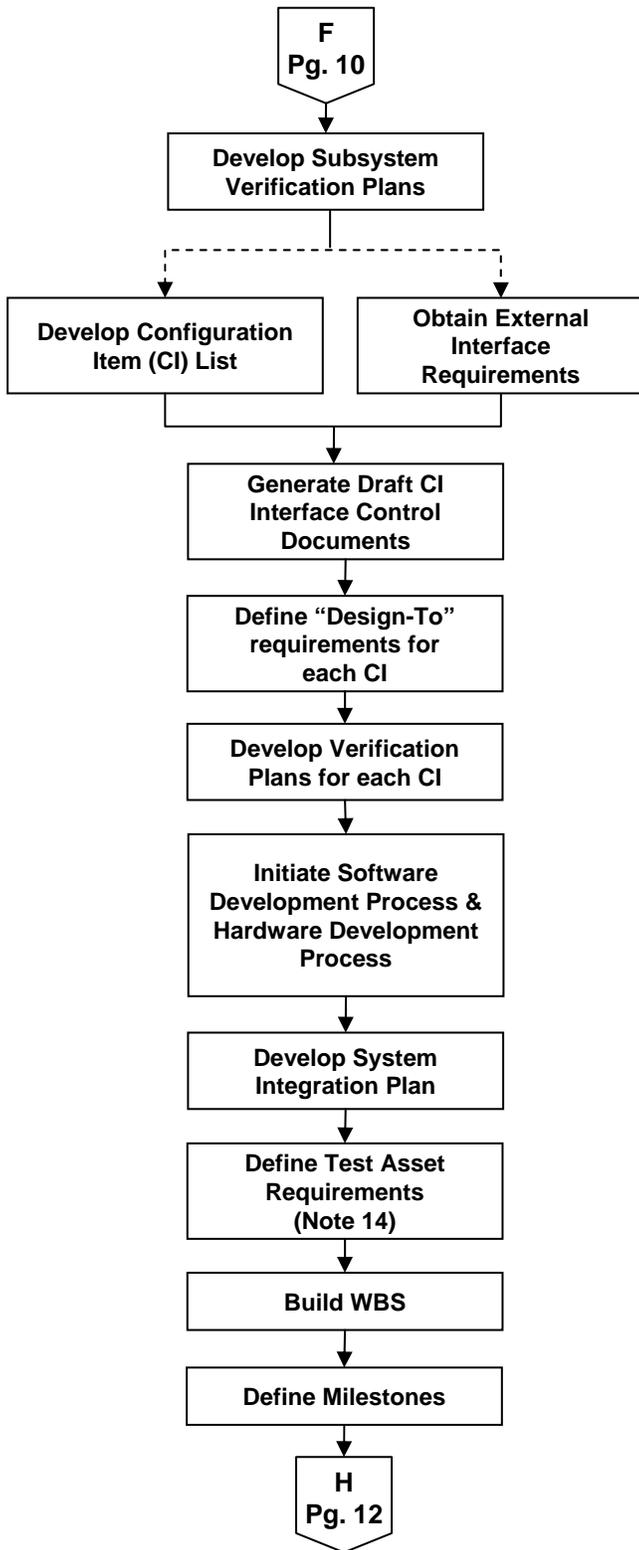
Note 8: Tailoring should be based on the following: Project size and complexity; Project scope and number of participating organizations; Project risk; etc. Tailoring should include definition of appropriate entry points for design reviews.



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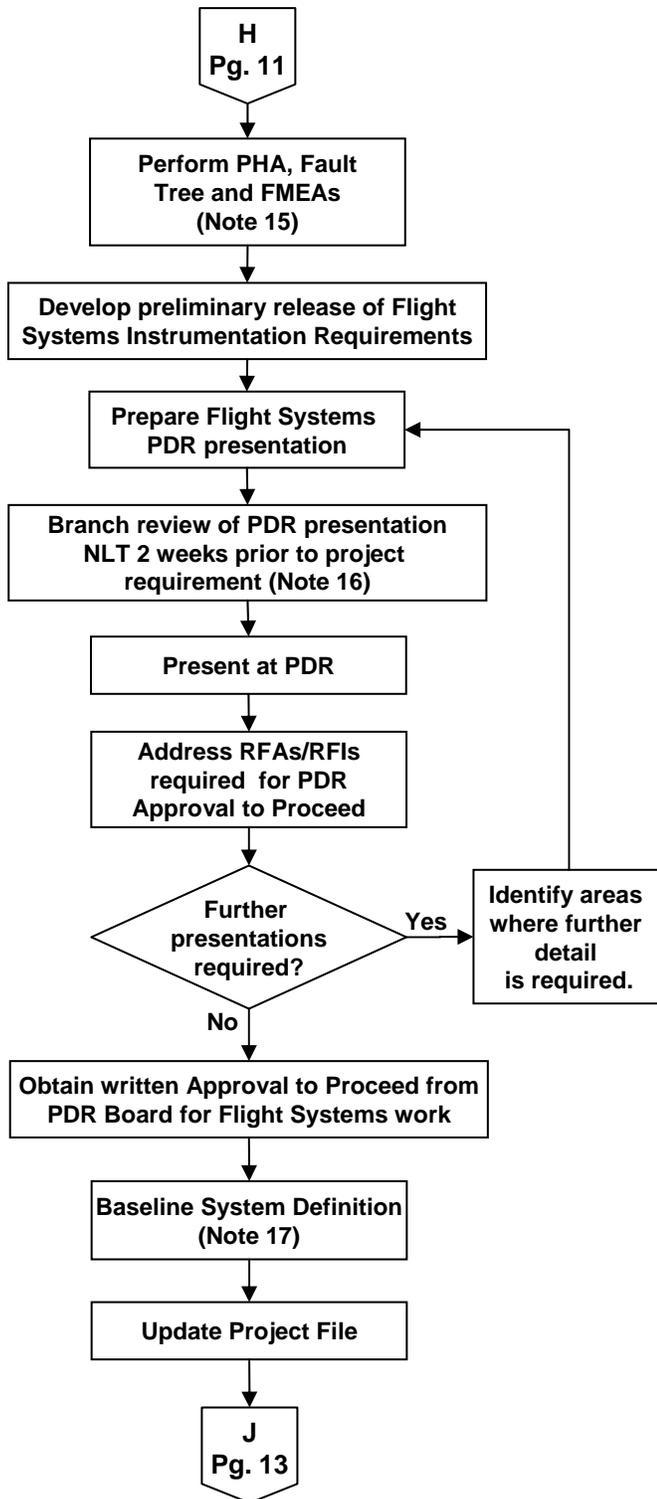
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Definition Phase (continued)

Note 14: Test assets may include Simulations, Facilities, Hardware, Software, etc.

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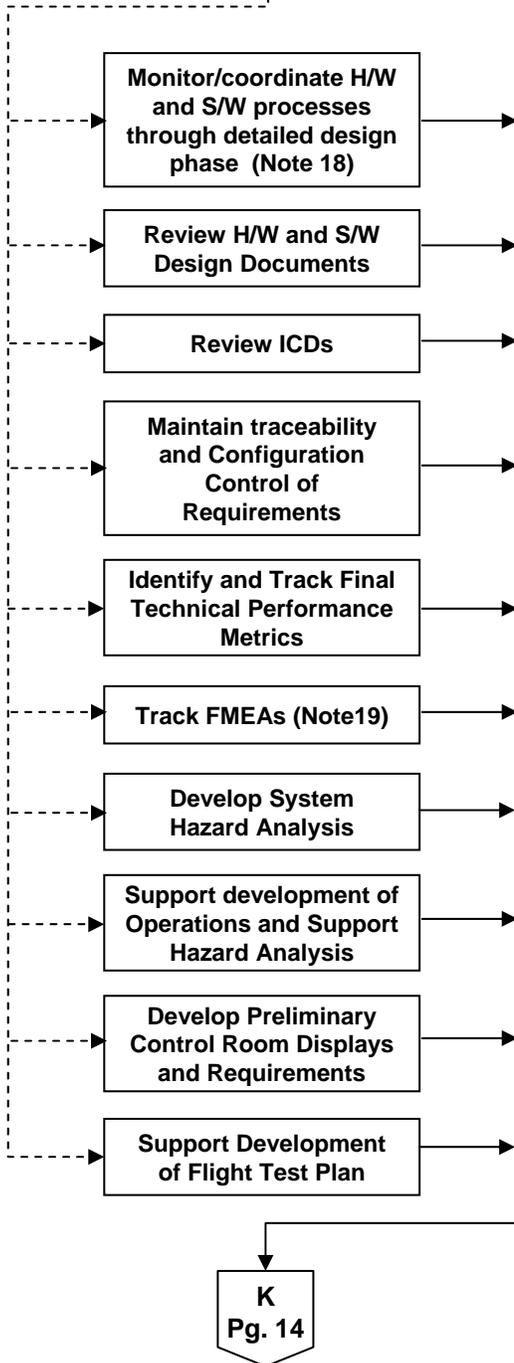
Definition Phase (completed)

Note 15: FMEAs typically are done at a box/IO/functional level.

Note 16: Branch review of Code RF generated presentations for the PDR shall begin NLT 2 weeks before they are due to the project (which is, in turn, usually 4 to 6 weeks before PDR). RF Engineers shall coordinate this with branch chief so that sufficient time is allotted in the event that conflicts exist. Branch review of Code RF generated presentations for delta-PDR's, etc. shall begin NLT 2 days before they are required by the project. All or part of this requirement may be waived at Branch Chief's discretion.

Note 17: System Definition is embodied in all of the requirements documents and the ICDs. If desired, a document identifying all of the documents by title and revision may be written to clearly determine the system definition that was approved on completion of PDR.

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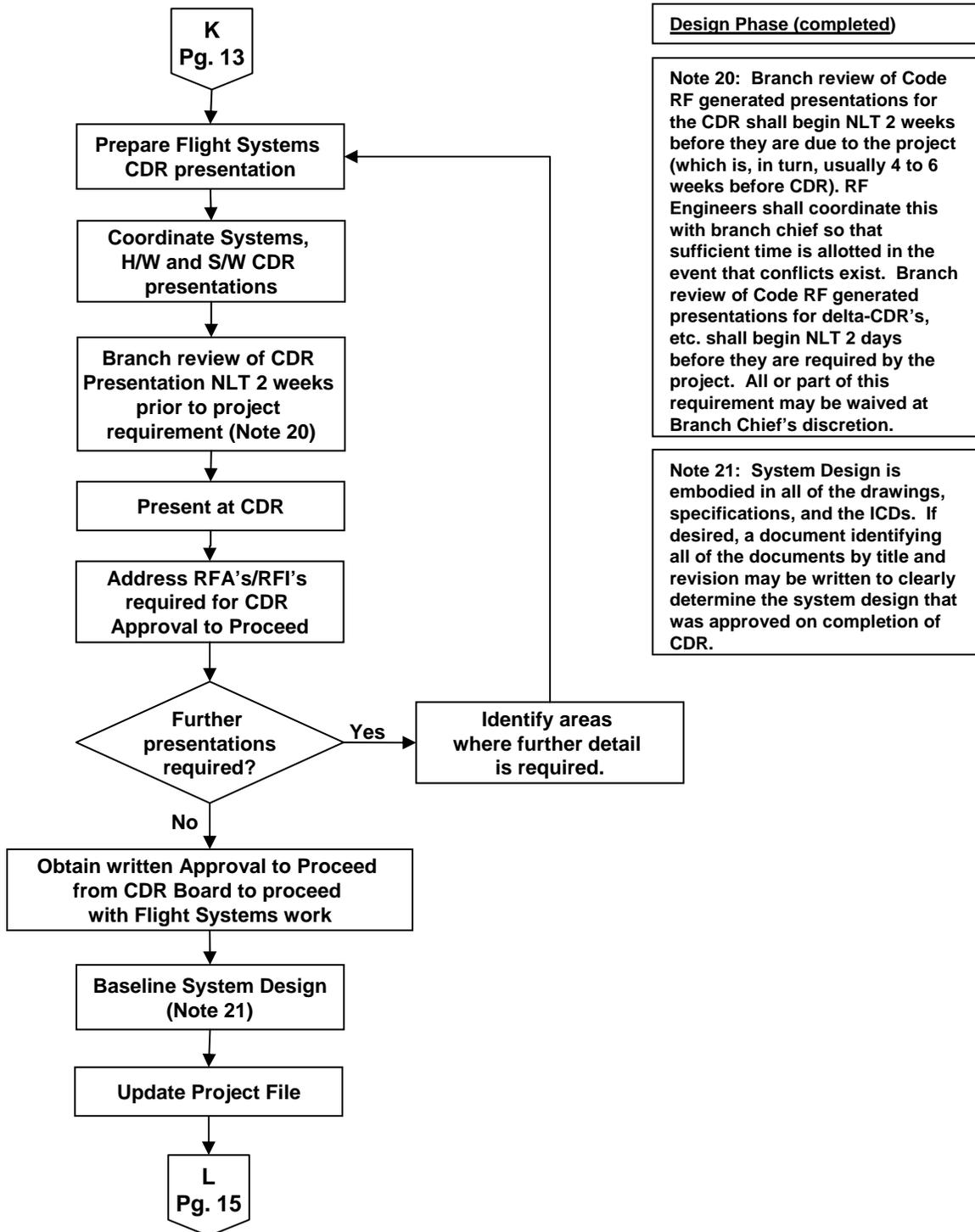
Design Phase

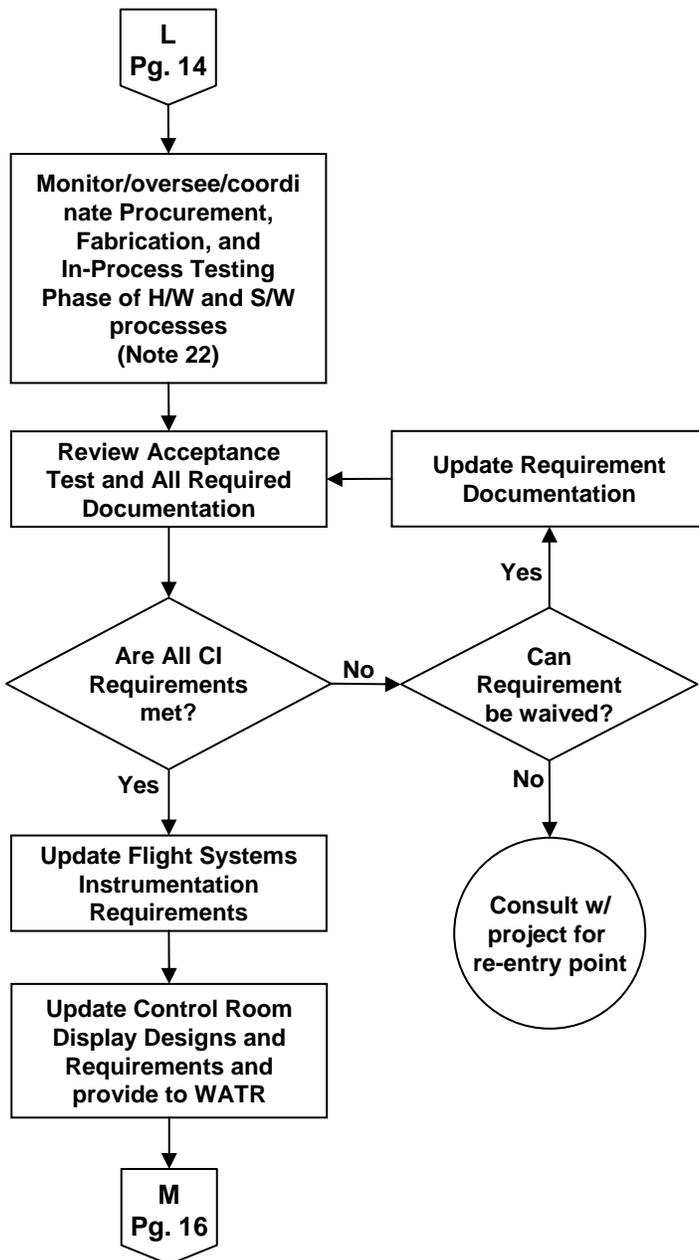
Inputs:
 Software Development Plan,
 Software Quality Assurance Plan,
 Software Design Specification,
 Hardware Development Plan,
 Hardware Design Description,
 Hardware Drawings,
 Cable and Wiring Drawings,
 System Verification Plans,
 Subsystem Verification Plans,
 CI Verification Plans,
 Final ICDs,
 Component FMEAs,
 Acceptance Test Procedures,
 Environmental Test Procedures,
 Component Statements of Work

Outputs:
 Final Technical Performance Metrics,
 System Hazard Analysis,
 Preliminary Control Room Displays and Requirements,
 Updated FMEAs,
 Updated Project File

Note 18: Monitoring of the subsystem development processes should include a critical evaluation of each design from the top level system perspective.

Note 19: As the system matures, the Component FMEAs should be developed and the System/Subsystem FMEAs should be updated as appropriate.



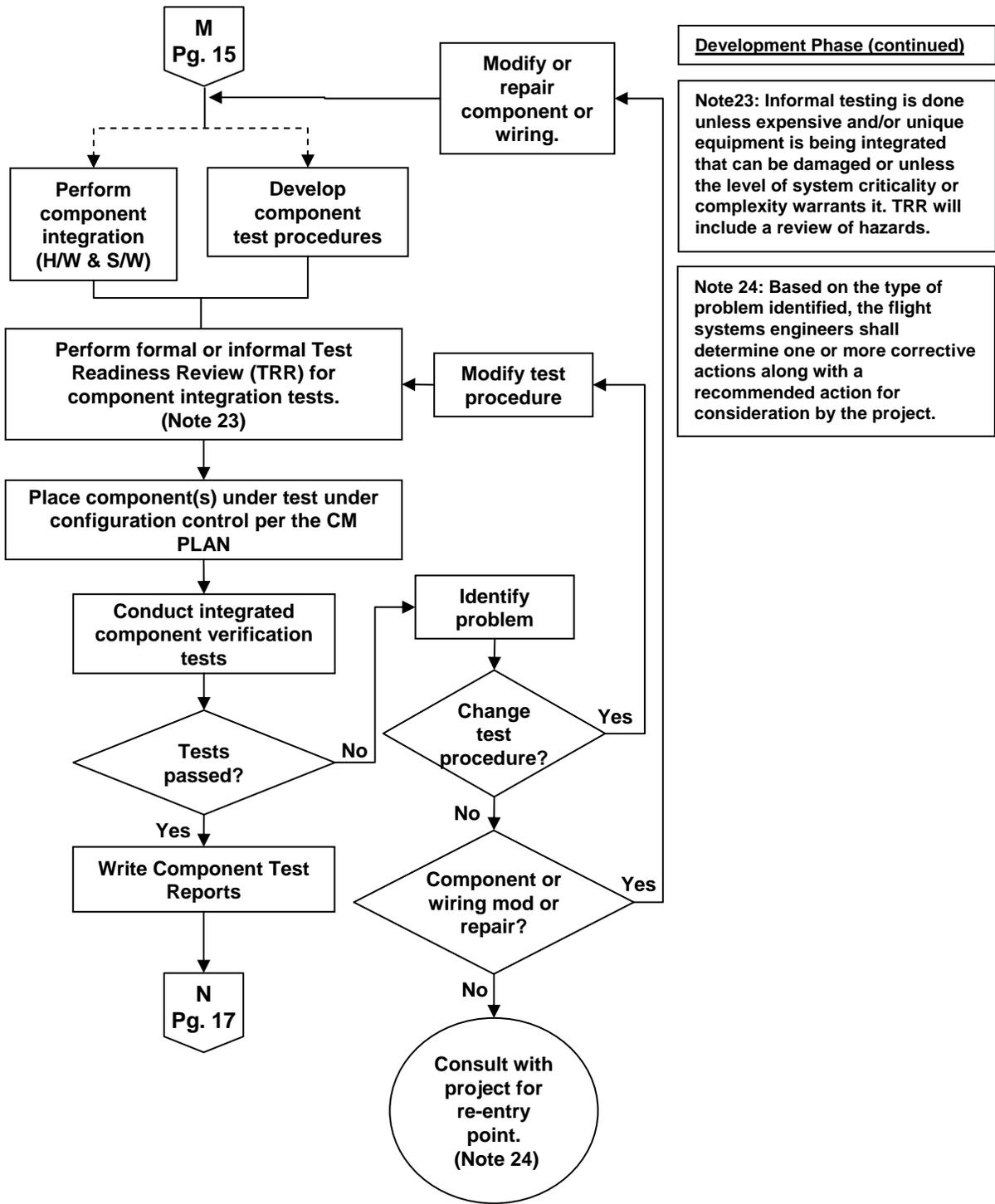


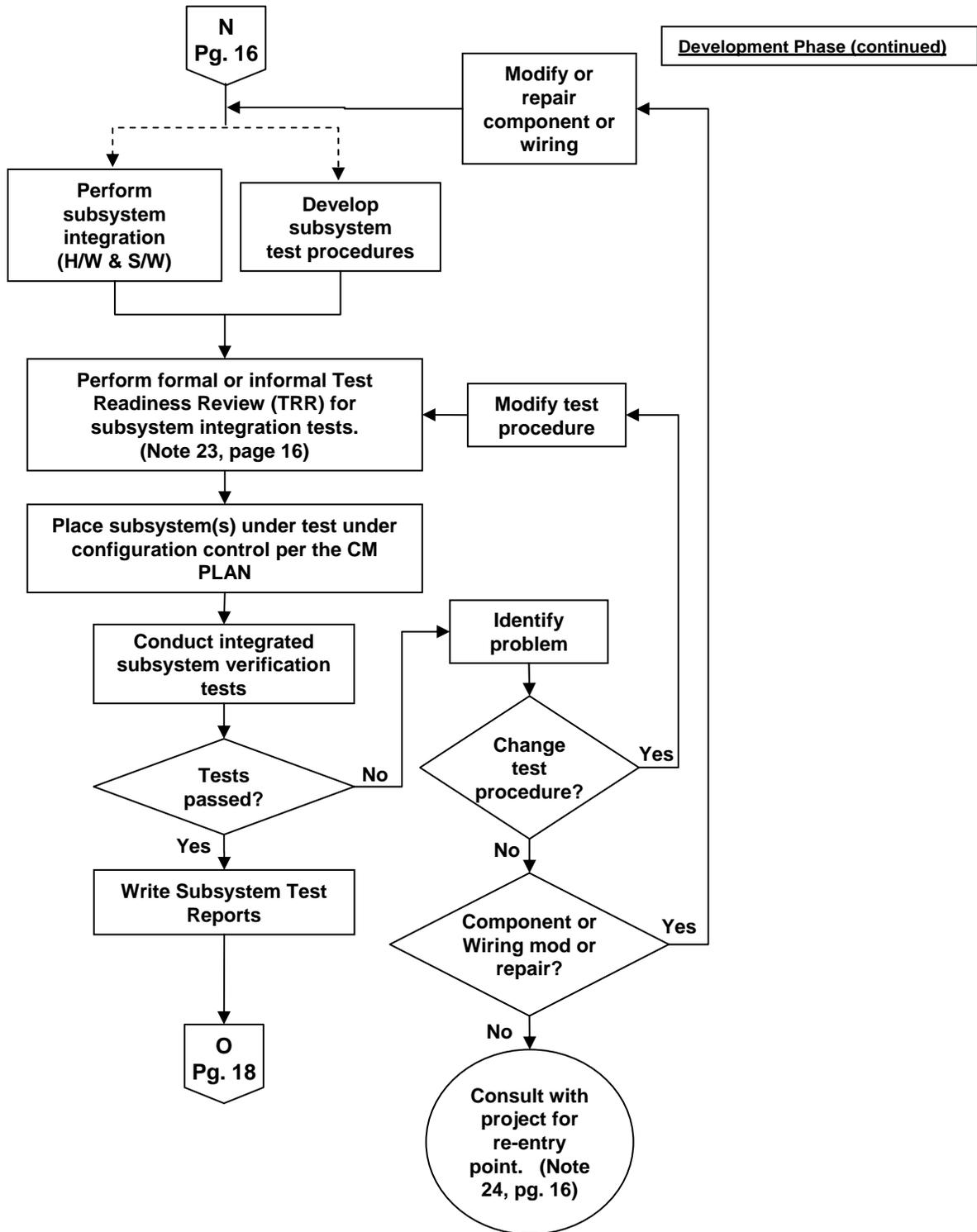
Development Phase

Inputs:
 System Integration Plan,
 CI Verification Plans,
 Subsystem Verification Plans,
 System Verification Plan,
 Test Asset Descriptions,
 Acceptance Test Reports,
 Environmental Test Reports

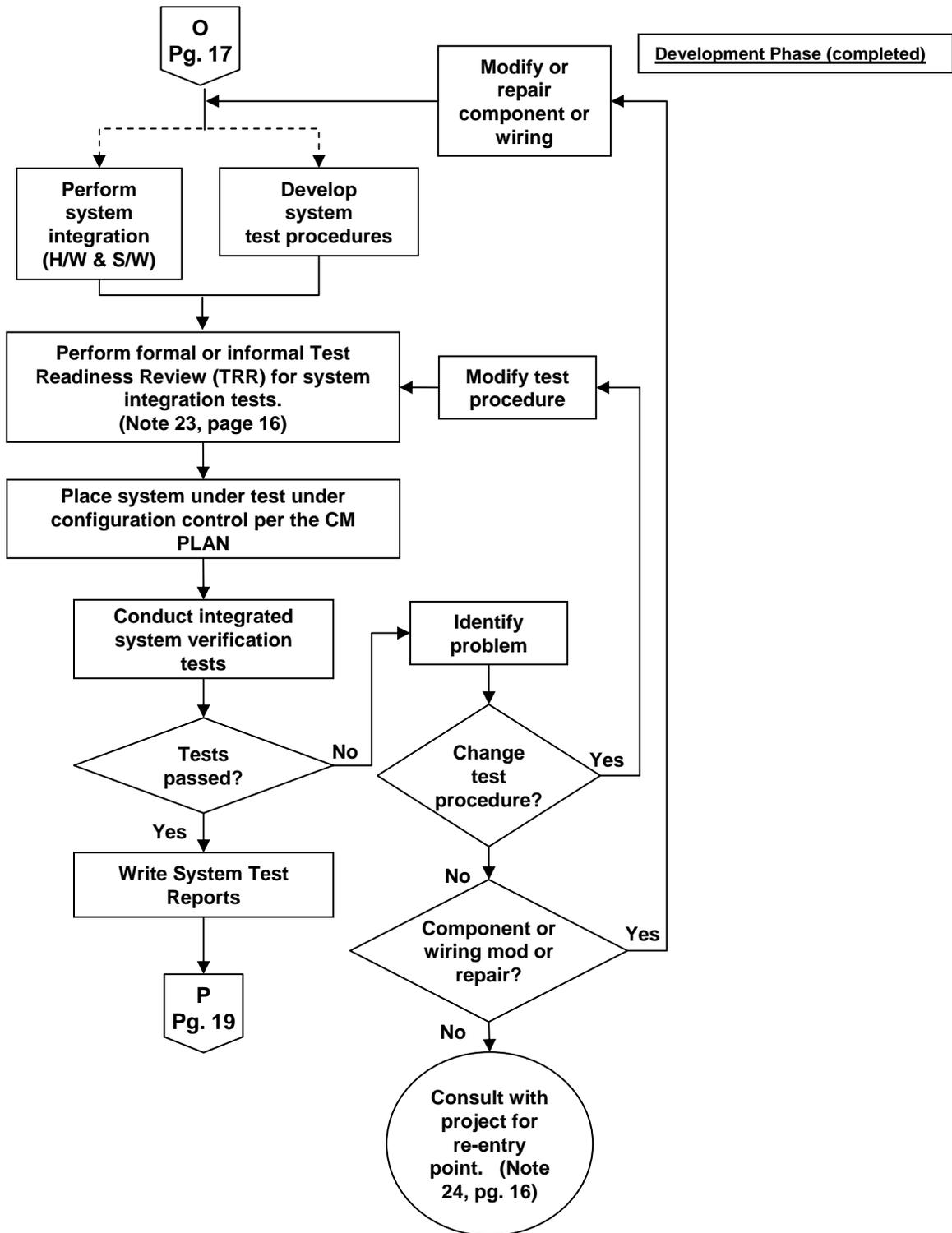
Outputs:
 Component Test Procedures,
 Component Test Reports,
 Subsystem Test Procedures,
 Subsystem Test Reports,
 System Test Procedures,
 System Test Reports,
 Updated Flight System Instrumentation Requirements,
 Updated Control Room Displays and Requirements,
 Updated FMEAs,
 Updated Project File

Note 22: With the completion of the system design baseline and the approval to proceed from the CDR Board, hardware build-up and procurement, and software coding and procurement can begin. Flight Systems Branch engineers shall, as a minimum, monitor or oversee the development of the hardware and software to ensure that the design is implemented and documented per plan and spec. In some cases, Flight Systems Branch engineers shall perform or participate in the hardware design and software coding. In such cases it is highly recommended that a separate engineer perform the monitor or oversight function.

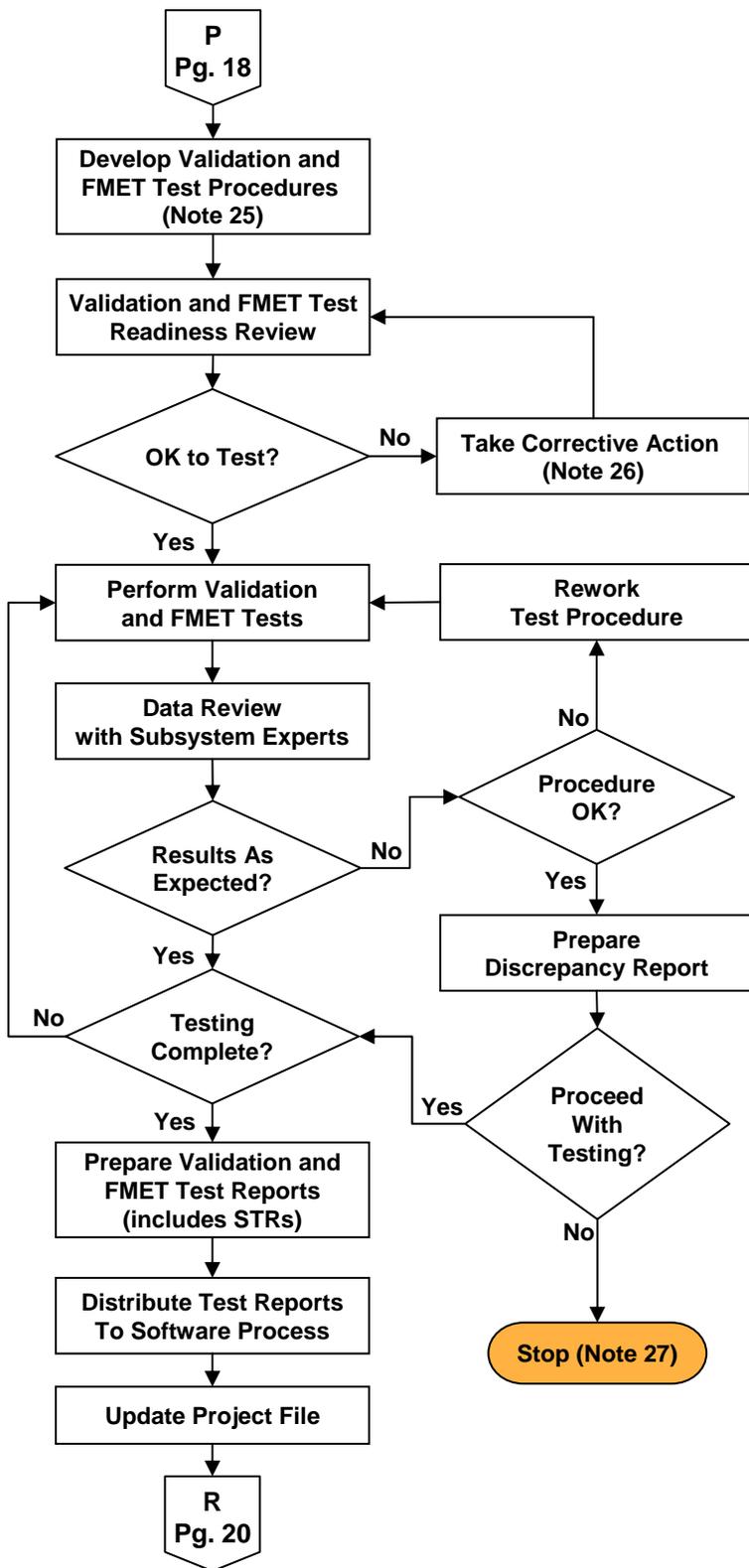




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Test Phase

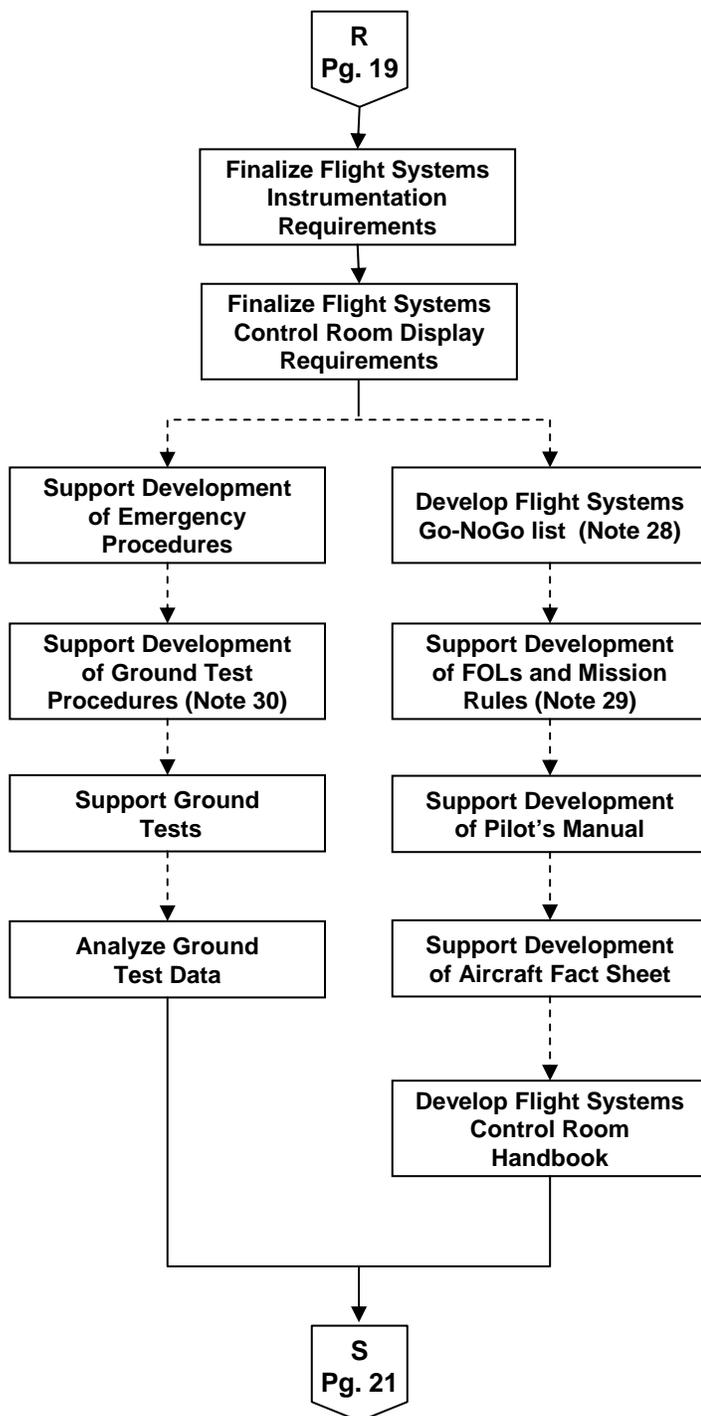
Inputs:
System Validation Plan,
Test Asset Descriptions

Outputs:
Validation Test Reports

Note 25: Test procedure development includes informal tests. Validation testing may include piloted tests. FMET may also include piloted tests.

Note 26: Corrective action may include test procedure corrections, test equipment upgrades, etc.

Note 27: Process has been stopped because the current design was implemented correctly but did not produce the correct results. At this point, the engineer must investigate the cause and plan corrective action. Corrective action may require the process to be reentered at some prior step.



Operations Phase

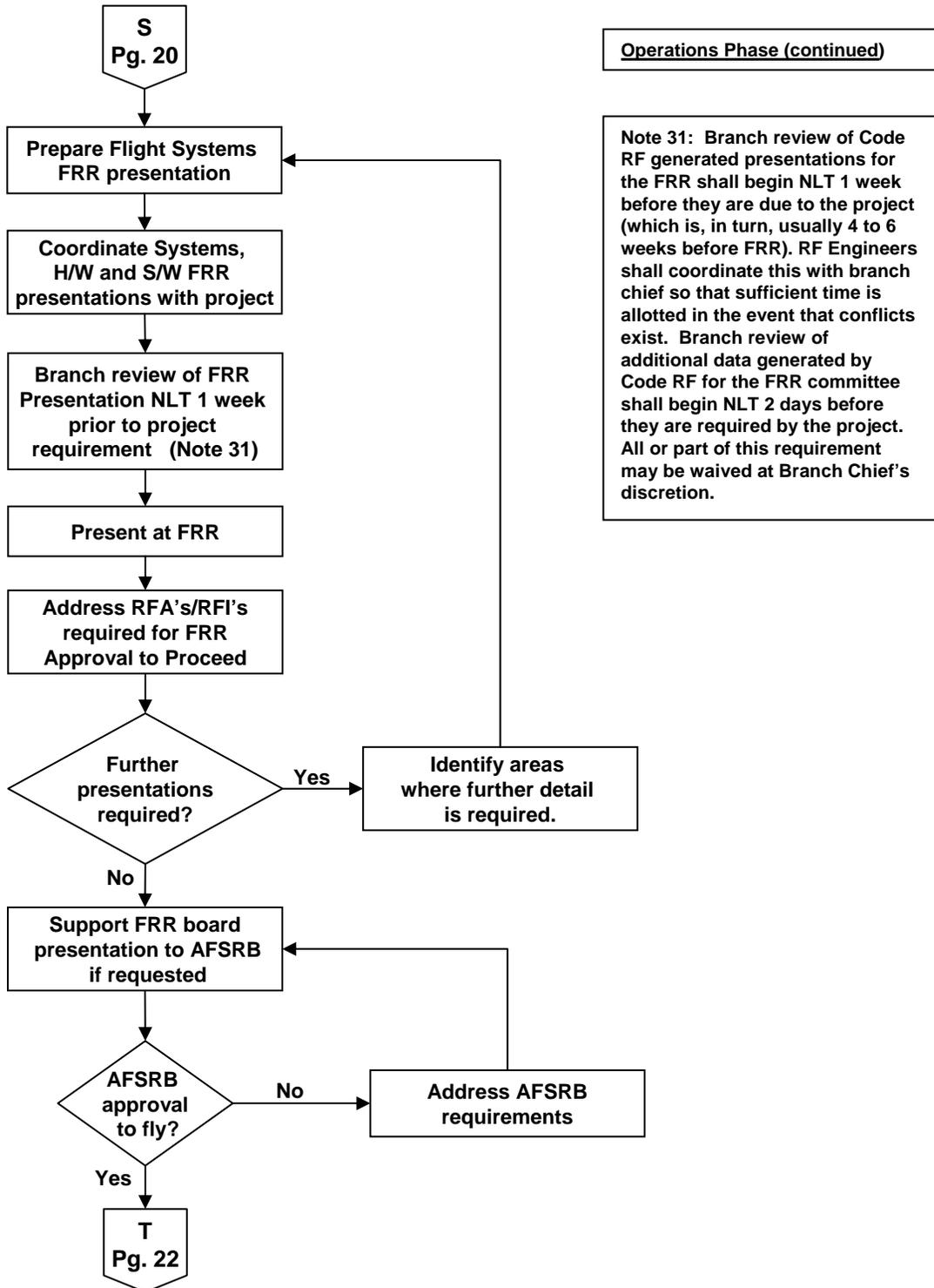
Inputs:
 Preliminary Hazard Analyses,
 Subsystem Hazard Analyses,
 System Hazard Analyses,

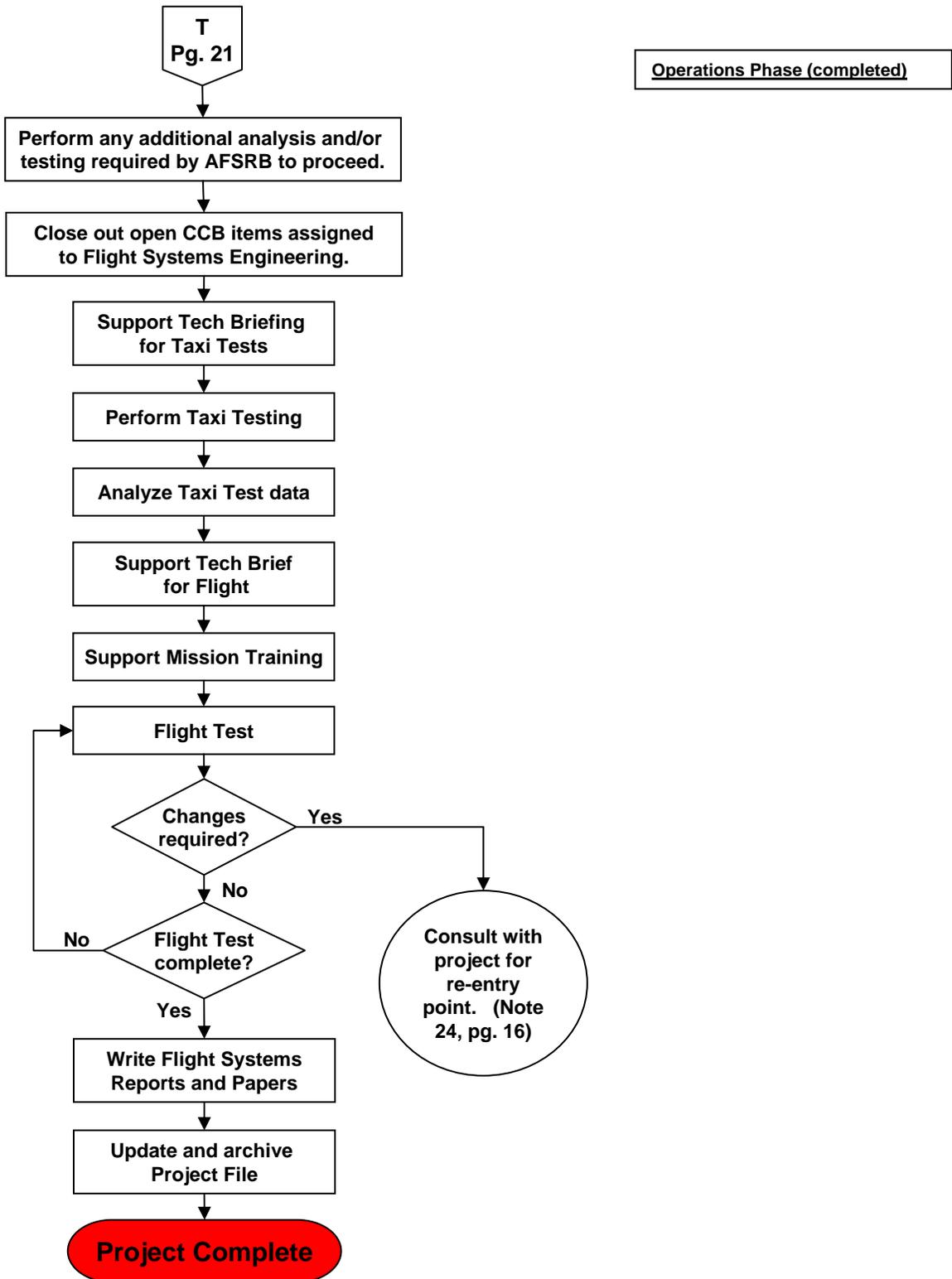
Outputs:
 Final Flight Systems
 Instrumentation Requirements,
 Final Flight Systems Control
 Room Displays,
 Flight Systems GO-NOGO List
 Flight Systems Control Room
 Handbook,
 Flight Systems Reports and
 Papers,
 Updated Project File,
 Project File Archive

Note 28: Go-NoGo list will be generated by determining which parameters have been defined as flight critical by hazard analyses (PHA, SHA, SSHA, OSHA) and any FMEAs or FMECAs.

Note 29: FOLs are derived from hazard analyses (PHA, SHA, SSHA, OSHA) and from vehicle. This also includes any special EMI/EMC testing of the integrated vehicle.

Note 30: Ground test procedures include Hangar Radiation Test (HRT), Ground Vibration Test/Structural Mode Interaction (GVT/SMI), Combined System Test (CST), and Taxi Test.





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8.0 METRICS & TREND ANALYSIS

The metrics in this section identify the specific criteria that measure the success or effectiveness of the stated objectives.

- Zero findings from project assessments, internal and external audits
- Product delivered on time verified through schedule plan vs. actual
- Product delivered on budget verified through budget plan vs. actual
- Product meets product design and customer acceptance requirements verified through test plan - test objectives vs. test results
- Zero safety incidents related to the execution of the procedure

9.0 MANAGEMENT RECORDS & RECORDS RETENTION

The project file contains all the outputs of this process and will be maintained in accordance with NPR 1441.1.

Document History Log

This page is for informational purposes and does not have to be retained with the document.

Status Change	Document Revision	Effective Date	Page	Description of Change
Baseline		1-28-99		
Revision	A	4-5-99	1 4	Modified signature block from "Approved" to "Electronically Approved by" and Note 1. Added Note 4 to page 4. Reformatted document.
Revision	B	4-19-99	All	Reformatted document and modified Note 4.
Revision	C	6-14-99	1 2 2, 3 3	Corrected spelling errors in Note 2. Added Test Results to contents of Project File in Note 2. Added branch-level design review option. Added new Note 4 and Note 5. Renamed existing Note 4 to Note 6. Added requirement to document test results in Project File to last block on page.
Revision	D	1-21-03	All	This revision is a complete re-write of the document.
Revision	E	10-25-05		<ul style="list-style-type: none"> Embedded flowchart in Word template. Added Sections 1.0 – 9.0.

DISTRIBUTION in addition to Document Library

This document may be released to the public.

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