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Mission Planning and Analysis Division Development Plan for STS-2 Through STS-4

Mission Planning and Analysis Division

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National Aeronautics and
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Lyndon B. Johnson Space Center
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SHUTTLE PROGRAM

MISSION PLANNING AND ANALYSIS DIVISION DEVELOPMENT PLAN FOR STS-2 THROUGH STS-4

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FOREWORD

The contents of this initial publication of the STS-2 through STS-4 Product Development Plan are consistent with the POP 80-1 Option 2 schedules and resources. The document will be updated to be consistent with POP 80-2 as soon as possible.

CONTENTS

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

This document is the second in a series of three that defines the baseline products, schedules, and resource requirements for the Mission Planning and Analysis Division (MPAD). MPAD support of STS 2, 3, and 4 are included in this document. The other documents in this series are STS-1 and transition to OPS. The document represents the baselined MPAD work plan and will be updated on a periodic basis.

The purposes of the document are to provide a management tool for use within MPAD and to provide visibility and a coordination tool for use with external organizations who use MPAD generated products.

The document is structured into two main sections, which are: (1) products and schedules and (2) resources required. The major functions addressed in each section are:

a. Orbiter software

b. MCC software

c. Flight design

d. Flight operations support

e. Simulation tools

f. Postflight analysis

1.2 GUIDELINES AND ASSUMPTIONS

The following guidelines and assumptions were used in developing the STS 2-4 schedules, products, and resources:

a. The flight dates are those contained in POP 80-1 Case II:

STS-2	5/1/81
STS-3	9/30/81
STS-4	12/31/81

b. The Flight Readiness Reviews will be 4 weeks prior to scheduled launch dates for STS 2-4.

c. Option II of Orbiter software options will be baselined; i.e., version 16 will be used for STS-1 and version 18 for STS 2-4, and version 19 for STS-5 and subs.

d. Version 18 FACI is September 9, 1980, and CI is March 5, 1981.

e. SAIL/FSL will implement version 18 in December 1980.

f. SDL/SVDS comparison testing will be done on version 18 of the Orbiter software.

g. SMS validation will not be done for version 18.

2.0 SUMMARY SUPPORT PLAN

(TBS by FM 17)

3.0 PRODUCTS AND SCHEDULES

3.1 ORBITER SOFTWARE

This task consists of all work associated with certifying the performance of the guidance and targeting, attitude and pointing, and navigation flight software for STS 2-4. The activity includes requirements development and analysis and verification support.

3.1.1 Ascent/OMS Maneuvers

This task will be responsible for developing, reviewing, and verifying onboard guidance software for ascent and insertion OMS maneuvers. Specific duties include development of essential guidance software change requests (CR's) necessary to satisfy ascent maneuver requirements, performing a detailed review of the actual flight software code, generating comparison test tapes used for verification of the onboard software, monitoring selected SAIL and FLS verification tests for guidance anomaly and discrepancy reports, and reviewing necessary guidance formulation changes. Other duties include activity supporting briefings at the OASB, organizing and supporting the guidance mode team meeting and participating in the CI and FRR. Also, specific trajectory data are generated for the guidance performance data book and finally, generating new software performance reports as required. This task will also monitor Orbiter software changes that affect sequencing in the SRB and ET separation events to assure that the current flight software is incorporated into the flight software math models associated with the SRB and ET separation simulations.

The detailed products and schedules for this task are presented in table 3.1.1.

3.1.2 Aborts

This task will be responsible for developing, reviewing, and verifying onboard software pertaining to intact and contingency aborts. Specific duties include development of essential software change requests (CR's) necessary to satisfy abort requirements, review of all CR's pertaining to aborts including generation of impact statements for non-incorporation, performing a detailed review of the

actual abort flight software code, generating abort comparison test tapes used for verification of the onboard software, monitoring selected abort related SAIL and FSL verification tests, and making and reviewing necessary abort formulation changes. Other duties include activity supporting abort briefings at the OASCB, guidance mode team meeting, and the CI and FRR. Also specific abort trajectory data are generated for the guidance performance data book. This task will also monitor Orbiter software changes that effect sequencing in the SRB and ET separation events to assure that the current flight software is incorporated into the flight software math models associated with the SRB and ET separation simulations.

The detailed products and schedules for this task are presented in table 3.1.2.

3.1.3 Onorbit

The onorbit task is divided into the three areas of attitude and pointing, onorbit OMS maneuvers, and RMS support.

3.1.3.1 Attitude and Pointing

This task consists of all work associated with certifying the performance of the universal pointing, antenna management, and prethrust attitude alignment software for STS 2-4. This activity includes CR analysis, performance testing of requirements, and verification support.

This task will evaluate all CR's that interact with the attitude and point function and report the results to the OASCB. Any attitude and pointing CR's that are required as a result of previous flight data or any other reason will be developed on this task. The performance testing of requirements will center on the additional attitude maneuver options and onorbit OMS maneuver capability that are a part of version 18 of the Orbiter software that will be used on STS 2-4. This task will also evaluate the impact of previous flight data and any scheduled flight test requirements (FTR's) for the next flight.

This activity will also support verfication activities. The detailed code for version 18 will be reviewed. Comparison tests between the SVDS and SDL will be executed for the initial version 18 release and smaller set of cases will be run prior to STS 3 and 4, if required. Also, the IBM levels 6 and 7 cases will be reviewed prior to customer inspection (CI). This activity includes the analysis of all FSL and SAIL verification cases for STS 2-4 in the attitude and pointing area. Each case will be evaluated in terms of attitude and pointing performance. Even though the SMS onorbit dynamics will have been validated previously, SMS support will be required to verify the additional attitude and pointing capability in version 18.

The products and schedules for this task are presented in table 3.1.3.1.

3.1.3.2 Onorbit OMS Maneuvers

This task consists of all work associated with developing and verifying the performance of the onorbit OMS guidance system for STS 2-4. This activity includes

GNC CR analysis, GNC performance testing, IBM verification support, and SAIL and FSL verification support.

This task will evaluate all ascent GNC CR's that interact with the onorbit guidance and targeting function and report the results to the OASCB. Any guidance and targeting CR's that are required as a result of previous flight data, performance studies, or other reasons will be developed on this task.

This task will also evaluate the onorbit OMS guidance system performance for the version 18 software requirements which contains new functional capability for STS 2-4 such as Lambert guidance and OMS short burn and recycle capability. Also, previous flight data will be analyzed to determine possible guidance system modifications. The effects of any flight test requirements or flight design constraints on the guidance system will be analyzed.

This task will support verification activities. The detailed code for version 18 will be reviewed. Comparison test cases between the SVDS and SDL will be executed for the initial release of version 18. Comparison tests for subsequent flights will be made only if warranted by significant software or flight profile modifications. The IBM level 6/7 test cases will be reviewed prior to CI. This activity includes supporting the definition of the verification test plans and procedures and analyzing the SAIL and FSL verification cases for STS 2-4. Selected cases will be analyzed in terms of OMS guidance system performance.

The products and schedules for this task are presented in table 3.1.3.2.

3.1.3.3 RMS

The primary effort of this task will be the validation of mission/payload dependent Level C data. The results of this task will consist of simulator documentation as well as technical reports/presentations in support of formal verification of the RMS auto-sequence flight software.

The products and schedules for this task are presented in table 3.1.3.3.

3.1.4 Descent

3.1.4.1 Deorbit

This task consists of all work associated with developing and verifying the performance of the deorbit guidance system for STS 2-4. This activity includes GNC CR analysis, GNC performance testing, IBM verification support, and FSL verification support.

This task will evaluate all deorbit GNC CR's that interact with the guidance and targeting function and report the results to the OASCB. Any guidance and targeting CR's that are required as a result of previous flight data, performance studies, or other reasons will be developed on this task.

This task will also evaluate the guidance system performance for the version 18 software requirements which contains new functional capability for STS 2-4 such as OMS short burn and recycle capability. Also, previous flight data will be analyzed to determine possible guidance system modifications. The effects of any flight test requirements or flight design constraints on the guidance system will be analyzed.

This task will support IBM verification activities. The detailed code for version 18 will be reviewed. Comparison test cases between the SVDS and SDL will be executed for the initial release of version 18. Comparison tests for subsequent flights will be made only if warranted by significant software or flight profile modifications. The IBM level 6/7 test cases will be reviewed prior to CI. This activity includes supporting the definition of the verification test plans and procedures and analyzing the FSL verification cases for STS 2-4. Selected cases will be analyzed in terms of deorbit guidance system performance.

The products and schedules for this task are presented in table 3.1.4.1.

3.1.4.2 Entry-through-Landing/GRTLS

This task consists of all work associated with certifying the performance of the entry guidance systems for STS 2-4. This activity includes evaluating the impact of OTT on GNC performance, RM testing, CR analysis, FSL GNC verification test analysis, IBM CT generation, and definition of entry guidance modifications based on flight data and postflight analysis from STS-1. The products and schedules for this task are presented in figure 3.1.4.2.

3.1.4.2.1 Requirements analyses

Task 1 - GNC Performance Analysis

This task will center on the impact of utilizing version 18 of the Orbiter software which contains new functions such as optional TAEM targeting (OTT) and programed test inputs (PTI's). Also to be considered are mods resulting from STS-1 flight data. GNC performance studies will be conducted for any special test inputs of angle of attack and control surface deflections for the flight test programs.

Task 2 - IMU RM Testing

This task will evaluate the impact of flight data, mission changes, and RM threshold changes on IMU RM performance. In addition, IMU RM studies will be conducted to validate flight test mission requirements such as test inputs, special control surface schedules, or special angle-of-attack profiles.

Task 3 - CR Analysis

All STS 2-4 GNC software changes will be evaluated in terms of performance analysis and GNC interaction effects. The results of these studies will be reported to the Orbiter Avionics Software Control Board (OASCB) for CR evaluation. Any entry guidance modification required as a result of postflight analysis will be developed and CR's prepared as a part of this task.

3.1.4.2.2 Verification support

Task 1 - FSL GNC Verification Test Analysis

This activity includes the analysis of each of the FSL GNC verification cases for STS 2-4. Each case will be evaluated in terms of guidance performance, GNC interaction, consumables analysis, and mission rule evaluation. The number of cases for each flight should be small compared to the STS-1 FSL effort.

Task 2 - SDL/SVDS Comparison Testing

This task will generate SVDS data to be used for comparison for SDL cases. Cases will be generated at least once for each mission (STS 2-4) using the operational flight profile data and more often if subsequent major profile changes are made.

3.1.5 Navigation

This task consists of all work associated with developing and verifying the navigation system for STS 2-4. This activity includes CR analysis, constants and I-load definition, navigation system hardware/software compatibility analysis, performance testing, IBM verification support, and SAIL and FSL verification support.

The major functions for which the above activities are performed include: IMU RM, IMU align, attitude processing, nav display and control, navigation parameter processing to support display, guidance, flight control, and telemetry, state propagation, state updating via filter using nav aid measurements, TACAN RM, surface feature and ground nav aid position and orientation data, and coordinate system and transformation.

3.1.5.1 Ascent Navigation

This task will evaluate all CR's that interact with the ascent navigation system and report the results to the OASCB. Any navigation CR's that are required as a result of previous flight data, performance studies, vehicle, or other changes will be developed on this task. I-loads for STS 2-4 will be updated based on previous flight data, hardware changes, flight test requirements, flight profile changes, and any other reasons.

This task will analyze current performance characteristics of the vehicle hardware on which the navigation system depends for inputs to ensure a compatible hardware/software navigation system. Previous flight data will be analyzed and proposed changes to the navigation system be made as required.

The ascent navigation system performance for the version 18 software requirements will be evaluated. Previous flight data will be analyzed to determine any impacts on the version 18 navigation system. Also, the effects on the navigation system of any flight test requirements, hardware changes, or flight design constraints will be evaluated.

This task will support IBM and SAIL verification activities. The detailed code for version 18 will be reviewed. The IBM level 6/7 test cases will be reviewed prior to CI. This activity includes supporting the definition of the verification test plans and procedures and analyzing the SAIL verification cases for STS 2-4.

The products and schedules for this task are presented in table 3.1.5.1.

3.1.5.2 Onorbit Navigation

This task consists of all work associated with development of the onorbit navigation system for STS 2-4. The activity includes CR analysis and requirements documentation support, I-load analysis and definition, IMU hardware/software compatability analysis, IBM implementation and verification support, SAIL verification support, and FTR definition support using previous flight data and experience.

MPAD is under track task to RI/Downey to provide requirements development and documentation support. This task integrates approved requirements changes into the FSSR documentation as required. The task also evaluates all CR's that interact with the onorbit navigation function and report the results to the OASCB. Any navigation CR's that are required as a result of previous flight data, performance studies, or other reasons will be developed on this task. I-loads for STS 2-4 will be updated based on requirements analysis, previous flight data, or hardware changes.

This task will analyze the current IMU hardware performance characteristics that are a basis of the navigation software to ensure a compatible hardware/software system. After STS-1, the flight data will be analyzed and changes proposed for subsequent flights if necessary. The version 18 navigation system performance will be evaluated for the verious onorbit mission activities.

This task will support IBM's version 18 implementation activities by supporting the design and code reviews and the modular development testing activities. Support will also be given to the IBM verification activities. The detailed code for version 18 will be reviewed. Also, the IBM levels 6 and 7 cases will be reviewed prior to CI.

The task will support the definition of a verification test plan for STS-2 (version 18) and analyze all SAIL verification cases for STS 2-4 in the area of

onorbit navigation. Each case will be evaluated in terms of navigation system performance.

3.1.5.3 Descent Navigation

This task consists of all work associated with developing and verifying the performance of the descent navigation system for STS 2-4. This activity includes CR analyses, I-load analysis, navigation system hardware/software compatibility analysis, performance testing, IBM verification support, and SAIL and FSL verification support.

This task will evaluate all CR's that interact with the ascent navigation system and report the results to the OASCB. Any navigation CR's that are required as a result of previous flight data, performance studies, hardware, or other changes will be developed on this task. I-loads for STS 2-4 will be updated based on previous flight data, vehicle changes, flight test requirements, flight profile changes, and any other reasons.

This task will analyze current performance characteristics of the vehicle hardware on which the navigation system depends for inputs to ensure a compatible hardware/software navigation system. Previous flight data will be analyzed and proposed changes to the navigation system be made as required.

This task will evaluate the descent navigation system performance for the version 18 software requirements. Previous flight data will be analyzed to determine any impacts on the version 18 navigation system. Also, the effects on the navigation system of any flight test requirements, vehicle changes, or flight design constraints will be evaluated.

This task will support IBM and SAIL/FSL verification activities. The detailed code for version 18 will be reviewed. The IBM level 6/7 test cases will be reviewed prior to CI. This activity includes supporting the definition of the verification test plans and procedures and analyzing the SAIL and FSL verification cases for STS 2-4. Verification cases will be analyzed in terms of descent navigation system performance.

3.1.6 Consumables Management

This task includes support in the areas of nonpropulsive and OMS/RCS consumables. The products and schedules for this task are shown in table 3.1.6.

3.2 MCC SOFTWARE

3.2.1 Ascent/Aborts

This task consists of support to the real-time MCC processors and off-line MCC processors. The offline programs include the SRB impact predictor and the launch trajector qualification system products and schedule for the LTQS are TBS.

Formulation changes necessary to support operational flights will be developed for the abort region determinator (ARD) and the abort maneuver evaluator (AME). These changes will be documented and presented to the Level B Requirements Review (BRR) Board for approval. These plans will be developed and verification of the processors will be supported.

A performance report will also be published to summarize the performance capability of each processor with the incorporated changes.

3.2.2 Onorbit

The area of onorbit processing includes the maneuver-related software including PEG, MPT, DMT, PFNI, PFI, GPM, two-impulse, RELMAT/REFSMAT, and attitude and pointing. Support includes reconfiguration testing, which is accomplished principally by inspection, and CR processing and testing as required. Schedules for the activities are shown in table 3.2.2.

3.2.3 Descent

This task involves activity related to the entry target generator (ETG) and the entry planning processor of the Mission Control Center (MCC). For STS 2-4, this includes: (1) verifying that the MCC has been configured properly for each flight, (2) level C change request (CR) definition, analysis, and verification, and (3) incorporating aero and aero heating data as updated by flight test data analysis.

The configuration verification task requires verifying the data load for the MCC (i.e., atmosphere, aerodynamic, thermal protection system (TPS), and I-load data) and the software configuration. The basis for the verification is data generated by independent ETG and entry/TAEM simulation test beds maintained in SVDS. Generating the data requires configuring the test beds to the specified version (i.e., the specified "rev") and then running four ETG test cases and four to six entry/TAEM trajectories. The data are compared to similar cases run on the MCC. Discrepancies are then resolved. That activity is scheduled for STS-2, 3, and 4.

Two CR's are known to be required for STS-2: optional TAEM targeting (OTT) and a modification to the flightpath angle iteration in the ETG. The OTT CR has been approved, and the level C MCC requirements document has been updated to include the OTT model. Work is in progress on a test plan document. This document will describe a series of tests to verify that the CR has been implemented correctly in the MCC. The tests are similar in concept but independent from the configuration verification tests. The independent tests are more comprehensive because of the size of the change.

The change in the ETG flightpath iteration will reduce the likelihood of a flightpath angle solution not being determined under extreme conditions. The change is discussed in MDTSCO Working Paper 1.4-WP-DI232-063, "Improvements to the ETG", December 24, 1979. The work on the modification has been largely theoretical to date. Additional analysis is scheduled to increase the data base of

the change. The change is scheduled to go into the MCC concurrently with the OTT changes. In addition, ongoing CR support is scheduled for possible changes to the guidance or the thermal protection system (TPS) model during STS 2-4. If the change to the TAEM range prediction equation described in the STS-1 Work Statement for MCC support does not fit into the STS-1 timeline, it will be included in this item.

Updates to the MCC aero data may be required due to flight data analysis. Updates to the C_L, C_D, and C_M data used by the MCC are anticipated 4 to 6 weeks after each of the first three flights. This will allow the MCC aero data to be updated for the next flight if necessary. That activity is included on the schedule. The activity will be similar to configuration verification tests but of a lesser magnitude.

Updates to the aero heating data may also be required. Updates to these data are anticipated 2 to 3 months after each flight. This will not allow the MCC data to be updated for the next flight. However, the data will allow the MCC TPS model output to be calibrated for the following flight and the MCC aero heating data will then be updated for the subsequent flight. This update is concurrent with the reconfiguration testing for the appropriate flight, and this activity is included on the schedule.

3.2.4 Navigation

The ground navigation system includes MCC HW/SW and KSC HW/SW aid to the tracking systems and communications network. The MCC software task involves requirements changes, constants definition design review, verification support, and requirements testing.

3.2.4.1 Ascent/Descent

The MCC ascent/descent software functions include:

a. Tracking data input processing by the high-speed input processor (HSIP)

b. Determination of Orbiter position and velocity on a cyclic basis by the high-speed trajectory determination processor (HSTD)

c. Computation of changes to onboard knowledge of position and velocity using the state vector update processor (SUP).

The products and schedules for this task are shown in tables 3.2.4.1.

3.2.4.2 Onorbit

The MCC orbital nav SW functions include:

a. Tracking data input processing by the low-speed input processor (LSIP)

b. Determination of position and velocity by processing tracking data using the onorbit determination processor (ODP)

c. Determination of downtrack position (quick-look DTP processor)

d. Evaluation of orbital state solution using measurement residual and state comparison display driving software.

e. Control software for the LSIP, ODP, DTP and for positioning vectors for uplink to the onboard nav system.

The products and schedules for this task are shown in table 3.2.4.2.

3.2.5 Consumables Management

3.2.5.1 OMS/RCS Consumables

This task supports the real-time MCC quantity remaining comps and mass properties, and provides the offline processors for OMS/RCS (ELDON and mini-ELDON). Products are shown in table 3.2.5.1.

3.2.5.2 Nonpropulsive Consumables

This task supports the real-time MCC quantity remaining comps and provides the offline processors for EPS, CAP, systems configuration management, and APU fuel. Products are shown in table 3.2.5.2.

3.3 FLIGHT DESIGN

This task covers all of the activities required to develop the trajectory, attitude, nonpropulsive consumables and OMS/RCS consumables profiles for the STS-2 through STS-4 flights. This includes the effort required to develope the operational flight profiles (OFP) as well as the program support leading up to the OFP. The overall schedule for the development of the OFP for STS-2 through STS-4 is shown in table 3.3.

3.3.1 General

(Write-up TBS by FM 17)

The schedules and products for this task are shown in table 3.3.1.

3.3.2 Ascent/Ascent Aborts

This task consists of performing the necessary ascent/ascent abort trajectory, SRB/ET separation, and SRB/ET disposal analyses to support the development

groundrules, conceptual flight profiles and the operational ascent/abort flight profiles for STS-2 through STS-4. Specific duties include generating and verifying all ascent and abort onboard guidance S/W I-Loads, generating onboard ascent/abort flight data file and crew activity inputs, generating ascent/abort trajectory data for MCC displays and console data packs, generating ascent/abort trajectory data for the onboard CRT displays, defining ascent/abort inputs for the MCC and generating ascent products in support of range safety. This task is directly responsible for publishing the ascent and abort volumes of the Operational Flight Profile and the associated dispersion analyses.

The schedules and products for this task are shown in table 3.3.2.

3.3.3 Onorbit

3.3.3.1 Trajectory and Attitude/Pointing

This task consists of integrating the onorbit flight trajectory and attitude timeline with the ascent and descent phases. Groundrules and constraints are compiled and integrated with flight test requirements and payload objectives to produce conceptual flight profiles and the onorbit profiles for the operational flight profile. Specific products are: conceptual flight profile documents: groundrules and constraints (OFP Vol. I), flight profile summary (OFP Vol. II), onorbit flight profile (OFP Vol. IV), attitude and pointing appendix, supertapes for CFP and OFP, and common format trajectory and attitude tapes.

Reconfiguring the onorbit trajectory and attitude/pointing for launch slips may cause the supertapes, common format data tapes, and attitude timeline to be regenerated. In addition, RELMATS and REFSMATS must be updated for the simulation data packs and flight data files.

The schedules and products for this task are shown in table 3.3.3.

3.3.3b P/H Ejection and RMS

The payload ejection systems analysis part of this task will provide a quality assurance of various flight design ejection systems by reviewing and critiqueing contractor ejection designs, operational tests and ejection analyses at contractor hardware installations. An evaluation of the groundrules and operating procedures of ejection systems with respect to crew safety and safe separation clearances will be performed. The results of the QA effort will be documented and input to specific mission groundrules and procedures documentation if appropriate and required. If independent additional dynamic analyses are necessary for problem ejection systems, these will be performed by JSC with local contractors to assure a safe and adequate, verified ejection system.

The RMS part of this task includes the establishment of RMS groundrules, constraints, and a data base for purposes of generating paylaod handling phase timelines, profiles, and I-loads for supporting OFT flight design activities and

Operational Flight Profile development, and the plume impingement FTR that is currently scheduled for STS-4.

The schedules and products for this task are shown in table 3.3.3.

3.3.4 Descent/GRTLS

3.3.4a Deorbit Targeting

For each OFP, the following products will be generated by this deorbit task:

Nominal deorbit targets
Entry RELMAT's and REFSMAT's
Block data solutions for each deorbit opportunity
Parametrics data for deorbit analysis (triple down-mode cures, burn data, tank failure capability, etc.)

These data will be published in the descent OFP document and/or by memo.

The schedules and products for this task are shown in table 3.3.4.

3.3.4b Descent

Schedules and manpower for a descent design cycle have been developed using templates or models that address the recurring tasks and products of a design cycle. Templates were developed based upon STS-1 Cycle 3 experience, but projecting increased automation and efficiency. Near-term minimum and maximum templates were developed to represent schedules and manpower in the STS-1 to STS-4 timeframe. A minimum template represents the resources required to develop a cycle update when no major profile reshaping is required, but enough changes have occurred to warrant a new cycle with attendant products. The maximum template represents a major update, for example, updated aerodynamics or thermal criteria or major mass properties changes or new angle-of-attack profile. These templates are presented in tables 3.3. These templates are the basis for schedule and resource estimation for each flight design activity. The appropriate template is chosen based upon flight design complexity and experience level. Additional tasks are then scheduled as necessary to accommodate unique flight activities requiring early or parallel activity compared to the template.

The major tasks for a descent design cycle include the design of the end of mission and AOA, the design of the GRTLS, and the definition of the contingency abort entries (CAE).

The end of mission and AOA task encompasses all those activities required to generate a flight profile and guidance I-load set from deorbit through rollout, as well as the generation of data for ground and onboard monitoring, simulator reset points, flight program verification and documentation. The AOA is

included with the nominal profile because the AOA utilizes the same set of I-loads as the nominal profile.

The GRTLS task encompasses all those activities required to generate a flight profile and guidance I-load set from external tank (ET) separation through rollout, as well as the generation of data for ground and onboard monitoring, simulator reset points, flight program verification and documentation. The CAE task involves all those activities required to generate representative flight profiles from ET separation to touchdown or ditch after identification of MECO conditions from powered CA procedures. The CAE manual flight procedures are evaluated and potential modifications are identified. The flight envelope is defined and survivability assessment performed.

The schedules for the descent design task are shown in table 3.3.4. The template used for the flight design cycle is specified for the operational flight profile for each flight and the additional tasks to be accomplished are also identified.

3.3.5 Nonpropulsive Consumables

(The write-up is TBS by FM2)

The schedules and products for this task are shown in table 3.3.5.

3.3.6 OMS/RCS Consumables

(The write-up is TBS by FM2)

The schedules and products for this task are shown in table 3.3.6.

3.3.7 Navigation

This task involves the activity related to the specification of the navigation constants required for flight design. The products and schedules for this task are shown in table 3.3.7.

The schedules and products for this task are shown in table 3.3.7.

3.4 FLIGHT OPERATIONS SUPPORT

Flight operations support is of three fundamental types. One is the analysis support to the Flight Techniques Panel to develop techniques for data management and decision logic for real-time trajectory control. The second fundamental type of support is called direct flight support and includes real-time support to the flight control team during simulated flights and during the STS 2-4 flights. The third type is the systems design support, which includes analysis of various subsystem/vehicle configurations.

3.4.1 Flight Techniques Support

Support for STS 2-4 will consist of updating techniques based upon previous flight results, revisions to flight or MCC software, additional flight test requirements, and revisions to flight profiles to accomplish flight test objectives.

3.4.1.1 Ascent/Aborts

This task will be responsible for developing ascent/abort and SRB/ET separation and disposal flight techniques, attending flight technique meetings, briefing recommended Ascent flight techniques and responding to flight technique action items.

3.4.1.2 Onorbit

3.4.1.2.1 Attitude and pointing.- Support to flight techniques consists of analyses as requested on subjects such as timeline effects due to lighting changes, maneuvers to achieve flight test or payload objectives, and star selection and IMU alignment procedures. Products are usually in the form of presentation material and/or memos. Schedules and resources are difficult to estimate due to the uncertainty of meeting schedules and number of action items. Products and schedules for this task are shown in table 3.4.1.2.1.

3.4.1.2.2 Onorbit OMS maneuvers.- This task will be responsible for developing onorbit OMS maneuvers flight techniques, attending flight techniques meetings, briefing recommended techniques, and responding to flight technique action items. The products and schedules for this task are shown in figure 3.4.1.2.2.

3.4.1.2.3 RMS.- This task will support the Flight Techniques Panel with trade studies, analyses, action-item support and presentations. For this purpose, the task will evaluate the capability of the RMS to handle specific payloads planned for OFT missions. This also includes support of the plume impingement FTR scheduled for STS-4.

The products and schedules for this task are shown in table 3.4.1.2.3.

3.4.1.2.4 Payload ejection.- This task will perform quality assurance of various flight techniques with respect to ejection systems for payloads being ejected from the Orbiter payload bay and evaluate with respect to crew safety and safe separation clearances from the Orbiter. The task will document results of the QA effort and input to specific mission techniques if appropriate and required.

The products and schedules for this task are shown in table 3.4.1.2.3.

3.4.1.3 Descent

3.4.1.3.1 Deorbit.- Flight techniques meetings will be supported, and action items will be answered by memo or presentations to the techniques meetings.

Products and schedules for this task are shown in table 3.4.1.3.1.

3.4.1.3.2 Entry through landing/GRTLS.-

STS-2

The TAEM flight techniques must be revised for STS-2 and subsequent flights due to the incorporation of OTT. Some of the basic flight techniques concepts were developed during the simulations leading to the OTT flight software development. However, subsequent reduction of the TAEM flight corridor will cause significant revisions in the OTT TAEM profile and in the OTT procedures from those developed during the OTT simulation. This is because the dive maneuver required for large turn angles onto final approach will be severely restricted, thus limiting the maximum turn angle onto final approach. This is also the first flight that will incorporate attitude maneuvers to develop data to define the Orbiter aerodynamic and aerodynamic heating characteristics.

STS-3

Presently there are no fundamental profile changes for STS-3; however, this is the first flight that will use the autoland guidance through landing and the attitude maneuver required for flight testing will be a different set than accomplished on STS-2. Thus, the primary flight operation support activity will be to update the flight techniques based upon flight test data, to define techniques for monitoring the autoland guidance, and in providing direct flight support to the flight control team.

STS-4

STS-4 will be the first flight using a low angle-of-attack profile required to flight test the high crossrange capability. In addition, this will be the first flight that lands at KSC, and this flight will have a different set of attitude maneuvers then previous flights. Further, analysis of flight test data on STS-2 and 3 to define the Orbiter aerodynamic heating and aerodynamic characteristics may permit or may require profile modifications. Thus, the primary flight operation support activities will be revisions of the flight techniques because of profile revisions and because of Orbiter performance update using flight test data.

The products and schedules for this task are shown in table 3.4.1.3.2.

3.4.1.4 Consumables Management

3.4.1.4.1 Nonpropulsive consumables.- TBS by FM 2

3.4.1.4.2 OMS/RCS Consumables.- TBS by FM 2

3.4.1.5 Navigation

3.4.1.5.1 Onboard S/W support.- Crew procedures and ground support requirements for monitoring, control, and support of onboard nav will be defined/developed. Flight technique action items will be supported on demand within resource constraints.

3.4.1.5.2 MCC ascent/descent.- Preparation and presentation of existing information is provided upon demand. Information requiring special studies or computer runs are costed and scheduled as new starts.

3.4.1.5.3 MCC onorbit.- Action items response is provided on demand including computer runs and studies within resource availability constraints.

3.4.2 Simulation and Real-Time Support

3.4.2.1 Ascent/Abort

This task will be responsible for suporting ascent/abort guidance evaluation abort region determination, SRB impact prediction, and day-of-launch I-load evaluation. The products and schedules for this task are shown in table 3.4.2.1.

3.4.2.2 Onorbit

3.4.2.2.1 Attitude and pointing.- This task will provide sim and real time support to FOD from the flight dynamics staff support room. It will also assist FOD personnel with off-line bench programs such as the orbit attitude graphics program and the universal pointing bench program.

3.4.2.2.2 Onorbit OMS maneuvers.- TBS by FM 41

3.4.2.2.3 RMS.- TBS by FM 41

3.4.2.2.4 Payload ejection.- TBS by FM 41

3.4.2.3 Descent

3.4.2.3.1 Deorbit

3.4.2.3.2 Entry through landing/GRTLS

3.4.2.4 Consumables Management

3.4.2.5 Navigation

3.4.2.5.1 Onboard.- This task will monitor quality and control the onboard navigation and attitude determination including nav sensors, filters, and nav sensor RM. It will also recommend nav system control to flight dynamics officer.

3.4.2.5.2 MCC ascent/descent.- This task will monitor quality and select incoming tracking data and advise TRACK on data problems, control state determination process, control state update process, assess performance of above, and support FLT DYN officer.

3.4.2.5.3 MCC onorbit.- This task will monitor and control incoming data and advise TRACK on data problems, select/edit data, control orbit determination process, assess performance of solution, advise FLT DYN officer on state use/quality, support tracker scheduling, and control state vector handling.

3.4.3 Systems Design Support

3.4.3.1 Nonpropulsive Consumables

TBS FM2

3.4.3.2 ET Disposal

TBS FM41

3.5 TOOL DEVELOPMENT

This task includes development of integrated division tools such as SVDS, internal branch bench programs, and real-time offline programs.

3.5.1 Integrated Division Tools

3.5.1.1 SVDS

The Space Vehicle Dynamics Simulation (SVDS) program is the primary Shuttle simulation tool used by MPAD. The SVDS is used by MPAD to support five major functions:

1. Vehicle performance analyses
2. Flight software algorithm development and testing
3. Flight software testing and verification
4. Flight techniques analyses
5. Generation of operational flight profile (OFP) data products

The SVDS is a complex of computer programs simulating Shuttle ascent, SRB and ET Separation, ascent aborts, onorbit, and descent mission phases. The SVDS generates trajectory and vehicle dynamics information for each mission phase. Modeling includes the physical environment, vehicle system characteristics, and the onboard software algorithms providing guidance, navigation, and control. Both six-degrees-of-freedom (6 DOF) and three-degrees-of-freedom (3 DOF) simulations are available for most mission phases. Multivehicle simulation capability is available for several mission phases.

A trajectory simulation program, which contains the modeling capabilities desired, is prepared for each flight. These capabilities include approved revisions to the guidance, navigation, and control models. Additional alterations are also made for the modeling of environment, physical properties, and data generation to reflect data source changes and output requirements definition. The models and support routines are verified individually and merged for a final verification. The completed alter capability is stored on system files for access by the user community.

The current STS-1 version of SVDS is a collection of program files, data files, and runstreams provided or collected by SDB to support the generation of the Cycle 3 OFP and the latest round of SDL comparison tests. That version of SVDS is being updated to support a scheduled revision of the STS-1 OFP. Further model enhancements and validation will be done to support continued (post-OFP) STS-1 performance and flight techniques analyses. Additionally, a programer/analyst level of effort will be maintained until STS-1 flight for unschedules user support, troubleshooting, and last minute model and flight software changes. SDB anticipates SVDS programing requirements will also arise out of MPAD's TBD postflight analysis responsibilities. A programing level of effort has been projected for that.

3.5.1.1.1 Ascent/abort/deorbit.- This task consists of developing the SVDS program files, data files, and runstreams that are required to simulate nominal

ascent through OMS-2 insertion, nominal deorbit, AOA, ATO, and PRTLS. The products and schedules for this task are shown in table 3.5.1.1.

3.5.1.1.2 Ascent separation sim.- This task consists of CR incorporation, enhancements, and program maintenance and mods. Products and schedules are shown in table 3.5.1.1.

3.5.1.1.3 Onorbit sim.- This task consists of developing and maintaining the SVDS program files, data files, and runstreams that are required to simulate Shuttle orbital operations for STS-2, 3, and 4.

Program files are separated into two basic groups:

a. 3-DOF simulation

b. 6-DOF simulation

Basic components of the 3-DOF simulation are:

a. Integration of vehicle translational motion (multivehicle)

b. Powered explicit guidance (PEG) or simple cross-product steering guidance

c. Pseudo control system, i.e., steering interface

d. Environment including drag and gravity

e. Vehicle hardware including RCS and OMS engines

f. Detailed maneuver table (DMT) software

Basic components of the 6-DOF simulation are:

a. Integration of vehicle translational and rotational motion (multivehicle)

b. Onorbit digital autopilot (DAP)

c. Onboard orbital navigation

d. Universal pointing processor/attitude processor flight software

e. RCS engines with plume impingement

f. Environment including drag and gravity

g. IMU model

h. Vehicle mass properties

3-DOF Orbital Sim

The current 3-DOF orbital simulation program file supporting existing requirement to produce detailed maneuver table (DMT) information. DMT tapes are generated from SVDS runstreams representing translational maneuvers and coast phases. The resulting burn data are written onto a tape and printed by a DMT postprocessor. In addition, existing SVDS display software produces a plot tape. Both of these tapes are then used to supply information to the supertape processor. The supertape processor will output a mission-dependent supertape for use by the crew activities group.

6-DOF Onorbit Sim

Program file updates to the 6-DOF sim will include:

Flight Planning Update File

Updates to the onorbit DAP, universal pointing processor, and the star tracker will enable analysts to do flight planning for OFT missions including the following:

a. RCS propellant usage analysis

b. Verification of universal pointing processor and star tracking capability

Source of program file updates is a set of change requests (CR) to the flight software.

The products and schedules for this task are provided in table 3.5.1.1.

3.5.1.1.4 Descent sim.- This task consists of developing and maintaining the SVDS program files, data files, and runstream that are required to simulate STS-2, 3, and 4 descent through roll-out (including GRTLS).

The major simulation products in this area are:

a. STS-2 end-of-mission capability

The preparation for the STS-2 simulation requires a number of new modeling capabilities. These include OTT, MSBLS error model, input matrix testing, altered COV matrix input options, nav state update, and flight software modifications. The modifications for the guidance, navigation, and control are defined by FSSR change requests which are reviewed and those appropriate changes and additions are made and verified. A collection of the subroutines and alters are placed onto the user file along with data elements and runstreams. Following delivery of the capability to the user, continued user support for debug, correction, and minor addition is needed.

b. STS-2 ORTLS OFP capability

The task required for preparation of this product includes several items described for the EOM OFP plus some additional capabilities including: variable mass and mass properties, rollout, RCS thrust, and EWGDDT ILOAD additions. The flight software activity and user support will be similar to the EOM activities.

c. STS-3, 4 descent OFP capability

The general support of this product will be similar to the STS-2 activities and will also include the addition of several long lead-time navigation items including new ATPROC, Tacan, and IMU modeling routines.

The entry capability is to be brought to the SVDS milestone in order to provide additional capabilities for FAB analysis tasks. This activity is also a necessary part of the FDS preparation.

3.5.1.1.5 SVDS System, utilities, and postprocessors.- This task develops and maintains the SVDS system software required to operate the [illegible]tional simulations for ascent, abort, onorbit, and descent. The miscella[illegible]us utility programs and postprocessors used in conjunction with those sims are also contained here.

The SVDS system software consists of the SVDS input processor, the SVDS initialization logic, the numerical integrators, the termination logic, and the output processing. Included in this product area is the task of periodically collecting SVDS modifications that have been made in all areas of SVDS and producing unified SVDS milestones.

The set of postprocessors consists of the program files, data files, and runstreams required to process SVDS output data to generate OFP data products. Several such postprocessors are operational and require little modification and maintenance. Others are scheduled to undergo major enhancements.

a. RELMAT and REFSMAT Generator (ADIMOT): Documentation and user consultation planned.

b. Format Converter for Common Data Tape (CTAPE): This program converts UNIVAC binary unformatted D-tapes to an IBM compatible EBCDIC tape. No further development planned.

c. Common Data Tape Generator (DTAPE): This program reads output SVDS files and generates D-tapes. No further development planned.

d. Separation Picture Plot Generator (HPLOT): This program produces separation picture plots of SRB and ETSEP. No further development planned.

e. Station Contact Generator (RADAR): This program produces contact displays that describe vehicle visibility with respect to groundstations or TDRS. No further development planned.

f. Sun Angle Generator (SUNANG): This program computes Sun look angles. No further development planned.

g. Supertape Generator (DASG): This program generates a tape of auxillary trajectory information stored in 10 files. This tape is required for crew activity planning by the Crew Training and Procedures Division. The program has been built and is operational but is undergoing some major revisions and enhancements. The resulting DASG program will provide all requested OFT and OPS capabilities. The work to be done under this subtask includes the review and completion of each processor, code, and COMMON standardization and cleanup, incorporation of a version of the SVDS input processor, and conversion of the program tape output to the plot tape format both for MPAD use when DASG becomes part of the FDS and for creation of the tape deliverable to Crew Training and Procedures Division (CTPD). Each processor will be reviewed for inclusion of computations for all required OFT and OPS output parameters. Checks will be made for correct units, rotational sequences and adherence to requested conventions. Each review will include a walk-through of code for all possible processor options. All code and COMMON structures will meet SVDS standards. The processor comment cards will be checked and updated if required to reflect the final program design implementation (CD cards and code imbedded comments). A version of the SVDS input processor will be implemented to handle program input requirements. The output routines will be modified to produce a binary plot tape for use by the FDS and an ASCII "plot tape" formatted tape for delivery to CTPD.

h. Table Display Generator (TABDIS): This program generates tabular display for OFT from data tapes generated by SVDS and its postprocessor. Only a user's guide update is currently planned, but a significant TBD set of requirements is expected from FAB.

i. Tape Print Program (TPRINT): This program prints an SVDS generalized output tape. No further development is planned.

j. Generalized Plot Program (TRWPLT): This program generates plots for OFT from a data tape generated by another program. This is the generalized plot program used by SVDS, but it also is used across the center by non-SVDS users. Current work planned will produce a user's guide update incorporating information for OFT-1 Cycle 3 OFP capabilities, and will produce a capability to generate the entry constraint boundary plots. In addition, a significant TBD set of requirements is expected soon from FAB.

The products and schedules for this task are provided in table 3.5.1.1.

3.5.1.2 Launch Trajectory Qualification System (LTQS)

This task will continue the maintenance and mods of the LQTS throughout the STS 2-4 flights. The LTQS is a non-MCC ground software program that will analyze the launch trajectory based on specific vehicle dependent data and environmental conditions on the day of launch. This program will generate first-stage guidance I-loads based on measured winds and evaluate the adequacy of first-stage guidance constants by simulating the trajectory and determining the vehicle

forces using measured environmental conditions. A set of trajectory data will also be generated for further loads analysis by other programs. The products and schedules for this task are shown in table 3.5.1.2.

3.5.2 Ascent/Abort

This task will primarily be responsible for maintaining and developing necessary ascent trajectory generation tools to carry out the required services to satisfy the ascent/abort products and schedules. Specific ascent tools include the SVDS with the required model modifications, bench and off-line programs to support ascent guidance checkout and verification, and automated OFP and onboard S/W I-load generation processors. Specific abort tools include bench programs for the ARD, AME, stand-alone PEG; SVDS modifications compatible with abort requirements; and automated OFP and onboard S/W I-load generation processors for abort.

The products and schedules for this task are shown in table 3.5.2.

3.5.3 Onorbit

3.5.3.1 Attitude and Pointing

This task will be responsible for maintaining and developing adequate tools to carry out the required services to satisfy the attitude and pointing products and schedules.

This includes bench programs for the onboard Universal Pointing and Antenna Management Processors, the View Program, the Flight Plan Summary Program, the Reference Mission Analysis Program, the Antenna Field of View Program, and the Orbital Attitude Graphics Program.

The products and schedules for this task are shown in table 3.5.3.1.

3.5.3.2 Onorbit OMS Maneuvers

TBS FM41

3.5.3.3 RMS

This task will validate modification to and provide long-term configuration control over the PDRSS program. This task also includes maintenance of a functional simulation of the RMS flight software including tracking and evaluating RMS flight software CR's.

Products and schedules for this task are shown in table 3.5.3.3.

3.5.4 Descent

3.5.4.1 Deorbit

TBS FM41

3.5.4.2 Entry Through Landing

This task is for the continued development of the SVDS and LAND programs to support STS 2-4.

The SVDS and LAND simulations, and the associated postprocessors, provide a capability for medium- and high-fidelity simulation of atmospheric descent for EOM, AOA, GRTLS and CA. Both simulation programs can be used for 3-DOF and 6-DOF simulations of the descent dynamics. The 6-DOF simulations have a high-fidelity functional simulation of the GN&C flight software and systems. The 3-DOF simulations have a high-fidelity simulation of the G and N flight software and systems, however these simulations employ a low-fidelity model of the flight control system and the Orbiter high-frequency dynamics. Both programs in the 3-DOF and 6-DOF versions require significant computer core and computer time so that a batch mode of computer operations is required. This results in a time-consuming process for analysis requiring an iterative process.

The SVDS simulation is one of the primary descent support tools used for GN&C performance verification; for flight design verification (except for Monte Carlo analyses); for SMS validation testing; for MCC program development and verification; for performance analysis of atmospheric descent; and for development of trajectories for APU and RCS consumable analysis. The SVDS simulation was originally conceived to have end-to-end simulation capabilities from deorbit through wheels stop on the runway, but the overhead and structure of the simulation does not allow for automatic phasing of the 6-DOF deorbit simulation to the entry and rollout simulation.

Major program modification for new capabilities development are the incorporation of the OTT guidance logic and models for simulating the ASI, PTI and POPU attitude maneuvers. These models are required to support STS-2 and subsequent test flights. The simulations will also be updated to incorporate aerodynamic, aerodynamic heating and GN&C flight software model revisions based upon flight test results, and to incorporate GNC flight software modifications.

In addition to these requirements to support particular OFT flights, long-term development of the general SVDS capability will continue. This includes continued development of the automated output capability and the banking technique for relieving the Univac 1108 computer core limitations. The automated output capability will include a link between the SVDS program and the Daconics word processor for report generation; automatic output of data required for the MCC, FDF, and simulator reset points; automatic processing of I-loads from external sources; and automatic handling of data bases for SVDS simulation interfacing.

The banking concept will also be incorporated in the LAND simulation.

The capability development for the SVDS program is defined below. This capability development is divided into two basic categories. One category defines the requirements to support each individual flight. The other category is the long-term development of the general SVDS program capability that is not essential for support of an individual flight.

The products and schedules for this task are shown in table 3.5.4.

3.5.5 Consumables Management

3.5.5.1 Nonpropulsive Consumables

This task covers the consumables models updates and the consumables data base management. The consumables models are continuously being revised based on new test data (Hotfire, OIT, ATD, etc.), simulator results, and hardware changes.

The consumables data base management covers the EPS data base and its documentation via the Orbiter Electrical Equipment Utilization Baseline. The requirement is to keep it current with all of the hardware changes, LRU test data, thermal analysis results (heater duty cycles) and electrical component utilization changes resulting from changes via flight techniques, simulations, onboard software, crew activity timelining, etc.

The products and schedules for this task are shown in table 3.5.5.1.

3.5.5.2 OMS/RCS Consumables

(TBS FM2)

3.5.6 Navigation

3.5.6.1 Onboard Software Tools

Navigation bench programs will be developed, maintained, and updated for use in verification and evaluation of all navigation-related software. Support will be required in the evaluation of actual OFT mission downlist data through development of appropriate computer programs, and use of these programs to analyze navigation system performance and navigation system hardware math model fidelity.

3.5.6.2 MCC A/D Software

The high-speed ground navigation tasks are supported by both bench and offline programs. The bench programs for the HSIP, HSTD and SUP MCC processors are contained in the HSIP, HELLO and SUPPER programs, respectively. HSTD and SUP

performance analysis are performed using the HELLO and SUPPER programs, respectively. The ADDLOG program provides for conversion of the MCC 800 BPI Mission Log Tapes to Univac 1108 computer compatible tapes. The development of the HSIP, SUP and ADDLOG programs is complete, although none of these programs are documented. The HELLO program, which is the HSTD bench and analysis program, has been placed under NAS configuration control. Modifications are being performed to assist production use of HELLO. An early version of the HELLO program has been documented, but it is out of date. There are no plans to provide documentation of these programs. The MCC analysis tasks requiring support can be performed on an as needed basis to provide capabilities required to satisfy MCC A/D navigation software performance analysis requirements. The schedules and products associated with these programs are presented in table 3.5.6.2. (TBS FM8)

3.5.6.3 A/D Postflight

The ascent/descent postflight tasks are supported by the ADDLOG and PREEDIT programs. The development of these programs is complete. Modifications to these programs will be provided on an as needed basis to satisfy changes in the postflight requirements. There is no documentation for either of these programs, and none is planned. There are no products nor schedules associated with these programs.

3.5.6.4 Onorbit Ground Nav Tools

a. Bench programs.- Bench programs are maintained for both the OFT MCC Encke Numerical Integration (NI) and for the OFT MCC Orbit Determination Program (ODP). These programs represent independent codings of the MCC programing requirements as published by MPAD. These programs have been developed and verified and are in a maintenance-only status for STS-1. Any mods to the MCC will be reflected in bench programs, however, none are anticipated at this time. The bench programs are utilized to help analyze problems that are encountered with MCC software.

b. Offline support programs.- A large collection of offline support programs, both large and small, are being maintained for STS-1. These programs are a maintenance-only status for STS-1, although a programing staff is available to make mods as requirements are defined. Among the larger programs currently being maintained are the HOPE orbit determination program, the LOVE data preprocessing program, and the ICOAST numerical integration package. Numerous smaller software packages and peripheral programs are also maintained and modified as required. New programs are being developed to deal with new processing requirements as they arise.

c. Postflight BET tools.- A large library of programs has been developed through the Apollo, Skylab and ASTP programs to deal with the generation of postflight BET data. These include programs to perform the following functions:

(1) Stamp attitude information from raw data tapes provided by IDFSD through WTG.

(2) Edit, merge, and fill attitude information to form a continuous attitude history.

(3) Generate spacecraft ephemerides from groundtracking observations

(4) Merge ephemeris and attitude information

These programs are being modified, as required, for STS-1. A full-scale verification of the resulting software, plus interface checks with potential users, are planned.

The products and schedules for this task are presented in table 3.5.6.4.

3.6 POSTFLIGHT ANALYSIS

The basic objectives of MPAD postflight analysis for STS 2-4 are to define the best estimated trajectory (BET) for all mission phases, evaluate Orbiter GNC performance to determine the guidance and targeting software performance, evaluate MCC performance, compare the actual and predicted flight profiles, evaluate the flight techniques, and evaluate consumables usage.

Any actions necessary to incorporate results obtained from the postflight analyses such as profile revisions, Orbiter software changes, MCC software changes, or flight technique changes are not a part of this task. These actions are included in the flight design, Orbiter software, MCC software, and flight operations tasks.

3.6.1 Ancillary Data

Determine the as-flown Orbiter position, velocity, and altitude-related parameter values as required and baselined in support of flight test objectives.

3.6.2 Ascent/Aborts

Postflight analysis will be performed, based on actual flight conditions, to determine the level of adequacy of ARD and AME performance for the flight. This will include assessment of preflight-supplied support data and procedures. Recommendations will be developed, in light of any deficiencies observed, to be incorporated into logic, procedures, or data for subsequent flights.

In addition, postflight analysis will be performed, based on actual flight conditions, to determine the adequacy of the onboard ascent guidance for the flight.

This task will reconstruct SRB and ET real-time separation parameters from actual flight data and compare these with premission planned profiles and document results.

This task will use ARIS ship tracking data to reconstruct the ET trajectory from separation through entry to calibrate rupture and breakup. This is a joint effort between FM41, and MSFC/MCC resulting in a quick look, intermediate and final postflight report. FM4 has primary responsibility.

The products and schedules for this task are shown in table 3.6.2.

3.6.3 Onorbit

3.6.3.1 Attitude and Pointing

(TBS by FM2)

3.6.3.2 OMS Maneuvers

(TBS by FM41)

3.6.3.3 RMS

This task will analyze RMS DFI data to determine RMS performance in carrying out DTO's concerned with auto-sequences. Documentation of results will be used in final verification of the RMS prior to OPS.

This task will also analyze the plume impingement flight test requirement (FTR) by taking the forces, moments, and relative position data that will be obtained from the STS-4 plume impingement FTR and comparing the results with preflight predictions. The plume model may also require updating based on these data. Evaluation and comparison runs will be made as required.

The products and schedules for this task are shown in table 3.6.3.

3.6.3.4 Payload Ejection

This task will review and perform quality assurance on all postflight data involving real-time operations of a payload ejection system. The task will determine if crew safety was adequate, safe separation clearances were realized, and if any groundrule/mission techniques or procedures alterations or changes are required to enhance or improve the ejection system operation. Results of this QA effort should be documented in specific postflight documentation if appropriate and required.

The products and schedules for this task are shown in table 3.6.3.

3.6.4 Descent

3.6.4.1 Deorbit

A nominal postflight analysis will be conducted to confirm the deorbit targets and to match the targeted burn to the actual burn. The results will be published by memo.

The products and schedules for this task are shown in table 3.6.4.1.

3.6.4.2 Entry Through Landing/GRTLS

There are three basic tasks of the entry through landing postfight analysis. These are flight profile analysis, GN&C performance analysis, and analysis of flight techniques.

The flight profile analysis includes comparison of the actual trajectory to the nominal profile and to flight constraints, evaluation of energy management, and control surface deflections. This analysis will determine how well the nominal profile was flown, determine the degree of maneuvering required to achieve the profile, evaluate transients across guidance interfaces because of state vector updating using external measurements, and will include preliminary evaluation of the Orbiter L/D and pitching moment. Results will be correlated with measured environment such as winds, atmospheric density, atmospheric pressure, and with other postflight results that determine the BET and Orbiter aerodynamic characteristics. This analysis will provide an early indication of the need for profile shaping changes.

The GN&C performance analysis will include evaluation of the entry guidance performance, and integrated GN&C performance for entry, TAEM, and approach and landing (if appropriate). Detailed analysis of the TAEM and autoland guidance is not included in this task. Purpose of this analysis is to evaluate the integrated GN&C performance compared to expected performance in the actual STS-1 environment. Results of this analysis will be used to define the need for flight software or flight profile modifications.

The flight techniques for the descent flight phase will be evaluated by comparison of mission rule constraints and decision points with flight experience. Results of this analysis will be reported to appropriate groups for action, if necessary.

Preparation for postflight analysis must begin prior to the STS-1 flight. This preparation includes development of analysis techniques and overall data flow of the analysis.

The products and schedules for this task are shown in table 3.6.4.2.

3.6.5 Consumables Management

3.6.5.1 Nonpropulsive Consumables

(TBS FM2)

3.6.5.2 OMS/RCS Consumables

(TBS FM2)

3.6.6 Navigation

3.6.6.1 Onboard

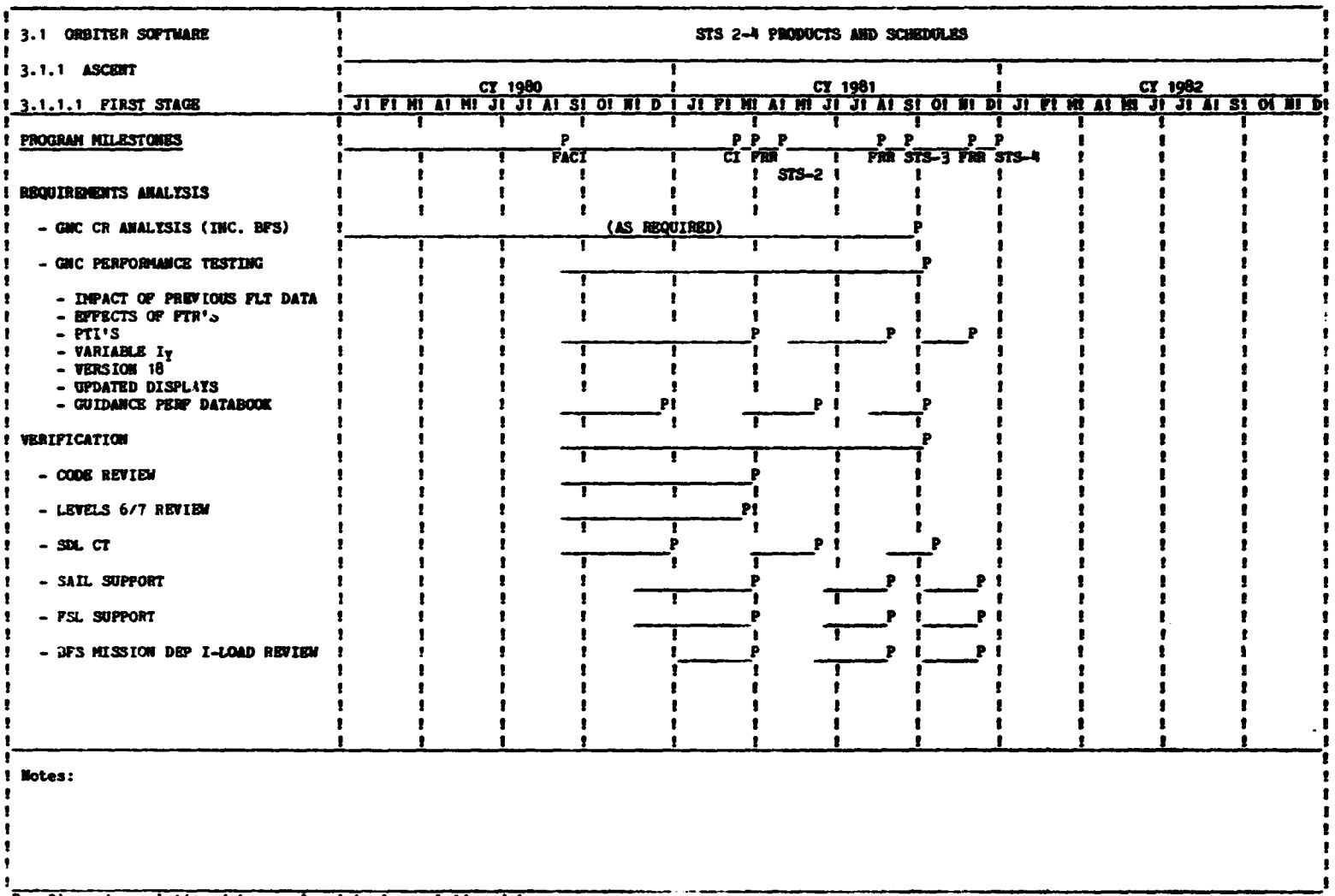
Develop FTR support products as required.

3.6.6.2 MCC Ascent/Descent

There are no tasks in this area. Any work done postflight included as a part of the preflight analysis for the next mission.

3.6.6.3 MCC Onorbit

There are no tasks in this area. Any work done postflight is included as a part of the preflight analysis for the next mission.

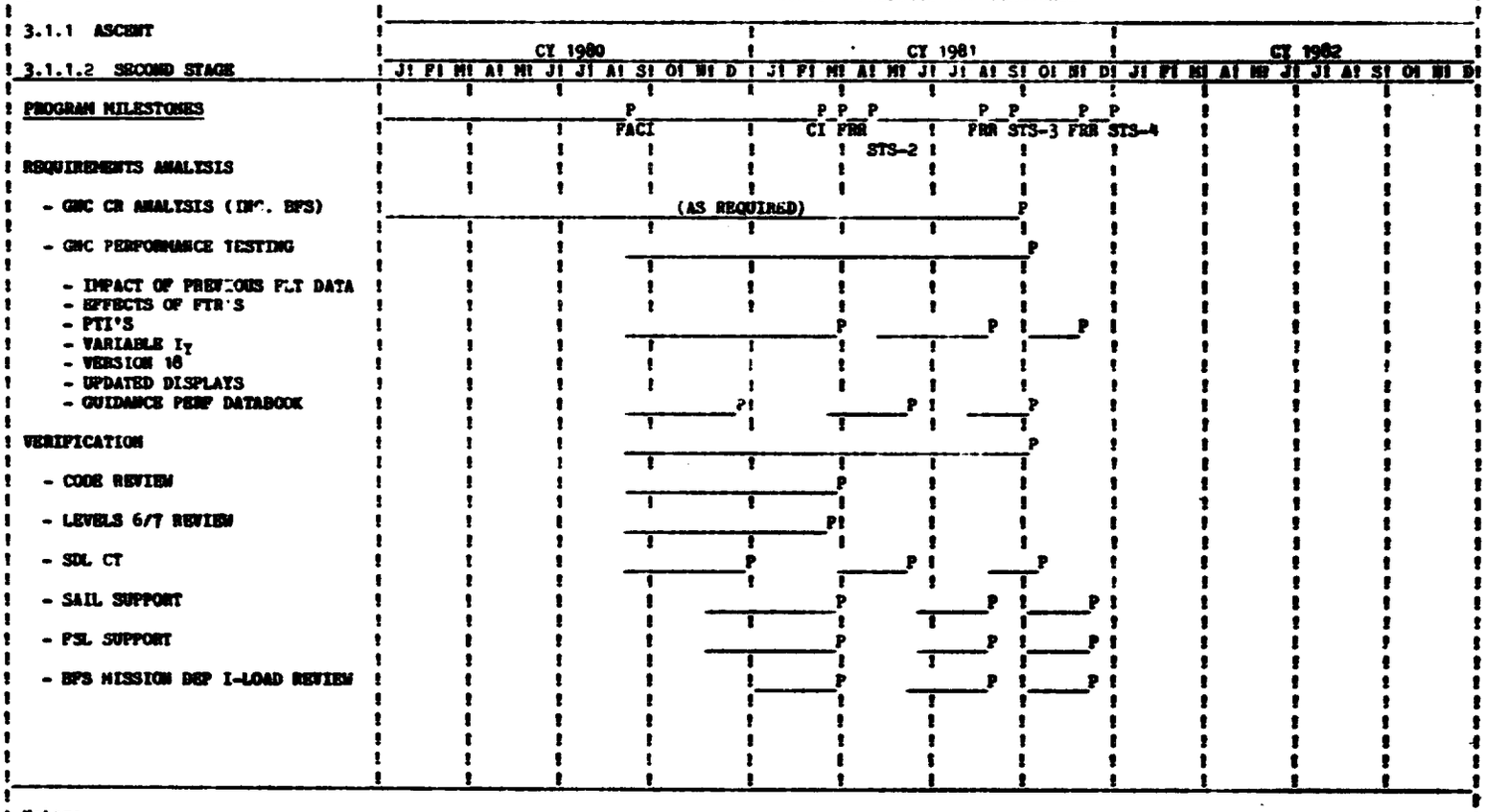

3.1 ORBITER SOFTWARE
3.1.1 ASCENT
3.1.1.1 FIRST STAGE
STS 2-4 PRODUCTS AND SCHEDULES
CY 1980
CY 1981
CY 1982
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PROGRAM MILESTONES
P P P P P P P P
FACI CI FRR FRR STS-3 FRR STS-4
STS-2
REQUIREMENTS ANALYSIS
- GNC CR ANALYSIS (INC. BFS)
(AS REQUIRED)
- GNC PERFORMANCE TESTING
- IMPACT OF PREVIOUS FLT DATA
- EFFECTS OF PTR's
- PTI'S
- VARIABLE I_y
- VERSION 18
- UPDATED DISPLAYS
- GUIDANCE PERF DATABOOK
VERIFICATION
- CODE REVIEW
- LEVELS 6/7 REVIEW
- SDL CT
- SAIL SUPPORT
- FSL SUPPORT
- BFS MISSION DEP I-LOAD REVIEW
Notes:
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.1 ASCENT

3.1.1.2 SECOND STAGE

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

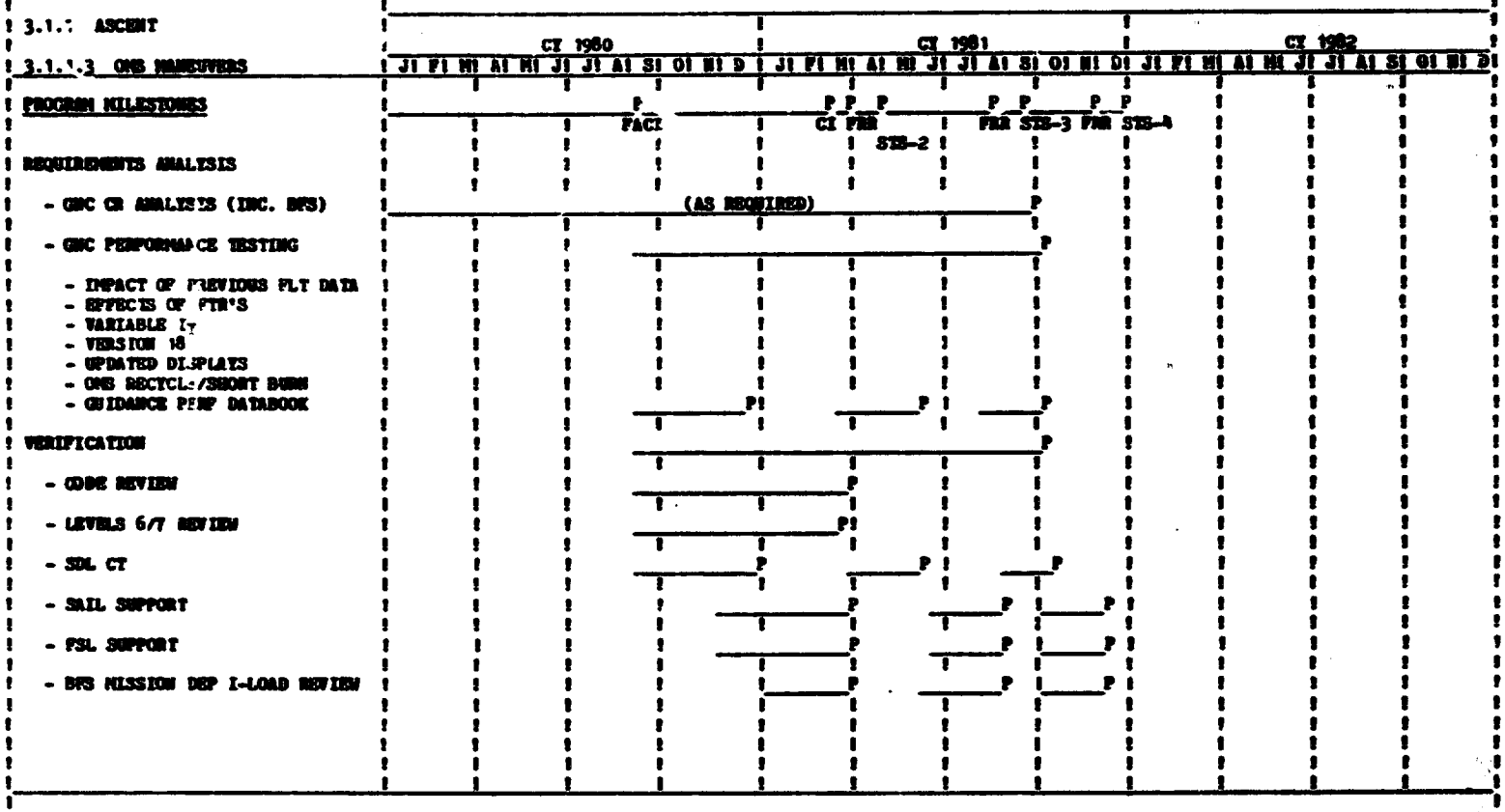
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.7 ASCENT

3.1.7.3 OMS MANEUVERS

STS 2-A PRODUCTS AND SCHEDULES



Notes:

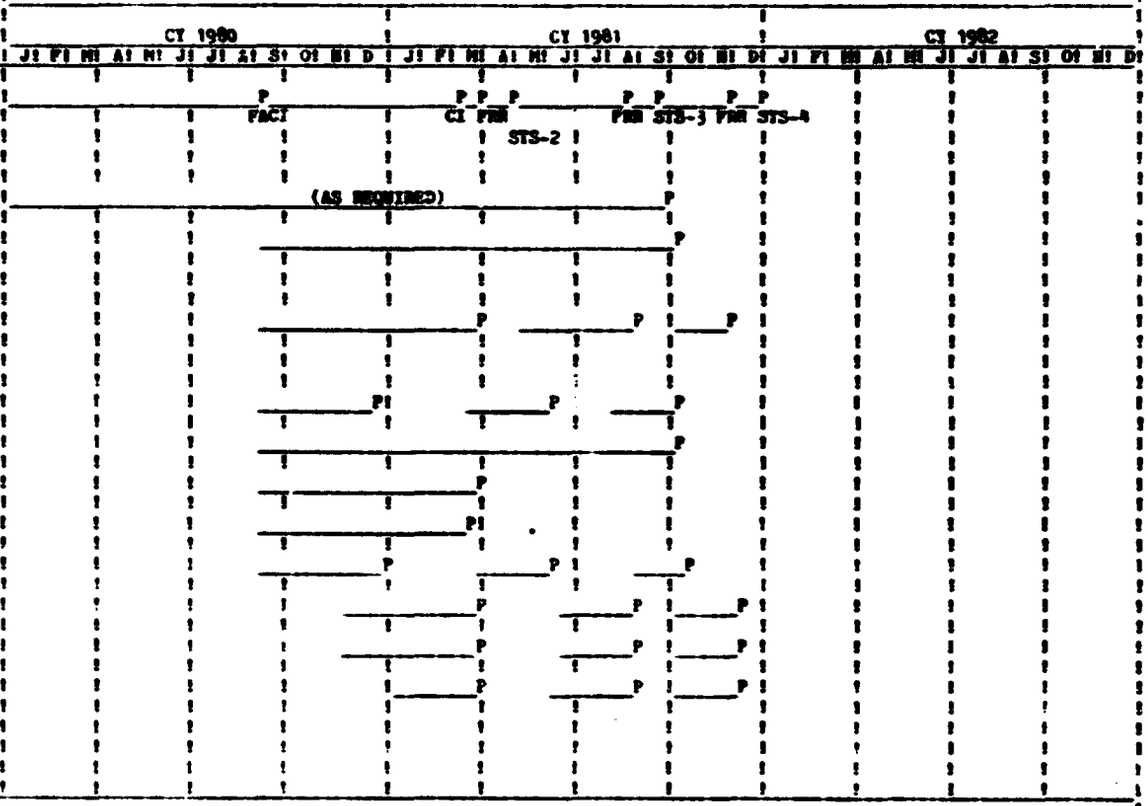
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.2 ABORTS

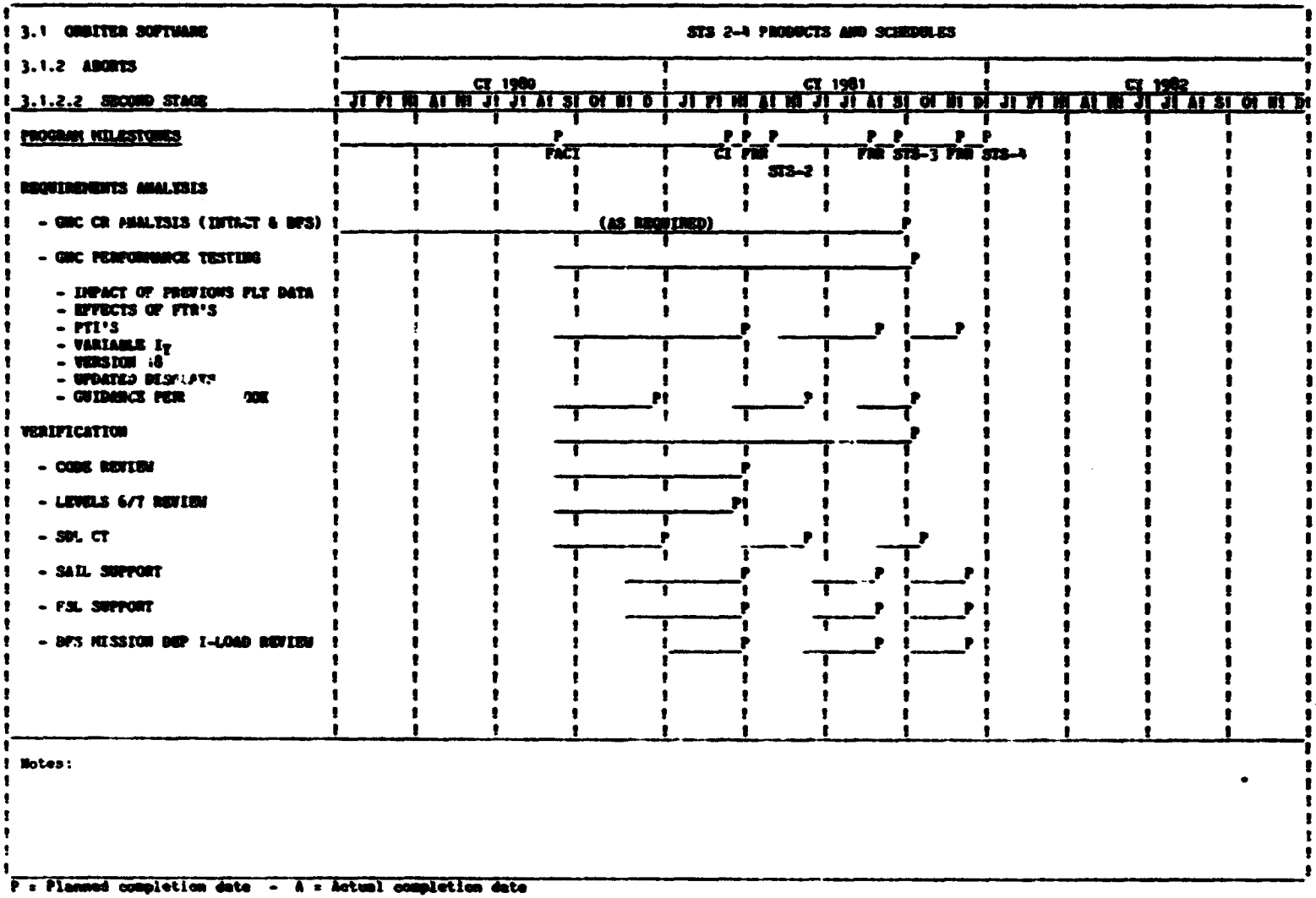
3.1.2.1 FIRST STAGE

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date



Notes:

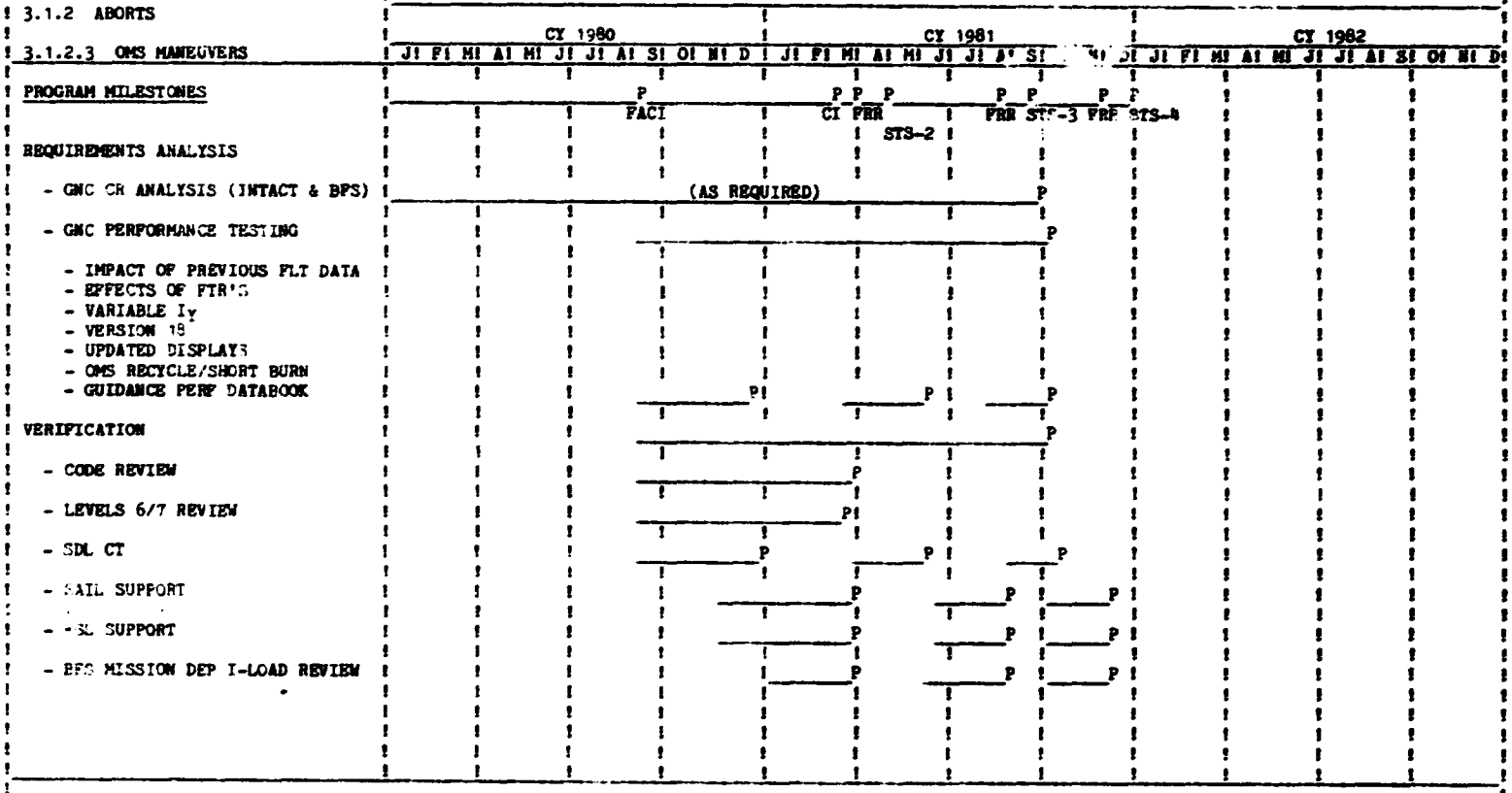
P : Planned completion date - A : Actual completion date

3.1 ORBITER SOFTWARE

3.1.2 ABORTS

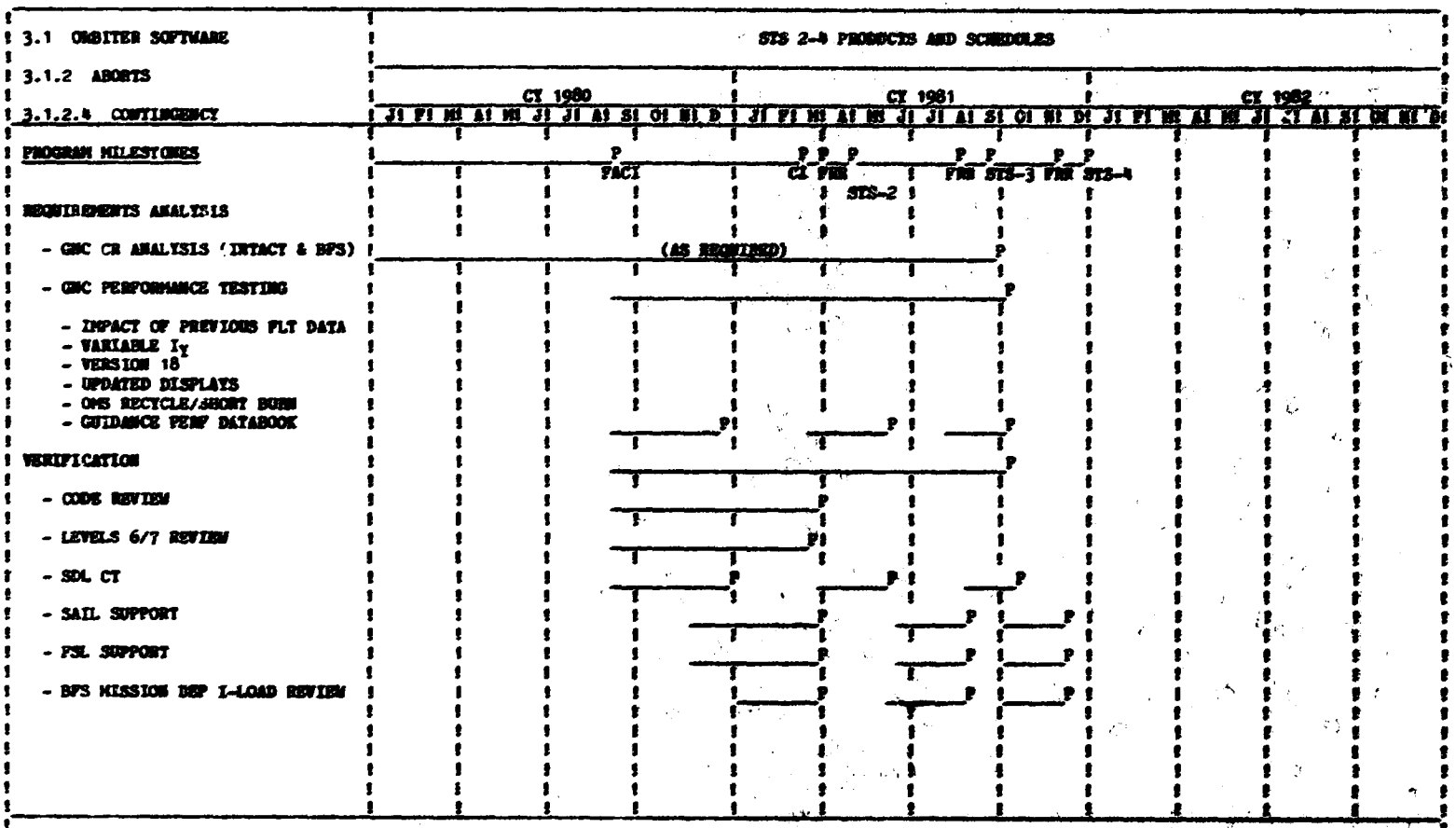
3.1.2.3 OMS MANEUVERS

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date



Notes:

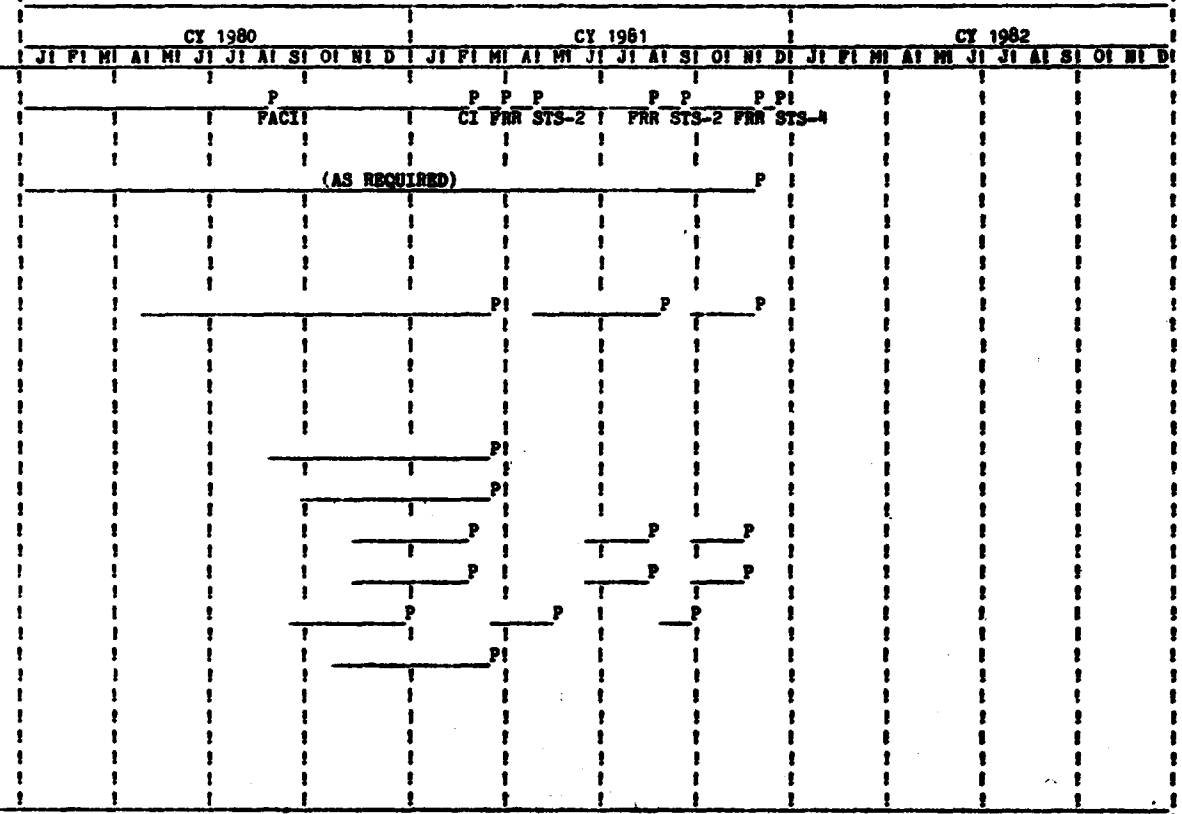
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.3 ONORBIT

3.1.3.1 ATTITUDE AND POINTING

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

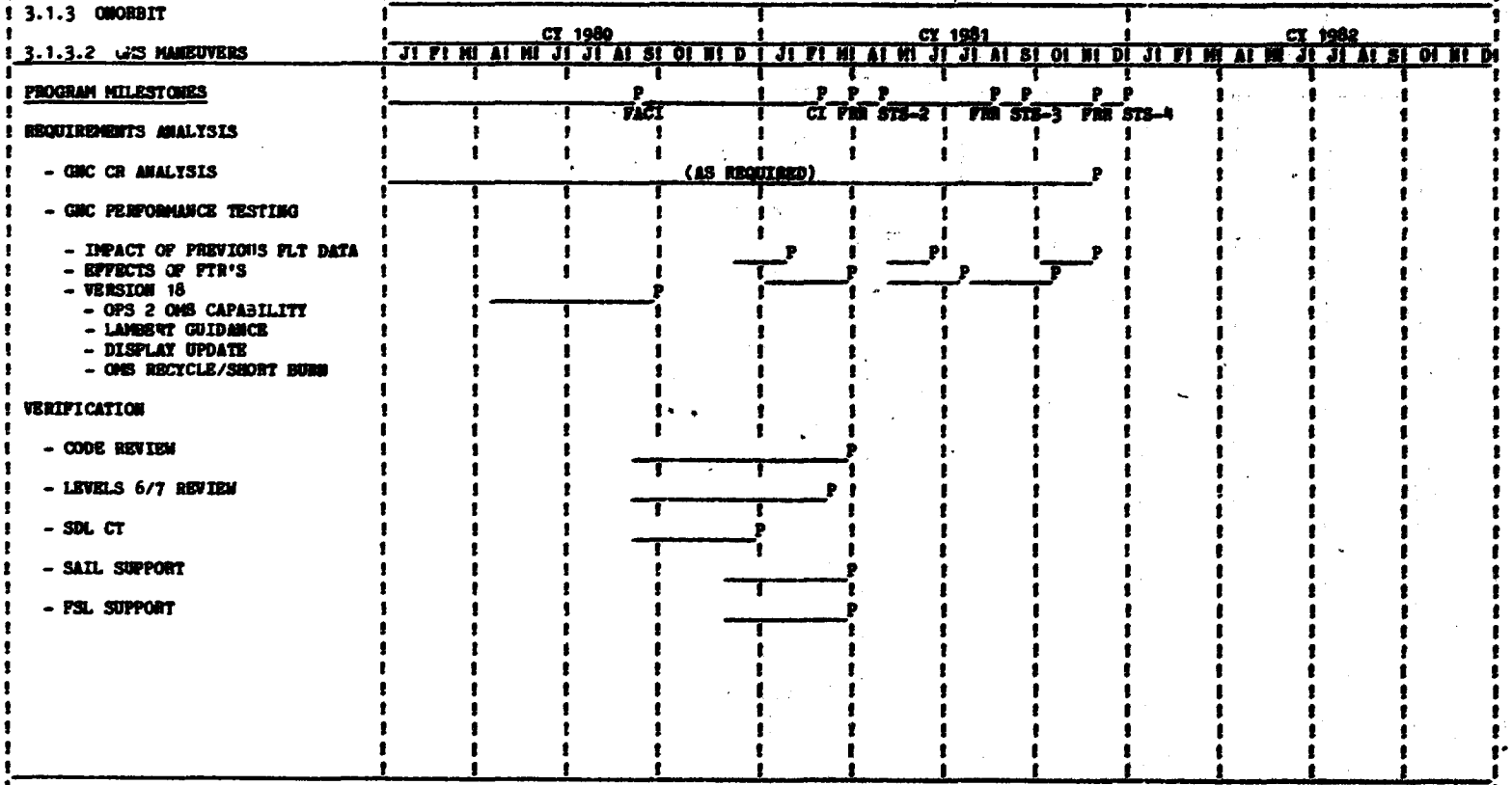
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.3 ONORBIT

3.1.3.2 GNS MANEUVERS

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

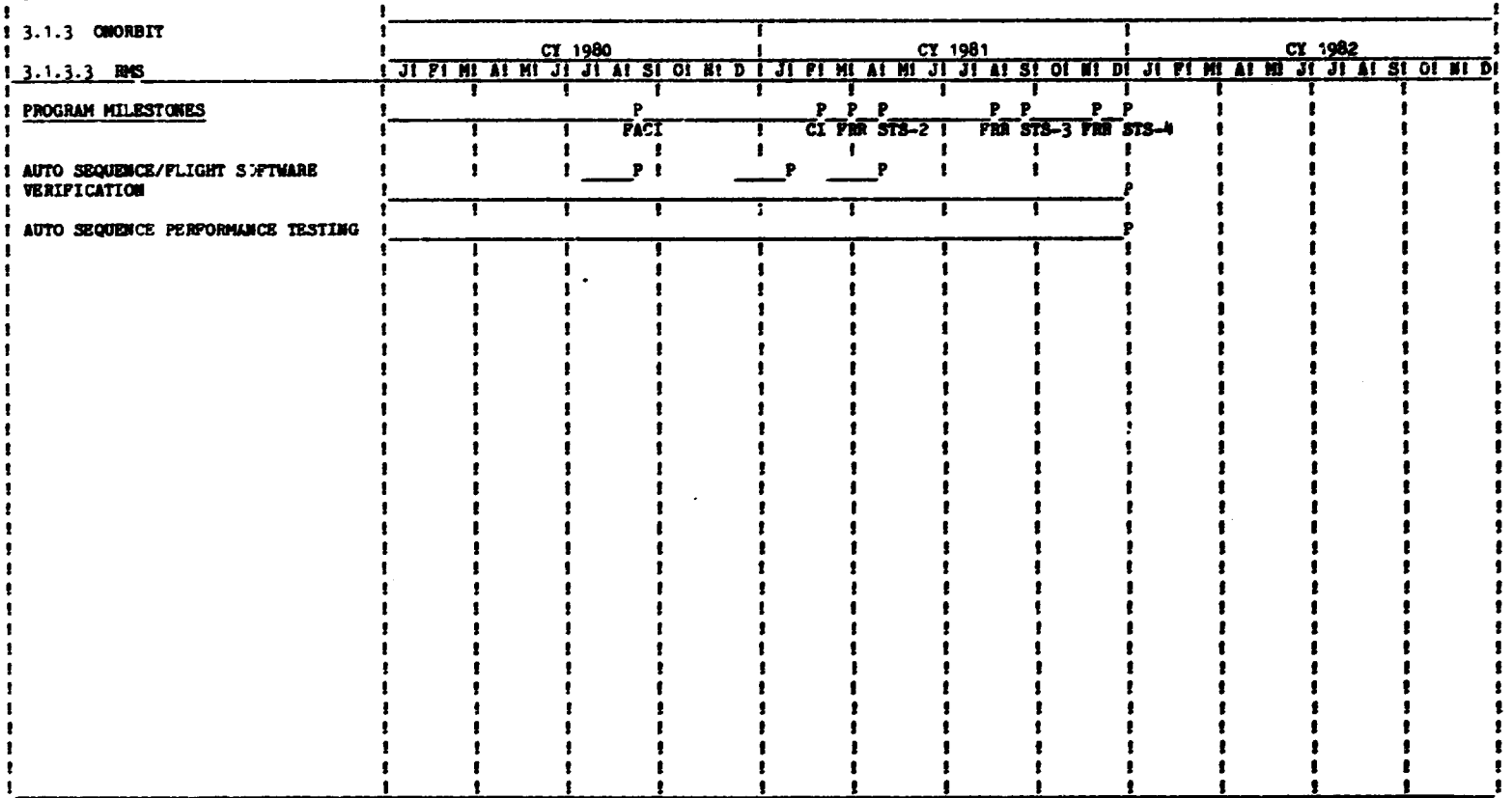
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.3 ONORBIT

3.1.3.3 RMS

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.4 DESCENT

3.1.4.1 DEORBIT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES									P						P	P	P				P	P		P	P												
									PACI						CI	FRR	STS-2				FRR	STS-3		FRR	STS-4											
REQUIREMENTS ANALYSIS																																				
- GNC CR ANALYSIS										(AS REQUIRED)														P												
- PERFORMANCE TESTING																																				
- IMPACT OF PREVIOUS FLT DATA																																				
- EFFECTS OF FTR'S																P																				
- OMS SHORT BURN/RECYCLE																																				
- VERSION 18																																				
VERIFICATION																																				
- SDL CT										P																										
- LEVELS 6/7 REVIEW																P																				
- PSL SUPPORT																P																				
- CODE REVIEW																P																				

Notes:

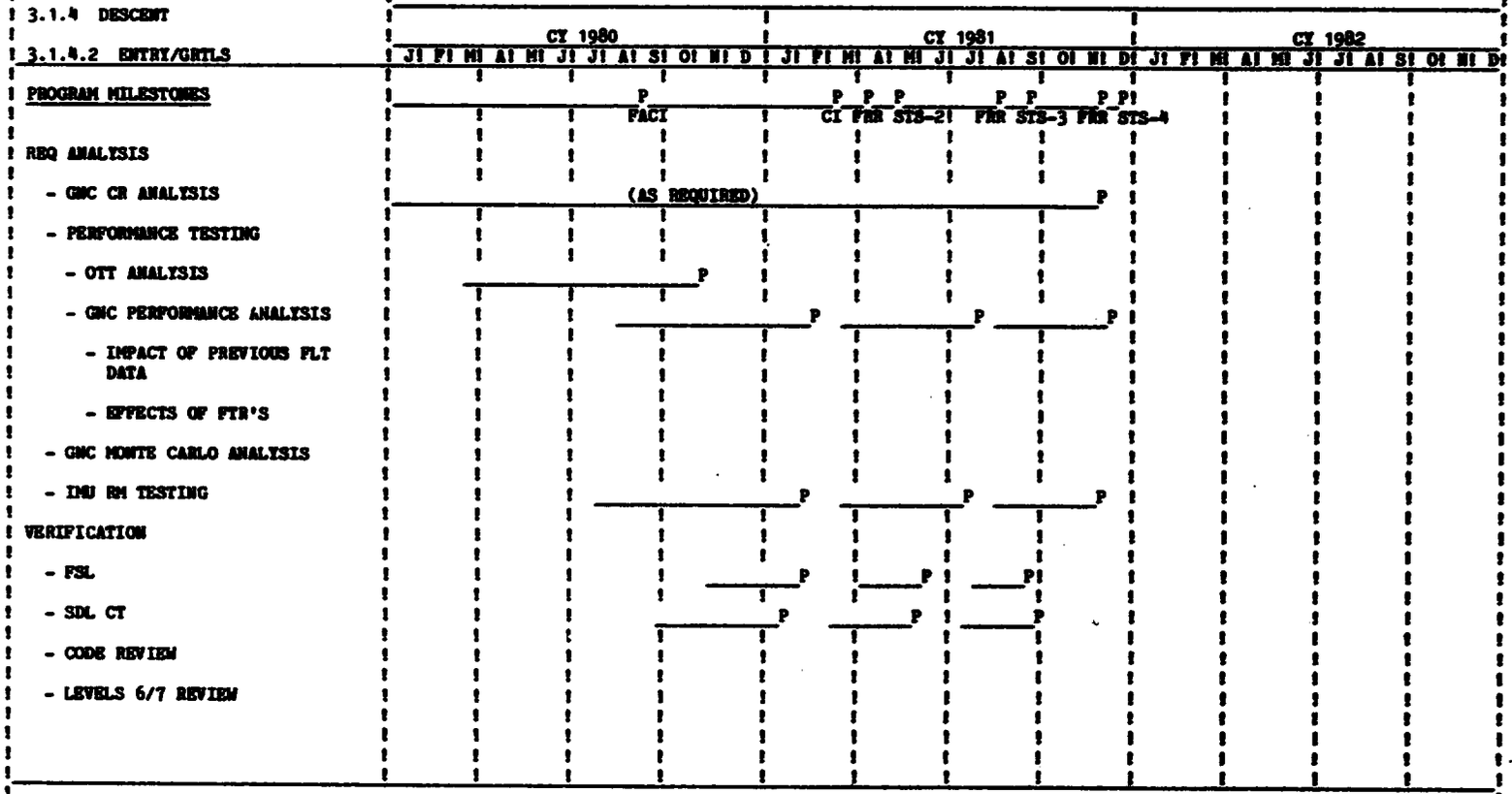
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.4 DESCENT

3.1.4.2 ENTRY/GRTLS

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

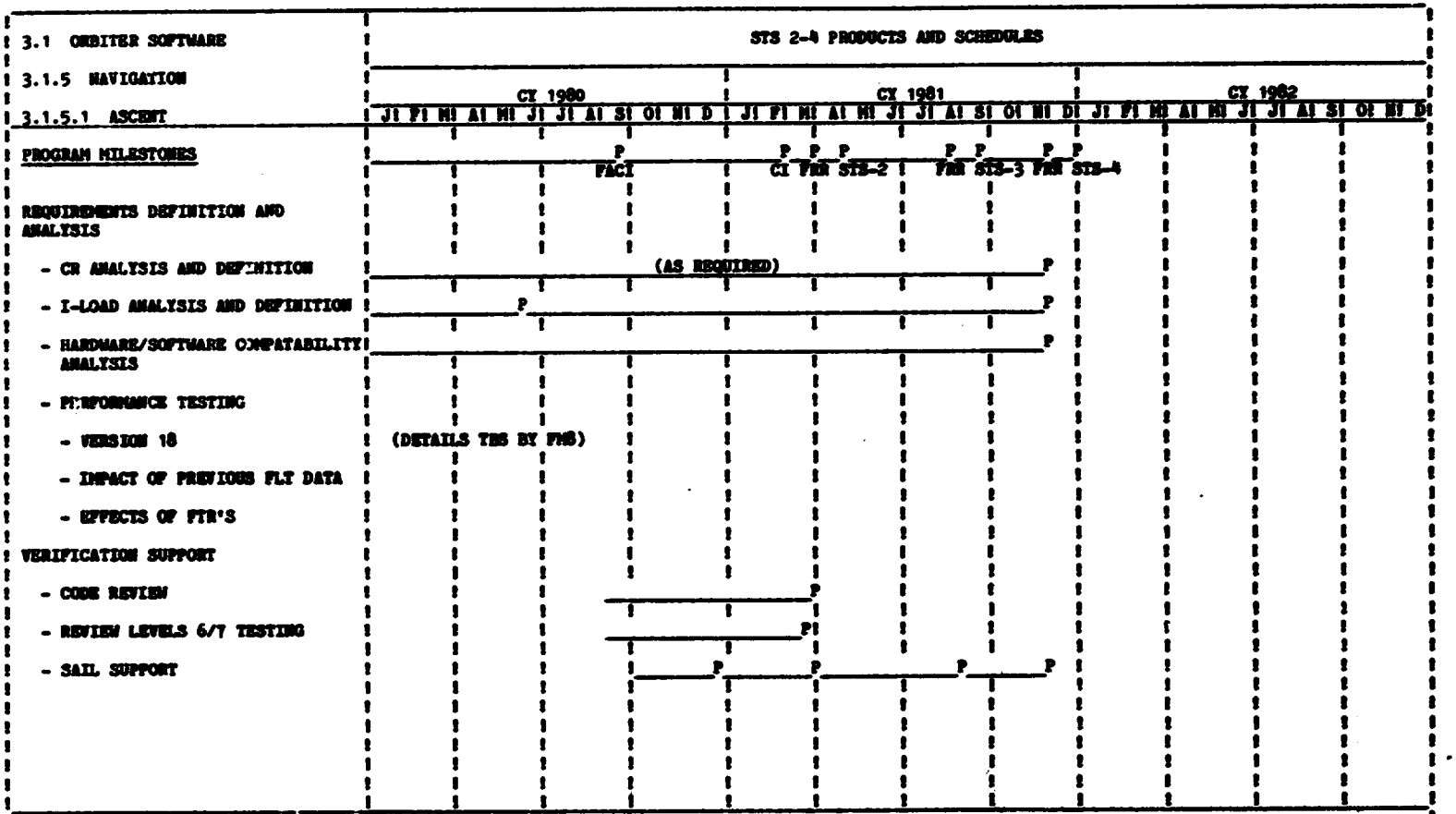
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.5 NAVIGATION

3.1.5.1 ASCENT

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE — STS 2-4 PRODUCTS AND SCHEDULES

3.1.5 NAVIGATION

3.1.5.2 OMNIBIT

CY 1980 | CY 1981 | CY 1982

J1 F1 M1 A1 M1 J1 J1 A1 S1 O1 N1 D | J1 F1 M1 A1 M1 J1 J1 A1 S1 O1 N1 D1 | J1 F1 M1 A1 M1 J1 J1 A1 S1 O1 N1 D

PROGRAM MILESTONES

- P — PACI
- P — CI
- P — FMR STS-2
- P — FMR STS-3
- P — FMR STS-4

REQUIREMENTS DEFINITION AND ANALYSIS

- FSSR SUPPORT (DOCUMENTATION) — (AS REQUIRED) — P
- CR ANALYSES — (AS REQUIRED) — P
- I-LOAD ANALYSIS AND DEFINITION — P — P
- INU HARDWARE/SOFTWARE COMPATABILITY ANALYSIS — P — P — P

IMPLEMENTATION SUPPORT

- DESIGN REVIEWS — P
- MODULAR TESTING SUPPORT — P

VERIFICATION SUPPORT

- CODE REVIEW — P
- LEVELS 6/7 TESTING SUPPORT — P
- SAIL SUPPORT — P — P — P — P

Notes:

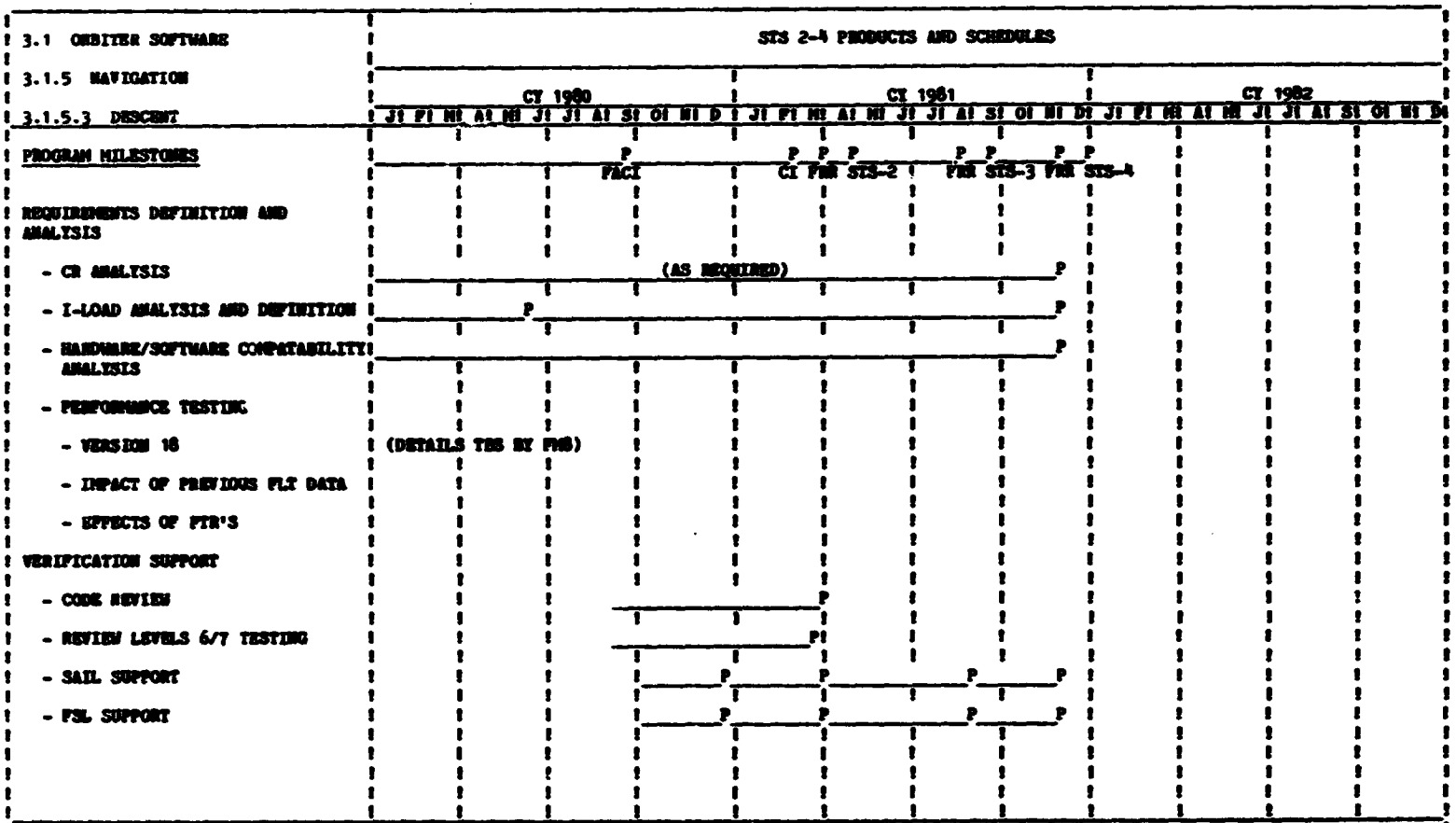
P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.5 NAVIGATION

3.1.5.3 DESCENT

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.1 ORBITER SOFTWARE

3.1.6 CONSUMABLES MANAGEMENT

STS 2-4 PRODUCTS AND SCHEDULES

CY 1980: J F M A M J J A S O N D
CY 1981: J F M A M J J A S O N D
CY 1982: J F M A M J J A S O N D

PROGRAM MILESTONES

P FACI — P CI — P FRR — P STS-2 — P FRR — P STS-3 — P FRR — P STS-4

NON-PROPULSIVE CONSUMABLES

- SMS VERIFICATION SUPPORT (TBS)

OMS/RCS CONSUMABLES (TBS BY FM2)

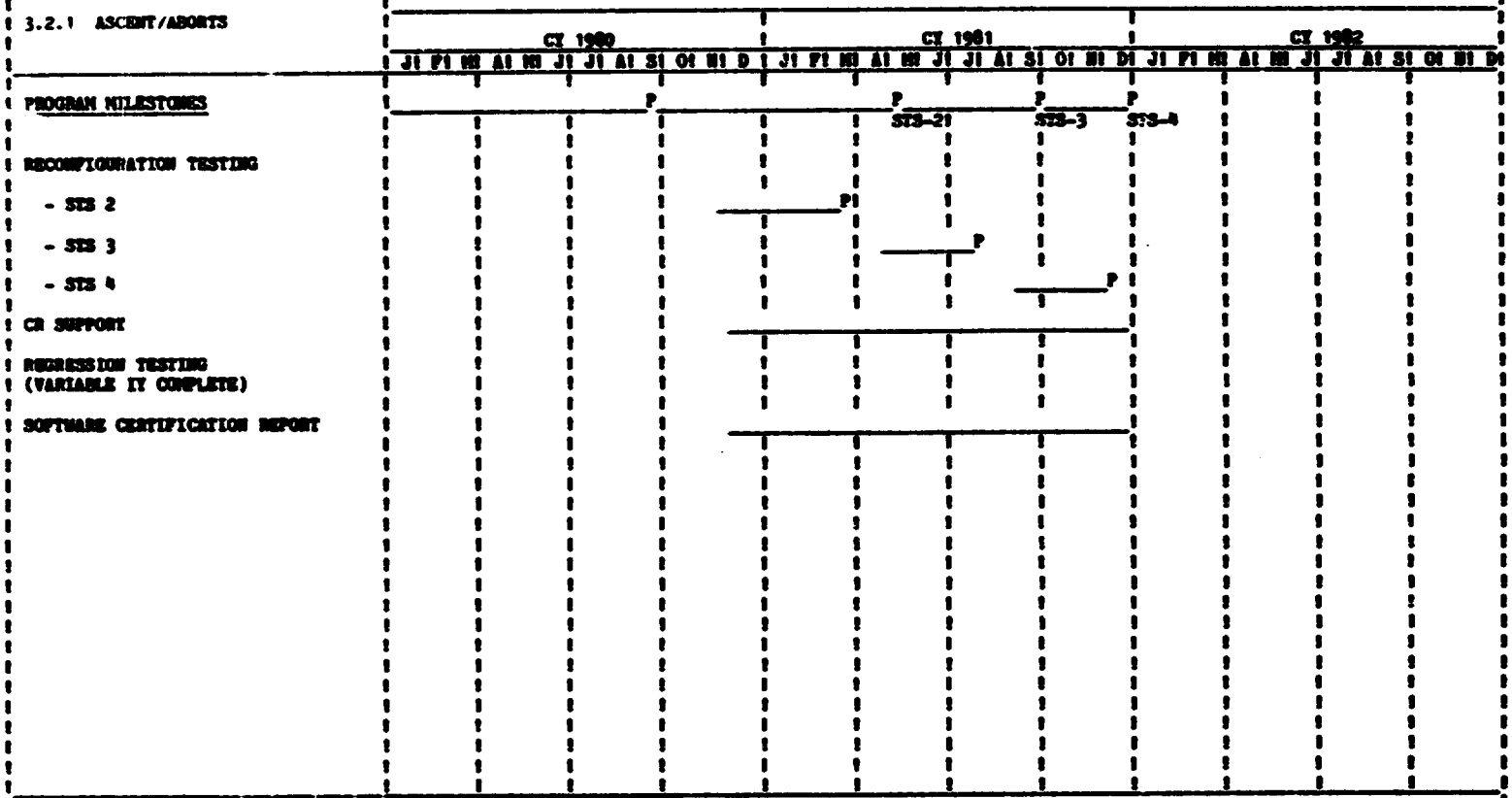
Notes:

P = Planned completion date - A = Actual completion date

3.2 MCC SOFTWARE

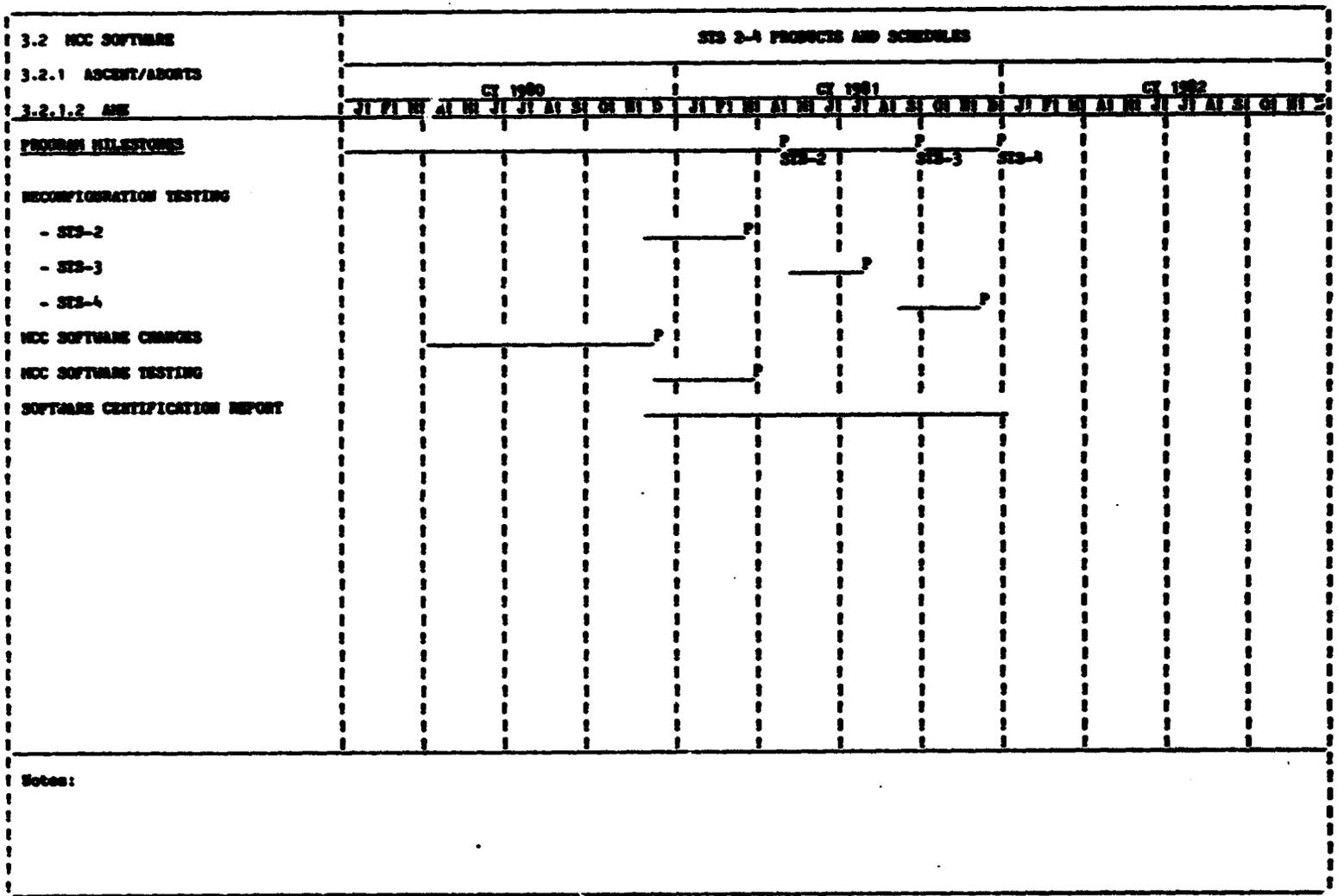
3.2.1 ASCENT/ABORTS

STS 2-4 PRODUCTS AND SCHEDULES

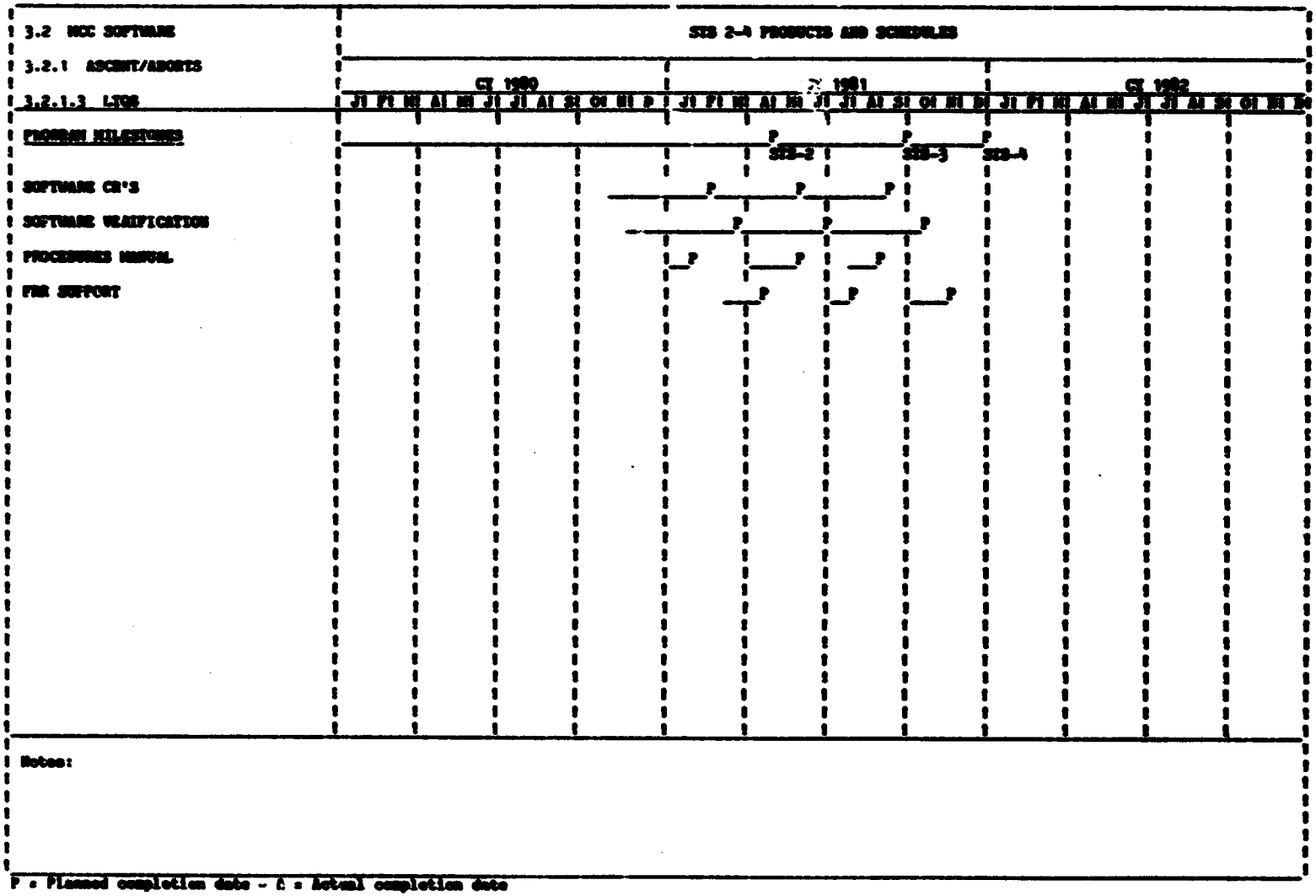


Notes:

P : Planned completion date - A : Actual completion date



P = Planned completion date - A = Actual completion date


3.2 HCC SOFTWARE
3.2.1 ASCENT/ABORTS
3.2.1.3 LTOS
SSS 2-4 PRODUCTS AND SCHEDULES
CY 1980
CY 1981
CY 1982
J1 F1 M1 A1 M1 J1 J1 A1 S1 O1 N1 D
PROGRAM MILESTONES
SSS-2
SSS-3
SSS-4
SOFTWARE CR'S
SOFTWARE VERIFICATION
PROCEDURES MANUAL
FOR SUPPORT
Notes:
P = Planned completion date - C = Actual completion date

3.2 MCC SOFTWARE 3.2.2 ONORBIT	STS 2-4 PRODUCTS AND SCHEDULES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																		P STS-2					P STS-3			P STS-4										
ATTITUDE AND POINTING																																				
- RECONFIGURATION TESTING																																				
- STS 2																																				
- STS 3					TBS FM2																																
- STS 4																																				
- CR SUPPORT																																				
- SOFTWARE CERTIFICATION REPORT																																				
MANEUVER SIMULATION																																				
- RECONFIGURATION TESTING																																				
- STS 2																																				
- STS 3					TBS FM5																																
- STS 4																																				
- CR SUPPORT																																				
- SOFTWARE CERTIFICATION REPORT																																				
DEORBIT TARGETING					TBS FM1																																

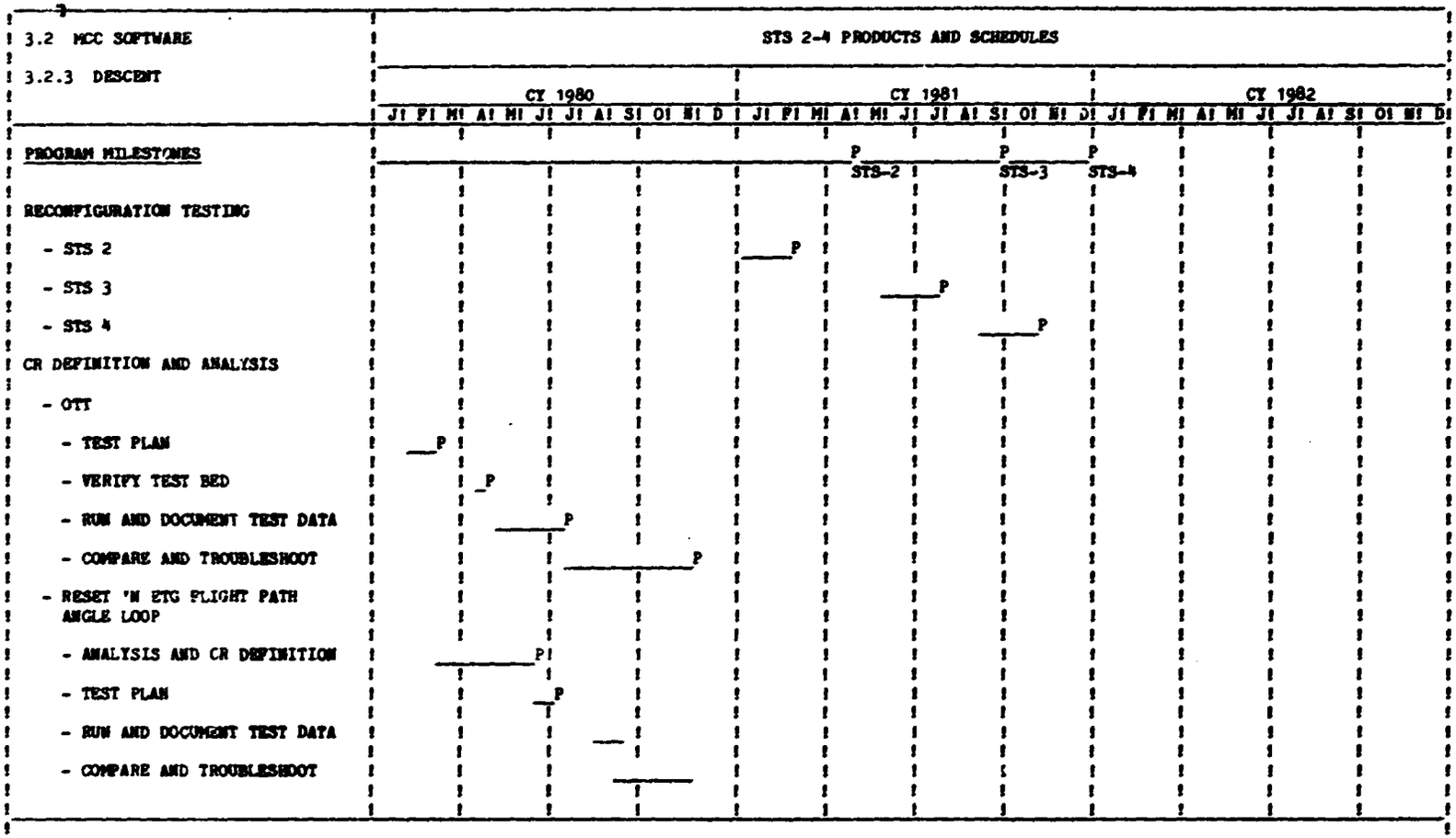
Notes:

P = Planned completion date - A = Actual completion date

3.2 MCC SOFTWARE

3.2.3 DESCENT

STS 2-4 PRODUCTS AND SCHEDULES



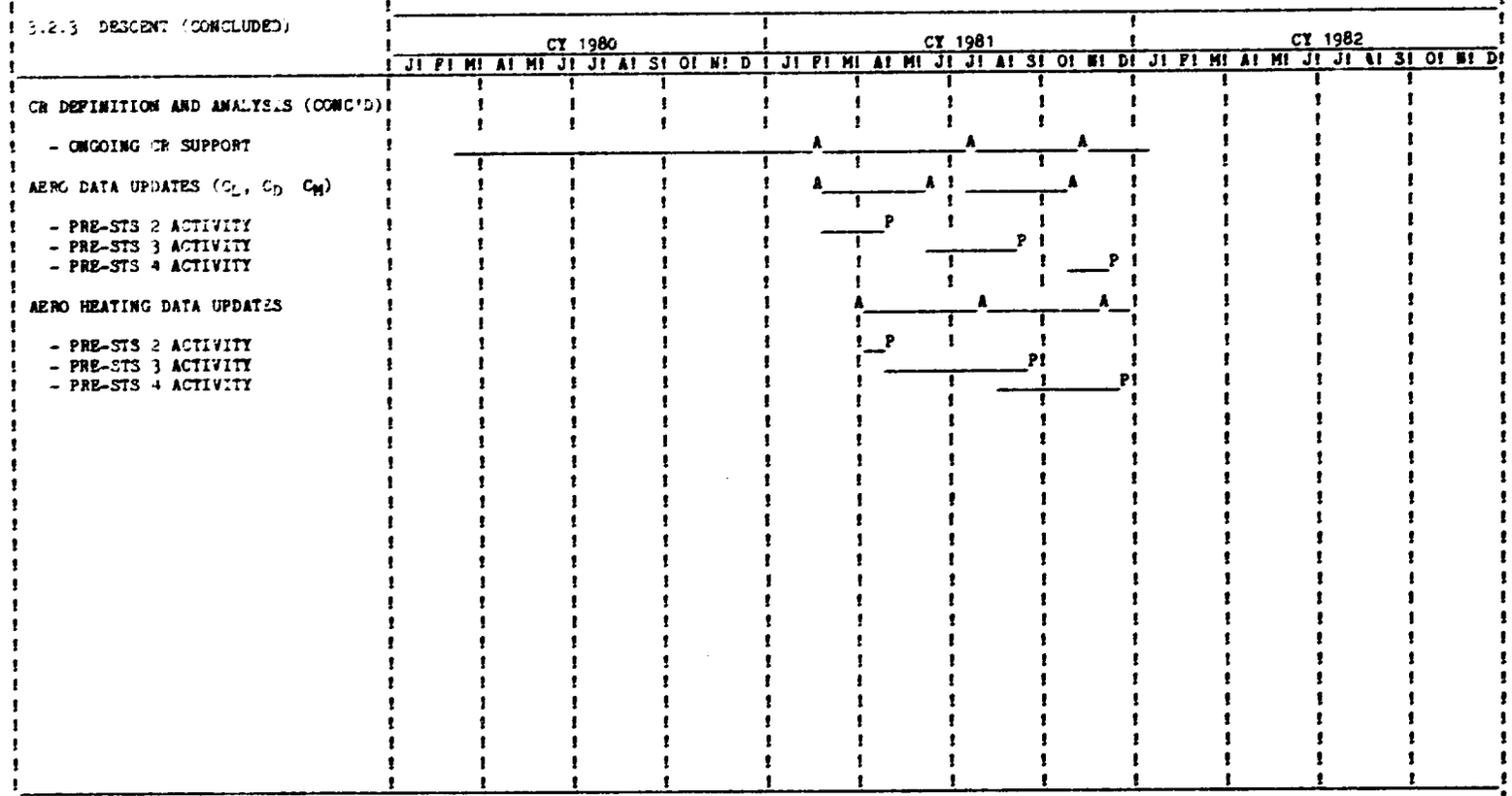
Notes:

P = Planned completion date - A - Actual completion date

3.2 MCC SOFTWARE

3.2.3 DESCENT (CONCLUDED)

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.2 MCC SOFTWARE

3.2.4 NAVIGATION

3.2.4.1 ASCENT/DESCENT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
STS 2																																				
- SOFTWARE EVALUATION																P																				
- CONSTANTS DEFINITION																																				
STS 3																																				
- SOFTWARE EVALUATION																						P														
- CONSTANTS DEFINITION																				P																
STS 4																																				
- SOFTWARE EVALUATION																								P												
- CONSTANTS DEFINITION																							P													

Notes:

P = Planned completion date - A = Actual completion date

3.2 MCC SOFTWARE

3.2.4 NAVIGATION

3.2.4.2 ONORBIT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
RECONFIGURATION				TBS		FMB																														
PERFORMANCE TESTING																																				
CR SUPPORT																																				
SOFTWARE CERTIFICATION REPORT																																				

Notes.

P = Planned completion date - A = Actual completion date

3.2 MCC SOFTWARE	STS 2-4 PRODUCTS AND SCHEDULES																																			
3.2.5 CONSUMABLES MANAGEMENT	CY 1980												CY 1981												CY 1982											
3.2.5.1 OMS/RCS CONSUMABLES	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																		P					P		P											
																		STS-2					STS-3		STS-4											
MASS PROPERTIES																																				
- RECONFIGURATION																																				
- STS 2																																				
- STS 3	(TBS FM2)																																			
- STS 4																																				
- ELDON																																				
- MINI-ELDON																																				
- SOFTWARE CERTIFICATION																																				

Notes:

3.2 MCC SOFTWARE	STS 2-4 PRODUCTS AND SCHEDULES																																			
3.2.5 CONSUMABLES MANAGEMENT	CY 1980												CY 1981												CY 1982											
3.2.5.2 NON-PROPULSIVE CONSUMABLES	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																	P					P			P											
																	STS-2					STS-3			STS-4											
TM COMPS	(TBS FM2)																																			
- QUANTITY GAGING PVT CURVES																																				
OFFLINE TOOLS																																				
- RECONFIGURATION																																				
- EPS																																				
- CAP																																				
- CONFIGURATION MANAGEMENT																																				
- APU FUEL																																				
CR SUPPORT																																				
SOFTWARE CERTIFICATION																																				

Notes:

3.3 FLIGHT DESIGN

3.3.1 GENERAL

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P STS-2					P STS-3			P STS-4												
DATA MANAGEMENT FOR STS-2 THRU STS-4 PRODUCTS																																				
- INITIALIZATION DATA PACKAGE																																				
- I-LOADS CR COORDINATION																																				
- SIMULATOR DATA PACK																																				

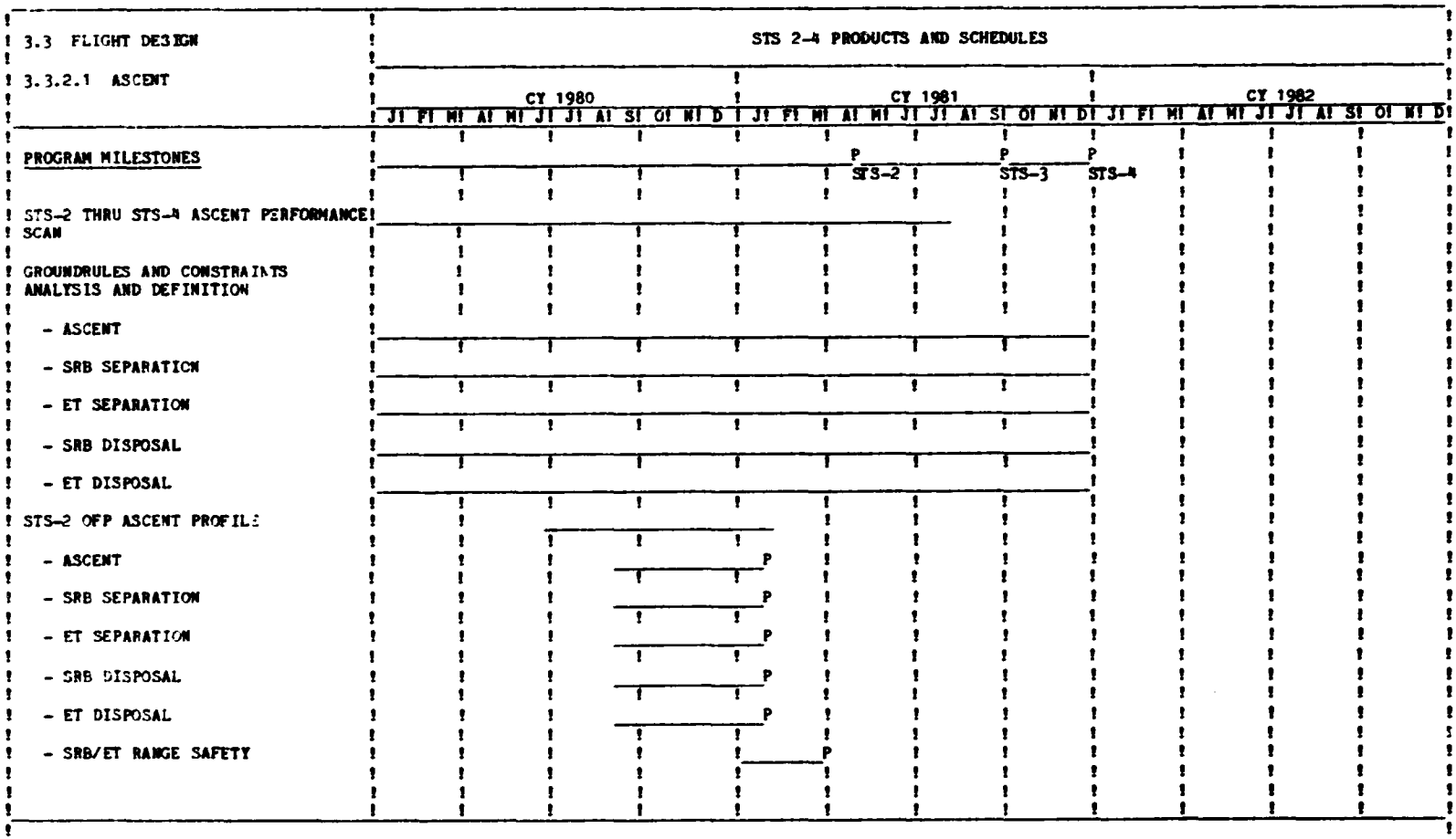
Notes:

P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN

3.3.2.1 ASCENT

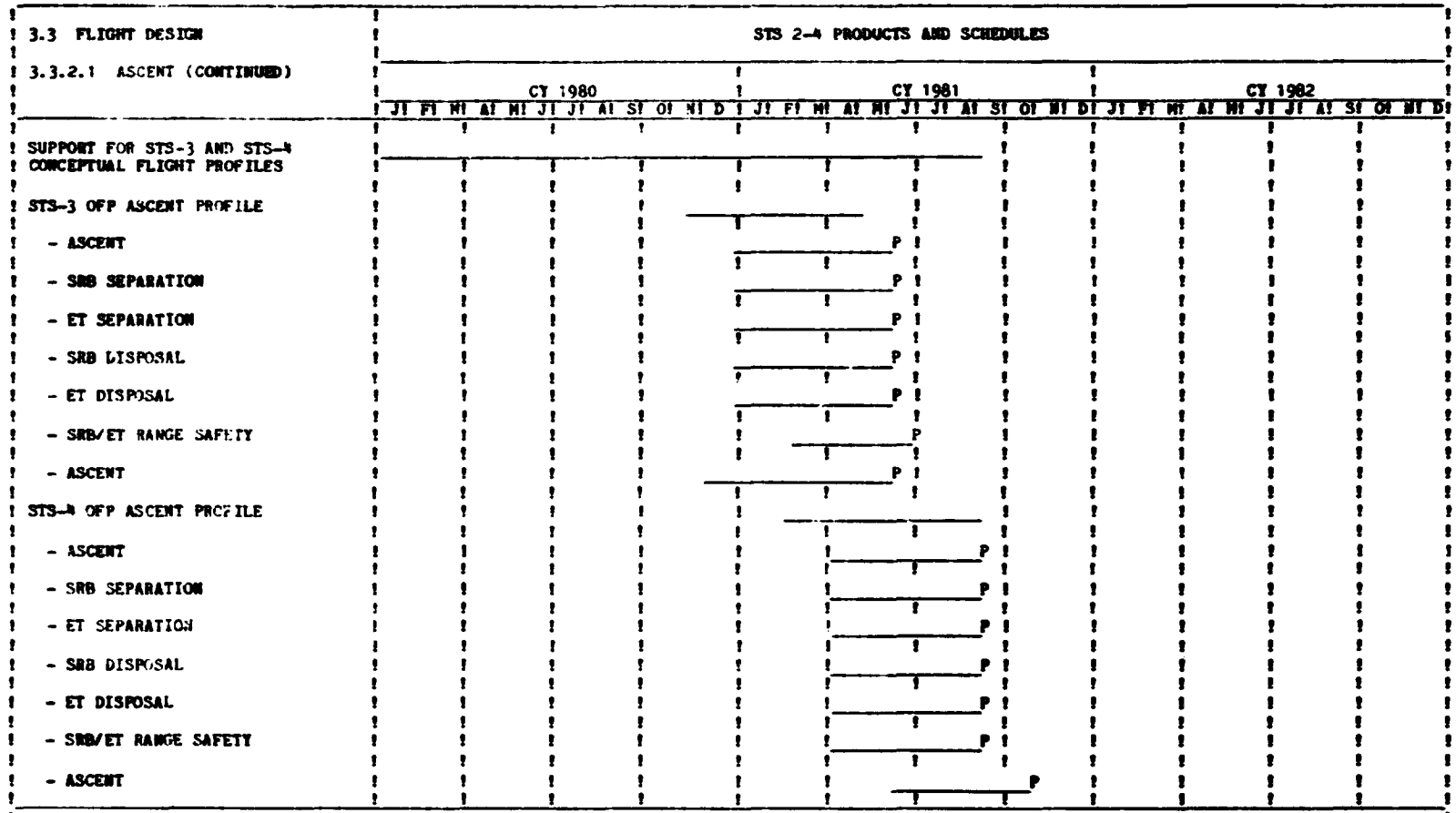
STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN

3.3.2.1 ASCENT (CONCLUDED)

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
MONTH-TO-MONTH LAUNCH SLIP ANALYSIS																			P																	
- ASCENT																																				
SUPPORT TO DESIGN CHANGES (HARDWARE INTEGRATION SUPPORT)																																				
- ET DISPOSAL																																				

Notes:

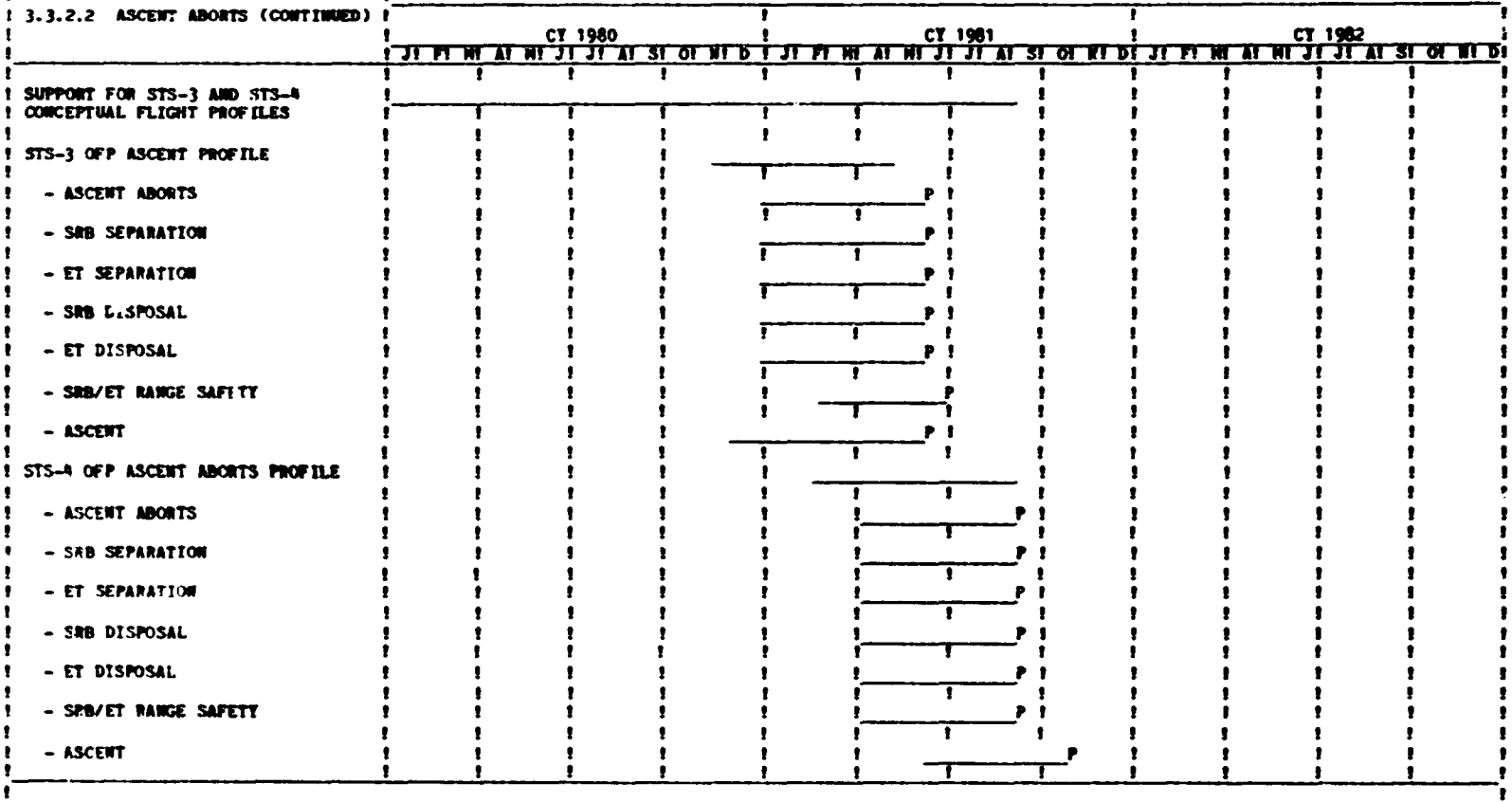
P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN	STS 2-4 PRODUCTS AND SCHEDULES																																	
3.3.2.2 ASCENT ABORTS	CY 1980												CY 1981												CY 1982									
	JI	FI	MI	AI	MI	JI	JI	AI	SI	OI	NI	DI	JI	FI	MI	AI	MI	JI	JI	AI	SI	OI	NI	DI	JI	FI	MI	AI	MI	JI	JI	AI	SI	OI	NI	DI
PROGRAM MILESTONES																P				P			P												
																STS-2				STS-3			STS-4												
STS-2 THRU STS-4 ASCENT PERFORMANCE SCAN																																			
GROUNDRULES AND CONSTRAINTS ANALYSIS AND DEFINITION																																			
- ASCENT ABORTS																																			
- SRB SEPARATION																																			
- ET SEPARATION																																			
- SRB DISPOSAL																																			
- ET DISPOSAL																																			
STS-2 OFP ASCENT ABORT PROFILE																																			
- ASCENT ABORT											P																								
- SRB SEPARATION											P																								
- ET SEPARATION											P																								
- SRB DISPOSAL											P																								
- ET DISPOSAL											P																								
- SRB/ET RANGE SAFETY												P																								
- ASCENT											P																								

Notes:

P = Planned completion date - A = Actual completion date

STS 2-4 PRODUCTS AND SCHEDULES



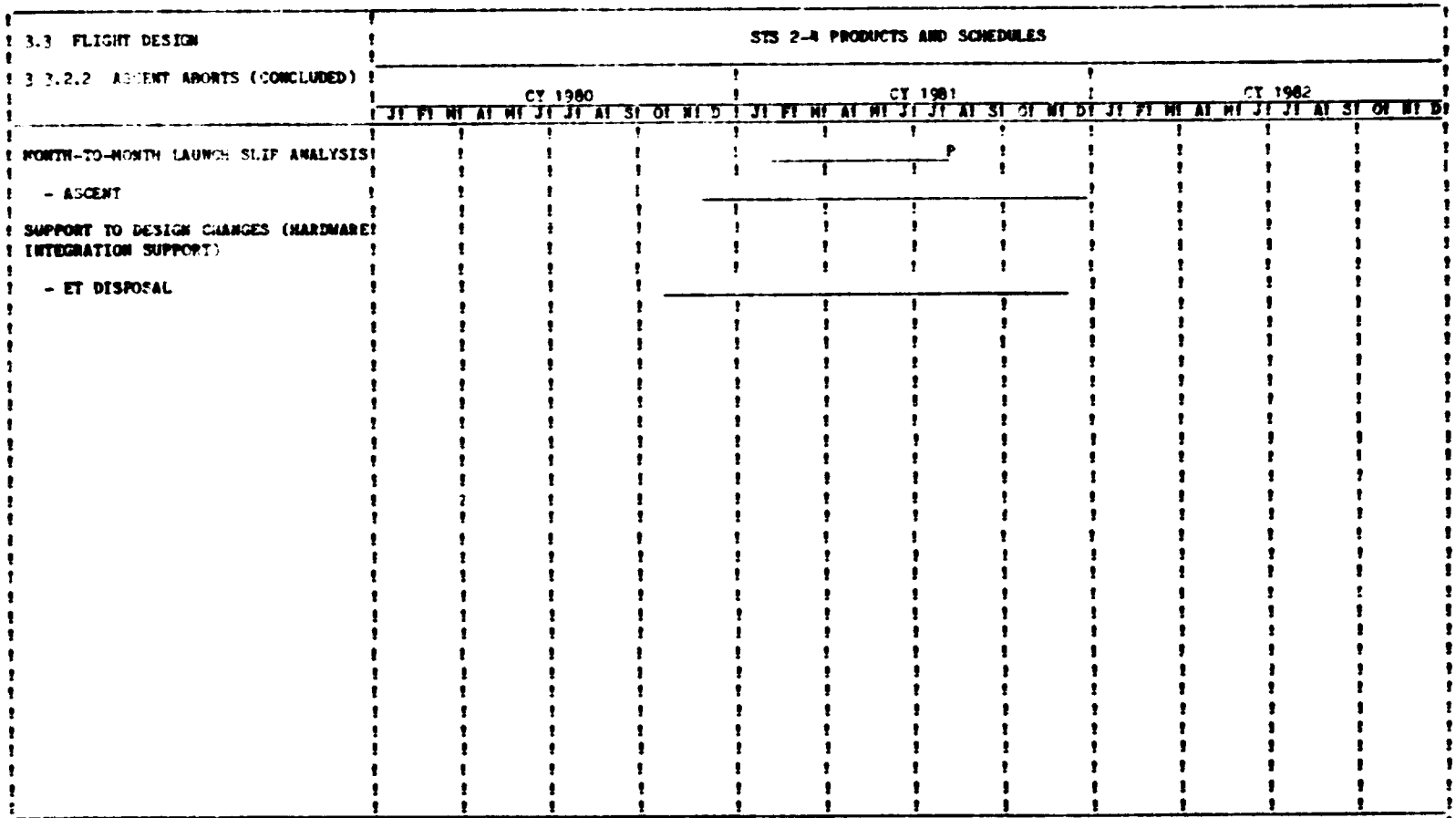
Note:

P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN

3.3.2.2 ASCENT ABORTS (CONCLUDED)

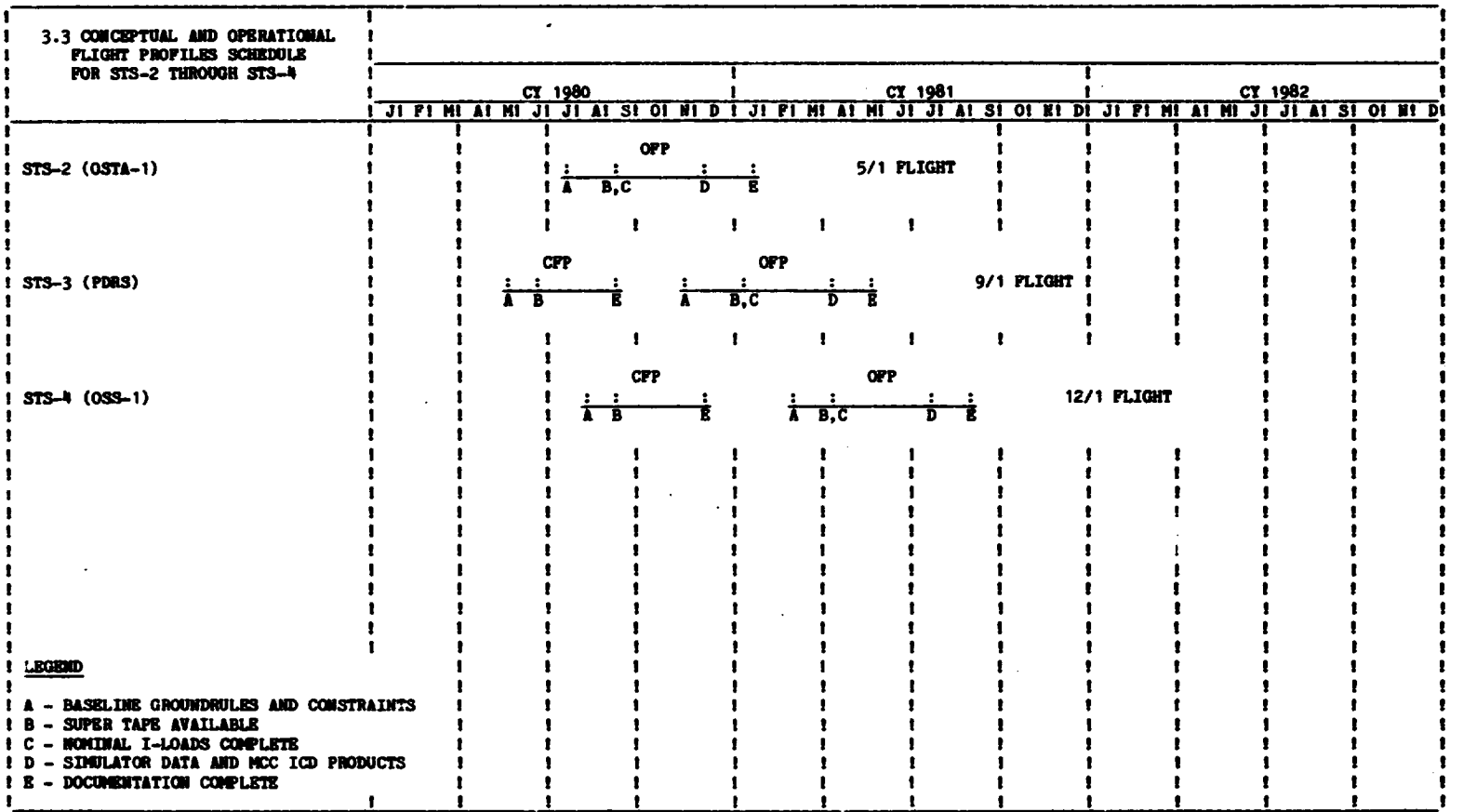
STS 2-4 PRODUCTS AND SCHEDULES



Notes:

F = Planned completion date - A = Actual completion date

3.3 CONCEPTUAL AND OPERATIONAL FLIGHT PROFILES SCHEDULE FOR STS-2 THROUGH STS-4



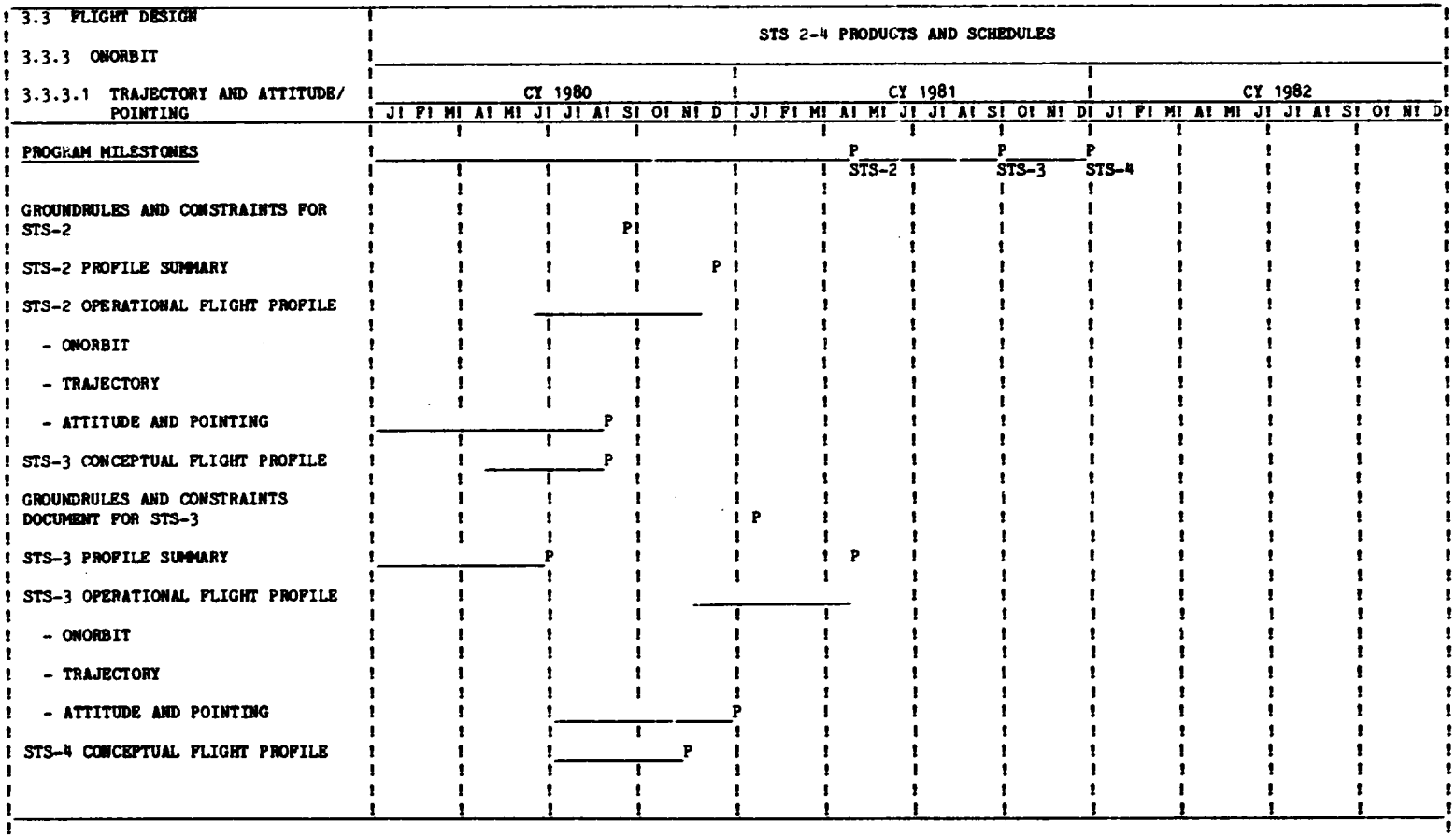
Notes:

3.3 FLIGHT DESIGN

3.3.3 ONORBIT

3.3.3.1 TRAJECTORY AND ATTITUDE/ POINTING

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

3.3 FLIGHT DESIGN

3.3.3 ONORBIT

3.3.3.1 TRAJECTORY AND ATTITUDE/ POINTING (CONCLUDED)

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982					
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
GROUNDRULES AND CONSTRAINTS DOCUMENT FOR STS-4																P														
STS-4 PROFILE SUMMARY																		P												
STS-4 OPERATIONAL FLIGHT PROFILE																														
- ONORBIT																														
- TRAJECTORY																	P													
- ATTITUDE AND POINTING PLUME IMPINGEMENT FTR SUPPORT (STS-4)												P																		

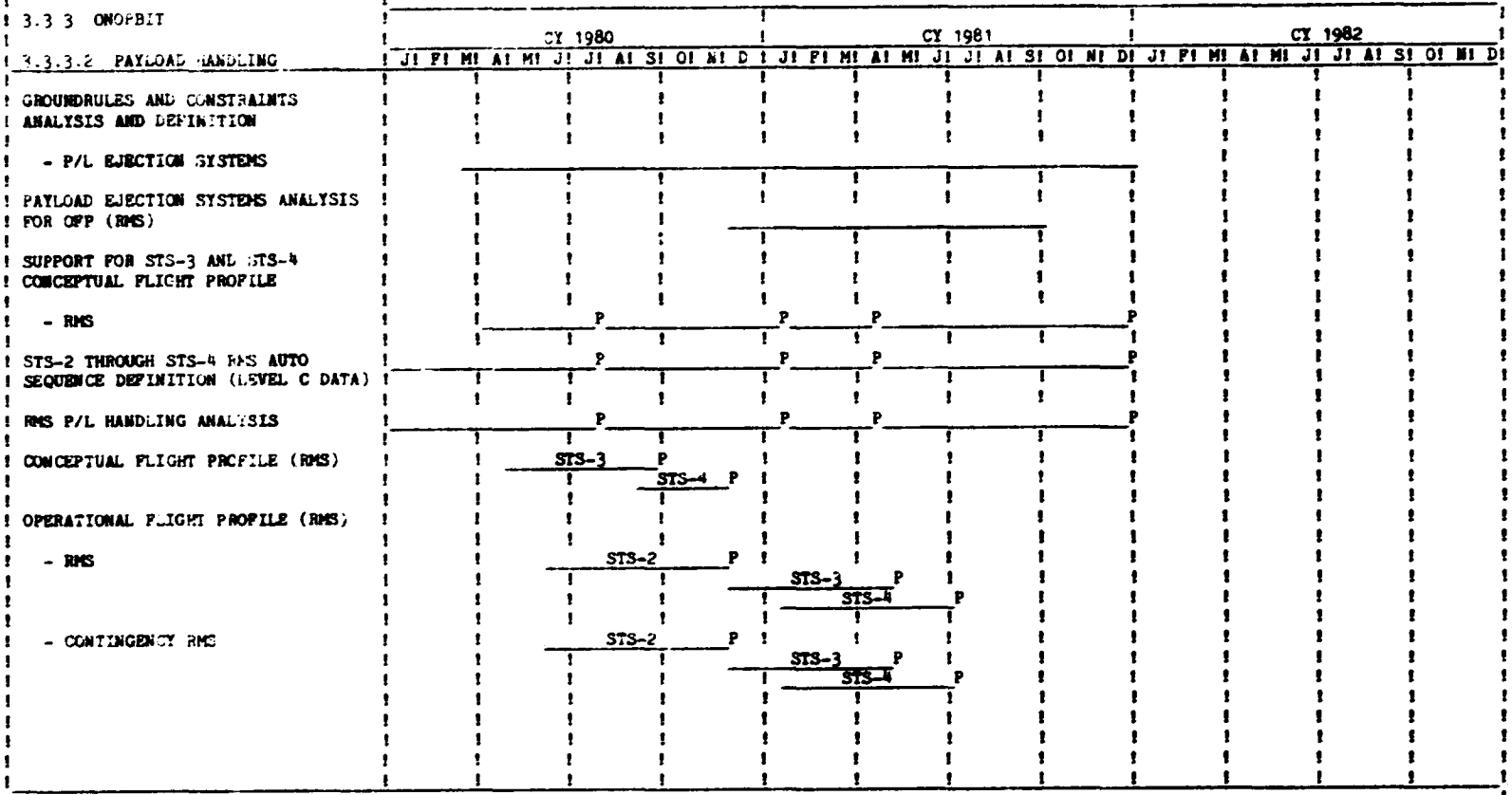
Notes:

3.3 FLIGHT DESIGN

3.3.3 ONORBIT

3.3.3.2 PAYLOAD HANDLING

STS 2-4 PRODUCTS AND SCHEDULES

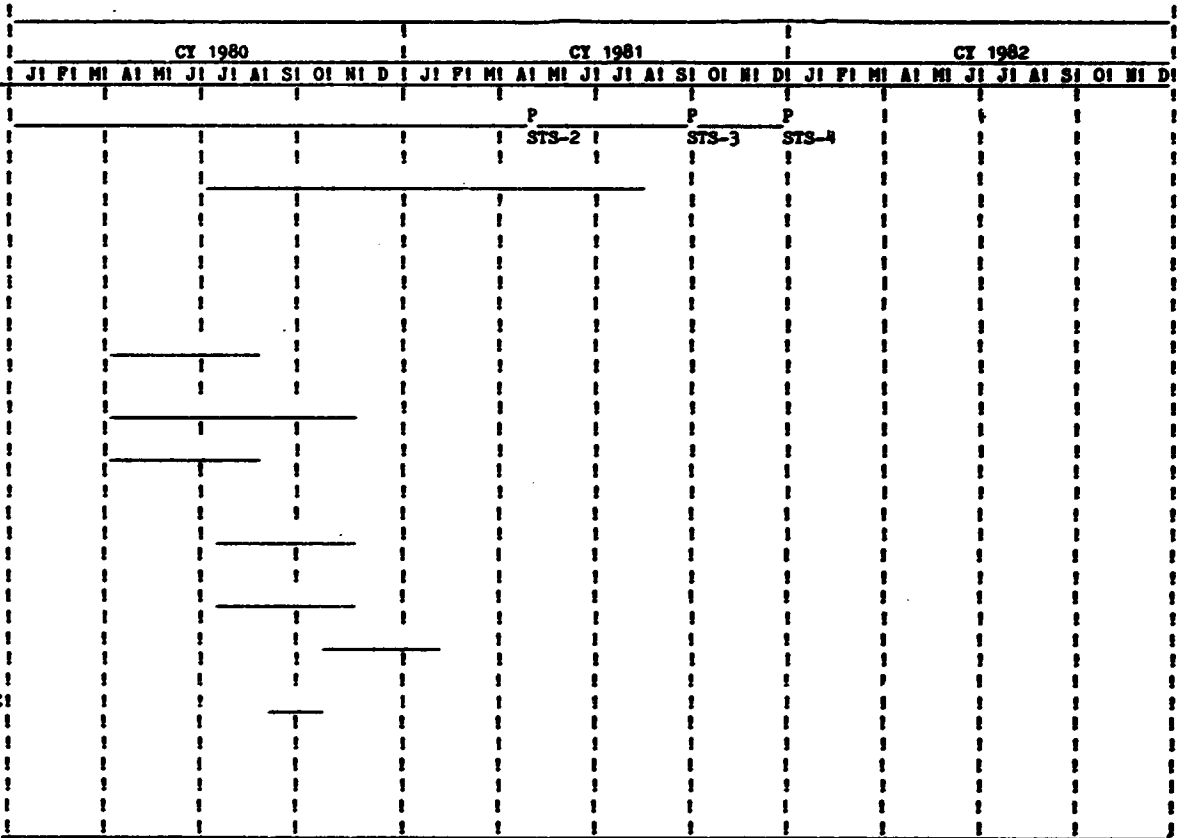


Notes:

3.3 FLIGHT DESIGN

3.3.4 DESCENT/GRTLS

STS 2-4 PRODUCTS AND SCHEDULES

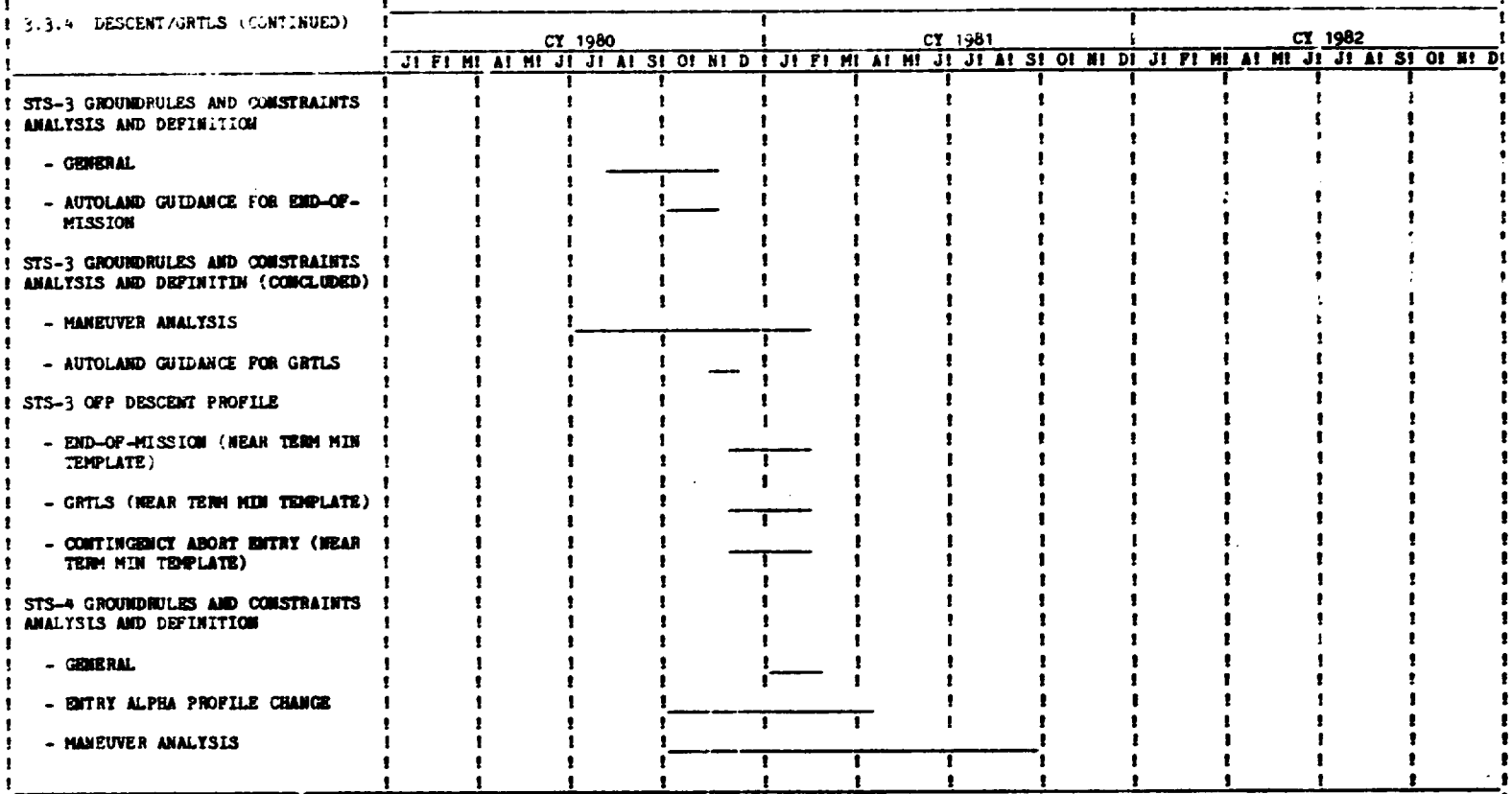


Notes:

3.3 FLIGHT DESIGN

3.3.4 DESCENT/GRTLS (CONTINUED)

STS 2-4 PRODUCTS AND SCHEDULES

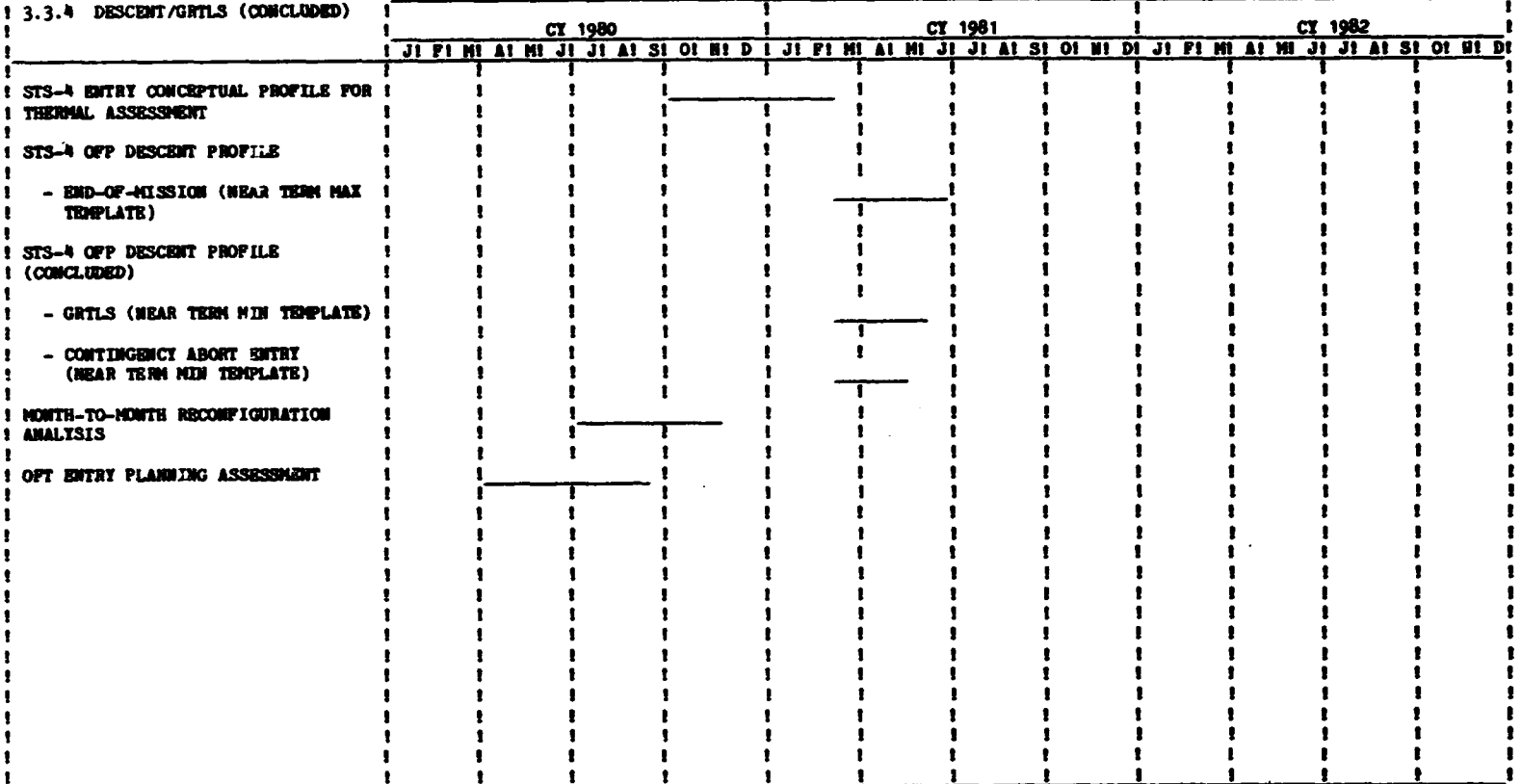


Notes:

3.3 PLIGHT DESIGN

3.3.4 DESCENT/GRTLS (CONCLUDED)

STS 2-4 PRODUCTS AND SCHEDULES

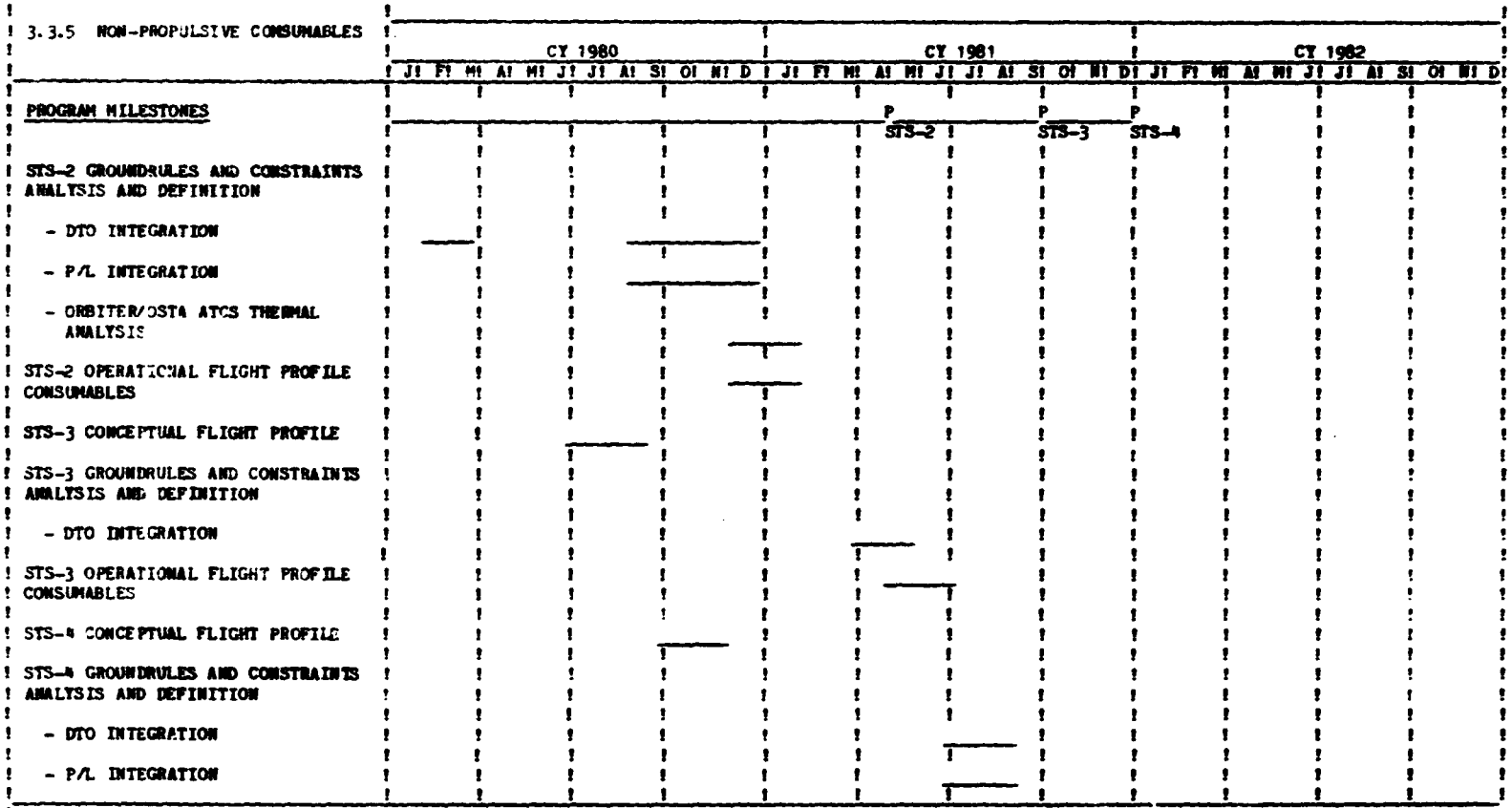


Notes:

3.3 FLIGHT DESIGN

3.3.5 NON-PROPULSIVE CONSUMABLES

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN 3.3.5 NON-PROPULSIVE CONSUMABLES CONCLUDED	STS 2-4 PRODUCTS AND SCHEDULES																																	
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
STS-4 OPERATIONAL FLIGHT PROFILE CONSUMABLES																				P	A														

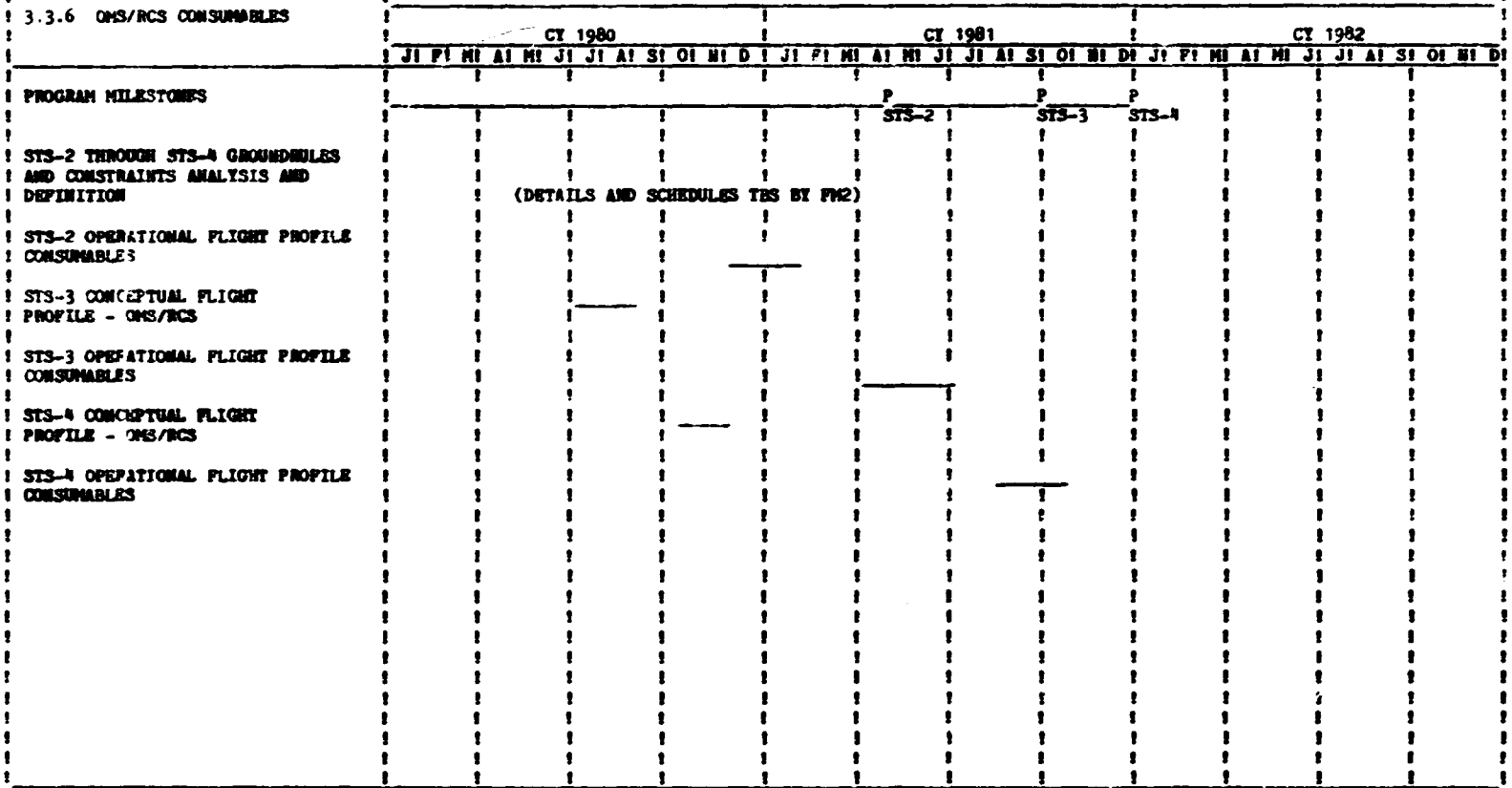
Notes:

P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN

3.3.6 OMS/RCS CONSUMABLES

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.3 FLIGHT DESIGN

3.3.7 NAVIGATION

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P STS-2					P STS-3				P STS-4											
NAVIGATION SUPPORT FOR STS-2 OFP																																				
- MCC ICD PRODUCTS											P																									
- O/B I-LOADS									P																											
NAVIGATION SUPPORT FOR STS-3 OFP																																				
- MCC ICD PRODUCTS																P																				
- O/B I-LOADS													P																							
NAVIGATION SUPPORT FOR STS-4 OFP																																				
- MCC ICD PRODUCTS																		P																		
- O/B I-LOADS																P																				

Notes:

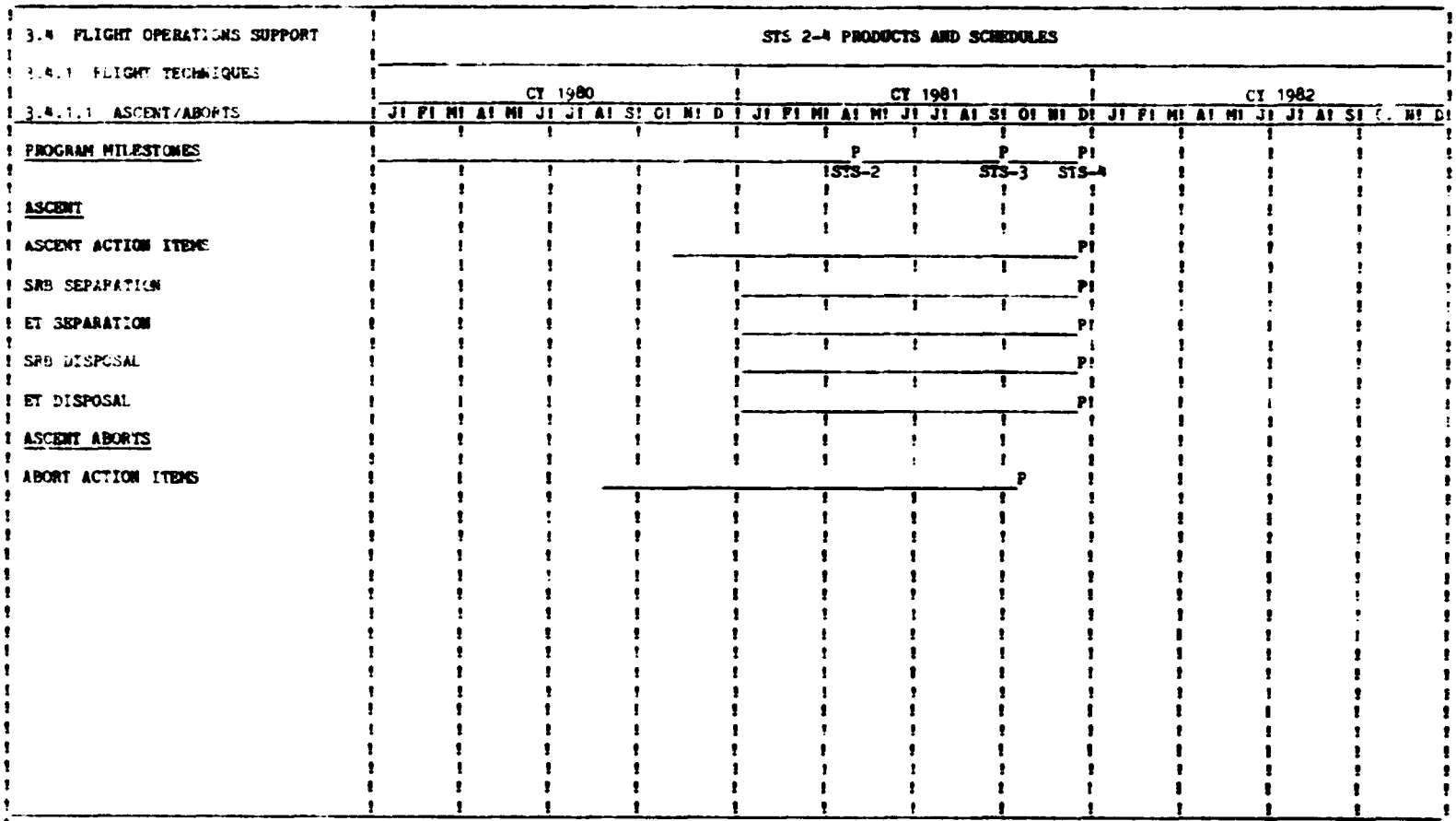
P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.1 FLIGHT TECHNIQUES

3.4.1.1 ASCENT/ABORTS

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.1 FLIGHT TECHNIQUES

3.4.1.2 ONORBIT

3.4.1.2.1 ATTITUDE AND POINTING

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P													
																STS-2					STS-3			STS-4													
ACTION ITEMS																																				
ATTITUDE DISPLAYS FOR THERMAL ANALYSIS																								P												
COMMUNICATIONS TIMELINES																								P												

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.1 FLIGHT TECHNIQUES

3.4.1.2 ORBIT

3.4.1.2.2 OMS MANEUVERS

PROGRAM MILESTONES

ACTION ITEMS

STS 2-4 PRODUCTS AND SCHEDULES

CY 1980: J F M A M J J A S O N D

CY 1981: J F M A M J J A S O N D

CY 1982: J F M A M J J A S O N D

P STS-2

P STS-3

P STS-4

(PRODUCTS TBS BY FMA1)

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.1 FLIGHT TECHNIQUES

3.4.1.2 ONORBIT

3.4.1.2.3 RMS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																																				
																P					P			P													
																STS-2					STS-3			STS-4													
ACTION ITEMS																		P					P			P											
PLUME IMPINGEMENT FTR SUPPORT (STS-4)																									P											

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.1 FLIGHT TECHNIQUES

3.4.1.2 ONORBIT

3.4.1.2.4 PAYLOAD EJECTION

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
ACTION ITEMS																								P												

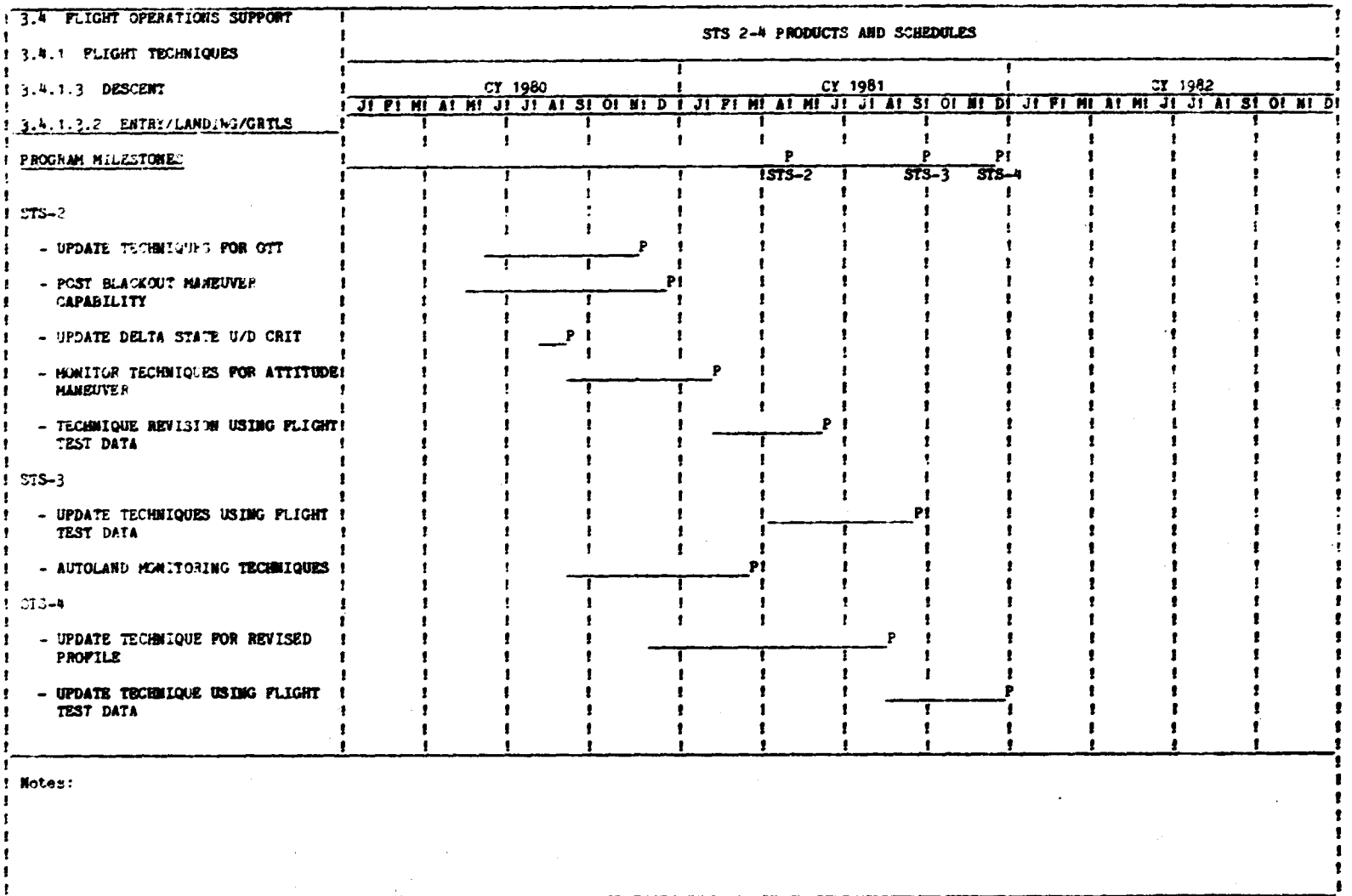
Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT	STS 2-4 PRODUCTS AND SCHEDULES
3.4.1 FLIGHT TECHNIQUES	
3.4.1.3 DESCENT	CY 1980 J F M A M J J A S O N D | CY 1981 J F M A M J J A S O N D | CY 1982 J F M A M J J A S O N D
3.4.1.3.1 DEORBIT	
PROGRAM MILESTONES	P STS-2 P STS-3 P STS-4
ACTION ITEMS	P

Notes:

P = Planned completion date - A = Actual completion date


3.4 FLIGHT OPERATIONS SUPPORT
3.4.1 FLIGHT TECHNIQUES
3.4.1.3 DESCENT
3.4.1.3.2 ENTRY/LANDING/GRTLS
STS 2-4 PRODUCTS AND SCHEDULES
CY 1980
CY 1981
CY 1982
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PROGRAM MILESTONES
P P P
STS-2 STS-3 STS-4
STS-2
- UPDATE TECHNIQUES FOR OTT
- POST BLACKOUT MANEUVER CAPABILITY
- UPDATE DELTA STATE U/D CRIT
- MONITOR TECHNIQUES FOR ATTITUDE MANEUVER
- TECHNIQUE REVISION USING FLIGHT TEST DATA
STS-3
- UPDATE TECHNIQUES USING FLIGHT TEST DATA
- AUTOLAND MONITORING TECHNIQUES
STS-4
- UPDATE TECHNIQUE FOR REVISED PROFILE
- UPDATE TECHNIQUE USING FLIGHT TEST DATA
Notes:
P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS 3.4.1 FLIGHT TECHNIQUES 3.4.1.4 CONSUMABLES MANAGEMENT	STS 2-4 PRODUCTS AND SCHEDULES CY 1980 J F M A M J J A S O N D	 CY 1981 J F M A M J J A S O N D	 CY 1982 J F M A M J J A S O N D
PROGRAM MILESTONES		P STS-2 (Apr); P STS-3 (Sep); P STS-4 (Dec)	
NON-PROPULSIVE CONSUMABLES			
- ACTION ITEMS	(PRODUCTS TBS BY FM2) [bar from Feb]	[bar to P, Sep]	
OMS/RCS CONSUMABLES	(PRODUCTS TBS BY FM2)		

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS

3.4.1 FLIGHT TECHNIQUES

3.4.1.5 NAVIGATION

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
ONBOARD S/W SUPPORT																																				
- ASCENT ACTION ITEMS																																				
- ONORBIT ACTION ITEMS																																				
- DESCENT ACTION ITEMS																P				P			P													
MCC ASCENT/DESCENT																																				
- ACTION ITEMS																																				
MCC ODP																																				
- ACTION ITEMS																																				

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.2 SIMULATION AND REALTIME SUPPORT (CONTINUED)

3.4.2.2 ONORBIT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P						P		P												
																STS-2						STS-3		STS-4												
3.4.2.2.1 ATTITUDE AND POINTING																																				
- O/B ATTITUDE AND POINTING																								P												
- MCC ATTITUDE AND POINTING																								P												
3.4.2.2.2 OMS MANEUVERS																																				
- O/B GUIDANCE AND TARGETING																								P												
- MCC MANEUVER SUPPORT																								P												
3.4.2.2.3 PL EJECTION																																				
- P/L EJECTION SUPPORT																P						P		P												

Notes:

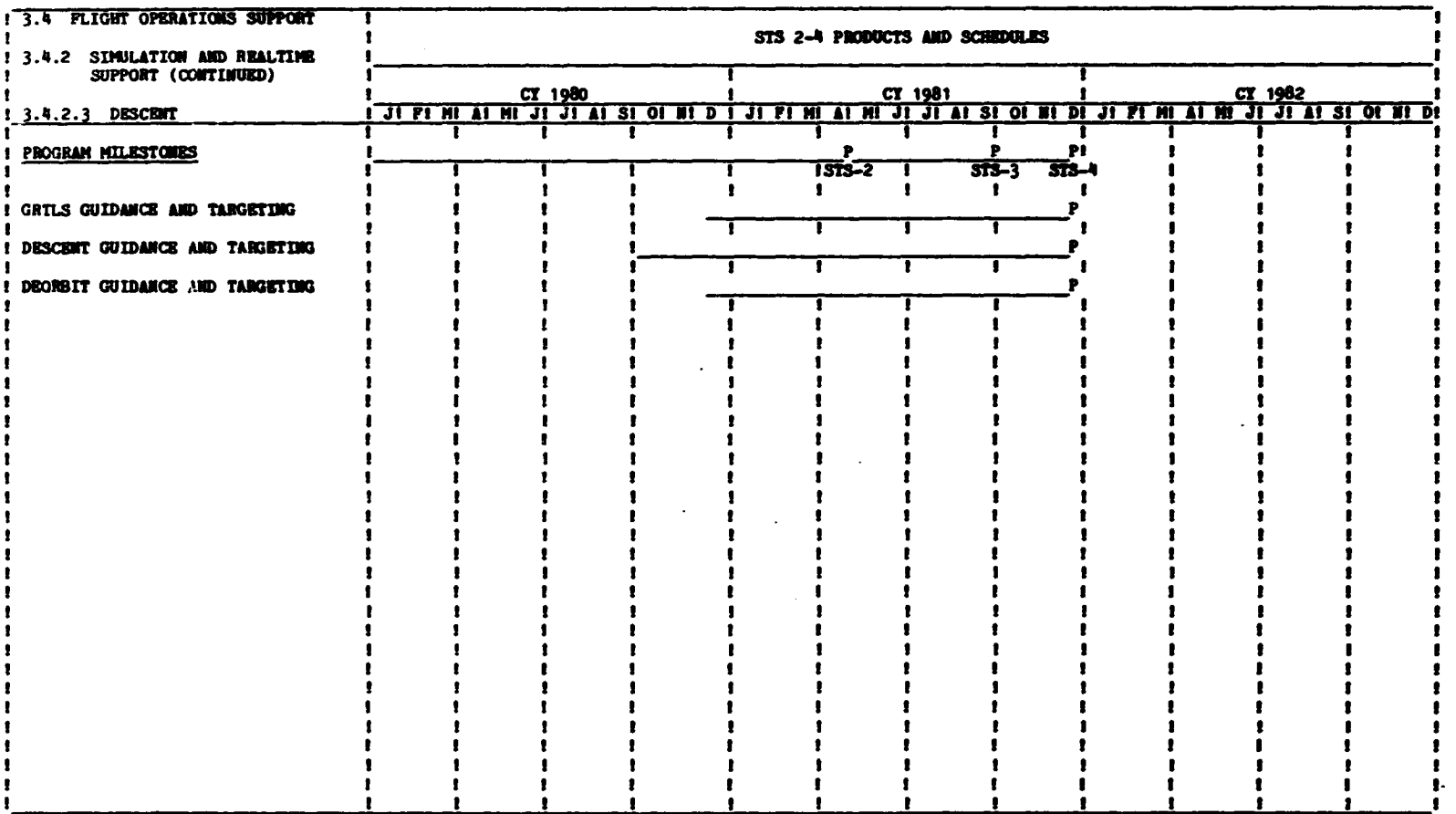
P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.2 SIMULATION AND REALTIME SUPPORT (CONTINUED)

3.4.2.3 DESCENT

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.2 SIMULATION AND REALTIME SUPPORT (CONTINUED)

3.4.2.4 CONSUMABLES MANAGEMENT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P		P													
																STS-2					STS-3		STS-4													
APU FUEL																																				
EPS																																				
ECLSS																																				
CONFIGURATION MANAGEMENT																																				
OMS/RCS																																				
TM COMPS																																				

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT

3.4.2 SIMULATIONS AND REALTIME SUPPORT (CONCLUDED)

3.4.2.5 NAVIGATION

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P STS-2					P STS-3		P STS-4													
MCC ASCENT/DESCENT NAV																																				
MCC ONORBIT NAV																																				
O/B ASCENT/ONORBIT/DESCENT NAVIGATION																																				

Notes:

P = Planned completion date - A = Actual completion date

3.4 FLIGHT OPERATIONS SUPPORT 3.4.3 SYSTEMS DESIGN SUPPORT	STS 2-4 PRODUCTS AND SCHEDULES																																	
	CY 1980												CY 1981												CY 1982											
	J1	F1	M1	A1	M1	J1	J1	A1	S1	O1	N1	D	J1	F1	M1	A1	M1	J1	J1	A1	S1	O1	N1	D1	J1	F1	M1	A1	M1	J1	J1	A1	S1	O1	N1	D1
	ITEM		TBS		FM2																															
					FMA																															

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.1 INTEGRATED DIVISION TOOLS

3.5.1.1 SVDS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P STS-2				P STS-3			P STS-4													
ASCENT/ABORT/DEORBIT SIMULATION																																				
- PRELIMINARY ANALYSIS FILE				P 28																																
- OFP FILE						P 20																														
- PROGRAM MAINTENANCE, MODS, AND USER SUPPORT																								P												
- SDL COMPARISON TEST FILES	(TBS BY FM6)																																			
- SMS VERIFICATION SUPPORT	(TBS BY FM6)																																			
- OFP REVISION FILE	(TBS BY FM6)																																			
ASCENT SEPARATION SIMULATION																																				
- MAINTENANCE, MODS, USER SUPPORT																								P												
ORBITAL SIMULATION																																				
- 3 DOF	COMPLETE																																			
- 6 DOF SIMULATION FOR FLIGHT PLANNING						P																														
- MAINTENANCE, MODS, USER SUPPORT																								P												

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT	STS 2-4 PRODUCTS AND SCHEDULES																																	
3.5.1 INTEGRATED DIVISION TOOLS	CY 1980												CY 1981												CY 1982									
3.5.1.1 SVDS (CONTINUED)	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
DESCENT																																				
STS-2																																				
- OFP			P				P																													
- OFP - EOM			P				P																													
- OFP - GRTLS						P			P																											
- CT - EOM									P																											
- CT - GRTLS									P																											
STS-3																																				
- OFP EOM												P																								
- OFP GRTLS												P																								
- MILESTONE SUPPORT						P																														
- MAP BANKING				P																																
- FDS PREPARATION									P																											
SYSTEM AND POST PROCESSORS																																				
- MILESTONES			P						P																											
- TABDIS MODS		(TBS BY FM6)																																		
- TRWPLT MODS		(TBS BY FM6)																																		

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT 3.5.1 INTEGRATED DIVISION TOOLS 3.5.1.1 SVDS (CONCLUDED)	STS 2-4 PRODUCTS AND SCHEDULES																																	
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SYSTEM AND POST PROCESSOR (CONC'D)																																				
- SUPERTAPE ENHANCEMENTS									P																											
- MAINTENANCE, MODS, USER SUPPORT																																				

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.1 INTEGRATED DIVISION TOOLS

3.5.1.2 LTGS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
MAINTENANCE, MODE, USER SUPPORT																																				

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.2 ASCENT/ABORTS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980											CY 1981											CY 1982										
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P											
																STS-2					STS-3			STS-4										
SVDS REQUIREMENT AND VERIFICATION																								P										
BENCH PROGRAMS MAINT AND MODS																							P											
- AME CHANGES										P																								
OFFLINE MAINT AND MODS																							P											

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.3 ONORBIT

3.5.3.1 ATTITUDE AND POINTING

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980											CY 1981											CY 1982										
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																	P					P			P											
																	STS-2					STS-3			STS-4											
SVDS REQUIREMENT AND VERIFICATION																																				
- MAINTENANCE AND MODS																								P												
BENCH PROGRAMS																																				
- MAINTENANCE AID MODS																								P												
- VIEW																																				
- ARM																																				
- ANTENNA FOV																																				
- FLT PLAN SUMMARY																																				
OFFLINE																																				
- MAINTENANCE AND MODS																								P												
- ORBITAL ATTITUDE GRAPHICS (HP)																																				

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT 3.5.3 ONORBIT (CONTINUED) 3.5.3.2 ONORBIT OMS MANEUVER	STS 2-4 PRODUCTS AND SCHEDULES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
SVDS REQUIREMENT AND VERIFICATION (CONTINUED)																																				
- (TBS BY FM 41)																																				
BENCH PROGRAMS																																				
- (TBS FY FM41)																																				
OFFLINE PROGRAMS																																				
- (TBS BY F141)																																				

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.3 ONORBIT (CONTINUED)

3.5.3.3 RMS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
RMS SIM VALIDATION										P																										
PDRS MAINTENANCE AND ENHANCEMENT																								P												
HP 9835 DEVELOPMENT, MAINT, AND ENHANCEMENT																								P												

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.4 DESCENT

3.5.4.1 DEORBIT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
SVDS REQUIREMENT AND VERIFICATION																																				
- (PRODUCTS TBS FM41)																																				
BENCH PROGRAM																																				
- (PRODUCTS TBS FM41)																																				
OFFLINE PROGRAMS																																				
- (PRODUCTS TBS FM41)																																				

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.4 DESCENT

3.5.4.2 ENTRY THROUGH LANDING

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																	P					P		P												
																	STS-2					STS-3		STS-4												
SVDS - EOM, AOA, GRTLS AND CA																																				
STS-2																																				
- OTT MODEL AND GNC UPDATE			P																																	
- PTI, ASI POIU MODEL UPDATE			P			P																														
- INCORPORATE NAV/FC I-LOAD UPDATE						P																														
- INTEGRATE MODIL CHANGES							P																													
STS-3																																				
- MODIFY NAV/FC CONTROL MODELS								P			P																									
- INCORPORATE GNC MODEL UPDATE								P			P																									
- THERMAL MODEL UPDATE																P	P																			
- AERO MODEL UPDATE																P	P																			
- INTEGRATION OF MODEL CHANGES											P																									
STS-4																																				
- CP MODIFICATIONS											P		P																							
- THERMAL MODEL UPDATE																						P	P													

Notes:

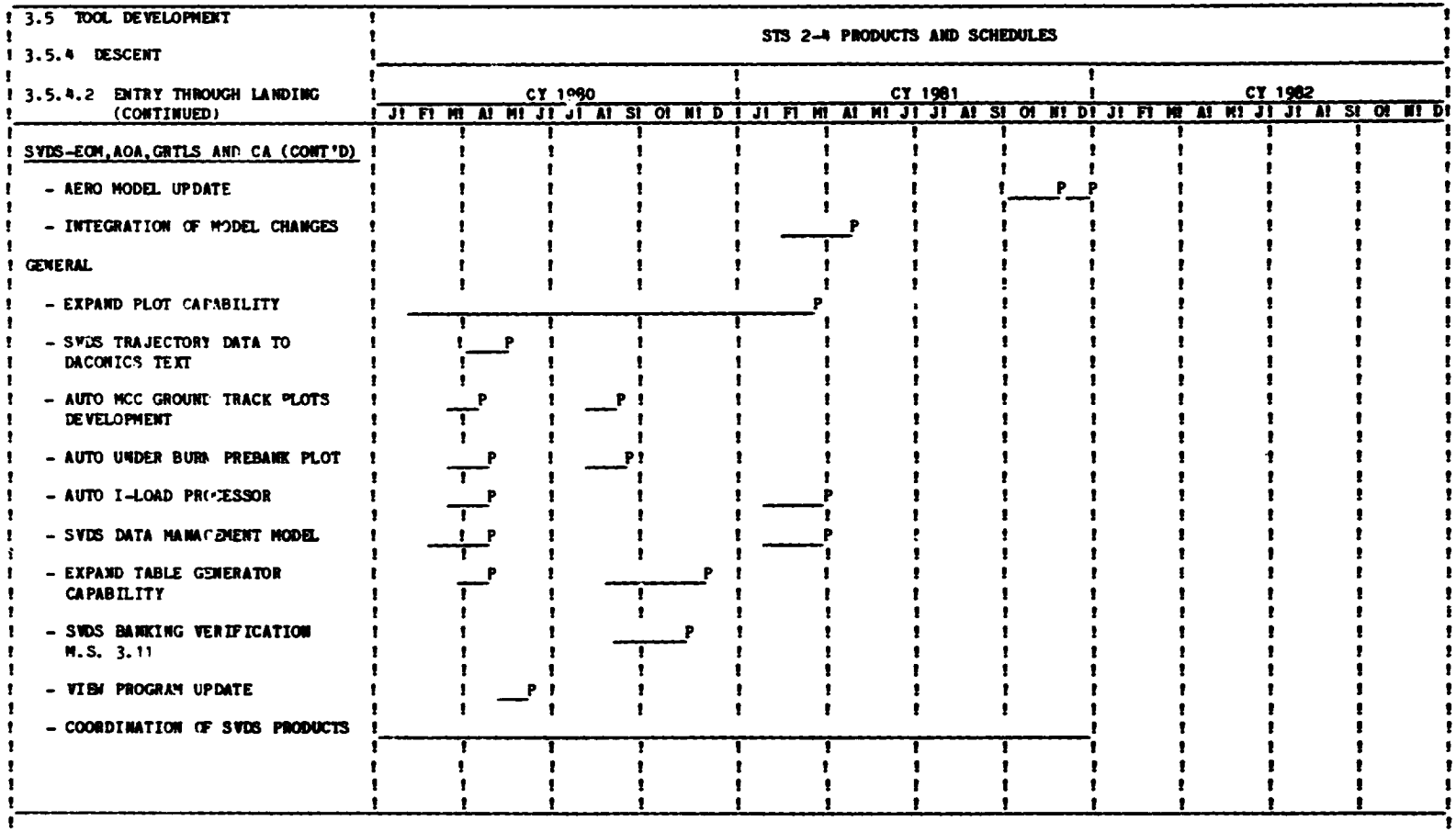
P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.4 DESCENT

3.5.4.2 ENTRY THROUGH LANDING (CONTINUED)

STS 2-4 PRODUCTS AND SCHEDULES



Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.4 DESCENT

3.5.4.2 ENTRY THROUGH LANDING (CONCLUDED)

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
GVDS-EOM, AOA, GRTLS AND CA (CONC'D)																																				
LAND PROGRAM (EOM, AOA, GRTLS)																																				
- MAINTENANCE AND MODS			P				P						P					P				P														
- BANKED 6 DOF MONTE CARLO			P						P																											
- MONTE CARLO MAINTENANCE AND DEVELOPMENT				P						P							P																			

Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT

3.5.5 CONSUMABLES MANAGEMENT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
OMS/RCS CONSUMABLES SVDS SUPPORT																																				
- PRODUCTS	(TBS FM2)																																			
BENCH PROGRAMS																																				
- PRODUCTS	(TBS FM2)																																			
OFFLINE SUPPORT																																				
- PRODUCTS	(TBS FM2)																																			
NON-PROPULSIVE CONSUMABLES																																				
- BENCH PROGRAM																																				
- MAINTENANCE AND MODIFICATIONS																								P												
- OSTA PALLET MODEL									P																											
- DATA BASE MANAGEMENT																								P												
- OFFLINE	(TBS FM2)																																			

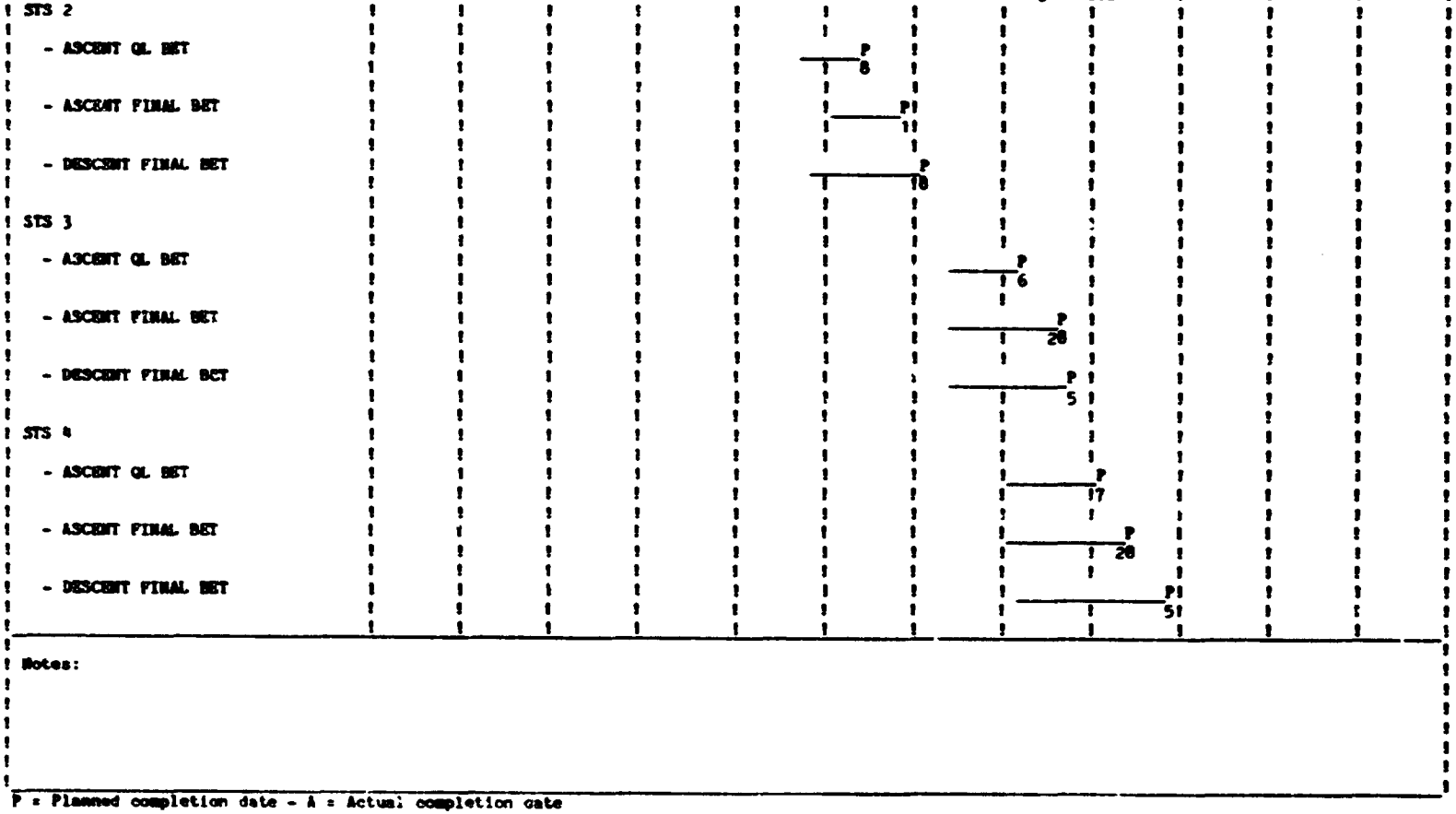
Notes:

P = Planned completion date - A = Actual completion date

3.5 TOOL DEVELOPMENT 3.5.6 NAVIGATION	STS 2-4 PRODUCTS AND SCHEDULES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																	P STS-2				P STS-3			P STS-4											
ONBOARD SUPPORT TOOLS																																				
- BENCH																																				
- MAINTENANCE																																				
- OTHER																																				
- MAINTENANCE AND MODS																																				
ASCENT/DESCENT MSTD																																				
- BENCH PROGRAM																																				
- PRODUCTS	(TBS FMS)																																			
ONORBIT ODP																																				
- BENCH PROGRAM																																				
- SUPPORT AS REQ																																				
- MAINTENANCE																																				

Notes:

P = Planned completion date - A = Actual completion date


3.6 POSTFLIGHT
3.6.1 ANCILLARY DATA
3.6.1.1 ASCENT/DESCENT
STS 2-4 PRODUCTS AND SCHEDULES
CY 1980
CY 1981
CY 1982
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PROGRAM MILESTONES
P
STS-2
P
STS-3
P
STS-4
STS 2
- ASCENT QL DET
P
8
- ASCENT FINAL DET
P
11
- DESCENT FINAL DET
P
10
STS 3
- ASCENT QL DET
P
6
- ASCENT FINAL DET
P
20
- DESCENT FINAL DET
P
5
STS 4
- ASCENT QL DET
P
17
- ASCENT FINAL DET
P
20
- DESCENT FINAL DET
P
5
Notes:
P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.1 ANCILLARY

3.6.1.2 ONORBIT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P				P											
																STS-2					STS-3				STS-4											
STS 2																																				
- SOFTWARE VERIFICATION														P																						
														1																							
- DATA GENERATION																P																				
																15																					
- DOCUMENTATION																	P																			
																	1																				
STS 3																																				
- SOFTWARE VERIFICATION																	P																			
																	1																				
- DATA GENERATION																			P																	
																			15																	
- DOCUMENTATION																																				
STS 4																																				
- SOFTWARE VERIFICATION																					P															
																					1															
- DATA GENERATION																							P													
																							15													
- DOCUMENTATION																								P												
																								1												

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.2 ASCENT/ABORTS

3.6.2.1 ASCENT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P				P				P												
																STS-2				STS-3				STS-4												
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN					(TBS BY PM#1)																															
FLIGHT PROFILE ANALYSIS																																				
- ASCENT																	P			P				P												
- ET DISPOSAL																																				
- QUICK LOOK, INTERIM, FINAL																		P																		
																			P																	
																					P															
- ET SEPARATION																	P				P			P				P								
- SRB SEPARATION																	P				P			P				P								
SOFTWARE ANALYSIS																																				
- ASCENT																P				P				P												
FLIGHT TECHNIQUES ANALYSIS					(PRODUCTS AND SCHEDULES TBS PM#1)																																	
MCC ASCENT																																				
- AME ANALYSIS																	P				P				P											

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.2 ASCENT/ABORTS

3.6.2.2 ABORTS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P				P											
																STS-2					STS-3				STS-4											
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN			(TBS BY FM#1)																																	
FLIGHT PROFILE ANALYSIS																																				
- ABORT																P					P				P											
- ET DISPOSAL																																				
- QUICK LOOK, INTERIM, FINAL																	P																			
																		P																		
																					P															
- SRB SEPARATION																P				P				P												
- ET SEPARATION																P				P				P												
SOFTWARE ANALYSIS																																				
- ABORTS																P				P				P												
FLIGHTS TECHNIQUES ANALYSIS			(PRODUCTS AND SCHEDULES TBS BY FM#1)																																	
MCC ABORTS																																				
- AME/ARD ANALYSIS																P				P				P												

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT	STS 2-4 PRODUCTS AND SCHEDULES																																			
3.6.3 ONORBIT	CY 1980												CY 1981												CY 1982											
3.6.3.1 ATTITUDE AND POINTING	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P STS-2					P STS-3			P STS-4												
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN																																				
SOFTWARE																																				
			(PRODUCTS AND SCHEDULES TBS BY FM2)																																		
FLIGHT PROFILE ANALYSIS																																				
FLIGHT TECHNIQUES ANALYSIS																																				

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT	STS 2-4 PRODUCTS AND SCHEDULES																																			
3.6.3 ONORBIT	CY 1980												CY 1981												CY 1982											
3.6.3.2 OMS MANEUVERS	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P				P			P													
																STS-2				STS-3			STS-4													
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN																																				
SOFTWARE ANALYSIS																																				
					(PRODUCTS AND SCHEDULES TBS BY FM#1)																																	
FLIGHT PROFILE ANALYSIS																																				
FLIGHT TECHNIQUES ANALYSIS																																				

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.3 ONORBIT

3.6.3.3 RMS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P				P			P													
																STS-2				STS-3			STS-4													
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN																											P									
SOFTWARE ANALYSIS																																				
FLIGHT PROFILE ANALYSIS				(PRODUCTS AND SCHEDULES TBS BY PM41)																																	
FLIGHT TECHNIQUES ANALYSIS																																				
RMS PERFORMANCE																											P									
STS-4 PLUME IMPINGEMENT ANALYSIS																												P								

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.3 ONORBIT

3.6.3.4 PAYLOAD EJECTION

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
FLIGHT PROFILE ANALYSIS																P					P			P												

Notes:

P = Planned completion date - A = Actual completion date

	STS 2-4 PRODUCTS AND SCHEDULES		
3.6 POSTFLIGHT			
3.6.4 DESCENT	CY 1980	CY 1981	CY 1982
3.6.4.1 DEORBIT	J F M A M J J A S O N D	J F M / M J J A S O N D	J F M A M J J A S O N D
PROGRAM MILESTONES		P STS-2; P STS-3; P STS-4	
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN			
SOFTWARE ANALYSIS	(PRODUCTS AND SCHEDULES TBS BY FM41)		

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.4 DESCENT

3.6.4.2 ENTRY/LANDING/GRTLS

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN																			P										P					P		
SOFTWARE ANALYSIS																																				
FLIGHT PROFILE ANALYSIS																																				
FLIGHT TECHNIQUES ANALYSIS																																				

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

3.6.5 CONSUMABLES MANAGEMENT

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
NON-PROPULSIVE CONSUMABLES																																				
- POSTFLIGHT ANALYSIS AND DATA FLOW PLAN					(TBS BY FM2)																															
- MODEL UPDATE																	P					P			P											
- DATA BASE REVISION																	P					P			P											
OMS/RCS CONSUMABLES																																				
(TBS BY FM2)					(TBS BY FM2)																															

Notes:

P = Planned completion date - A = Actual completion date

3.6 POSTFLIGHT

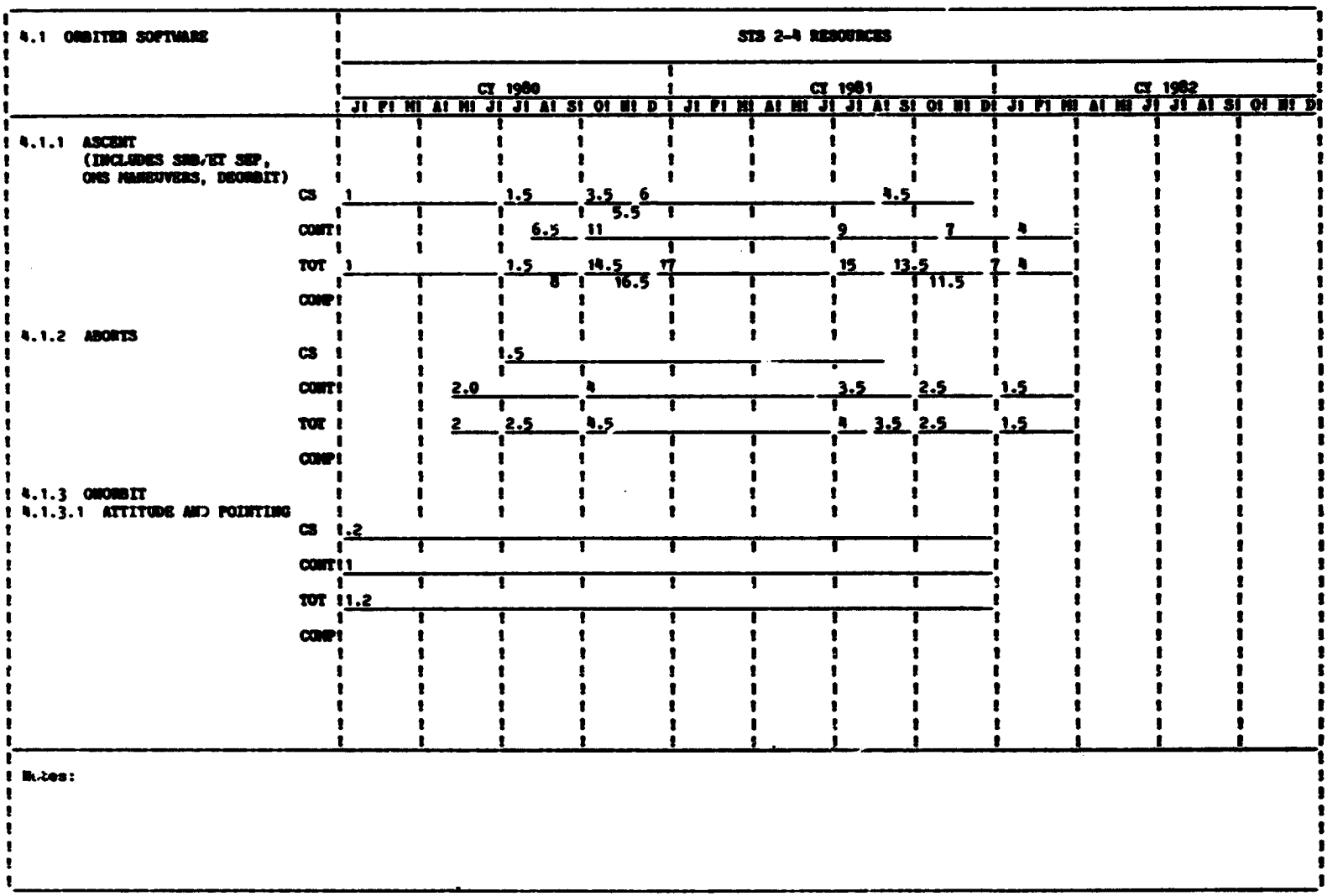
3.6.6 NAVIGATION

STS 2-4 PRODUCTS AND SCHEDULES

	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
PROGRAM MILESTONES																P					P			P												
																STS-2					STS-3			STS-4												
POSTFLIGHT ANALYSIS AND DATA FLOW PLAN	NONE	(WORK INCLUDED AS PREFLIGHT ANALYSIS FOR FOLLOWING MISSION)																																		
SOFTWARE ANALYSIS	NONE																																			
PROFILE ANALYSIS	NONE																																			
FLIGHT TECHNIQUES ANALYSIS	NONE																																			

Notes:

P = Planned completion date - A = Actual completion date


4.1 ORBITER SOFTWARE
STS 2-4 RESOURCES
CY 1980
CY 1981
CY 1982
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
4.1.1 ASCENT (INCLUDES SRB/ET SEP, OMS MANEUVERS, DEORBIT)
CS 1 1.5 3.5 6 5.5 4.5
CONT 6.5 11 9 7 4
TOT 1 1.5 8 14.5 16.5 17 15 13.5 11.5 7 4
COMP
4.1.2 ABORTS
CS 1.5
CONT 2.0 4 3.5 2.5 1.5
TOT 2 2.5 4.5 4 3.5 2.5 1.5
COMP
4.1.3 ONORBIT
4.1.3.1 ATTITUDE AND POINTING
CS 1.2
CONT 1
TOT 1.2
COMP
Notes:

4.1 ORBITER SOFTWARE (CONTINUED)		STS 2-4 RESOURCES																																			
		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.1.3 OMS/RCS (CONCLUDED)																																					
4.1.3.2 OMS MANEUVERS																																					
	CS																																				
	CONT						(INCLUDED IN 4.1.1 ASCENT)																																
	TOT																																				
	COMP																																				
4.1.3.3 RMS																																					
	CS	.5																																			
	CONT	2.5																																			
	TOT	3																																			
	COMP																																				
4.1.4 DESCENT																																					
4.1.4.1 DEORBIT																																					
	CS																																				
	CONT						(INCLUDED IN 4.1.1 ASCENT)																																
	TOT																																				
	COMP																																				

Notes:

4.1 ORBITER SOFTWARE (CONTINUED)		STS 2-4 RESOURCES																																			
		CY 1980												CY 1981												CY 1982											
		J1	F1	M0	A1	M0	J1	J1	A1	S1	O1	N1	D	J1	F1	M0	A1	M0	J1	J1	A1	S1	O1	N1	D1	J1	F1	M0	A1	M0	J1	J1	A1	S1	O1	N1	D1
4.1.4 DESCENT (CONCLUDED)																																					
4.1.4.2 ENTRY/LANDING/GRTLS																																					
	CS				.5				2.5			4			3.5	3	4		3.5	4			2	.5														
															2.5					3																		
	CONT								3		5	7			4	3	5	6		4	5	6		3	1												
	TOT								5.5		7.5				7.5	6	10		7.5	10			5	1.5													
												11				5.5					8																	
	COMP	hrs/mo.			54				25	47	101		120		46	39		90	113		100	77	16														
											189				82		181				185																
4.1.5 NAVIGATION																																					
4.1.5.1 ASCENT																																					
	CS																																				
	CONT																																				
					(TBS BY FNB)																																		
	TOT																																				
	COMP																																				
4.1.5.2 ONORBIT																																					
	CS				2.0								1.3																									
	CONT				1.5								1.0																									
	TOT				3.5								2.3																									
	COMP																																				

Notes:

4.1 ORBITER SOFTWARE (CONTINUED)		STS 2-4 RESOURCES																																			
		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.1.5 NAVIGATION (CONCLUDED)																																					
4.1.5.3 DESCENT																																					
	CS																																				
	CONT																																				
						(TBS BY FM8)																																	
	TOT																																				
	COMP																																				
4.1.6 CONSUMABLES MANAGEMENT																																					
4.1.6.1 NON-PROPULSIVE CONSUMABLES																																					
	CS													.1					.1				.1															
	CONT													.1					.1				.1															
	TOT													.2					.2				.2															
	COMP																																				
4.1.6.2 OMS/RCS CONSUMABLES																																					
	CS																																				
	CONT																																				
						(TBS BY FM2)																																	
	TOT																																				
	COMP																																				

Notes:

4.1 ORBITER SOFTWARE (CONCLUDED)	STS 2-4 RESOURCES																																	
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.1.6 CONSUMABLES MANAGEMENT (CONCLUDED)																																				
4.1.6.2 OMS/RCS CONSUMABLES																																				
CS																																				
CONT					(TBS BY FM2)																																
TOT																																				
COMP																																				

Notes:

4.2 MCC SOFTWARE

STS 2-4 RESOURCES

		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.2.1 ASCENT/ABORTS DEORBIT																																					
	CS							.6																													
	CONT						3			6										5.5			4		2												
	TOT						3		3.6	6.6										6.1			4.6		2												
	COMP																																				
4.2.2 ONORBIT ATTITUDE AND POINTING																																					
	CS	.2																																			
	CONT	1																																			
	TOT	1.2																																			
	COMP																																				
4.2.3 DESCENT ENTRY-LAND																																					
	CS		0																																		
	CONT		1									.75			.5	1		1.25	1		.5																
	TOT		1									.75			.5	1		1.25	1		.5																
	COMP				3		5						2	3	1		2	3		2			1														

Notes:

4.2 MCC SOFTWARE (CONTINUED)		STS 2-4 RESOURCES																														
		CY 1980												CY 1981												CY 1982								
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.2.4.1 ASCENT/DESCENT NAV																																
	CS	12.8																														
	CONT	3.1																														
	TOT	15.9																														
	COMP	12 hrs/week (1108) 3 hrs/week (370)																														
4.2.4.1 ONORBIT NAV																																
	CS					(TBS FM8)																										
	CONT																															
	TOT																															
	COMP																															
4.2.5.1 OMS/RCS																																
	CS					(TBS FM2)																										
	CONT																															
	TOT																															
	COMP																															

Notes:

4.2 MCC SOFTWARE (CONCLUDED)	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.2.5.2 NON-PROPULSIVE CONSUMABLES																																				
CS													.1																							
CONT													.2									.1														
TOT																																				
COMP																																				

Notes:

4.3 FLIGHT DESIGN		STS-2-4 RESOURCES																																			
		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.3.1 GENERAL																																					
	CS																																				
	CONT	(TBS BY FM17)																																			
	TOT																																				
	COMP																																				
4.3.2 ASCENT/ASCENT ABORTS																																					
4.3.2.1 ASCENT (INCLUDES RANGE SAFETY)	CS	2.5					3.5			4.5			5.5							4.5			3.5		1.5												
	CONT	3		4		3			6					5							4				3			2									
	TOT	5.5		6.5					10.5												8.5			6.5		4.5		2								
																						7.5															
	COMP																																				
4.3.2																																					
4.3.2.2 ASCENT ABORTS																																					
	CS	.5							1.0																												
	CONT	.5			3		2.5			5			4							3.5				3			2									
	TOT	1				3			6					5						4.5				4			2									
					3.5			3.5																														
	COMP																																				

Notes:

4.3 FLIGHT DESIGN		STS-2-4 RESOURCES																																	
		CY 1980												CY 1981												CY 1982										
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.3.2																																			
4.3.2.3 SRB/ET SEP AND DISPOSAL (NO RANGE SAFETY)																																			
	CS							1.1	1.3	1.5									1.4		1.2	.2															
	CONT			.1					1.1			3.1					3	1																			
	TOT			.1				2.2	2.4	2.6		4.6					4.5	2.4		3.2		.2														
	COMP																																		
4.3.3 ONORBIT																																			
4.3.3.1 TRAJECTORY AND ATTITUDE/POINT																																			
	CS	3.5								4.5																										
	CONT	0																																	
	TOT	3.5								4.5																										
	COMP																																		
4.3.3.2 RMS AND P/L EJECTION AND PLUME MANAGEMENT																																			
	CS	1.2																																		
	CONT	3.6										3.6											3.7	3.6													
	TOT	4.8										4.8											4.9	4.8													
	COMP																																		

Notes:

4.3 FLIGHT DESIGN		STS-2-4 RESOURCES																																	
		CY 1980												CY 1981												CY 1982										
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.3.4																																			
4.3.4.1 DEORBIT																																			
	CS													.3																						
	CONT																																			
	TOT													.3																						
	COMP																																			
4.3.4																																			
4.3.4.2 DESCENT/GRTLS																																			
	CS			.5		1	2.5			3									2			1															
							12.5			8.5																											
	CONT			3	3.5		7.5		9.0		9.5			8.5	7		8	5		1.5	1		.5													
									9.5		10	10.5			5																						
	TOT			3.5	4.5		12		13		13.5			8			10		3.5		2		.5													
				4			10		11.5		12.5			11.5	10		7																			
	COMP	15	67		104			150		126		58		102			45	97			20															
			71			115			155		60		63		87		92			67																
4.3.5 NON-PROPULSIVE CONSUMABLES																																			
	CS	2.5					1.1	2	1	1.1	3.1	1.2		.6	2.5	2	1	2	1																	
	CONT	1						1			3	2		.5	2.5	2	1	2	1																	
	TOT	3.5					1.1	3	1	2.1	6.1	3.2		1.1	5	4	2	4	2																	
	COMP																																		

Notes:

4.3 FLIGHT DESIGN	STS-2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.3.6 OMS/RCS CONSUMABLES																																				
CS																																				
CONT																																				
TOT					(TBS BY FM 2)																																	
COMP																																				
4.3.7 NAVIGATION																																				
CS																																				
CONT																																				
TOT					(TBS BY FM 8)																																	
COMP																																				

Notes:

4.4 FLIGHT OPERATIONS SUPPORT / 4.4.1 FLIGHT TECHNIQUES	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.1.1 ASCENT/ABORTS																																				
4.4.1.1.1 ASCENT																																				
CS										2																										
CONT						.5			1									.5																		
TOT						.5			1	3								2.5				.5														
COMP																																				
4.4.1.1.2 ABORT																																				
CS									.5																											
CONT						1.5			3									2.5				2		1												
TOT						1.5			3.5									3				2		1												
COMP								2																												
4.4.1.2 ONORBIT																																				
4.4.1.2.1 ATTITUDE AND POINTING																																				
CS	.5																																			
CONT	0																																			
TOT	.5																																			
COMP																																				

Notes:

4.4 FLIGHT OPERATIONS SUPPORT		STS 2-4 RESOURCES																																	
4.4.1 FLIGHT TECHNIQUES (CONTINUED)		CY 1980												CY 1981												CY 1982									
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.1.2.2 OMS MANEUVERS																																			
	CS																																		
	CONT					(TBS BY PMR1)																															
	TOT																																		
	COMP																																		
4.4.1.2.3 RMS (PLUS PLUME IMPINGEMENT)																																			
	CS	.25																																	
	CONT	.45												.7	.25																					
	TOT	.7												.55	.5																					
	COMP																																		
4.4.1.2.4 PAYLOAD EJECTION																																			
	CS													.10																						
	CONT													.5																						
	TOT													.5																						
	COMP																																		

Notes:

4.0 FLIGHT OPERATIONS SUPPORT	STS 2-R RESOURCES																																			
4.4.1 FLIGHT TECHNIQUES (CONTINUED)	CY 1980												CY 1981												CY 1982											
	JI	FI	MI	AI	MI	JI	JI	AI	SI	OI	NI	D	JI	FI	MI	AI	MI	JI	JI	AI	SI	OI	NI	DI	JI	FI	MI	AI	MI	JI	JI	AI	SI	OI	NI	DI
4.4.1.3 DESCENT																																				
4.4.1.3.1 DEORBIT																																				
CS													1.1																							
CONT													10																							
TOT													1.1																							
COMP																																				
4.4.1.3.2 ENTRY/LANDING/CRTLS																																				
CS					2		3		1.5	2.5		1.5	2.5			2.5		1.5	1			2	1														
CONT				.5		1		2	3.5				2	3							2		1													
TOT				.5	2.5	3	4	3.5	6.0		5.0		4.5	5.5		5.5		4.5	4		3	4	2													
COMP				33		77		62				50			73		95	57			40		28													
					47		85		58				75			80			70			53															
4.4.1.4 CONSUMABLES MANAGEMENT																																				
4.4.1.4.1 NON-PROPULSIVE CONSUMABLES																																				
CS				1.5																																
CONT				.7									1																							
TOT				2.2									2.5																							
COMP																																				

Notes:

4.4 FLIGHT OPERATIONS SUPPORT	STS 2-4 RESOURCES																																			
4.4.1 FLIGHT TECHNIQUES (CONTINUED)	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.1.4 CONSUMABLES MANAGEMENT (CONTINUED)																																				
4.4.1.4.2 OMS/RCS CONSUMABLES																																				
CS																																				
CONT																																				
					(TBS BY FM2)																																	
TOT																																				
COMP																																				
4.4.1.5 NAVIGATION																																				
4.4.1.5.1 ONBOARD SOFTWARE ONORBIT DE																																				
CS										.2																										
CONT																																				
					(TBS BY FM8)																																	
TOT										.2																										
COMP																																				
4.4.1.5.2 MOC ASCENT/DESCENT																																				
CS	0																																			
CONT	0																																			
					(TBS BY FM8)																																	
TOT																																				
COMP	0																																			

Notes:

4.4 FLIGHT OPERATIONS SUPPORT	STS 2-4 RESOURCES
4.4.1 FLIGHT TECHNIQUES (CONCLUDED)	CY 1980 J F M A M J J A S O N D | CY 1981 J F M A M J J A S O N D | CY 1982 J F M A M J J A S O N D
4.4.1.5.3 MCC ORBIT	
CS	
CONTI	(TBS BY PHB)
TOT	
COMP	

Notes:

4.4 FLIGHT OPERATIONS SUPPORT 4.4.2 SIMULATION AND REALTIME	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.2.1 ASCENT/ABORTS																																				
4.4.2.1.1 ASCENT (INCLUDES DISPOSAL)																																				
CS												12																								
CONT													0																								
TOT												12																								
COMP																																				
4.4.2.1.2 ABORTS																																				
CS												.5																								
CONT												0																								
TOT												.5																								
COMP																																				
4.4.2.2 ONORBIT																																				
4.4.2.2.1 ATTITUDE AND POINTING																																				
CS				(TBS FM2)																																		
CONT																																				
TOT																																				
COMP																																				

Notes:

4.4 FLIGHT OPERATIONS SUPPORT 4.4.2 SIMULATION AND REALTIME (CONTINUED)		STS 2-4 RESOURCES																														
		CY 1980												CY 1981												CY 1982								
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.2.2.2 OMS MANEUVERS																																				
	CS																																			
	CONT																																			
							INCLUDED IN 4.4.1.1.1																															
	TOT																																			
	COMP																																			
4.4.2.2.3 RMS																																				
	CS																																			
	CONT																																			
		(NONE)																																			
	TOT																																			
	COMP																																			
4.4.2.2.4 PAYLOAD EJECTION																																				
	CS													0																							
	CONT													.1																							
	TOT													.1																							
	COMP																																			

Notes:

4.4 FLIGHT OPERATIONS SUPPORT	STS 2-4 RESOURCES																																	
4.4.2 SIMULATION AND REALTIME (CONTINUED)	CY 1980												CY 1981												CY 1982									
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.2.3 DESCENT																																				
4.4.2.3.1 DEORBIT																																				
CS													.4																							
CONT													0																							
TOT													.4																							
COMP																																				
4.4.2.3.2 ENTRY/LANDING/GRTLS																																				
CS									.25							1.25		.25			1.5		.25	1.25												
CONT													0																							
TOT									.25							1.25		.25			1.5		.25	1.25												
COMP													1.5			10	5				15		5	10												
4.4.2.4 CONSUMABLES MANAGEMENT																																				
4.4.2.4.1 NON-PROPULSIVE CONSUMABLES (INCLUDES TOTAL SYSTEMS CONFIGURATION MANAGEMENT)																																				
CS							.5							.8			.5		.8					.2												
CONT							2							2.3			2		2.3					.2												
TOT							2.5							3.1			2.5		3.1					.6												
COMP																																				

Notes:

4.4 PLIGHT OPERATIONS SUPPORT / 4.4.2 SIMULATION AND REALTIME (CONTINUED)		STS 2-4 RESOURCES																																	
		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.2.4.2 OMS/RCS CONSUMABLES																																			
	CS					(TBS BY FM2)																															
	CONT																																		
	TOT																																		
	COMP																																		
4.4.2.5 NAVIGATION																																			
4.4.2.5.1 ONBOARD SOFTWARE ONORBIT DEF	CS										.5																								
	CONT										.5																								
	TOT										1.0																								
	COMP																																		
4.4.2.5.2 MCC ASCENT/DESCENT																																			
	CS	2				(TBS BY FM8)																															
	CONT	0.9																																	
	TOT	2.9																																	
	COMP	6 hours/week (370) 0 hours/week (1108)																																	

Notes:

4.4 FLIGHT OPERATIONS SUPPORT 4.4.2 SIMULATION AND REALTIME (CONCLUDED)	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.2.5.3 MCC ONORBIT																																				
CS			(TBS BY FMB)																																	
CONT																																				
TOT																																				
COMP																																				

Notes:

4.4 FLIGHT OPERATIONS SUPPORT 4.4.3 SYSTEMS DESIGN SUPPORT	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.4.3.1 NON-PROPULSIVE CONSUMABLES																																				
CS					(TBS BY FM2)																																	
CONT																																				
TOT																																				
COMP																																				
4.4.3.2 ET DISPOSAL																																				
CS					(TBS BY FM#1)																																	
CONT																																				
TOT																																				
COMP																																				

Notes:

4.5 SIMULATION TOOL DEVELOPMENT	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.5.1 INTEGRATED DIVISION TOOLS																																				
4.5.1.1 SVDS																																				
CS	4.5												5.5					3.5						1.5													
CONT	18.5					20.5			25			23						28.5					22.5			15.5					10.5					
TOT	23					25			29.5			27.5						34					26			19					12					
COMP	124 hrs/mo					140			152			151						187					143			110					66					
						138																														
4.5.1.2 LTQS																																				
CS	0																																			
CONT	0												1																							
TOT	0												1																							
COMP													16 hr/mo																							
4.5.2 ASCENT/ABORTS																																				
4.5.2.1 ASCENT																																				
CS							1					2.5												1													
CONT						.5			1											.5																
TOT						.5	1.5		2			3.5								3				.5												
COMP																								1.5												

Notes:

4.5 SIMULATION TOOL DEVELOPMENT (CONTINUED)	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.5.2.2 ABORT																																				
CS		0																																		
CONT						.5			1											.5																
TOT						.5			1											.5																
COMP																																				
4.5.3 ONORBIT																																				
4.5.3.1 ATTITUDE AND POINTING																																				
CS			.1																																	
CONT	.1																																			
TOT	.1		.2												.1																					
COMP																																				
4.5.3.2 OMS MANEUVERS (INCLUDED IN 4.5.2.1 ASCENT)																																				
CS																																				
CONT																																				
TOT																																				
COMP																																				

Notes:

4.5 SIMULATION TOOL DEVELOPMENT (CONTINUED)	STS 2-4 RESOURCES																																	
	CY 1980												CY 1981												CY 1982										
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.5.3 OMORBIT (CONCLUDED)																																				
4.5.3.3 RMS																																				
CS	1																																			
CONT	1.5																																			
TOT	2.5																																			
COMP																																				
4.5.4 DESCENT																																				
4.5.4.1 DEORBIT (INCLUDED WITH 4.5.2.1 ASCENT)																																				
CS																																				
CONT																																				
TOT																																				
COMP																																				
4.5.4.2 ENTRY/LANDING/GRTLS																																				
CS	1		1.5	2	1.5	1		.5	1.5	1		.5		.5		1.5	1	.5																		
CONT	.5	1	2.5	1	2.5	2	3	1.5		2	3	1	3.5	2.5	.5	1	2.5	3	3.5	.5																
			11.5			3																														
TOT	1.5	2	4	2.5	3.5		4	2	3	3	4		1.5 3.5	2.5 1	1.5	4	4	4	.5	1	.5															
COMP			31/20	10/39	61/86		15/24	49/54		45/30	44/29		7/4		15																				

Notes:

4.5 SIMULATION TOOL DEVELOPMENT (CONTINUED)	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981												CY 1982											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.5.5 CONSUMABLES MANAGEMENT																																				
4.5.5.1 NON-PROPULSIVE CONSUMABLES																																				
CS						.2				.8	.3	.7						1.2		1.2																	
CONT[1]						1				2		4.1						.7		.7																	
TOT						1.2				2.8	2.3	4.8						4.8																			
																		5.3		5.3	4.8																
COMP																																				
4.5.5.2 OMS/RCS CONSUMABLES																																				
CS			10																																	
CONT			1.5																																	
TOT			1.5																																	
COMP																																				
4.5.6 NAVIGATION																																				
4.5.6.1 ONBOARD SOFTWARE																																				
CS				(TBS)																																
CONT																																				
TOT																																				
COMP																																				

Notes:

4.5 SIMULATION TOOL DEVELOPMENT (CONCLUDED)		STS 2-4 RESOURCES																																	
		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.5.6.2 MCC ASCENT/DESCENT																																					
	CS	11				(TBS)																															
	CONT	11																																			
	TOT	12																																			
	COMP	11	hour/week (1108)																																		
4.5.6.3 MCC ONORBIT																																					
	CS					(TBS)																															
	CONT																																				
	TOT	1																																			
	COMP	1																																			

Notes:

4.6 POSTFLIGHT		STS 2-A RESOURCES																																	
		CY 1980												CY 1981												CY 1982										
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.6.1 ANCILLARY																																			
4.6.1.1 ASCENT/DESCENT	CS	2.2																																	
	CONT	2																																	
	TOT	4.2																																	
	COMP																																		
4.6.1.2 ONORBIT	CS																																		
	CONT																																		
				(TBS BY FNG)																																	
	TOT																																		
	COMP																																		
4.6.2 ASCENT/ABORTS																																			
4.6.2.1 ASCENT																																			
	CS																																		
	CONT															2			1.5						1											
	TOT													.5		1.5	3		1.5	2.5	3	2.5	3		1										
	COMP													.5		1.5	3		7.5	2	3	3.5	8	3	3.5	8	1								

Notes:

4.6 POSTFLIGHT (CONTINUED)		STS 2-4 RESOURCES																																			
		CY 1980												CY 1981												CY 1982											
		J1	F1	M1	A1	M1	J1	J1	A1	S1	O1	N1	D1	J1	F1	M1	A1	M1	J1	J1	A1	S1	O1	N1	D1	J1	F1	M1	A1	M1	J1	J1	A1	S1	O1	N1	D1
4.6.2.2 ABORTS																																					
	CS																0																					
	CONT																1																					
	TOT																1																					
	COMP																																				
4.6.3 OMNIBIT																																					
4.6.3.1 ATTITUDE AND POINTING																																					
	CS																																				
	CONT																																				
	TOT					(TBS BY FH2)																																	
	COMP																																				
4.6.3.2 OMS MANEUVERS																																					
	CS																																				
	CONT																																				
	TOT					(INCLUDED IN 4.6.1 ASCENT)																																	
	COMP																																				

Notes:

4.6 POSTFLIGHT (CONTINUED)		STS 2-4 RESOURCES																																			
		CY 1980												CY 1981												CY 1982											
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.6.3.3 RMS (PLUS PLUME IMPINGEMENT)	CS																				.5																
	CONT										1.5				.2									1.2			.2										
	TOT										1.5				.2						.7			1.7			.7										
	COMP																																				
4.6.3 ONORBIT (CONCLUDED)																																					
4.6.3.4 PAYLOAD EJECTION																																					
	CS													10																								
	CONT													.1																								
	TOT													.1																								
	COMP																																				
4.6.4 DESCENT																																					
4.6.4.1 DEORBIT																																					
	CS																																				
	CONT					(TBS BY FY81)																																	
	TOT																																				
	COMP																																				

Notes:

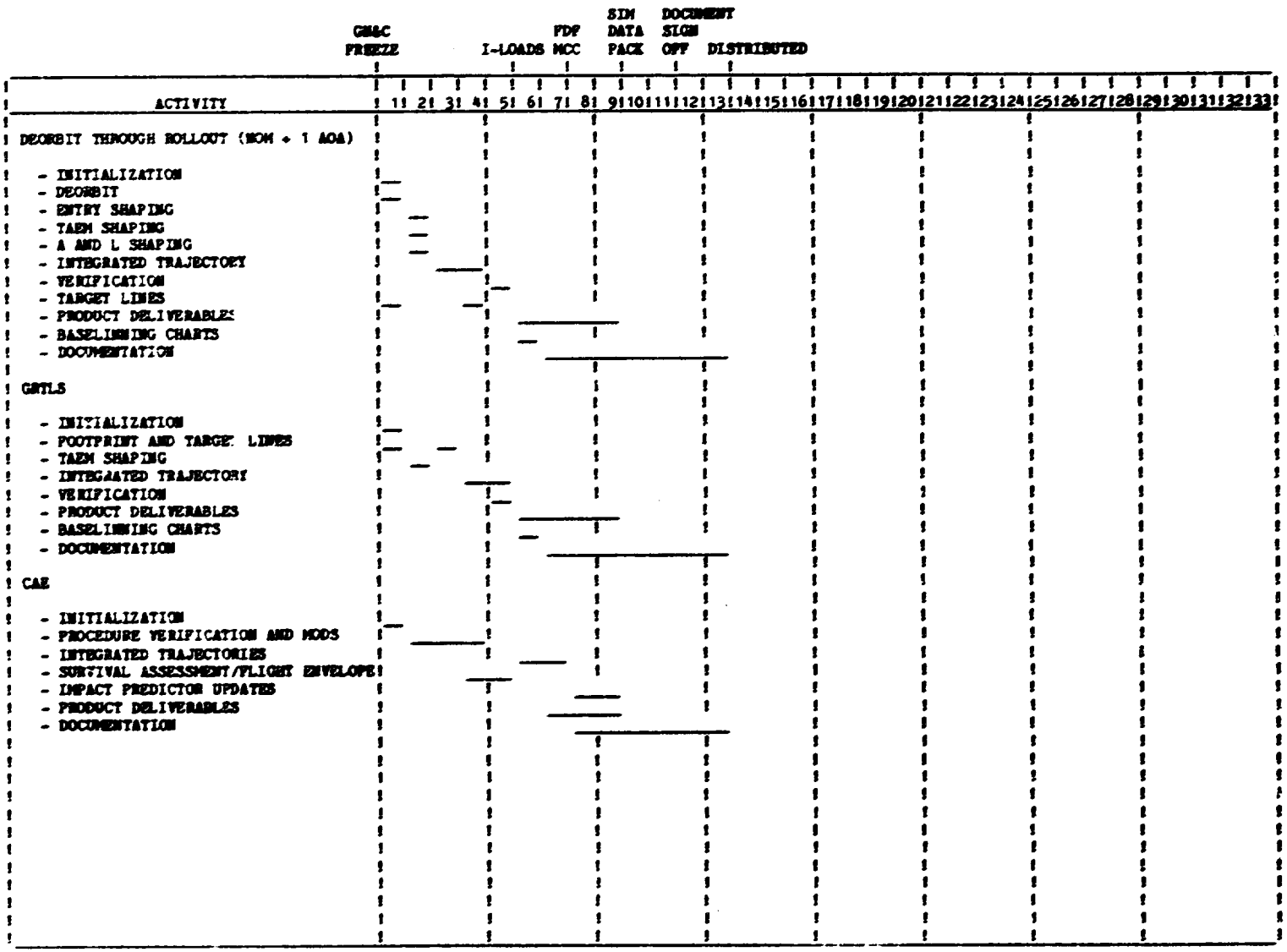
4.6 POSTFLIGHT (CONTINUED)	STS 2-4 RESOURCES																																			
	CY 1980												CY 1981																CY 1982								
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.6.4.2 ENTRY/LANDING/GRTLS																																				
CS																1					1			2	1											
CONT																1					1			2	1											
TOT																2					2			4	2											
COMP																15	10	5		1	15	10	5	10	5											
4.6.5 CONSUMABLES MANAGEMENT																																				
4.6.5.1 NON-PROPULSIVE CONSUMABLES																																				
CS																1.1					1.1			1.1												
CONT																3					3			3												
TOT																4.3					4.3			4.3												
COMP																																				
4.6.5.2 OMS/RCS CONSUMABLES																																				
CS																																				
CONT																																				
				(TBS BY FM2)																																		
TOT																																				
COMP																																				

Notes:

4.6 POSTFLIGHT (CONCLUDED)		STS 2-4 RESOURCES																																	
		CY 1980												CY 1981												CY 1982										
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
4.6.6 NAVIGATION (CONCLUDED)																																			
4.6.6.1 ONBOARD SOFTWARE																																			
	CS	NONE																																	
	CONTG	NONE																																	
	TOT	NONE																																	
	COMP	NONE																																	
4.6.6.2 MCC ASCENT/DESCENT																																			
	CS	NONE																																	
	CONTG	NONE																																	
	TOT	NONE																																	
	COMP	NONE																																	
4.6.6.3 MCC ONORBIT																																			
	CS	NONE																																	
	CONTG	NONE																																	
	TOT	NONE																																	
	COMP																																		

Notes:

TEMPLATE FOR DESCENT FLIGHT DESIGN NEAR TERM-MID

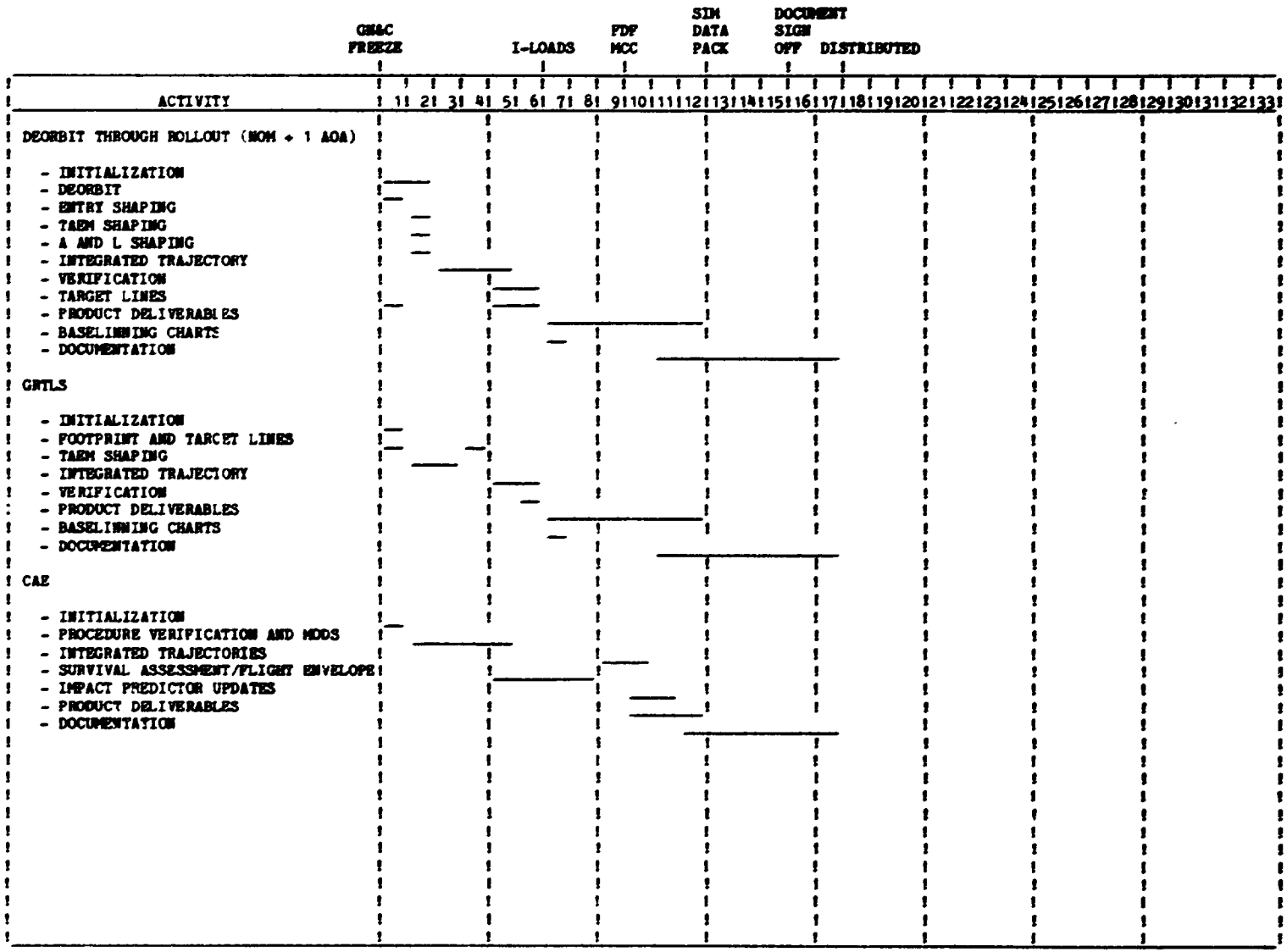


TEMPLATE FOR DESCENT FLIGHT DESIGN NEAR TERM-MIN

GN&C FREEZE; I-LOADS; FDF MCC; SIM DATA PACK; DOCUMENT SIGN OFF; DISTRIBUTED

ACTIVITY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
DEORBIT THROUGH ROLLOUT (NOM + 1 AOA)																																	
- INITIALIZATION																																	
- DEORBIT																																	
- ENTRY SHAPING																																	
- TAEM SHAPING																																	
- A AND L SHAPING																																	
- INTEGRATED TRAJECTORY																																	
- VERIFICATION																																	
- TARGET LINES																																	
- PRODUCT DELIVERABLES																																	
- BASELINING CHARTS																																	
- DOCUMENTATION																																	
GRTLS																																	
- INITIALIZATION																																	
- FOOTPRINT AND TARGET LINES																																	
- TAEM SHAPING																																	
- INTEGRATED TRAJECTORY																																	
- VERIFICATION																																	
- PRODUCT DELIVERABLES																																	
- BASELINING CHARTS																																	
- DOCUMENTATION																																	
CAE																																	
- INITIALIZATION																																	
- PROCEDURE VERIFICATION AND MODS																																	
- INTEGRATED TRAJECTORIES																																	
- SURVIVAL ASSESSMENT/FLIGHT ENVELOPE																																	
- IMPACT PREDICTOR UPDATES																																	
- PRODUCT DELIVERABLES																																	
- DOCUMENTATION																																	

TEMPLATE FOR DESCENT FLIGHT DESIGN NEAR TEMP-MAX



TEMPLATE FOR DESCENT FLIGHT DESIGN NEAR TERM-MAX

ACTIVITY	GN&C FREEZE	I-LOADS	FDF MCC	SIM DATA PACK	DOCUMENT SIGN OFF	DISTRIBUTED
	1 2 3 4	5 6 7 8	9 10 11	12 13 14	15 16	17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33
DEORBIT THROUGH ROLLOUT (NOM + 1 AOA)						
- INITIALIZATION						
- DEORBIT						
- ENTRY SHAPING						
- TAEM SHAPING						
- A AND L SHAPING						
- INTEGRATED TRAJECTORY						
- VERIFICATION						
- TARGET LINES						
- PRODUCT DELIVERABLES						
- BASELINING CHARTS						
- DOCUMENTATION						
GRTLS						
- INITIALIZATION						
- FOOTPRINT AND TARGET LINES						
- TAEM SHAPING						
- INTEGRATED TRAJECTORY						
- VERIFICATION						
- PRODUCT DELIVERABLES						
- BASELINING CHARTS						
- DOCUMENTATION						
CAE						
- INITIALIZATION						
- PROCEDURE VERIFICATION AND MODS						
- INTEGRATED TRAJECTORIES						
- SURVIVAL ASSESSMENT/FLIGHT ENVELOPE						
- IMPACT PREDICTOR UPDATES						
- PRODUCT DELIVERABLES						
- DOCUMENTATION						