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Year 2000 Plan for the ECS Project

Technical Paper

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Abstract

This technical paper presents the plan for ensuring that the ECS system is year 2000 compliant. It addresses issues related to Y2K compliance and ECS requirements, design, and test activities intended to support this goal.

Keywords: Y2K, Year 2000, requirements, IRD, RbR, Level 4, CSS Time Service, DCE Time Service, Rogue Wave, COTS

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1. Introduction

1.1 Purpose

This technical paper is a plan by which Year 2000 (Y2K) ECS system analysis and upgrades are to be accomplished, including the early development of Y2K Level 4 requirements. ECS Technical Direction Number 28, *Year 2000 Requirements*, and updates to the ECS Statement of Work in accordance with Contract Modification 82, directed ECS to develop and document this plan.

1.2 Organization

This paper is organized as follows:

Section 2.1 contains discussion regarding Y2K issues and describes ECS activities to address them. Section 2.2 summarizes a timeline for these activities.

1.3 Review and Approval

This technical Paper is an informal document approved at the Office Manager level. It does not require formal Government review or approval; however, it is submitted with the intent that review and comments will be forthcoming. Questions regarding technical information contained within this Paper should be addressed to the following ECS contacts:

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2. Y2K Plan

2.1 Y2K Problem

The Year 2000 (Y2K) problem stems from the programming practice of attempting to conserve computer resources (e.g., memory, disk space, screen area) by storing and processing year dates as non-absolute two digit fields. While this technique worked as long as all years in question began with the same two digits ("19xx"), as of the year 2000 it can become ambiguous as to which two digits will/should precede "xx" to form the desired four digit year - "19" to form "19xx" or "20" to form "20xx". Along with the obvious potential problem of dates mistakenly being interpreted as 100 years earlier than they should be, date comparisons between 19xx and 20xx may be in error when based only on the final two digits.

Although not directly related to the situation described above, another significant event that arises coincidentally in the year 2000 is the exercise of a relatively seldom-used part of the rule for identifying leap years. The rules for determining whether a given year is a leap year are:

1. If the year is evenly divisible by 4 it is a leap year, except for years ending in 00.
2. A year ending in 00 is a leap year if it is evenly divisible by 400.

The first part of the rule given above is the commonly understood definition of a leap year. But the much less frequently used second part of the rule is less commonly understood. This rule produces the result that although 1900 and 2100 are not leap years, 2000 is a leap year.

ECS has two conditions requiring Y2K compliance checks. The first is when the local on-site clock (e.g., GSFC, LaRC, etc.) transitions from year 1999 to year 2000. The second is when Universal Time Code (UTC) time tags of the received spacecraft information transitions year 1999 to year 2000. It is important to test that both transitions happen successfully. The first (on-site) transition has a single occurrence whose impact may be minimized by powering down the system at the time of the transition. The second (UTC) transition can occur multiple times (e.g., processing and then reprocessing data sets that span midnight on Dec 31, 1999 and processing queries that have temporal coverage that spans the Y2K transitions). Any system anomalies in handling the second transition must be found and corrected.

2.1.1 Requirements

ECS Level 4 requirements addressing various date issues that include Y2K (New Century and Leap Year) have been defined and baselined in the requirements database (RTM). Each CSMS/SDPS software CI/service and FOS have a requirement of the following form, where xxxx is the component:

> The xxxx shall ensure that the following calendar transitions are handled
> completely and accurately:
> a. New Year

b. New Decade
c. New Century
d. Leap Year.

Further analysis will be performed to determine whether other more specific requirements are necessary. Areas for special consideration are Graphical User Interface (GUI) inputs, Commercial-Off-The-Shelf (COTS) software interfaces, data migration, and external interfaces.

No COTS hardware-specific Y2K requirements have been or are expected to be included, nor are COTS software-specific Y2K requirements included. Both COTS hardware and software will be evaluated for procurement based on their ability to support the software CIs/services for which they are allocated. They will be tested as part of the component they support. Thus, these COTS products, including the operating systems of hardware platforms, will be tested for support of these requirements.

ECS Technical Direction Number 28, *"Year 2000 Requirements",* states that *"ECS shall include the Y2K requirements in all external interfaces, as appropriate."* Under the assumption that ECS External Interfaces were thought to be Y2K compliant and after considering the resources required to coordinate and update each of approximately 30 ECS IRD documents, the ECS Chief Engineer (Raytheon) and the ECS COTR (ESDIS) verbally agreed that, instead of generating external interface requirements, an audit of these interfaces was more appropriate at this time. Therefore, ECS conducted an extensive audit of its external interfaces to verify Y2K compliance. This audit began with IRD and ICD reviews. Further investigative discussions were held with external organization representatives where review revealed potential problems. A Technical Paper (212-TP-001-001) documenting the results of the audit has been published and is available on the EDHS Server (http://edhs1.gsfc.nasa.gov). Currently, there are a small number of open action items resulting from the audit. Open resolution issues will be completed by 20 December 1998.

2.1.2 Design

The ECS Communications Subsystem (CSS) Time Service provides a common set of time access services. These services provide centralized control for time retrieval, comparison, and calculation methods in support of all ECS custom software. No ECS custom software will use any other time methods, except for the Rogue Wave Time widget, which handles date/time entry. This directive is enforced during design and code review activities.

All ECS designed user GUIs require year parameters to be submitted for processing as four digits. Web based user and operator GUIs require year information to be entered by users as four digits. X/Motif GUIs require either four digit years to be entered or, if using the Rogue Wave object RWTime, allow two digits to be entered with Rogue Wave automatically adding the prefix "19". Although it is unclear when the Rogue Wave libraries will be updated to add the prefix "20" for user interoperability in the next century, whatever prefix Rogue Wave adds to the year is apparent to the user on the screen before the parameter is submitted for processing. If it is incorrect, the user can enter the full four-digit year.

All ECS external interface dates used for time reference are currently defined to include four digit years which will avoid any Y2K rollover confusion. There are a limited number of instances where two digit years are embedded in file names, but no time calculations are performed by ECS based upon these filenames. This is documented in the ICDs and will continue to be the standard for future ICDs.

2.1.3 COTS

2.1.3.1 COTS Software

ECS is heavily dependent on the integration of COTS, both hardware and software. As part of the procurement process, COTS Y2K compliance is a major evaluation and selection criterion. Further, ECS obtains written assurances from vendors that their products are or will be Y2K compliant.

The three Unix vendors (Sun, Hewlett Packard, and SGI) currently part of the ECS baseline architecture will have operating systems or patches available for Y2K compliance. HP has had updates available for HP-UX 10.01, 10.10, and 10.20 since February 1997. A Y2K compliant upgrade for Sun Solaris 2.5.1 has been available since December 1997. SunOS 5.5 (also in the baseline configuration) is not currently scheduled for compliance. It may need to be phased out of the baseline before the year 2000. SGI's IRIX 6.5, scheduled for release in mid-to-late 1998, will be Y2K compliant. SGI is committed to making IRIX 5.3, 6.2, and 6.3 Y2K compliant as well. The current baseline is IRIX 6.2. The upgrade path for Y2K compliance for these hardware platforms is clear.

Most modern COTS appear to have adopted four-digit year formats, thus avoiding typical Y2K rollover problems. But, if any are identified as non-Y2K compliant, a clear upgrade path to a Y2K compliant version of that COTS product, or a different Y2K compliant COTS product, will be identified. This upgrade must occur at or before the last ECS release before the year 2000.

In actuality, many COTS products only support date/times through the year 2037. This is typically a hardware limitation stemming from the use of 32 bit words. This problem will resolve itself as computing platforms migrate to 64 bit word hardware architectures over the next few years.

ECS has conducted extensive surveys of the COTS software vendors regarding Y2K compliance for the software products. With the exception of two products, all commercial software products integrated into the ECS solution are currently shipping product versions that are advertised as meeting Year 2000 compliance criteria. The exceptions are the AMASS product and HP Multi-threaded debugger. ECS procures maintenance support for the COTS software products that include version upgrades and patches. Therefore, no additional COTS software product cost is anticipated. Appendix A lists all COTS software products, current version in use by ECS, and the Y2K-compliant version.

The Systems Engineering Department conducts a weekly Change Control Board (CCB) devoted strictly to changes with respect to COTS software within the ECS project. This CCB monitors and approves the progress of COTS installations, upgrades, and rollout through the ECS system.

In addition, the COTS CCB works closely with Development to ensure that plans and schedules are developed and adhered to with respect to the ECS program. The CCB also monitors the ability of COTS package versions to meet internal ECS program requirements, as well as any other external requirement.

One of the most visible internal as well as external requirements that the COTS CCB is currently tracking is the Version upgrades of COTS packages in the ECS program such that the Year 2000 (Y2K) problem is resolved in time for the Year 2000. This monitoring is active, and a game plan is in place to make sure that all COTS software is Y2K compliant.

2.1.3.2 COTS Hardware

ECS has also surveyed project hardware vendors regarding Year 2000 compliance. With the exceptions noted below, all of the vendors indicated that compliant versions of the product are currently available at no additional cost to ECS when covered by the appropriate maintenance support contracts.

- Cisco Systems FDDI network interface adapter cards for HP workstations. This product is no longer manufactured by the vendor and there are no vendor plans for Year 2000 test or certification. No upgrades or enhancements are available from the vendor. ECS has purchased 30 each and will procure replacements.
- Network General *Sniffer* LAN protocol analyzer. ECS has procured 8 each. The Network General product is integrated into a portable unit that is the non-compliance component. ECS will procure replacements.

2.1.4. SDPS/CSMS Custom Code Assessment

The SDPS/CSMS software baseline consists of custom code developed in C, C++, Fortran, and Java. Additionally, the baseline consists of a large number of scripts developed for the purpose of configuration control, setup, and monitoring. In order to comply with Y2K Requirements as previously discussed, the following software development roadmap is proposed:

1. Plan the assessment (detection) and resolution/test (correction),
2. Assess using the DISCOVER Tool (C/C++),
3. Assess the Fortran, Java, and script baseline,
4. Resolve identified problems and deliver the updated Custom Software baseline to Development Integration,
5. Formally Integrate and regression test prior to turnover to the System Verification and Test Organization, and
6. Work-off NCRs.

For the purposes of this plan, all of the areas listed above will be addressed, however only areas 1, 2, and 3 are considered as cost impacts. The remaining areas are addressed for completeness and understanding, but are considered in scope. It is importance to note the assumption that all Y2K Development-related activities will be completed in accordance with the currently baselined ECS Drop 5A schedule. All efforts will be completed in accordance with current processes required for baseline delivery to the System Verification and Test Organization.

2.1.4.1 Planning Activities

The Development Organization will support the overall ECS Y2K efforts via inputs to an overall Y2K Verification Plan. Development will define the software baseline inventory, and identify established methods for systematic assessment for C, C++, Fortran, Java, and Scripts. Actual assessment (and resolution) activities will be in accordance with the Drop 5A schedule. Because of this schedule constraint, Development will identify support above and beyond currently scheduled activities. In addition, Development will interact with the System Verification and Test Organization to ensure that complete regression testing is performed against current functionality, while identifying Y2K-specific tests which must be developed and performed in accordance with the Drop 5A schedule.

2.1.4.2 Assessment using the DISCOVER Tool (C/C++)

The *Software Emancipation Technology's* DISCOVER Tool has been chosen because of its proven track record and recognized strength in identifying specific code errors, impact analysis, and providing a code migration tool. An add-on module has been selected which specifically addresses Y2K problems by providing advanced search and assessment reporting functionality. In addition, the services of an established Y2K consulting firm (*proServices, Inc.*) will be retained to provide certified Y2K guidance for the overall assessment effort, in the DISCOVER context.

The DISCOVER Tool operates using a model of the actual custom code baseline. Once this model is successfully generated based upon the ECS Software baseline, it will be provided to *proServices,* who will provide preliminary and detailed assessments of the custom code (C/C++) baseline. These assessments will identify potential Y2K problem areas that require further investigation. In addition to scheduled assessment reports, *proServices* will provide scheduled management briefings. At the completion of its activity, *proServices* will provide a detailed Y2K Development Plan that will document the complete results of the detailed assessment of the baseline, and will provide specific guidance concerning resolution and testing of the necessary modifications to insure Y2K compliance.

2.1.4.3 Assessment for the Fortran, Java, and Script Baseline

The DISCOVER Tool mentioned above does not currently operate against custom code produced using Fortran, Java, or Scripting Languages. Accordingly, alternative assessment activities are required for non-C/C++ custom code. In order to minimize impacts to the Drop 5A delivery schedule, State College Operations, a separate division of Raytheon Services Company, will provide a plan for assessment activities against the non-C/C++ custom code baseline using the assessment reports provided by *proServices*. State College Operations already supports the ECS Program through an established remote engineering environment. In addition to direct network connectivity, State College Operations has access to ClearCase, DISCOVER, and all necessary development environment tools. In addition to recommended code modifications, State College will provide inputs to the Development Integration Plan for Drop 5A using the Impact Analysis Feature of Discover.

2.1.4.4 Delivery of the Updated Software Baseline to Development Integration

Once all custom code proposed modifications have been approved by ECS Development, Raytheon-State College will make the necessary code modifications, adhering to the standard NCR and Merge Processes defined for ECS. Prior to delivery to ECS Development Integration, applicable unit testing will be performed to isolate and resolve problems as early as possible, so corrections can be quickly and accurately resolved. When code is ready for delivery, the applicable test scenarios will be identified and delivered along with the necessary code modifications.

2.1.4.5 Formal Development Integration Activities

Y2K modifications, identified and resolved as part of the assessment activity, will result in merges to the ECS Drop 5A Custom code baseline. Drop 5A will have an established set of integration activities which will include new capability integration, the check-out of NCR fixes, and modifications resulting from the Y2K modifications discussed above. The integration activities will be enhanced to include specific scenarios, which address the various defined permutations of the Y2K problem. The Development Organization will interact closely with the System Verification and Test Organization to identify the test environment necessary to test the Y2K functional capability. This may include recommendations for equipment strings and a test methodology that augments core integration scenarios. The development Organization will perform informal dry runs of Y2K SVAT scenarios, which will place additional demands on currently scheduled Drop 5a integration activities. A trade-off will be performed which matches overall Drop 5a schedule constraint against risk-reduction activities relating to Y2K scenarios. The goal is to assure that the current Drop 5a SVAT test schedule is minimally impacted, while reducing system risk due to Y2K functionality. Once all scenarios have been successfully demonstrated, the ECS Custom Code baseline will be delivered to the Test organization, in accordance with established procedures for delivering a drop. Development will support formal System Verification and Test Activities, using established processes, such as the Patch IPT.

2.1.4.6 NCR Work-off

NCR activity resulting from the Y2K Compliance activity described here will be handled via established ECS Processes. NCR fixes identified during Integration or subsequent SVAT activities will be handled via approved merges and patches to the baseline, as directed by the Patch IPT, and upon direction from System Verification and Test.

2.1.5 SDPS/CSMS System Verification and Test

The ECS Y2K validation process includes activities required to develop test plans and procedures; conduct subsystem and end-to-end testing; document the results of testing; and certify that ECS is Y2K compliant. This section provides a road map by which the ECS Program will accomplish Y2K assessment.

2.1.5.1 ECS Y2K Verification Roadmap

The ECS Y2K verification will be applied to two general elements of the ECS: Those provided by COTs products and the custom code that instantiates functionally provided by ECS.

ECS COTS products Y2K compliance shall be accomplished by conducting an inventory all the COTs products used in the ECS, contacting the vendors and obtaining written certification from each that their COTS package is compliant. In the event that a vendor does not certify his COTS product Y2K compliant, special arrangements will be made concerning its disposition and use. COTS certification was addressed in section 2.1.3.

Assessment of ECS custom code will be performed at two levels: the functional or subsystem level and the overall system level. Functional testing techniques ensure the system and end user requirements and specifications are met at the subsystem level. These tests focus on the results of processing instead of how processing is implemented. System level tests ensure the ECS performs in accordance to requirements from a user standpoint at the overall ECS system level.

Functional level testing will make use of the existing System Verification Test procedures wherever possible. System level testing will also make use of modified or new Acceptance Test procedures wherever possible.

There will be the need to modify existing SV and AT test procedures and, in many cases, write new SV and AT test procedures.

2.1.5.2 Y2K Test Scenarios

Assessment testing is expected to be a significant effort in Y2K. After all of the requirements analysis, design and code reviews, and vendor reassurances are accomplished, it still remains to verify that the ECS system is Y2K compliant by actually testing the entire ECS with simulated dates and times. These simulated time frames will cover at least three general simulation cases:

Approximately 20 Scenarios will be generated at the subsystem level and at system level to cover the following tests listed below:

1) Operations during 1999 which

   - Prepare projections of activities that will occur in 2000 (production plans, resource schedules, etc.)
   - Roll-over operationally at midnight of December 31, 1999 and go into 2000 (data ingest, production, distribution, activity logs, etc.

2) Operations that test the leap year condition of 2000 by beginning before:

   - Midnight of Feb. 28, 2000 and going into Feb. 29, 2000
   - Midnight of Feb. 29, 2000 and going into March 2000

- Operations during 2001 or some non 2000 year in the 21st century to include pre-year 2000 date use (e.g., search and order for 1999 data)
- Julian Day Roll-over - 2000 - Day 365 to Day 366
- Julian Day Roll-over New Year - 2000 Day 365 to 2001 Day 001
- Arithmetic operation recognize Year 2000 has 366 days
- Ensure that system properly process data going over leap year for ingest of EDOS, Aster and Landsat data.

3) Other test cases
   - Both metadata and data generated in 2000 are properly time-tagged
   - Messages and any other data items generated in 2000 are properly time-tagged
   - Production and resource plans that span midnight of December 31, 1999 have properly time-tagged the events in the plan
   - Queries performed in 2000 obtain the correct results when the query parameters span 1999 and 2000
   - Subscriptions submitted in and/or beginning in 1999 still apply and are satisfied in 2000
   - Production Requests and their corresponding PGE information which are entered in 1999 will continue to generate Data Processing Requests without requiring changes in this information in 2000.
   - Reprocessing Test using data that spans over 2000.
4) Date & Time Stamps
   - Part of the processing associated with dates deals with transactions between two systems that normally utilize "data/time stamped " information. Its essential that both the sending and receiving systems use a common time reference
5) Data Migration
   - Ensures that Date Migration efforts result in ECS metadata that is Y2K compliant
6) Graphical User Interface (GUI) Testing
   - Test that all system GUIs will correctly accept various 20th and 21st century dates
   - Ensure that 20th century data is accessible when the system clocks are set to the 21st century

7) Business dates for planning/scheduling

- Fiscal Year Roll-over (9/30/1999 to 10/01/1999 to assure that the fiscal year changes to 2000)
- Quarterly Dates
- Year-End Dates

8) System Level Tests

- Acceptance Tests - testing the entire information system, including simulted interfaces
- End-to-End Tests - verifies that a defined set of interrelated systems, which collectively support a key mission or business function or thread, inter-operate as intended in an operational environment.

9) Operations during 2001 or some non-2000 year year in the 21st century to include pre-year 2000 data use (e.g., search and order for 1999 data)

2.1.5.3 Test Methodology

A detailed test plan will be available on 30 September 30, 1998. This plan will provide a full description of how ECS plans to perform Y2K testing. It shall include a description of the test procedures that will be used, define the manner in which tests are conducted, and describe the controlled environment in which the tests will be performed.

Y2K testing and assessment culminates with the formal execution of the test procedures before appropriate witnesses. Mandatory witnesses include representatives of the Quality Office, ECS project management, and ESDIS integration office. As always, the authority to witness may be delegated or waived on a case-by-case basis.

The testing of the local time Y2K transition (by computer time shifting) will be performed in the VATC. This testing is not planned to be performed at the DAACs. Instead, the COTS and custom code installed at the DAACs will be audited to ensure and is consistent with the system versions (COTS & custom) that was tested for Y2K compliance in the VATC. The capability of ingesting, processing and archiving science data that transitions over the critical Y2K time periods will be regression tested at the DAACs in a mode separate from operations. Access to this data will also be demonstrated at the DAACs.

2.1.5.4 Toolkit

Toolkit will also be impacted and drivers will have to be modified and test cases written.

2.1.6 Science Data Engineering

The ECS Science Office is currently responsible for providing SSI&T support to the DAACs and the Instrument Teams, plus development of the Earth Science Data Types (ESDTs. As part of this support they work with the Instrument Teams to help insure their PGEs work with the ECS system. The Science Office also performs pre-SSI&T on many of the PGEs, analyzing them before formal SSI&T. This analysis helps both the DAACs and the Instrument Teams to resolve problems before formal delivery of their PGEs.

2.1.6.1 SSI&T Y2K Effort

ECS assumes NASA will require the Instrument Teams to make their PGE software Y2K compliant in accordance with the same schedules applied to ECS. Accordingly, it is expected that the Science Office will be required to support the Instrument Teams and DAACs in their efforts. The Science Office will act as consultants for ECS-related questions and issues. The Science Office will also perform pre-SSI&T and regression testing on any PGE that requires modification.

2.1.6.2 Y2K Testing

Science Office's scope will be extended to assist the Test team in the preparation of test scenarios, test data, and test execution for Drop 5a. This additional scope will be needed to analyze changes made by the Instrument Teams.

2.1.7 FOS Software Development, Integration, and Test

The EOSDIS Core System Project (ECS) Flight Operations Segment (FOS) system has been designed, developed, and tested in an era of Y2K awareness. We have Y2K specific level 4 requirements, and we have performed (and passed) specific Y2K tests. Analysis for Y2K of FOS system was performed during the Release B timeframe. In particular, the approach for verifying Y2K for FOS will be oriented towards updating the test procedures, and ensuring that a comprehensive verification process is performed. The enhanced set of plans and procedures will be developed in accordance with "*NASA Year 2000 Agency Test and Certification Guidelines and Requirements*". The verification process will include test reporting on the details of the Y2K testing that is performed in addition to the requisite updates to the test procedures. This effort is not a complete system test, it is merely a regression test specifically designed to verify that the entire FOS system is Y2K compliant.

The FOS Y2K testing occurred during the Release B formal tests in summer of 1997. At that time, we ran a test (ETE-2050B – "Year 2000") which was specifically designed to address this issue. The testing consisted of setting the system time for Y2K, and verifying the software performed correctly. In particular, this testing addressed functionality for event history reports, real-time telemetry processing and display, and analysis requests created, and execution of command proceduresThe FOS Acceptance Test Report for Release B: Earth Observing System (EOS) Operations Center (EOC) was delivered to NASA October 1997.

2.1.7.1 FOS Y2K Test Scenarios

The FOS test program will be enhanced in response to the new NASA guidelines. We will develop specific test cases focusing on verifying Y2K and the leap year in Y2K. In particular:

1) Operations during 1999 which

- Prepare projections of activities that will occur in 2000 (scheduling activities on the mission timeline, execution of analysis requests, etc.).
- Roll-over operationally at midnight of Dec. 31, 1999 and go into 2000 (ingest of Flight Dynamic products, ingest of ASTER One Day Schedule, etc).

2) Leap Year Testing

- 2000 is a leap year, therefore, it will be necessary to test that all data processing properly indicates the presence of Feb. 29, 2000
- Julian Day Roll-over - 2000 - Day 365 to Day 366
- Julian Day Roll-over New Year - 2000 Day 365 to 2001 Day 001
- Arithmetic operation recognize Year 2000 has 366 days

3) Other test cases to verify transitions from December 31, 1999 to January 1, 2000 and time transitions for leap year.

- Ingest, validate, and schedule orbital events for planning aids from Flight Dynamics.
- Ingest and process ASTER One-Day Schedule.
- Build spacecraft loads.
- Schedule activities on the mission timeline.
- Monitor spacecraft housekeeping telemetry and User Performance Data from NCC.
- Produce analysis datasets and plot the telemetry parameters for time.
- Produce event history reports for time transitions.

4) Date & Time Stamps

- Part of the processing associated with dates deals with transactions between two systems normally utilizes “data/time stamped “ information. Its essential that both the sending and receiving systems use a common time reference

5) User Interface Testing

- Test that all system GUIs will correctly accept various 20th and 21st century dates
- Ensure that 20th century data is accessible when the system clocks are set to the 21st century

2.1.8 Configuration Management and Performance Assurance

Current ECS Configuration Management (CM) and quality assurance (QA) processes will be applied to the Y2K tasks. Since the approach being taken assumes that Y2K compliance will be incorporated into the scheduled Drop 5A release, there would be a minimal impact on Software CM activities due to changes in the custom code. Software CM and QA activities to support the custom code in Drop 5A have already been scheduled. Additional changes to the custom code in Drop 5A to incorporate Y2K would not change the current estimated level of support necessary by CM unless additional parallel activities were necessary.

There will a minor impact to CM in the updating of COTS software and their subsequent deployment. This impact will be in the generation of the necessary release documentation for each of the COTS products, in administration of Y2K CCRs and, in performing updates to the current baseline documents. Part of this effort would have occurred as part of normal COTs upgrades; however, it has been assumed that 50% of the COTs that will be upgraded are due solely to Y2K releases. As part of this effort, release documentation and CCR/NCR tracking systems will be updated to specifically reflect Y2K compliance/changes.

Lastly, as part of the CM audit process, CM will support the Y2K assessment process by maintaining and reporting the Y2K assessment status.

Overall Configuration Management specific tasks are:

1. Modify DDTS to allow Y2K “binning”.
2. Modify CCR form and CDMTS system to include Y2K impacts
3. Prepare/Update Release documentation in support of Y2K specific patch releases.
4. Add Y2K compliance as an element in baseline status accounting documentation.
5. Support the Y2K compliance demonstration process by maintaining assessment records and supporting audits.

2.1.9 Data Migration

ECS will insure that Data Migration efforts result in ECS metadata and non-native format data that is Y2K compliant. But Y2K compliance of data migrated in its native format remains the responsibility of the data source. ECS will not change native data migrated into the ECS archive. This was stated in the clarification included in the acknowledgment by Hughes of ECS Technical Direction No. 28:

“... Hughes can not ensure that data that is part of the V0 Data Migration effort is interoperable if a DAAC directs us to store it in its native format. Some native V0 data (HDF and other formats) have embedded 2 digit times in their data fields. It is a DAAC decision as to whether the native time data should be changed to 4 digit times. If the data are changed, the DAAC would have to update any read software. This would result in impact to V0 data migration (alter and validate data) and impact to the DAAC (modify any software that reads the native data). Packed binary files and other data structures may not have room to add 2 more digits.

Additionally, anytime we change the internal data or file structures, we would have to apply full validation to make sure we have preserved the integrity of the data."

2.2 Y2K Plan Summary

The activities in support of ECS Y2K compliance are identified in the table below. Their projected timelines for completion are included.

Table 2-1. Y2K Plan Summary

Activity	Timeline	Description
L4 Requirements Analysis	Initial set of L4s already defined	Determine whether new L4 requirements are necessary
External Interface Analysis	Analysis complete. Resolve open actions by 20 December 1998	Audit each external interface for Y2K compliance
Design	Design and code reviews IAW Drop 5A schedule	Y2K check-off item in reviews
COTS Procurement	All current and future COTS procurements	Y2K COTS procurement criteria
Implementation	SDPS/CSMS – 31 Mar 1999 FOS – 31 Mar 1999	Integrated and installed in VATC FOS 2.4 installed in mini-EOC
Test	In accordance with Y2K Test Plan (30 September 1998)	Establish test cases to simulate year 2000 rollover and operations
DAAC Availability	SDPS/CSMS - IAW Drop 5A Schedule	Drop available at SMC
EOC Availability	30 April 1999	Y2K compliant system at mini-EOC
IST Availability	31 May 1999	Drop available at ISTs
Data Migration	As each data set is migrated	Extracting Metadata compliant with Y2K for the migrated data

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Appendix A. COTS Software Product Versions

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
Operating System	Solaris	Sun	2.5.1	2.5.1 requires patches or 2.6
	HP-UX	HP (Excepts K420s)	10.01	10.20
		HP (K420s)	10.10	10.20
		HP (VATC only)	10.20	X
	Digital UNIX	DEC	4.0.c	4.0.d
	IRIX	SGI	6.2	6.2 & 6.4 requires patches or 6.5
	AIX	IBM	4.0	4.3
		IBM	4.2	4.3
	OS/2 Warp	EMASS	V3	V3 requires patches
	Windows	Microsoft	Win95/Plus	X
RDBMS	Sybase SQL Server (HP/SUN)	Sybase	11.0.2.2	11.0.3.2
	Sybase SQL Server(SGI)	Sybase	11.0.2.1	11.0.3.2
	Replication Server	Sybase	11.0.3 except sql & bcp are 10.0.4	X
	Open Client/C (HP/Sun)	Sybase	11.1.0	11.1.1
	Open Client/C (SGI)	Sybase	10.0.3	11.1.1
	Open Client/C (PC)	Sybase	10.0.3/pre-release 11.1.1	11.1.1
	SQL Monitor	Sybase	11.0.1	11.1.1
	ESSM	Sybase	11.0.1	11.1.1
	ODBC Drivers	Intersolv	1.12	X
	Spatial Query Server (SQS)	Autometrics	2.2.2 Version 29-1A	Compliant w/appropriate Sybase version
	DB Artisan	Embarcadero	4.0	X
Development Suite	Visual Workshop	Sun	1.1	X
	SoftBench for C++	HP	5.0.3	X
	ProDev Workshop	SGI	2.6.2	X
C++ Compilers	C++ (SparCompiler)	Sun	4.1	X
	C++ (Cpp)	HP	10.01	X
	C++ (Cpp)	DEC	5.10	X

* X indicates installed version is Y2K compliant

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
	C ++ (Cpp)	SGI	7.2 on Science Proc., 7.1 elsewhere	X
C Compilers	C (SPARC Compiler)	Sun	4.0	X
	C (ANSI & K&R)	HP	10.24	X
	C (K&R only)	HP	10.01	X
	C (KAI)	KAI	3.0b	X
	C Compiler	DEC	5.2	X
	C Compiler	SGI	7.2 on Science Proc, 7.1 elsewhere	X
	C Compiler	IBM	3.1.4	X
FORTRAN 77 Compilers	FORTRAN Compiler	Sun	4.0	X
		HP	10.24	X
		DEC	5.2	X
		IBM	3.2.5	X
		SGI	7.2 on science Proc., 7.1 elsewhere	X
Java Development Kit Compiler	JDK	Sun	1.1.5	X
Java Runtime Environment	jre	Sun	1.1.5	X
FORTRAN 90 Compilers	NAG90	NAG	2.2	NAG Fortran 95 release1.0 is Compliant
	FORTRAN Compiler	SGI	7.2 on Science proc., 7.1 elsewhere	X
		NAG	2.2	NAG Fortran 95 release1.0 is Compliant
FORTRAN Checker	FORCHECK		12.3	X
ADA Compilers	SPARCompiler Ada	Sun	2.0	X
	Ada 95 Compiler	SGI	1.2	X
Multithreaded Debugger	DDE debugger	HP	4.0	Awaiting vendor response
	ladebug	DEC	4.0-7	4.0d
GUI Development	BuilderXcessory	ICS	3.5.1	4.0
	XVT		4.58	X
	Epak/GraphPak	ICS	2.5	3.0

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
	ArcInfo	ESRI	7.1	X
Runtime Window Manager	OSF/Motif	DEC	1.2.4	X
		IBM	1.2.5	X
		Sun	1.2.5	X
Common Desktop Environment	HP Vue	HP	10.01	X
	CDE (Vue)	HP	10.10	X
		HP	10.20	X
	CDE	Sun	1.0.2	X
Shared Libraries	Tools.h++	Rogue Wave	7.0.2	7.0.2 requires patches
	Tools.h++ Pro	Rogue Wave	7.0.2	7.0.2 requires patches
	DBTools.h++	Rogue Wave	2.1.1	2.1.3
	Net.h++	Rogue Wave	7.0.2	7.0.2 requires patches
	IMSL Libraries	Visual Numerics	2	3.0.1
High Fidelity Memory Leak Detector	Purify	Rational	4	X
	Insure++	Parasoft	3.0.1	X
Code Coverage Analysis	PureCoverage	Rational	4.01	X
	Insure++	Parasoft	3.0.1	X
	Battlemap Analysis Tool (BAT)	McCabe & Associates	5.0	X
Configuration Management	ClearCase	Rational	3.1.1	X
	ClearCase DDTS Integration	Rational	3.2.1	X
	XRP II	HTG	3.0	X
	ACCELL	IDS	2.0.7.2.0	X
	Physical Network Manager	Accugraph	3.0	X
Distributed Defect Tracking System	DDTS	Rational	3.2.1	4.1
Testing Software	Xrunner	Mercury Interactive	4.01	X

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
	LoadRunner	Mercury Interactive	4.0	X
DCE	OODCE	HP	1.4	X
	DCE - Server	Transarc	1.1	X
	DCE - Client	Transarc	1.1	X
		DEC	2.0A	X
		HP	1.4.2	X
		IBM	2.0	X
		SGI	1.16	X
	DCE - Distributed File System (DFS) Server/Client	Transarc	1.1	X
		HP	1.4	X
	DCE App. Develop. Tool Kit	Transarc	1.1	X
		DEC	2.0A	X
		HP	1.4.2	X
		IBM	2.0	X
		SGI	1.16	X
	DCE Cell Manager CDS Browser	Chisholm Technology	1.6.2	X
ER Based Database Modeling Tool	PowerDesignor - Data Architect	PowerSoft	5.1	X
	PowerDesignor - Process Analyst	PowerSoft	5.1	X
	Power Designor - MetaWorks	PowerSoft	5.1	X
Hypertext Access Server	Netscape Enterprise Server	Netscape	2.02a	X
Internet Browser	Netscape Browser	Netscape	3.0.x, 3.01	X
SNMP Agent	Optima SNMP Toolkit	BMC Software	1.7	X
Help Desk Software	Action Request System	Remedy	2.1.3	3.0
Processing COTS	AutoSys	Platinum	3.37	3.42
	AutoSys Xpert	Platinum	3.37	3.42
	AutoSys Remote Agent	Platinum	3.37	3.42

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
Document Generation	WABI	Sun	2.2	X
		Sun	2.2	X
	WABI's Microsoft Office Professional (Word 7.0)	Microsoft	4.2	X
	Microsoft Office Pro- fessional (Access)	Microsoft	7.0 (MS Windows95)	X
Editing and Viewing Software	Adobe Acrobat Distiller	Adobe	2.0	X
	Adobe Acrobat Reader	Adobe	3.0	X
	IDL	RSI	4.0.1 with patch 4.0.1b	X
On-Line Documentation Viewer	AnswerBook	Sun	2.5.1	X
	HP Laserom	HP	10.01	X
	Insight	SGI	6.2	X
Network Management	HP OpenView	HP	4.1	5.0 with patches or 5.01
Tivoli Server	Tivoli Mangmt Platform (framework)	Tivoli	3.0 Rev C	X
	Tivoli Mangmt Platform framework) Service Pack 1	Tivoli	3.0.1 Rev A	X
	Tivoli Sentry	Tivoli	3 Rev A	X
	Tivoli Courier	Tivoli	3.0 Rev B	X
	Tivoli Admin	Tivoli	3.0 Rev D	X
	Tivoli Enterprise Console (T/EC)	Tivoli	2.6 Rev B	X
	T/EC RDMBS Support	Tivoli	2.6 Rev B	X
	T/EC OpenView Adapter	Tivoli	2.6 Rev B	X
	T/EC Logfile Format Editor	Tivoli	2.6 Rev B	X
	T/EC Rulebuilder	Tivoli	2.6 Rev B	X
	T/EC Logfile Adapter	Tivoli	2.6 Rev B	X
	T/EC SNMP Adapter	Tivoli	2.6 Rev B	X
	T/EC Adapter Config- uration Facility (ACF)	Tivoli	2.6 Rev B (Dev only)	X
	T/EC Event Integration Facility (EIF)	Tivoli	2.6 Rev B (Dev only)	X

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
	Tivoli Application Extension Facility (AEF)	Tivoli	3.0 Rev B (Dev only)	X
Tivoli Clients	Tivoli Management Platform (framework)	Tivoli	3.0 Rev C	X
		Tivoli	3.0 Rev E	X
	Tivoli Management Platform (framework) Service Pack 1	Tivoli	3.0.1 Rev A	X
		Tivoli	3.0 Rev E	X
	Tivoli Sentry	Tivoli	3.0 Rev A (Eng only)	X
	Tivoli Courier	Tivoli	3.0 Rev B	X
		Tivoli	3.0 Rev A	X
	Tivoli Admin	Tivoli	3.0 Rev D	X
		Tivoli	3.0 Rev A	X
	T/EC Logfile Adapter	Tivoli	2.6 Rev B	X
	T/EC SNMP Adapter	Tivoli	2.6 Rev B	X
HIPPI SW Driver	BDS	SGI	2.0	X
Network Backup	Legatto Networker	Legato	4.2	All Compliant with exception of DEC which requires patches or 4.4
Software Analysis Tool	Discover	Software Emancipation	5.1	6.0
Reverse Engineering Tool	Rational Rose C++	Rational	3.03	Rational Rose 98 Professional for Unix
Documentation Tool	Rational SoDa	Rational	1.4.2	2.2.4
Requirements Tracing	RTM	Marconi	2.3.3	X
Report Generation	IQ	IQ Software Corp.	5.1.00	X
Report Writer	SQR Workbench	Sybase	3.0	X
		Sybase	3.0.5	X
UNIX Mail software sendmail	Zmail	NCD/ Net Mgr.	3.2.0	X

Function	Product Name	Vendor	Installed Version	Y2K Compliance*
HP LaserJet SW	JetAdmin	HP	2.3.3	X
		HP	2.3.3	X
File Storage Mgt System	AMASS	EMASS Raytheon	4.9.0.2 (Rev 12)	Version 4.9.1 (Scheduled for release 9/15/98) will be compliant
	DAS	EMASS Raytheon	1.3C7	X
	AML Management Unit (AMU) Software	EMASS Raytheon	2.40E	X
	Microcode	EMASS Raytheon	I9_430	X
System Monitoring	Performance Co-Pilot (PCP)	SGI	1.2	2.0

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Abbreviations and Acronyms

CI	Configuration Item
COTR	Contracting Officer’s Technical Representative
COTS	Commercial Off-the-Shelf
CSS	(ECS) Communications Subsystem
DAAC	Distributed Active Archive Center
EOC	EOS Operations Center
FDDI	Filter Distributed Data Interface
FOS	Flight Operations Segment
ICD	Interface Control Document
ECS	EOSDIS Core System
FOS	Flight Operations Segment
GUI	Graphical User Interface
HDF	Hierarchical Data Format
IRD	Interface Requirements Document
L4	Level 4 (requirements)
NCR	Non-Conformance
RbR	(Level 3) Requirements by Release
RTM	Requirements and Traceability Management
SDPS	Science and Data Processing Segment
SVAT	System Verification and Test
VATC	Verification and Test Center
V0	Version 0
Y2K	Year 2000

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