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Version 0 Analysis Report PDR Update

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RESPONSIBLE ENGINEER

Judith A. Feldman

Judy Feldman, Senior Engineer — Date
EOSDIS Core System Project

SUBMITTED BY

Stephen Fox — 1/30/95

Steve Fox, SDPS Office Manager — Date
EOSDIS Core System Project

Peter G. O'Neill — 1/30/95

Peter G. O'Neill, SI&P Office Manager — Date
EOSDIS Core System Project

Hughes Applied Information Systems
Landover, Maryland

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Executive Summary

This Working Paper is an update to the Version 0 Analysis Report (CDRL 206/SE2). Its purpose is to provide timely information about reuse of V0 components for the SDPS portion of the ECS Preliminary Design Review (PDR). This paper focuses on reuse of V0 components for ECS Interim Release 1 (IR1) and Release A. A version of this paper was prepared for the CSMS portion of the ECS PDR which contained analysis of the CSMS areas as well as V0 testing lessons learned. A complete version of the V0 Analysis Report will be prepared for the wrap-up PDR.

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4. Applicability of EOSDIS Version 0 to ECS

4.1 System Tasks

The new information collected on system tasks is presented in sections 4.2 and 4.3 below.

4.2 IMS

This section provides updates to the analysis previously provided in the SDR release of the Version 0 Analysis Report. Section 4.2.1.1 focuses on Version 0 experience integrationthru informal meetings and integrating of V0 personnel into the ECS team. Section 4.2.1.2 identifies Version 0 software integration into ECS. Some of the information presented here includes all of Version 0, not just the IMS. Most of the Version 0 comments are related to the IMS and were therefore determined to be most relevant to this section.

4.2.1 Version 0 Experience Integration

The principal source of V0 reuse has been not in the specific components, but in the knowledge and experience of the people involved with the V0 system. This reuse of experience includes not only the V0 developers, but the V0 scientific user community. A number of vehicles have maintained a flow of information between the individuals involved with VO and the V1 developers. The mechanisms for integrating experience are presented in the following sections

4.2.1.1 Informal Meetings

Informal meetings such as workshops and telecons provide a forum for exchange of ideas and analysis of ECS design. Version 0 developers have had direct influence on the SDPS architecture, the requirements, the data architecture, and operations concepts thru the following:

• Design Working Group Telecons. The telecons provide for a periodic forum for the exchange of ideas on topics in specific areas of the ECS design. Participants include ECS developers, the VO DAACs, and the science advisors. Telecon topics in areas of design specific to IMS have consisted of implementation of dependent valids, homogeneous data collections and user defined terms in the data dictionary. The Design Working Group telecons provided a means for IMS developers to present their design ideas and obtain rapid feedback.

- The L4 Requirements Workshop. This workshop was held in December 1994 to provide for the review of the initial draft of the ECS level 4 requirements. VO DAACs and the V0 system developers were represented at the workshop, as well as members of the science community. IMS was assigned approximately 40 action items from the workshop relating to the IMS Level 4 requirements.

- The UVA/SWA Tirekicking Workshop. The workshop objective was to provide "real time" feedback on Version 0 functionality, useability, problems, and suggestions to both ECS and Version 0 developers. Major IMS lessons learned from the workshop were:
  - Provide consistent results for searches. This encourages confidence in the system data
  - Use aids to inform users what to do and how to do it. This promotes user friendliness in the interface. Tirekickers noted that it was east to get lost in the screens.
  - Provide consistent terms between the screens.
  - Provide exact valids information directly on the screen or inform user that lists are available to be used.
  - Provide an data order capability directly from the directory screen.
  - Provide visibility of keywords for guide and directory searches.
  - Provide undo buttons
  - Provide an online users manual
  - Status ongoing operations
  - Provide a summary of number of granules returned from a search

• IMS bi-weekly meetings with the ESDIS IMS from NASA Goddard. The meetings provide for the periodic exchange of status information between the IMS V1 development leads and the ESDIS IMS development leads. Although agendas are prepared, the meetings are informal, and provide for an open exchange of information without any restrictions on topics. Follow-on meetings are scheduled on specific topics on an as-heeded basis.

4.2.1.2 Version 0 Personnel Personnel integrated with ECS

IMS has brought into the V1 development team two individuals with considerable V0 and V0 related development experience. Kevin Limperos brings expertise from both ECS Version 0 and TSDIS (Tropical Rainfall Monitoring Mission Science Data Information System) prototype development work. His V0 work included performing technology trade studies for the EOSDIS V0 IMS project. This included writing a detailed survey of user interface technology. In addition, he undertook a detailed survey of public domain image display products for V0. Related NASA experience which is being applied to the ECS V1 effort includes analysis, design, and implementation of the TSDIS Browse Display System user interface, which included X-windows and Motif programming to generate a portable, user friendly interface. This provided invaluable experience interacting with the science community, then obtaining and incorporating relevant feedback into the user interface design. Further, interacting with the production generation staff lead to an understanding of the issues germane to processing the TRMM data and creating an efficient user interface to access it. Kevin is presently the team leader for design and development of the V1 Client Subsystem.

Sreedhar Muppala brings to the IMS development team experience on EOSDIS V0 at the Goddard DAAC for the DAAC unique IMS. Sreedhar, who is presently the team leader for design of the V1 Data Management Subsystem, worked on both the design and implementation of the user interface and database portions of the Goddard IMS. His user interface experience includes developing IMS client screens, use of valids in the client, results display, product order, and document search. His database experience includes work on the interface software to the Goddard DAAC server database for the metadata base. The software supported document and product searches, user help, product requests and request statusing, dependent valids, and tracking of product requests. Sreedhar also wrote for the Goddard DAAC IMS a subset of an FTP client integrated with rest of the client software. This permitted a user to use FTP without invoking a separate interface, and is expected to be similar to the implementation used by V1.

As part of the recent decision to reuse/enhance the V0 ESDIS Client for the Release A ECS Client, Hughes STX VO ESDIS Client developers will be assigned to directly work with the ECS IMS development team. The integrated client development team will focus on incremental improvements in the V0 Client software to support access to the Release A V1 components. Upgrades for V0 will be determined by impact on V1 schedules and technical merits. Some specific areas being examined include V0 client support for the V1 visualization toolkit (EOSVIEW), and VO client upgrade to support V1 data dictionary functionality. All V0 client upgrades will be for Release A delivery only. Full V1 functionality will be introduced with Release B delivery of the V1 client.

4.2.1.2 Software Integration

Version 0 Gateway. IMS has recently created a new CSCI (Computer Software Configuration Item) for which there is a high probability of reuse of VO code. The CSCI, which is named the Gateway, is in the Data Management subsystem, and will serve as the interoperability interface to VO and NOAA. The Gateway design calls for it to emulate the ESDIS VO Client and an ESDIS VO DAAC in order to achieve a high level of transparency to the VO system. It is expected that a high degree of V0 code reuse will be realized in the implementation of the Gateway VO emulation. An analysis of required Gateway functionality is underway, and VO code will be examined for identification components reusable for the Gateway CSCI. Since the Gateway CSCI was approved by the SDPS CCB only in early January, formal work on it is just beginning. Informal estimates of reuse at this time are approximately 60%-70% of the IMS server code will be reused. This consists of two complete server layers and a portion of a third layer. It is expected that the message building and network layers will be heavily reused. Portions of the format translation layer will also be reused. It is not expected that the data base interface layer will be reused.

Evaluation of V0 mapping software. In a collaborative effort between ECS and the University of Maryland, a process experiment is being performed that seeks to match existing software assets in class libraries with desired capabilities. This process has been partially enacted in an experiment in choosing software to fulfill the Map function of the SDPS Client Subsystem. The intent is to reduce custom software development with attendant cost, schedule, and quality advantages. The purpose of the experiment is to quantify both effort avoidance and potential side effects such as integration complications. An off-the-shelf package has been provisionally selected from a group of four candidates that included the V0 map function. The early stages of this experiment have yielded findings on selection criteria, estimated effort avoidance, and counter-balancing required evaluation effort. The experiment shows promising results and will proceed into the detailed design phase of ECS. The intent is to eventually solidify a systematic process on the difficult cognitive problem of matching available software to desired capabilities. The results of the analysis are presented in Table 4-1.

Table 4-1. Object Reuse Evaluation Results

Functional Criteria	UIT	V0	Vendor X	Vendor Y
Zoom-in	Yes	Yes	Yes	Yes
Pan	Yes	Yes	Yes	Yes
Adequate Resolution	Yes [1]	No	Yes	Yes
Political Boundaries	Yes	Yes	Yes	Yes
Terrain features	No	Yes	Yes	Yes
Lat/Lon lines and labels	Yes	Yes	Yes	Yes
Various Projection Options	Yes	Yes	Yes	Yes
Polygon Drawing	Yes	Yes[2]	Yes	Yes[2]
Display spacecraft foot tracks	Yes	No	Yes	Yes
Display ground stations	Yes	No	Yes	Yes
Display bathymetry data	Yes	No	No	No
Region highlighting	No	No	Yes	No
Select Granules	Yes	No	No	No
Access to services available for granules	Yes	No	No	No
Source Code Available	Yes	Yes	No	No
Cost	Free	Free	?	10-12K
[1] WDB-2				
[2] No general polygons				
Quality Criteria				
Non-functional Application Characteristics			n/a	n/a
Reliability			n/a	n/a
Usability			n/a	n/a
Maintainability			n/a	n/a
Efficiency			n/a	n/a
Portability			n/a	n/a

4.3 Data Server (DADS)

Since the beginning of the ECS contract, DADS (now data server) personnel have been in communication with Version 0 personnel. ECS personnel have worked to understand and learn from V0 experiences to date in the areas of system development, user access loads, and earth science data specific problems. Prior to SDR a number of site visits, teleconferences and E-mail messages were exchanged to better understand the lessons learned at each DAAC. After PDR several meetings and occasional E-mail messages reinforced Version 0 lessons learned. Data server personnel participated in the review of the GSFC DAAC's Backup Design. LaRC DAAC personnel visited the ECS facility in Landover to participate in vendor presentations, share technical problems and discuss solution strategies and options. ASF personnel also visited Landover to discuss their requirements, share system information and obtain copies of ECS technical papers. Data server personnel also maintained an interface with the ECS Systems Engineering Site Liaisons who provided a window into the daily operations at each of the DAACs.

Aspects of Version 0, such as the IMS client, which ECS will incorporate into Release A as described elsewhere in section 5. Other aspects, such as the archive systems, would be more difficult to integrate for the reasons explained below. The SDR version of this document describes in Section 4.3.4.2.1.3 the role that the File Storage Management System (FSMS) plays in the archive, and how knowledge of the workings of this component is critical to the entire archive system. The Version 0 archives fall into three broad categories:

- SunCoast-based Systems (2 Sites)
- UniTree-based Systems (3 Sites)
- Custom/Manual Systems (2 Sites)

SunCoast-based Systems (MSFC, NSIDC) These systems essentially separate volume and file serving requirements in a manner similar to the data server architecture. The SunCoast product acts as a volume server which manages a Write Once File System and the associated device drivers for WORM type devices and a limited number of tape devices. The file server consists of a relational database "Front-End" that holds metadata and pointers to the associated file data.

This is a sound design but the product is primarily limited to lower capacity devices. In addition it is unclear that the product will handle data rate and other functional and performance requirements imposed by ECS, or that it will scale to handle the required capacity.

UniTree-based Systems (GSFC, JPL, LaRC) UniTree represents one of the few archive products which was available when several of the Version 0 prototype projects began. Though two different versions of UniTree are in use, DAAC personnel report many of the same problems. These include: (1) poor or non-existent network file system (NFS) performance, (2) limited archive management and performance monitoring capabilities, (3) proprietary data storage formats, (4) poor or inconsistent general logging and error logging, and (5) limited or non-existent concurrent read/write operations.

UniTree also suffers from the lack of a consistent baseline across fielded products, as described in the SDR version. The acquisition of Discos by Open Vision has not provided any impetus for standardization, and product capabilities vary widely between vendors and host platforms.

Custom/Manual Systems (ASF, EDC) These systems may utilize existing File Storage Management Systems for a portion of their internal working but custom code provides the majority of the functionality. In addition, these sites primarily rely on manpower intensive "lookup, fetch, and load" operations to find the requisite media volumes for processing. This type of system is unacceptable for Version 1 use from an operational perspective given the projected number of archive queries and retrieval requests expected under Version 1 operations.

Discussions with DAAC technical personnel prior and subsequent to SDR have given data server personnel a more complete understanding of the implications associated with the envelopment or integration of the DAAC archive components, as discussed in Section 4.3.4. The description of V0 as a prototype with operational elements has been shown to be very accurate and appropriate. These systems were constructed with the best equipment available at their inception, but much of this equipment does not meet the current reliability, maintainability, and availability (RMA), bit error rate (BER), and capacity requirements of ECS. Version 0 systems provided a basis from which many of the ECS requirements were drawn. These include: BER and performance monitoring, archive and volume viability testing, degraded mode operations capabilities, scaleability, and evolvability. These systems were not designed to meet the data loads and storage capacities required by ECS. Rather they provided the foundation for the ECS requirements and design that is reflected in the current ECS Element and Segment Design Specification documentation.

4.3.4 V0 Archive Envelopment Study Update

This section of the Version 0 Analysis Report updates the V0 archive envelopment study that was initiated prior to the ECS SDR. There were several goals driving the SDR version of the analysis. The principal goal was to determine to what extent existing V0 archives could be enveloped into the ECS architecture with minimal disruption to existing V0 operations and in a manner that would be cost-effective to the ESDIS Project. Envelopment is assumed to mean that the component becomes part of ECS; ECS is responsible for ensuring the operability and maintainability of the component according to ECS requirements. [For complete definitions see section 3] Additionally, this analysis assisted the SDPS design effort through an investigation of potential DAAC V0 hardware, software, design, experience, and processes to be reused or built upon as the design effort progressed. The content of the SDR version of the analysis was, however, constrained by several factors. The SDPS architecture concepts were still evolving as the envelopment analysis was being performed, so it was not possible to ascertain exactly how candidate components could be enveloped into SDPS elements. Additionally, Level 3 requirements were still evolving, and the Level 4 requirements and complementary subsystem design efforts had not yet begun. These factors directed the focus of the SDR envelopment analysis away from integration of components into the ECS design and towards a more complete understanding of the DAAC V0 architectures, components, and design rationale. This analysis was completed at SDR for those DAACs required to support ECS Release A. It included a discussion of the components at each of the DAACs and potential issues associated with the envelopment of those components based on the SDPS architecture concepts at the time.

The conclusion of the SDR analysis was that no DAAC V0 components could be recommended for envelopment based on issues identified and documented in the analysis. The identified issues included system-level, hardware, software, data, requirements, logistical, and other issues that would need to be resolved in order for DAAC V0 archive components to be enveloped. It was determined, however, that the possibility of envelopment would remain open until PDR-level SDPS design efforts were completed. The PDR update to the envelopment analysis focuses on how the identified issues would affect the envelopment of components in light of the progress that has been made in the definition of more detailed SDPS requirements and design concepts. This analysis makes use of the knowledge of the DAAC V0 requirements, architectures, and components gained during and subsequent to the SDR analysis and applies it to the current SDPS data server requirements and design. The conclusions of the PDR analysis support those of the SDR analysis, in that no DAAC V0 archive components can be recommended for envelopment into the data server. The migration of data sets from Version 0 to Version 1 remains an approach that is both more cost-effective and one which promotes consistency in meeting ECS functional and performance requirements for all Version 1 data sets. The following sections discuss the implications of envelopment on the data server design that was developed and is documented in the PDR SDPS Segment Design Specification. The analysis follows with a discussion of critical SDPS requirements and design goals and the challenges associated with meeting these requirements with enveloped components. Finally, the analysis concludes with recommendations for other possible mechanisms that would allow access by ECS users to data contained within heritage archive systems without the ramifications associated with envelopment.

4.3.4.1 PDR Envelopment Analysis Process

The PDR envelopment analysis took advantage of SDPS and data server subsystem requirements and design information that were not available at SDR. Level 4 requirements for the data server subsystem were analyzed along with data server trade studies and the element design specification being developed for PDR in order to gain a thorough knowledge of the design with which enveloped components would potentially be integrated. Combined with this was an analysis of the implications of envelopment on both the data server subsystem and the enveloped components in terms of compliance with requirements, maintenance and operations, and evolvability considerations. The results of this analysis are presented in terms of the implications of envelopment on ECS requirements and design goals.

4.3.4.2 Envelopment Implications

As a preface to discussing how archive components could be enveloped it is important to identify and understand the implications of what it means for the ECS to envelop a component or group of components. Enveloped components must be logically and physically separated from the heritage system from which they originated and must become an integral part of the ECS operational system. Furthermore, since the enveloped components become an integral part of the ECS, they must meet all ECS functional and performance requirements, and are subject to the same evolvability goals as other ECS components. Finally, ECS would be responsible for the operation and maintenance of all enveloped components. Consideration had been given prior to SDR concerning the relaxation of ECS requirements for enveloped components. The relaxation of certain requirements, especially those related to performance, could be accommodated without major impact to system operations. Certain basic functional requirements, however, could not be relaxed without significant impact to system development, operations, and data integrity. The following sections discuss the ECS requirements that are not met by enveloped components. They are divided into those items which are deemed to be critical to the ECS design, and those which are not critical, but raise significant developmental or operational issues.

4.3.4.3 Critical Envelopment Issues

ECS Level 4 requirements that have been allocated to the data server subsystem are broken down into several types including functional, performance, security, standards, and others. The requirements related to the envelopment of components that are deemed to be critical are basic functional requirements related to maintaining data integrity within the archive. A series of requirements have been levied on the archive components that are related to the monitoring of archive system parameters related to archive media degradation. These requirements are designed to ensure that data integrity is maintained within the data server. This requirement is implemented through bit error rate (BER) monitoring capabilities provided by the archive file storage management system (FSMS). The FSMS will periodically read portions of all media contained within the archive, and will calculate, maintain, and report BER statistics that track the eventual degradation of the archive media. When the reported BER reached a predetermined threshold the archive system copies the data contained on the degrading media to fresh media before any loss of data occurs. Maintaining the integrity of the data contained within the data server is one of the most important goals of the ECS, and is one which is difficult to assure with enveloped components. The gathering of BER statistics required to support the media refresh process is currently supported by very few FSMS products, none of which are currently in use in the DAAC V0 archives. If the integrity of the V0 data is not to be put at risk, it would involve the transfer of V0 data out of its current FSMS structure and into one which supports automatic BER monitoring. The effort required to perform this transfer is a major step in the data migration process, and the subsequent insertion of the newly structured data and supporting FSMS back into the heritage components would require additional integration effort and offer none of the advantages associated with completing the data migration process.

Several other requirements are placed on the ECS data server archives that collectively are not supported by the current V0 archive components. One is a requirement that the data server use openly published and non-proprietary data formats to archive data. Several of the storage management products in use in V0 use vendor-proprietary formats. The implication of this is that ECS is not able to alter or tailor the operation of the FSMS to a particular application without vendor involvement. The use of proprietary file storage formats also often limits control in how data is physically stored on the archive media. The use of non-proprietary archive formats allows easier tailoring of archive storage parameters, and is one mechanism that will be used to increase archive system performance and flexibility. A related pair of requirements is that the archive shall use a fully described file structure and physical file organization on the volume containing the archived data. This is especially important in later ECS releases as the archive functions and components become more distributed. The monolithic archive system approach supported by many of the V0 components does not support these file structure and organization requirements. Another design item that is critical to successful data server operation is the use of standard applications programming interfaces (APIs) in support of all data storage and retrieval requests. The requests for proposal (RFPs) that ECS has released to FSMS vendors includes a requirement that the vendor provide a standard set of APIs for communication with other archive system elements. This is critical to the ability to add, delete, or otherwise modify select archive components without disrupting other data server or SDPS elements. Finally, the FSMS products under consideration for ECS must also support the mechanisms that simplify performing content based searching within the archive (e.g., providing access to archive data at granularities smaller than the file level). Not all of the requirements or functions mentioned above are currently supported by any of the V0 archive components.

The envelopment of archive components which do not support the requirements listed above would impact the data server and SDPS in several ways. The foremost concern is that of maintaining integrity of all data contained in the Version 1 archives. Second would be the cost and schedule risk associated with the internal development and maintenance of the APIs and other software required to integrate the heritage components. Third would be the impact on the performance of the data server archive components when any query or retrieval request would need to access data stored on the enveloped components. This stems both from basic differences in supported metadata between V0 and V1 systems, as well as other differences in supported level of service. Associated with this is the concern that certain standard ECS services (such as content based search) would not be supported for the data contained within the enveloped archive.

Other key envelopment issues identified in the SDR version of this analysis (e.g., the implication of testing and integrating an operational V0 archive component into V1) still present serious concerns in addition to the concerns described above. It is for these reasons that envelopment is not recommended as a viable or cost-effective alternative to the migration of V0 data to V1. Methods other than envelopment for connecting heritage archives to Version 1 are integral to the ECS design and are presented below.

4.3.4.4 Envelopment Alternatives

In the event that data contained within a particular Version 0 archive or any other heritage system is deemed to be too costly or not in high enough demand to justify the cost of data migration, there are several options for how this data could be made accessible through Version 1. The first alternative data transfer mechanism for Version 0 archive data is through the V0 to V1 interoperability that is being provided through the ECS data management subsystem. This interface provides a translation between the V0 ODL and ECS query language for the transfer of archive queries and data retrieval requests. This interface is being developed and maintained as part of the ECS contract in support of the transition between Version 0 and Version 1 operations. This is not, however, a permanent mechanism for accessing data outside of the ECS archives since the V0 system IMS will cease to be supported at some point. Therefore, an alternate mechanism is provided within the ECS architecture which allows the connection of archives outside of the ECS sphere of control.

The ECS architecture does have a effective method for Version 0 integration built into its design. This involves wrapping an interface layer around Version 0 systems via the use of the ECS Services API toolkit. Each Version 0 system would then become another data server at its associated DAAC site. Using the appropriate ECS API & toolkit documents and Interface Control Documents (ICDs) for this work, Version 0 personnel, who are intimately familiar with their system, could develop the necessary interface modifications using their design documents, Unit Development Folders (UDF), and ICDs. This approach would result in some performance and administrative penalties as well as Level of Service differences between Version 0 and Version 1 data sets, but this approach would allow Version 0 systems to be tied into the ECS system. The ECS architecture also provides for data migration between data servers. As the Version 0 data and storage technologies continue to age, the same ECS Services API could be used in the migration process to move this data to other data servers and storage devices.

5. Integration of V0 in ECS

Section 5 presents two areas in which V0 has been integrated into ECS. Section 5.1 identifies the ECS requirements which have been effected by Version 0. Section 5.2 discusses the integration of V0 and V1 in the TRMM Release (Release A). Section 5.3 discusses integration of data into ECS and Version 1.

5.1 Version 0 Recommendations Utilized in Requirements

Of the 673 recommendations in the User Recommendation Database (URDB), 164 are directly related to improvements, lessons, and concepts taken from V0. There has been a constant and continuing stream of such inputs related to V0 since the URDB (formerly RRDB) was activated. A listing of the items by status is shown below.

Of these 164 recommendations, 48 were taken from the May, 1994, issue of the V0 Analysis Report and will be addressed elsewhere in this report.

There were 23 recommendations that were dispositioned as Comments. These were generally an early collection of lessons learned that addressed concerns such as staffing requirements, program planning, testing, and the IMS "look and feel". These general, often rudimentary, comments were reviewed by the developers in the ECS program and influenced the direction of the program. For example, one item, #211, raised the issue the Guide's content and configuration control; this question affects both the ECS development and the operations at the DAACs. After this item was addressed by the URDB Assessment Panel it was taken to the DAAC Manager's and is currently being worked by the Science Office.

Another 31 recommendations were found to be covered by existing ECS functional and performance requirements at the time of their review by the URDB. There were 8 more recommendations that were not originally covered by ECS requirements but which, as the design matured, have now been incorporated. Four of these recommendations requested the capability for coincident searching, that is the ability to locate a set of data which is coincident in space and/or time with another set of data. This capability was not provided by V0. After a thorough review of the merits of these recommendations by the URDB Assessment Panel, it was agreed that this was a valuable tool for the science community and a CCR was initiated. This CCR resulted in a new requirement to provide this capability, IMS-0575.

Twenty-two of the recommendations were implementation suggestions based on experience with V0. These were sent to the development group to consider as part of their PDR preparations. They have used these recommendations in the creation of the level 4 requirement and design documents. At this point, over 60 draft level 4 requirements are traceable to the recommendations. These requirements have addressed various aspects, such as providing legends associated with browse images, displaying data timelines for data selection, obtaining the status of queries, and the ability to manipulate saved search results.

Six recommendations are currently undergoing technical assessment in the URDB. In this process the benefits and impacts are examined to determine whether a CCR is warranted to incorporate the request. Three of these recommendations deal with displaying the satellite orbit plots on coverage maps. Two raised the issue of linking the coverage map function with other client functions. The remaining item requested that ECS establish a Standard Data Format support lab. All three issues will be addressed before the SDPS PDR.

Two items were rejected during their review in the URDB. One requested that ECS provide access to a non-existent NOAA database. The other asked for the ability to manipulate browse images, but, since these images are pre-defined by instrument teams, this is not possible.

At this point, 23 items are being re-examined by the URDB screening team. Two are related to other recommendations that have already been incorporated in the L4 requirements definition process. Four are related to the ECS pricing policy, which is still being defined. The remaining are pending the completion of various design studies.

Closed-Comment

#132 Personnel requirements for ingest and archive driven by diversity of data types

#146 Emphasis of SYSTEM over DATA.

#152 VO IMS GUI CHARACTERISTICS

#157 Flight project support: Need Archive Plan

#158 Flight project support: use of ICDs

#181 SDFWG participation in V1

#211 Investigator knowledge base

#212 Additional control of query results display

#224 stress testing

#229 Integrated COTS UIs

#230 Terminology in menus

#234 Users prefer whole query form

#235 Browse granule id select

#239 Consistent menus/buttons

#243 Various results display details

#253 Minimize path delay

#254 Granule numbering

#260 Processing levels on search window

#268 Why got 'hit'

#270 Rule for polar mapping

#278 Various input about software used in V0 IMS

#280 Multiple windows flexibility vs clutter

#295 EP Plan per DAAC

Closed (Existing Req)

#134 Granule metadata, in-situ, causes large volume and long search times

#139 Metadata in IMS for holdings at SCFs

#143 Should have review and mechanisms for removal of data from the archive

#144 Read Software

#148 Distributed archive catalog

#161 Granularity varies at the various DAACs

#167 Simple, portable tools needed

#168 Development of API to common data structures

#207 Tools for guide documentation

#214 Additional content of metadata requested

#215 Summary statistics search

#220 Extensibility

#222 Accommodate EDC wall gracefully

#223 GIS search approaches

#226 Automated tools for assisting ingest

#246 Help and tutorials

#269 Security

#271 Multiple emails

#272 Order by package

#335 Summary comments on IMS: password-protect ordering

#396 Dataset specific metadata

#399 Expert and novice modes

#404 Data visible by granule or by granule "package"

#406 Automatic usage statistics reports

#407 User registration and validation for restricted datasets

#408 "Movie loop" browse

#411 Second round of query on previous query's results

- #414 IMS map of functions
- #417 Preferred media in user profile
- #418 Save and retrieve query (search criteria)
- #548 User interface functionality self-contained, segregated from ECS architecture characteristics

<u>Closed (New Requirement)</u>

- #136 Coincident search--in-situ and remotely sensed data
- #208 Hierarchical document management
- #216 Search on processing history
- #217 Coincidence searching
- #221 APIs--interoperability in the reverse direction
- #227 Various complex query support
- #275 Coincident search
- #398 Coincident search

<u>Design Consideration</u>

- #162 Content-based metadata, to reflect quality, done automatically
- #178 Use of HDF as baseline for ECS SDF
- #182 Distribution of NCSA tools and information with products.
- #198 Varying GUI display sizes
- #209 Various browse features
- #210 GUI portability
- #219 Alternative visualization paradigms
- #262 Selection list
- #265 Timeline
- #267 Valids backout
- #273 Georeferencing
- #324 Order summary window
- #325 Timeline
- #340 On line Help
- #400 Categorize and save not only the query but the results(?)
- #402 Timeline
- #403 Number of granules and volume displayed as soon as recieved

#405 Request tracking, usage and accounting facility available to all DAACs

#410 Save and email of query results

#413 Help: terms

#415 Specify four corner coverage direction

#419 Query of and display browse of orbital data that wraps around the globe

<u>Assessment</u>

#180 SDF Lab

#191 Orbit plots in coverage map

#264 Orbital model

#397 Orbit model as part of coverage map

#412 Use of coverage map to select a specific granule

#553 V0 IMS visualization capabilities (implied minimum ECS standard)

<u>Rejected</u>

#213 Interoperability with NOAA phenomenology data base

#420 Select projection for display of browse data

<u>Screening</u>

#130 Pricing policy: unforeseen procedural bottleneck

#142 Levels of service required for different data types

#190 DAAC-selectable database toolset

#218 Automatic billing

#225 Data Dictionary particulars

#263 Legend and description label in browse products

#274 Cost accounting

#277 Window size constraints for portability

#279 User model statistics that can be used in ECS modeling

#336 Summary comments on IMS: tutorial

#401 Machine to Machine interaction

#409 Keyword aliasing

#416 Dependent valids narrow as query is entered

#538 When using the V0 IMS, I found it inconvenient to be require to always have to specify geographic coverage in my query

#545 Desired characteristics of selection lists

#549 ECS must be consistent with V0 GUI Style guide

#552 Desired IMS software support - specific list

#567 Coincidence searching definition detail

#582 back space in the VO IMS does not work.

#589 automatic set up for image contrast.

#590 cloud cover information of area of interest

#592 correction on #590

#659 accounting services need to understand user discounts

<u>V0 Analysis Report Items</u>

#672 Candidate VO Function for Reuse: IMS server cookbook

#673 Candidate VO Function for Reuse: GUI

#674 Candidate VO Function for Reuse: Guide Software

#675 Candidate VO Function for Reuse: IMS Staff experience

#676 Candidate VO Function for Reuse: Tirekicker Involvement Process

#677 Candidate VO Function for Reuse: Network Routers

#678 Candidate VO Function for Reuse: Network circuits

#679 Candidate VO Function for Reuse: LAN Network Components

#680 Candidate VO Function for Reuse: V0 Network Services Experience

#681 Candidate VO Function for Reuse: WAN design

#682 Candidate VO Function for Reuse: LAN Design

#683 Candidate VO Function for Reuse: Anonymous FTP

#684 Candidate VO Function for Reuse: X.500 Directory Service

#685 Candidate VO Function for Reuse: Listserv

#686 Candidate VO Function for Reuse: E-mail Forwarding Utility

#687 Candidate VO Function for Reuse: Bulletin Board Service

#688 Candidate VO Function for Reuse: Gopher interface

#689 Candidate VO Function for Reuse: World Wide Web interface

#690 Candidate VO Function for Reuse: V0 Information Services experience

#691 Candidate VO Function for Reuse: Display Results Human-Machine I/F

#692 Candidate VO Function for Reuse: Distribute Status Human-Machine I/F

#693 Candidate VO Function for Reuse: Dumb Terminal Human-Machine I/F

#694 Candidate VO Function for Reuse: Guide Search Human-Machine I/F

#695 Candidate VO Function for Reuse: Inventory Search Human-Machine I/F

#696 Candidate VO Function for Reuse: Order History Human-Machine I/F

#697 Candidate VO Function for Reuse: Product Request Human-Machine I/F

#698 Candidate VO Function for Reuse: User Comments Human-Machine I/F

#699 Candidate VO Function for Reuse: User Registration Human-Machine I/F

#700 Candidate VO Function for Reuse: Human-Machine I/F Experience and Process

#701 Candidate VO Function for Reuse: LaRC User Interface

#702 Candidate VO Function for Reuse: NSIDC Guide Authoring Tools

#703 Candidate VO Function for Reuse: EDC-GLIS coverage map

#707 Candidate VO Function for Reuse: EDC Wall Algorithm

#708 Candidate VO Function for Reuse: DAAC archive components

#709 Candidate VO Function for Reuse: Media devices

#710 Candidate VO Function for Reuse: Data Set Specific Software

#711 Candidate VO Function for Reuse: Data compression software

#712 Candidate VO Function for Reuse: DADS Experience and Process

#713 Candidate VO Function for Reuse: LAS geolocation routines

#714 Candidate VO Function for Reuse: NSIDC automated Q/A software

#715 Candidate VO Function for Reuse: GSFC V0 scheduler

#716 Candidate VO Function for Reuse: ERBE scheduling procedures

#717 Candidate VO Function for Reuse: PGS Experience and Process

#718 Candidate VO Function for Reuse: Automated Q/A Software

#719 Candidate VO Function for Reuse: DORRAN (accounting system from EDC)

#720 Candidate VO Function for Reuse: LaRC Risk Assessment Software

#721 Candidate VO Function for Reuse: ASF Accounting System Experience

#722 Candidate VO Function for Reuse: Configuration management (resource, inventory, logistics, training and maintenance

FAM cells entered as reuse recommendations in the URDB. The entry of FAM cells as distinct recommendation for reuse in the URDB provides a means of formally tracking the disposition of the candidate functions for reuse. The danger of analysis reports is that they are forgotten as quickly as the reports are distributed. Entry of the FAM cells into the URDB provides a mechanism for continuing to view the reuse recommendations as open items until a final decision is made on their reusability. The URDB committee maintains status on the FAM cells as entered in the URDB, and it maintains status updates from the segments on the suggestions for reuse as the V1 development progresses.

5.2 Integrated V0 and V1 System Component

A complete presentation of this approach is included in ECS white paper 420-WP-002-001, Potential Integration of V0 and V1 Components for Release A. The proposed integration of System-V0 and ECS V1 components to form the Release A configuration is shown in Figure 5-1. The gray lines indicate interaction between components during a user session; black lines transfer of data from one component to another to allow them to work; dashed lines are connections which need further analysis. The key characteristics of this configuration are:

1. The System-V0 client is retained for Release A as the primary user search agent, receiving inputs from the System-V0 CHUI and GUI clients. (*see point 5 below*)

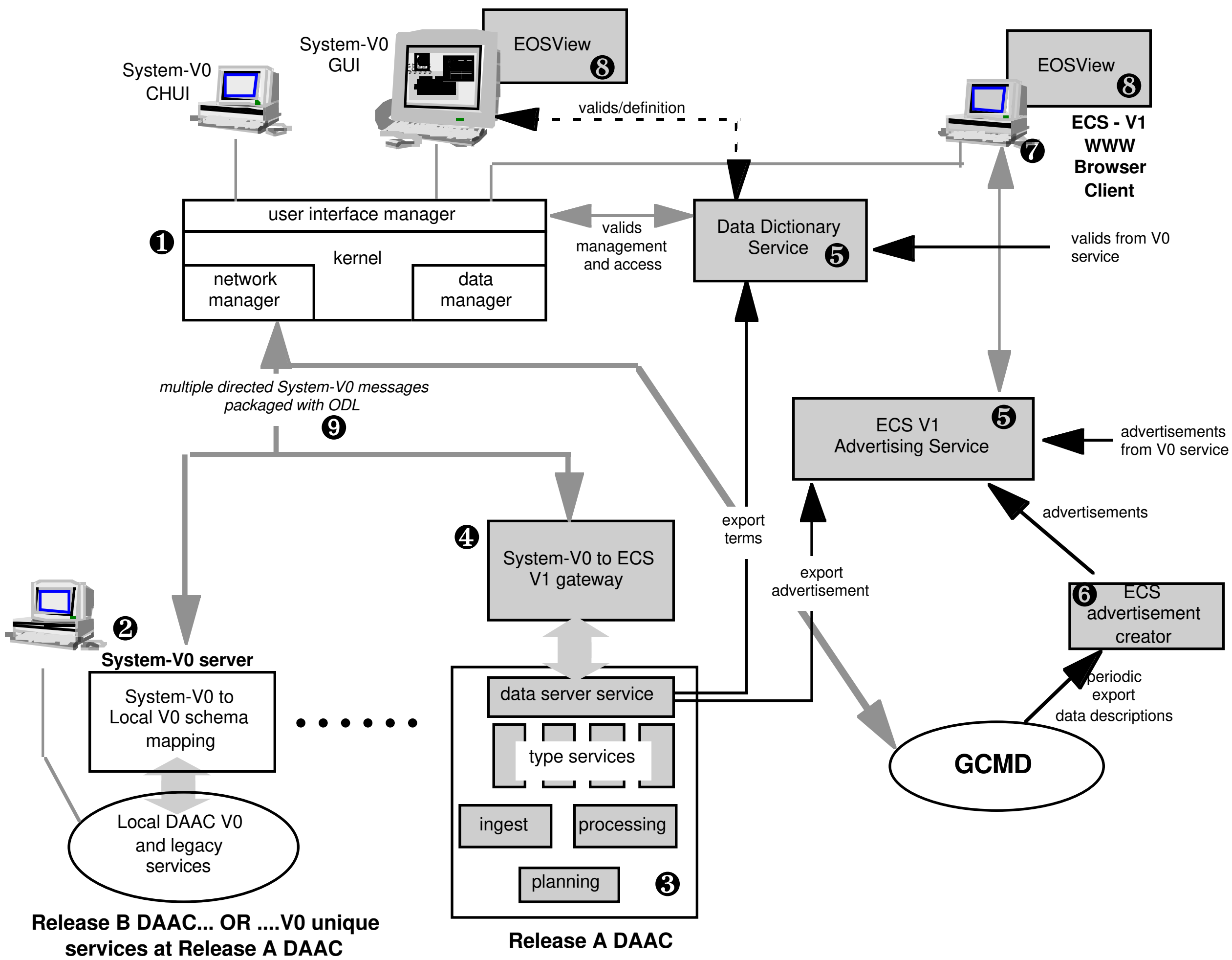

Figure 5-1. Integrated V0 and V1 Release A Concept

2. The majority of DAACs not involved in the Release A delivery will continue to operate with the System-V0 client in the same way as before. In addition DAAC specific functionality at the Release A DAACs which is not replaced by ECS V1 functionality will still be supported by DAAC specific interfaces.

3. At the Release A DAACs the provider level services, including science processing at LaRC and MSFC will be developed and installed as described in the ECS V1 design documentation and release plans. This will include all Release A functionality for the Data Server, Ingest, Planning, and Processing Subsystems.

4. A gateway to provide translation between System-V0 protocol and the chosen ECS V1 protocol(s) will be developed to allow requests placed via the System-V0 client to be handled by the new Release A functionality. The primary interface from the gateway to ECS will be to the data server service CI, which is part of the Data Server subsystem. This gateway has always been in the Release A plan to allow a migration from V0 to V1 interoperability.

   The integrated V0 and V1 component strategy discussed here will make the development of this component much easier since it will avoid the gateway having to be developed against a constantly changing and separate system; the design processes will be brought together under a single CCB (see Section 3.2.1).

5. Two components from the ECS architecture are added to the configuration to support the System-V0 client.

   The Data Dictionary Service will provide terms and definitions which could be used to semi-automate the management of the list of permitted values ('valids'). The Release A Data Servers will be able to automatically export data dictionary updates to the service as part of the schema management approach in ECS V1. The manual export of 'valids' from V0 services (see Section 3.1) will be to the Data Dictionary service.

   The DD service can then be used by the System-V0 client to access the controlled 'valids' list. In addition the GUI interface could also access this service directly to get the current 'valids' at session start-up. Obviously caching could be used to prevent repeat copying of the same data.

   Figure 2-3 also shows the use of the Advertising Service. This would be used as an operational prototype for providing users with one service from which to discover all of the services that are available in the Release A time frame.

   The Advertising Service would receive advertisements from both the V1 and V0 services. The V1 functions will provide a managed solution to the formatting and export of advertisements. For V0 services the advertising process may be more manual.

6. One strategy for populating the ECS Advertising Service with information on services held outside of ECS, is to utilize information held in the Global Change Master Directory (GCMD). This would allow a user to find earth science data services (and the data associated with a service) within ECS and elsewhere from a single service. It is proposed that for Release A the population is achieved through a periodic (quarterly) update from the GCMD by basic manipulation of an export of all of the data set entries in DIF format.

Each data set not already advertised as part of the EOSDIS services would be advertised with either a telephone contact service or a URL to further information. The Advertising Service design is likely to support a multiple views (layers) on advertisements so that an EOSDIS only view can be obtained. [Note: even within the EOSDIS services there are likely to be several views; e.g. V0, V1, mandated services, DAAC unique etc.].

7. To ensure immediate widespread access to the Release A system it is imperative that a WWW browser interface is developed. With the startling rate of functionality advances within the WWW, it is clear that a reasonably capable interface could be developed[1]. This would ensure that there are no artificial barriers to widespread use of Release A as soon as it is released [Note: this is an important issue with less than a year scheduled between Release A and Release B there is a very real danger that the normal inertia involved in user access to a new system would mean that the system is essentially unused until Release B is made available].

   The Advertising Service component will already be developed to work with WWW browsers via an HTTP interface. The System-V0 client would need to be developed to support the HTTP protocol and provide HTML interface definitions.

8. The EOSVIEW tool for local viewing of HDF formatted data will be made available for users of either the WWW browser or System-V0 GUI to unpack and view any data delivered in EOS-HDF format. The degree of integration of EOSVIEW with each interface needs further analysis; as a minimum it would be a standalone tool the user has access to. [Note: the tool will work with either general HDF files or the products using the HDF-EOS structures. More information will be available for the latter products]

9. The System-V0 query/result messages and ODL packaging would be unchanged. There might be some benefit from using a message passing protocol other than TCP/IP sockets for communicating between the client and server (see Section 3.1).

5.3 Integration of Version 0 data.

Data Migration. Version 1 is a complete system comprised of Version 0 and ECS components. As such, all data that is currently in Version 0, is automatically in Version 1. The V0 data will either migrate to the ECS component of the DAAC or remain temporarily in the V0 component of the DAAC. V0 and ECS provide bi directional interoperability so that users continually have access to all data at all times. ECS has the responsibility for supporting the migration of the data. A paper has been published to define the process. This process has been reviewed and discussed with the Version 0 staff via meetings (DAAC UWGs, DAAC TIMs, DAAC managers meeting) and a PDR workshop specifically on this topic. The White paper titled, Version 1 Data Migration, (160-TP-002-001) is available through the ECS Electronic Data Handling System (EDHS).

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1 There are already several effective interfaces to data services using relatively standard WWW functionality, and there are several R&D activities in the public and commercial domain looking at GIS interfaces within a WWW application.

Data Design. Version 0 developers have been active in the definition of the layers of the data pyramid through participation in the Data Modeling Working Group, chaired by Denise Heller. This group is responsible for production of the lexicon, the taxonomy, and the Core Metadata Model. Specifically, the metadata for the V0 data sets identified for Release A has been compared to the ECS Core Metadata model. The comparison resulted in modifications to the Core Metadata model. The modifications will be reflected, by DAAC, in appendixes to the SDPS database design specification (DID 311) being released in parallel to this document. The appendixes identify: addition of aliases, addition of attributes, and broadening of domain values.

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Appendix A. Version 0 Functional Analysis Matrix for ASF, EDC, GSFC, and JPL

SDPS	ASF	EDC	GSFC	JPL
System Access & User Registration 1. User Registration - User authentication - User profiles	Now: Submission of 2 page proposal required - NASA approval required (ASF has a restricted data set). User Services register approved new user (creates accounts, sys. authorization, etc.). Account password authentication is done. Minimal user profile contains shipping addresses. In V0, ASF will be compatible with user authentication and profiles.	System is open to all for most functions. Registration required to place orders. GLIS was the foundation for the V0 IMS. V0 asks for the users affiliation while GLIS extracts the general affiliation from the users e-mail address (e.g., "edu").	User Registration, ~~password and~~ User profiles (organization, occupation address, etc.) ESDIS IMS. User profile inf. is subset of local GDAAC profile inf.. **Password required only for restricted data access.**	User profiles is a superset of what ESDIS IMS will have. Shipping information, but no billing information. Use both a fixed distribution list and users calling User Support Office if they need data, or to be added to distribution list.
2. Dumb Terminal Support - Dial-up - Network connection with terminal	ChUI with graphics extensions for Internet and Mac/PC modem users.	Character GLIS on PC as well as on UNIX	Yes - Alpha numeric IMS **Dial-up and Network connection**	Yes
3. Executive Function - Higher level menu that provides single access to all ECS applications	Not a V0 Function.	Not a V0 Function.	Not a V0 Function.	Not a V0 Function.

SDPS	ASF	EDC	GSFC	JPL
Algorithm Integ. & Test 1. Tools - Standards checkers (coding standards, PGS toolkit use) - Code checkers, static/dynamic/performance analyzers - Resource management tools - Development environments (compilers, linkers, debuggers, etc.) - CASE tools - Data checking tools - User interface	Planned for Radarsat upgrade.	LAS tool, ADAPS reused. C, FORTRAN, TAE CASE tool Software Through Pictures, Purify (a code cleaner like lint), Code Vision Geometric Correction and Atmospheric Correction code reused extensively.	Planned SGI Code View. SGI development tools C, C++, FORTRAN. Kronos scheduler planned with LISP compiler. Utilities to gather information on CPU usage referenced in SeaWiFS mini-test procedures.	TOPEX/POSEIDON merged GDR algorithms for T/P enhanced level 2 and level 3 products have been provided by the TOPEX and POSEIDON projects and members of the TOPEX SWT Will archive algorithms for EOS ALT reprocessing. Algorithms provided by E. Rodriquez will be used for a new geophysical product from TOPEX Altimeter SDR. Product specific QA tools [MGDR, Pathfinder] Data production string for MGDR. CD-ROM pre-production capability. Pathfinder data processing string.
2. Procedures - Algorithm delivery procedures (New algorithms, Updates to existing algorithms, Updates to calibration and other data files) - Documentation of procedures - Formats/templates for reports, test plans, and other required documents - Creation of algorithm metadata	For Processor, team evaluation for Level 1 and UWG review for Level 2.	Anytime change is made to LAS I&T is done but not formally documented. There is a standard Project Request Form (PRF) used to get change approval but each project monitors its own requests and has their own PRF tracking system.	AVHRR Transition Plan ~~is currently being worked/coordinated~~ **4/18/94.**.	Yes. Data Management Plan (DMP) System Integration and Test Plan (SITP). Configuration Management (CM).

SDPS	ASF	EDC	GSFC	JPL
SDPS Scheduler 1. Automatic and Manual Scheduling of Processing, Data Distribution - Automatic scheduling software - Manual scheduling procedures	Prototype planned for Radarsat upgrade. Manual time allocation. Manual production scheduling.	ADAPS AVHRR pass schedule is manually loaded into data base which is used to do antenna pointing to track the satellite as it passes overhead. Data is batched for down stream processing which is data availability driven. Weekend passes are captured on 3480s using tape stackers. Landsat Pathfinder Processing history collected - good case for PGS study. Real time AVHRR processing uses spacecraft schedule to schedule processing of signal data. Landsat MSS data was processed with EDIPS which had capability to accept data acquisition requests made by phone calls from users. Good procedural experience but a very manual process.	~~Planned (Kronos)~~ DADS has resource manager. **DADS has simple automatic scheduler.** **More powerful scheduler (kronos) planned.**	PGS for TOPEX/POSEIDON will track the schedules required for the products to be generated. MGDR uses manual schedules. Pathfinder will use an automated scheduler with manual override. An ftp site is being prepared.
2. Staging/De-staging of Ins/Outs - Software/Procedures for staging processing inputs and destaging processing products	?	Yes - custom	~~Planned~~ **Yes**	Incoming data is handled with product-specific tools and procedures. PGS scheduler includes I/O.
3. Task Initiation - Software/Procedures for initiating processing per a schedule	Manual, by operations.	Yes - AVHRR processes initiate tasks. DORRAN/PCS (Production Control System) has some potential here.	Planned	Manual
4. Communications w/ SMC	No	DORRAN/PCS relates to this somewhat	No	Status of PGS production, Pathfinder.

SDPS	ASF	EDC	GSFC	JPL
5. Communications w/ EDOS/Pacor	No	Kind of like EDC interface to EOSAT	No	No
6. Communications w/ FDF	No. ASF communicates with foreign flight agency to obtain ephemeris, send DARs, and receive schedules.	ephemeris from Navy Space Surveillance	No	Manual and automated file transfer, as required, from project offices (planned for NSCAT).
7. Processing Control Language - Scripting language tailored for running processing algorithms	Yes - DCL and UNIX scripts.	TAE and shell scripts	**UNIX and TCL scripts**	No
8. Publishing Production Schedules - Software/Procedures/Formats for publishing planned production schedules for the rest of the user community to persue	No	DORRAN has order status, scheduling is manual	No	Manual
9. Messages to Production Monitor Personnel - Messaging software, types of messages which have proven useful	Yes - both systems.	DORRAN used for this on the floor, thinking about adding a specific subsystem for this.	Planned	On-screen text messages to operators.
10. User Interface - Any kind of specialized user interface tailored to scheduling personnel	Yes - for operators only.	Yes - custom by product type	Yes (Internal staff interface) ~~"Staff Tools"~~	No
11. Error Handling/Recovery - Software/Procedures for recovering from aborted product generation due to errors, crashes, etc.	Poor	Yes - console messages and other monitoring (e.g. Bit Error Rate detectors are monitored on tapes) Famous for recovery from bad HDT (High Density Tapes).	Yes, manual procedures. Plan to incorporate better error detection and tracing capability (e.g., flow through all s/w processes).	As provided by the operating system and the Pathfinder production system.

SDPS	ASF	EDC	GSFC	JPL
Information Search 1. Directory Search	Available to authorized users and guest account (search capability only). V0 compatibility in July, '94.	Yes - GLIS With Directory (summary), Guide (summary details) and Inventory (to granule level). 30 USGS data sets now available, cannot query across data sets for now, links are provided to about 8 other systems including GCMD, CCRS, Sinfonia, and PLDS.	Extending ESDIS GUI for local functionality. Supported by server to ESDIS IMS clients. ~~Local ChUI.~~ **Data product searches supported in local CHUI.**	Supported by server to ESDIS IMS clients. The V0 IMS does the information searches, so everything in the "V0 System" column applies.
2. Inventory Search - Core metadata - Spatial queries - Complex queries (i.e., the use of "not", "and", or "or" in the query) - Dependent valids - Coincident search	Local ChUI with graphics extensions. Processed image inventory available for ordering on-line. Core Metadata = time, space, and spacecraft. Yes - spatial queries. Use binning algorithm (needs improvement). Complex queries - support queries on any combination of metadata parameters (approx. 40), either core or secondary. Can be very slow. No - dependent valids. Support coincident searches for SAR image sets only. Search presently limited to processed data only. May incorporate some NSIDC capabilities with V0 (i.e., spatial query).	Yes, (considered metadata search) Same as V0. No coincident search.	GUI & ChUI coincident, "brute force" query, user specifies primary data set, and secondary data sets that are compared against the primary . Will add coincident search to local GUI. **Core metada: dataset, data product,sensor, platform, parameter, lat/lon, begin/end date.** **Dependent valids in local CHUI, incl auto fill-in.** **Limited 'or's supported for specific parameters.** **Spatial queries: rectangular & quadrilateral search areas**	Subsets of data based on temporal and spatial criteria specified by the users (I think this refers to Subsetting below the data set level to data granules) - using ESDIS IMS client for GUI - core metadata inventoried by geo-reference and time, spatial queries same as ESDIS IMS, dependent valids as implemented by ESDIS IMS client - no complex queries or coincident search IOS is the DAAC Interval inventory system, which will have a DAAC-specific set of capabilities.

SDPS	ASF	EDC	GSFC	JPL
3. Guide Search	Current ACS has limited Guide functionality. Upgrades planned 7/94 through ESDIS IMS.	Yes GLIS	Yes. Not populated. Developed widget that interfaces with WWW and WAIS servers. (This is V0 system.) We will have it by default in our GUI. ChUI ~~probably won't~~ use**s** WWW ~~WAI&S~~.	Will support ESDIS IMS guide effort. Uses V0 System.
4. Guide Development - Tools for creation of guide				None. Use V0 guide.
5. Reference Search - Algorithms, calibrations, etc.	On-line bibliography capability. Available but not populated.	Yes, part of the Guide Information	Yes - documentation. Some information on algorithms, calibrations, etc., provided in the guide	Algorithm, calibrations, etc., available in the guide inf.
6. Display Results - Coverage map - View details - Showing coincident results	Alpha-numeric tables and coverage map through graphics extensions.	Coverage map provided in XGLIS coverage. Does everything V0 can do.	Yes (coverage map, view details, coincident results is planned). coverage map is same as ESDIS IMS. View details is same as ESDIS IMS. Sort by date and time like ESDIS IMS. Cross-DAAC mode of GUI is the same as ESDIS, but local mode will have local functionality.	View details is same as ESDIS IMS Sort by date and time like ESDIS IMS Coverage maps off-line (hardcopy) for MGDR. (Assuming here that this relates to Browse products.)
7. Data Set Specific Search Parameters - Search on attributes related to a specific data set (i.e., path row)	Yes - SAR images have common metadata, upper level products have own metadata. All metadata fields are searchable and reportable.	Yes - AVHRR has 15 parameters, MSS has 17, TM has 19 ... only 4 or 5 of these are common parameters.	Yes, if required by science project.	Yes, a local, non-IMS capability. Available in the IOS, the local version of IMS.
8. Data Set Specific Results	Yes.	Yes	**Yes, dataset specific attributes supported.**	Yes, part of previous local capability. The IOS is the interface seen by the DAAC users.

SDPS	ASF	EDC	GSFC	JPL
9. ADC/ODC Inventory Interoperability	Interoperability with CSA. Radarsat catalog in V1 timeframe. ASF gets Greenwich Hour Angles from JPL via FTP.	Yes - Landsat & AVHRR data sets can be accessed even though not transitioning to ECS (where ADC is the DAAC itself) Level 1 (to the front door of the data centers IMS) interoperability to 8 other systems.	No	No
10. Design Documents - Edits have the ability to search design documents in general	No.	Yes - hypertext for developers, but not through the IMS yet. Some image display software distributed on CD ROMs.	Yes. Some high level, **online, hypertext, for internal consumption**	Paper and electronic copies available.
11. Browse - Ability to query browse data - Ability to display browse data	Hardcopy prints of image.. Looking at degraded SAR to support V0 browse.		Yes - Distributed software as a product to user workstation; user can order product from local browse s/w; map overlay; overlay granule coverage on browse image. Provides ability to browse and order data even when not attached to search & results process. Will display multiple images from one file. Mapping between browse granule and corresponding data granule gives product request re-using ESDIS server. Yes, if generated by science projects.	Same as ESDIS IMS Will include a browse mechanism which supports multi-image HDF browse files. Will be called “browse viewer”. The same files will be used with FrameViewer and by the V0 guide in HTML. The Browse data will be on CD-ROM.

SDPS	ASF	EDC	GSFC	JPL
Archival Product Requests 1. Product Requests - Product orders - Media/Electronic - Spatial/Parameter subsetting - Standing orders	Placed by users or ops. staff in case of error recovery. Due 7/94 through ESDIS IMS. Current system allows product requests for processed data. FY'94 adding product request from raw signal data.	Standing order capability. Every order is verified via phone call to requester. (assume generation request here) implied in order, special products produced for cooperative agencies, many orders for level 1	ChUI manual **standing** ~~Automatic~~ order database. FTP held for 3 days. (minimum) **Spatial and parameter subsetting planned**	Limited. Automated on-line ordering system will be open to UWG and selected members of the scientific community. Use V0 IMS. Now done by phone/e-mail with User Support Office.
2. ADC/ODC Product Orders	Manual or through V0 System IMS.	EOSAT=ODC (where EOSAT TM metadata is stored at EDC mixed with EDC TM metadata) SPOT=ODC ESA exchange of AVHRR 1km data is another ODC example. Through V0 System IMS.	None other than own holdings. Through V0 System IMS.	None other than own holdings. Through V0 System IMS.
3. ADC/ODC Browse	No	Not image browse but metadata browse, EOSAT CORE can support image browse.		None other than own holdings.
4. Distribution Authentication - Checking authorized users for restricted data sets (How?, Custom or COTS?)	Verified when order is placed.	All orders have personal call to authenticate	Yes. Not automatic. Semi-automated data security, data authentication **(custom)**	Yes, through User Support Office (USO). Some ERS data is proprietary. There is a TOPEX verification period.
5. Order History (i.e., What is tracked per order? Stored in DBMS? Available reports? How long is it kept?)	Yes - Lists of images ordered and by whom.	Yes, DORRAN is very complete, data is archived forever, customer satisfaction surveys are taken with cards sent out with the orders.	Yes **Status, dates tracked in RDMS Routine and custom reports kept some months then "archived" to separate table.**	Yes, manually through user profiles and DOTS. Summary reports are generated through DOTS.
Processing Request Services				
1. Ancillary Data Sets for Processing (i.e., stored, displayed, queried)	Not currently distributed (time correl. elements, ephemeris, wind and temp. data) (UNIdata)	Yes - Ephemeris, DEMs Ground Control Points (GCP), Digital Line Graphs (DLG)	AVHRR processing	JPL will archive ancillary data for reprocessing of EOS ALT and SeaWinds, TOPEX, NSCAT, etc.. No automated methods.

SDPS	ASF	EDC	GSFC	JPL
2. Ancillary/Aux. Data Limits Checking & Pre-processing - QA of ancillary data - Reformatting - Regridding	Yes	Assume all data provided from other sources has been QA'ed but have many examples of errors. NLAPS does gross limit checking.	No	No Flight project people have the responsibility for ancillary data reliability.
3. Level 0 Data Validation - "Generic" validation of Level 0 data prior to processing	Yes	Visual QA of Landsat as big backlog is reprocessed from HDT to archive (NLAPS and TMACS) but not every scene is checked - just a sample is. All of MSS was checked. Assume QA for TM from EOSAT is correct.	No (no level zero data)	No level 0 data at this time. But this would not be performed by request; checks done upon data receipt. MGDR validated at Level 2. Pathfinder data at Level 1B.
4. Processing - Standing order product processing - On-demand product processing - Changes to standing orders - Priority processing requests - Quick-look processing - Reprocessing - Recovery procedures	No - standing order, changes to standing order Yes - on-demand, quick-look, reprocessing Priority proc. - yes, but with greatest reluctance Recovery procedure - too many manual recovery procedures -- tools needed!	Yes. Quick-look processing has been done in isolated cases for AVHRR.	Standing order and on-demand capability. On-line order capability is limited by data sets that have currently been ingested.	Customer processing to be performed based upon user request. Spatial and temporal subsetting for some data sets. Pathfinder has planned capability.
5. Metadata Creation/Uploading/Updating - Creation of inventory metadata during processing - Uploading of metadata to IMS - Updating of existing metadata (e.g., updating of QA flags after manual QA)	Yes	Yes, examples of automated metadata creation where data is taken from headers upon ingest and where tape IDs are changed.	Yes Data ingest ~~strips~~ **extracts** metadata & sends to IMS.	PGS will provide metadata.

SDPS	ASF	EDC	GSFC	JPL
6. Product QA	Visual Inspection Manual QA of GPS (Geophysical Processor System) data. Maintain SAR calibration arrays in the field SAR processor validation SAR inter processor calibration Planned to coordinate cross-calibration of ERS-1 and ERS-2 Media QA performed	Yes - metadata is an active interface, QA flag can be updated. Random sample of tape products are read to make sure they are readable, custom products are closer checked, all photos are QA'ed.	Yes - limited Manual QA of TOVS Pathfinder level 3 data. AVHRR products are quality checked. A commercial image processing package is used for some checking (EASI PACE).	For Pathfinder and the MGDR, JPL will provide quality control of data sets that are generated. Data flags alert user to special conditions. QA checks software.
7. Processing Tracking, Logging, Reporting	Primarily manual now - some database support available. Additional tools required.	Yes - AVHRR data flow good but may not automatically collect/store much history but best example is an SCF supported by EDC for Landsat Pathfinder. NLAPS collects processing history and the history is part of the product.	Yes - More planned IMS and DADS log improvements have currently been recommended. Master Scheduler keeps track at the order number level, but this order number is not flowed through the individual routines. This is one of the planned improvements.	Yes, a QA report.
8. Collection of Mgt. Data - Fault detection and reporting	Very little error processing in the current system.	Yes - time to complete order - other "marketing" information also collected.	**Operator alerts** Planned	Manual record keeping.

SDPS	ASF	EDC	GSFC	JPL
9. Multi-DAAC Orders - Data obtained from more than 1 DAAC to be used in product generation or to satisfy a user request	Only 1 DADS - manual coordinated User Services	JPL, AMES, STENIS For example, EOSAT sends data to EDC to mix with EDC based data to complete order; SPOT data is distributed by EDC. EDC acts as a broker for others. A mechanism was developed to pass order requests from the IMS to JPL for product generation of AVIRIS data sets. (1994) The definition, development and implementation of software, procedures and associated user documentation to facilitate the distribution of raw and higher level products to the science community in HDF or other acceptable format on a variety of media or via electronic networks.	~~Yes - Data sets saved for multiple orders~~ **No**	No

SDPS	ASF	EDC	GSFC	JPL
Manage Storage System Service 1. Send Distribution/Staging Status - Manual override of distribution priorities - Tracking/reporting Distribution Status and history - Distribution status provided upon request - Verify/check distribution correctness	Operator control of priorities. User status inf. cryptic but available on-line.	In the areas of archive management, order processing, and distribution functions, the DAAC is able to utilize existing EDC systems and operational flows with little or no modifications. Emphasis on history, tracking, metadata and browse going into the EDC production database system. DORRAN keeps records forever. As data is ingested, metadata is created and stored in DORRAN. Ext. users cannot access DORRAN, user support services access the sys. in response to user requests. DORRAN scene hit list printout are sent to users who pick what they want from the list.	Much automation planned, cost estimation. User services interface is the same as "Staff Tools" Automated verify user request correctly translated; manual check by operators; automated sample of 3% of distribution tape media. Automated sampling of VHS tapes planned. **User correspondence tracking.**	Statistical information maintained, distribution requests tracked. Selected samples report; statistical information maintained in Ingres database. Handled via DOTS.

SDPS	ASF	EDC	GSFC	JPL
1. Send Distribution/Staging Status (continued)		DORRAN computes cost to user from the user order. User Services checks w/ user to see if they still want order after cost is computed. Credit card or cash in account at EDC required before order is processed for non-govt. orders. DORRAN generates prod. production instr. to production staff and prints labels for mailing out prod. orders. DORRAN has a complete accouting sys. that interfaces electronically to many govt. agencies; it uploads billing to these agencies. 6 indep. copies of DORRAN are running at various USGS sites that can talk to each other. DORRAN can handle the gambit of accounting problems incl. Gov. regulations, refunds, ... Manual, call customer service.		
2. Report on Resource Conflicts - Take corrective measures when network performance impacts distribution - Manage contention for storage system resources	No	UNITREE handles some of this, tape drive contention occurs, Operating System handles alerts.	Current resource information is being collected, however, there are no defined user reports.	Site fault detection and correction
3. Manage Element Resource Utilization - Alternate between tape units to minimize overuse of any one tape unit	Tricks with wires and mirrors (i.e., manual)	Manual planning activity prioritizes the addition and allocation of resources such as disk and tape units.	Yes Resource manager **UniTree uses tape drives in defined order, which can be adjusted to avoid overuse.**	

SDPS	ASF	EDC	GSFC	JPL
4. Generate Accounting Inf. for Distributed Data - Generate distribution reports - Cost and billing information	Yes	Yes, for file transfers, for the silo and performance status on the EPOCH, networking status.	No billing is involved, but user order information is tracked in an Oracle database. The Staff Interface is used to generate reports.	JPL maintains a user database to document the data ordering cycle and support data distribution; system also supports generation of user statistics. No billing is performed.
5. Monitor Status of Storage Systems - Performance	Manual	Yes	Planned - GUI displays for status, performance monitoring	Manual monitoring, no formalized parameters.
6. Collect Storage System's Operating Statistics - Performance - Security - Fault	Yes for ACS (I/O, memory-performance stats), otherwise, manual - more needed	Yes, using operating system account utilities	Planned	System usage report, user processing statistics kept in Ingres database This is not automated.
7. Storage System's Operator HMI	Yes - menu-driven - GPS, ACS ChUI Simple QA and lists on processor.	Yes - custom by system and data type based on generic code library (ADAPS) where AVHRR is the model. ChUI interface to archive database.	Yes ~~DAAC Staff Interface (GUI)~~ **command line only.** **Storage system almost completely automated.**	Yes Vendor supplied (i.e., Metrum)
Toolkit Services 1. PGS Toolkit - File I/O tools - Error/status reporting tools - Process control tools - Ancillary data access and manipulation tools - Time and date conversion tools - Math and modeling support tools - Constants and unit conversion tools - Graphics support tools - I&T support - Platform data simulation tools (ephemeris)	None used now. In Radarsat, plan to use PGS toolkit.	LAS is main tool and public domain software. Geolocation and terrain correction software. ARC - Inf. custom routines, PVWAVE, Image Display Language (IDL). TAE much reuse LAS and ADAPS.	AVHRR ~~is in the process of~~ transition**ed** to the DAAC. AVHRR processing s/w includes time conversions, sun vector computations, satellite position and velocity computations, sensor orientation from orbit position, and others. Refer to the AVHRR description documentation.	PO.DAAC has no tools to contribute to others for V1. DAAC uses some COTS, IDL visualization tool.
2. IMS Toolkit - IMS server API for update, query, DBA utilities	None now.	IMDIS software from Goddard includes on some CD ROMs.		ESDIS capability.

SDPS	ASF	EDC	GSFC	JPL
3. Data Visualization - 2D & 3D plots - Earth coordinate cursor - Contour plots - 3D surfaces - Image manipulation		Builder Xccessory used to build IMS window templates.	Image zoom by 1994	Browse, IDL, NCSA
4. Geographic and Geophysical Overlays (i.e., embedded in data or visualized at runtime?)	?	Yes - Geographic overlay for showing data coverage in XGLIS.	~~No, unless embedded~~ **Yes, if info is included** in the products.	No, unless embedded in the products. For Pathfinder, uses a hand mask.
5. Production Management Toolkit	Will be developed for Radarsat			
Communication Services 1. Bulletin Board	Yes, but poorly designed.	Kind of in GLIS - one way, ADP INFO is used for EDC internal status (one way interface).	News Service within IMS. **Dataset comments submit and view within IMS**	Update of PO.DAAC.DATA bulletin board on OMNE. Quick-Look Bulletin Board for TOPEX/Poseidon data.
2. User Feedback - Facility for user to enter comments - Facility to ask questions of user about tools	Feedback to user via e-mail as instruction warrants.	Yes at any screen in GLIS, forms with distributed data, THIS NEEDS TO BE REPLICATED IN ECS	Yes - submit and view comments from others on data set and/or DAAC.	Done through User Support Office.
Distribution Service 1. Distribution Media	8mm, photo products, 9 trk, CD ROM sampler in production 4mm and electronic FTP planned	8mm, 4mm, 9 trk, 3480 tapes, FTP, film (b/w & color), CD-ROM (1994) electronic networks, transparencies, CALCOMP and photo-like plots. 4mm capability exists but is used for a custom interface and is generally not available to everyone	9 track, 8mm, 4mm, CD ROM, FTP. Floppy's, hard copy, 3480 cartridge, VHS tapes. Manual shipment of physical media. No automatic labeling.	8mm, anonymous FTP, 4 mm, CD-ROM, FTP 9 track, 3480 cartridge, 5 1/4" floppy, 3 1/2" floppy, QLBB.

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2. Distribution Formats - Format conversions - Quick-look products	CEOS current, HDF planned Level 0 are identical to standard product in format.	Native COES - no HDF data sets but some (Aircraft Scanner) HDF browse (1994) The definition, development and implementation of software, procedures and associated user documentation to facilitate the distribution of raw and higher level products to the science community in HDF or other acceptable format on a variety of media or via electronic networks for AVHRR 1KM 10 day composite and related orbital stitch data sets.	No - Distributed in current format. UNIX compression distribution option.	HDF, plus native formats: AVHRR Oceans Pathfinder to be in 9 km gridded fields in HDF QLBB permits access to IGDR in near real-time by the SWT. Native, HDF, CDF, netCDF, determined by PO.DAAC UWG; Extract regional data products from global HDF fields of MCSST and AVHRR Oceans Pathfinder; some data sets converted to HDF (SSM/I, CZCS, AVHRR Oceans Pathfinder, AVHRR). Quick-look bulletin board
3. Prioritized Distribution - Process data transfer delay or cancellation	Yes, manual	Yes	No	The Project SWT is highest priority during verification period. Flight Project priorities on data distribution (TOPEX/Poseidon, NSCAT, ERS-1/2) are met before other data sets.

SDPS	ASF	EDC	GSFC	JPL
4. Browse Storage - Browse archive characteristics	Hardcopy prints available	Yes - AVHRR browse is on line (JPEG compressed), TM & MSS is on tape for now, Aircraft scanner is on line in the EPOCH. Aircraft scanner is stored in HDF in 24 bit but is dithered to 8 bit in real time as it is sent to the V0 client. Browse stored in native and converted to HDF on way to V0 IMS, some browse for data sets that will transition to ECS stored in HDF, 4 data sets have no browse. AVHRR browse stored JPEG compressed.	Currently, browse images exist only for AVHRR Pathfinder data. They are being compressed using UNIX compress, which is the GDAAC standard compression tool. Images are reduced from 344K to 90K (just < a factor of 4). GDAAC anticipates browse images for 2 other data sets in the future, TOVS and SeaWiFS. The content of these future browse products is still TBD, thus it has not yet been determined if they will be compressed or what the factor will be. The one certainty is that if they are compressed, it will be the std UNIX compression tool.	Stored on-line and on CD ROM.
5. Subsetting/Subsampling	No	Yes - much work on this, advanced concepts considered good ideas for ECS prototyping. This is data set dependent.	Developed AVHRR land continental Sub setting software for distribution. Will have HDF parameter subsetting.. Will have geographic subsetting for global products. **Automatic subsetting planned**	Software will be developed to extract regional data products on demand from global HDF formatted fields in support of the distribution of the MCSST data set and of the AVHRR Oceans pathfinder data set. Fill Order performs subsetting (time, location), gridding

SDPS	ASF	EDC	GSFC	JPL
6. Push vs. Pull of Data Distributed to Users		Today, hard copy (film, tapes,...) data is sent to users if payment is in place. No electronic shipment in place today but soon users can pick up data via anonymous ftp account. Users will be notified by e-mail of data availability.	User notified. FTP file transfer by users; deletion from distribution areas based on time and disk space reqs.	Push vs. pull, data staged locally, user notified, data deleted after 72 hr. For all FTP's, user pulls the data.
7. Read Software	Yes - CEOS Reader and SCF tools	Data set specific	**Yes**	Read software available and specific to each product.
Application Program Interface (API) Services 1. Local User I/F	No	No API	No	No
2. Metadata Searching	Currently planned for Radarsat.	No API	No	No
3. Guide	No	No API	No	Nothing now. Plan to use ESDIS.
4. Archive API	No	No	No	No
Data Acquisition Requests 1. Orbital Model Display - IMS portion of DARs - DAR submission	Submits DARs to foreign flight agc. for scheduling. In future, geographic display available via user interface.	Old MSS system had standing acquisition requests and customer services reported back to flight ops., an AVHRR project had a say as to what scenes would be saved on the LAC recorder and DOD has called in requesting EDC to advise NOAA, not part of GLIS.	~~N/A~~ ~~Will have by 7/94. Will be working w/ MSFC on theirs~~ **No**	None
Statistical Collection for LSM 1. Monitor IMS Usage (i.e., what statistics are kept and how are they implemented?)	Yes - manual and limited automated	Yes - GLIS	**Log files with log-reader.** Statistics are kept in an Oracle database, with limited reporting capability. Additional statistics are still required.	Collect statistics on Browse and Order requests using DOTS (Data Order and Tracking System)
2. User Access Patterns (i.e., what and how?)	Limited available - need more	Maybe not to individual user. Could be done but USGS policy prohibits this for client confidentiality.	Monitor media, type of access, who ordered what data sets. **Usage tracking planned.**	Software will be generated to capture user statistics from FTP transfers, and to transfer them to the DOTS,

SDPS	ASF	EDC	GSFC	JPL
Ingest Service 1. Basic Electronic & Tape Ingest - 8mm - 6250 bpi - CD ROM	Don't ingest from outside now. With Radarsat, planned to ingest foreign station signal data and associated metadata.	Data set dependent: 4mm (one case), 8mm, 9-trk 6250 bpi, 3480 cartridges, CD-ROM, HDT Electronic: Procedures were developed and tested to support the transfer of AVHRR HRPT and LAC data to and from the NSIDC DAAC via the Version 0 DAAC-to-DAAC network. It is estimated that data transfers would involve approximately 600 MB of data daily.	Yes 9-track tape, 4mm tape, 8mm tape, 3480 tape, CD-ROM Use client server data transfer program for electronic transfers.	9-track, CD-ROM, electronic file transfer, 3480 cartridge, 8mm cartridge, hard copy, 4mm DAT, Sony optical disk, floppy
2. Media Formats - Tar, backup, ...	N/A	TAR, backup - not for ingest, prefers ANSII labeled tapes, HDT is CCSDS telemetry scheme, many custom tape I/O device drivers	Yes (TAR) Use COTS to translate from VAX/VMS to UNIX; tar; magnetic tape archive.	UNIX unlabeled tapes, and VAX labeled and unlabeled tapes, tar tapes
3. Data Checking - Media readability - Checksum - Check format - Check data ranges	N/A	Yes, data set dependent	QA software for TOVS Pathfinder L3. Checksum built-in processing sequence. Automated check user request; Operations personnel check. QC software used in AVHRR post processing (EASI PACE)	Various quality assessment checks; check media readability, check data format; product QA provided by PGS, DADS QA

SDPS	ASF	EDC	GSFC	JPL
4. Receive HDF & Native Formats, Format Conversions	N/A	Yes, native.	Yes Translate UARS L3A to HDF Vset. HDF conversion software for TOVS Pathfinder. TOMS2 L3 translation to HDF. CAC-SST, TOMS2, GridTOMS, UARS, AVHRR Land Pathfinder, SeaWiFs ingest. AVHRR L1B (p), TOVS processing(p), TOGA-COARE(p), AVHRR/Pathfinder Atmosphere & ancillary data ingest. TOVS/pathfinder ingest (L3, L1b). Meteor3/TOMS2 ingest (L3). 15 yrs. TOMS conversion to HDF. CZCS ingest L1, 1a, 2, 3.	MCSST/CZCS CD-ROM; ERS-1, ERS-2, NSCAT, TOGA CD-ROM, SSM/I Oceans products, altimetric CD-ROM, TOPEX/POSEIDON, AVHRR Oceans Pathfinder, SeaWinds; Data format standards task. Read & display software for all data sets. Some enhancements of levels of service. Ingest of ERS-1 low bit rate data into a private archive. Ingest of TOPEX/POSEIDON, AVHRR Oceans Pathfinder into public archive. Ingest Level 0 through level 4 algorithms, ancillary data, metadata, data, and correlative data. On ingest, data quality and completeness will be verified.

SDPS	ASF	EDC	GSFC	JPL
5. Data Compression Techniques	N/A With the exception of one Level 2 product compressed with run length encoding (RLE), no compression in being used.	No compression is done on standard products. For browse, some advanced work (e.g., AVRIS compression study) EDC has also been testing the recent incorporation of JPEG compression capabilities in HDF and investigating their possible implementation in AVHRR browse delivery to the IMS. Today, V0 IMS AVHRR browse data is JPEG compressed on WORM drive. For V0 IMS the browse is decompressed, converted to raster, put into HDF and shipped to the user. In the future, the raster will be compressed and sent out in HDF to user for V0 IMS client to decompress. For GLIS, the browse is sent compressed to the client on the users machine where the client uncompressed it.	Standard UNIX. Study of software compression techniques. Currently all AVHRR is compressed before archive and distributed in compressed form. UARS is always not compressed. AVHRR Pathfinder data is being compressed using standard UNIX compression. In general, data is distributed as archived.	No. HDF.
6. Metadata Generation on Ingest - File location or file identification - QA status	N/A	Yes - QA flag not from an Expert System but following technology to do this someday.	Yes - some data	Generates inventory entry on ingest of TOPEX/Poseidon QA, pathfinder, MGDR. Difference from core V0 metadata attributes - TBD
7. Receive Metadata, L0-L4 Data Products, Instrument Data - Schedules - Status	N/A	Yes	Yes	Yes, to all.
8. Scan Hardcopy for Ingest - Data or documents	N/A	Yes, digitize maps to make Ground Control Points.	No	Planned

SDPS	ASF	EDC	GSFC	JPL
9. Request Re-transmission of Missing Data	N/A	Yes, manual (AVHRR and MSS)	Requests all	Yes, automated for TOPEX/Poseidon IGDR/GDR, AVISO/CNES GDR.
10. Push vs. Pull of Received Data	N/A	Both; stage data for NSIDC pull, receiving pushed data, doubt pushing data to external interface except for V0 experiment	Push, using client/server file transfer software.	Data ingested under submission package worked out with project. Presently, the data is pulled in.
Archive Service 1. Import & Export Physical Data - Manual or automatic remove/add of media to archive) - Recover data from failed devices and media	Receive Level 0 data directly from softcopy to a HDDT (DCRSi)	Yes.	Yes, for CD ROM. Planned for Metrum tapes and ATG WORM platters.	Manual
2. Automatic Copying/Refreshing of Media - Manage media degradation	2 original copies made on signal acquisition - if working copy goes bad, new one copied from archive.	Semi-automated process. Previously, tapes were mounted and are monitored manually. The schedule for refresh to media was manually scheduled based upon media life expectancy. Now specific BERT testing is done on DCRSi data.	Error detection and correction code for optical disks and VHS tapes.	Planned. Manual at present.

SDPS	ASF	EDC	GSFC	JPL
3. Integrated FSMS to Manage Archive	No	STK SILO/UNITREE and EPOCH EPOCH's FSMS, not for off-line data. The archive storage for these data sets are in environmentally controlled space, access control system security etc. and has a UNIX based relational database tape archive inventory management system to provide inventory control and report writing capabilities. The tape archive inventory management system contains no science metadata. This system contains archive housekeeping information concerning storage location and media health.	Yes - UniTree has been enhanced to support asynchronous I/O to take advantage of multiple CPUs and to improve performance for simultaneous archive and distribution.	Maintain according to NARA/NIST, configuration control of data sets. Off-line inventory. Metrum mass storage device.
4. Verify Data is Present & Accounted for	Yes - manually - need tools	Yes - manual	Yes	Yes It is manual, with Metrum/Unitree to be implemented.
5. Deletion of Archive Data	Bad images hidden in catalog - available in archive.	Data is not deleted but a scheme exists to mark data as not available.	Replacement policy is planned	Upon scientist/UWG approval

SDPS	ASF	EDC	GSFC	JPL
6. Data Archive Integrity Check	Manual checks	Yes, Bit Error Rate testing. On the DCRSi cassettes EDC is writing 3 BERT patterns at beginning, middle, and end of tape. After tape is complete, EDC reads the error patterns and collects the min., max., and med. error rates; this data is saved into a file for future ref.. The file is checked when the tapes are played back. EDC ensures that tapes are w/in a min. req. and EDC is looking for long-term changes to give clues when media migration must start. The tape library also has a few cassettes that have known patterns that are read for tests periodically to see how many times a tape can read before it fails. EDC has done this once a week for a year and has not seen any degradation yet.	Manual	Yes, manual.
7. Backup for EOS Data - On-site - Off-site	No	No, two copy process where master tape stored and working copy used in distribution for popular data sets	No. Off-line archive. Backup of L1 is provided at data producer site. Full archive backup planned.	One copy in mass storage device and a second copy maintained in deep archive
8. Restore Archive	Yes - for individual tapes (manual), optical archive may require reprocessing to restore.	Have assisted others. Parts of many of the data sets are duplicated at other sites.	Backup copies planned	Yes

SDPS	ASF	EDC	GSFC	JPL
9. Capacity to Ingest 3x Normal Ingest Volume in 1 Day	No	Real time sys. are sized to handle slightly more than 100% max. downlink - no req. to handle 3x volume. Data spools to tape and there are enough time slots to catch up w/ backlog as well as to accept data on tape from other sites. Backlog on AVHRR data from ext. sites is substantial but processing is sized to meet users needs. Sys. are augmented for more capacity if user demand warrants it.	~~No - Inadequate space and performance.~~ ~~2 days worth planned.~~ **10x ingest rate planned for SeaWiFS**	Archived based upon project requirements (e.g., archive 10 days of TOPEX data in 1 day). Not for Pathfinder.
10. Monitor Bit Error Rate (BER)	Yes, for raw and Level 1 data	Yes	No	FTP BER for data transmission.
11. Stored Data Format - HDF - Native - Some other format	Varies as a function of data set. CEOS for image data, machine dependent for signal data, pseudo-CEOS for GPS	Native ANSII labeled 3480 is the standard but data set dependent. Production metadata is kept with the browse record.	**As received (HDF or Native)**	Determined by PO.DAAC UWG, HDF Native DSP.
12. Monitor Archive Performance	Yes, mostly manual	Yes - manual	Planned	Provide quarterly report
13. Prioritized Data Retrieval - Browse, quick-look, standard products assigned different priorities	Yes, user driven	Yes - manual	**Yes, browse kept on mag disk.**	Yes - done manually
14. Track Access to Specific Data Granules	Yes - better tools needed	No	~~Planned capability~~ **Yes, report capability planned.**	Done via ordering system.
15. Archive Hardware	DCRSi tape drives	High Density Tape recorder (old system), 3480 is current standard, 9 track tape, DCRSI, STK Silo and EPOCH jukebox	Cygnet 1803 12" Optical WORM jukebox (1179 GB); Metrum RSS600b VHS Automated Cartridge System (ACS) (8700 GB), SGI 4D/440S 26 9 GB mag disks magnetic tape (p).	Data Storage controller, controlled by SGI. HSC 50 8 GB 16 Disk drives DEC type RA81 Metrum

CSMS	ASF	EDC	GSFC	JPL
Communications Network Infrastructure 1. Network Components - Gateways (X.400/SMTP) - Routers - Hubs - Circuits (site-to-site, i.e., including DAACs and selected ADCs and SCFs) - Dial-up access	Via Internet and SPAN. 1200 & 2400 Baud dial -up T1 link shared by mission success and mission critical networks Ethernet LAN 1 cisco router 256 kbps link to JPL	Yes 2 cisco routers (primary Ags +, backup IGS) Ethernet LAN 256 kbps link to MSFC 5 WANS: DAAC - DAAC, NSFNET (T1), NSINET(T1), GEONET II (2 T1s), BANYAN VINES to USGS. EDC is Part of MAGIC which is a DARPA-funded testbed with a T3 going to 1Gb bandwidth.	Gateways (x.400?), routers, hubs(?). 2 cisco routers (primary Ags +, backup IGS), 168 kbps link to JPL, 504 kbps link to MSFC, 168 kbps link to LaRC, T1 link to NOAA, FDDI LAN, Ethernet LAN	2 cisco routers (primary Ags +, backup IGS) 256 kbps link to ASF 256 kbps link to NSIDC 168 kbps link to GSFC 168 kbps link to MSFC Internet Omnet Ethernet FDDI internal and external. Planned link to NASDA @ T1 bandwidth.
2. Network Management - Security - Performance - Network monitoring - Performance tuning & analysis (file transfer timing) - Browse applications time	Stuck with Internet Performance router managed by V0 NOC at GSFC	SNMP workstation being acquired, SUN NETMASTER routers managed by V0 NOC at GSFC data transfer performance testing with host machine at MSFC DAAC and the Sun machine at EDC	Routers managed by V0 NOC at GSFC	Routers managed by V0 NOC at GSFC. FDDI and Ethernet ILAN managed by JPL Security.

CSMS	ASF	EDC	GSFC	JPL
3. Basic Communications Services - Directory (e.g., DNS, X.500) - Data compression - Network security (authentication, authorization, address filtering, sub-network isolation (e.g., FOS LANs), card key security for remote ISTs) - Session (GUI type) - Xterminal support - Remote terminal support - File transfer support - Interprocess communication - Time synchronization support - E-mail - Remote data (distributed file system, DBMS client/server) - Remote process invocation - Bulletin board	FTP, Internet for e-mail, Telnet Yes - remote terminal support No - Xterm support, interprocess communication, remote data, remote process invocation No time synchronization - planned for Radarsat	Data compression, authorization, Xterminal support, remote terminal, file transfer, e-mail, DBMS - yes. Inter-process comm. Support data transfer to and from NSIDC via V0 network (up to 600MB of data daily) FTP, Telnet e-mail (SMTP) Data compression Browse delivery to IMS TCP/IP EDC product distribution system (initially staging data for FTP pickup) GUI enhancement, design and development	Directory, data compression, network security, authentication, authorization, session, Xterminal support, remote terminal support, file transfer support, e-mail, DBMS FTP, Telnet, client/server, e-mail (SMTP). Automated network data transfer. Current data ingest load is 12 GB/day, 1.5 GB/hr. Evaluated losses data compression techniques: recommendation is UNIX compress, GUI: Motif/X	FTP, Telnet, Internet, Sneakernet.
4. Protocol Suites - TCP/IP, GOSIP, DECNet	TCP/IP, DECNet	TCP/IP - yes GOSIP- doubt DG's are GOSIP compatible. BANYON/VINES, DECNET, some Apple Talk	TCP/IP DECNet currently available, but will not be part of official DAAC.	TCP/IP, DECNet
Local Site Management 1. Fault Management - Alarm processing/display - Vendor diagnostics - Event logging and analysis - Expert-system analysis	Manual troubleshooting	Yes - to all examples PC Based version now. SNMP workstation being acquired, SUN NETMASTER	Yes DADS and IMS logs available. Need additions to improve usability.	Yes, SGI Tools.

CSMS	ASF	EDC	GSFC	JPL
2. Network Configuration Management - Resource, logistics, policy & proc., maintenance, and inventory management - Software distribution (incl. toolkits) - Event logging and analysis	Inventory and maintenance management done manually	Policy based system, not dynamic, have hot backups on critical systems.	Yes	Yes, SGI Tools.
3. Acct./Accountability Management (Including billing systems) - OS account-data extraction - Event logging and analysis - Production/data status tracking	No for network. Weekly meeting held to review production Product order scheduling tracking and delivery 3 kinds of ASF users ESA - data credits NASA - data credits NASA - $ Further write-up	Yes - DORRAN system Refunds Assimilate changes in Gov. reg. Proof of sale to treasury Automatic upload of billing to other agency systems. Also system accounting, login tracking, system utilization tracking.	No billing is involved, but user order information is tracked in an Oracle database. The Staff Interface is used to generate reports. **Key staff actions in order filling are logged.**	Yes, DOTS (no billing).
4. Security Management - Event logging and analysis - Limited key management - Virus checks - Key mgmt. for private e-mail	No - Key mgmt., virus checks Event logging and audit trails done by operating system CERT (Computer Emergency Response Team) guidelines are used	Yes - Event logging, analysis of event logs, logs FTPs, but not telnets, logs 3 or more attempts to login, limited key mgt., virus checks.		Yes, JPL Network Security.
5. Performance Management - Event logging and analysis - Logging application perf. - Trending and stat. analysis - Load balancing	Network - none, better tools required for Santa VAX, basic performance parameters extracted daily with weekly summaries.	Yes - Event logging, analysis of event logging, logging appl. perf., trending & stats. analysis	Yes, on variable intervals dictated by current activities. Performance data is logged, but there is generally no reporting or analysis, except on as needed basis. Reporting capabilities are limited.	Yes, Event logging, FTP log.
6. Report Generation - Analysis of event logs - 4GL reports	Very limited for network, production data, data distribution, user support stats, USWG stats, intra-subsystem comparison reports. Better tools needed.	Yes - Analysis of event logs	Yes	Yes, DOTS.

CSMS	ASF	EDC	GSFC	JPL
7. Scheduling - Timeline creation/display	Data acquisition timeline created on-site, sent to FFA for inclusion, conflict analysis and resolution, schedule data acquisition, schedule processing of signal data	Manual, not in network sense, some queuing capability for batch jobs needing the CALCOMP plotter.	No	Yes
8. Servers and Workstations - Directory/e-mail/security servers for users - Directory/e-mail/security servers for computers - Directory/e-mail/security servers for applications - Local system management workstation	VAX 8530 (Santa) VAX 4000-90 (2) Sun 4 (UNIX) - GPS Sparc 2 (calibration station) Sun 4 (UNIX) - IIAS Masscomp - SPS HP9000 (2), RmBasic - RGS	Yes - servers for users, computers, servers for applications, PC workstation now for network IMS server. Sun workstation (host for network testing)	**SGI 40/440 VGX - IMS** **SGI 40/440 - DADS**	Yes, IMS will be hosted on an SGI machine.
Non-Local System Management 1. Scheduling - Multi-site schedule monitoring - Cross-site schedule coordination and adjudication	No	No	**No**	V0 Net Management.
2. Fault Management - Cross-site data aggregation - Alarm processing/display - Vendor diagnostics - Event logging and analysis - Expert-system analysis	Minimal, manual	Yes - network information centers interact with EDC routers.	**No**	N/A

CSMS	ASF	EDC	GSFC	JPL
3. Network Configuration Management - Cross-site data aggregation - Training, resource, logistics, policy & proc., maintenance, and inventory management - Enhancement rqmt. processing - User feedback processing - Source code control system - Event logging and analysis	No	Policy based.	?	N/A
4. Acct./Accountability Management - ECS-wide status tracking - Product pricing and user billing - Accounts payable/receivable - Transaction proc. - OS account-data extraction - Production/data status tracking - Event logging and analysis	No, for network No - transaction proc. Yes - Prod. pricing, Accounts payable/receivable - manual, Prod./data status - lots, manual, need more, Event logging - need better tools	No, on the WAN.	?	N/A
5. Security Management - Key management - Event logging and analysis - Virus checks	No	Yes Firewall - Monitor password tries	?	N/A
6. Performance Management - End-to-End network - Event logging and analysis - Logging appl. performance - Trending and stat. analysis - Load balancing	No	Yes - Can get data from GEONET, Sprint, NSF, NSI - the controlling entity does the monitoring. BANYON VINES has internal monitor.	?	N/A
7. Directory Information - User identification - Facility and equip. id - Data identification - User registration information	No, for network No - Facility id Yes, User id - have accounts, Data id - users restricted to certain data sets...manual, User reg. - manual	Yes - BANYON VINES has name list. Not X400 or X500 type of stuff.		N/A

CSMS	ASF	EDC	GSFC	JPL
8. Report Generation - System-wide analysis of event logs - Cross-site 4GL reports	No - system-wide, 4GL	Yes - Can pull down their reports	?	N/A
9. Network Help Desk	No network help desk, but do have a user help desk.	Yes - Network operations centers		N/A
10. Servers and Workstations - Directory/e-mail/security servers for users - Directory/e-mail/security servers for computers - Directory/e-mail/security servers for applications - System management workstation	EOS Server - e-mail equivalent	Yes	?	N/A
System Engineering				
System Performance 1. Analysis of Needs/Operations Concepts	Existing science requirements document. Draft ops. concepts and science requirements document in work for Radarsat.	Yes - Each project does Sys. Eng. in their own fashion.	~~Limited.~~ In-depth description of the roles of Users and other V0 system elements for each type of IMS traffic. **Various operational documents**	PODAAC Phase A study (FY 95) for ECS needs.
2. Implementation & Performance Tradeoff Studies	In works for Radarsat upgrade.	Yes	~~Limited - Planned testing~~ **Trade study on archive system performance modelin of DADS**	Rudimentary performance rqmts. and implementation constraints defined (PO.DAAC FRD)
3. Analysis of Major Interfaces - External - Internal (element-to-element)	In works for Radarsat upgrade.	Yes	Planned. Some interfaces to NASA Science Internet described. Architecture & DFDs for Alpha Test V0 system **IRD with SeaWiFS**	Internal (element-to-element) - in FY94 on-line ordering system will be integrated with the physical archive managed by DADS. PODAAC Phase A study (FY 95) PODAAC Phase B study (CDR FY 97) EOS-Alt
4. Prototyping Activity	V0 IMS Server JPL - Ghost Granule Archive (no archive) JPL - planning and user interface	Yes - GLIS is an example of a prototype that went operational.	System modeling & simulation. **User tirekicking of prototypes and releases.**	PGS for NSCAT/SeaWinds.

System Engineering	ASF	EDC	GSFC	JPL
5. Documentation (e.g., System Design, Ops. Documentation, SOPs, etc.)	Current system - incomplete Radarsat era - in work	Project unique	~~Various~~ **Functional requirements** **CM Plan** **CCB-approved DAAC policies** **Manual Pages**	Functional Rqmts Document Functional Design Document CM plan Software Management IOM Integration & Test Plans for Phase I and Phase II system delivery
6. Plans for System Growth/Evolution	Yes - major plans to support Radarsat and future missions	Yes	Yes	Yes, UWG
7. Change Control			**CM at group and DAAC levels**	Internal CM and change control.
8. Problem Tracking			**RDBMS, custom tool**	Manual.
User Model 1. Classification of Users & Services	Limited, working on user model to define user base.	Yes	Limited. IMS interactions are well defined.	Yes - Statistics of number of users. User profiles, DOTS.
2. Collection of Statistics on User Activity	Orders placed, products distributed - better tools and information model needed	Yes	Collects monthly, # queries, # users, Avg. session (min.)	Yes, via DOTS.
3. Developing Predictive Model of Users	No	Monitors access history	SeaWiFS user model. WG participation.	No
4. Implications for System Requirements - Service loads, response times	Informal only.	Yes	Yes - planned upgrades to meet predicted SeaWiFs user load	Yes, from statistics.
Integration and Test 1. Test Data - Test algorithm (benchmark algorithm) - Simulated data sets (for AM-1 instruments) - Data generators	Testing for GPS and for processor (hardware and software) at JPL Have test data sets from real data. No data generators - have real data	Yes - Use real data to simulate test data. Gets simulated sensor data from sensor developers.	TOVS data generator, SeaWiFS data generator (Level 0 data) SeaWiFS test data (from SeaWiFS project). SeaWiFS data generator?	Will be supplied by flight projects and Pathfinder.
2. Test Procedures for New System Installation	Yes, under development	Yes	Test plans for each new system build	Test Plans for Phase I & II deliveries
3. Simulators - Simulators for ext. interfaces	No Have for internal interfaces.	Yes	DADS model No	No

System Engineering	**ASF**	**EDC**	**GSFC**	**JPL**
4. Test Tools - Auto test planning and test management tools - Requirements trace tool - Hardware test equipment - Data reduction and analysis tools - Auto testing tools	No - test tools Requirements trace tool - currently no, but maybe in future. Hardware test - yes, for DAAC unique systems Limited data reduction and analysis tools.	Custom for project, uses Purify and lint.	No	No
5. System Configuration Management	Done by JPL, not system-wide, on a subsystem basis (Transitioning to DAAC)	Yes - For Hardware Control USGS National Mapping Division has a CCB - Ron Parsons (Chief Computer Services Branch) is on it. DORRAN is used by 7 mapping centers has CCB like controls. Government property tags and inventory system for hardware.	Yes **- on a baseline basis:** **- Development** **- System Testing** **- Acceptance Testing** **- Operational**	Yes
6. Configuration Management Tools - Hardware and software	Subsystem unique by developer (JPL) - remote (Transitioning to DAAC)	Yes - Uses the three library level technique, custom software config. tools per project, SCCS and Make. GLIS has capability to download update code to user client at user connect time. TMAX had remote developers used a custom software config. mgmt. package.	SCCS (UNIX Tool?) for software CM AVHRR CM s/w is Concurrent Version System (CVS)	Locally developed scripts. Acquiring ClearCase.
7. Discrepancy/Problem Tracking Tool	Database ARSCR database	Help desk has a problem tracking tool which is COTS called UTOPIA but now looking at a better tool called Fastback. Each project maintains its own problem log.	Software Modification Request (SMR) tracking system	Locally developed scripts. Acquiring commercial CM tools.

System Engineering	ASF	EDC	GSFC	JPL
Internal/External Interfaces 1. Other Data Centers - Data availability schedule - Data request and orders - Data products - Ancillary data - Search criteria - Metadata - Browse - Cost estimates - Order status	User Services network - manual V0 working groups	Yes Data request, cost estimates Metadata (available for some data sets) Data orders Data products Browse (available for some data sets)	~~Planned.~~ Yes. Data request, metadata, data orders, data products, order status, schedule adjudication. Browse (implemented in latest version for selected data	Yes Data availability schedule, data request, search criteria, metadata, data orders, data products, order status
2. SCF - Algorithm, I&T specifications - Toolkit - I&T test schedule - Algorithm delivery package - Test, special products - Calibration coefficient, QA exchange	- IIAS is a prototype SCF - IIAS provides tools for analyzing and manipulating ASF data by end users. - Testbed for prototyping new science algorithms - Special product generation	Bi-directional flow Landsat Pathfinder is a good example.	Planned for SeaWiFS, 4D assimilation	N/A
3. Other Interfaces - FDF, NCC, ICC, IST, NASDA, ESA - Aster, Landsat	Coordinates with NASDA, ESA, and CSA System developers (JPL, Vexcel, ECS)	Planned activities Level 1 interoperability to several other systems.	National Space Development Agency (NASDA)	
Staffing Profiles 1. System Development Staffing (System enhancements and upgrades, both hardware and software) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				
2. System Testing Staffing (Development, maintenance/upgrade, regression testing) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				

System Engineering	ASF	EDC	GSFC	JPL
3. System Management Staffing (Site management, CM of hardware/software/data, document management) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				
4. System Maintenance Staffing (Hardware, software, performance analysis/sustaining eng., sys. eng., facility planning, document mgmt., QA) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				
5. Operations Staffing (Routine processing, cataloging archiving, distribution, reprocessing, sys. admin., accounting, operations analyst, operations training, media lib.) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				
6. User Support Personnel - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				
7. Algorithm Science Software Development, Integration and Test - Number of DAAC personnel - Skill mix - Shifts worked - Days/week				

HMI	ASF	EDC	GSFC	JPL
		The V0 IMS used GLIS as its foundation.		
Accessibility 1. User Interaction	Primarily Alphanumeric to support minimal VT100 capability. Extended to support graphics, but requires user to support tektronics or more advanced VTxxx series. User must re configure their terminal each time move between graphics & alphanumeric parts of interface. Dial-up.	Yes - see V0 column	Yes. Staff Tools. **CHUI** ~~GUI~~ developed in JAM. Valid lists.	For V0, main interaction is via V0 IOS.
2. User Friendly Features - Multiple windows - Buttons and pull-down menus - Valids list - Help - Consistency - Save and restore - Standardized commands/terms - Meaningful error messages - Acronym expansion - Menu tree diagram - Command language	Yes - consistency, save and restore (limited - user sites only), valids list (limited), help (some) No - mult. windows, buttons, error messages, acronym expansion, tree diagram, command lang. N/A - standardized commands/terms	Yes - has hypertext at the key word level using Hypertext Markup language (HTML).	Multiple windows, buttons and pull down menus, valid lists, help**, dependent valids, preferences**	Yes VO IMS
3. Level of User Ability - Expert - Intermediate - Novice	System - interface requires intermediate to expert user abilities.	No	**No**	Yes
4. Ease of Use	System - interface requires intermediate to expert user abilities.	Yes	Yes **- intermediate, expert**	Yes
5. Use of Color/Fonts	None	Yes	Yes	Yes
6. System Feedback - Status, alerts, prompts, defaults	Very limited	Same as V0, user can give comments at screen level.	help, data entry validation	V0 IMS.
7. Error Prevention/Correction	Limited	Valid lists pop up for pick.	~~No~~ **Valids lists**	V0 IMS.
8. Expert Shortcuts	No	Can save and store query, some use of control keys	Yes	V0 IMS.
9. Information Access - Direct vs. Hierarchical	Hierarchical	Hierarchical Same as V0 - hit list oriented	Direct & Hierarchical	V0 IMS.

Maintenance & Operations	**ASF**	**EDC**	**GSFC**	**JPL**
1. Backup Procedures	All systems have weekly backups - nightly data checkpoints of database, 2 copies of raw data on creation.	Yes	Planned use of one drive of Metrum tape archive device for automated backup of the archive. **DLT backup planned**	Yes
2. Recovery Procedures	Yes, see above	Yes	Planned. Recovery procedures for ORACLE DB developed	Yes
3. Security Controls	Passworded accounts - minimal Cypher lock on control room door.	Yes	~~No~~ **Yes, passwords in OS and RDBMS** **Key card access to computer room**	Yes
4. Daily/Weekly Reports	Meetings weekly to review status/problems. Reports done.	Yes	No	Yes
5. Level of System Control	A lot of manual intervention	Yes	**Semi-automated**	Manual, with some automation with scripts.
6. Staffing Profiles	Control room - 6 X 24, 1 X 16 GeoData (User Services) - 1 shift X 5 X 8 hrs./day	Yes - 3 shifts, 5 days a week, no weekends, no holidays	Yes	See proposal.
FOS				
1. DAR Processing	Consolidates & submits DARs to foreign flight agencies.	See above - some experience w/ MSS and AVHRR.	N/A	N/A
2. Planning	Schedule acquisition of new data based on user request.	1km AVHRR project requires planning with NOAA.		N/A
Miscellaneous				
1. Other Data Distribution Types	Special purpose CD ROMs generated outside of DAAC. Other data types (incl. aerial photography and a variety of geophysical data sets)		**Special CD-ROMs**	Distribution of data and metadata Distribution of coverage maps for MGDR and distributed with the CD ROM CD ROMs include processing history and QA information Distribution of documentation from an off-line inventory PO.DAAC handles restricted data sets for ERS-1 in a closed archive.

Miscellaneous	**ASF**	**EDC**	**GSFC**	**JPL**
2. Data Dictionary (i.e., using as active data dictionary?)	Yes - upgrading in FY 94		**Yes, used for ESDIS and actively for metadat validation on ingest**	JPL (or ESDIS) developing tools for supporting dictionary access and interchange
3. Design	?			None
4. IMS Configuration	?	Client Server	**Local, but telnet access**	Yes, IMS.
5. Major Data Sets Visible via V0 System or DAAC IMS/Format	All restricted. ERS-1 SAR (closed data set) JERS-1 SAR (closed data set) ERS-2 (12/93) Radarsat (1/95) ERS-1 ice vectors, ice classification, and WAVE products	*TIMS Aircraft (7/94) *NS-001 Aircraft(7/94) *TMS Aircraft(7/94) *AIRSAR (7/94) *AVIRIS Aircraft (7/94) *SIR-B (7/94) *SIR-C (7/94) *Landsat 7 (1/98) *Global Land 1-KM AVHRR both 10 day composite and stitched orbits *Global Change Landsat Data Collection *Seasat	HDF data sets: AVHRR Land Pathfinder (1 product) GRIDTOMS TOVS Pathfinder TOMS - CDTOMS TOMS2 - CDTOMS2 SeaWiFS (20 products) FNOC, NMC, COADS, TOMS Ozone Climatology (SeaWiFS ancillary) AVHRR Land Pathfinder (1 product) ~~AVHRR Atmosphere Pathfinder~~ SeaWiFS (4 products) UARS CACSST ~~ECMWF~~ CZCS ATMOS 4D Data Assimilation ~~SBUV~~ TOMS TOMS2 LIMS TOVS (non-NASA) AVHRR (non-NASA) TRMM (mid 97) NCDS data sets (existing)	HDF data sets: MCSST CZCS pigment concentration AVHRR Pathfinder SST Wentz SSM/I geophysical tapes Geosat Altimeter Seasat Altimeter Seasat SASS Seasat SMMR Seasat VIRR SSM/I (Wentz) TOPEX Altimeter SDR TOPEX GDR TOPEX TMR ERS-1 (closed data set) ERS-2 (12/93) NSCAT (2/96) All the above, as stated in the 'Blue Book' product listing available from User Support Office, plus any future additions to the Blue Book list.
6. Tutorials and Help	No	Yes, on-line	Yes, on-line for IMS interface	None
Operating System 1. UNIX - Major platforms/element	Yes, IIAS (SCF) processor, GPS	UNIX is current standard, several older vendor specific systems still supported	Yes, SGI IRIX.	IMS ported to UNIX from VMS in early FY 94 DADS - only partially UNIX in FY94.

ASF ACRONYMS

ACS	Archived Catalog System
GPS	Geophysical Products System
IIAS	Interactive Image Analysis System
MPS	Mission Planning System
RGS	Receiving Ground Station
SPS	SAR Processing System

EDC ACRONYMS

DORRAN	Distributed ORdering Research Accounting Network

JPL ACRONYMS

DOTS	Data Ordering and Tracking System
GDR	Geophysical Data Record
IDL	A COTS visualization tool
IGDR	Interim Geophysical Data Record
IOS	Inventory and Order System
QLBB	Quick-Look Bulletin Board
SDR	Sensor Data Record
SWT	Science Working Team

For more information, the following are useful references:

Pathfinder specifications (in progress, University of Miami)

DOTS Specification

IOS Specification

PO.DAAC FY 94 Proposal

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Appendix B. Version 0 Functional Analysis Matrix for LaRC, MSFC, NSIDC, and the ESDIS V0 System

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SDPS	LaRC	MSFC	NSIDC	V0 System
System Access & User Registration 1. User Registration - User authentication - User profiles	LaRC V0 IMS has a single publicly-available account for both the GUI and ChUI. UWG advised against additional password protection. User information is stored by a combination key of first name, last name, and phone no. in the Informix database. The user information includes name, phone #, fax #, affiliation, mailing address, e-mail address, and country of residence.	User Registration and Authentication - TBD User Profile matches ESDIS IMS.	Manual registration & via V0 system level IMS interface.	Will be included by 7/94 User authentication will be included by 7/94 - user profiles captures name, address, affiliation, e-mail address, provides easy system access and current inf. on Welcome screen. Input inf. for user profile primarily for ordering preferences such as user, shipping, and billing address. Self registration will be available at each DAAC for system level. No central registration. User Services will coordinate user keys between DAACS for billing purposes.
2. Dumb Terminal Support - Dial-up - Network connection with terminal	ChUI interface. Dial-up access via LaRCNET. No dial-up via EOS Local (i.e. LaRC V0 network).	Yes, a character oriented interface	V0 system IMS ChUI only	V0 has a ChUI and it is kept current with the latest release level.
3. Executive Function - Higher level menu that provides single access to all ECS applications	No higher level menu.	Not a V0 Function.	Not a V0 function.	All access is through the IMS menus. There is no access to PGS or other related functions. 2 major functions: GO TO and SCREEN FUNCTIONS plus HELP V0 IMS is a metadata search function only (nothing to do with PGS) - V0 PGS functions are DAAC unique - V0 ingest functions are DAAC unique

SDPS	LaRC	MSFC	NSIDC	V0 System
Algorithm Integ. & Test 1. Tools - Standards checkers (coding standards, PGS toolkit use) - Code checkers, static/dynamic/performance analyzers - Resource management tools - Development environments (compilers, linkers, debuggers, etc.) - CASE tools - Data checking tools - User interface	SCF: standards checkers: locally-modified version of ftnchek; development environments: compilers for FORTRAN 77, ADA, and C; CASE tools: recent experience with Software Through Pictures; Graphics/statistics tools: locally-developed GRaphical Analysis and Statistical Package (GRASP); Analysis tools: Khoros image processing software, IDL, Matlab, Mathematica. DAAC: development environments: compilers for FORTRAN 77 and C, Informix database. Analysis tools: PV Wave.	Will be available: - SGI Code view - SGI development tools - RCS for code management - Spyglass Transform, HDF Collage	Limited LAS (from EDC), local code from CCAR will be used (calibration & geolocation)	Currently no function for algorithm integration available and do not believe there is any plan for a user interface to be added

SDPS	LaRC	MSFC	NSIDC	V0 System
2. Procedures - Algorithm delivery procedures (New algorithms, Updates to existing algorithms, Updates to calibration and other data files) - Documentation of procedures - Formats/templates for reports, test plans, and other required documents - Creation of algorithm metadata	EOPS: ERBE Operational Processing System: An integration and testing account is provided to the ERBE DMT to build executables (PGE) for delivery to the PGS production environment. At the request of the ERBE Configuration Management group, PGS operations staff run scripts to move new versions of the algorithms and/or ancillary data files from the I&T account to the production account. Configuration Management of the ERBE code, scripts, and ancillary data files, is handled by the ERBE DMT. The UNIX utility SCCS, in conjunction with the Informix data base, comprises the ERBE Configuration Management System. DAAC is assisting in operating procedures for ERBE Operations System (EOPS). DAAC has recently developed a Tape Order Processing System (TOPS) with which User Services manages the production of tape media orders.	Insofar as the Data Submission Procedures apply. Informal procedures in place to test & integrate alg.	Strawman developed, followed by iteration through PoDAG to get recommendations, revisions, etc.	

SDPS	LaRC	MSFC	NSIDC	V0 System
SDPS Scheduler 1. Automatic and Manual Scheduling of Processing, Data Distribution - Automatic scheduling software - Manual scheduling procedures	For pre-V0 DAAC, scheduling was performed mostly manually. A PC-based database and a mainframe database (RIM) were used to manage the tape inventory (input , output, and blank tapes) and manage a list of potentially-executable jobs. A subsystem analyst provided a request for job submission that includes the necessary runtime parameters. Software generated an executable batch file, but a human operator, via a ChUI interface, selectively submitted the jobs to the CDC Cyber mainframe based on resource optimization. Along with the output of scientific results, quality control reports were generated for analysis by the analyst. With a successful job request, the analyst updates the dual database. This mechanism serves to manage the data dependencies between subsystems of the ERBE data processing system. Manual scheduling for data distribution.	Manual procedures & UNIX utilities.	Manual, ad hoc scheduling of resources (computers and people).	N/A

SDPS	LaRC	MSFC	NSIDC	V0 System
1. Automatic and Manual Scheduling of Processing, Data Distribution (continued)	For V0 DAAC, scheduling is performed mostly manually. An Informix database is used to manage a list of potentially-executable jobs. Unlike the above scenario, GUI and 4GL ChUI interfaces are available. Human operator continues to make scheduling decision. Batch file capability on the UNIX workstation is provided by Sterling Software's version of NQS. Necessary runtime parameters stored in PGS Informix database by SCF. PGS executes jobs based on scheduling information in PGS database and human optimization decisions.			
2. Staging/De-staging of Ins/Outs - Software/Procedures for staging processing inputs and destaging processing products	Staging of ERBE Level 0 data to the PGS is operator-driven using automated procedures. These scripts are implemented in scripts. Operator-driven using automated procedures for de-staging lo data, ancillary data, high level ERBE science products to DADS are used.	Manual & automated procedures	Manual procedures	N/A
3. Task Initiation - Software/Procedures for initiating processing per a schedule	Crontab job used to automatically catalog (identify/quality control) ERBE Level 0 data received electronically from NOAA/NESDIS.	Manual or CronTab	Ad hoc	N/A
4. Communications w/ SMC	No	No	N/A	

SDPS	LaRC	MSFC	NSIDC	V0 System
5. Communications w/ EDOS/Pacor	NOAA/NESDIS electronically transfers ERBE Level 0 telemetry data daily. GSFC electronically transfers ERBE Level 0 telemetry data (telemetry and ephemeris) .	No	N/A	
6. Communications w/ FDF	No	No	N/A	
7. Processing Control Language - Scripting language tailored for running processing algorithms	UNIX scripts	UNIX scripts	No (previously used one with CDMS; menu-based)	
8. Publishing Production Schedules - Software/Procedures/ Formats for publishing planned production schedules for the rest of the user community to persue	Productions schedules for ERBE were tracked by the flow of paper authorizations (pre V0 DAAC). Currently published by ERBE DMT (not a daily schedule). User Services uses a new in-house tool (TOPS) to track the production schedule for filling tape media orders. None of these schedules is currently accessible by the user community (V0 DAAC).	Manual	No	
9. Messages to Production Monitor Personnel - Messaging software, types of messages which have proven useful	Manual procedures and informal format.	Manual procedures	No (previously done with CDMS)	
10. User Interface - Any kind of specialized user interface tailored to scheduling personnel	The EOPS has a ChUI & GUI . The TOPS has a GUI interface.	No	No (ChUI with CDMS)	Function is transparent to user

SDPS	LaRC	MSFC	NSIDC	V0 System
11. Error Handling/Recovery - Software/Procedures for recovering from aborted product generation due to errors, crashes, etc.	No	Manual procedures	Manual procedures	
Information Search 1. Directory Search	User Services System (GUI for DAAC staff) was developed using rapid prototyping. It is a hypertext viewer for directory information (uses Mosaic). Supported by server to ESDIS IMS clients.	Local and V0 System IMS Supported by server to ESDIS IMS clients. Will also provide local directory function that stores DIFs from the GCMD.	Supported by server to ESDIS IMS clients. Will continue to use the GCMD to store its DIFs.	Provides searches to all the DAACs. Directory searches are routed to the DAACs that are relevant. The V0 client sends requests to the DAAC, the DAAC translates the request to DAAC terminology and then sends back pointers. Sometimes get duplicate results if parts of the directory entry are handled by more than one DAAC.

SDPS	LaRC	MSFC	NSIDC	V0 System
2. Inventory Search - Core metadata - Spatial queries - Complex queries (i.e., the use of "not" (user defined), "and", or "or" in the query) - Dependent valids - Coincident search	Langley V0 IMS supports spatial search using map. A coverage map was created. For both GUI and ChUI interfaces, supports core metadata, complex queries, and dependent valids. Coincident search is planned. Also supported through V0 System IMS client.	Local and V0 System IMS - GUI & ChUI (later) - Using ESDIS IMS client for GUI. - core metadata will update client with "super granule" concept, will not be supporting metadata about data quality for all data sets - spatial queries same as ESDIS IMS No complex queries other than the implied "and" and "or" in the interface, however developing data miner for value based metadata.	Through V0 system IMS	Searching can be performed on time, space, parameters, sensors, platforms, data centers, browse availability, data set, processing level, and day/night flag. Spatial queries can be expressed as global granules, point/radius, and bounding box using a map. Dependent valids are implemented locally with the client using a public domain database called gdbm. Allows construction of queries through various "valids" lists selections are shown in a scrollable field on search panel, provides map projection to create spatial def. for various shaped areas and gives readout of coordinates, valid lists are filtered based on other query selections (seems to be very well done and should provide a good baseline for ECS...from an HMI perspective) - complex queries not currently available...in plan??? Coincident search not currently available...think they are planning to add the LaRC timeline function so will have a temporal basis for function. Have the ability to restrict the number of granules that will be returned

SDPS	LaRC	MSFC	NSIDC	V0 System
3. Guide Search	V0IMS & LARC IMS perform guide search via Mosaic-like interface.	Local and V0 System IMS - Using ESDIS guide server and populating - WWW & WAIS access to guide documents	Through V0 system IMS. Developed at NSIDC. Accessible via V0 system level, WWW, & WAIS (will be available 7/94)	Provides access to guide documents through Guide Inf. button on valid list screens and by searching the guide for text strings. Prototype developed, additional work in progress
4. Guide Development - Tools for creation of guide		Basic screen editors (vi)	Guide Authoring tools for creation of HTML documents will be provided to all DAACs.	
5. Reference Search - Algorithms, calibrations, etc.	Planning on a documentation tracking system for User Services.	Provide ref. search through guide function.	Have reference database in library, plus GCMD references.	Would be provided by the DAACs in the guide data.
6. Display Results - Coverage map - View details - Showing coincident results	Search results are provided as an abbreviated display of granule information with a "details" button. Pre-processed display in browse. Plans for regional searches. Provide capability to create order selection list. No coverage map for resulting granules; however, simple map coordinates are provided. Details can be displayed. Not showing coincident results. Added new field experiment data (not global) that allows spatial searching in Langley V0 IMS Version 2.0.	Local and V0 System IMS - view details same as ESDIS IMS Display missing data indicator on results screen (local IMS). Display result as granules or supergranules (local IMS).	Through V0 system IMS	Shows small number of fields (not dynamic). Coverage map shows one granule at a time, granules can be paged through one by one. View details shows all relevant data for a granule. Multiple sorts can be applied to the results such as date and time that will group coincident granules together in the results list. Provides list of data sets that can be marked for detail, browse, integrated browse, FTP browse, and order. Can overlay area of results on map projection (but only displays on specific maps). Detailed inf. provides time and location...more??? No showing coincident results
7. Data Set Specific Search Parameters - Search on attributes related to a specific data set (i.e., path row)	Currently none, but may be needed to support field experiments.	Local (non-VOIMS), parameters avail.	System level IMS does not do data set specific search.	

SDPS	LaRC	MSFC	NSIDC	V0 System
8. Data Set Specific Results	Available for FIRE & GTE data sets.	Local and V0 System IMS Using comments field in local & V0 IMS.	Through V0 system IMS	Suggested form for data set specific results is to embed attribute = value phrases in the comments field. The comments field is viewed in the view details window.
9. ADC/ODC Inventory Interoperability	No	No	NSIDC does not currently use any automated interfaces with any of the NOAA sites. When a user requests data of any type not distributed by NSIDC from user services personnel at NSIDC, they are referred whenever possible to the appropriate data center. This applies to all known data centers, whether NASA, NOAA, or any other agency or institution. There are plans underway for NSIDC to become part of NOAA's gopher/Mosaic site, which would start an automated advertising and referral link between NOAA and NSIDC for NOAA-owned data (also from the 'user pull' side).	Working on prototypes w/ NOAA and ESA (CINTEX experiment)
10. Design Documents - Edits have the ability to search design documents in general	No capability to search	No	No (NSIDC has not developed any toolkits).	User's guide exists for previous release-- needs to be updated for recent 9/93 release. Documents available off-line

SDPS	LaRC	MSFC	NSIDC	V0 System
11. Browse - Ability to query browse data - Ability to display browse data	Browse viewer in Langley IMS Version 2.0 permits scrolling through all images of an SRB, FIRE, SAGE II cloud HDF browse files.	Browse products available - some data sets. Provided the initial ESDIS browse request software and is working on upgrading to request multiple browse images with one message. Only provide standing browse orders to WetNet users. The distribution of real-time browse imagery to a specified group of WetNet investigators continued in 1993. In July, this was implemented as an automated process. Investigators now receive the previous day's browse products. each browse image linked in the metadata tables to its corresponding data granule. HDF browse access via WWW.	Integrated browse for SSM/I. AVHRR, SMMR, ice motion vectors will be integrated. May be graphics-based browse in future (e.g. for rawinsonde, buoy positions, others). Sea ice concentrations available on CD ROM or via FTP (product is also browse).	Browse data can be requested in an interactive mode or an FTP mode. Displays browse product in window with reference map and zoom/scroll capability. Can mark for order from this panel
Archival Product Requests 1. Product Requests - Product orders - Media/Electronic - Spatial/Parameter subsetting - Standing orders	Yes, via IMS GUI and ChUI, User Services, or ESDIS V0 IMS. Spatial subsetting, but not parameter subsetting (study in progress). No standing orders.	Manual & standing orders - will provide ordering of pre-packaged data sets without going through an inventory search.	Manual or through V0 System IMS.	Communications about orders are currently handled through e-mail. This is DAAC dependent, no custom products can be ordered. Can request orders from all DAACs. Each DAAC may fill the order in a different manner.
2. ADC/ODC Product Orders	Standing Orders with NOAA/NESDIS and GSFC. Currently utilizing electronic interface . For data request and orders: NOAA and GSFC pushes data to PGS and provides processing reports as a contribution to metadata.	Through V0 System IMS.	Manual (referral to data source) or through V0 system IMS	
3. ADC/ODC Browse	No.	Manual referrals	None	

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4. Distribution Authentication - Checking authorized users for restricted data sets (How?, Custom or COTS?)	No restricted data sets at LaRC and no data set-specific characterization of the user's authenticity.	User services, manual procedures	Manual or through TRAK, the NSIDC local system.	Any authentication of orders is done at the DAACs.
5. Order History (i.e., What is tracked per order? Stored in DBMS? Available reports? How long is it kept?)	The IMS collects statistics during a user's session and stores them in an Informix database. The User Services Utility accesses the database during their analyses. The statistics collected by the IMS are: login number: the quantity of users that log into the IMS, order number: the quantity of ftp and tape orders requested, order number by type: the media-type-specific(e.g. 4mm, 8mm, ...etc.) quantity of orders requested, search number: the quantity of inventory search attempts, browse number: the quantity of attempts to browse via the Result Window (GUI only), help number: the quantity of attempts to access the Help mechanism, new user number: the quantity for new users that leave a name and phone number. Reports are generated monthly. No reports have been deleted.	Yes, report from Data Order Tracking System (DOTS) Order history stored in database, can be tracked per user or per data set.	TRAK system documents user data requests. TRAK (before 10/94): dBaseIII-based; reports are run manually every month; reports and data files are kept indefinitely; access is limited to PC (self-contained system); data not replicated except for items reported to ESDIS Project on monthly basis TRAK (after 10/94): will have similar capabilities, but will be Ingres-based, with ChUI interface. Some statistics will be recorded by system level IMS.	
Processing Request Services				
1. Ancillary Data Sets for Processing (i.e., stored, displayed, queried)	Seasonal snow maps used for ERBE data processing system.	No	Manual or through V0 system IMS. (Treated like any other data.)	

SDPS	LaRC	MSFC	NSIDC	V0 System
2. Ancillary/Aux. Data Limits Checking & Pre-processing - QA of ancillary data - Reformatting - Regridding	Neither checking nor pre-processing, DMT for each project has the responsibility for ancillary data reliability, reformatting, and regridding.	No	Range checking & validity checking for SSM/I. (During routine production)	
3. Level 0 Data Validation - "Generic" validation of Level 0 data prior to processing	ERBE production software currently performs quality control on the ERBE Level 0 data on PGS.	No	AVHRR L0 validated upon ingest as part of routine browse production.	
4. Processing - Standing order product processing - On-demand product processing - Changes to standing orders - Priority processing requests - Quick-look processing - Reprocessing - Recovery procedures	Neither standard order nor Quicklook nor on-demand product processing. Priority processing and reprocessing performed annually.	Standing order is WetNet processing. Software implementations for the approved SSM/I derived products, such as Sea Surface Wind Speed, Atmospheric Liquid Water Content and Atmospheric Water Vapor.	Routine production, plus special processing upon request.	
5. Metadata Creation/Uploading/Updating - Creation of inventory metadata during processing - Uploading of metadata to IMS - Updating of existing metadata (e.g., updating of QA flags after manual QA)	Most metadata operations are manual. GUI interface for entering and updating Metadata on IMS data base (i.e. MPU software). Development of automated metadata generation for some of the ERBE processing on PGS is complete.	Automated & manual.	Automated via scripts; data set specific.	Transparent to user
6. Product QA	Yes, some product QA is done based on established process. (limits, tables) Science products and Quality Control reports are made available to the ERBE DMT for Science Quality Assurance. Automated data inspection tools have been developed.	Yes, for certain high priority data sets: SSM/I Automatic QA s/w to check the quality of each Daily granule -- performs statistical analysis, checks for missing data, outputs selected values for visual spot checks.	Manual checksum of file sizes; creation of browse products; visual inspections; SSM/I does comparisons of certain regions to establish baselines to detect anomalies. Automated QA software -- expert system under development.	

SDPS	LaRC	MSFC	NSIDC	V0 System
7. Processing Tracking, Logging, Reporting		No - not for processing.	Combination of manual & automated procedures. Simple log files (enclosed).	
8. Collection of Mgt. Data - Fault detection and reporting	Hardware failures are tracked manually.	Yes, manual procedures & DOTS.	Minimal, as required by data set documentation. H/W failures tracked in log book (hardcopy). No fault detection. Maintain H/W and S/W configuration.	
9. Multi-DAAC Orders - Data obtained from more than 1 DAAC to be used in product generation or to satisfy a user request	No	No. If a portion of a data order requires data from another DAAC, the customer is referred to that DAAC. MSFC User Services also alerts the other DAAC, giving them the customers name.	V0 system splits requests into separate orders.	Manually coordinated via User Services Working Group.
Manage Storage System Service 1. Send Distribution/Staging Status - Manual override of distribution priorities - Tracking/reporting Distribution Status and history - Distribution status provided upon request - Verify/check distribution correctness	Distribution and staging status shown in IMS. User Services Utility permits staff to rack user information via GUI. Yes, some ancillary parameters are stored, may not be a comprehensive list.	User services, manual procedures. Users will be able to track order status through local IMS. Provide coordinated user services for cross DAAC ADC/ODC ordering. Data Order Tracking System (DOTS)	Manual (system IMS has no data tracking system; Local IMS will have it.) Currently none; will come through TRAK.	
2. Report on Resource Conflicts - Take corrective measures when network performance impacts distribution - Manage contention for storage system resources	Automated FTP system reports problems to system manager via e-mail. No corrective measures prescribed. No management of contention.	Yes - manual system.	No	
3. Manage Element Resource Utilization - Alternate between tape units to minimize overuse of any one tape unit	Resource element management is not automated.	No	Yes, schedules will be maintained for resources and priorities established.	

SDPS	LaRC	MSFC	NSIDC	V0 System
4. Generate Accounting Inf. for Distributed Data - Generate distribution reports - Cost and billing information	Accounting information is not needed (no charge for data), but currently tracking basic statistics.	No money handled	Through TRAK, with standard V0 reports generated monthly (standard V0 reports).	
5. Monitor Status of Storage Systems - Performance	Manually monitor UniTree logs (activity). Analysis for debugging purposes only.	Manual procedures, supported by SGI Tools	No	
6. Collect Storage System's Operating Statistics - Performance - Security - Fault	Manual procedure for fault statistics collection. Only event descriptions are collected. No formal report cycle.	Manual procedures, supported by SGI Tools	Yes, manual log book. No reports generated.	
7. Storage System's Operator HMI	UniTree command interface. Combination of shell scripts and GUI for operations personnel to process orders	No - through FY94. Yes, JAM developed GUI (FY95)	None planned (standard UNIX interface).	Unknown
Toolkit Services 1. PGS Toolkit - File I/O tools - Error/status reporting tools - Process control tools - Ancillary data access and manipulation tools - Time and date conversion tools - Math and modeling support tools - Constants and unit conversion tools - Graphics support tools - I&T support - Platform data simulation tools (ephemeris)	See the ERBE library software, named ERBLIB, from the ERBE data processing system for file I/O tools, error/status reporting tools, time and date conversion tools, constants and unit conversion tools, maybe others.	Yes SGI tools Yes WetNet provides McIDAS & HDF RCS.	No	Not available???
2. IMS Toolkit - IMS server API for update, query, DBA utilities	GUI interface for entering and updating Metadata on IMS data base.	Yes Oracle tools.	ODL parser for queries; ABF for DBA utilities; looking at INGBBA	

SDPS	LaRC	MSFC	NSIDC	V0 System
3. Data Visualization - 2D & 3D plots - Earth coordinate cursor - Contour plots - 3D surfaces - Image manipulation	General HDF/NCSA tools to develop in-house software. Other COTS products (Spyglass, Transform, PV-Wave...etc.) for visualization. DBA utilities: Informix database-provided.	NCSA Collage Spy Glass Transform LinkWinds		Some limited capability to pan and zoom
4. Geographic and Geophysical Overlays (i.e., embedded in data or visualized at runtime?)	No overlays unless embedded in the products.	Yes, in WetNet/McIDAS Orbit model display software	Yes, for SSM/I products (separate files overlaid at runtime) (Land mask, coastline, lat./long.)	
5. Production Management Toolkit			None	
Communication Services 1. Bulletin Board	No bulletin board incorporated into LaRC V0 IMS. No bulletin board on any of the hosts of the LaRC V0 network.	No	No local BB; access and update to Omnet/POLAR and Omnet/OCEAN BBs. NSIDC does not provide IMS users with access to these BBs.	V0 bulletin board not available from the IMS user interfaces. - first screen in IMS tells you system news
2. User Feedback - Facility for user to enter comments - Facility to ask questions of user about tools	LaRC V0 IMS provides a comments window for user's on-line feedback, monitored by User Services. LaRC V0 IMS has a News feature which provides information about new data sets available via the IMS. Some data set-specific mailing lists have been established.	Yes - through user services. User comments through local & V0 IMS.	Manual or through V0 IMS (client has comment feature)	Ability to enter comments at any time from the GO TO menu. On-line user feedback capability
Distribution Service 1. Distribution Media	Pre-generated CD-ROMs (with "read and display" software on 3 1/2" floppy) are distributed. 4mm, 8mm, 9 track, FTP, hard copy for documentation and VHS tape for the ERBE movie.	Yes, all required V0 media will be supported 9 trk tapes,8 mm, magneto-optical cartridges, FTP, 1/4" tape cartridge.	9 trk, CD-ROM, Exabyte, 4mm, 3480 cartridges, floppy disk, FTP. (All required V0 media will be supported.)	Not a V0 System function.

SDPS	LaRC	MSFC	NSIDC	V0 System
2. Distribution Formats - Format conversions - Quick-look products	Read software is provided for the conversion of the following archived data products formats: 1) HDF to ASCII 2) ERBE data format to ASCII 3) ISCCP to ASCII 4) FIRE to ASCII	HDF for some data sets, native for others No format conversions	HDF, ASCII, native formats	
3. Prioritized Distribution - Process data transfer delay or cancellation	No	Under refinement	Yes, occasionally to support algorithm development.	
4. Browse Storage - Browse archive characteristics	Browse products (e.g. ERBE S4, FIRE, SRB and SAGE II) are distributed in the same manner as data sets. Available through Langley V0 IMS, stored in HDF.	Yes. HDF Raster images, GIF and McIDAS browse images are archived.	AVHRR data stored on tape; browse on optical WORM; SSM/I also different; browse in HDF; data in native Browse available through V0 IMS FTP staging; data on media	
5. Subsetting/Subsampling	Prototyping spatial and parameter subsetting for HDF.	Software available for users to subset SSM/I level 1b & Pathfinder data.	Evaluated on a case by case basis (considered special processing).	
6. Push vs. Pull of Data Distributed to Users	Once completed, user is sent e-mail on the Internet to pick up data.	For electronic (ftp) distribution of data there are two methods. If the customer provides an ftp drop address, and requests a data push then that is done. Otherwise the data is staged to the DAAC anonymous ftp server and the customer is notified to pull it from there. All other data orders (tapes, etc.) are mailed when they are ready. The WetNet project automatically pushes browse images to its customers on a daily basis.	Notification to users upon staging to FTP; others planned when jukebox comes on-line (status will route through user services).	

SDPS	LaRC	MSFC	NSIDC	V0 System
7. Read Software	Available for HDF data sets (on-line), also distribute read software contributed by Data Set Producer for native formats.	Yes, Pathfinder & WetNet, NESDIS level 1b & Wentz data.	HDF specific tools. IDL tools. Data set specific.	
Application Program Interface (API) Services 1. Local User I/F	No	No	No	
2. Metadata Searching	No	No	No	
3. Guide	No	No	No	
4. Archive API	No	No	No	
Data Acquisition Requests 1. Orbital Model Display - IMS portion of DARs - DAR submission	None	No	No	Not available through IMS interface
Statistical Collection for LSM 1. Monitor IMS Usage (i.e., what statistics are kept and how are they implemented?)	User Services manually tracks IMS usage. IMS collects the following statistics during a IMS user's session: login number: the quantity of users that log into the IMS, order number: the quantity of ftp and tape orders requested, order number by type: the media-type-specific(e.g. 4mm, 8mm, ...etc.) quantity of orders requested, search number: the quantity of inventory search attempts, browse number: the quantity of attempts to browse via the Result Window (GUI only), help number: the quantity of attempts to access the Help mechanism, new user number: the quantity for new users that leave a name and phone number.	User Services collects statistics on all customer requests. Data orders are tracked with DOTS. Additional statistics are maintained manually. Media & ftp distributions are tracked. Customer history information also maintained.	TRAK and IMS are used to collect statistics, including: user name, address, ship-to address, phone, email, fax, type, data set code, media code, # media, description Information requests: data set or product (or group code); referral information (if data is not local); phone #, email, letter contacts (note: “documentation sent” is counted as a data request); time spent to fill request (both data and inf.); specialist’s initials For charged orders: purchase order #; invoice #; amount billed/date; amount received/date; bill-to address	

SDPS	LaRC	MSFC	NSIDC	V0 System
2. User Access Patterns (i.e., what and how?)	None	Yes, user history database is kept.	Through V0 request log (tracks who, what, and how long).	
Ingest Service 1. Basic Electronic & Tape Ingest - 8mm - 6250 bpi - CD ROM	9 track, 3480, 4mm, 8mm, 3 1/2" and 5 1/4" floppy, FTP, and CD-ROM.	Yes, for 6250 bpi, CD-ROM, electronic, 4mm, and 8mm tape. If a data producer has data on any of these media, the DAAC can accept and read it.	Yes, 8mm, 9 trk, CD-ROM, 3480 cartridge, 4mm, FTP.	Transparent to user
2. Media Formats - Tar, backup, ...	Varied, UNIX systems. Read software is required.	TAR, BRU, ISO9660, ANSI tapes.	TAR, flat files, hierarchical file directories.	
3. Data Checking - Media readability - Checksum - Check format - Check data ranges	Inspection performed to check limits and verify documentation. Anomaly reports generated for data producers to reconcile discrepancies.	Limited: Number & size of copied files are checked.	Manual (checksum and comparison of file sizes.)	

SDPS	LaRC	MSFC	NSIDC	V0 System
4. Receive HDF & Native Formats, Format Conversions	1) HDF to ASCII 2) GEMPRO to ASCII from NCAR 3) Enhanced Binary Universal FoRmat (E-BUFR) to ASCII from World Meteorological Organization 4) Standard Data Format (SDF) to ASCII from the First ISCCP Regional Experiment (FIRE) 5) ERBE data format to HDF 6) SAGE I and II to HDF 7) ISCCP to HDF	Yes, the DAAC will accept data in any format. Most of the data has arrived on tape media. In the process of populating the Optical Mass Storage System, several data sets have been reformatted. The SSM/I data from Remote Sensing Systems (Frank Wentz), the Wentz Ocean Products, and the SMMR data have been, or will be, converted from large multi-day files to smaller daily files. Individual orbits were extracted from the large files and collected into a daily file using the UNIX 'tar' facility. Each daily file contains just the orbits for that day. The individual orbits remain in their native format. The SSM/I Pathfinder Project has converted SSM/I data from the native (Wentz) format to HDF. Once again, daily files are produced. Data exists for the period 8/87 through 11/88. All data has been reformatted. None of the original native structure remains. Reformatting of data is determined by the service level given to the data. Level 4 and 5 data are reformatted. Below level 4 is native.	Yes Image or gridded data: filtered through HDF utility (SSM/I, FII) Data set specific Near-term exercise using NGDC's Freeform for conversion	

SDPS	LaRC	MSFC	NSIDC	V0 System
5. Data Compression Techniques	Standard UNIX compression used for Level 0 and ephemeris data that is then stored on CD-Recordables. This data is not distributed to users. Browse images are compressed using NCSA compression techniques.	Data set dependent. Data compressed when archived, distributed compressed or uncompressed. Large data sets like SSM/I are compressed with Limpel-Ziv (UNIX) compression. Other data sets are not compressed at all. The data sets that are being migrated to the Optical Mass Storage System are typically compressed. It is possible to employ JPEG or RLE compression for the SSM/I browse images using built-in HDF utilities. At present, the DAAC is not using those compression schemes although some experimentation has taken place in cooperation with the V0 IMS development. Customers can request compressed data sets. In fact, the larger data granules are only distributed in compressed form. Again, if the data is given a high level of service (4 or 5), the data will be converted, given adequate resources.	GNU Zip is used to compress SSM/I and TOVS 3 data sets. Data is uncompressed before distributing to user. User may request compressed data, but this is not a standard option.	

SDPS	LaRC	MSFC	NSIDC	V0 System
6. Metadata Generation on Ingest - File location or file identification - QA status	Metadata is generated manually. Developing automated methods for ERBE and SRB processing on PGS. File location or identification: path for read software, and master directory id. QA status: yes.	Manual for data set inf. procedure. Automated for granule inf.- file id for all files, file location for files on jukebox. QA status for SSM/I Pathfinder data. Submission procedures are being designed to ensure that data sets submitted to the DAAC will include a scientific description of the data set and instrument source, the software to read the files, the data volume, the processing documentation and history, and sufficient information available to permit the creation of metadata. SSM/I data & limited inf. for MSU, WSI & GDS data sets.	Yes (generated from headers of data products). Yes, file location and file ID; only include QA status if data producer says what the values are (not S/W generated)	
7. Receive Metadata, L0-L4 Data Products, Instrument Data - Schedules - Status	Scheduled reception of NOAA/NESDIS ERBE Level 0 data, and GSFC ERBE Level 0 data. Metadata and other data products manually scheduled. Status updates procured manually.	Yes, the DAAC will accept data in any form that is available. We accept it but do not convert it, except as described above.	Yes, data set dependent. No schedules.	
8. Scan Hardcopy for Ingest - Data or documents	Neither.	No	Text scanning/OCR for documents planned.	
9. Request Re-transmission of Missing Data	Manually.	Manual procedure	Manual	
10. Push vs. Pull of Received Data	NOAA/NESDIS ERBE Level 0 data-push; GSFC ERBE Level 0 data-pull. For ingested data with eventual availability to the user, data is most frequently pushed.	For some data sets. Pull from NESDIS.	Pull AVHRR data from EDC; also push to EDC. All data is pulled from FTP.	

SDPS	LaRC	MSFC	NSIDC	V0 System
Archive Service 1. Import & Export Physical Data - Manual or automatic remove/add of media to archive) - Recover data from failed devices and media	3480 tape capability has not been implemented. DAAC has 1-off CD-ROM production system. Concerning failed devices or media, received data is immediately backed up to the institutional MASSTOR system. Concerning removal/addition of media to archive, LaRC version of UniTree is deficient since it does not allow for archived media to be shelved (i.e. physically removed from the archival device) and remain in the archival directory (i.e. no 'archival fault' to force operator to retrieve infrequently referenced data from the shelf).	V0 functionality: A CD-ROM pre mastering facility was added to the DAAC in April 1993. The MSFC DAAC is able to pre-master CD-ROMs either on 8-mm tape or a write-once read many "CD-WORM" after which the CD-ROMs may be massed produced by a commercial manufacturing facility. (p) Procurement is underway to add 4-mm DAT drives to the system.	Tape and floppy import/export; some FTP as well.	
2. Automatic Copying/Refreshing of Media - Manage media degradation	Operations staff is migrating all ERBE science products from the Aquidneck WORM system to 5 1/4 optical jukebox using UNIX scripts.	No: Thus far all MSFC Data Sets have another source of deep backup.	Copying/refreshing is done, but not automated.	
3. Integrated FSMS to Manage Archive	Yes - UniTree	SUNCOAST	SUNCOAST (SUNCOAST provides primitives which applications use.)	
4. Verify Data is Present & Accounted for	Manual audits	Manual procedures	Yes, manual.	
5. Deletion of Archive Data	Follow recommendation of UWG.	Yes, after the approval of UWG.	Yes, rarely (usually due to reprocessing)	
6. Data Archive Integrity Check	Mostly manual procedures, but some tasks have been automated.	Manual procedures	Manually	
7. Backup for EOS Data - On-site - Off-site	No off-site backup of Version 0 data. Separate backup of products on DISC jukebox on institution mass storage system in same facility.	Yes, for some data sets	All NSIDC data sets are backed up off-site at NOAA's NGDC facility.	

SDPS	LaRC	MSFC	NSIDC	V0 System
8. Restore Archive		Yes, from backup tapes	No	
9. Capacity to Ingest 3x Normal Ingest Volume in 1 Day	3x Normal Ingest volume in 1 day for current demands (i.e. NOAA/NESDIS and GSFC).	N/A	No	
10. Monitor Bit Error Rate (BER)		Yes, within SUNCOAST software device driver.	SUNCOAST device driver does it.	
11. Stored Data Format - HDF - Native - Some other format	HDF and native	Yes, HDF and native	Native, HDF (browse)	
12. Monitor Archive Performance	Some performance monitoring available from UniTree.	Yes, System Tools	Planned reporting of ingest & access activity.	
13. Prioritized Data Retrieval - Browse, quick-look, standard products assigned different priorities	No	Based on prioritized order filling.	No	
14. Track Access to Specific Data Granules	Track read-accesses that are attributed to orders. Write-accesses are limited to a single UNIX account.	No	Planned for mass store system; data on media is not tracked to granule.	
15. Archive Hardware	DISC, Inc. optical disk jukebox. Data is stored on 1.3 GB read-write platters. Double-sided jukebox has 3 drives on each side and at total capacity of 1024 platters. Interface to ERBE Acquidneck Optical Platter Jukebox (122.3 GB of storage).	Cygnet Optical WORM jukebox (1.2TB)	Cygnet WORM jukebox (1 TB). (Converting from 9 trk tape)	

CSMS	LaRC	MSFC	NSIDC	V0 System
Communications Network Infrastructure 1. Network Components - Gateways (X.400/SMTP) - Routers - Hubs - Circuits (site-to-site, i.e., including DAACs and selected ADCs and SCFs) - Dial-up access	Internet access through LARCNET, 2 cisco routers (primary AGS +, backup Cisco 3000), Ethernet (twisted pair, one segment) LAN (192.107.191.xx, "EOS Local"), 168 kbps link to GSFC, dial-up access to LARCNET, no dial-up access to EOS Local.	168 kbps link to JPL 256 kbps link to EDC 504 kbps link to GSFC Ethernet LANs 1 cisco router (plan to have a backup router in FY94) The center has an X.400/SMTP gateway (FDDI upgrade Q1 95)	V0 network: 256 kbps link to MSFC, 2 cisco routers (primary and backup), Ethernet LAN. Local network: SNOWGW cisco router to C.U. (gateway), ethernet LAN, plan to add an FDDI LAN (4 machines).	See GSFC's links and routers. The process of establishing the DAAC to DAAC network is non trivial (a lot of time and energy was spent by the V0 group). No mail gateways. Dial in for out of band access of routers only. Regular dial in for users may be supported by the institution where a DAAC is located
2. Network Management - Security - Performance - Network monitoring - Performance tuning & analysis (file transfer timing) - Browse applications time	Routers managed by V0 NOC at GSFC. Security and Network monitoring: general scan of every packet using NNSTAT public domain software. Performance and performance tuning and analysis: none.	Computer and network operations done by the computer system administrator and his assistant Routers managed by V0 NOC at GSFC	Routers managed by V0 network and CNS. (CNS manages routers that link to CU)	DAAC to DAAC network managed by VO NOC. The network management software is a DEC MSU (Management Station for Ultrix) The DEC MSU is currently running on a DECStation 5000 and an X-Windows terminal is used to interact with it. An Operations Guide has been developed by the V0 Network group. It contains among other information troubleshooting flowcharts and instructions. Software has been written (few line code) to get key statistics such as free memory, number of users, number of jobs, bytes per day transferred on links between sites and time required for pings between sites.

CSMS	LaRC	MSFC	NSIDC	V0 System
3. Basic Communications Services - Directory (e.g., DNS, X.500) - Data compression - Network security (authentication, authorization, address filtering, sub-network isolation (e.g., FOS LANs), card key security for remote ISTs) - Session (GUI type) - Xterminal support - Remote terminal support - File transfer support - Interprocess communication - Time synchronization support - E-mail - Remote data (distributed file system, DBMS client/server) - Remote process invocation - Bulletin board	FTP, Telnet, e-mail (SMTP), session(GUI type), Xterminal support	FTP/Anonymous FTP, Telnet e-mail (SMTP & X.400) transmission of user's request for multiple FTP browse images in a single client/server message. Compression for browse images GUI and ChUI support WWW Server	FTP, Xterm support, e-mail, telnet, remote terminal, file transfer, data compression, data staging for FTP pickup, OMNET, SMTP.	FTP (anonymous FTP supported), telnet - Limited access usenet Bulletin Board - e-mail, listserv (mail exploder), mail reflector - X.500 Directory Service
4. Protocol Suites - TCP/IP, GOSIP, DECNet	TCP/IP, no GOSIP, no OSI, insignificant DECNet.	TCP/IP, HTTP	TCP/IP, DECNet (going away 6/1/94)	TCP/IP
Local Site Management 1. Fault Management - Alarm processing/display - Vendor diagnostics - Event logging and analysis - Expert-system analysis	No alarm processing/display, no vendor diagnostics, no event logging, no expert system analysis.	Troubleshooting, responding to problem reports (human) On-line problem report templates.	Trouble shooting DEC MCC (MSu) for net, system logs, FTP logs	

CSMS	LaRC	MSFC	NSIDC	V0 System
2. Network Configuration Management - Resource, logistics, policy & proc., maintenance, and inventory management - Software distribution (incl. toolkits) - Event logging and analysis	Informal manual procedures for resources, logistics, policy and procurement, maintenance, and inventory management. No cross-DAAC functions. No event logging and analysis.	Loading new version of software. Testing and integrating new hardware and software. Coordinate maintenance upgrades. (all of this is not automated. Standard Unix utilities are used)	Connecting new machines, inventory & maintenance management. UNIX PS command (processes) DEC MCC (network) SUN traffic command	
3. Acct./Accountability Management (Including billing systems) - OS account-data extraction - Event logging and analysis - Production/data status tracking	No billing systems	Data Order Tracking System (DOTS) is used for monitoring outstanding data orders	V0 machine has (disk usage) accounting now.	
4. Security Management - Event logging and analysis - Limited key management - Virus checks - Key mgmt. for private e-mail	Limited security management. Periodic password checker executed. Macintosh virus checking. Internet worm patches.	Automatic authentication by IMS/DADS interface software as part of order tracking	Yes, manual through system logs (FTP logins, etc.); virus checkers for PCs.	
5. Performance Management - Event logging and analysis - Logging application perf. - Trending and stat. analysis - Load balancing	No formal performance management.	System performance analysis is performed manual & UNIX SES Workbench software used for simulation of user interaction with the system	Yes, limited. Manual monitoring with UNIX utilities. No trending.	

CSMS	LaRC	MSFC	NSIDC	V0 System
6. Report Generation - Analysis of event logs - 4GL reports	No formal report generation.	Currently only minimal reports are produced. There are forms for user statistics from User Services that pertain to system use from an order filling perspective. Operations keeps an eye on performance and disk usage on an occasional basis. There will be numerous reports generated when the Data Order and Tracking System goes on-line. The addition of a Systems Management personnel will result in more formal procedures in the near future.	No No increase in data collection anticipated.	
7. Scheduling - Timeline creation/display		Manual scheduling done for activities such as use of tape drives and backups (no automatic scheduling mechanism)	No	
8. Servers and Workstations - Directory/e-mail/security servers for users - Directory/e-mail/security servers for computers - Directory/e-mail/security servers for applications - Local system management workstation	IMS: HP 735, DADS: RS 6000/560, and PGS: Sun SPARCstation 10.	2 Silicon Graphics hosts	IMS file server (SGI 340D); DECstation 5000/240 is IMS server (local) IMS client will be SGI Indigo SGI Challenge for ingest/production	DECStation 5000 for network monitoring SparcStation 10 for X.500 directory server, anonymous FTP
Non-Local System Management 1. Scheduling - Multi-site schedule monitoring - Cross-site schedule coordination and adjudication	N/A	N/A (if requested data is not available, users are redirected to other DAACs using e-mail and phone)	Paul Buster, Doug Carey CNS@CU. handles these (Communications and Network Services).	

CSMS	LaRC	MSFC	NSIDC	V0 System
2. Fault Management - Cross-site data aggregation - Alarm processing/display - Vendor diagnostics - Event logging and analysis - Expert-system analysis	N/A	N/A	Manual, as needed	
3. Network Configuration Management - Cross-site data aggregation - Training, resource, logistics, policy & proc., maintenance, and inventory management - Enhancement rqmt. processing - User feedback processing - Source code control system - Event logging and analysis	N/A	N/A	Manual, as needed	
4. Acct./Accountability Management - ECS-wide status tracking - Product pricing and user billing - Accounts payable/receivable - Transaction proc. - OS account-data extraction - Production/data status tracking - Event logging and analysis	N/A	N/A	Manual, as needed	
5. Security Management - Key management - Event logging and analysis - Virus checks	N/A	N/A	Manual, as needed	

CSMS	LaRC	MSFC	NSIDC	V0 System
6. Performance Management - End-to-End network - Event logging and analysis - Logging appl. performance - Trending and stat. analysis - Load balancing	N/A	N/A	Manual, as needed	Cross site monitoring of the performance of hosts and routers is done.
7. Directory Information - User identification - Facility and equip. id - Data identification - User registration information	N/A	- MSFC has a domain name server. There is also a new system which allows all of us to specify our e-mail address as: firstname.lastname.msfc.nasa.gov. The system adapts if we change workstations. - X.500 directory service	No	X.500 directory service (currently about 1200 entries of people affiliated with EOS)
8. Report Generation - System-wide analysis of event logs - Cross-site 4GL reports	N/A	No	No	
9. Network Help Desk	User Services	User Services	Comm. staff	
10. Servers and Workstations - Directory/e-mail/security servers for users - Directory/e-mail/security servers for computers - Directory/e-mail/security servers for applications - System management workstation	N/A	No	Same as above.	

System Engineering	LaRC	MSFC	NSIDC	V0 System
System Performance 1. Analysis of Needs/Operations Concepts	Informal analysis of needs, based specifications on informally-determined performance estimates, considered current work station performance. Ongoing planning and analysis for DAAC growth and data set population. Developing Operations Concept Document. Operations manual that focuses on physical operations (e.g. nefric collection).	preliminary Operations Plan	Yes	
2. Implementation & Performance Tradeoff Studies	None	Yes, manual procedures by system engineers as required	Informal	
3. Analysis of Major Interfaces - External - Internal (element-to-element)		Analysis on a case by case basis.	None written	
4. Prototyping Activity	Version 2.0 of Langley V0 IMS (in alpha test). User Services Utility. TOPS. EOPS. MPU.	Data miner.	Yes, (V0 sponsored) Polar browse, guide, server, guide-population, automating QA procedures with AI techniques.	
5. Documentation (e.g., System Design, Ops. Documentation, SOPs, etc.)	Langley IMS Lessons Learned Document, Granule Naming Conventions Lessons Learned (draft), Langley DAAC Data Set Ingest Plan, Langley IMS Configuration Guide, Langley DAAC Handbook, Langley Compact Disc Publishing Guide (draft).	Ops. Plan IMS server document MDMS Fun. Req. & IMP Plan Mass Store Trade Study CM Plan CPU Trade Study	In progress	
6. Plans for System Growth/Evolution	See FY94 Proposal	Yes, manual activity by system engineers as required	In progress (space, human resources).	

System Engineering	**LaRC**	**MSFC**	**NSIDC**	**V0 System**
7. Change Control	Manual procedures for change control process.	Manual procedures. Typical CCB approach.	No formal review process. All under control (except ops. procedures); manual control.	
8. Problem Tracking	Detailed but informally organized problem reports.	Partially automated with on-line problem report templates.	System logs.	
User Model 1. Classification of Users & Services	Enhanced ability to collect user classification in Langley IMS Version 2.0. Development of "Frequently Asked Questions" list and examination of comments to identify needs.	Yes, based on manual & automated order tracking & customer history.	Yes, based on user statistics.	
2. Collection of Statistics on User Activity	Capturing statistical information with IMS. Analyzing and reporting statistical information performed by User Services. Currently determining the validity of statistics being collected.	Yes with DOTS and manual procedures.	Manually keyed in, with canned output reports.	
3. Developing Predictive Model of Users	No	No	None	
4. Implications for System Requirements - Service loads, response times		No	All analysis reported through V0.	
Integration and Test 1. Test Data - Test algorithm (benchmark algorithm) - Simulated data sets (for AM-1 instruments) - Data generators	No benchmark algorithms and no simulated data sets in the strict sense of simulation.. CERES Raw Data Generator (CERDAG) produces a data stream for the CERES data processing system based on ERBE instrument and ERB satellite data (an SCF activity).	None yet. Expect these to appear as LIS/OTD mission nears.	SSM/I had specific test data sets provided by GSFC to verify algorithm conversion. Keep set of queries (43) for testing V0 IMS (directory, inventory, browse)	

System Engineering	**LaRC**	**MSFC**	**NSIDC**	**V0 System**
2. Test Procedures for New System Installation	Yes, but limited for system-wide test. Procedures for installation and testing of PGS software.	Yes, very limited.	Use test client to send queries to server.	
3. Simulators - Simulators for ext. interfaces	None	No	No (just test client)	
4. Test Tools - Auto test planning and test management tools - Requirements trace tool - Hardware test equipment - Data reduction and analysis tools - Auto testing tools	None	No	As above	
5. System Configuration Management	Manual procedures	Yes, manual procedures	Yes, source code control system	
6. Configuration Management Tools - Hardware and software	Mostly manual. UNIX utility SCCS for ERBE data processing system on PGS.	Yes, RCS only	SCCS (UNIX tool); may evolve to RCS	
7. Discrepancy/ Problem Tracking Tool	Manual.	Yes, paper to date.	Yes - use C debugging options to debug	
Internal/External Interfaces 1. Other Data Centers - Data availability schedule - Data request and orders - Data products - Ancillary data - Search criteria - Metadata - Browse - Cost estimates - Order status	Currently implementing and testing of electronic interface with GSFC for ERBS and NOAA-10 telemetry and ephemeris data, currently a 6250 tape interface. Currently utilizing electronic interface with NOAA/NESDIS for NOAA-9 telemetry. For data request and orders: NOAA & GSFC pushes data to PGS and provides processing reports as a contribution to metadata. Yes. Data availability schedule, data request, metadata, data orders, data products, order status	Yes, but limited to capabilities of V0 System IMS. Automatic ingest of SSMI, WSI & GDS data. NOAA/NESDIS interface (ftp). Distribution of WetNet browse electronically to WetNet scientists.	Mostly manual for mediation of data request services (e-mail, fax, phone).	Yes - data availability schedule, data request, search criteria, metatdata, data orders, data products, browse, order status

System Engineering	**LaRC**	**MSFC**	**NSIDC**	**V0 System**
2. SCF - Algorithm, I&T specifications - Toolkit - I&T test schedule - Algorithm delivery package - Test, special products - Calibration coefficient, QA exchange	With ERBE and ISCCP input data, the Surface Radiation Budget effort is generating data that is being archived at LaRC DAAC.	e-mail, FAX, FTP	Yes, human interface (CRYSYS, POLES)	
3. Other Interfaces - FDF, NCC, ICC, IST, NASDA, ESA - Aster, Landsat		None	NOAA, University, other NSIDC projects.	
Staffing Profiles 1. System Development Staffing (System enhancements and upgrades, both hardware and software) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	4 analysts; 2 B.S., 2 M.S., all 3-7 years; 1 shift; 5 days/week.	5.5 people Mix of BS/Ms 1 shift 5 days/week	3.5 people for development Mix of BS/MS All employees work 5 days/week, day shift (as of 1/1/94) (Numbers do not include DAAC management)	
2. System Testing Staffing (Development, maintenance/upgrade, regression testing) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	Level of effort: 1 FTE (no dedicated staff) comprised of development staff, User Services, system engineering and science; 1 shift 5 days/week	Level of effort: 1 FTE (no dedicated staff) comprised of development staff, User Services, System Engineering and Science; 1 shift 5 days/week	0 people (integrated w/ previous cell) (Numbers do not include DAAC management)	
3. System Management Staffing (Site management, CM of hardware/software/data, document management) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	3 "personnel": DAAC manager, system engineer, and 1/2 FTE Administrative support and 1/2 FTE contractor management support; 1 shift; 5 days/week.	2 FTEs Mix of BS/MS 1 shift 5 days/week	2 people (Numbers do not include DAAC management)	

System Engineering	LaRC	MSFC	NSIDC	V0 System
4. System Maintenance Staffing (Hardware, software, performance analysis/sustaining eng., sys. eng., facility planning, document mgmt., QA) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	2 analysts; both B.S., 1 2-7 years, 1 >7 years; 1 shift; 5 days/week.	6.5 FTEs Mostly BS w/ 1.5 MS 1 shift 5 days/week	3 people (Numbers do not include DAAC management)	
5. Operations Staffing (Routine processing, cataloging archiving, distribution, reprocessing, sys. admin., accounting, operations analyst, operations training, media lib.) - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	2 analysts; both B.S., 1 2-7 years, 1 >7 years; 1 shift; 5 days/week. 4 Operations technicians; 2 on the day shift, 1 on the 2nd shift, and 1 on the 3rd shift; all 5 days/week.	7.5 FTEs 2.5 BS; the rest are operations technicians 1 shift 5 days/week	1 person (Numbers do not include DAAC management)	
6. User Support Personnel - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	3; all M.S., 1 >7 years, 2 0-3 years; 1 shift; 5 days/week.	3 people; all MS; one w/ 4-5 yrs. and two w/ 1-2 yrs. 1 shift 5 days/week	2.5 people (Numbers do not include DAAC management)	
7. Algorithm Science Software Development, Integration and Test - Number of DAAC personnel - Skill mix - Shifts worked - Days/week	SCF staff only.	3.0 for DAAC 2.5 for Pathfinder 1 has BS w/ 10 yrs; 4.5 have MS	2.7 people (Numbers do not include DAAC management)	

HMI	LaRC	MSFC	NSIDC	V0 System
Accessibility 1. User Interaction	Version 2.0 of Langley IMS.	Local user interface GUI & ChUI developing WWW Server	Human contact (phone, mail, or e-mail) or V0 system IMS	Easy to access and begin working with system. System responsiveness is slow ChUI has no graphics capability. GUI requires Xwindows/Motif and Internet.
2. User Friendly Features - Multiple windows - Buttons and pull-down menus - Valids list - Help - Consistency - Save and restore - Standardized commands/terms - Meaningful error messages - Acronym expansion - Menu tree diagram - Command language	Multiple windows, Buttons and pull-down menus, valids list, help, and consistency. Save and Restore user profiles and user IMS queries. Standardized commands and terms. Meaningful error messages but focused upon error prevention when designing IMS. Acronym expansion. No menu tree diagram, avoided deeply nested menu tree (i.e. greater than two levels). No command language, but tried to avoid the need for the command language by providing an interface with the necessary functionality as requested by the users.	Yes, under development based on V0 IMS. WWW HTML documents for most data sets, SSMI browse.	See V0 system description.	New version has multiple windows but take up entire screen and do not facilitate interaction between panels, everything under 2 pull-down menus...some buttons available to pull up other panels, good implementation of valid lists and dependent valids, functions under the “Screen Functions” menu change with each panel...this could be more consistently implemented - limited implementation of help - limited error messages - ?? on save and restore - no acronym expansion, menu tree diagram, and command language
3. Level of User Ability - Expert - Intermediate - Novice	UWG specifically advised AGAINST developing a system with novice and expert modes.	Under development Expert & Novice.	See V0 system description	Expert and novice can be set, but do not think function is implemented at this time
4. Ease of Use	Reasonably easy.	Good, we hope	See V0 system description	
5. Use of Color/Fonts	Well-chosen colors, legible fonts	Yes, but not user changeable	See V0 system description	New version has color
6. System Feedback - Status, alerts, prompts, defaults	Yes, status, alerts, prompts, defaults Minimal feedback.	Under development	See V0 system description	Very limited system feedback provided

HMI	LaRC	MSFC	NSIDC	V0 System
7. Error Prevention/ Correction	Sometimes. For example: valid lists pops up with possible answers, phone number checked for inclusion of area code. Minimal correction, if any.	Minimal	See V0 system description	None
8. Expert Shortcuts	UWG argued against this feature.	Yes	See V0 system description	Command keys can be used in place of menu selections
9. Information Access - Direct vs. Hierarchical	Direct and Hierarchical exist.	Direct for some data sets.	N/A	Access is very hierarchical since options are buried deep within 2 menus and windows cover entire display
Maintenance & Operations				
1. Backup Procedures	Yes	Yes, TAR and BRU onto 8mm	Yes, BRU, dump (system & data) daily, weekly, monthly.	
2. Recovery Procedures	Yes	Yes, from backup tapes	Yes, from backup tapes.	
3. Security Controls		Yes, security plan under development.	UNIX (monitoring rhosts file, yellow pages, etc.)	
4. Daily/Weekly Reports	Yes	Yes compiled manually	Weekly meetings to review status/problems. Building an anomaly database.	
5. Level of System Control		Manual	Crontab to run backups; everything else manual.	
6. Staffing Profiles	Yes, EOSDIS staff works 1st shift (generally 8:00 - 4:30). 1 operations staff member on 2nd shift and 1 operations staff member on 3rd shift.	1 shift/day 5days/week. See proposal for staffing profile.	Yes All 5 days/week; 8 hours/day; no shift work	
FOS				
1. DAR Processing		N/A	No	
2. Planning		N/A		

Miscellaneous	LaRC	MSFC	NSIDC	V0 System
		WetNet Magneto-optical cartridges are restricted.		
1. Other Data Distribution Types	CD-ROMs generated outside the DAAC (ISCCP). Documentation provided by Data Set Producers. Documentation about the DAAC.	No		
2. Data Dictionary (i.e., using as active data dictionary?)	Support ESDIS V0 Requirements	Used for valids list in local IMS.	Ingres-based	
3. Design	Rapid development tools involvement of user services staff in development. Worked with data producers to develop ingest procedures. Work in small teams; 3 people did the entire IMS development.			
4. IMS Configuration		Local IMS directly accesses database. ESDIS IMS accesses server that accesses MSFC database.		

Miscellaneous	LaRC	MSFC	NSIDC	V0 System
5. Major Data Sets Visible via V0 System or DAAC IMS/Format	All data sets that are currently available are visible to the V0 IMS. All data sets that are planned for V0 will be visible to the V0 IMS. Current data sets in native format: ERBE_S2 ERBE_S4 ERBE_S4N ERBE_S7 ERBE_S8 ERBE_S9 ERBE_S10 (4) FIRE_CI1 (3) FIRE_CI2 (21) FIRE_CI2_ER2_MAS FIRE_MS(7) GTE-ABA-ELEC-CHEM ISCCP_B3 ISCCP_C1 ISCCP_C2 SAGE1_Aerosol SAGE2_Aerosol SAM2_Aerosol Current data sets in HDF format: ERBE_S4G (14)	Wentz data sets: SSM/I Antenna Temps. (Ta) SSM/I Geophysical Products NESDIS data sets: NESDIS Level 1B sensor counts HDF data sets: SSM/I Pathfinder Antenna Temps. SSM/I Pathfinder Atmospheric Products SSM/I Pathfinder Precip. Product SSM/I Pathfinder Land Products SSM/I Pathfinder Sea Ice Product MSU Monthly Temp. Anomalies Ch. 2 MSU Monthly Temp. Anomalies Ch. 2R MSU Monthly Temp. Anomalies Ch. 4 MSU Daily Temp. Anomalies Ch. 4 MSU Monthly Temp. Anomalies Ch. 23R MSU Daily Temp. Anomalies Ch. 23R MSU Monthly Ocean Precip., Spencer WSR Composite Rainfall Product Native data sets: SSM/I Monthly rain indices over ocean, Chang	HDF data sets: AOBP temp, pressure, and ice velocity grids (maybe by July) DMSP SSM/I (F8)Sea Ice Concentration Grids SMMR Brightness Temp & Sea Ice Conc. Grids SSM/I (F11) Bright Temp & Sea Ice conc. Grids SSM/I Pathfinder (EASE-Grid) SSM/I Derived Snow Products (1994) LEADEX AVHRR polar subset (may not be HDF) Navy/NOAA JIC SIGRID (browse only HDF) Russian (FSU) digitized sea ice charts (browse only HDF) TOVS temp and pressure profiles (polar region) Ice surface temp maps (TBD-may not have) Cloud-cleared (TBD-may not have) AVHRR ice maps AOBP Buoy Positions (not HDF) Arctic Atmospheric Soundings (not HDF - may be translated) SSM/I Brightness Temp. Grids for Polar Regions Fowler's ice motion vectors (TBD)	

Miscellaneous	LaRC	MSFC	NSIDC	V0 System
5. Major Data Sets Visible via V0 System or DAAC IMS/Format (continued)	ISCCP_C2 SAGE2_Aerosol SAGE2_Ozone SAGE2_Cloud SAGE2_03_Monthly SRB_Daily SRB_Monthly	OLS Derived lightning product, Goodman MSU Brightness temps. (Tb) SMMR Antenna Temp., TAT Rf Ant. GDS Lightning Ground Strikes AMPR Brightness Temp. (Tb) Multi GOES Precip. Index (GPI) In-situ Global land precip., GPCC In-situ Surface Raingauge Obs., Jaeger In-situ Surface and Ship Obs. Precip., Legates In-situ Comprehensive Pacific Raingauge DB In-situ Amazonia River Discharge, Richey In-situ Hydroclimatology, Wallis et al. In-situ Wetlands In-situ Comprehensive Precip. Data Set for Global Land Areas, CDIAC	J. Zwally ice sheet altimetry data set (not HDF) SMMR-derived snow cover maps ECMWF (T, P, Wind) (TBD) NMC (T, P, Wind) (TBD)	
6. Tutorials and Help	Frame document provides an on-line tutorial w/ screen dumps embedded	No		No
Operating System 1. UNIX - Major platforms/element	UNIX, Macintosh, DOS.	Yes	Everything UNIX based. (No VMS) Administrative functions are PC- or Mac- based	