REQUIREMENTS FOR POLAR, WIND AND GEOTAIL SPACECRAFT OPERATIONS AND GROUND SYSTEM DATA HANDLING
Final – 9/20/2001

Relevant Documentation: The following documentation will aid in understanding the current ISTP ground system. PDF versions are available from barbara.giles@gsfc.nasa.gov.
Data Format Control Document (DFCD)
ISTP Central Data Handling Facility (CDHF) Users Guide
ISTP CDHF Programmer's Guide to Key Parameter (KP) Generation Software

1. SCIENCE OPERATIONS PLANNING

Event Identification

Issues: Identification of important sun-earth connection events and the subsequent coordination and support of science analysis for those events has been a major achievement for the ISTP system. Continuation of this support is necessary for coordinated SEC science efforts in the future.

Requirements: With respect to the basic operation of the Polar and Wind spacecraft and the flow of level zero (LZ) data to the Polar, Wind, and Geotail instrument teams, there is little or no requirement for geophysical event identification. With respect to the support of science analysis, and collaborations with SOHO, ACE, Cluster, and IMAGE, it is desirable to continue some level of event monitoring.

Comments/Recommendations: The funding levels provided for Polar, Wind and Geotail operations require the termination of the current structure for identification of sun-earth connection events and the subsequent coordination of operation planning and special event data distribution. We anticipate that the Polar, Wind and Geotail project and science teams will, as well as can be done within provided funding levels, take greater responsibility for operations coordination with other spacecraft and ground stations, the production and distribution of special event data for the science community, and the production of press related images. Event identification will rely on monitoring the space weather alert mechanisms of external organizations and the recommendations from Polar, Wind and Geotail experimenters.

Predictive Orbit Information

Issues: The GSFC Flight Dynamics Facility (FDF) routinely generates separate orbit predict and attitude files for Polar, Wind and Geotail. The FDF files for Polar and Wind are processed further by the ISTP CDHF into a CDF format product that is heavily relied upon for science operations planning by the instrument teams and by the science community for data interpretation. The orbit and attitude predict files for Geotail that are processed by the CDHF are generated by ISAS.

The orbit predict files include several coordinate systems (inertial and geomagnetic) for the position and velocity of the spacecraft and reference positions of the Earth and Sun and other ancillary parameters. The use of common algorithms to calculate these parameters have been key to coordinated science interpretation between the difference spacecraft. Details on these parameters may be had from the orbit CDF file skeleton tables.

The wide use of automated scripts by instrument teams and the NSSDC archive in the use of the CDF product mean that changes to content or format would result in a need for significant software re-engineering at those institutions.

The widely used orbit plots provided on the ISTP web site are generated by the GSFC Satellite Situation Center (SSC) using the FDF generated Polar, Wind and Geotail orbit predict files.

Requirements: Timely generation of the orbit predict files remains a high priority requirement for science operations planning. There is a medium priority requirement for consistency for the content and format of the files.

Comments/Recommendations: We do not expect any impact on the production of orbit plots. We plan to continue to supply predictive orbit information. We recommend that procedures for producing comparable products be reviewed and implemented as efficiently as is feasible.

Polar Despun Platform Pointing Planning

Issues: The Polar imagers are pointed to geophysical phenomena which are not fixed with respect to inertial space and therefore require pointing information which varies from orbit to orbit. Because several instrument teams require this information, it is efficient for one organization to generate the relevant parameters and supply the information to all interested parties. To date, the GSFC FDF and ISTP SPOF have provided a high level of service in this area.

The wide use of automated scripts by the instrument teams in the use of these products mean that changes to content or format will result in a need for significant software re-engineering at those institutions.

Requirements: Polar spacecraft platform pointing analysis will continue to be a high priority requirement for the imaging instruments, especially during the more complex operations anticipated during ecliptic normal spacecraft orientation

Comments/Recommendations: We anticipate needing to retain the current type of service to maximize imaging time with respect to varying Earth viewing windows, horizon sensor information, orientation of the sun, and any slow drifts of the spin axis.

Submission Of Commanding Sequences By Instrument Teams

Issue: Several of the Polar and Wind instrument teams submit commanding plans with few changes other than to the time tag. The Wind portion of this commanding flow is very low as compared to Polar. In addition, there are Polar instrument teams that submit varying, sometimes complex commanding plans due to changing position or attitude with respect to geophysical locations. Error checking of these command uploads is recognized as an important contribution currently performed through automated software processing by facilities within the SPOF.

The Polar/VIS instrument team will continue to generate and submit microload commanding sequences that, at present, require further processing before insertion into the overall spacecraft commanding sequence.

In the case of a future instrument anomaly, a Polar or Wind instrument team may require assistance in the development of commanding microloads to aid in instrument operation diagnosis.

Requirement: Polar and Wind have a high priority requirement for a conduit for the timely submission of instrument commanding instructions from the instrument teams. Polar and Wind have a high priority requirement for maintaining automated error and conflict review of these commanding sequences.

Comments/Recommendations: We recommend the physical relocation of this facility or this function from the SPOF to the mission operations center.

2. FLIGHT OPERATIONS PLANNING

Preparation Of Spacecraft And Instrument Commanding Sequences

Issue: Preparation of the stored command tables for Polar and Wind, including instrument microloads, is currently performed within the MOC. The Wind portion of this commanding flow is very low as compared to Polar.

Requirement: The verification and preparation of Polar and Wind spacecraft and instrument commanding sequences remains a high priority requirement.

Comments/Recommendations: We anticipate continuing the present procedures for these tasks. In addition we recommend incorporating the hardware and software, or the function associated with the instrument command receipt and checking process, be placed under the operation of the mission operations center. We recommend reviewing the joint operation for possible equipment upgrades or architecture improvements to relieve any additional burdens the joint operation might impose.

Spacecraft Ranging Information

Issues: The GSFC Flight Dynamics Facility (FDF) routinely generates spacecraft ranging information for Polar, Wind and Geotail for use by the DSN.

Requirements: Timely generation of the ranging files remains a high priority requirement for flight operations.

Comments/Recommendations: We plan to continue the current level of service in this area.

DSN Scheduling

Issue: The joint Polar and Wind MOC currently supports a full time DSN scheduler. Partial support for a DSN scheduler for Geotail based at JPL is currently funded by ISTP/GGS. The Polar, Wind and Geotail contact schedules are, on average, well known in advance. Polar and Wind spacecraft and instrument anomalies requiring additional DSN contact time have occurred on an average of 1 time per year.

Requirement: Polar, Wind and Geotail have a high priority requirement for competent DSN scheduling. There is a high priority requirement for DSN contact adjustments in the case of spacecraft or instrument anomalies or problems with scheduled DSN stations.

Comments/Recommendations: We anticipate the current load of Polar and Geotail DSN scheduling to continue for the next few years. We anticipate the current load of Wind DSN scheduling to decrease by ~1/2. We recommend that spacecraft and instrument commanding procedures and timelines currently in place for commonly experienced anomalies be reviewed for the inclusion of streamlined procedures which could reduce some need for extended DSN contacts.

Special Operations Planning/Scheduling

Issue: Twice per year the Polar spacecraft spin axis direction must be "flipped" with respect to the ecliptic. The current orientation of the orbit requires special planning for prolonged eclipse

periods. Significant planning is underway to stretch the remaining Polar fuel reserves and to switch to ecliptic normal operations beginning in FY02.

Several times per year the Wind spacecraft requires orbit corrections and maneuvers. Management of the Wind fuel reserves is important and aims at reducing the usage as much as possible.

Requirement: Polar and Wind have a high priority requirement for special operations planning and scheduling. Continued engineering analysis of fuel measurements and utilization is required. The complexities of the operations and the complexities of the spacecraft present a high priority requirement for access to or retention of experienced personnel.

Comments/Recommendations: We anticipate the current load of special operations planning to continue. We plan to continue the current level of service within the flight dynamics and spacecraft operations area. We recommend increased use of the civil service engineering staff available within GSFC.

Anomaly Analysis, Generation Of Recommendations

Issue: On occasion, understanding of Polar and Wind spacecraft and instrument anomalies requires in-depth study and analysis by specialized engineering and science staff (e.g., there is a current study regarding a greater than average number of Polar despun platform unlocks).

Requirement: There is a high priority requirement for the understanding of the Polar and Wind spacecraft subsystems and instrument operations after anomalies and the generation of recommendations for recovery or mitigation.

Comments/Recommendations: We recommend increased use of the civil service engineering staff available within GSFC.

Generation Of Spacecraft Status Reports

Issues: A minimum level of Polar and Wind spacecraft operations reporting is required by GSFC management and by NASA HQ directives.

Requirements: Polar and Wind have a high priority requirement to meet spacecraft reporting requirements as set by GSFC and NASA HQ management.

Comments/Recommendations: We anticipate supplying spacecraft status reports at the minimum level required by GSFC and NASA HQ directives. We recommend the possibility of shifting this function to civil service personnel.

3. FLIGHT OPERATIONS

DSN Contacts with the Polar and Wind Spacecraft

Issues: NASA HQ has assured the ISTP GGS project office that DSN contact costs will continue to be supported at current levels and need not be included in the re-engineering efforts under the direction of the Polar, Wind and Geotail project scientists.

Requirements: Polar's transmitter/receiver capabilities and 2 x 9 R_E orbit require, on average, the use of a 26-meter antenna. Limited testing has been done using 16- and 18-meter antennas at Fairbanks and Wallops with mixed results. Currently, the 26-meter and 34-meter antennas at Canberra, Madrid, and Goldstone stations are used 80% and 20% of the time, respectively.

Beyond a distance of ~60 R_E, the Wind transmitter/receiver capabilities require the use of 34-meter antennas. Currently 34-meter antennas are used almost exclusively.

Geotail DSN scheduling averages 17 contacts/week using a 26-meter antenna, 3 contacts per week on a 34-meter, and 1 contact/week on a 70 meter. Constraints on this usage are not known at this time.

Polar's 12.75-hour data recording capability results in a high priority requirement for three to four contacts per 24-hour period, each of approximately 1-hour duration.

Wind has a 66 hour data recording capacity which, if used fully, would allow the present once-per-day contact schedule to stretch to one 3-4 hour contact per 60 hours of operation.

For Wind and Polar, these contacts are routinely used for data downloads, command uploads, and health and safety checks of the spacecraft and payload. In the case of Polar, occasional lengthening of these contacts is necessary for special spacecraft or instrument commanding.

In addition, at least twice per year for both spacecraft, a series of longer contacts is necessary for spacecraft maneuvers.

Comments/Recommendations: We anticipate continuing with the current DSN support and to continue relying on the current mechanisms and funding sources to do so.

Real Time Flight Operations:

Issues: The Polar and Wind spacecraft have been jointly operated by a flight operations crew on a 24-hours per day, 7 days per week work schedule. Because DSN contact lock with both spacecraft is known to fail and to require FOT interaction with DSN personnel on an average of 1 out of 10 contacts, this level of flight operations was required to achieve the very high level (>99%) of data capture.

There are no flight operations at GSFC associated with Geotail.

Because Polar and Wind are now extended missions and the normal behavior of the spacecraft and payloads are well known, NASA HQ has recommended the acceptance of some increased level of risk with respect to spacecraft operations and a data capture rate no higher than 95%. This suggests the acceptance of some unattended operations. Polar and Wind have not, as yet, been autonomously operated; the re-engineering for this function will require some level of planning, testing and monitoring before smooth, routine operation in this mode becomes the norm.

There are several constraints that will impact the procedures, scheduling and maximum percentage of unattended operations. These constraints include but may not be limited to:

The Polar/VIS instrument can store a maximum of four orbits worth of commanding sequences on average.

The Polar instrument and spacecraft commanding load is expected to remain the same and, perhaps, increase during the change to ecliptic normal operations.

Loss of contact lock during unattended data downloads will result in a loss of an entire playback sequence (anywhere from 4 to 8 hours of data for Polar and up to sixty hours of data for Wind).

Requirements: The health and safety of the Polar and Wind spacecraft and primary payloads remain the highest priority requirement. Health and safety monitoring of spacecraft subsystems and payload parameters/red lines during each contact must be maintained. Commanding uploads to the spacecraft must be timed with sufficient margin to avoid load shed at the point that the command sequence ends. Measured responses to subsystem and instrument anomalies must be carried out with timeliness appropriate to the anomaly experienced.

All instruments have a high priority requirement for the continued support of command uploads. There is a high priority requirement to schedule command uploads to meet Polar/VIS requirements and allow some contingency for unexpected events associated with this frequency.

Polar science goals can be met with an average of 90% Level Zero data recovery per month. Dropping below an average 80% data recovery per month has been set as the level at which science productivity would be compromised and the level of unattended operations would be re-evaluated. The corresponding percentages for Wind are 85% and 80%, respectively.

Reaction to spacecraft and instrument anomalies should be scaled to fit within the data recovery requirement with the exception of anomalies that affect the health and safety of spacecraft or payload subsystems.

Comments/Recommendations: We recognize that this new mode of operation and the ground system re-engineering effort may well result in increased responsibility for the spacecraft operators; we recommend careful oversight such that this process does not result in lowered attention to detail. The Polar project scientist will instruct the Polar instrument teams and spacecraft engineers to review their commanding procedures and implement streamlining measures if possible to relieve some level of real-time commanding and to shorten the length of those that are necessary.

Spacecraft Engineering, Health And Safety

Issues: Polar and Wind currently have dedicated engineering support for spacecraft operations planning and spacecraft health and safety. We recognize that the new Polar ecliptic normal operations periods may require added analyses and that a significant portion of the planning and implementation for unattended operations on Polar and Wind will fall on the spacecraft engineers.

Requirements: The health and safety of the Polar and Wind spacecraft and payloads remain the highest priority requirement for the project. The requirement for timely recovery to the science mode operation level after spacecraft or instrumentation anomalies/events can be relaxed to fit within the overall data recovery and health and safety requirements.

Comments/Recommendations: We anticipate continuing the current level of spacecraft operation planning and spacecraft health and safety oversight.

Payload Engineering, Health And Safety

Issues: During the life of the mission, the Polar and Wind instrument teams, the FOT spacecraft engineers, and the FOT console personnel have been supported by a dedicated instrument engineer for payload operations planning and payload health and safety. We recognize the value of this knowledge base, both for the operation of the complement of complex instruments and the operation of these aging spacecraft.

Requirements: The Polar/CEPPAD, CAMMICE, MFE, PIXIE, TIDE, and TIMAS instrument teams have expressed a high priority requirement for planning, commanding, and health and safety support. The remaining teams could, if required, plan and execute their commanding requirements directly through interaction with the FOT console personnel.

Comments/Recommendations: We anticipate continuing the support for Polar instrument engineering functions.

Maintenance Of Instrument GSEs

Issues: Several instrument GSE systems remain operational, occupy space in the Polar and Wind FOT area and, occasionally, require minimal maintenance attention from FOT personnel. We recognize that instrument GSEs, designed for pre-flight instrument testing and post flight commissioning operations, display diagnostic parameters unavailable within the real-time data stream visible to FOT console personnel and, in some cases, unavailable through the NRT network stream. Access to real-time or near-real-time data streams during special operations can be important to instrument and spacecraft safety. This is especially true for the particle instruments when performing HV procedures. Because the spacecraft and science instruments were not originally designed for "hands off" operations, re-engineering of these procedures is impractical and would be costly to the program.

Polar/CAMMICE and CEPPAD rely exclusively on their GSE to monitor instrument health and safety when returning their instruments to science mode after spacecraft maneuvers and other events. The Aerospace Corporation's network security requirements prevent their adapting to the "network push" setup of the NRT stream. Substantial re-engineering on the part of the CAMMICE and CEPPAD team or on the part of the project would be necessary to change this.

Polar/UVI remotely connects to their GSE during special operations and when necessary to obtain health and safety information for each major frame, a capability that is not available through any other UVI tool.

Polar/VIS uses either its GSE or the NRT network connection for instrument health and safety monitoring during real time instrument commanding. The frequency of VIS real time commanding has, to date, required the availability of both streams as the various types of network links can be unstable preventing the use of one or the other monitoring capability.

There is a question as to whether the current architecture feeding the real data stream to the GSEs is compatible with a series of unattended contacts.

Requirements: The Polar/CAMMICE and CEPPAD team has a high priority requirement for continued access to their GSE. Polar/VIS and Polar/UVI has a medium priority requirement for continued access to its GSE. This access would be required only during real time commanding procedures.

Comments/Recommendations: We anticipate maintaining the current level of support for the CAMMICE, CEPPAD, UVI and the VIS GSE systems. Because the maintenance of these GSE systems does impose a level of oversight and maintenance on the part of FOT staff, the project scientists will recommend that other instrument teams with GSE systems in the FOT area review their monitoring procedures, and over time, consider retiring that equipment. We recommend reviewing the current real time data feed to these systems for possible equipment upgrades or architecture improvements to increase system reliability.

Continuation of the Near Real Time (NRT) data stream

Issues: Several Polar instrument teams rely on the NRT data stream available to their home institutions through network connections for instrument health and safety monitoring both during real time commanding and for day-to-day monitoring. This is especially true for the particle instruments performing HV procedures. The near real time stream allows access to science data and diagnostic parameters unavailable within the real-time data stream visible to FOT console personnel. The NRT data are also utilized to provide timely, processed science data products after important sun-earth connection events. The NRT architecture is primarily automated but has been reported to require greater than expected oversight for an automated system. There is a

question as to whether the current architecture is compatible with a series of unattended contacts involving multiple DSN sites.

The Polar imaging teams rely on the NRT data stream to update their "current" or "latest" auroral images at their web sites for outreach purposes.

Requirements: The Polar/TIDE, TIMAS, and VIS instrument teams have a high priority requirement for continued access to the NRT data stream during real time commanding sequences. Several instrument teams have a medium priority requirement for access to the stored NRT data files for daily monitoring of instrument health and safety. It is desirable to continue this service for the smooth, continued operation of our outreach efforts.

Comments/Recommendations: We anticipate continuing NRT service to the Polar instrument teams. We recommend reviewing the current operation for possible equipment upgrades or architecture improvements to increase system reliability. The NRT system reliability is expected to be of increased importance during Polar's new phase of unattended operations.

Continuation of Quicklook Data Products:

Issues: Quicklook data products are produced on request for the Polar/VIS instrument team primarily for the production of PR products after an important sun-earth connection event.

Requirements: With respect to the basic operation of the Polar spacecraft and the flow of level zero (LZ) data to the instrument teams, there is little or no requirement for Polar Quicklook data products. It is highly desirable to retain the capability for timely production of PR products after important sun-earth connection events.

Recommendations: We recommend that capabilities and procedures for producing comparable PR products be reviewed and implemented.

4. DATA PROCESSING, ARCHIVING AND DISTRIBUTION

Level Zero Processing

Issues: Polar and Wind Level Zero (LZ) data processing is accomplished in two basic steps. The initial packaging of the LZ data into 24-hour files and decommutation into instrument specific files is done within the confines of the GGS MOC. Afterwards the ISTP CDHF absorbs the files, performs file verification, and distributes the files both by network transfer and CD-ROM distribution. Changes to the timely nature of the distribution of LZ data will likely result in a degradation of service on the part of the science investigators in the supply of data to the science community after important sun-earth connection events.

Geotail LZ data production follows a similar path with the exception that the original blocked telemetry files must be downloaded from the JPL Central Data Receiver (CDR) facility. Geotail LZ processing currently supports the processing of Sirius files as well.

The extensive collection of science analysis software in use by the instrument teams means that any changes to content or format of LZ data will result in a need for major software re-engineering at those institutions. The use of automated scripts by instrument teams in the use of this product means that changes to the unique naming convention will result in a need for some level of software re-engineering at those institutions.

Requirement: Polar, Wind and Geotail have a high priority requirement for the continued availability of LZ data to their instrument teams and supported science investigators. There is a high priority requirement that the content and format of these files remain constant over the

course of this re-engineering effort. There is a low priority requirement that the unique file naming convention for these files be preserved.

Comments/*Recommendation*: We recommend that procedures and equipment for producing comparable services be reviewed and implemented as efficiently as is feasible. We recommend that a "best effort" level of LZ data reprocessing be supported within the overall data recovery guidelines given above.

We recognize that this substantially decreased level of service will occasionally result in delays in LZ data delivery, the occasional loss of data, and that instrument teams are likely to be burdened with increased responsibility for file downloads, verification and security.

Spacecraft Health and Safety Data Processing

Issues: Polar and Wind spacecraft housekeeping data are routed through the ISTP CDHF, packaged into a LZ format, and routed to the NSSDC for archival purposes.

Requirements: It is desirable to continue archiving the performance history of the Polar and Wind spacecraft.

Comments/*Recommendations*: We recommend that procedures and equipment for producing a comparable product be continued.

KP Generation:

Issue: The timely production of Key Parameter (KP) data for the entire ISTP fleet of spacecraft and associated missions stands as a major achievement for the ISTP project. A large portion of the science community in the United States and other countries depends on this resource for efficient science analysis. There are instruments for which the KP data represents a definitive high resolution data product and is used as such. The generation of KP data and its archive within the NSSDC are necessary for coordinated SEC science efforts in the future.

Requirement: With respect to the basic operation of the Polar and Wind spacecraft and the flow of Polar, Wind and Geotail level zero (LZ) data to the instrument teams, there is little or no requirement for Polar, Wind or Geotail KP data generation. However, it is desirable to continue this function to assure the continued high level of science productivity on the part of the Polar, Wind and Geotail science teams and the wider science community. There would be a medium priority requirement to retain the CDF format of the KP data products. There would be a low priority requirement for timely generation of this product ($\leq$ 3 months).

Comments/*Recommendations*: We recommend that procedures and equipment for producing a comparable product be reviewed for possible implementation.

The project scientists will recommend that Polar and Wind instrument teams examine the possibility of producing a similar product at their home institutions for submission directly to the NSSDC. We recommend that instrument teams consider the substitution of the high time resolution CDF product recently defined for the special event data.

We recognize that this substantially decreased level of service will result in substantial delays in KP delivery to the CDAWeb interface and that the NSSDC is likely to be burdened with increased responsibility for file verification and security.

Definitive Orbit and Attitude Files

Issue:. The Polar, Wind and Geotail predictive spacecraft orbit and attitude files are also used as the definitive spacecraft orbit and attitude product and are delivered to the instrument teams with the CD-ROM LZ distribution. There have been infrequent updates to a small number of

these files. Polar despun platform attitude and Polar, Wind and Geotail spacecraft spin phase files are derived from the LZ files. These are heavily relied upon for data interpretation and science analysis.

The extensive collection of science analysis software in use by the instrument teams would mean that changes to content or format would result in a need for major software re-engineering at those institutions. The use of automated scripts in the use of this product mean that changes to the unique naming convention would result in a need for some level of software re-engineering at those institutions.

Requirement: Timely generation of definitive platform attitude and spin phase files remains a high priority requirement for data interpretation and science analysis. There is a medium priority requirement for consistency in the content and format of the files. There is a high priority requirement for the timely generation of definitive spacecraft orbit and attitude files in the event that corrections are needed in the predictive information.

Comments/Recommendations: We plan to continue to supply definitive platform attitude and spin phase information and, as needed, corrected spacecraft orbit and attitude information. We recommend that procedures for producing similar products be reviewed and implemented as efficiently as is feasible.

We recognize that this decreased level of service will occasionally result in delays in orbit/attitude delivery and that the Polar instrument teams are likely to be burdened with increased responsibility for file downloads, verification of the parameters, and file security.

Ancillary Data Ingestion

Issue: The ingestion and archival of Key Parameter (KP) data for a wide range of ground and space-based missions (Canopus, SESAME, SOHO, GOES, LANL, FAST, and SAMPEX) represents a substantial resource within the Sun-Earth Connections theme. The NSSDC depends on the ISTP conduit as a major source of data for CDAWeb. A large portion of the science community in the United States and other countries depends on CDAWeb for efficient science analysis. The loss of the ISTP infrastructure to facilitate archival of this wide range of data within the NSSDC may well result in a setback for coordinated SEC science efforts in the future.

Requirements: With respect to the basic operation of the Polar and Wind spacecraft and the flow of Polar, Wind and Geotail level zero (LZ) data to the instrument teams, there is no requirement for the ingestion of ancillary mission data within the ground system. It is desirable for a wide range of ground and space-based missions to continue the supply of KP data to the NSSDC to assure the continued high level of science productivity the part of the wider science community.

Comments/Recommendations: It is unlikely that Polar, Wind and Geotail funding alone will be sufficient to continue this activity. We recommend that alternative procedures for the direct insertion of these KP products to the NSSDC be reviewed and, if found feasible, implemented. We recognize that termination of this activity will result in substantial delays of KP delivery to the CDAWeb interface and that the NSSDC is likely to be burdened with increased responsibility for file verification and security.

Data distribution

Issues: Polar, Wind and Geotail LZ data, spacecraft orbit and attitude, platform attitude and spacecraft spin phase files are routinely distributed by automated network transfers to the instrument teams and associated science teams that request them.

Polar, Wind and Geotail LZ data, spacecraft orbit and attitude, platform attitude and spacecraft spin phase files are also routinely distributed on CD-ROM to the instrument and associated science teams by standing request. The timeliness and excellent quality of the CD-ROM distribution services have resulted in several teams being completely reliant on these CD-ROMs for their data delivery and/or their data archive.

Requirements: There is a high priority requirement for network access to Polar, Wind and Geotail LZ and orbit/attitude files on a 24-hour basis. There is a low priority requirement for the delivery of LZ and orbit/attitude files on CD-ROMs to some science teams.

Comments/Recommendations: We anticipate continuing to provide network access to Polar, Wind and Geotail LZ and orbit/attitude data. The project scientists will encourage instrument and science teams to implement procedures for the electronic transfer and storage of LZ and orbit/attitude files. We recommend studying the limited production of a few CD-ROM LZ disks for a few instrument teams.

We recognize that instrument teams are likely to be burdened with increased responsibility for file downloads, archival, and system security.

Data Archiving

Issues: The ISTP CDHF maintains a mass store system for on-line, near-on-line, and off-line data storage (currently ~200 Gbytes in size for on-line, 1 Terrabyte in size for near-on-line, and ~ 4 Terrabytes for off-line storage). Polar, Wind and Geotail investigators and the broader science community have enjoyed timely access to the entire ISTP dataset through this facility. The excellent quality of service provided by the ISTP CDHF for the distribution of ISTP data throughout the life of the various missions has resulted in no requirement for any level of data distribution service on the part of the NSSDC.

The Polar, Wind and Geotail projects are responsible for archiving its LZ data and orbit/attitude information with the National Space Science Data Center (NSSDC). Currently this is accomplished by CDHF production of “POLAR ALL”, “WIND ALL” and “GEOTAIL ALL” CD-ROMs which are stored within the NSSDC facility.

Requirement: Polar, Wind and Geotail have a high priority requirement to archive LZ data to the NSSDC. It is desirable to maintain on-line storage of the datasets for the timely delivery of LZ, KP, and orbit/attitude data to the instrument teams or science community.

Comments/Recommendations: We plan to investigate providing some quantity of on-line storage either before the data are ingested to the NSSDC or through the NSSDC facilities. We recommend studying how the current mass store equipment might be utilized to advantage.

We recognize that the loss of this mass store would result in all requests for Polar, Wind and Geotail data older than a few weeks be routed to the NSSDC and that the NSSDC is likely to be burdened with substantially increased responsibility for Polar, Wind and Geotail data distribution.

GENERAL COMMENT:

The Polar project has been given some additional funding for FY02 to implement a revised operations and data processing system. We recommend reviewing the current system for possible equipment upgrades and/or architecture improvements to increase system efficiencies and reduce overall costs in the following years.

END OF REQUIREMENTS