

## **IT Security Plan for Polar/TIMAS**

Last Updated, December 31, 2001.

### **Summary of Critical Functions**

Overall responsibility for all Polar/TIMAS operational and data issues lies with the TIMAS principal investigator, W.K. Peterson, Laboratory for Atmospheric and Space Physics (LASP), University of Colorado, 1234 Innovation Drive, Boulder, Colorado, 80303, 303-492-0686, Bill.Peterson@lasp.colorado.edu.

*Monitoring the health of the instrument:* Timely receipt of the Polar near real time (NRT) data stream is critical during instrument commanding exercises involving the high voltage power supplies. Commanding of this type takes place approximately once per month. In addition, saved files from the NRT data stream are important for quickly monitoring changing conditions at the spacecraft due to extreme geophysical conditions and when monitoring TIMAS's frequent changes to various operational limits. This additional level of monitoring is required at least twice per week. LZ data files are also used daily to monitor instrumental status words not available to the Goddard operators..

*Generating routine command sequences:* TIMAS software exists for generating the project-required, instrument specific, commanding sequences (RQL files) and for analyzing orbital parameters for the optimal timing of commands. A strategy for generating TIMAS mode changes to obtain maximum science benefit for the evolving orbital conditions is developed by the TIMAS PI. The TIMAS operator, Daryl Carr, implements this strategy in daily RQL command files for routine (daily) instrument commanding. Significant oversight to the commanding process is provided by the TIMAS PI. This oversight is implemented in the form of weekly operational reports delivered by e-mail to the TIMAS PI, frequent informal phone conversations, and visits.

*Generating unique and/or prompt command sequences:* When instrument commanding lies outside the routine path described above, real-time command request lists (RTC files) are generated by the TIMAS operator after consultations with the TIMAS PI and appropriate members of the Lockheed Martin Development Team (e.g. Lead analog engineer, Tony Magoncelli, GSE developer Gary Heyman, retired PI Ed. Shelley) and SwRI (Lead digital engineer, Ron Black).

*Transfer of commanding sequences to mission operations personnel:* RQL and RTC files, once generated, can be transferred to the Polar operations team by a variety of means. Routine transfer is by email from the TIMAS command account on timas.spasci.com to the

spofcmd account on spof01.gsfc.nasa.gov. Commanding has also been accomplished by fax and telephone directly with flight operations personnel although these methods are not considered to be error-free and therefore used only when necessary.

*Maintenance of support equipment:* Development, support and maintenance of TIMAS supporting hardware and software is the responsibility of the lead TIMAS investigator at each of the three US sites: W.K. Peterson at the University of Colorado, Karlheinz Trattner at the Lockheed Martin Palo Alto facility, and Martin Wuest at SwRI.

### **Summary of Other Non-Critical, But Important, Functions:**

The TIMAS team is also responsible for the supply of LZ data files, associated calibration and analysis files, analysis software, processed data files, and graphic image files to the various TIMAS and Polar science teams. The team is also responsible for archiving the appropriate data products to the NSSDC. TIMAS data analysis and distribution software resides on several unix machines. The primary site is in the Lockheed Martin Palo Alto Space Physics Laboratory, Building 255, 3251 Hanover St., Palo Alto Ca, 94304. This site consists of several Sun unix machines, with cross mounted disks that include access to and a 500-count CDROM jukebox capable of holding ~ 8 years of TIMAS LZ CDROMs. The Palo Alto facility also includes a large disk array on which all TIMAS raw and high resolution summary data for the period from launch to December 8, 1998 are rapidly accessible for data base intensive investigations. Secondary TIMAS sites are located at the University of Colorado , and the Southwest Research Institute (SwRI). These secondary sites are basically stand alone Sun unix workstations with access to limited disk space. The SwRI site also has access to 50-count CDROM jukebox.

### **TIMAS Backup and Recovery Policies:**

The TIMAS team has general policies in place that apply to all the servers and software under its responsibility. These policies flow from general policies in place at each of the three institutions.

At the main Palo Alto facility, all workstations and support equipment are maintained according to the ISO-9000 command media and Lockheed security policies. The responsible Palo Alto system administrator is Mark Noga. At the University of Colorado all computer equipment is maintained under policies set and administered by the LASP (Laboratory for Atmospheric and Space Physics) Computer Oversight Committee, Tom Woods, Chair. The responsible LASP system administrator is Phil Evans. At the

Southwest Research Institute the system is administered by Michael Muller who is in the process (1/1/2002) of generating the appropriate written computer security plans.

All information content on workstations supporting TIMAS are backed up on a regular schedule set by institutional policy. In the Palo Alto Facility the most current tape backups are stored at sites physically remote from the computers in locations known to Daryl Carr and Mark Noga. At the Colorado facilities backup media for all workstations are consolidated and controlled with backup media for the NASA approved satellite operations center. At the SwRI a new backup procedure and archive are in the process of being implemented. Details are available from Martin Wuest.

Older backup sets rotate to secondary locations following the ISO-9000 command media at Lockheed Martin, the LASP control center IT plan.

In addition, a CDROM, updated yearly, with ASCII files of all TIMAS data analysis, data service and instrument commanding software resides with the TIMAS PI at the University of Colorado .

Passwords for key machines and accounts are held by at least two people as required and identified in the ISO-9000 command media at the Palo Alto site, and the IT plans for the University of Colorado control center .

*For critical instrument monitoring and commanding functions:* Software to receive the TIMAS NRT data stream and to create commanding sequences resides and is active on the timas.spasci.com workstation in Palo Alto. The software also resides on the willow.colorado.edu workstation in Colorado only to verify its functionality in case of future need. Because all monitoring and commanding software resides on both machines, backup and recovery for these functions is more robust.

*For data service functions:* Almost complete data service redundancy is provided because of the structure of the data files and software. The full suite of released TIMAS data analysis software and required data input files are available through shared disks to multiple workstations at each of the three TIMAS data analysis sites.. Because all data and data servicing software resides at the three sites, backup and recovery for data serving functions should be easily accomplished. Existing, automated data download/production processes running in Palo Alto could be easily installed on new workstations in Palo Alto from back up media if required with a minimal effort. Implementing TIMAS automated data download/production process at SwRI or the University of Colorado would require

modifications. We estimate that this would be on the order of 2-man weeks of experienced software support staff.

*Documentation:* TIMAS software, data processing and commanding software is documented according to the established ISO-9000 command media controlling them at the Palo Alto facility. The TIMAS web site [ftp://sierra.spasci.com/DATA/timas/TIMAS\\_description.html](ftp://sierra.spasci.com/DATA/timas/TIMAS_description.html) documents the location and use of TIMAS related software.

### **TIMAS Backup and Recovery Plan:**

GSFC security personnel have identified seven levels of security threat to be addressed by NASA mission security plans. Definitions of these threat levels are available at the web site: <http://eiger.gsfc.nasa.gov/burst/>. Backup and recovery plans to be applied for TIMAS, with regard to these levels of threat, are as follows:

#### *7. Credible threat*

Access to software and data from multiple machines at Palo Alto and at LASP and SwRI provide for rapid recovery for all mission critical functions and almost immediate recovery for the less critical data processing functions. The instrument commanding sequences are ASCII files which can be remotely generated through computers in Palo Alto, LASP, and on lap tops of the PI and Daryl Carr, the TIMAS operator. Electronic submission to the GSFC FOT is controlled by IP address, but no significant delay is anticipated in shifting the acknowledged valid source of TIMAS commands in an emergency. The GSFC FOT also have often provided multiple methods, or routes, for command submission. It is also possible, though not optimal, to command the instrument from within the GSFC mission operation center if experienced personnel can be transported there.

#### *6. Data loss/corruption*

same as 7, above

#### *5. Loss of one or more critical systems*

If required, recovery of software, data, and/or data processing hardware at any of the TIMAS sites can be provided through the use of backup tapes and newly procured servers. Remote downloads from alternate sites, or backup tapes stored off-site, would be used if access to local backup tapes was not possible.

System and TIMAS software backup procedures are designed so that TIMAS ground system machines can be restored or duplicated within 1 day to 2 weeks time depending on the extent the machines are affected and the availability of experienced personnel, hardware, and space resources. New servers and associated equipment for a replacement Palo Alto facility could be acquired for approximately \$150k.

*4. Extended power outage/cyber attack*

same as 5, above

*3. Localized destruction or contamination*

same as 5, above

*2. Widespread destruction*

same as 5, above

*1. Complete devastation*

a. Including substantial loss of life

Knowledge of TIMAS instrumental behavior and safe commanding procedures is distributed among current and former TIMAS Engineers, including the following individuals: Ed. Shelley, Tony Magoncelli, Ron Black, Gary Heyman, Bill Peterson., Jerry Drake, Harry Collin, Walter Lennartsson, The TIMAS operator, Daryl Carr, has assembled this information (including contact information for these individuals) and uses it on a daily basis. No one individual therefore has unique and primary knowledge of instrument behavior and safe commanding procedures. However, in the case of loss of experienced personnel, instrument commanding can be competently assumed by Harry Collin (Palo Alto) or Bill Peterson (Colorado). An unplanned interruption of instrument commanding may require safing the instrument (i.e. turning off the high voltages) for as much as one month's time. Such a move would not require additional funding, but could involve transferring operations to another institution. The complete software duplication between TIMAS sites means that data service would be impacted only to the degree that functions would need initiation as noted above.

b. Little or no loss of life

same as 1a, above

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