SECTION 5 - OPERATIONS CENTER REPORTS

5.1 Mission Control Center

Vladimir Glotov, *Russian Mission Control Center*

The MCC activity as an Operation Center of the Russian SLR network started in 1990. MCC controls five operational SLR stations now: Maidanak-1, Maidanak-2, Komsomolsk, Mendeleevo, Katzively (partially). The MCC Operation Center also participates in the regular testing of new SLR station Shelkovo (near Moscow). The MCC's main tasks, as the Operation Center of the Russian SLR network are:

- Delivery of satellite predictions, tracking schedules and technical information to SLR stations;
- Daily satellite prediction generation for Reflector and Meteor-3M
- Collection, quality check, failure detection of raw SLR data in FR format from tracking stations; NP generation for all stations and satellites;
- Transferring SLR data to the IRS Global Data Centers (EDC, CDDIS)
- Permanent (daily) monitoring of SLR stations data quality, cooperation with the station developers (RISDE - Head Russian SLR stations development) and staff in the analyses of station failures.

The 2001 SLR tracking results for the Russian network for low satellites, high satellites and GLONASS are shown in Table 5.1-1.

Table 5.1-1. Data Yield from the Russian SLR Network.

Site Name	Sta	ER2	BEC	STA	WES	GFO	TPX	AJI	STE	CMP	Total
Komsomolsk	1868	0	11	15	0	1	21	30	3	0	81
Maidanak-2	1864	2	3	8	0	1	25	19	2	0	60
Maidanak-1	1863	1	0	1	0	0	5	5	0	0	12
Mendeleevo	1870	48	0	11	23	48	54	41	37	16	278

Site Name	Sta	G36	L1	L2	ET1	ET2	G78	G80	G84	Total
Komsomolsk	1868	0	18	9	3	1	3	8	1	43
Maidanak-2	1864	1	30	9	1	1	5	7	0	54
Maidanak-1	1863	3	6	9	4	6	1	4	0	33

KEY POINTS OF CONTACT

Coordinator of the work	Vladimir Glotov	cnss@mcc.rsa.ru
Person responsible	Michael Zinkovsky	cnss@mcc.rsa.ru
Administration support	Sergey Revnivych	cnss@mcc.rsa.ru

5.2 NASA Goddard Space Flight Center

David Carter, *NASA Goddard Space Flight Center*
Scott Wetzel, *Honeywell Technology Solutions, Inc.*

The NASA SLR Operational Center provides oversight responsibilities for all components associated with NASA SLR network control, including sustaining engineering, and logistics. The NASA SLR Operational Center also oversees ILRS mission operations and ILRS and NASA SLR data operations.

NASA SLR network control and sustaining engineering tasks include technical support, daily system performance monitoring, system scheduling, satellite prediction generation, operator training, station status reporting, system relocation, logistics and support of the ILRS Networks and Engineering Working Group. These fundamental activities provide the infrastructure necessary to meet or exceed all NASA SLR and ILRS mission goals and requirements.

ILRS mission operations tasks include mission planning, mission analysis, mission coordination, development of mission support plans, and support of the ILRS Missions Working Group. These activities ensure that all new mission and campaign requirements are successfully and efficiently coordinated with all participating organizations.

Global Normal Points (NP data), NASA SLR fullrate data, and satellite predictions are also managed as a function of data operations. In addition, NASA SLR data operations provide support to the ILRS Data Formats and Procedures Working Group.

Global NP data operations consist of receipt, format and data integrity verification, archiving, merging and transmission of data. The daily transmission of the global NP data to the CDDIS for scientific use remains the primary output of this process. All functions associated with NP operations are automated processes not subject to manual intervention. Maintenance and monitoring of all operational software systems, computer systems and networks are performed to confirm the reliability and accuracy of all data processing functions. Statistical analysis is also performed to compare station tracking activity with data center acquisition to assist in the identification of any potentially lost data.

Activities in NP data operations during 2001 included the implementation of the Generic Normal Point Field Processor (GNP 2.5) to field systems. This upgrade was deployed in 2001 in MOBLAS-7, located in Greenbelt, Maryland and MOBLAS-4 located in Monument Peak, California. This upgraded processing system contains superior data screening and editing techniques, reducing the production of marginal NP data by approximately 10% while increasing high quality NP data volume. The implementation of GNP 2.5 to all remaining NASA SLR field systems is scheduled for 2002.

Activities in 2001 also included a collaborative effort with the Naval Research Laboratory in the development of prediction vectors for the STARSHINE 3 satellite with increased accuracy. This successful effort has resulted in improved acquisition capabilities of the STARSHINE 3 target for SLR ground systems.

Process planning commenced in 2001 to deliver sub-daily acquisition data for several satellite missions including CHAMP, GRACE-A and GRACE-B. The incorporation of drag functions to increase prediction accuracy was also a planned future activity by NASA SLR Missions Operations

Noteworthy during 2001 was the incorporation of upgraded Target Pointing software developed for the LRE satellite-tracking mission. This software which enhances SLR ground system s ability to acquire and track satellites in Geo-stationary transfer orbits, will have beneficial applications to other current, and future satellite tracking missions.

The fullrate data product continued to be produced by NASA SLR systems and transferred to the CDDIS during 2001. Though this product was not an ILRS data requirement, fullrate was automatically received, processed and transmitted to the CDDIS on a daily basis to augment user needs and requirements.

Daily satellite predictions continue to be generated and distributed to stations and ILRS data centers (i.e., CDDIS, EDC) for every ILRS and NASA supported satellite.

The NASA SLR Operations Center is located at:

Honeywell Technologies Solutions Inc. (HTSI) / NASA SLR and VLBI
Goddard Corporate Park
7515 Mission Drive
Lanham, MD 20706, USA

HTSI has been the NASA SLR operation center contractor since November 1983, the start date of the consolidated NASA SLR mission contract.

Key Points of Contact

Name	E-Mail	Phone
Carter, David, NASA	dlcarter@pop900.gsfc.nasa.gov	301-614-5966
Chason, Ray, HTSI	ray.chason@honeywell-tsi.com	301-805-3962
Brogdan, Oscar, HTSI	oscar.brogdan@honeywell-tsi.com	301-805-3933
Horvath, Julie, HTSI	julie.horvath@honeywell-tsi.com	301-805-3951
Davisson, George, HTSI	george.davisson@honeywell-tsi.com	301-8053963
Donovan, Howard, HTSI	howard.donovan@honeywell-tsi.com	301-805-3985
Schupler, Bruce, HTSI	bruce.schupler@honeywell-tsi.com	301-805-3992
Stevens, Paul, HTSI	paul.stevens@honeywell-tsi.com	301-805-3960
Wetzel, Scott, HTSI	scott.wetzel@honeywell-tsi.com	301-805-3987
Steve Krietz, HTSI	steve.krietz@honeywell-tsi.com	301-805-3377

5.3 University of Texas LLR Operations Center

Peter Shelus, *University of Texas at Austin*

The very small size of the LLR network and the small number of LLR analysis centers dictate the unique nature and operational procedures of the LLR Operations Center at the University of Texas at Austin. LLR observing predictions are computed on-site at the stations and the data are automatically and electronically transferred from the observing sites to the data centers on a near-real-time basis. Analysts secure their data directly from the data centers as needed. Feedback from the analysts, when necessary, goes directly to the observing stations. Therefore, the responsibility of the LLR Operations Center is one that assures a smooth flow of data, in a form and format for obtaining the best scientific results.

Concerning work at the UT LLR Operations Center on data formats, a special study group was formed within the ILRS Data Formats and Procedures Working Group in 2000, with Ricklefs as its chair. The goal of this Working Group was to create a set of consolidated formats for ranging predictions to all current and anticipated laser targets, including passive Earth satellites, lunar reflectors, and transponders on or orbiting around the moon and other solar systems bodies or in transit. These formats are to be used by all SLR/LLR stations. During 2001, the group charter was finalized, a working document prepared, and actual work began. The working document presented the current state of affairs for predictions in the SLR/LLR communities and posed incisive questions as to the future of the process. Largely through e-mail-based discussions, several conclusions were reached: 1) predictions are to be tabular, so that an interpolator and not an integrator is used; 2) the elements of the predictions are to be geocentric state vectors, possibly in the same reference frame as existing IRVs; 3) provision is to be made for extrapolating past the end of the predictions for continued scheduling, or in the event of a network communications failure; 4) geosynchronous satellites are to be handled gracefully; 5) new on-site, but centralized, prediction software are to be developed; 6) file compression is probably necessary, due to the larger size of the prediction files. To begin with, SLR predictions would fit into the above specifications without difficulty. To identify unique LLR prediction information for inclusion, a feasibility study is under way, starting with modifications of existing lunar prediction code. Transponders present the largest source of uncertainty. Contacts are now established to solidify the unique transponder requirements. Work so far indicates a convergence to a the specific format with testing a possibility next year.

As to the LLR scheduling task, early in the experiment, the main task of the LLR program was to secure the maximum amount of data. As LLR data volume rose to reasonable levels, the UT Operations Center for LLR began to work with the stations and the analysts, seeking how best to improve the quality of the LLR data, with a bit less emphasis on mere data volume. For quality, this entails improving system calibration stability, reducing photon detection jitter, and improving the timing systems. With limited budgets at each station, these tasks can be daunting. For quantity, we look for ways to obtain more observations significantly nearer new moon and full moon. Both are important to increase the scientific payback of the LLR experiment. The UT Operations Center for LLR continues to coordinate this activity, serving as the intermediary between the observing stations and the analysis centers.

Progress has been accomplished in the LLR experiment within the UT LLR Operations Center. We are looking forward to another year of successful activity.

KEY POINTS OF CONTACT

Operations Center Manager:
Dr. Peter J. Shelus
McDonald Observatory
University of Texas at Austin
Austin, TX 78712-1083, USA
pjs@astro.as.utexas.edu

LLR Data Formats:
Mr. Randall L. Ricklefs
McDonald Observatory
University of Texas at Austin
Austin, TX 78712-1083, USA
rlr@astro.as.utexas.edu