Laser Ranging Ground System

- **Progress**
  - **Zimmerwald (Switzerland) and Herstmonceux (Gr.Britain) have been approved by the Selection Committee to participate as ground stations for LRO Laser Ranging.   Mount Stromlo (Australia) has submitted a proposal and Wettzell (Germany) is also expected to turn in a proposal this month. Grasse (France), Matera (Italy), and Katsively (Ukraine) have also indicated an interest in participating.**

  - **Design completed for modifications needed for MOBLAS-5 (Australia) and MOBLAS-6 (South Africa) to participate in LRO-LR. Timing board has been purchased and is in-hand. Testing in lab should occur this month.**

  - **One-way system delay measurements are in progress at NGSLR. MLRS and Herstmonceux are also working this issue at their stations.**

  - **All LR tests at NGSLR have been completed and passed with the exception of the independent timing test with Instrument Scientist. This will occur as soon as one-way system delay has been adequately determined.**

  - **Document detailing the LR tests at NGSLR and results is in preparation and a presentation on this testing was given at the ILRS Workshop in Poland (Oct 13-17,2008).**

  - **There were several presentations given on LRO-LR at the International Laser Ranging Workshop in Poznan, Poland (Oct 13-17). All of the participating ILRS stations were in attendance and we had good discussions with all of them.**

- **Issues & Risks:**
  - **NENS to SCNS contractor change has potential to cause major disruption for LRO-LR.**

Ground Station Characteristics

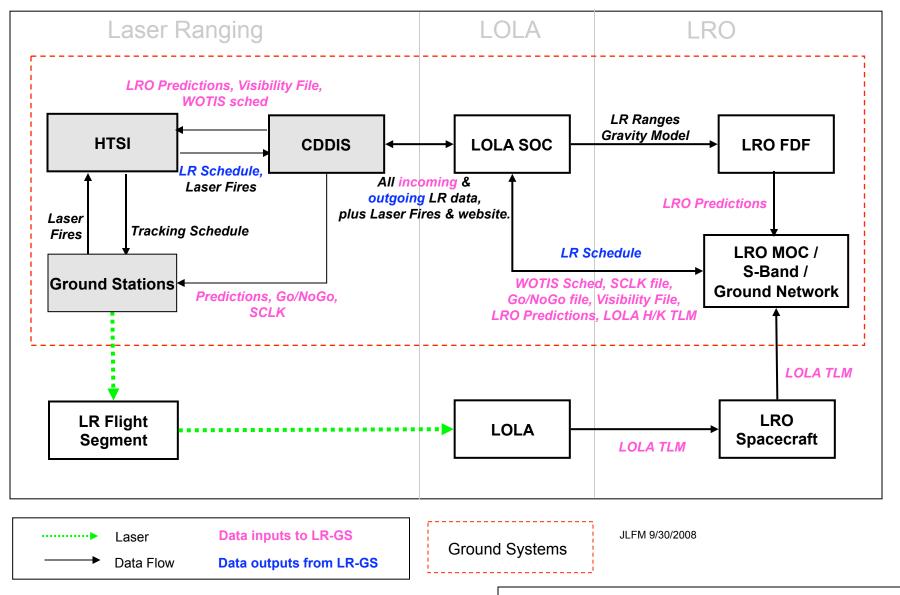➢Station fire rate and probable events per second in LOLA Earth Window with system configurations as we currently understand them:

	Synch?	FireRate	Events/second in Earth Window	Energy per pulse at LRO fJ/cm^2
NGSLR	YES	28Hz	28	2 to 5
MLRS	NO	10Hz	2 to 4	4 to 12
Zimmerwald	YES	28Hz	28	2 to 10
Herstmonceux	YES	7 or 14Hz	7 or 14	1 to 3
Mt Stromlo	YES	28Hz	28	3 to 14
MOBLAS	NO	5Hz	1 to 2	1 to 2

Requirement: between 1 – 10 femtoJoules per square centimeter at LRO and between 1 and 28 events per second in LOLA Earth Window.

➢ Stations that can deliver energy densities of > 10 fJ/cm^2 or peak power of > 0.07 mW/cm^2 at LRO will need to modify their configuration.   This will be worked out prior to predictions being available.

Laser Ranging Network Block Diagram

Presented at 16th ILRS Workshop, Oct 13-17 (McGarry)

Real-time Feedback from Spacecraft

➤ Website: http://lrolr.gsfc.nasa.gov hosted on CDDIS.

➤ "Real-time" spacecraft telemetry display will be password protected.

➤ Delay from "real-time" will be between 10 – 30 seconds.

➤ Stations can use display to determine if their fires are being detected at LRO/LOLA, and where their pulses are falling in the Earth Window.

➤ Synchronously stations can use website to modify their fire times, if desired:

- to move their returns earlier in LOLA Earth Window (pulse arrivals earlier in the window have a higher probability of detection because this is a single stop receiver)

- to "scan" if LRO/LOLA is not detecting their pulses

Real-time telemetry website

Presented at 16th ILRS Workshop, Oct 13-17 (McGarry)