# The DSI Small Satellite Launcher

Donald Gibbons*
and
Jeff Wise+
*Defense Systems Inc. McLean, Virginia 22102*

Three DSI Launchers were used aboard the Discovery (STS-39) in May 1991 as part of the Infrared Background Signature Survey (IBSS). Each launcher successfully deployed a Chemical Release Observation (CRO) Subsatellite which were launched under the Complex Automonous Payload (CAP) program, an outgrowth of NASA Goddard's GAS program. Because the CRO subsatellites contained hazardous liquids (MMH, UDMH, and MON-10) and were launched from GAS Cylinders without lids, the launchers were required to pass NASA Shuttle Payload safety and verification requirements. Some of the more interesting components of the design were the V-band retention and separation mechanism, the separation springs (surprisingly the dynamic response is dramatically different from the static), and the launcher electronics which provided a properly inhibited release sequence operated through the Small Payload Accommodations Switch Panel (SPASP) on board the Orbiter. The DSI launcher is space flight qualified hardware, has Space Shuttle flight heritage, and is available for use in the Small Satellite Community.

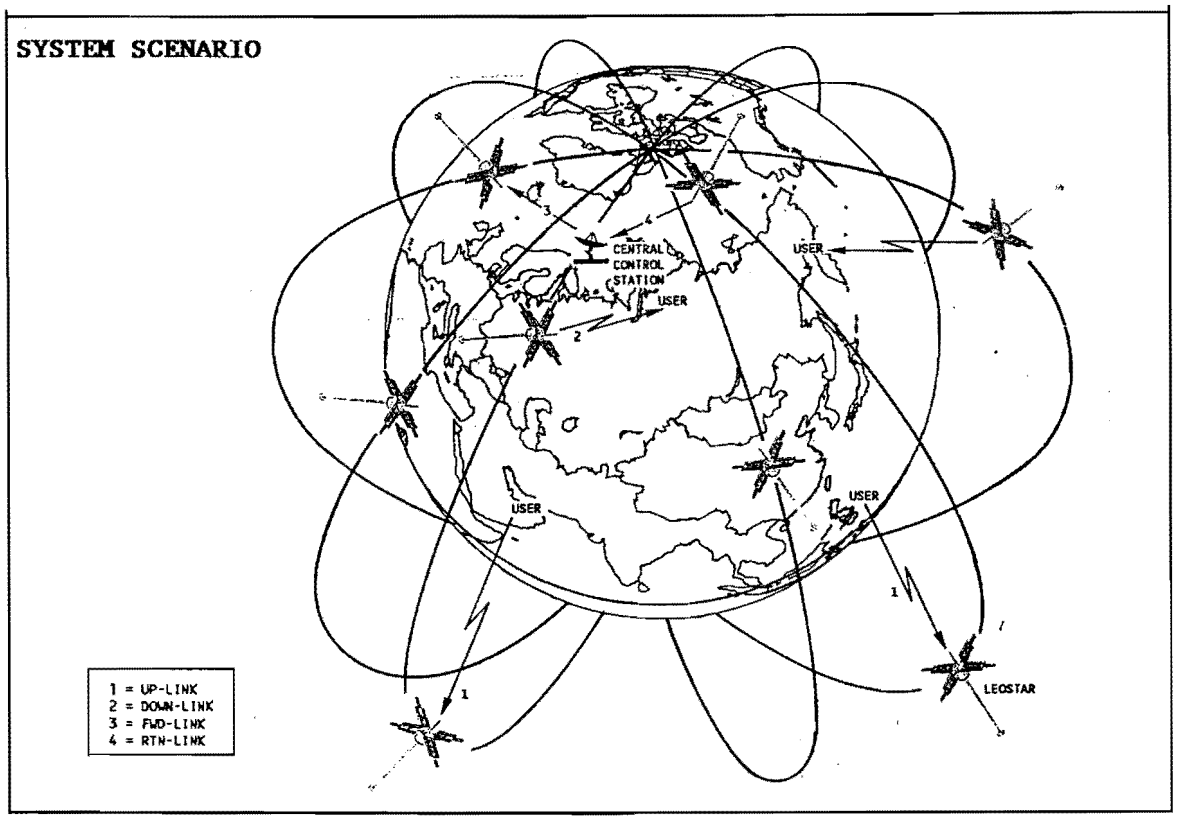
---

Presented as Paper at the 5th Annual AIAA/USU Conference on Small Satellites, August 27-29, 1991.

*Spacecraft Engineer, 1521 Westbranch Drive.

+Senior Spacecraft Engineer, 1521 Westbranch Drive.

| LEOCOM System Major Features | | |
|---|---|---|
| . Satellite constellation | : | 24/32 satellites deployed in 4 orbit planes (typically) |
| . Payload | : | regenerative, with memory for message storage |
| . Orbit period | : | 1 h, 40 min. |
| . Service coverage | : | world wide, simultaneous coverage area = 5000 Km diam. |
| . User's links freq. | : | UHF; 400 MHz down; 500 MHz up |
| . Control links freq. | : | C-band 4 GHz down; 6 GHz up |
| . User's terminals | : | low cost, small size, low bit rates |
| . Gateways | : | private, nationals/regionals, medium rates |
| . Network management | : | one Central Control Master Station |




Two broad types of communications have been foreseen for LEOCOM mission:
- real time mode: message exchange between users located inside the same satellite coverage area; that is originator and addressee users have simultaneous visibility of the satellite;
- mail-box (indirect) mode: message communications between users everywhere located, when simultaneous visibility condition does not apply.

The communication characteristics are of course dependant from the selected orbit, the type of satellite in terms of payload memory, number of active circuits, transmission power, Space-Earth-Space RF interfaces. The service efficiency derives from a correct combination of above parameters. Aspects such as waiting time, queuing length for users accessing the system, message length, relations with the orbital geometry and maximum communication delay time are the peculiar parameters governing the system architecture.