

EARTH OBSERVATION SYMPOSIUM (B1)  
Earth Observation Data Management Systems (4)

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GROUND VS. SATELLITE RELAY BASED COMMUNICATIONS FROM LOW EARTH ORBIT – A  
TECHNICAL, FINANCIAL AND COMMERCIAL COMPARISON**Abstract**

Over the past decade, the polar orbit earth observation (EO) satellite business has been growing fast with satellite operators requiring ever increasing data download capacity and reductions in data latency from the space to ground data acquisition communications networks. As of today, a large portion of this traffic is handled by commercial ground station operators disposing over an extensive network of interconnected polar and mid-latitude antenna sites.

The only current exception to the use of ground stations for global coverage is the US TDRSS relay satellite system, in operation since the 1980's and originally conceived for assuring continuous communications with US governmental manned and unmanned space assets. A second relay satellite system, the European Data Relay Satellite (EDRS) is currently under development by the European Space Agency. Restricted to a half-hemispherical coverage, EDRS is claimed to provide governmental and commercial satellite operators with a high capacity, zero latency TTC and data download service. Unlike the RF-based TDRSS, EDRS relies on laser terminals for the space-to-space portion of the overall up- and downlink chain. The promise of zero latency and high data download capacity is generally being held up as the big advantages of space based data relay systems. But what is the reality; how do satellite relay systems performance measure up to ground station networks when subjected to a closer look?

Satellite operators, including agencies, are looking for data download services to be cost efficient, procured in a commercial, competitive market. Hence, a second interesting comparison between the two concepts is on the financial aspects. In particular this applies to the vast difference in investment required for a space based vs. a ground based communications solution, but also in terms of technical requirements, risk and price associated with the terminals on board the EO satellites themselves. In addition, the tricky issue of infrastructure programs underwritten by public investment being offered on the commercial market is explored in the paper.

The nature of the space business is such that there is a significant tendency for space-based solutions to almost unquestionably be put forward as the “best” solutions. This is not necessarily the case for commercial EO satellite TTC and data download services.