

GEO-CAPE

Air quality & Ocean color from space



A Hosted Payloads Approach for Access to Geostationary Orbit

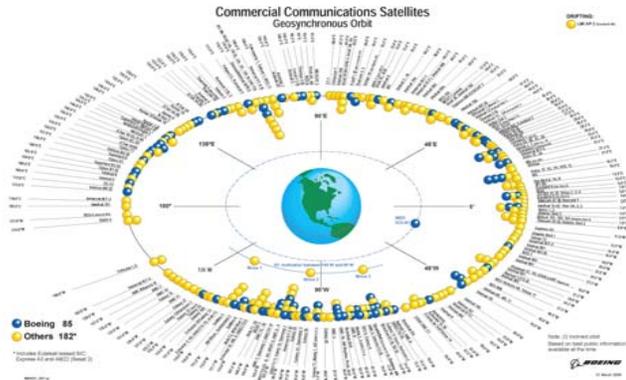


Alan Little, Michael Grant, Carlos Roithmayr, Doreen Neil (NASA); Larry Zanetti and Sam Yee (JHU APL)

The Hosted Payload Approach leverages commercial space industry satellites to “host” payloads that meet mass and size constraints, are highly autonomous, and operate in a low-interference manner with the host satellite. The Hosted Payload Approach provides significant cost savings compared to dedicated NASA spacecraft and launch costs.

Hosted Payloads provide appropriate use of commercial capabilities.

The motivation for hosted payloads derives from the present fiscal constraints on science investigations, minimal NASA infrastructure for GEO, and from the effective infrastructure assembled by the commercial industry. For the hosted payload, the commercial satellite provides nadir view, electrical power, thermal environment, basic attitude, command uplink, and data downlink as on-orbit services.



Hosted Payloads have been proposed to and selected by NASA

In June 2008, NASA selected the GOLD project under the Small Explorer Missions of Opportunity solicitation to fly aboard a yet-to-be-determined future commercial satellite. In 1996, NASA selected GEO TROPoSAT¹ under the ESSP-1 solicitation. The concept of Earth science payloads as hosted payloads was seriously entertained in this and subsequent proposals focused on the air quality aspects of the GEO-CAPE mission.

¹ Remote sensing from geostationary orbit: GEO TROPoSAT, a new concept for atmospheric remote sensing. Alan D. Little, Doreen O. Neil, Glen W. Sachse, Jack Fishman, Arlin J. Krueger. SPIE Proceedings Vol. 3221, Sensors, Systems, and Next-Generation Satellites, Hiroyuki Fujisada, Editors, pp.480-488. December 1997. DOI: 10.1117/12.29811

FAA provided a successful example of federal civilian experience with the commercial communications industry

The Federal Aviation Administration’s Wide Area Augmentation System (WAAS) safely guides aircraft approaching the nation’s airports everyday.

FAA has employed a hosted payload approach to place its own payloads (60 kg, 300 Watts) on four commercial geostationary satellites to date.

Pointing Feasibility Study indicates challenge for ocean color needs from GEO.

We established a framework to compare nominal pointing requirements (10% displacement of spatial footprint) to spacecraft pointing capability for four commercial geostationary satellites. We found:

1. Pointing requirements from geostationary orbit (GEO) are more difficult to meet than pointing from low Earth orbit.
2. Existing NASA Space Science mission pointing capability exceeds GEO pointing requirements.
3. Commercial communications satellites generally have sufficient pointing accuracy to acquire chemistry data, but not color data.
4. Short term stability/jitter requirements need to be addressed as a system property.

- Jitter can be allocated to payload mounting structure and/or closed loop pointing system on the instrument side of the interface.

Specific cost savings estimates show that science from GEO is highly affordable.

- The Decadal Survey estimated GEO-CAPE would cost \$550M.
- Forty two percent of this cost is spent on the launch and spacecraft.
- Access to space costs for the FAA payload were \$14M - \$23M for 60 Kg, 300 W payload.
- Using the hosted payload approach, spacecraft and launch costs could be **reduced by an order of magnitude**. (\$232 M to \$23 M or less).
- If savings similar to the FAA payload were obtained for GEO-CAPE, the hosted payload approach saves nearly half of the total mission cost.

WAAS Geostationary Communication and Control Segment
CLINs and Price from Contract DTFA01-03-C-00059

Satellite	Satellite Scarring CLINs 1201, 1202, 1203	Satellite I&T CLIN 1210	3 rd party Liability Insurance CLIN1301	Total s/c, I&T, Launch Firm Fixed Price (FFP)
Galaxy XV	13,000,000 FFP	4,530,000 FFP	5,000,000 FFP	\$ 22,530,000
Anik F1R	6,000,000 FFP	3,325,000 FFP	6,000,000 FFP	\$ 14,325,000
On-Orbit Satellite Service for 5 years total: \$30.2 - \$33.25 M FFP				
Galaxy XV	CLIN 1220: \$603,333/mo FFP for 120 mo			No-interruption ops : \$ 6.04 M/yr
Anik F1R	CLIN 1220: \$554,167/mo FFP for 120 mo			\$ 6.66 M/yr

We gratefully acknowledge FAA, Pamela Gomez, and Hal Bell for providing the FAA’s contract and statement of work for our evaluation, and for their enlightening discussions.

