

United Nations/China Forum on Space Solutions: realizing the sustainable development goals

Hosted Payload Solutions on Commercial Satellites

By: Yilkal C. Eshete Ethiopian Space Science and Technology Institute

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1. What is a hosted payload?

- A hosted payload is an instrument, transponder, or set of sensors integrated on a commercial host satellite to perform a mission different from the mission of the primary payload.
- Secondary payloads sharing the host spacecraft's bus;
 it denotes the utilization of excess available capacity on
 the satellite.
- It is not a secondary satellite sharing a launch.

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Host Spacecraft:

- Provides all the resources to support the hosted
 - payload's structure, power, and communication.
- Use extra margins of the host spacecraft at the beginning of life (BOL).
- The spacecraft owner markets its extra capacity which exists at the BOL.



2. Rationales of Hosted Payloads

- Launching dedicated satellites is expensive.
- Access to space have been unaffordable for government institutions which in most cases run their space programs under the constraints of budget.
- So, how could access to space be viable for different institutions that run missions under limited budgets?
 - Hosted payload solutions would offer government organizations to fly their payloads on commercial satellites in cost efficient manner.

3. Why Commercial satellites chosen for Hosting?



- Commercial satellite programs have strict construction and launch schedules.
- Less time from development to operation.
- On the contrary government programs take more time due to government bureaucracies. Mostly delayed missions.
- Commercial programs are thus preferred to fly hosted payloads in time.



4. Potential Applications

- Hosted payloads have got applications for:
- Communication
- e Earth observation
- Scientific researches
- Technology demonstration/maturation test beds:
 - Hosted payloads can be used to test and verify the
 - operational capability of a newly invented technology
 - before launching on a dedicated satellite.



....applications

Particular hosted payload missions done in the past:

- WAAS of FAA, hosted on Galaxy-15 of Intelsat & Anik-F1R of Telesat.
- EGNOS of EU, hosted on SES satellites (SES-5 and ASTRA-5B).
 CHIRP, hosted on SES-2 for missile warning purposes over the territory of U.S.
- UHF payload of the ADF, hosted on Intelsat-22 to provide military communications services.
- Iridium NEXT with its constellation of 66 LEO satellites has offered a huge hosting potential.





Operational hosted payloads on GEO:WAAS and EGNOS; Both to improve the quality of GPS signals for aviation and navigation services

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5. Hosted Payloads opportunities on GEO and LEO Satellites



Hosted payload opportunities occur both on GEO & LEO satellites with different level of hosting capability.

GEO:

- High frequency of commercial launches each year.
- Most commercial satellite operators have their fleet of satellites in the Geo orbit.
- Provide the second s
- More power and space available.

GEO satellites preferred though limited global coverage.





LEO:

- Limited launches in comparison.
- ^e Can not support relatively large hosted payloads.
- Small commercial operators in the LEO orbit; Iridium, and Orbcomm are common operators having constellations in LEO.
- Most government payloads are limited in LEO because of the high costs to get up to GEO.

6. Benefits and Limitations of Hosted Payloads



Benefits:

\checkmark	Offer low cost access to space
~	Fast access to space
\checkmark	Frequent commercial launch opportunities: there exists a huge
	chance of launching payloads at different orbital locations.
\checkmark	The use of existing commercial ground facilities: The host
	satellite operator's ground facility can be used to operate hosted
	payloads.





Limitations:

- Limited size and mass
- Limited power supplies: The amount of power available to the hosted payload will be limited.
- Low mission life: Most hosted payloads have short mission durations. They operate only for two to five years.
 - Not to affect the mission life time of the host satellite.
- Fast pace of commercial programs: Delayed delivery of the

hosted payload for integration by government customers.

7. Hosted Payload Standardization and Interfaces



Standardization and Challenges:

- No common standardized interfaces up on which spacecraft manufacturers should follow.
- Different companies propose their own standards to fit with their satellite buses.
- S/C manufacturers produce different bus sizes and a standardized interface seemingly to limit their flexibility to take up varied hosted payload sizes.
- Most S/C manufactureres look resistant to the idea of developing standardized interfaces.
- NASA has developed a guideline "Hosted Payload Interface Guide for Proposers" July 10, 2017.



...Standardized Interfaces

Importances of Standardization:

- It will allow flexibility in the choice of the host S/C for the
 - hosted payload customers.
- Enables fast development and integration time line for commercial spacecrafts.
- Helps to reduce risks which may arise due to interface problems.
- It enables the hosted payload to operate efficiently.

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8. Integration and Testing

- After a hosted payload production is completed, it has to be delivered to the host spacecraft for integration.
- If the hosted payload is manufacture by a separate company, it should be delivered for integration per the development schedule of the host S/C.
- Late delivery can delay the progress of the commercial mission.
- After integration, the hosted payload will under go all

simulation tests with the host spacecraft.



9. In-orbit Deployment and Operations

e Launch

- In-orbit tests: First the functionality of the spacecraft will be verified and then the hosted payload will be tested.
- Output and In-orbit operation commences.
- Ground operations: It can be done either by the satellite operator or the hosted payload customer.
- If satellite operator takes care of operations, mission data

can be received through ground communication networks.



10. Operation Abnormalities and Risks

- The hosted payload by no means should interfere with the normal functioning of the primary payload.
- If the hosted payload poses a problem on the primary payload, it will be stopped to operate.
- It must be in a state of do No Harm to the primary payload.
- Operational abnormalities may occur either due to the problem of the host s/c or the hosted payload.





- Hosted payload interference with the primary payload.
- Excessive power drain than the value it should.
- Power supply failure to the hosted payload.
- Oata bus connection failure.

Proper design and integration can reduce the risks.

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11. Conclusion

- Hosted payloads are becoming alternative means of getting access to space in a cost efficient manner as compared to a dedicated mission.
- Government institutions should take advantage of this innovative solution to accomplish targeted missions. They can launch their payloads at a reduced cost and time.
- In return, commercial satellite operators will market the extra capacity (enough power margins) that exists at the beginning of life of the satellite and generate a revenue.



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