Hosted payload opportunities: What are some of the issues and steps to be taken from awareness of an opportunity to final agreement to host a payload?

STP manifest typically includes the following:

- Flight Opportunity Notice
- Memorandum of Agreement
- Funding Letter
- Experiment Requirements Document
- Preliminary Mission Risk Assessment

Possible stumbling blocks:

- ITAR
- Classified Information
- Proprietary Information
- Need for Sole Source
- Color of Money
- Level of Acceptable Risk
- MOA Signatures
- Money Transfer

STP can manifest a payload in about 3 months. Getting an SV on-contract could take an additional 6 months.

Biggest issues are signing the MOA and refining the technical requirements for accommodation (defining the TBDs).

We don't "transfer" sensors – the payload organization owns them the entire time. The SV contractor retains Satellite Decision Authority until after on-orbit checkout, then transfers it to STP.

Host platform concerns: What are the most common requirements, concerns, and interface characteristics of hosted platforms?

- Driving requirements: jitter/pointing/real-time attitude knowledge, finicky environments (magnetic, EMI, cleanliness, security, thermal), peak power, other-than-LEO orbit, fragility, amount of data and data rate

- Most common requirements: timing signal, FOV, mounting location, SWAP, thermal isolation, timed command/script storage, data storage

- They will ask you to: launch off, wait a month for on-orbit commissioning, auto-safe during emergency power down, limit data uploads, perform your own on-board data processing if necessary, be the lowest priority objective

- They will not ask you to: store your own data on-board, store your own commands, condition your own power within reason

- Be as self-sufficient as possible

- Always focus on Do No Harm (see all DNH standards)

- Look at existing rideshare Enablers – STP ISS pallet, ESPA, Cubesats, ESPAStar, launch unit (between ESPA and CubeSats), NanoRack, STP SIV, GSA schedule

There are published criteria/requirements for specific platforms (ESPA, SpaceX, Nanorack, etc.) and DNH. There are many standard payload interface definitions in the works but I don't know specifics. Can expect about 1U of accommodation for a CubeSat rideshare.

Some operational satellites have concerns about hosting student designed/built payloads but organizations like STP can help, as does DNH. R&D satellites don't mind higher risk payloads. High levels of risk are acceptable for LDPE, STP, AFRL, and venture class LVs. ISS accepts managed risk (canisterization). Hosts assess their own risk, as does Aerospace, generally per Aerospace DNH criteria.

ICDs, MSPSPs, testing documentation are required by the hosts. I don't know of any hard limits on data produced by a hosted payload - that is mission-specific. I don't know of a preferred data format.

Low priority LEO sat on the AFSCN can have a data latency from on-orbit to ground of 24 hours. Less for GEO and SVs with more contact time. My WAG is $500,000 to $5M to accommodate a hosted payload.

Program Design: If you were designing a hosted payload program, what aspects should be focussed on and what are the major obstacles (with solution ideas if possible)?

- Do No Harm (DNH)

- Canisterization – ppod, 6U railed (or tabbed) cubesat – often LV-provided

- Enablers – STP ISS pallet, ESPA, Cubesats, ESPAStar, launch unit (between ESPA and CubeSats), NanoRack, STP SIV, GSA scheduleTest to highest possible standards

- Launch powered off – lowest EMI and safety risks

- Be autonomous, can go a long time without ground contact after sep or batt charge before launch (30++ days – aim for 3 months)

- Low contamination risk; no finicky reqts

- No purge requirement

- Be prepared to lose a couple of payloads

- High risk acceptance

- Get connected with rideshare community

- Rideshare organizations (payload integration companies and CubeSat developers)

- Use existing LV interface but not be hard over about bringing your own sep system – some LVs want MLBs, some pyros, - this can be hard if you are done testing

- High first fund frequency

- Few pins – need a loopback or separation indicators for LV telemetry side

- Test-correlated FEM

A STP/AFRL/R&D satellite takes about 3 years (contract award to launch). Payloads are to be delivered around the 2-year mark, but interface and support requirements must be known at acquisition.

Biggest obstacles are software, changing payload requirements, environmental test tailoring/completion, testing of payload interface prior to delivery (flatsat).

Infrastructure to store and access data from multiple instruments needs to accommodate different classifications/access restrictions, formats, alignment of timestamps or locations, resolution of duplicate or conflicting data.