Towed Glider Air-Launch System (TGALS)

STATUS QUO

- Existing Air-Launch platforms include all of the systems required to support crew, propulsion, and launch vehicle. These specialized air-launch platforms are expensive to build and maintain.

PROBLEM / NEED BEING ADDRESSED

Use of a towed air-launch platform can more efficiently carry a launch vehicle than a direct-lift launch platform because of separation of functions (systems).

NEW INSIGHTS

- Use of a towed glider launch platform allows for separation of systems between the towing aircraft and the towed aircraft, thereby allowing the launch platform (towed a/c) to lift a heavier LV than a direct-lift "mothership" of similar planform area.
- A non-specialized aircraft, such as a business jet, can be utilized for towing the relatively inexpensive glider launch platform.

PROJECT DESCRIPTION/ APPROACH

- Utilize a scaled glider launch platform—developed under NASA CIF— as a proof-of-concept demonstrator for a larger scale system.
- Utilize a similarly scaled LV, to demonstrate carry efficiencies of greater than the current state-of-the-art for direct-carry air-launch platform. The LV has already been developed under a previous NASA contract.
- Seek partners for a full-scale demonstration

QUANTITATIVE IMPACT

- Launch platform carry efficiency is defined as:

  Carry Eff. = $W_{carried}$ / $W_{carrier}$
- Current state-of-the-art carry efficiency for direct-carry air-launch platforms is approx. 0.7
- The scaled launch platform should be able to demonstrate carry efficiency of greater than 1.

PROJECT GOAL

- Demonstrate a launch platform carry efficiency of 1.5 – 2.0.

TGALS Overview

What would you say to a Senator in an elevator?

- Investigating an alternative approach to direct-carry air-launch . . . utilizing a one-third scale, twin fuselage glider to demonstrate proof-of-concept performance and operation. Seeking to show that a towed launch platform can carry a launch vehicle of 1 to 2 times its own weight, whereas the current state-of-the-art for direct-carry is roughly 0.7.

Integration with other projects/programs and partnerships

- Twin-fuselage glider developed under the STMD/CIF
- The MiniSprite launch vehicle developed under SBIR Phase II, funded by STMD/Flight Opportunities Program
- Utilizing FTE resources from STMD/GCD, HEOMD/ AES, and SMD/Directed R&T
- Sustainer Options:
  - Grant to Utah State University for flight-weight PVC hybrid prop. sys
  - Exquadrum, Inc., STTR Ph. II—Hybrid Upper-Stage Booster (HUSB); evaluating re-scope of ground test deliverable into flight test unit

Technology Infusion Plan:

Plan: PC, Technology, Commercial launch provider capability to NASA, DoD

- Phase 1: Utilize one-third scale vehicle to demonstrate proof-of-concept vehicle performance and operation
- Phase 2: Develop full-scale demonstrator and perform small-sat launch to LEO
  - Currently advocating outside partnership
- Transition technology to commercial launch suppliers

Key Personnel:

Program Element Manager: Wade May/LaRC

Project Manager: John W. Kelly/AFRC

Lead Center: AFRC

Supporting Centers: N/A

NASA NPR: Task Agreement

Guided or Competed: Guided

Type of Technology: Push

Key Facts:

GCD Theme: FPES, Affordable Access to Space (AAS)

Execution Status: Year 1 of 1

Technology Start Date: Oct FY15

Technology End Date: Sep FY15

Technology TRL Start: 3

Technology TRL End: 6

Technology Current TRL: 3

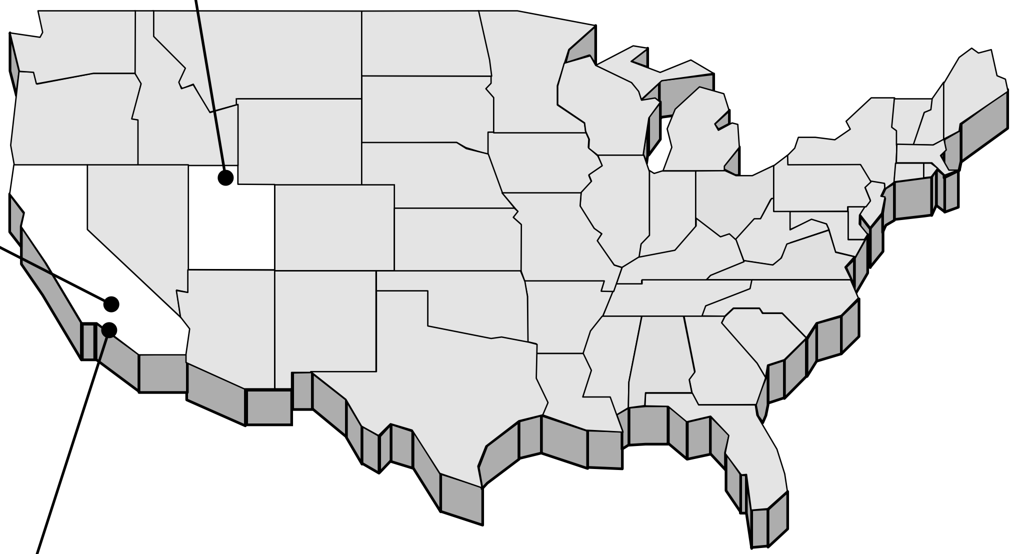
Technology Lifecycle Phase: Implementation (Phase D/E)

TGALS Organization and Key Members

Utah State University, Logan, UT

- Flight-weight Sustainer Motor

NASA AFRC



Whittinghill Aerospace LLC, Camarillo, CA

- MiniSprite Scaled Launch Vehicle

- Wing Structure for Twin Glider