DPA26BZ05-DV022
Commercialization of Ultra-High Payload-to-Weight UAS Subsystems
Frequently Asked Questions (FAQs)

As of 8/26/26

Category 1: Technical Metrics & Program Definitions

Q1.1: How is the $\geq 4:1$ payload-to-weight ratio formally defined, and what are the baseline operational and environmental parameters required for testing?

Official Response:
The payload-to-weight ratio is strictly defined as:

$$Payload-to-Weight\ Ratio\ =\ \frac{Mass\ of\ Payload}{Gross\ Takeoff\ Weight - Payload} \geq 4.0$$

- **Mass of Payload** refers to the dead-weight or operational payload carried by the UAS that is not required for flight operations.
- **Operational Validation Conditions:** For the Month 18 hover test, performers must demonstrate a continuous 5-minute untethered hover under maximum payload capacity. Performers must assume standard sea-level atmospheric conditions (15°C, 101.3 kPa) as the baseline for testing, unless a specific operational envelope (such as high-altitude, high-temperature, or high-wind environments) is proposed and mathematically justified in the Phase II commercialization plan.

Q1.2: What specific power-density, efficiency, and thermal-management metrics define a qualifying "revolutionary powertrain" under Track B?

Official Response:
DARPA has intentionally avoided mandating rigid, prescriptive hardware limits to allow for maximum commercial and technical innovation. However, a qualifying Track B "revolutionary powertrain" must demonstrably enable an integrated aircraft to meet the overall $\geq 4:1$ payload-to-weight metric throughout an operational timeline.
Proposers are expected to target and define aggressive self-imposed metrics particular to their design, such as, but not limited to:

- Extremely high motor specific power and torque (expressed in ft-lbs at the output shaft).
- High-voltage, low-current system architectures to minimize integrated wiring and Electronic Speed Controller (ESC) weight.

- High efficiency powertrain metrics that enable 4:1
- Sustained thermal stability where motor stator and winding temperatures reach a steady-state thermal equilibrium well below material degradation limits during sustained maximum-load operations.

Q1.3: Is there a minimum aircraft size, payload weight, motor power, or thrust class requirement for Track B?

Official Response:
While there is no explicit minimum payload weight or thrust class limit, the proposed technology must scale to enable a practical heavy-lift tactical UAS. The absolute upper limit of the system is strictly constrained by the solicitation weight ceiling of **1,320 lbs** (Maximum Takeoff Weight) to remain aligned with FAA Part 108 regulations and military Group 3 tactical logistics profiles. Sub-scale or micro-UAS concepts that do not possess a logical scale-up path to heavy-lift logistics capabilities are unlikely to be competitive.

Category 2: Direct-to-Phase-II (DP2) Feasibility & Evidence

Q2.1: Must the DP2 eligibility evidence originate from the DARPA Lift Challenge, or are independently developed heavy-lift technologies and commercial reference platforms acceptable?

Official Response:
No. Prior participation in the DARPA Lift Challenge is **not** a prerequisite for eligibility. Proposers are fully permitted to submit feasibility evidence derived from independent research and development, academic programs, or commercial product lines. Proposers may also reference public-domain performance parameters or other heavy-lift programs to ground and baseline their own system-level target requirements.

Q2.2: Does the baseline feasibility requirement to "meet or exceed 4:1" require a prior full-scale flight demonstration, or can it be satisfied via component-level testing combined with system-level modeling?

Official Response:
A complete-aircraft flight demonstration at a $\geq$ 4: 1 ratio is **not required** at the proposal stage. For Track B, proposers can establish sufficient DP2 technical feasibility by presenting:

1. Rigorous empirical bench-test or dynamometer data (e.g., measured thrust, torque, RPM, efficiency, and thermal curves) from a prototype motor or powertrain component.
2. A mathematically sound, physics-based first-order aircraft-level mass and performance model demonstrating how the proposed propulsion subsystem mathematically enables an integrated UAS to achieve the $\geq 4:1$ payload-to-gross-weight threshold.

Q2.3: Can Track B proposers satisfy DP2 feasibility requirements using reduced-scale empirical testing (e.g., thrust stand data) correlated with full-scale scaling analysis? If so, what are the expectations for modeling fidelity?

Official Response:
Yes. Proposers who experienced hardware limitations or structural failures during previous full-scale prototype testing may utilize reduced-scale empirical data, such as data generated on a precision thrust stand like, to satisfy the feasibility requirement.
However, the proposal must support its scaling analysis with:

- Correlated, high-fidelity Computational Fluid Dynamics (CFD) and Finite Element Analysis (FEA) models throughout the flight regime.
- Clear mathematical scaling analysis (e.g., Reynolds, Froude, or Mach similitude scaling) that explicitly quantifies full-scale performance projections and details the associated engineering uncertainty that will be addressed in Phase II.

Q2.4: For the Track B proposal-stage prototype, must the complete powertrain (motor, ESC, power distribution, and propeller) be demonstrated, and are partner-supplied or Commercial Off-The-Shelf (COTS) components allowed?

Official Response:
The primary proof-of-concept focus for Track B must be the proposer's core propulsion innovation (e.g., a high-power-density motor and its scalable manufacturing process). Proposers do **not** need to have proprietary, custom-developed ESCs, power distribution boards, or custom propellers ready at the proposal stage.
Using partner-supplied or COTS hardware to support the initial feasibility bench-testing is fully acceptable, provided the proposal clearly defines the boundary between the proprietary proposed technology and the integrated commercial ancillary components.

Category 3: System Integration, Standards & Teaming

Q3.1: For Track A, what specific ancillary systems (autonomy, communications, flight control, transportability) are mandatory commercialization deliverables versus optional integrations?

Official Response:
Track A deliverables must focus primarily on the revolutionary aerodynamic design and structural integrity of the airframe. However, because the Month 18 milestone requires a stable, untethered 5-minute hover test, a functional avionics suite (including flight control, telemetry, mission planning, and safety mechanisms) is required. Proposers may integrate commercial-off-the-shelf (COTS) flight controllers and communications links to satisfy this flight test. The proposal must clearly outline which components are proprietary structural innovations and which are integrated third-party systems.

Q3.2: For Track B, what mechanical, electrical, and data interfaces must be standardized to ensure the powertrain is a plug-and-play module for multiple airframes?

Official Response:
A critical goal of the commercialization phase is modularity. Track B performers are expected to design, document, and deliver a standardized interface control document (ICD) that defines, at minimum, the following:

- **Mechanical Interfaces:** Standardized bolt patterns and structural mounting interfaces.
- **Electrical Interfaces:** Standardized DC voltage input ranges and high-current power connections.
- **Data Interfaces:** Open-standard digital telemetry and control protocols (e.g., CAN bus, Serial, or Ethernet) to ensure compatibility with a wide range of flight controllers.

Q3.3: Does DARPA view an autonomy or flight-control company as a valuable subcontractor to a hardware-focused Track A or Track B prime?

Official Response:
Yes. DARPA strongly encourages multidisciplinary teaming. While the core innovations of this program lie in structures (Track A) and propulsion (Track B), partnering with specialized flight-control, autonomy, or aerospace certification software subcontractors can significantly strengthen a proposal. Such partnerships

help de-risk the Month 18 integration milestones and bolster the long-term commercialization and certification pathways.

Category 4: Regulatory, Safety, & Supply Chain

Q4.1: What specific certification pathways, airworthiness standards, and safety/failure contingencies must be addressed in the proposal?

Official Response:
Performers must assume a dual-pathway commercialization approach targeting both civilian and defense markets:

- **Civilian Pathway:** Proposers should outline a roadmap targeting Federal Aviation Administration (FAA) operational approvals under Part 108, special class, or experimental airworthiness certifications.
- **Military Pathway:** Proposers must plan for compliance with military airworthiness flight releases (e.g., MIL-HDBK-516C standards).
- **Safety/Failure Contingencies:** Performers must demonstrate how the integrated system handles critical safety events, such as lost communications, propulsion subsystem failures, degraded lift states, and automated contingency/landing routines.

Q4.2: Do domestic-content or country-of-origin restrictions apply to components used strictly in pre-award proof-of-concept prototypes?

Official Response:
Strict domestic-content restrictions (e.g., FCC, Buy American Act, NDAA-compliant magnet sourcing, and restrictions on covered foreign technologies) are generally not strictly enforced on raw, pre-award laboratory bench-test prototypes (e.g., stator laminations or permanent magnets used in preliminary laboratory validation). However, all Phase II program deliverables **must strictly comply** with Civil and DoD domestic-content guidelines. Proposals must include a highly detailed, actionable transition plan to migrate all materials, motors, and electronic components to an NDAA-compliant, secure domestic supply chain by Phase II execution.

Q4.3: What manufacturing-rate, recurring-cost, and supply-chain targets should guide the commercialization design?

Official Response:
A key goal of the Direct-to-Phase-II mechanism is to transition from high-cost, low-

yield "one-off" prototype) to scalable, low-cost manufacturing processes or Low Rate Initial Production (LRIP) planning. Proposers must explicitly target, at a minimum, the following:

- Automated fabrication techniques that produce and result in predictable, reliable parts and performance..
- A clear estimation of Unit Recurring Flyaway Cost (URFC) at production volumes of 100+ units/year. **To not include** one-time engineering/NRE, R&D, tooling development, management overhead, training, facilities, initial spares, or other support infrastructure.
- A resilient, dual-sourced supply chain mapping that mitigates single points of failure.

Additional Questions

Q1. Recommended Task 2 in Track A requests that the team produce 3 identical copies of the "primary structural component". How does DARPA define "primary structural component", since there may be some differences in terminology depending on the proposer's background? For example, for a rotary-wing aircraft (main rotor/tail rotor, tandem, coaxial, multi-copter etc) the primary structural component could be defined as the fuselage/structure that contains/supports the payload, or the rotor blades since they support the total weight or the aircraft. Alternatively it could be the aircraft's complete load path (i.e. rotor blades to rotor shaft, shaft to gearbox/motor, gearbox/motor to fuselage).

A1. For the purposes of Track A, DARPA considers the primary structural component to be the major load bearing structural element or integrated structural assembly that is central to the proposer's aerodynamic/structural innovation and representative of the aircraft's ability to support the intended payload.

The intent of the Month 9 requirement is not necessarily to manufacture three complete aircraft or reproduce the aircraft's entire load path. The objective is to demonstrate that the critical structure enabled by the proposed design can be manufactured repeatedly using a scalable process and exhibits consistent structural performance across the three copies.

Because the appropriate component will vary by aircraft architecture, proposers should identify and justify the structural component or assembly that is most representative of their design. For a conventional configuration, this may be an airframe, chassis, boom, or similar primary structure. For configurations in which the rotor or another structural element is fundamental to the proposed innovation, a different component or integrated assembly may be appropriate if the proposer can demonstrate that it meaningfully represents the critical structural load path and can be subjected to the required repeatable load to failure testing.

The key consideration is that the selected component allows the performer to demonstrate both structural capacity consistent with the 4:1 payload-to-weight objective and manufacturing repeatability, including less than 10% variance in failure load across the three units.

Proposers should clearly define the component they intend to use, explain why it represents the primary structure for their specific architecture, and describe the proposed test methodology in their proposal.

Q2. Is Track B open to teams whose innovation is at the electric-machine/magnetics level, delivered as a certified motor module (with the balance of the powertrain integrated from qualified COTS power electronics), or must the full powertrain be novel?

A2. Track B does not require every element of the powertrain to be novel. An innovation at the electric-machine or magnetics level may be responsive to the topic, provided the proposed technology represents a meaningful advancement in powertrain performance and can be matured into the complete, integrated powertrain module described. Use of COTS components for supporting elements such as power electronics is acceptable.

The intent of Track B is to mature the underlying revolutionary propulsion technology into a manufacturable, repeatable, and ultimately certifiable product that can be readily integrated. Accordingly, while the core innovation may reside in the motor, rotor/stator, magnetics, or another element of the propulsion architecture, performers should be prepared to demonstrate the integrated powertrain subsystem required by the Track B milestones, including the Month 9 production and testing of three complete powertrain units.

Q3. For D2P2 Phase-I-equivalence, is feasibility evidence from prior commercial and DoD-adjacent magnet/motor development acceptable, or is participation in a recent heavy-lift prototype program (e.g., the DARPA Lift Challenge) effectively a prerequisite?

A3. Participation in the DARPA Lift Challenge is not a prerequisite for this DPII topic. The Lift Challenge is cited as one example of a rigorous testing environment that may provide appropriate feasibility evidence.

Prior commercial, DoD, or other relevant prototype development and testing may be used to establish Phase I-equivalent feasibility, provided the proposal contains sufficient empirical data, prototype test results, and supporting analysis to demonstrate a working proof of concept and establish that the technology can

be tailored to meet the Phase II objectives, including the 4:1 payload-to-weight objective.
For a Track B proposal, the proposer should clearly connect the demonstrated performance of the motor or powertrain technology such as power density, efficiency, thermal performance, weight, and other relevant test data to its ability to enable the payload-to-weight UAS performance targeted.

Q4. Can you confirm that advancing the subsystems based on flight-test experience from the Challenge, rather than replicating the flyoff configuration, is consistent with the topic's intent?
A4. Yes. The intent is not to require teams to replicate the exact configuration flown during the DARPA Lift Challenge.
For this DPII opportunity, it is appropriate to take the technical lessons learned through Lift Challenge development and flights flown at the challenge and use them to mature or evolve the aircraft and its subsystems.
The proposal should clearly articulate how the Lift Challenge flight-test experience informed these design changes and how the resulting subsystem improvements advance the performance, reliability, manufacturability, or P:W objectives of the topic.

Q5. Weight-limit interpretation at the Month-18 readiness test: the Track A Month-18 readiness test specifies integration into "a full UAS weighing no more than 1320 lbs (with weight in anticipation of FAA Part 108)." Does the 1320-lb limit refer to the vehicle's empty weight or its maximum all-up (gross) weight? At a 4:1 payload-to-weight ratio the two interpretations imply substantially different total-lift and payload figures and confirming this will let us define our performer-specified metrics and demonstration scale accurately.
A5. It applies to all up weight or the max operating weight as the Part 108 defines it.

Q6. **For Track A, what specific carbon fiber mechanical properties or composite preform architectures do you prioritize to achieve the >4:1 payload-to-weight threshold while staying under the 1,320-lb full-system limit?**
A: DARPA is not prescribing specific carbon fiber mechanical properties, material systems, or composite preform architectures for Track A. We are intentionally leaving those design trades to the proposing teams. The proposal should identify and substantiate the material system and structural architecture

necessary to achieve the required performance while supporting a credible path to scalable manufacturing.
The emphasis is on the resulting subsystem performance, manufacturability, repeatability, and ability to contribute to a complete UAS capable of achieving the >4:1 payload-to-weight objective.

Q7. **For the Month 9 structural test articles, what automated composite manufacturing methods (e.g., AFP, compression molding, RTM) are considered ideal benchmarks for demonstrating repeatable fabrication with less than 10% variance?**
A: There is no single preferred manufacturing method or "ideal" benchmark such as AFP, compression molding, or RTM. The topic provides examples of scalable approaches, but teams should propose the manufacturing process most appropriate for their design.
The key Month 9 objective is to move away from bespoke, hand-built prototype methods and demonstrate a process capable of producing three identical copies of the primary structural component, with testing demonstrating the required structural capacity and less than 10% variance in failure load between units.
Your proposal should explain why the selected manufacturing method provides a credible path toward repeatable, commercially relevant production.

Q8. How critical is integrating a 100% domestic carbon fiber precursor into the material specification and Technical Data Package for downstream DoD airworthiness and supply chain security?
A: A 100% domestic carbon fiber precursor is not an explicit requirement of the topic. However, domestic sourcing, resilient supply chains, scalability, and reduced dependence on vulnerable sources may strengthen the commercialization and defense relevance of an approach where they provide a meaningful technical or transition advantage.
If domestic precursor technology is central to your solution, we recommend clearly explaining how it improves the performance, manufacturability, cost, scalability, or supply chain resilience of the proposed structural subsystem rather than treating domestic content alone as the technical objective.

Q9. What are your milestone expectations and research objectives for transitioning mature composite airframe subsystems directly from the Month 24 demonstration into active DoD heavy-lift programs?
A: The Month 24 objective is to leave the effort with a system that is substantially more mature than a prototype and has a credible pathway to both military and commercial adoption.
For Track A, this **could** include a complete Technical Data Package, manufacturing instructions, bill of materials, commercialization plan, and an active certification roadmap. The intent is that a third-party manufacturer or

integrator can understand how the system/subsystem is produced, integrated, and certified.

Q10. Beyond breaking the 4:1 lift bottleneck, what are the primary operational warfighter problems, such as contested logistics durability or rapid field repairability—that this topic aims to solve?
A: Breaking the 4:1 payload-to-weight bottleneck is the enabling technical objective, but the larger goal is to make heavy lift UAS practical for operational and commercial missions.
Proposers are encouraged to identify the operational problems their particular technology is best positioned to address and explain how their design decisions support those missions.

Q11. Are there specific military service transition offices or program managers evaluating these demonstrations, and would you be open to introducing us to discuss end-item requirements?
A: DARPA will continue to evaluate transition opportunities as technologies mature, but we cannot commit through the Q&A process to specific introductions or downstream acquisition activities.