VFS 43rd (2026) Annual Student Design Competition
Hybrid Electric Tiltrotor
REQUEST FOR INFORMATION from SDC Teams
Leonardo Responses

Q: Does Final Proposal necessarily contain an Executive Summary?

VFS Response: The submission is not considered complete unless both the Final Proposal and a separate Executive Summary file are included. Teams must submit both documents for their proposal to be accepted and reviewed.

Q: In section 1.6, It is mentioned that the Final Proposal must be self-sustained in terms of references or other files. Is this inclusive of any codes we have used for automation of our methods (which are mentioned in the proposal). If not, are we permitted to hyperlink or add a GitHub repository for the same?

VFS Response: A working hyperlink publicly accessible website is acceptable, not a repository

Q: Reporting of requirements: In the process of designing the hybrid-electric variant of the Bell XV-15, a large number of requirements (spanning multiple pages) have been derived on stakeholder, mission, system and subsystem levels. Although they are relevant for traceability of the design, they take up a large amount of documentation space. Would it be possible to provide these in a separate file, or make them exempt from the page count?

VFS Response: No. In accordance with Section 1.1.6 – Proposal Format, Length, and Medium of the RFP, all required content must be included within the prescribed page limits. The information may not be submitted in a separate document or excluded from the page count. We suggest an appropriate summary of this information indicative of the significant or driving requirements or constraints relevant to the proposed configuration.

Leonardo Response: The reviewers will permit a certain amount of liberty related to subsystems unrelated to the primary lift/power/propulsion/control system design; however, the decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Page sizes: A page size of 8 ½ x 11 is imposed on the final proposal in subsection 1.1.6 of the RFP. Does this requirement also hold for contents that are best presented on larger page sizes, such as three-view drawings of the design and interface diagrams, or can these be provided on a larger page size?

VFS Response: The final proposal must follow the 8½ × 11-inch page size requirement outlined in Section 1.1.6 of the RFP. However, diagrams that require additional space—such as three-view drawings or interface diagrams—may be submitted on pages no larger than 11 x 17 inches (tabloid size) and counting as two pages, if used.

Q: There is a task mandatory for graduate teams but optional for undergraduate teams:

- If an undergraduate team chooses not to complete it, will their submission still be evaluated for full credit: **The submission will still be evaluated for full credit (VFS Response)**
- Or will additional points be awarded to undergraduate teams that include it? **No additional points will be awarded for completing the task (VFS Response)**

- Additionally, will completing or omitting this task affect the final scoring of undergraduate submissions? **Completing or omitting this task will not affect the final scoring of the undergraduate submissions (VFS Response)**

Q: Is it permissible to add a new student member to our team after the Letter of Intent (LOI) has already been submitted?

VFS Response: Yes, if adding members does not exceed the 10-student maximum or 12-students (for multi-university) per Section 1.1.2 Team Information of the RFP.

Q: According to Section 1.1.6, the final submittal consists of two files: the Final Proposal and the Executive Summary. Should the design and analysis for both Phase I and Phase II be integrated into a single Final Proposal document, and if so, does the page limit (50 pages for Undergraduate / 100 pages for Graduate) apply to this combined document?

VFS Response: Yes, the final proposal should include <u>both</u> the Phase 1 and Phase 2 design information and must not exceed the 50-page (Undergraduate) and 100-page (Graduate) page-limit per Section 1.1.6 of the RFP

Q: If additional questions or issues arise during the design process after the official Request for Information (RFI) submission deadline has passed, will teams have any opportunity to seek further clarification from the organizers, or must all uncertainties be resolved strictly before the deadline?

VFS Response: No. Once the official Request for Information (RFI) submission deadline has passed, no additional questions or clarification requests will be accepted. Teams are expected to resolve any uncertainties prior to the final proposal submission deadline.

Q: How should the full report be organized, and are there any particular elements or details the judges are especially interested in seeing?

VFS Response: As outlined in Section 1.6 – Proposal Requirements of the RFP, submissions must include the specified elements listed in that section. The organization and structure of the report are at the team's discretion, provided all required components are clearly addressed.

General responses:

- Scoring will be primarily based on the approach to hybridization. If a respondent is more inventive on other design improvements, this may be considered in evaluating originality and creativity of a proposal.
- The RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.
- Unless reflected or noted, either in the question or response, statements apply in general to the RFP.
- In Phase I, only weight or drag changes, if **specifically** related to the hybrid system design, are permitted.
- To reduce the complexity of this design challenge, improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale but will be accepted with appropriate rationale.
- 10% of the entire mission operating energy requirement must be from electrically generated sources.
- The reviewers will permit a certain amount of liberty related to subsystems unrelated to the primary lift/power/propulsion/control system design.
- The level of accuracy or fidelity of any analysis should reflect the level of detail required to confidently demonstrate the rationality as well as key features and benefits of the proposed configuration.
- The decision on the CG envelope is left to the respondent subject to a demonstration of adequate stability and control throughout the proposed flight envelope.
- The proposed configuration must meet civil/commercial operating standards for OEI conditions as documented by the respondent.
- A civil/commercial operating environment should guide this prioritization of design decisions.
- NASA CR-114-682 is authorized as a source solely for wing and blade detailed geometry. https://ntrs.nasa.gov/api/citations/19740003720/downloads/19740003720.pdf
- For Phase II, assume that the XV-15 was designed to carry 6 passengers plus crew at 200lb each and design accordingly.

Q: (Pg. 13, Para 2.3) Is the 400nm cruise followed by 306 nm descent and landing with 10% fuel reserve for a total of 706 nm (plus climb nm) what was intended as the RFP mission?

Leonardo Response: The RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.

Q: (Pg. 13, Para 2.2.2) *Entry into autorotation maneuvers at any airspeed or flight mode.* Does this mean at the given airspeeds for the defined mission segments (e.g., min airspeed at given altitude)? Should we include any conditions (e.g., slower speeds) outside of the defined mission segments?

Leonardo Response: This requirement is as stated, irrespective of mission segment.

Q: (Pg. 12, 2.2.1) Can some clarification be provided on any further expectations the T53 downscaling would entail beyond keeping the same SFC and rating structure, as well as the implied weight and drag changes?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: (Pg. 12, 2.2.1) The requirements indicate that a minimum of 10% up to 100% can be hybridized. At 100%, the vehicle is fully electric. In this instance can the T53 thermal engine be removed (downsized to 0)?

Leonardo Response: Yes

Q: (Pg. 12, 2.2.1) Is the minimum 10% power specification required for each mission segment or it 10% of the entire mission power. In other words, does each mission segment need to have 10% of its power from electrical sources or is the requirement for 10% of the total mission power and results during one or more mission segments, but not every segment?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: (Pg. 12, 2.2.1) *Changes to improve the aircraft that are not related to the hybrid system in this phase are not allowed*. Are changes such as reducing vehicle weight through various design options to offset the battery weight permitted?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: (Pg. 13, 2.4) Should the final payload weight mentioned be the payload for the maximum structural capability of the vehicle or is it a/the mission payload (1600 lb from pg 13, 2.2.2)?

Leonardo Response: It is a mission payload requirement.

Q: (Pg. 15, 2.5) As part of the RPM task, are teams able to submit a video simulation to demonstrate the changes?

Leonardo Response: As desired, however, the key features and capabilities must be described in the text without requiring use of a video simulation.

Q: What degree of accuracy or fidelity must the CAD have?

Leonardo Response: The level of accuracy or fidelity should reflect the level of detail required to confidently demonstrate the key features and benefits of the proposed configuration.

Q: During the Phase 1 integration of the hybrid-electric propulsion system, should teams consider the CG shift as a fixed constraint based on battery/generator placement? or is there a specific tolerance range expected for the CG envelope during transition phases?

Leonardo Response: The decision on the CG envelope is left to the respondent subject to a demonstration of adequate stability and control throughout the proposed flight envelope.

Q: Regarding the integration of the hybrid-propulsion system in Phase 1, are there any specific tolerance limits or constraints for the Center of Gravity (CG) shift, particularly when referring to the stability envelopes of the NASA XV-15 as a baseline?

Leonardo Response: The decision on the CG envelope is left to the respondent subject to a demonstration of adequate stability and control throughout the proposed flight envelope.

Q: Considering the thermal load generated by the battery packs during high-power mission segments (e.g., hover and transition), is it permissible to implement localized material substitutions with high-temperature resistant alloys or composites in the battery compartments to ensure structural integrity?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Which should be the primary objective in this competition while converting the XV-15 aircraft into a hybrid system: achieving fuel savings? or increasing maximum speed by utilizing battery power? Which one should be prioritized in the design process?

Leonardo Response: This decision is left to the respondent; however, civil/commercial operating economics should guide the prioritization.

Q: Given the high thermal output associated with the hybrid-electric propulsion system, should the design incorporate a dedicated, independent cooling architecture for the battery and power electronics? Or is it expected to integrate these requirements into the aircraft's existing primary cooling system?

Leonardo Response: The decision is left to the respondent. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Regarding environmental impact, will the competition evaluate the acoustic signature changes resulting from the hybrid system? Should the design prioritize optimizing the RPM of the rotors during the transition to mitigate the noise increase caused by the additional weight and power requirements?

Leonardo Response: A civil/commercial operating environment should guide this prioritization.

Q: Should the design focus on 'plug-in' charging during ground operations? Or is it expected that the internal combustion generator provides full recharge capability for the battery packs during the cruise phase to ensure mission readiness for consecutive flights?

Leonardo Response: The decision is left to the respondent. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: In Phase I, does the term “downscaled T53” refer to an existing lower-rated version of the T53 engine? Or to a geometrically scaled derivative, and is a specific scaling methodology expected?

Leonardo Response: The T53 is the T53 of the Model 300 report. A scaling methodology, if required, should be described. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Does the requirement that at least 10% of power be electrically generated and/or distributed refer to total mission energy, instantaneous segment power, and may this percentage vary by flight segment?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: For mission segments where duration or performance parameters (e.g., climb or descent rate) are not specified, should teams define their own engineering assumptions or use recommended reference data?

Leonardo Response: The mission requirements are as provided. Additional information should be provided in the proposal, as necessary.

Q: Is the mission profile defined in Section 2.3 applicable to both Phase I and Phase II?

Leonardo Response: Yes.

Q: For the 2G helicopter/conversion mode and 3.5G airplane mode load factor requirements, should teams generate new V-n diagrams for the modified aircraft? Or use baseline XV-15 envelope data as reference?

Leonardo Response: A V-n diagram, if supplied, should reflect the modified aircraft.

Q: In Phase II, while maintaining the 25 ft rotor diameter, may parameters such as blade number, airfoil selection, wing span, and wing chord be modified?

Leonardo Response: No. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Could you clarify whether the total mission range requirement is 400 nm? or 306 nm? as stated in Section 2.3?

Leonardo Response: The RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.

Q: In Phase I, if a downscaled engine is selected, may the nacelle mass and geometry be reduced accordingly?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Does the “4K/95°F” hover requirement refer to hover at 4,000 ft altitude under 95°F ambient temperature conditions?

Leonardo Response: Yes.

Q: If at least 10% of propulsion power is electrically generated, is electrical distribution at the same percentage mandatory or optional?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: Is the mission profile intended solely as a sizing mission? Or are teams expected to define a broader operational concept?

Leonardo Response: A broader operational concept is not required.

Q: In Phase I, which structural and aerodynamic parameters must remain strictly unchanged, and what degree of modification is permitted for hybrid system integration?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Are official XV-15 power requirements for different flight phases (hover, climb, cruise, descent) available? And if so, could you recommend some sources?

Leonardo Response: See the referenced works.

Q: Would it be possible to provide access to NASA-CR-114614? Or suggest an alternative official reference source?

Leonardo Response:https://ntrs.nasa.gov/api/citations/19730022217/downloads/19730022217.pdf

Q: In Phase I, provided MTOW remains unchanged, may structural materials be modified?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Should the cost analysis explicitly include the modified engine and any new or modified transmission system components as separate cost elements?

Leonardo Response: The cost analysis should reflect the total cost for the proposed configuration.

Q: For added batteries, should specific commercial products be identified? Or should teams assume generic battery packs based solely on the provided performance metrics?

Leonardo Response: The choice is at the discretion of the teams. Battery requirements are as described in the RFP.

Q: Is a detailed internal design of the transmission gearbox required? Or is a system-level architectural description sufficient?

Leonardo Response: The reviewers will permit a certain amount of liberty related to subsystems unrelated to the primary lift/power/propulsion/control system design; however, the decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: If changes in nacelle mass and geometry due to electric motors and transmission modifications affect aeroelastic behavior such as flutter or vibration, are teams expected to perform aeroelastic analyses? Or is compliance with CG envelope and structural load limits sufficient?

Leonardo Response: The reviewers will permit a certain amount of liberty related to subsystems unrelated to the primary lift/power/propulsion/control system design; however, the decision is left to the respondents as to the level of detail required to demonstrate a rational concept. The decision on the CG envelope is left to the respondent subject to a demonstration of adequate stability and control throughout the proposed flight envelope.

Q: In section 2.3 of the Request For Proposal (RFP), requirements for a simplified mission analysis are provided. Are the flight segments to be taken as sequential, or separate?
Should the performance of the vehicle be analyzed for a hover of 5 minutes at take-off conditions, then a climb to 10,000 ft followed by a cruise phase of 400 nautical miles, a descent of an additional 306 nautical miles, finishing with another 5 minute hover at landing conditions?
The summed distance of 706 nautical miles for just cruise and descent would already greatly exceed the maximum cruise range of the original Bell XV-15, being 445 nautical miles. Please confirm if this interpretation is correct? Or whether there is a different interpretation of the provided segments that prevails?

Leonardo Response: The segments are sequential and consecutive. The RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.

Q: Interpretation of the 10% Electrical Power Requirement: The requirement is for at least 10% of propulsion power must be electrically generated and/or electrically distributed, could Leonardo clarify whether this percentage should be evaluated based on:

- Total installed propulsion power;
- Total mission energy consumption;
- Segment-specific power demand (e.g., hover or cruise);
- OR overall electrically distributed bus power capacity, for determining how hybridization is optimally allocated across the mission profile?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: Electrical Generation vs. Electrical Distribution: If the 10% requirement is satisfied through electrical transmission of engine power (e.g., electrically distributing turboshaft-generated power) rather than stored battery energy contribution, does this fully satisfy the intent of the requirement? or is stored electrical energy expected to contribute to that percentage?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: Thermal Engine Scaling Assumptions: When integrating hybrid propulsion in Phase I, if the original T53 turboshaft is downscaled, must its specific fuel consumption strictly match the historical baseline values? or may modern but performance-equivalent turboshaft assumptions be used if technically justified?

Leonardo Response: The T53 is the T53 of the Model 300 report. A scaling methodology, if required, should be described. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Payload Trade-Off Interpretation (Phase I): Given that MTOW must remain unchanged in Phase I, is reduction in payload considered an acceptable trade-off for hybrid system mass addition? or is maintaining original payload capacity strongly preferred as a primary evaluation metric?

Leonardo Response: The mission payload for Phase I is not defined.

Q: Battery Specification Enforcement: The battery pack specification is constrained to 250 Wh/kg, 2500 W/kg, and 600 Wh/L at pack level. Should these values be treated strictly as maximum allowable system-level metrics? Or may additional structural, cooling, containment, and integration allowances be included beyond these values, provided they are clearly documented?

Leonardo Response: Battery specifications are as stated. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Expectation of Regenerative Capability: Is regenerative energy capture (e.g., during descent or low-power flight segments) considered an expected feature of the hybrid architecture? Or may regen be treated as optional depending on demonstrated mission-level efficiency benefit?

Leonardo Response: Regenerative capability is up to the discretion of the teams. 10% of the mission operating energy requirement must be from electrically generated sources.

Q: Structural Modification Boundaries (Phase I): Within the constraint that external geometry must remain unchanged in Phase I: may material substitutions be implemented to reduce structural mass while maintaining safety margins; may internal structural members (skeleton, load paths, compartment layout) be redesigned, provided rotor, wing, and outer geometry remain unchanged?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Phase II Design Freedom Clarification:

- Beyond maintaining rotor diameter and mission constraints, are fuselage reshaping, internal volume redistribution, and structural reconfiguration encouraged?
- Is the material of the whole structure or relative things have to be same as the original XV 15 or we can change the material in the design?
- May alternative proprotor RPM strategies be explored specifically to optimize hybrid power flow?

Leonardo Response: Phase II configurations are only required to meet the design parameters provided.

Q: Availability of XV-15 Detailed Baseline Data: NASA SP-2000-4517 and Model 300 references provide performance and general configuration data; however, detailed structural blueprints, internal layout drawings, blade twist and chord distributions, and structural cross-sectional properties are not publicly available. Could the committee clarify whether: Additional archival geometric or structural references are accessible? Or whether reconstruction of missing parameters from published aerodynamic and performance data is the expected approach?

Leonardo Response: NASA CR-114-682 is authorized as a source solely for wing and blade detailed geometry. https://ntrs.nasa.gov/api/citations/19740003720/downloads/19740003720.pdf

Q: Validation of Reconstructed Parameters: In cases where exact structural or geometric parameters (e.g., blade structural properties, internal structural dimensions, compartment volumes) are not available, is it acceptable to:

- Reverse-engineer parameters from documented performance data?
- Apply standard aerodynamic and structural estimation methods; And validate assumptions through sensitivity analysis?

Leonardo Response: Yes and yes, provided such processes are documented sufficiently.

Q: The thermal engine is specified as either the original T53 or a downscaled version with the same specific fuel consumption (SFC) and similar rating structure.

- For a downscaled engine, should teams assume proportional scaling of mass, dimensions, and performance parameters?
- Or is it sufficient to scale only the power output while maintaining the stated SFC and ratings?
- Additionally, must the SFC of the downscaled engine remain identical to that of the original, or may a lower SFC be assumed if justified?

Leonardo Response: A scaling methodology, if required, should described. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Will an official CAD model of the baseline/original vehicle be provided by the organizers, or are teams expected to develop the geometry and CAD model independently?

Leonardo Response: A CAD model does not exist.

Q: The rules reference specific documents (e.g., the XV-15 book — NASA SP-2000-4517 and the NASA Model 300 report — NASA-CR-114614) as baseline references, but these exact titles are difficult to locate.

- Will the organizers provide official copies, or may teams use publicly available or closely matching sources if the originals cannot be obtained?
- Additionally, since Section 2.2.1 references these documents as baseline material and different reports provide varying payload figures for the XV-15, which specific configuration or authoritative document should be used as the definitive baseline payload for the Phase I comparison?

Leonardo Response:

4517: https://www.nasa.gov/wp-content/uploads/2023/04/sp-4517.pdf
11614: https://ntrs.nasa.gov/api/citations/19730022217/downloads/19730022217.pdf

Q: Section 2.2.1 states that "If batteries are desired for energy storage, they shall consist exclusively of the following specification..."

- Does the battery specification (250 Wh/kg) apply to the cell level or the fully integrated pack level?
- Does this rigid specification apply only if the battery is strictly used for energy storage, or can we use different battery specifications if we utilize them differently (e.g., primarily for high-power energy generation/discharge)?

Leonardo Response: The battery specifications apply at the fully integrated pack level. Alternate batteries are not permitted.

Q: In Section 2.3, the text specifies a "400 nm cruise, 260KCAS," but the very next bullet says, "Descend and land for a total distance of 306 nm with 10% fuel reserve." Could you please clarify what the actual total mission distance should be?

Leonardo Response: RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.

Q: What is the expected Technology Readiness Level (TRL) for the proposed hybrid components? Should teams design based on currently available technology or projected advancements for a specific future entry-into-service (EIS) date?”

Leonardo Response: Only the batteries are specified. Respondents are free to propose components that are rational and can be justified.

Q: Are there specific One Engine Inoperative (OEI) safety requirements for the hybrid propulsion system during hover or transition? Should the electrical system be sized to compensate for a thermal engine failure?

Leonardo Response: The proposed configuration must meet civil/commercial operating standards for OEI conditions as documented by the respondent.

Q: Section 1.5.2 mentions 'affordability' as an evaluation criterion. Are teams required to use a specific quantitative cost estimation model and currency (e.g., USD), or is a qualitative discussion regarding manufacturing, reliability, and maintenance sufficient?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate the cost effectiveness of their concept. No specific currency type is required, as long as teams are consistent throughout their proposal.

Q: Regarding autorotation in conversion mode (where nacelles/rotors are in intermediate positions): Given the inherent complexity of this maneuver in a hybrid tiltrotor, are teams expected to provide a purely mechanical solution for handling power failure? or is utilizing the electric motors and battery system as a safety backup for emergency landing encouraged?

Leonardo Response: The proposed configuration must be capable of continuous, safe, controlled flight throughout the proposed flight envelope.

Q: What level of fidelity is expected for battery system modeling? Is system-level sizing based on energy and power density assumptions sufficient, or is detailed electrochemical modeling expected?

Leonardo Response: The battery specifications apply at the fully integrated pack level. The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Are literature-based assumptions for battery energy density and power density acceptable, provided sources are cited?

Leonardo Response: Battery specifications are as stated.

Q: Does the competition prefer a specific hybrid architecture (series vs parallel)? Or are teams free to propose alternative architectures if justified?

Leonardo Response: No specific architecture is prescribed.

Q: Is inclusion of emerging technologies (e.g., hydrogen fuel cells or SAF-compatible systems) encouraged, or should designs prioritize near-term certifiable technologies?

Leonardo Response: Battery specifications are as stated. Respondents are free to propose components that are rational and can be justified.

Q: What level of aerodynamic fidelity is expected? Are conceptual-level methods (momentum theory, blade element approximations) acceptable in place of high-fidelity CFD?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Is wind tunnel testing conceptual planning sufficient? Or are teams expected to provide detailed scaling and Reynolds number correction analyses?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Are spreadsheet-based analytical models acceptable for propulsion and power sizing? Or is preference given to time-domain simulation tools (e.g., MATLAB/Simulink)?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: If mission parameters are not explicitly defined, are reasonable assumptions allowed provided they are clearly justified?

Leonardo Response: The mission requirements are as provided. Additional information should be provided in the proposal, as necessary.

Q: What level of detail is expected for thermal management systems? Is conceptual sizing with heat load estimates sufficient?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: What forms of validation are most valued: comparison with existing aircraft data, sensitivity analyses, or experimental validation?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: In a parallel hybrid tiltrotor architecture, are mechanical couplings between the ICE, turbogenerator, and rotor drivetrain allowed, or should all power sources be combined only through an electrical bus? Are there preferred coupling strategies from a reliability or TRL perspective?

Leonardo Response: No specific architecture is prescribed.

Q: Are we required to model the transition phase from helicopter mode to airplane mode in the power calculations?

Leonardo Response: All phases of flight and transitions should be included in analyses. The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Regarding the statement in the specification: “Similar or improved aircraft flight envelopes (Altitude, Airspeed, Service Ceiling, CG range, Height-Velocity diagram) should be included in the proposal…” For the Altitude–Airspeed flight envelope

- Is a comparative envelope based on the XV-15 reference sufficient; Or is a fully calculated performance envelope required, including aerodynamic and power limitations (stall boundaries, maximum speed limits, service ceiling, power constraints, etc.)
- Additionally, should the helicopter-to-airplane transition regime be included in the envelope

assessment?

Leonardo Response: All phases of flight and transitions should be included in analyses. The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Considering that the RFP does not define explicit avionics constraints, should the XV- 15's original avionics configuration—including analog instrumentation, legacy navigation systems, and mechanical control philosophy—be preserved as the baseline? or are teams encouraged to redesign the avionics architecture according to contemporary standards such as fully digital glass cockpit layouts, integrated modular avionics, modern data bus architectures (e.g., ARINC/MIL-STD-1553 equivalents), advanced flight management systems, and sensor fusion capabilities?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: If avionics modernization is permitted, should the additional electrical load, system weight, and cooling requirements be treated strictly as empty weight penalties affecting payload? or will improvements in operational capability, safety, maintainability, and integration depth be positively evaluated in the scoring process?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: In the context of hybrid-electric integration, is it acceptable to retain the original mechanical flight control architecture of the XV-15, or are teams expected to evaluate partial? Or full fly-by-wire conversion, especially considering increased electrical power availability within the hybrid architecture?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: If flight controls remain hydraulically actuated, should the original hydraulic system be preserved entirely? Or would transitioning toward electro-hydraulic actuation or electrically driven hydraulic pumps be considered a more appropriate hybrid-integrated solution?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: If hydraulic actuation is retained for rotor pitch and primary flight controls, would integrating electrically powered auxiliary or backup hydraulic pumps—supplied by the hybrid electrical system—be considered a meaningful contribution to hybridization within the scope of the competition?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Regarding the “at least 10% electric power” requirement, should this percentage be calculated based on maximum installed propulsion power, peak mission-phase power demand? or average mission power consumption?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: Does the 10% electric power requirement apply strictly to propulsion power delivered to the rotors, or can electrically powered subsystems—such as hydraulic pumps, environmental control systems, avionics loads, and cooling systems—contribute toward satisfying this threshold?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: What level of technical detail is expected for the electrical power distribution architecture? Should teams define voltage levels, DC/AC bus configurations, fault isolation strategies, redundancy philosophy, protection systems, and load prioritization logic? Or is a high-level functional block diagram sufficient?

Leonardo Response: The decision is left to the respondents as to the level of detail required to demonstrate a rational concept.

Q: Are minor structural modifications permitted to accommodate batteries, power electronics, and cooling systems—such as resizing sponsons or reconfiguring internal compartments—provided that MTOW, rotor geometry, and primary aerodynamic surfaces remain unchanged?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale. No specific architecture is prescribed.

Q: Is the starting elevation of the mission profile at sea level? Or at 4k feet above sea level?

Leonardo Response: The starting elevation is 4K/95ºF.

Q: Is the descent and landing of 306 nm the horizontal distance? Or the actual distance of the travel? Also, please verify the 306 nm value.

Leonardo Response: RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.

Q: Is the power split of 10% considered for the power required for the whole mission profile or per phase of the mission?

- Is it necessary to use this throughout the phase, or can we use it as a burst of power?
- What if we use the 10% power for 10% of cruising time?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: In the case of a battery discharging and if a team recharge it again mid-flight, is power drawn from this battery considered electrically sourced? or electrically generated?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources. Configuration changes mid-mission, such as battery swaps or charging from external sources, are not permitted.

Q: Is there any specific type of engine in the T53 family we need to use? If not, then please specify the engine type?

Leonardo Response: The T53 is the T53 of the Model 300 report. A scaling methodology, if required, should described. In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted.

Q: Is the downscaling of the T53 engine with respect to its shaft horsepower technically changing the components of the T53 engine?

Leonardo Response: No.

Q: In Phase 2, at what height should we descend to after cruise for the 306 nm distance? Can we assume our own hover height?

Leonardo Response: Hover altitudes are provided. All hovers are out of ground effect.

Q: In Phase-2, hover is at 4K ft/95°F, then why are cruise conditions (Maximum Airspeed) specified according to the standard day?

Leonardo Response: The mission is as described.

Q: What is the cell-level configuration of the battery?

Leonardo Response: Battery specifications are as stated. Respondents are free to propose components that are rational and can be justified.

Q: Should the battery be sized per phase or as per the energy requirements for the entire flight path?

Leonardo Response: 10% of the entire mission operating energy requirement must be from electrically generated sources.

Q: If we change the material of various structures in Phase 1 does it mean that we are violating the rules stated in the RFP (Phrase 2.2)?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Is 2G/3.5G load factor experienced by the pilots? Or the aircraft's structure only?

Leonardo Response: Aircraft structure.

Q: Do we have to use the original compatible fuel for the engine? Or can teams use other fuels that are compatible with better efficiency?

Leonardo Response: The fuel used is per the Model 300 report.

Q: In the RFP under 2.3 Mission Requirements, it states that there is descent and land total distance of 306 nm after the 400 nm cruise, but in the familiarity document the stated range of the XV-15 is ~450 nm. Is this a typo or are we expected to design a hybrid retrofit that has almost double the range of the original aircraft?

Leonardo Response: RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.

Q: Can the original XV-15 research instrumentation weights be neglected in the retrofit design (for part 1)?

Leonardo Response: No.

Q: What contingency requirements, if any, should be accounted for in the retrofit performance?

Leonardo Response: The proposed configuration must meet civil/commercial operating standards for OEI conditions as documented by the respondent.

Q: Does the mission profile apply to both Phase I and Phase II?

Leonardo Response: Yes.

Q: May NASA-TM-X-62407 be another valid reference?

Leonardo Response: No.

Q: Can extraneous parts modeled be placed anywhere (within reason) inside the vehicle?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Phase-1: If the empty weight of the hybrid-electric redesign is lower than the XV-15 baseline, can teams add fuel to match take-off weight?

Leonardo Response: The MTOW in Phase I must remain unchanged.

Q: Phase-1: If the hybrid system uses less space compared to the XV-15 baseline propulsion and transmission systems, can teams remove or make components smaller?

Leonardo Response: In Phase I, only weight or drag changes, if specifically related to the hybrid system design, are permitted. Improved rotor, structural, or flight control system design changes yielding weight or drag improvement are not desired but will be accepted with appropriate rationale.

Q: Phase-2: What is the volume (length, width, height) and/or density of the 1600 lb payload?

Leonardo Response: For Phase II, assume that the XV-15 was designed to carry 6 passengers plus crew at 200lb each and design accordingly.

Q: Phase-2: Are the maximum airspeeds given (300 kts and 350 kts) calibrated airspeed or true airspeed?

Leonardo Response: These are true airspeeds.

Q: Phase-2: Do the airspeeds of 300kts and 350kts correspond to V_NO (max structural cruising speed) and V_NE (velocity to never exceed)? What about V_DIVE?

Leonardo Response: RFP is revised to reflect V_{NO} as 300 ktas and V_{NE} as 350 ktas. Detailed structural design is not required.

Q: Phase-2: In forward flight (cruise), the proprotors are in axial flight not edgewise flight. For the autorotation requirement, is the tiltrotor required to immediately transition into edgewise flight regardless of flight condition? or can the tiltrotor continue flying in airplane mode (fly on limited power or glide) until we deem it safe to transition into edgewise flight for autorotation?

Leonardo Response: The proposed configuration must be capable of continuous, safe, controlled flight throughout the proposed flight envelope.

Q: Mission Requirements: Is this mission used for phase 1 and phase 2? Or should teams utilize the original XV15 mission profile for phase 1?

Leonardo Response: The mission is common to both phases.

Q: Mission Requirements: Is there a required flight path for the descent and landing segment? Must teams descend at a very shallow angle for 306 nm, or may we instead say descend first and then cruise for 306 nm?

Leonardo Response: RFP is corrected to reflect a total distance of 306 nm, cruising at 260 kcas.