The NextGenCTR is called to safely operate in harsh environmental conditions, characterized by contaminated air-flow (dust, ash, sand, salt and moisture) and icing conditions. To achieve this goal, the Clean Sky 2 project TRIcEPS will develop an air-intake with integrated engine protection systems, which will be geared on two key enabling technologies:

- a removable thermoelectric ice protection system based on the heater layer technology.
The air intake will be equipped with a bypass for operation in clean flow and a compressor washing system. The full system will be tested and qualified through extensive testing, which will include icing wind tunnel measurements and flight tests. TRlcEPS will deliver the air intake, its engine protection system and all the relevant sub-systems at TRL 7.

During the first reporting period, TRlcEPS consortium characterized the performance of the baseline nacelle air-intake design provided by the Topic Leader. The baseline design does not include any engine protection system, but it has been optimized for ensuring the proper flow to the engine and introducing low losses. TRlcEPS consortium performed several aerodynamic, droplet impingement and structural numerical calculations, which have been used to refine the numerical workflows and to guide the intake design.

During the second reporting period, TRlcEPS consortium developed and presented a conceptual design of the air-intake with integrated engine protection systems employing the Vortex tubes filter, which satisfied TL’s aerodynamic requirements.

The preliminary design of air-intake concept has started, focusing on refining the by-pass door and it opening mechanism, due to its large impact on the intake pressure losses.

TRlcEPS will advance the NextGenCTR air intake technology by enhancing the capabilities of the air intake of its single components and sub-systems. At a system level, the IPS, the particle EPS and the compressor washing for tiltrotors are not available on the civil aircraft market. SotA civil tiltrotor intake normally does not include an IPS, while only an integrated inertial particle separator is considered as EPS in civil application. Therefore, TRlcEPS innovation potential is expressed by the following proposed advancements:

• provide the civil market for tiltrotors with a fully electro-thermal solution for the IPS;
• provide the civil market for tiltrotors with a particle EPS with a separation efficiency above 96%, i.e. significantly higher than the present SotA (i.e. below 80%);
• almost match the performance, with respect to particle separation, of the military Bell solution but removing (or largely reducing) the icing protection requirements, the need of maintenance, and easing the flight certification of the system;
• perform a research study on compressor washing system for tiltrotor civil applications;
• reduce and optimize overall weight of the air intake and its systems by designing and employing advanced composite materials.

Concerning the potential impact, TRlcEPS holds the promise of delivering the engine protection system for the air intake of the NextGenCTR, contributing to strengthening the EU position in the global civil rotorcraft market and enabling expanding the market for heavy multi-engine civil rotorcraft. Being TRlcEPS focused on delivering a part of the NextGenCTR, i.e. the air intake and its ice and...
particle engine protection system, the impact of the project corresponds with the impact of delivering the aircraft for which the part is built.

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