The object of this research topic is to develop approaches for robust propulsion control design to maintain engine operation in the presence of engine icing, foreign object damage such as ice ingestion and bird strikes, or extreme operating conditions such as high angle of attack.

Aircraft engines are designed to operate safely over a wide range of conditions. They can ingest small birds with little or no effect, and they are designed with enough stall margin available that the amount of inlet distortion encountered under normal circumstances is not detrimental. However, there is a limit to the variation that the engine can accept. In the case of larger than normal inlet distortion, large bird ingestion, or internal ice build-up, the engine’s operation can be far enough from its design point that stability is compromised. In these cases it might still be possible to maintain basic engine function by moving bleed valves or variable stator vanes off of their nominal schedules. This requires the development of a robust control algorithm that delivers normal engine performance over the traditional operating range, but is capable of maintaining operation beyond normal conditions.

The expected outcome of the research will be a demonstrated robust propulsion control using a realistic engine model such as the NASA-developed Commercial Modular Aero-Propulsion System Simulation (C-MAPSS). Any modifications to the simulation required to accurately model the effects of engine ice, FOD, inlet distortion, etc., will be the responsibility of the contractor, and must be based on physical considerations.

NASA resources available for the research are the publicly available Commercial Modular Aero-Propulsion System Simulation (C-MAPSS) or a similar simulation. C-MAPSS is available upon request to US Citizens and permanent residents.