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Flight Resource Optimization:

Safety, Technology, Well-being, and Infrastructure for Northern Geography

ABSTRACT

Aviation provides a lifeline for many remote communities in northern Canada, and is intrinsically linked to local food security, energy security, access to healthcare, and more. Unfortunately, small aircraft operators that serve these communities face significant safety risks when operating in such austere environments. Emerging Advanced Air Mobility (AAM) technologies show potential to substantially and positively impact these aircraft-reliant northern communities. This seminar introduces the FROSTWING framework developed to explore this complex socio-technical system-of-systems problem. FROSTWING uses a resource allocation and multi-commodity network formulation to model the operations of a small air taxi fleet. A multi-objective optimization explores tradeoffs and model sensitivities relating to three objective functions: Operational Risk Index, Community Well-being Index, and Operating Cost Index. The Operational Risk Index demonstrates how aircraft systems and fleet management decisions impact risk exposure. The Community Well-being Index provides a nuanced assessment of commodity urgency and time sensitivities relating to community demands. These novel metrics, combined with the Operating Cost Index, enable the assessment of aircraft systems, operations, and infrastructure to inform decisions on which technology investments could result in the highest value impact for underserved communities while lowering aviation risk factors.

SPEAKER BIO



Suzanne Swaine is a Ph.D. Candidate and Bilsland Fellow at Purdue University. Her research in aerospace systems and systems-of-systems includes aircraft design, optimization, and operations, with a human-centric focus. Suzanne's research has been recognized with the AIAA William T. Piper Sr. General Aviation Systems award. Suzanne is an Associate Fellow of Purdue University's Teaching Academy and has thrice been awarded the College of Engineering's Magoon Award for Teaching Excellence. Previously Suzanne worked at Gulfstream Aerospace Corporation as an Aircraft Performance Technical Specialist. Her work included flight manual development, avionics testing, wind tunnel testing, and flight test support. Suzanne is a member of AIAA's Aircraft Design and General Aviation Technical Committees. She is originally from Nova Scotia and obtained her B.Eng and M.A.Sc in Aerospace Engineering from Carleton University.