Modeling Ground and Air Risk of Drone Operation under NEDO ReAMO Projects

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As societal expectations for the widespread use of drones grow, addressing the inherent risks associated with drone operations becomes critical. The diverse use of drones in urban and rural environments, coupled with varying crew compositions, requires a thorough understanding and management of potential safety risks on the ground and in the air. As part of Japanese R&D funding to enable advanced air mobility, our consortium of experts from the University of Tokyo, AIST, NII, ENRI and others is conducting research to model these risks. The study is divided into three phases: 1:1, 1:N and m:N operational risk assessment. Having completed Phase 1, we are currently establishing the operational environment assumptions for Phase 2, which will be presented at IWAC2024.

Key Words: Drone, Air risk, Ground risk, SORA, risk evaluation

1. Introduction

From commercial deliveries and agricultural monitoring to emergency response and infrastructure inspection, drones are widely believed to offer unparalleled capabilities that improve business efficiency or provide innovative solutions to complex social problems. As societal expectations for the integration of drones into everyday operations grow, so does the need to address the inherent risks associated with their use.

The proliferation of drones in both urban and rural environments, and the variable composition of operating crews, necessitates a comprehensive understanding of the potential risks of operations to both ground and air safety. Ground risks relate to the potential harm to people, property and infrastructure from drone operations, while air risks relate to the safety of manned and unmanned aircraft sharing the same airspace. Effective risk assessment is critical to the safe integration of drones and public acceptance of their widespread use.

As part of the New Energy and Industrial Technology Development Organization's (NEDO) Enabling Advanced Air Mobility Project, namely ReAMo (Realization of Advanced Air mobility Project), we are conducting research as a consortium to model the ground and air risk of drone operations from 2022. The consortium includes experts in civil aviation traffic management, artificial intelligence, robotics and risk management from the University of Tokyo (UTokyo), Intent Exchange, National Institute of Advanced Industrial Science and Technology (AIST), National Institute of Informatics (NII), National Institute of Maritime, Port and Aviation Technology, Electronic Navigation Research Institute (ENRI).

The research involves three phases; 1) modelling 1:1 operation, which means the risk of a drone operation conducted by one pilot with possibly several other non-piloting crews is the target to evaluate; 2) modelling 1:N operation, which means the risk of N drones operation conducted by one pilot with possibly several other non-piloting crews is the target to evaluate; and 3) modelling m:N operation, which means the risk of N drones operation conducted by m pilots with possibly several other non-piloting crews is the target to evaluate.

We have just completed the Phase 1 (Fig.1 and 2) and now we are now defining a set of operational environment assumptions for Phase 2, which we will present at IWAC2024.

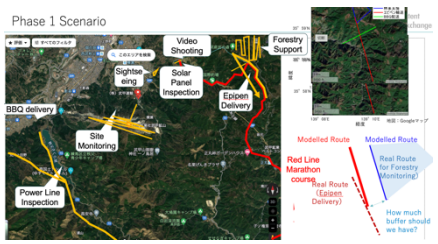

Figure 1. Phase 1 Scenario

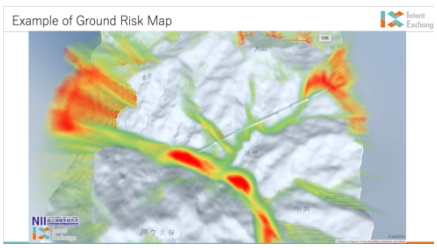

Figure 2. Example of Ground Risk Map

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