Procedures and Phraseology in case of Data Communication Loss during Integrated RPAS Operations in Terminal Manoeuvring Areas

Abstract:

Increasing demand for drones or remotely piloted aircraft systems (RPAS) and their applications, e.g. monitoring of infrastructure or transport of goods, likewise demands for a structured integration into the existing airspace used by conventional traffic. Integration and management of smaller drones in lower airspace is investigated by U-space, the initiative of SESAR Joint Undertaking to ensure safe and secure integration of drones in Europe [1]. The non-segregated integration of RPAS traffic into the existing Air Traffic Management structure, especially at and around airports, is still an open task, which is investigated by the INVIRCAT project. The project aims at developing a concept of operations for RPAS in terminal manoeuvring areas and airports under instrument flight rules. Furthermore, the project assesses this concept through real-time simulations, and drafts a set of requirements and recommendations for rule-makers and standardization bodies.

One part of the simulation activities of INVIRCAT has been performed at DLR premises in November 2021. The simulation at DLR focused on the arrival of instrument flights at an international airport, in this case Düsseldorf airport (EDDL). A baseline traffic scenario has been constructed based on recorded traffic at EDDL from 2019, with approximately 35 arrival movements per hour, combining unmanned and conventional aircraft. Up to three selected aircraft have then been replaced by remotely piloted aircraft systems, and RPAS-specific scenario events have been injected, such as data communication loss or high latency on the data communication link. This yielded a total of eight scenarios available for simulation purpose.

The simulation assessed the impact of the integration of RPAS within terminal manoeuvring areas on air traffic control, and the adequacy of procedures and phraseology introduced by the developed concept. For this purpose, external air traffic controllers from the organisations IFATCA and ANACNA have been invited to the simulation exercises. The air traffic controllers have been trained at the controller working positions and then been confronted with arriving RPAS. Neither conventional nor RPAS traffic should have been given preference if not required. RPAS should have been treated like the other traffic as much as possible. In case of data communication loss, the RPAS were programmed to enter certain new determined emergency loiter areas separated from the regular arrival streams, known to the air traffic controllers. After regaining the data communication link, the RPAS remained in the emergency loiter area until instructed by air traffic control otherwise. Additionally, these loiter areas may have been used to separate RPAS from the other traffic in any case the air traffic controller sees the need for. Voice communication between RPAS pilot and air traffic controller remained available through all research scenarios. Both RPAS pilot and air traffic controller were provided with suggested phraseology for the case of data communication loss.

During the trials, every five minutes each controller indicated his perceived workload on a scale from 1 to 5 (Instantaneous Self Assessment of workload – ISA). After each scenario, both air traffic controller and RPAS pilot have been provided with a questionnaire, asking for their feedback on the applied and available procedures as well as the adequacy of the used phraseology. The introduced procedures were welcomed and rated to be adequate and useful for the purpose of safe integration of RPAS into terminal manoeuvring areas and airports under instrument flight rules. The option to utilise the emergency loiter area during regular operation, i.e. other than automatic activation in case

of data communication loss, was not used. However, it was deemed valuable as a “last resort” backup for RPAS. The introduced phraseology for data communication loss was welcomed and rated to be adequate.

The full paper will give an insight to the recorded data. This includes a consolidated report of the answered questionnaires from controllers and pilots as well as a data analysis of the traffic flow and the instantaneous self-assessment of workload.

References:

[1] SESAR Joint Undertaking, (2020). Supporting safe and secure drone operations in Europe: a preliminary summary of SESAR U-space research and innovation results (2017–2019), Publications Office. https://data.europa.eu/doi/10.2829/952777