



WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

Agenda Item 5: Emerging issues

5.3: Remotely piloted aircraft system (RPAS)

PROPOSAL ON ISSUANCE OF A SECONDARY SURVEILLANCE RADAR (SSR) SPECIAL PURPOSE CODE AS AN RPAS LOST LINK CODE

(Presented by the Civil Air Navigation Services Organisation (CANSO))

EXECUTIVE SUMMARY

This paper proposes the use of 7400 as an SSR special purpose code to indicate that a Remotely Piloted Aircraft (RPA) is operating without a functional command and control link between the pilot and the remotely piloted aircraft (RPA).

Action: The Conference is invited to :

- a) Note the contents of this paper
- b) Make the recommendations in 4.3 a priority
- c) Direct the establishment of 7400 as a Mode 3/A SSR code for Lost C2 Link events.
- d) Direct the inclusion of the SSR code of 7400 for Lost C2 Link events in ICAO Annexes, PANS and associated documents.

1. CURRENT SITUATION

1.1 Remotely piloted aircraft (RPA) operations are unique as they are controlled (or “linked”) through commands sent via radio line of sight or satellite frequency to an on-board computer that provides inputs to the aircraft’s flight control surfaces.

1.2 When an uplink that transmits command and control (C2) instructions to the aircraft is not available, a condition commonly referred to as “Lost C2 Link.” When this occurs, the RPA reverts to flight routes, altitudes and airspeeds programmed into the remotely piloted aircraft system (RPAS) prior to the Lost C2 Link condition to ensure the safe recovery of the RPA.

1.3 The *Manual on Remotely Piloted Aircraft Systems (RPAS)* (Doc 10019) states: “C2 link loss is considered to be any situation in which the RPA can no longer be controlled by the remote pilot due to the degradation or failure of the communication channel between the RPS and RPA.”

1.4 There is no current ability for a remote pilot to electronically notify air traffic control (ATC) that an RPA is operating in Lost C2 Link mode. The use of secondary surveillance radar (SSR)

special purpose codes 7600 (radio failure) or 7700 (emergency) indicates a system malfunction, but does not accurately describe a Lost C2 Link contingency. Additionally, the Lost C2 Link condition may be momentary or endure until an alternative C2 Link becomes available, depending on the reason for the failure.

2. DISCUSSION

2.1 When an RPAS enters a Lost C2 Link condition, the remote pilot loses the ability to manage the flight path of the RPA and it transitions to a fully automated mode of flight. In many cases, dependent on aircraft and frequency configuration, the communications link between the remote pilot and air traffic control (ATC) may also be disabled. However, the remote pilot will usually be able to contact ATC via alternate means of communication (telephone, VOIP, etc.) in order to inform ATC of the pre-programmed flight path of the RPA.

2.2 Due to this unique set of circumstances, ATC should be made immediately aware when a Lost C2 Link event occurs. ATC might be notified (e.g. via the flight plan or other means) of the planned flight path of the RPA during a Lost C2 Link event, however something would need to trigger the rapid search for, and acquisition of, such information to avoid ambiguity. Without a dedicated and discreet SSR code, it is not obvious how this would occur quickly in a high-pressure ATC environment.

2.3 The German unmanned aerial vehicle (UAV) demonstration project, WASLA-HALE (Weitreichendes Abbildendes Signalerfassendes Luftgestütztes Aufklärungssystem – High Altitude Long Endurance) project report states that “Controllers would prefer that an [RPA] specific squawk for the datalink loss is introduced. A datalink failure does not correspond exactly to the Loss Com case (Squawk 7600) neither to the Emergency Squawk 7700 because the [RPA] is still in a stabilized situation due to the autonomous airborne systems. An additional [RPA] specific squawk for datalink loss would give as well the possibility to indicate further deterioration of the [RPA] in case of e.g. an engine failure.”

3. IMPACT ON ANNEXES

3.1 ICAO should create new provisions within Annex 2 — *Rules of the Air*, Annex 10 — *Aeronautical Telecommunications*, Volume II — *Communication Procedures* including those with Procedures for Air Navigation Services (PANS) status, and Annex 11 — *Air Traffic Services* that outline the details remote pilots and air traffic controllers should take related to Lost C2 Link occurrences, including designation of code 7400.

4. NEED FOR ICAO COORDINATION

4.1 The RPAS Panel reached consensus regarding the need for an SSR code for Lost C2 Link events and that the code 7400 should be used.

4.2 CANSO advocates that establishment and use of a designated code for RPAS Lost C2 Link events would further RPAS integration efforts and enhance safety and efficiency in the global ATM system.

4.3 Some countries have already taken actions related to this issue. Within the United States the use of SSR code 7400 for unmanned aircraft experiencing a Lost C2 Link event became effective November 10, 2016. Automation changes were made to all National Airspace platforms so that when the

7400 code is broadcast by an RPA, an alert will display notifying ATC personnel that a Lost C2 Link condition is occurring.

4.4 The conference is encouraged to prioritize and accelerate discussions to establish SSR code 7400 as the recommended standard within ICAO. By starting this work in a timely manner, it will reduce the time for implementation by several years.

4.5 Making this a priority will expedite the formulation of the necessary Standards, ensure inclusion within the appropriate Annexes, PANS, regional air navigation plans (ANPs) and will enable the prioritization of the following activities:

- a) regulators will have justification for creating and implementing the direction of an SSR code for Lost C2 Link within national regulations;
- b) ANSPs and other stakeholders (e.g. aircraft operators, military, Cospas-Sarsat) will have justification for funding and implementing the necessary equipment changes to meet the revised flight regulations; and
- c) manufacturers will have clear guidance regarding provisions required within system designs as part of the safety considerations for Lost C2 Link conditions.

5. **RECOMMENDATIONS**

5.1 The Conference is invited to:

- a) note the contents of this paper;
- b) consider the justification and proposed use of a dedicated SSR code for Lost C2 Link events;
- c) direct the establishment of 7400 as the discreet SSR code for lost C2 Link events; and
- d) direct the inclusion of the SSR code 7400 for Lost C2 Link events in ICAO Annexes, PANS and all additional relevant documents.

— END —