International Civil Aviation Organization

Fifth Meeting of the Surveillance Implementation Coordination Group (SURICG/5)

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Agenda Item 9: Next meeting & any other business

CASES OF SSR RF-INTERFERENCE CAUSED BY VIDEO TRANSMISSION EQUIPMENT IN UNMANNED AERIAL VEHICLE (UAV)

(Presented by Republic of Korea / Korea Airport Corporation)

SUMMARY

This document was written to inform SSR disruption cases caused by video transmission equipment in UAV and their danger

1. INTRODUCTION

To prevent RF-interference, the equipment using RF must be licensed by the authorities. Despite such efforts, however, the RADAR system disruptions by RF-interference still happens. Through the recent SSR failure cases, the following contents explain the danger of the video transmission equipment in UAV.

2. DISCUSSION

RF-interference Indication

2.1 When an alarm occurs from SSR, the maintenance manager handles according to the alarm's message. Finding the cause of the problem such as low power or fan stoppage and handling them are not difficult. However, it is necessary to learn about the indications of RF-interference because there is no specific alarm signal for RF-interference. When a RF-interference happens, SSR's signal processor signals alarm and automatically changes its channel over to standby-channel. As channel changeovers happen in every few seconds, aerial detection by SSR becomes impossible. The focus of this indication is this; the alarm message occurs in signal processor and after channel-changeover the signal processor recover itself but the same error message occurs at the other signal processor in few seconds.

Influence on Distance Measurement Equipment (DME)

2.2 Distance Measurement Equipment (DME) generally uses frequency bandwidth between 960 and 1215MHz. The previously mentioned frequency bandwidth includes SSR frequency, both 1,030MHz (Interrogation) and 1,090MHz (Reply). Therefore, RF-interference that affects SSR could also influence DME. In fact, the reply efficiency of operating DME (RX Frequency : 1075 MHz) in the same airport goes down when an error happens to SSR. If the DME's reply efficiency is checked when the failure discussed in 2.1 occurs with SSR, one could have determined faster that the cause of SSR malfunction is RF-interference.

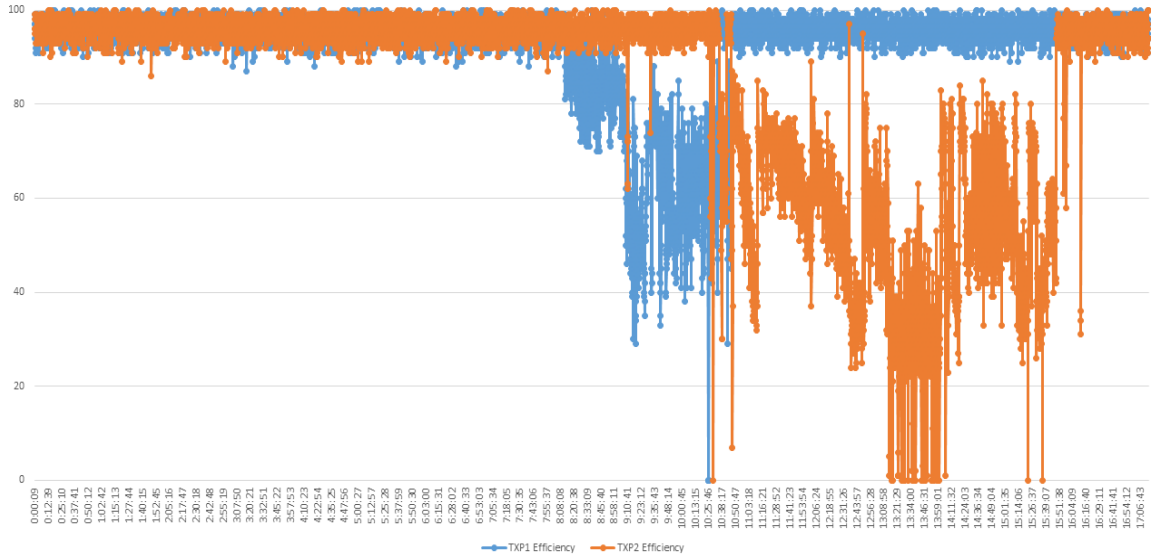

Figure 1 – DME Reply Efficiency graph when an alarm occurs in SSR by RF-interference

Tracking of RF-interference

2.3 First, the handheld spectrum analyzer has tracked down RF-interference by detecting 1090 MHz which is the SSR reception frequency. SSR transmission output was turned off to prevent confusion. After moving several times, we could check the strong interference signal from video transmission equipment of the crane located in the construction site 2.7NM away from SSR. By turning the equipment on and off and checking the SSR alarm message, the cause of the RF-interference was clear. The reply efficiency of DME also relied on whether the equipment was on or off.

Figure 2 - Video Transmission Equipment and location of crane

Danger of Video Transmission Equipment in UAV

2.4 The crane engineer confirmed that the video transmission equipment installed on the crane was at first made for UAV. The equipment used frequency ranging from 1,080 MHz to 1,200 MHz which overlaps usage frequency of SSR and DME. This kind of video transmission equipment can be used not only for crane but also for many other purposes. And if the device is attached to UAV, it could cause huge problems on SSR and DME.

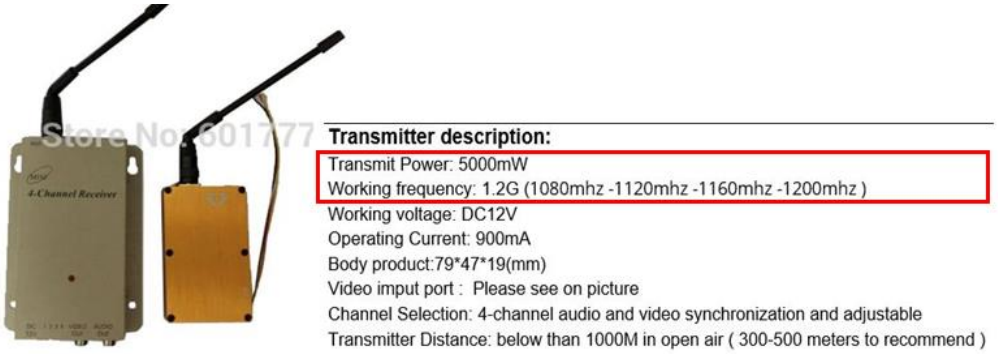

Figure 3 - Specification of Video Transmission Equipment in UAV

Difficult in tracking RF-interference

2.5 Although same indication of RF-interference was spotted last year, attempt to find the source failed. At that time, not only it was too late to figure out that the cause of failure was a malfunction by RF-interference, but the time of RF-interference was very short. If the occurrence time of the signal is not long, or if the signal moves fast, it can be very difficult to track it, which can have a fatal effect on all equipment using corresponding frequency bandwidth besides SSR and DME.

Conclusion

2.6 The paragraphs above have illustrated cases of SSR blockage by video transmission equipment for UAV. Due to widespread usage of UAV, similar cases could be filed in future. To prevent this, the authorities concerned must strictly manage the frequency bandwidth. Furthermore, the SSR maintenance manager should acknowledge the possibility of such issue and improve his or her reaction capability.

3. ACTION BY THE MEETING

3.1 List of Similar Cases

3.2 Idea Proposal for RF-interference Prevention

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