



ICAO

International Civil Aviation Organization

**THE THIRD MEETING OF MODE S DOWNLINKED
AIRCRAFT PARAMETERS WORKING GROUP
(MODE S DAPs WG/3)**

Web-conference, 12 – 15 May 2020

Agenda Item 4: Mode S monitoring and analysis

EXPERIENCE IN SSR MODE S MIX MODE OPERATION

(Presented by Republic of Korea)

SUMMARY

This paper presents some operation experience about false target or unexpected phenomenon using mode-S mix mode interrogation in Korea

1. INTRODUCTION

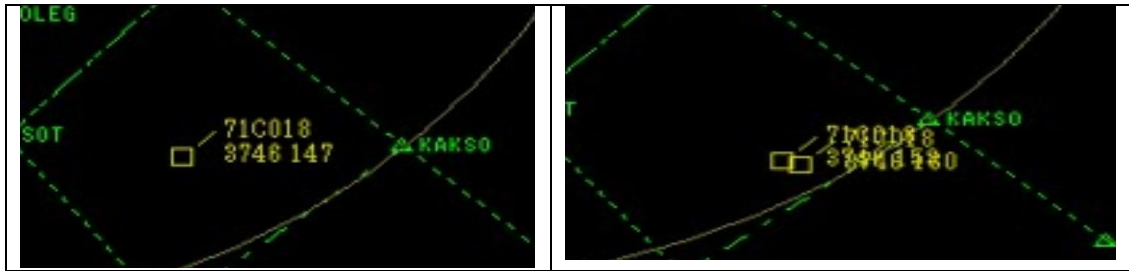
1.1 The SSR (Secondary Surveillance Radar) Mode-S radars in Korea have been using mode A/C (with short P4 pulse) together, which is the mix mode off (mode A, mode C, and mode S are used repeatedly).

1.2 This paper presents some issues are through the SSR Mode-S & mode A/C operation.

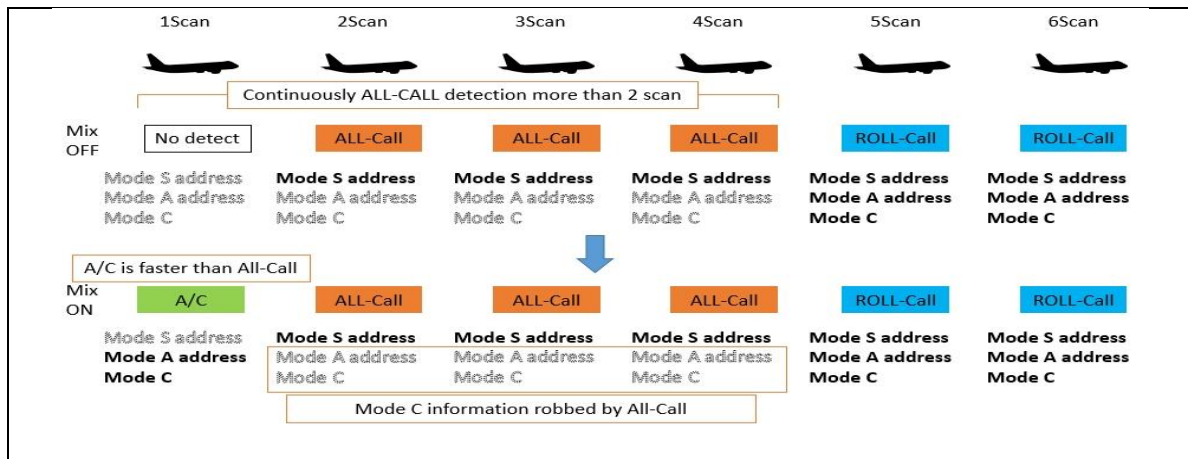
2. DISCUSSION

Share about Error handling

2.1 There are some reported errors in operation of Mode-S and A/C. Interrogation signal with P4 pulse is Mode-A/C only signal. Mode-S transponder recognizes P4 pulse and it does not respond to it. But some Mode-S transponder responds to both of the interrogation signal with and without P4 pulse. Therefore, in radar display there would be same two targets. Please see the pictures below. These issues are usually solved by Radar or ATC software. If radar receives same two target answers, it can recognize whether these signals are from the same targets or not by managing the Mode-S Addresses. Radar discriminates the answers and transmits just one of them. This process can be modified in Radar software. And It can also be possible that radar transmits all the targets and ATC software selects one of them to display.



2.2 In Mode S all-call, target must be detected more than 3 scans in a row to set as a track. Please see the pictures below. In Mix mode OFF operation, there will be “Mode S all-call” and “Mode A/C only”. Mode-S transponder does not respond to Mode A/C only. This can often lead to slow roll-call transitions and invisibility for the aircraft below 3000 feet, because it needs at least 3 scans to detect target. On the other hand, in Mix mode-ON operation, there will be a “Mode S all-call” and “Mode A/C”. In this mode, Mode S transponder respond to Mode A/C signal and radar can detect target right away without waiting 3 scans all-call. In this way, we can save time to detect target.



2.3 Please see the picture left below. Aircraft taking off at GMP was detected normally but other aircrafts landing at GMP or the others in the range of radar were not detected. Red circle means radar detects target only by PSR. That’s because there was ii code duplication. At that time, we temporarily changed the interlace pattern to use only A/C. After the pattern was changed, radar could detect all the target in the range of radar. In the picture of right below, ATCRBS code and targets are shown on the radar. Because Mode S interrogation was turn off, it was not able to display Mode-S information.



3. DISCUSSION

3.1 As before, we would like to share and discuss the unexpected phenomena of the mode-s radar.

- a) note the information contained in this paper; and
- b) discuss any relevant matter as appropriate
