

RTCA Special Committee 186, Working Group 5

ADS-B UAT MOPS

Meeting #4

UAT MOPS Considerations

Offered for discussion by Ronnie Jones, FAA

SUMMARY
The following items are offered to the UAT MOPS Working Group for discussion as forwarded to WG-5 by Ronnie Jones, FAA.

UAT MOPS Considerations:

Dynamic Allocation of UAT frame timing between Ground Broadcast and ADS-B segment

The current UAT system is specified to operate with a fixed time interval allocated between Ground broadcast interval and ADS-B message broadcasting from aircraft and surface vehicles. The allocation of the 1 second UAT frame is 188 milliseconds to the Ground broadcast interval and 812 milliseconds to the ADS-B segment. The future requirements for uplinking data from ground stations can not be predicted with high accuracy since requirements are still evolving. To allow for future growth of message traffic, instead of fixing the time slot allocation to the ground and ADS-B segments, a more flexible time slot allocation scheme would be more appropriate.. The cost and impact to modify any fixed allocation in the future after the initial MOPS and installations are underway would make such a change unachievable. Now would be the time to add the capability.

It is proposed that the draft UAT be modified:

1. To allow for at least two ground broadcast slots within each 1 second interval. This may be necessary to support an ADS-B crosslink gateway function where the latency introduced by the UAT ground station/gateway in re-broadcast of ADS-B reports could be unacceptable with the current channel access scheme.
2. To allow the percentage of the overall link capacity (i.e., timeline) allocated to ground vs. airborne transmissions to be varied. Given the uncertainties of the potential future role UAT will play for the delivery of uplink vs. ADS-B it is premature to define any fixed allocations of uplink vs. downlink slot time.

The desired flexibility in the channel access scheme could be implemented by defining a control message from UAT ground stations which would command all UAT transceivers with reception range to change the number and/or duration of the uplink slots that are allocated for ground broadcasts in that geographic area. It is suggested that the UAT design be modified to allow for at least 2 uplink slots which would begin at the second and half second GPS time. The duration of both uplink slots would be the same and variable over a range of 50 to 200 milliseconds. When aircraft power up or in the absence of ground station commands, a default value for the number and duration of the uplink slots would prevail. The avionics would be prohibited from any transmissions during, and for a guard time following the allocated uplink slots. Issues to be considered include boundary effects and the impact of aircraft which fail to receive ground commands. One approach to the boundary situation would be as shown by the following example:

1. the aircraft receives no commands from UAT ground station #1 (meaning the ground station is using the default number and uplink slot duration values, which for this example we will assume is one slot with a duration of 180 milliseconds starting at the beginning of the GPS second)
2. the aircraft receives a command from UAT ground station #2 that one uplink slot is being used with a duration of 200 milliseconds.
3. the aircraft receives a command from UAT ground station #3 that two uplink slots are being used with a duration of 150 milliseconds each.
4. the aircraft would then inhibit all ADS-B transmissions during any of the uplink slots that he knows are being used by any of these ground stations. Thus in this example the aircraft would inhibit ADS-B transmissions for the first 200 milliseconds + guardtime at the beginning of each GPS second and then again inhibit ADS-B transmissions for 150 milliseconds + guardtime starting at each GPS half second.

The above example would not preclude a low altitude aircraft in the coverage of perhaps only a single ADS-B ground station from generating ADS-B transmissions that would interfere with the reception, by other higher altitude aircraft, of transmissions from other ground stations. The impact of such interference cases would need to be examined to determine if a more complex channel access scheme would be necessary or not.

UAT Addressed Capability

The design of UAT currently supports the ADS-B broadcast capability. The future use of the link for applications requiring addressed messages has not been considered. It is not suggested that the initial release of the MOPS incorporate the detailed provisions for an addressed capability. However, it may be timely to consider the overall design of UAT at this early stage to facilitate an architecture to allow future addition of the capability. To attempt to consider this addition after the release of the MOPS would most likely preclude the possibility. The overall impact to the current design to incorporate the capability should be evaluated and considered but the link most likely has the potential to support an addressed capability. An initial study can be performed to determine the feasibility of the use of the link and the impact to the design to support the capability.