BULLET BACKGROUND PAPER

ON

MODE S USAGE IN USAFE

PURPOSE

Provide a better understanding of basic Mode S capabilities and usage standards within European Mode S designated airspace..

MODE S BASICS

Mode S system is a civilian upgrade to the Secondary Surveillance Radar (SSR) system.

- SSR system currently uses Mode 3/A/C for identification and tracking.
- Mode S uses upgraded airborne transponders that respond to both ground and airborne interrogators.
    - Ground stations can more accurately pinpoint the location and intentions of participating aircraft.
    - Airborne interrogator (through TCAS/ACAS), will be able to get better fixes on other aircraft within its vicinity.
    - "Squitter" function allows aircraft to transmit Mode S data without being actively interrogated.
        - Received mainly by TCAS to "see" other aircraft that it may not be actively interrogating
        - Can be turned off in some military aircraft.
- Maintains better resolution between closely spaced aircraft due to unique aircraft addresses (a.k.a. Address Announced [AA]) and Aircraft ID (a.k.a. Flight ID).
    - The address is a 24-bit, 8-digit address (i.e. 01234567).
        - Unique for every aircraft in every country that flies Mode S systems.
        - No two aircraft in the world should EVER have/use the same address.
        - A "default" address is assigned to each tail number with an installed Mode S transponder.
        - There also exists a military-only capability to input a "dynamic" address for OPSEC purposes.
            - Not all military aircraft have the capability.
            - "Dynamic" addresses are distributed by the DoD AIMS/PO.
    - The Aircraft ID is identical to the callsign entered on the Flight Plan (i.e. EAGLE11).

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    - It is entered as a 7-character alpha-numeric ID.
    - Spaces are ONLY input at the end (i.e. SPAR17_ not SPAR_17).

- Two major categories of Mode S surveillance, Elementary Surveillance (ELS) and Enhanced Surveillance (EHS).
    - Information is passed through electronic coding only, not all information is actually displayed to the controller.
    - Information displayed to the controller is annotated in the descriptions below by (D).
    - ELS (this list not all-inclusive)
        - Minimum capability for military aircraft
        - Provides basic replies to interrogations
            - Aircraft address
            - Altitude (D)
            - Mode 3/A code (D)
    - EHS (this list not all-inclusive)
        - Desired capability for flight in EUROCONTROL & UK airspace
        - “Required” for all transport aircraft by 31 Mar 09
        - Provides all ELS data plus
            - Mag Heading (D)
            - Speed: IAS/TAS/Mach/Ground (D)
            - Vertical Rate (D)
            - Intended Flight Level (D)
    - ALL members in a multiple-aircraft flight will squawk Mode S.
    - Default addresses
        - Will be annotated in block 9 of the AFTO Form 781F (front cover) as well as placarded in the cockpit/flightdeck.
        - In lieu of being issued a dynamic address, responsible personnel will ensure that the default address is entered into the Mode S terminal during ground ops (i.e. NOT all zeros or 1234567)

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- Dynamic addresses
    - Usage is not mandatory and is left to the discretion of the wing commander (highly encouraged for the CAF).
- Since both the default and dynamic (through approved MajCom/Wing usage plans) are deconflicted worldwide, units will use Mode S anywhere they fly in the world with the following exceptions:
    - Mode S will ONLY be used in non-contingency airspace.
    - CAF aircraft will not use Mode S during CORONET movements.

CONCLUSION

The Mode S deadline within the European airspace system is rapidly approaching. Due to the inherent safety-of-flight implications of improper usage, a thorough understanding of the Mode S system is paramount.

Mr. Allan Storm/HAF A3O-AYI/425-0576/allan.storm@pentagon.af.mil/ads/19Mar09