

## 2.2.6.2 ADS-B Message Transmit Timing

### 2.2.6.2.1 The Message Start Opportunity (MSO)

ADS-B Messages **shall** be transmitted at discrete Message Start Opportunities (MSO) chosen by a pseudo-random process. The specific pseudo-random number ( $R$ ) chosen by an aircraft depends on the aircraft's current position and on the previously chosen random number. Let:

$$\begin{aligned} N(0) &= 12 \text{ L.S.B.'s of the most recent valid "LATITUDE"} \\ N(1) &= 12 \text{ L.S.B.'s of the most recent valid "LONGITUDE"} \end{aligned}$$

where the "LATITUDE" and "LONGITUDE" are as defined in §2.2.4.5.2.1.

The procedure below **shall** be employed to establish the transmission timing for the current UAT frame  $m$ .

When  $m = 0$ ,  $R(0) = N(0) \bmod 3200$

When  $m \geq 1$ ,  $R(m) = \{4001 \cdot R(m-1) + N(m \bmod 2)\} \bmod 3200$

1. When in the first frame after power up, and whenever the Vertical Status is determined to be in the AIRBORNE condition, the transmitter **shall** be in the *full MSO range* mode, where the MSO is determined as follows:

$$\text{MSO} = 752 + R(m)$$

2. Under all other conditions the transmitter **shall** be in the *restricted MSO range* mode, where the MSO is determined as follows:

$$\text{MSO} = 752 + R^* + R(m) \bmod 800$$

With  $R^* = R(k) - R(k) \bmod 800$ , where "k" is the frame just prior to entering the *restricted MSO range* mode.

#### Notes:

1. *Retention of  $N(0)$  and  $N(1)$  in non-volatile memory is required to prevent common MSO selections amongst A/Vs when no valid latitude and longitude is currently available.*
2. *The latitude and longitude alternate in providing a changing "seed" for the pseudo-random number generation.*
3. *The restricted range MSO mode makes the choice of MSO more nearly periodic in order to support certain surface applications.*

### 2.2.6.2.2 Relationship of the MSO to the Modulated Data

The optimum sample point of the first bit of the UAT synchronization sequence at the antenna terminal of the UAT equipment **shall** occur at  $T_{TX}$  microseconds after the 1 second UTC epoch as supplied to the UAT Transmitting Subsystem according to the following formula:

$$T_{TX} (\text{microseconds}) = 6000 + (250 * \text{MSO})$$