



北京航空航天大学
BEIHANG UNIVERSITY

Avionics Technology

B31353551

— *Aero Communication*

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V. Aero Communication



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- (1) Some concepts
- (2) VHF Communication
- (3) Long-distance Communications



(3) Long-distance Comms



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- In particular, civil aviation widely uses the **Inmarsat service** for safety and regularity of flight applications. This service is called the **aeronautical mobile satellite (route) service**, i.e. **AMS(R)S**.

**Global coverage
of Inmarsat
system satellites**

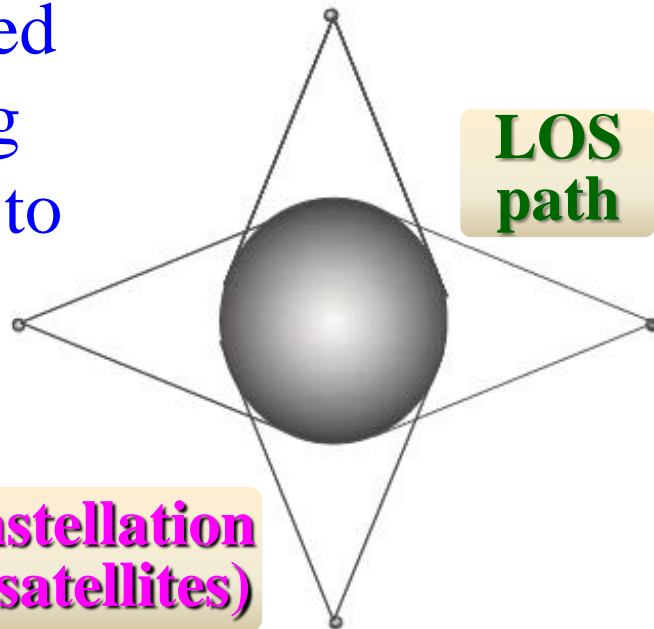


**Inmarsat: International
maritime satellites**

(3) Long-distance Comms



- Probably the **most significant factor** for Inmarsat satellite communications is the distance between the satellite and the earth. This introduces **significant delay time** between transmitted and received signals. Also this has a direct bearing on the **path attenuation**, which tends to be relatively large in satellite communications, i.e. an apparent **lift in the noise floor**, or **relatively lower SNR**.

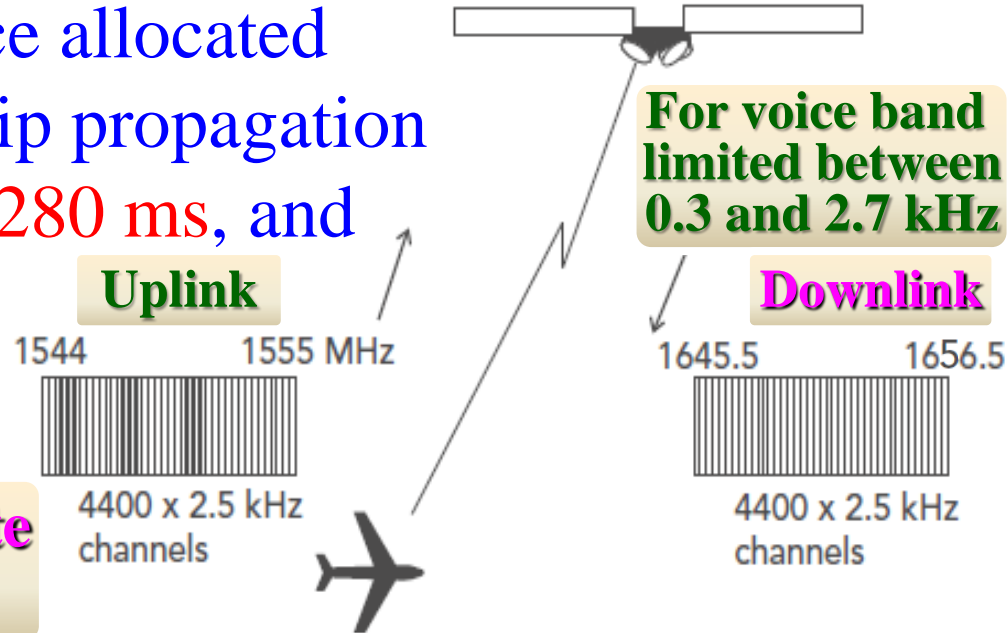


(3) Long-distance Comms



- The **up** (to Inmarsat satellites) and **down** (from Inmarsat satellites) mobile links use the frequency bands around **1.55** and **1.65 GHz** respectively in the **L satellite band** where AMS(R)S was once allocated exclusively. The round trip propagation delay varies from **240 to 280 ms**, and **call set-up times** are **consequentially a few seconds** typically.

AMS(R)S satellite channel plan

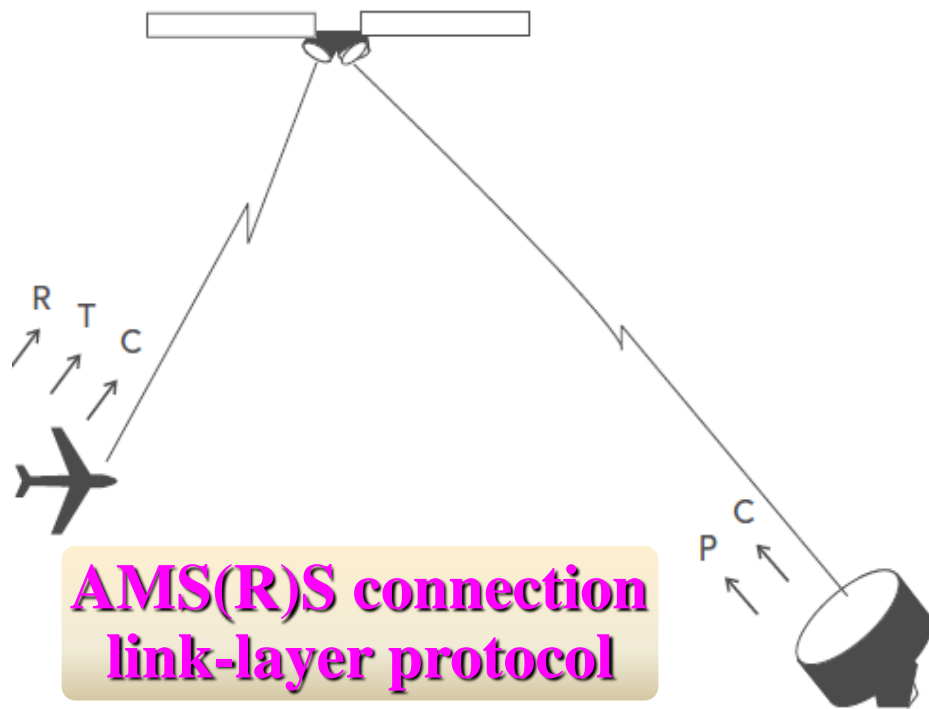


(3) Long-distance Comms



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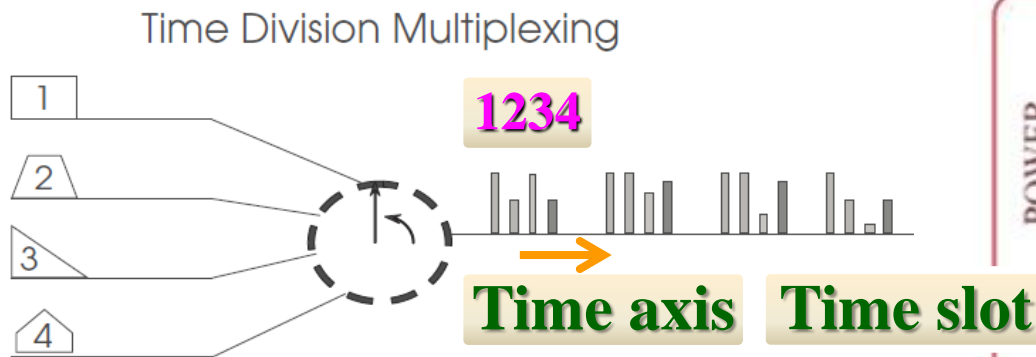
- Call set-up is facilitated by the P and R channel modes through a handshake. The P channel operates in (data) packet mode using TDM from ground earth station to the aircraft via satellite. The R channel is a random access protocol transmitted from the aircraft when initiating a link set-up for voice or data message.



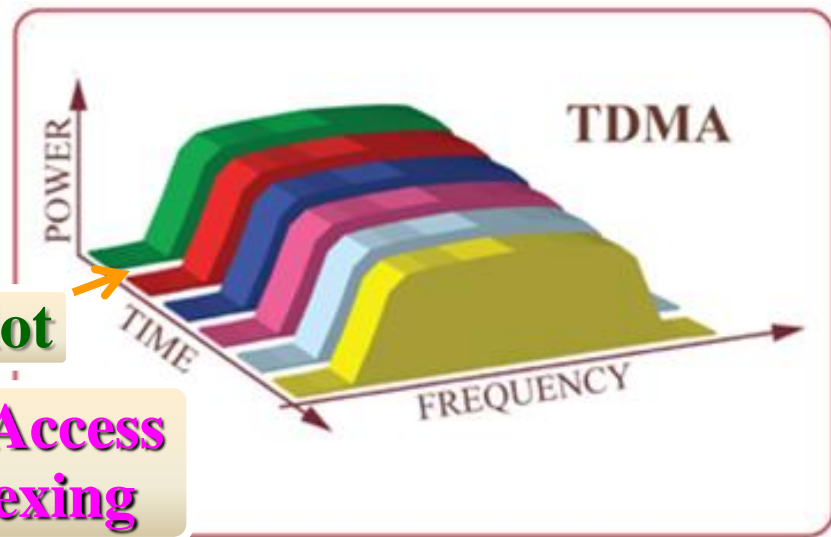
(3) Long-distance Comms



- **TDM** (time division multiplexing) is when there is **one RF channel shared in time** between the different users. Each user takes the RF channel in turn to use the communication resource in the time domain.



**Time Division Multiple Access
/ Time Division Multiplexing**



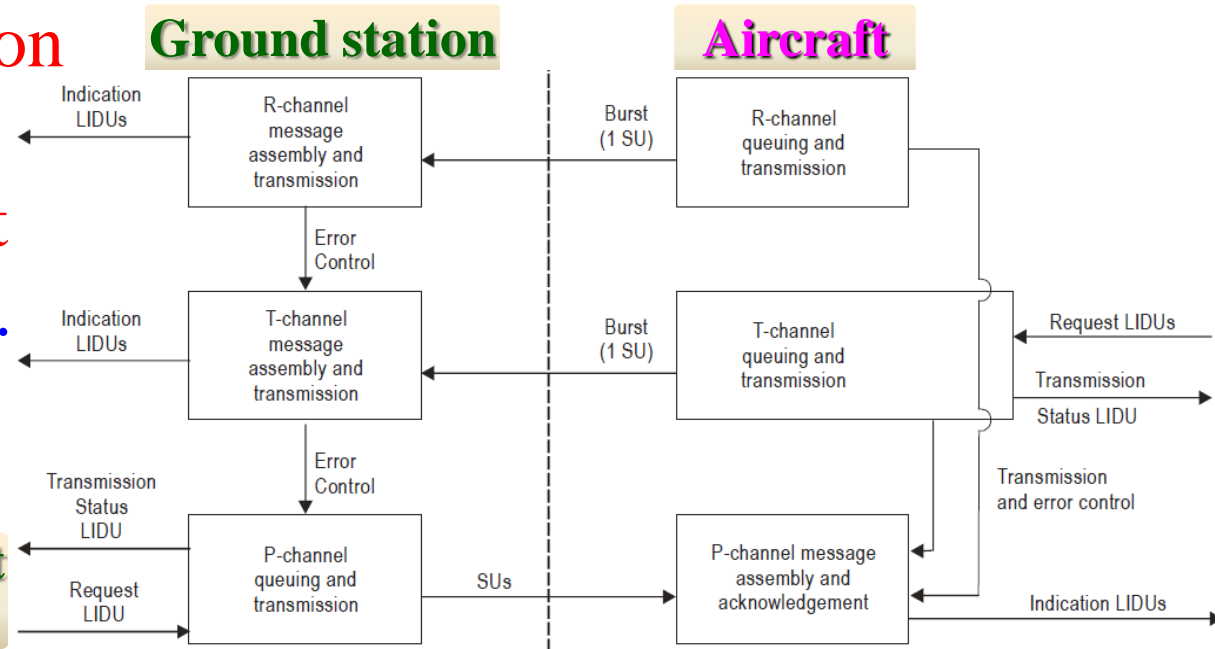
(3) Long-distance Comms



- The random access protocol uses a slotted Aloha random access process (strategy), where multiple users access the same communication channel independently, but each communication must be confined to a fixed time slot known to all users.

P, R and T channel transmission functions

LIDU: link interface data unit
SU: signal unit



(3) Long-distance Comms



- T channel is a data channel using the TDMA protocol from the aircraft only. And the C channel(s) are used go-and-return both ways for voice transmission.
- For the lower bit rate service provisions, the data modulation is specified to be binary phase shift keying (BPSK) running at a gross system bit rate of 0.6, 1.2 or 2.4kbps. For higher bit rates of greater than 2.4 kbps, quadrature phase shift keying (QPSK) is deployed.



The end of *Aero Communication*

