Aviation Usages of Frequency Spectrum (updated 26 July 2017 – Post WRC-2015)

Red: ATM Infrastructure – Communication Blue: ATM Infrastructure – Navigation
Green: ATM Infrastructure – Surveillance Purple: Avionics and Airborne equipment

Bands	Frequency Spectrum	Aviation Usages	Types of Services	Remark(s)
LF & MF	130 – 535 kHz	Non-Directional Beacon (NDB)	ARNS	Current allocations need to be protected until NDB has been phased out.
HF	2 850 – 22 000 kHz	Air-ground communication (HF voice and data)	AM(R)S	SATCOM (data) and SATVOICE (voice) will complement/replace HF in the long-term.
	3 023 & 5 680 kHz	Search and Rescue	AM(R)S	
VHF	74.8 – 75.2 MHz	Marker Beacon	ARNS	
	108 – 117.975 MHz	VOR/ILS localizer GBAS/VDL Mode 4 (voice and data)	ARNS AM(R)S	AM(R)S systems shall not cause harmful interference to the aeronautical radionavigation service. Aeronautical applications are vulnerable to FM Broadcasting and States must assess compatibility in order to avoid interference to ARNS and AM(R)S.
	117.975 – 137 MHz	Air-ground and air-air communications (VHF voice and data)	AM(R)S	
	121.5, 123.1 & 243 MHz	Emergency distress frequency	AM(R)S	
UHF	328.6 – 335.4 MHz	ILS glide path	ARNS	When GBAS is deployed, compatibility between ILS and GBAS VDB needs to be ensured where applicable.
	406-406.1	Emergency locator transmitter (ELT)	MSS	Frequency bands adjacent or near to those used by COSPAS-SARSAT, used for other services, have considerable potential to cause harmful interference.
UHF or L	960 – 1 164 MHz	Distance Measuring Equipment (DME) TACAN LDACS (for datalink), LDACS (for Alternative-PNT)	ARNS AM(R)S	At risk - UK OfCom is proposing a shared use with wireless A/V system (PMSE) for big events. Possible European-wide extension. IATA submitted comments. The frequency band 960–1 164 MHz is planned for future air-ground (and air-air) data communications (e.g. LDACS). LDACS developers are considering the frequency bands 963.5 – 970.5 MHz and 1149.5 – 1156.5 MHz as the most promising option. Nevertheless, a careful frequency coordination of LDACS and DME/TACAN is to be developed in order to enable a common and undisturbed operation.
	978 MHz	Universal Access Transceiver (UAT)	AM(R)S	UAT is used in the USA by aircrafts flying below 18,000 ft.
	1 020 - 1 040 MHz and 1 080 – 1 100 MHz	Secondary Surveillance Radar (SSR) 1090 Extended Squitter ADS-B Airborne collision avoidance system (ACAS)	ARNS	***At risk*** - UK OfCom is proposing a shared use with wireless A/V system. Possible European-wide extension. IATA submitted comments. Note: Allocation for Earth-satellite link of ADS-B at WRC-15.
	1 164 – 1 215 MHz	DME/Global Navigation Satellite System (GNSS)	ARNS/RNSS	GPS (L5)/GLONASS (L5)/Galileo (E5a)/Beidou (B2a, B2)
	1 215 – 1 400 MHz	Primary Surveillance Radar (PSR)	ARNS	
	1 525 – 1 559 MHz	Satellite Communications (FANS/ATN Baseline 1 and 2)	MSS (space-Earth)	
	1 559 – 1 610 MHz	GNSS	ARNS/RNSS	GPS (L1), GLONASS ***At risk*** – Ligado (previously LightSquared) is aggressively lobbying US FCC for 1525 – 1545 MHz (MSS Downlink), 1610-1626.5 MHz (LEO) and 1626.5-1660.5 MHz (MSS Uplink). This may interfere with GPS (L1). IATA submitted joint comments.
	1 610 – 1 626.5 MHz	Satellite Communications (IRIDIUM)	AMS(R)S (s-E, E-s)	The IRIDIUM non-geostationary Satellite system provides AMS(R)S service in this band in accordance with Radio Regulation Footnote 5.367. The IRIDIUM

				system provides for AM(R)S communications in accordance with the relevant SARPs as contained in Annex 10 Volume III.
	1 626.5 – 1 660.5 MHz	Satellite Communications (FANS/ATN Baseline 1 and 2)	MSS(Earth-space)	
UHF or S	2 700 – 3 300 MHz	PSR Meteorological RADAR	ARNS RNS/RLS	
	3 400 – 4 200 MHz	Satellite Feeder Links to ATS Services in Africa		***To monitor*** - WRC-15 agreed on a better regulatory protection for FSS in Africa. Effectiveness to be seen. An educational campaign may be needed.
SHF or C	4 200 – 4 400 MHz	Radio Altimeter Wireless Avionics Intra-Communications (WAIC)	ARNS	***To monitor*** - Mobile phone requested adjacent frequency @ WRC-15. Allocation for WAIC at WRC-15.
	5 000 - 5 250 MHz	Microwave Landing System (MLS) UAS CNPC/Airport Surface Communication (AeroMACS)	ARNS AM(R)S/AMS(R)S	WRC-12 allocation. ***To monitor*** - For WRC-15 allocation see Note 1.
	5 350 - 5 470 MHz	Airborne weather radar	ARNS	Also used for airborne ground mapping.
SHF or X	8 750 - 8 850 MHz	Airborne Doppler radar	ARNS/RLS	Also used for airborne ground mapping. Airborne Doppler radar is used to determine aircraft ground distance, speed and drift angle.
	9 000 - 9 500 MHz	Precision Approach Radar (PAR)/Airborne weather radar/ASDE	ARNS/RNS	
SHF or Ku	13.25 - 13.4 GHz	Airborne Doppler radar	ARNS	
	15.4 - 15.7 GHz	PAR/Airborne weather radar/ASDE	ARNS/RLS	
SHF or K	24.25 - 24.65 GHz	ASDE	RNS	
SHF or Ka	31.8-33.4 GHz	ASDE/Airborne radar	RNS	

Note(s)

1. WRC-2015 agreed on a regulatory spectrum provision related to Command and Control Link for Unmanned Aircraft in a form of a resolution. See RESOLUTION COM4/5 (WRC-15). This resolution will be reviewed at WRC-2023.

- WRC-2015 agreed that assignments to stations of geostationary FSS satellite networks operating in 10.95-11.2 GHz (space-to-Earth), 11.45-11.7 GHz (space-to-Earth), 11.7-12.2 GHz (space-to-Earth) in Region 2, 12.2-12.5 GHz (space-to-Earth) in Region 3, 12.5-12.75 GHz (space-to-Earth) in Regions 1 and 3 and 19.7-20.2 GHz (space-to-Earth), and in 14-14.47 GHz (Earth-to-space) and 29.5-30.0 GHz (Earth-to-space), may be used for UAS CNPC links in non-segregated airspace, provided that the conditions specified in RESOLUTION COM4/5 (WRC-15) are met.
- While this resolution will enable UAS to continue its operation and development, the resolution itself is a political compromise.
- While it is acceptable by ICAO, the resolution required ICAO to work diligently in identifying technical/operational requirement and developing SARPs for UAS within the next 4 years and to report the progress made at WRC-2019. IATA needs to be actively involved with this ICAO process as UASs are expected to share the same airspace with commercial airlines.

Descriptions of Terms

- AM(R)S: Aeronautical Mobile (Route) Service
- AMS(R)S: Aeronautical Mobile-Satellite (Route) Service
- ARNS: Aeronautical Radionavigation Service

- MSS: Mobile-Satellite Service
- RLS: Radio Location Service
- RNS: Radionavigation Service
- RNSS: Radionavigation-Satellite Service
- UAS CNPC: Unmanned Aircraft System Command and Non-Payload Communications