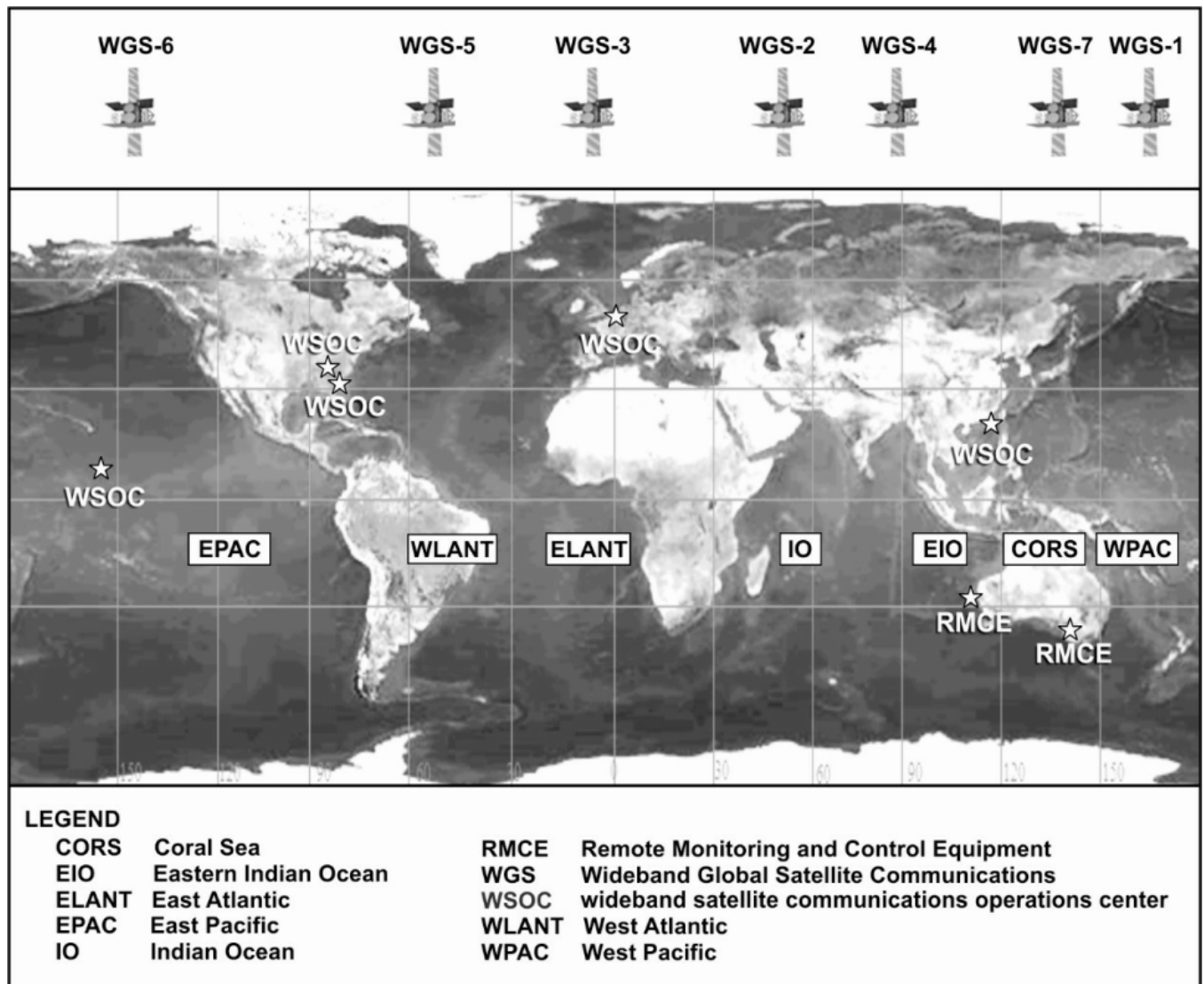
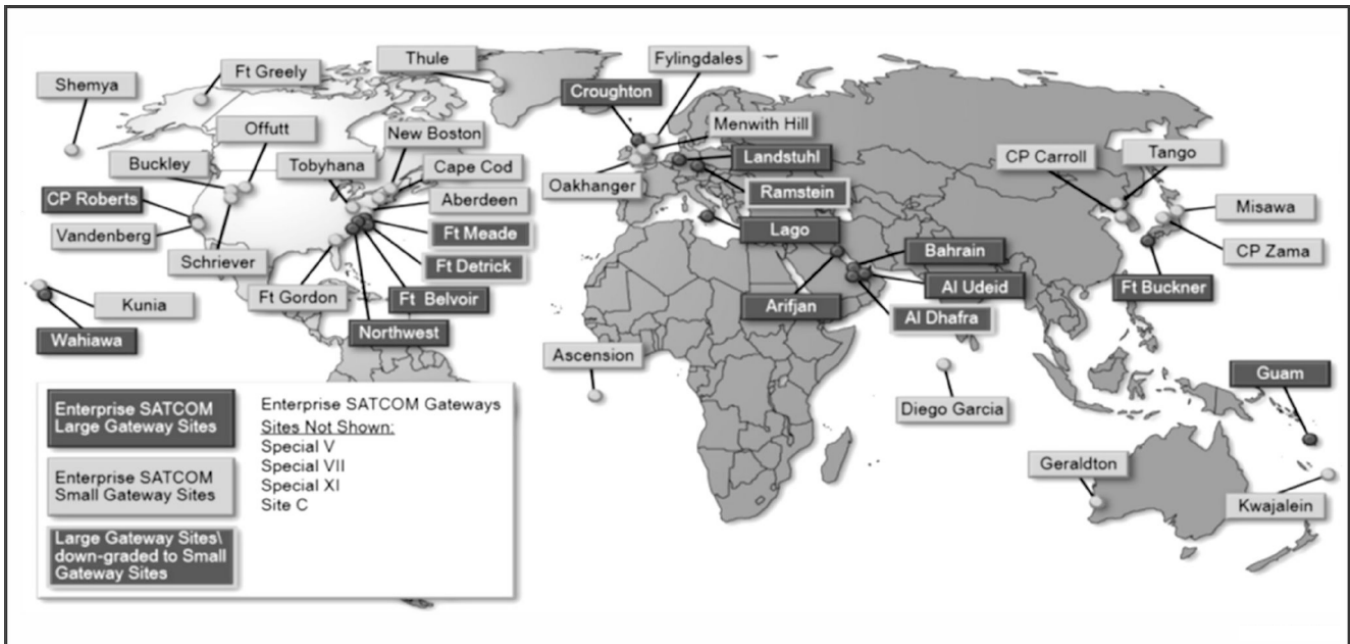


Today's era for long-range HF communications is the result of recent advances in radio and Digital Signal Processing (DSP) technology. HF radio is no longer limited to those slow traditional 9,600 bps data rates mentioned above. Modernized PSK systems can deliver rates up to 240,000 bps on a 48 kHz wide channel, allowing the same levels of data transmission speeds, quality and security of a narrow-band SATCOM system - particularly useful for more robust communications in hostile environments. These WBHF waveforms - a "very wide" PSK aggregate indeed, preceded by a pilot tone - can be easily identified on a wide-band sonagram: see page 25. Typical bandwidths are 12, 24 and 48 kHz. Most of these communication systems are military. The Australian Defence Force recently transmitted high-quality still images and video via internet protocol (IP) over a state-of-the-art wideband PSK HF radio link between the RAAF base at Townsville and the RAAF base at Wagga! See <https://news.defence.gov.au/media/media-releases/australian-defence-force-trials-new-data-transfer-technology> for details.

With the rise of Communist China, and the Russian Federation trying to resume superpower status in the 21st century, we're now witnessing the Second Global Cold War. SATCOM is increasingly vulnerable from jamming, and from potential total failure as a result of attacks on spacecraft or through the use of anti-satellite surface-to-air missiles.



NATO wideband global military SATCOM coverage areas



United States of America - Department of Defence worldwide SATCOM gateways

While uplink jamming (UJ) - i.e. corrupting the signal transmitted from a ground station to the satellite - is able to degrade the satellite's signal for all of its users, downlink jamming (DJ) has a localized effect since it blocks transmissions from the satellite to certain terrestrial receivers only. Logically, UJ requires a much more powerful signal in order to reach the satellite's transponders. The point is that today, powerful SATCOM jamming tools are increasingly inexpensive ... A pretty interesting summary of Chinese and Russian activities in this field, entitled "Challenges to Security in Space", can be found at http://swfound.org/media/207162/swf_global_counterspace_capabilities_2021.pdf.

NATO is significantly dependent on SATCOM for the planning and execution of operations. Members and partner forces are suffering from a disruption of SATCOM, particularly along the alliance's eastern flank where Russian armed forces continue to conduct electronic warfare. By consequence, there is a widespread comeback of HF in local and global communications. Says C4ISRNET on 22 September 2020, in a paper titled "The military renaissance in high frequency communications" at www.c4isrnet.com/battlefield-tech/it-networks/2020/09/22/the-military-renaissance-in-high-frequency-communications: "In an online presentation to the Association of Old Crows on 6 August 2020, Paul Denisowski, product management engineer at Rohde & Schwarz North America, described how communications satellites are vulnerable to antisatellite systems as well as ground-, air- and space-based 'kill vehicles'. China, Russia and the USA have all carried out anti-satellite (ASAT) tests, and many other countries are developing ASAT capabilities."

However, the recent Russian invasion of the Ukraine has, again, changed all that. *The Economist* of 7 January 2023 in "The satellites that saved Ukraine": "Russia's armed forces have lots of electronic-warfare equipment that can locate, jam or spoof radio emissions. But the Starlink signals are strong compared with those from higher flying satellites, which makes jamming them harder ... Starlink's use in Ukraine marks 'the beginning of the end' for the value of anti-satellite missiles."

Regarding the current rise of Communist China that we already mentioned above, *The Economist* published detailed articles on the fascinating subject of Open-Source Intelligence (OSINT) in its editions of 7 August 2021 and 19 February 2022. Using easily-sourced data such as satellite images, aircraft and ship tracking websites, social-media information and so on, another interesting field is professional radio monitoring. China illegally claims dozens of islands and reefs in the South China Sea and has built extensive military installations such as aircraft runways, missile launchers, and ... large HF antenna arrays. Johns Hopkins University's Applied Physics Laboratory recently published detailed reports with revealing and shocking pictures at www.jhuapl.edu/Content/documents/High-FrequencyCommunications.pdf and www.jhuapl.edu/Content/documents/Inter-IslandCommunications.pdf. Enjoy!

The recent Russian invasion of the Ukraine, resulting in the most brutal war in Europe since 1945, proved again the vital importance of HF communication. *The Economist* - 26 March 2022: "Degrading and ideally destroying your opponent's ability to communicate are elementary military tactics. And, in its war on Ukraine, Russia has certainly attempted this ... Many of Ukraine's roughly 15,000 amateurs are now manning radios for military or intelligence units, says Artem Billy, a ham operator in Lviv. To assist with this, Ukraine has temporarily banned conventional ham transmissions. But, if needed, hams could constitute a sort of alternative internet ... With the use of modem software, digital data on smartphones and computers can be converted into analogue signals for shortwave transmission. Using the same software, radio operators hundreds of kilometres away can translate the signals into text or images."

The screenshot displays the ResultViewer application interface. The main window shows a table of decoded messages with columns for Type, Modem, Start time, Sender ID, and Recipient ID. A specific message with Sender ID RA73678 is highlighted. A detailed view of this message is shown in a separate window, displaying the decoded text and parsed metadata.

Type(color)	Type	Modem	Start time	Sender ID	Recipient ID
85059	Content production	HFDDL	30.01.2023 17:15:27.865	RA73676	Auckland, NZL
85060	Content production	HFDDL	30.01.2023 16:42:11.399	RA73676	Auckland, NZL
85061	Content production	HFDDL	29.01.2023 17:54:05.672	RA73676	Auckland, NZL
85062	Content production	HFDDL	06.01.2023 03:59:52.597	RA73678	Muan, ROK
85063	Content production	HFDDL	29.01.2023 20:07:22.268	RA73678	Muan, ROK
85064	Content production	HFDDL	29.01.2023 20:06:15.814	RA73678	Muan, ROK
85065	Content production	HFDDL	13.01.2023 22:04:48.726	RA73678	Muan, ROK
85066	Content production	HFDDL	28.01.2023 00:31:20.794	RA73679	Agana, GUM
85067	Content production	HFDDL	28.01.2023 00:53:47.392	RA73679	Agana, GUM
85068	Content production	HFDDL	28.01.2023 00:25:58.297	RA73679	Agana, GUM
85069	Content production	HFDDL	28.01.2023 00:28:55.549	RA73679	Agana, GUM
85070	Content production	HFDDL	29.01.2023 17:34:33.883	RA73679	Auckland, NZL
85071	Content production	HFDDL	28.01.2023 00:30:29.098	RA73679	Agana, GUM
85072	Content production	HFDDL	29.01.2023 18:14:07.006	RA73680	Auckland, NZL
85073	Content production	HFDDL	28.01.2023 00:12:45.600	RA73680	Agana, GUM
85074	Content production	HFDDL	29.01.2023 17:43:37.935	RA73680	Auckland, NZL
85075	Content production	HFDDL	29.01.2023 17:48:57.964	RA73680	Auckland, NZL
85076	Content production	HFDDL	29.01.2023 17:54:47.536	RA73680	Auckland, NZL
85077	Content production	HFDDL	29.01.2023 18:15:50.400	RA73680	Auckland, NZL
85078	Content production	HFDDL	29.01.2023 18:13:22.694	RA73680	Auckland, NZL
85079	Content production	HFDDL	11.01.2023 06:37:17.198	RA73703	Reykjavik, ISL
85080	Content production	HFDDL	21.01.2023 23:21:11.806	RA73703	Shannon, IRL
85081	Content production	HFDDL	30.01.2023 20:24:39.006	RA73705	Auckland, NZL
85082	Content production	HFDDL	30.01.2023 20:09:01.097	RA73705	Auckland, NZL
85083	Content production	HFDDL	30.01.2023 20:14:03.869	RA73705	Auckland, NZL
85084	Content production	HFDDL	30.01.2023 19:32:35.060	RA73705	Auckland, NZL
85085	Content production	HFDDL	30.01.2023 19:47:48.374	RA73705	Auckland, NZL
85086	Content production	HFDDL	10.01.2023 16:41:36.306	RA73708	Shannon, IRL
85087	Content production	HFDDL	10.01.2023 17:13:38.938	RA73708	Shannon, IRL
85088	Content production	HFDDL	10.01.2023 16:40:22.453	RA73708	Shannon, IRL

Decoded text:
20:07:22 - 20:07:24 [2.1s], 20230129.200722.0268_10001_139.dec

Parsed:
ACARS:
Reassembly: skipped
Reg: RA73678 Flight: HZ5643
Mode: 2 Label: SA Blk id: 8 More: 0 Ack: 1 Msg num: 569A
Message:
0EH200551VH
Media Advisory, version 0:
Link HF established at 20:05:51 UTC
Available links: VHF ACARS, HF

Open-Source Intelligence at its best - in this case it's Open Signals Intelligence ... Since the start of the war at 24 FEB 2022, most of those hundreds of aircraft operated by airlines - such as Aeroflot - in the Russian Federation, and leased from e.g. "offshore" companies elsewhere, and registered in e.g. Bermuda (under *www.bcaa.bm*) as VP-ABC or VQ-XYZ for tax avoidance, have been "re-registered" (read: seized) under the new callsign series RA73... that has never been monitored before!

For example, RA73678 is yet another "re-registered" (read: seized) Airbus A319-111 aircraft leased from GECAS = General Electric Capital Aviation Services in Stamford CT, USA (!), and originally registered as VP-BWK in Bermuda ... here performing Aurora Airlines (based at UHSS = Yuzhno-Sakhalinsk) flight HZ5643: enroute UNNT - UHHH communication media advisory downlink message

Apart from perfectly decoding ADS-C and CPDLC messages such as Basic Reports (see page 34) and Waypoint Change Events (see page 123), the superb go2MONITOR's Result Viewer displays meta-data such as sender and recipient identifications, extracted from decoder result files - here selected from the 1 JAN to 2 FEB 2023 time range