Space Science and technology in Amateur Radio

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Who are Radio Amateurs

ITU Definition

- *1.56 amateur service:* A *radiocommunication service* for the purpose of self-training, intercommunication and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest.

- *1.57 amateur-satellite service:* A *radiocommunication service* using *space stations* on earth *satellites* for the same purposes as those of the *amateur service*.

HAM RADIO

- In the early days of wireless, as radio was called, radio amateurs were called experimenters
- Later the they became known as Hams, Radio Hams. The word ham dates to Shakespearian times when an amateur actor was called a ham.
- Whether called Radio Experimenters, Hams or Radio Amateurs, they remain at heart experimenters, well defined in the ITUrrgulations as people who focus on self-training, intercommunication and technical investigations
- Radio Amateurs have and still are making many contributions to technology development. They are in a unique position : they don’t have the pressure experienced in industry, no budgets and no timelines to meet.

1958 Amateur Radio enters the space age

- Barely four months after the successful launch of Sputnik I, the United States launched the unmanned Explorer I on January 31, 1958.
- At about that same time, a group of radio amateurs on the West Coast of the US began toying with the idea of launching an Amateur Radio satellite and organised themselves into Project OSCAR. **(Orbiting Satellite Carrying Amateur Radio)**
- After a series of high level exchanges, a launch opportunity on a Thor DM-21 Agena-B rocket from Vandenberg Air Force Base in California was secured for the very first Amateur Radio satellite: *OSCAR I*.

OSCAR 1

- OSCAR 1 was successfully launched into a low Earth orbit on the morning of 12 December 1961 -- four years after the launch of Sputnik I. The satellite was also the world's first non-government bird.

Spirit of adventure

- “The sprit of adventure lies buried in every man’s soul. Strike the spark and ignite the soul and the impossible is accomplished” - William I Orr, author of many technical books
- This is very much the story of Amateur Radio in Space.
- Many satellites projects have followed OSCAR 1 but there are two that really standout
- OSCAR 7 the satellite that refuses to die and
- OCAR 100, Amateur Radio’s first geostationary satellite

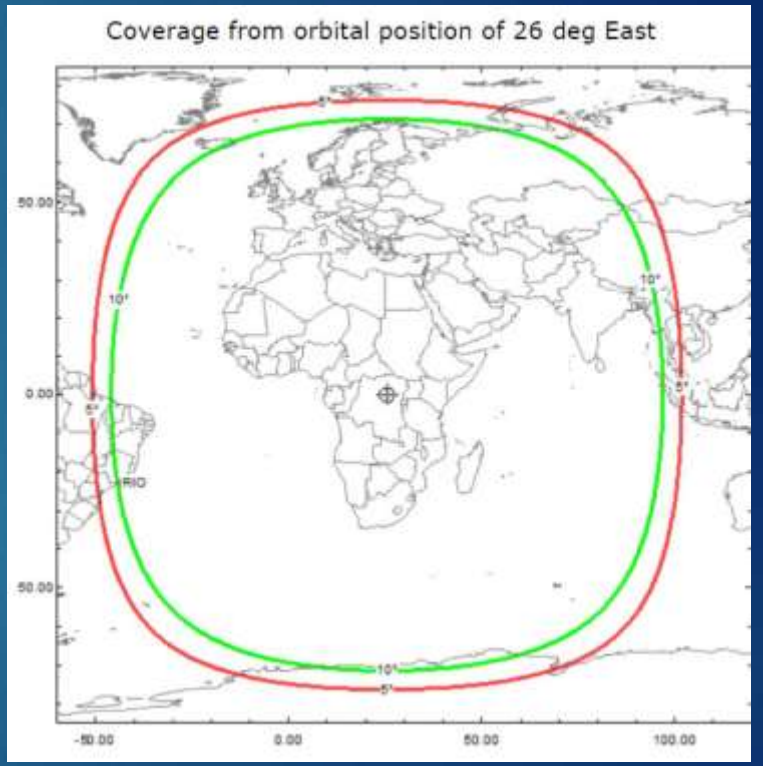
AMSAT OSCAR 7

It was launched into Low Earth Orbit on15 November 1974 and remained operational until a battery failure in 1981. After 21 years of apparent silence, the satellite was heard again on June 21, 2002 – 27 years after launch. At that time the public learned that the satellite had remained intermittently functional and was used surreptitiously for communication by the anticommunist opposition Fighting Solidarity during martial law in Poland.

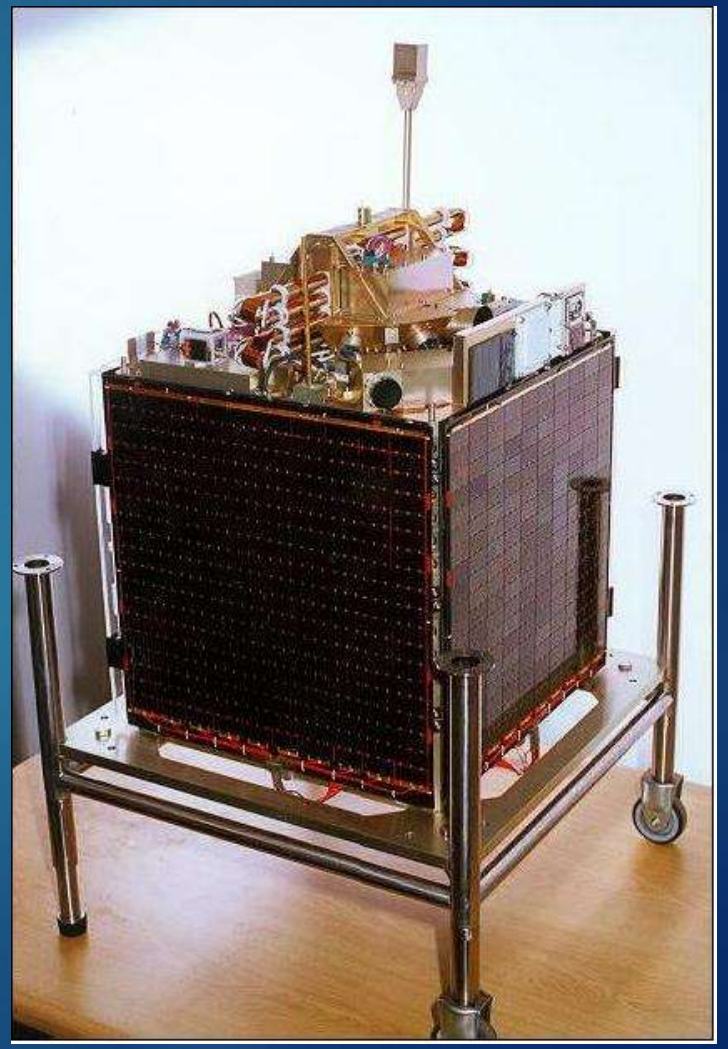
- **AO7 is still active when in Sunlight.**

Qatar OSCAR 100

- The OSCAR 100 is an amateur radio transponder located on the Es'hail-2 satellite.
- It was a joint project by the Qatar Satellite Company, Qatar Amateur Radio Society and AMSAT Deutschland.
- It was launched in 2018 and the current position is 26 Deg East.
- It consists of two sections; the narrowband transponder with a bandwidth of 250 kHz and the wideband transponder with a bandwidth of 8 MHz.



South African Amateur Radio Satellites: SunSat



SUNSAT

- Built by Students at University of Stellenbosch
- Launched by NASA

SUMBANDILASAT

The 81 kg microsatellite was launched from a Russian Soyuz rocket at e 5:55pm on Thursday 17 September 2009.

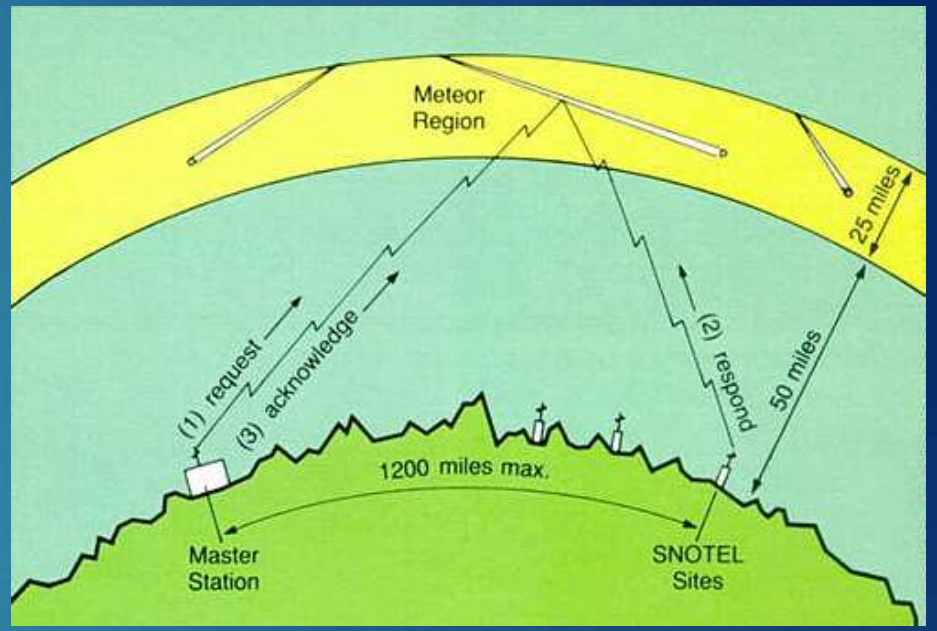
SUMBANDILA SAT SO67

- SumbandilaSat included an interface unit that turned one of the transponders into an amateur radio transponder.
- After launch the second transponder failed so the main payload was shifted to the one shared with amateur radio.
- While orbiting over South Africa the main camera payload was scheduled most of the time with the amateur radio activity put on the back seat with just an occasional operation while over South Africa.
- The world amateur radio community benefitted far more with frequent access to the transponder

Science projects

Meteor Scatter Communication

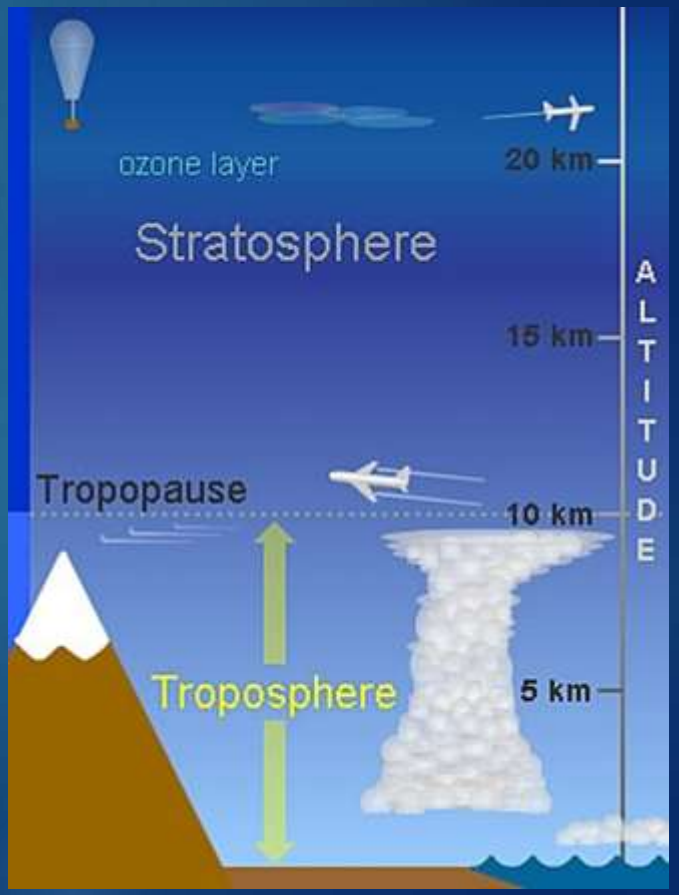
- Meteor scatter communications is a radio propagation mode that exploits the ionized trails of meteors during atmospheric entry to establish brief communications paths between radio stations up to 2000 kilometres apart.
- Experimenting with MSK144 software which is part of the WSJT-X suite developed by US radio amateur, Nobel laureate Joe Taylor, K1JT



Tropospheric Propagation studies

- Tropospheric propagation refers to the transmission of radio waves through the troposphere, significantly influenced by weather conditions and atmospheric phenomena.
- The South African Radio Leaue (SARL) supported by AMSAT SA is working on setting up a beacon on a farm near Strydenburg in the Northern Karoo to study inland tropospheric propagation.
- Project funding is by donations and crowd funding.

See www.amsatsa.org.za



Radio Frequency Noise and the impact on communication

- The increasing level of Radio Frequency will impact on the future of communication.
- Scientist have warned the world about the impact of CO_2 on the climate and how weather patterns will change. Governments have been slow in reacting and today we all suffer the consequences.
- We should not let this happen to the radio frequency spectrum.

We need to put programmes in place to collect and document evidence to convince spectrum regulators and industry bodies that unless action is taking to regulate against unwanted and unintentional RF transmissions, which are just noise, radio communication is going the same way as climate change.

RF Noise Monitoring

- **The SARL has developed an inexpensive method to monitor RF noise using a loop antenna , a dongle and a raspberry Pie with special developed software**
- **The DARC (Germany) has developed a more sophisticated system called ENAMS which is the recommended system costing around R30 000**

To learn more about RF noise minoring and the projects initiated by the Amateur Radio Service watch these to videos

Sarl presentation: https://youtu.be/wZV8XdKj5qw

EAMS: https://youtu.be/uTHUVSs36ZU

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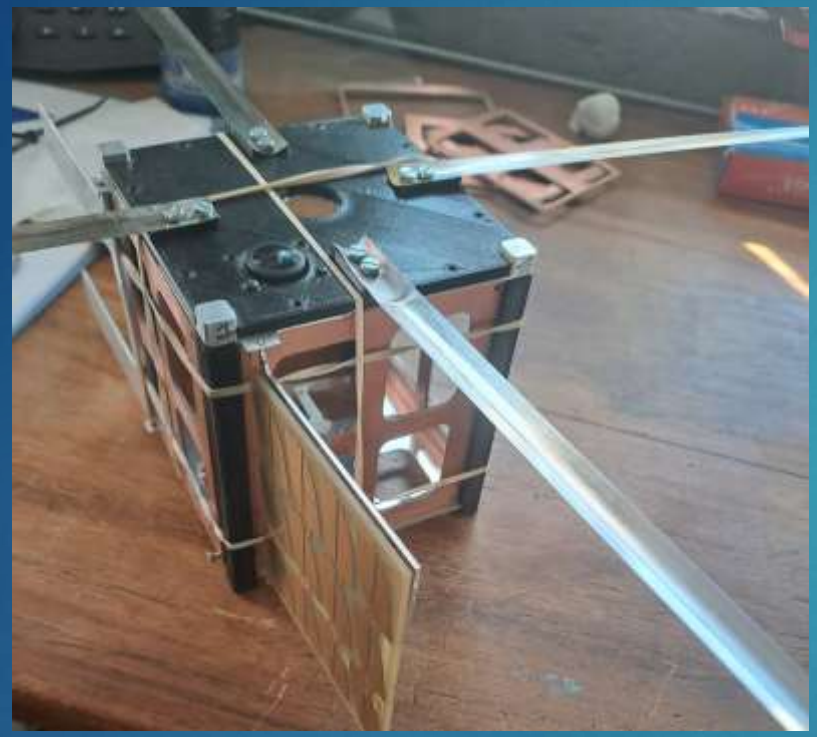
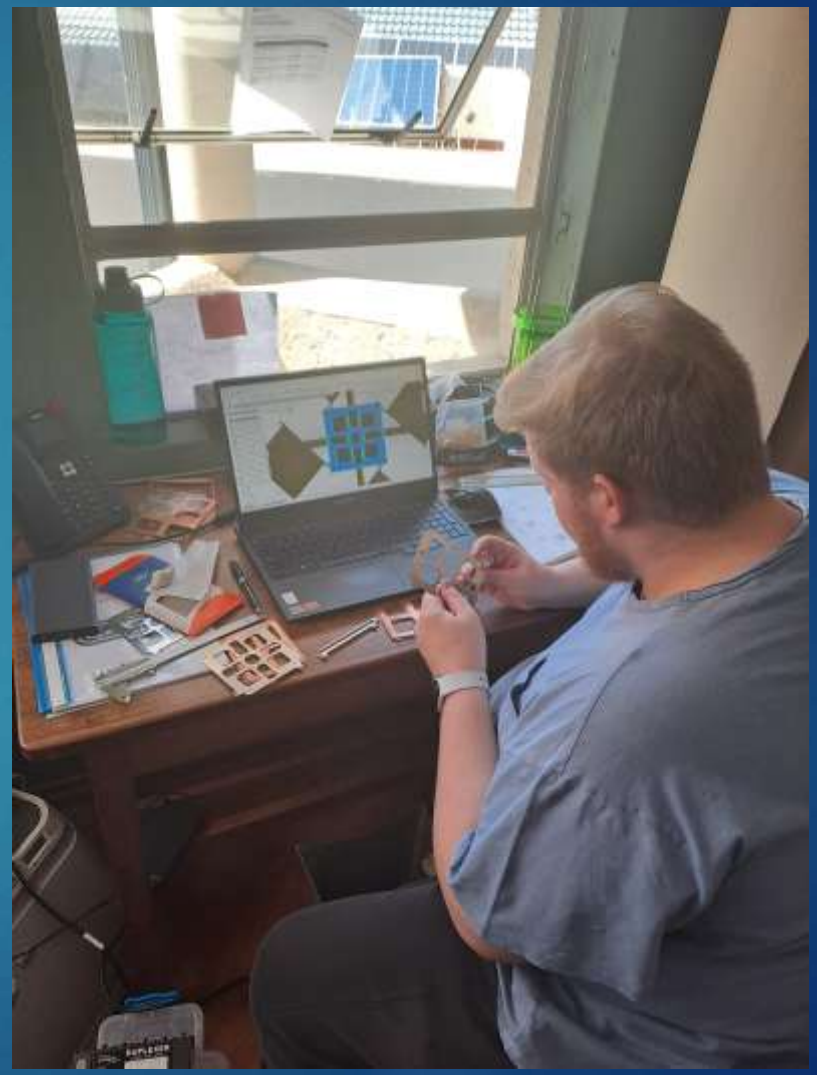
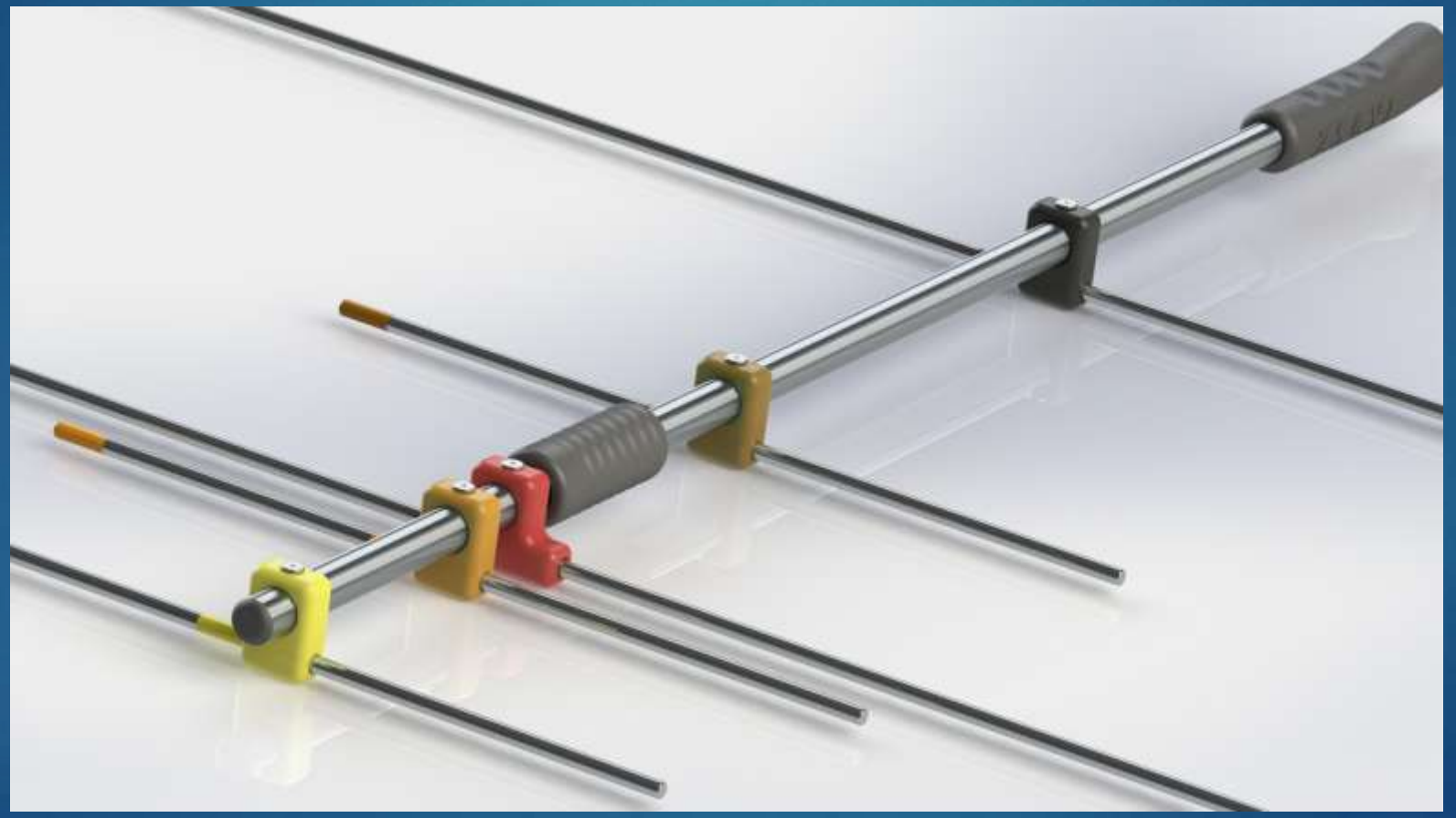




Project by South African Radio Amateurs
Designed, developed and constructed by volunteers.

Dual Band Antenna

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