DSRS THREATENED WITH CLOSURE

The L-band antenna at DSRS stands proud above the River Tay.

IMAGES: CSNA

One of the UK's key space assets – the Dundee Satellite Receiving Station (DSRS) – is going to close unless new funding is identified to cover its annual operating costs.

THE DECISION TO CLOSE the Centre was made by the University of Dundee following the withdrawal of core funding from the Natural Environmental Research Council (NERC). Dundee is one of the main stations in the UK receiving data from Earth observation satellites. It has been systematically collecting data on a daily basis since 1978 and was, until recently, funded by the NERC. The station developed from pioneering projects in electronics and communications undertaken by academics and students during the 1960s and 70s, and reached a point where the facilities could be used as an operational service to UK scientists. The user base now extends far beyond this community.

The station's main remit has been to receive and archive data and to provide the information to support studies in many areas. In the marine sector data from the station has contributed to directing research cruises where it is used to monitor properties such as sea temperatures and the development and extent of algal blooms. For the terrestrial environment, data have been used for monitoring vegetation and crop yield, wildfires and bird habitats. Atmospheric studies include severe weather conditions and phenomena, directing research aircraft. The archive was also used for a long-term investigation of aircraft contrails.

Over its 40 years of operations, notable events captured include the Fastnet yacht race storm of 1979, the Buncefield oil depot fire in 2005, volcanic eruptions in Iceland and at Mount Etna, forest fires, severe winter conditions in the UK and Ireland, Atlantic hurricanes and tropical cyclones.

The Dundee station archive contains over 200,000 recordings from polar orbit satellites with coverage of Europe and the North Atlantic as well as images from geostationary satellites providing global coverage. Hundreds of scientific papers have been supported with this data as well as many other publications. There is great public interest in the station's website with around five million images downloaded each year by thousands of users with incredibly varied applications.

DSRS currently has five operational tracking satellite dishes for polar satellite reception and a number of fixed position antennas for signals from geostationary satellites. Staff provide the essential electronic hardware and software expertise to design, build, operate and maintain the facility. The high level of in-house expertise ensures an extremely high success rate for collecting data (generally above 99.9% annually) and fast delivery for time-critical applications such as fire monitoring.

The DSRS can trace its origins back to the work of Peter Baylis and Dr John Brush in the 1970s when they began picking up data from meteorological satellites. This led to acquisition of a 3.7 m reflector which allowed data to be acquired from the Very High Resolution Radiometer (VHRR) instrument carried by NOAA-4, launched in 1974, and NOAA-5, launched two years later. After the launch of Tiros-N in 1978, the facility began archiving data including that from the satellite's Advanced VHRR which operated until 1981.

A major problem recognised from the outset was the challenge of data storage. At first, 75 MB of raw data was generated for each satellite pass, which grew to more than 93 MB after conversion from 10-bit to 16-bit data. Universally, around the world, throughout the 1980s the problem was data volume and storage capacity. In 1980 the first 5.25 in Shugart ST506 hard drive had a 5 MB capacity! To get over this problem, a 14-track reel-to-reel tape recorder was employed, operating at a slightly slower speed of 29.5 in/sec to get two satellite passes on to a single track. By the end of the decade the team had moved on to a Sun work station.

IMAGES: DSRS

The Station's operations room has been considerably updated since its inception.

ABOVE
A rare completely cloud-free view of the British Isles – obtained from polar satellite data via the DSRS station at Dundee.

Now, DSRS has 388 TB of data storage, essential when considering that the Terra and Aqua satellites alone transmit 1.5 GB and the group also captured data from Nimbus 7, SeaStar and other NOAA satellites as well as Meteosat. Recognition of process occurred when the European Space Agency asked the team to produce a design and construction manual for other users.

ADDED VALUE

Due to Dundee's geographic position in the northern hemisphere, the station is well-suited for the reception of "real-time" satellite data covering Europe, the North Atlantic and the Arctic; this is data received from satellites in a polar orbit. DSRS also procured geostationary satellite data such that EOS systems can give full global coverage. The satellite data collected by the DSRS ranged between 250 m to 1 km in resolution.

The planned construction of the UK Spaceport »

Briefing

IDEAS, PLEASE…

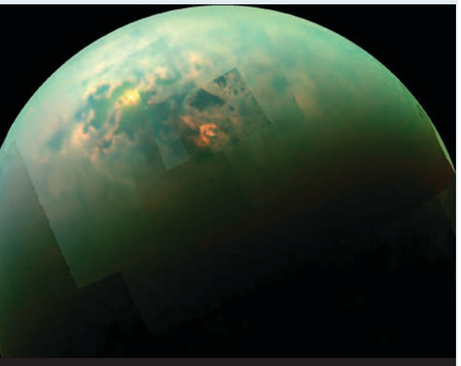
ESA is actively seeking ways to apply space technology to Earth-based problems. Through the Open Space Innovation Platform, a new challenge-based website, the Agency is hunting out bright ideas for monitoring plastic waste polluting the oceans, and to improve the self-steering abilities of ships. ESA is also looking for ways to advance the adoption of autonomous shipping, which would lower costs, increase safety and solve an anticipated shortage of crew. For example, current navigation satellites are only visible at low inclinations at the poles and their signals can be disrupted by the ionosphere.

ESA

Solution needed: GPS in Arctic regions is compromised by the high latitude.

LAKELAND DATA

On its final flyby of Saturn's largest moon in 2017, NASA's Cassini spacecraft gathered radar data revealing that the small liquid lakes in Titan's northern hemisphere are surprisingly deep, perched atop hills and filled with methane. The new findings, published 15 April in *Nature Astronomy*, confirm just how deep some of Titan's lakes are (100 m) and also their composition. The findings provide new information about the way liquid methane rains on, evaporates from and seeps into Titan – the only planetary body in our solar system other than Earth known to have stable liquid on its surface.



JPL

Near-infrared radiation reflecting off Titan.

« on the A'Mhoine Peninsula in Sutherland County, Scotland, provides an opportunity for both Dundee and the UK Space effort. The primary launch regimen envisioned presently for the UK Spaceports come from two primary clients. Lockheed-Martin and Orbex (a UK space start-up) are for polar-orbiting satellites, with a focus on AIS (Automatic Identification System) for commercial shipping and new mini-cubesats for specific earth observation missions (oceanographic, terrain monitoring etc.). These new platforms will require satellite data download capabilities for data testing, verification, calibration and other related issues. At a time of ever increasing "climate instability" the loss of the DSRS basic functionality in supporting atmospheric scientific research would be a grave loss.

It is well known that in the northern latitudes of the world, the largest deposits of frozen methane lie within the tundra of Canada and Russia. DSRS and its polar orbiting satellite data collection ability make it ideal for linkages to researchers in the key area of tundra monitoring. The release of methane into the Earth's atmosphere is well known as a potential future key contributor to global warming. Moreover, as new polar orbiting satellites take to space, they offer new sources of data from the bottom of the world, where at present, very little coverage of ocean mechanisms and the Antarctic is available.

CONSEQUENCES

The decision to close the station is more than unfortunate, coming as it does at a time when the UK, and particularly Scotland, aims to be a major player in the rapidly growing small satellites industry with many satellites built and launched here. Ground station support is needed for this activity. Dundee is currently the only established ground station in Scotland and has been involved in adding VHF/UHF TTC support to the previous L/X-band data capabilities.

The potential loss of a facility that has supported UK and European scientists for many years and is internationally recognised is deeply worrying, especially at a time when climate change and environmental issues are major concerns. Given the rapid growth of small satellites the decision to close the facility is indeed, unfortunate.

The DSRS has been a high value asset to the University of Dundee itself, which has steadfastly, albeit quietly, given both the university and Scotland, a name, or "brand" with incalculable value across the world. This comes from Dundee's unique role as the scientific birthplace of an essential critical technology, without which there would be no space industry: radar.

Invented by Sir Robert Watson-Watt, a graduate of what is now the University of Dundee, where his focus was on radio wave science, his research evolved into atmospheric science and storm tracking. Then most famously, his work evolved once more into the technology we now know as radar, which helped win the "Battle of Britain" and changed the course of World War Two. Later, radar evolved from aviation and naval applications into the early space achievements of the 1950s.

Radar is the technology that has allowed every rocket launched since that time, to be either navigated, tracked, or communicated with, and which has allowed the careful collection of EOS data by DSRS in supporting climate change research. The demise of the DSRS will be judged in future years as a catastrophic decision reflecting adversely on the wisdom of those who let it slip through their hands. If it can be said that we stand on the shoulders of giants, then all in the space industry stand upon the broad shoulders of Watson-Watt and Dundee.

AN OPPORTUNITY?

The University is currently looking at options for the DSRS including its imminent de-commissioning. There is still an opportunity for an external investor or commercial body with the right vision to put a proposal to the University stating how they might tap into the expertise and facilities at Dundee, given that the facility exists and has a proven track record. For anyone wishing to create a similar facility from scratch, the cost would run into several millions.

However time is of the essence here. After NERC ended its financial support for the DSRS facility, the University of Dundee announced the DSRS would no longer continue to operate but for now it remains intact and "ticking over" while options for its future are considered. As soon as the equipment is decommissioned, the opportunity to save the DRSR operation is gone.

It is unconscionable that DSRS is lost. Together with its valuable store of archived data, DSRS is a unique example of the capabilities that exist in Scotland for supporting a growing space science industry. Investors are urged to step in and capitalise on what is still a much needed, highly valued and productive facility.

There is an urgent need for beneficiaries and related interests to respond to this call for support. For further details, the initial point of contact is Mr. John Gardner at the Centre for Remote Environments, Univ. of Dundee, j.y.gardner@dundee.ac.uk. SF

Opinion

A GRAVE MISTAKE

THE ACCLAIMED VALUE TO THE BRITISH PEOPLE of a national space industry producing world-class science, technology and engineering is a proven fact; the UK space industry is in healthy growth with great potential for the next generation. And that is so for both deliverers and recipients; the career opportunities for those at the supply end are instantly recognizable as having enormous benefits to the vast number of people whose lives are enhanced by space technology.

But you sometimes have to wonder if the attached bureaucracy that surrounds any government, regulatory or academic enterprise is altogether in synergy with the public acceptance of space research as a national asset. In the phraseology of the bean-counters and paper-shufflers, a value-added investment with durable infrastructure. It doesn't always seem that they get the message.

This month I am turning a spotlight on the plight of the Dundee Satellite Receiving Station which is in imminent danger of closing unless a relatively paltry sum is found to keep alive what has, for several decades become an invaluable data collection and archiving centre of atmospheric and environmental data from a wide range of satellites. This is a national workhorse, and it is being summarily retired because, to mix metaphors, accountants are running the stables.

The public supports space – not just rockets, big-ticket satellite building or astronauts, but the very infrastructure that gives meaning to a national capability. Based on earth observation, remote sensing, weather and climate research, DSRS is an essential tool in unlocking the trends and vital signs of a rapidly changing environment, deciphering the heartbeat of our own planet. We urge reconsideration and we appeal for a sponsor to save this high-value asset. SF

David Baker

This is a national workhorse, and it is being summarily retired because, to mix metaphors, accountants are running the stables

SPACEX

Briefing

ABORT ABORTED

A test of Dragon 2's abort rocket motors (above) ended prematurely on 20 April when the the motor exploded. During a sequence of test firings, which started well, personnel at Cape Canaveral were alerted when a cloud of black smoke was released from the site. SpaceX was unwilling to comment, with NASA's Jim Bridenstine tweeting "This is why we test". With Boeing already announcing delays to its CST-100 crew-carrier, there is concern that the resumption of astronaut flights from US soil may push closer toward the end of this year.

SEASICK FALCON

After a near-flawless launch of the first commercial Falcon Heavy on 11 April, all three first stages were successfully returned to Earth. However, the central core stage was subsequently damaged aboard *Of Course I Still Love You*, while the recovery barge battled 3 m seas during its return to Port Canaveral. Apparently, there had been insufficient time to install a new grapple fixture that could have prevented the stage from toppling over. The existing fixture aboard the barge was compatible with the Falcon 9 – but not Falcon Heavy.

JACQUES VAN OENE

The aft end of the damaged central Falcon Heavy core.