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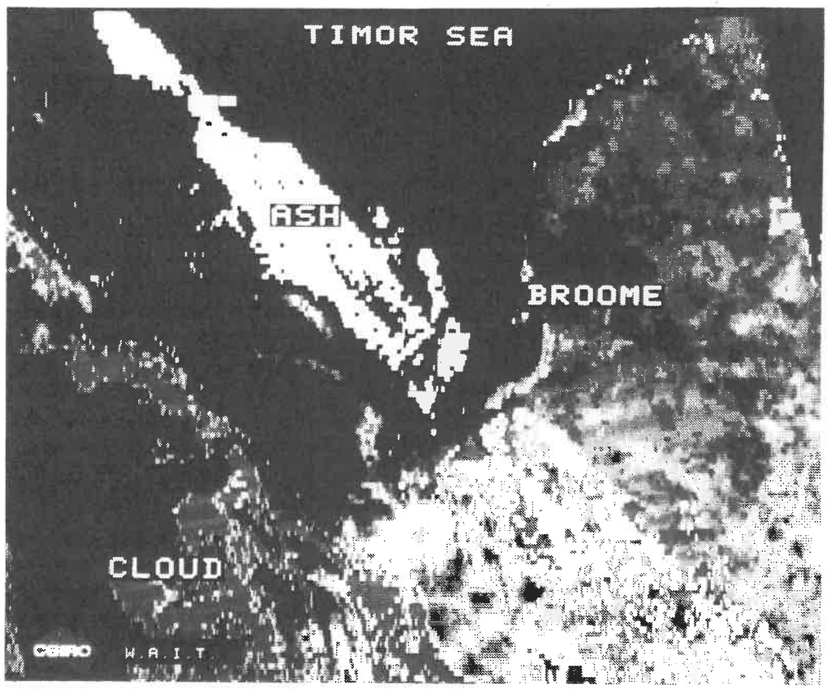
WAIT
Western Australian Institute of Technology

Satellite Breakthrough

"A brilliant piece of science, and a credit to the ingenuity of Australian science and technology" — that's how Minister for Science and Technology David Thomson described the work of Dr Frank Honey, Head of CSIRO's remote sensing group at Floreat Park, and Dr Bill Carroll, Head of WAIT's Satellite Technology Centre, and senior lecturer in Electrical and Electronic Engineering.

When an Indonesian volcano erupted on June 24 and July 14, the silicon particles in the volcanic ash clogged aircraft engines, and gave passengers a flight they would never forget. It could just as easily have become a major air disaster in each case.



(l to r) The cloud of volcanic ash shows up clearly in this computer photograph of the satellite readings.

The eruption sent clouds more than nine kilometres into the air. Soon after the eruption, the menacing clouds were picked up by the Japanese GMS geostationary satellite which provides routine weather information.

However, as the volcanic ash began to disperse and merge with other clouds, it became invisible to weather satellites because of the minute temperature differences between the cloud and the volcanic ash, which made recognition extremely difficult.

On July 17, when the Department of Aviation officials and meteorologists suspected that the volcanic ash cloud from the July 14 eruption was headed over our North-West, WAIT tracking facilities were brought into action to record images from the NOAA Polar orbiting satellite which can record finer temperature differences than the GMS satellite used for weather forecasting.

"We did not know which technique to use," said Bill Carroll, "but through scientific analysis and programming procedures, we managed to get a reading from the radiated and reflected energy of the silicon particles.

"The reflected energy coming up from the land made initial detection very difficult, but when the search changed from the land to the ocean, slight differences in temperature were picked up, and the ash was located."

Using a computer classification technique, the CSIRO/WAIT team was then able to follow the temperature patterns as the cloud projected over land. It took two days of painstaking computer programming to pinpoint the cloud. The key lay in the silicate content, which gave a distinctive thermal emission.

Back-up

Now the technique has been developed, the WAIT centre and CSIRO have been asked to provide a back-up monitor service for the Department of Aviation and the Bureau of Meteorology, should a similar situation occur again.

"Now we know what to look for, we can define the cloud's boundary, and can advise aviation authorities where the ash is within a few kilometres. This new information and knowledge can affect all aircraft briefings in incidents of volcanic ash disturbances," said Bill.

"It can also save the airline companies a great deal of money flying unnecessarily long diversion routes."

Frank Honey and Bill have been working together since late 1979, when our first dish antenna went up on Electrical Engineering. It was manually operated, but was a sign of things to come.

"Scrounge"

The second antenna was hauled up on to the roof of Civil Engineering a year later, a tribute to the acumen and ingenuity of Bill and workshop technicians Ralph Bennett and Don Grieves. Known as "Project Scrounge", the dish was build for around $2000, not including salaries and existing computer facilities. The market price for a similar system would be about a quarter of a million dollars. Student project work also assisted in getting the system functional.

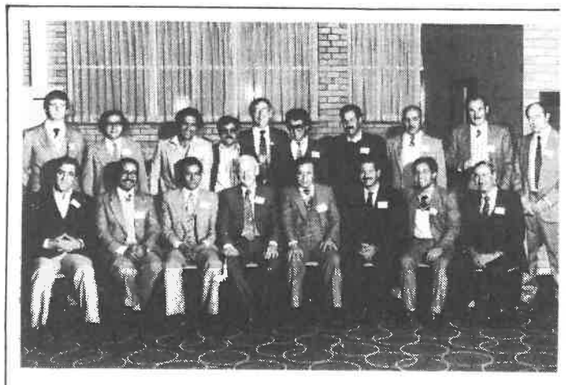
Part of the dish for the second antenna had been used in the 1950s along the US Alaskan coastline defences, and later by the Department of Transport for tropospheric scatter radio communications between Geraldton and Carnarvon.

After they had been in store for several years, Bill managed to arrange a long-term loan to WAIT of two of the dishes, to modify for satellite usage.

The WAIT tracking station was the first, and is still the only satellite-receiving station in the country capable of giving immediate access to high resolution NOAA data, instead of the usual six-to-eight-week gap for processing in America. It can also receive and process both low and high resolution images from the CMS satellite.

The NOAA data has been used to plot sea temperatures for fishermen, thereby helping them find the fish which follow the warm currents; to analyse water movements on the North-West Shelf by temperature data; to study regional geography throughout Australia; and to provide data on regional cloud temperatures and soil moisture.

Now it has hit the headlines with its ability to pick out volcanic ash from normal cloud cover, and the men behind the antenna are understandably proud of their "baby", rescued from the scrapheap and given an unexpectedly important role in world aviation.



Course for Muresk

Minister for Agriculture Dick Old (centre front) lines up for a formal group picture with staff and members of the WAIT-Aid course in Rainfed Dryland Agriculture. Conducted on behalf of the Australian Development Assistance Bureau, the course has attracted senior agriculturalists from Syria, Jordan, Algeria and Tunisia.