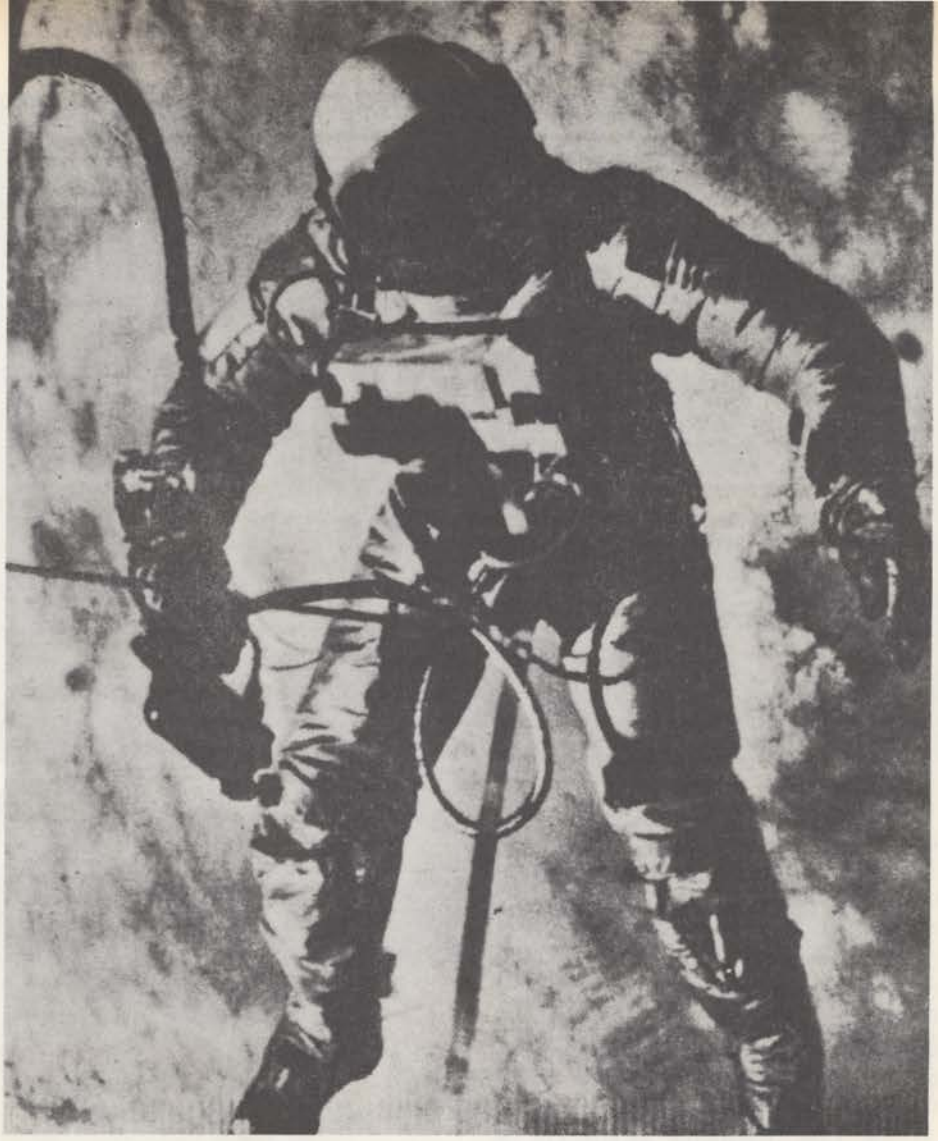
Australia is making a unique contribution to the new field of space medicine. There are now five Australian "space doctors" trained to monitor U.S. Astronauts from the Carnarvon space tracking station in Western Australia.
They are one civilian, Dr. John Lane, Director of Aviation Medicine, Department of Civil Aviation, and four R.A.A.F. officers — Wing-Commander Warren Bishop, C.O., R.A.A.F. Institute of Aviation Medicine, Point Cook, Victoria; Wing Commander Bill Walsh and Squadron-Leader Michael Murray-Alston, both of the Institute, and Squadron-Leader Bill Read, of Williamtown R.A.A.F. base, N.S.W. Last month, when McDivitt and White circuited the earth for 4 days aboard their Gemini space craft, Wing-Commander Walsh and Squadron-Leader Murray-Alston were part of the team which watched over their health. Eight further Gemini flights are planned—the next one in a few weeks' time is scheduled to last seven days—and eventually a three-man trip to the moon will be made aboard an Apollo spaceship. The Carnarvon station, which is run for the Americans by the Commonwealth Department of Supply, is expected to take part in the full lunar programme.



SPACE MEDICINE

IN the background, behind the soaring into space of U.S. astronauts McDivitt and White last month, medical men were as important as scientists and technicians.

For man, as he circles more than 100 miles above the earth, remains entirely human, with his need to eat, breathe, eliminate and operate his senses free of pain, illness or deterioration.

About a week before each manned space flight is due to begin, two selected from the team of Australian space doctors, together with a doctor from America, take up their posts at the man-in-space tracking station at Carnarvon, on the north-west coast of Australia.

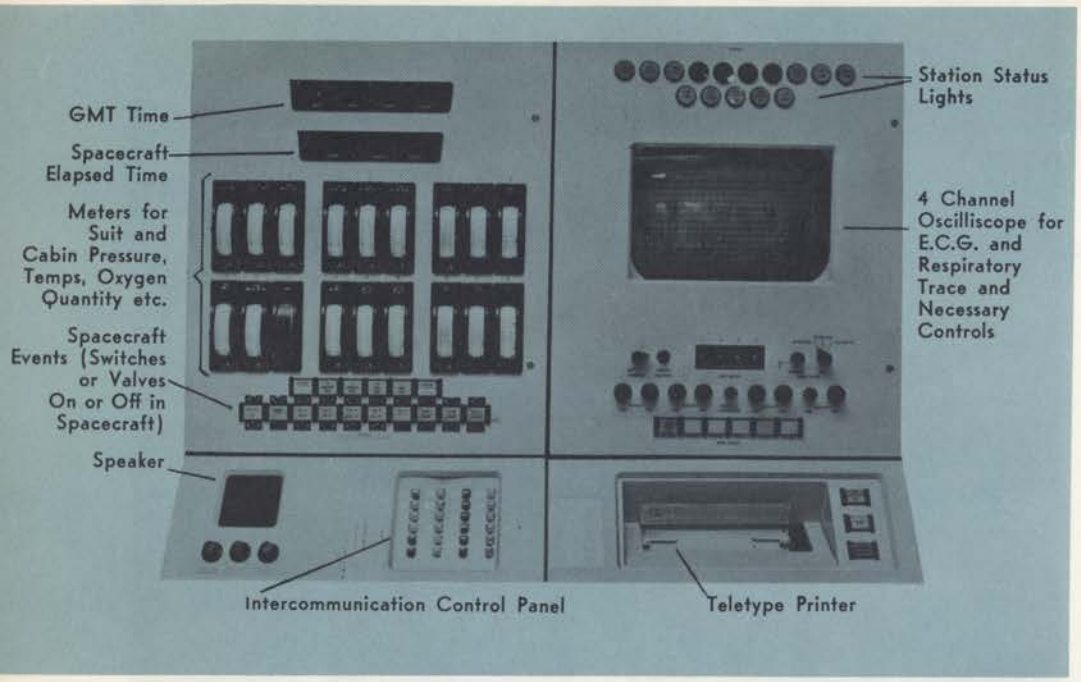
When a space capsule is flashing by they sit at an elaborate console of keys and winking lights, working calmly but with intense concentration.

In the middle of the console is an oscilliscope. This instrument, similar to a television screen, shows lines of light which jump and move, indicating how the astronauts' hearts are working and how they are breathing as they pass high overhead.

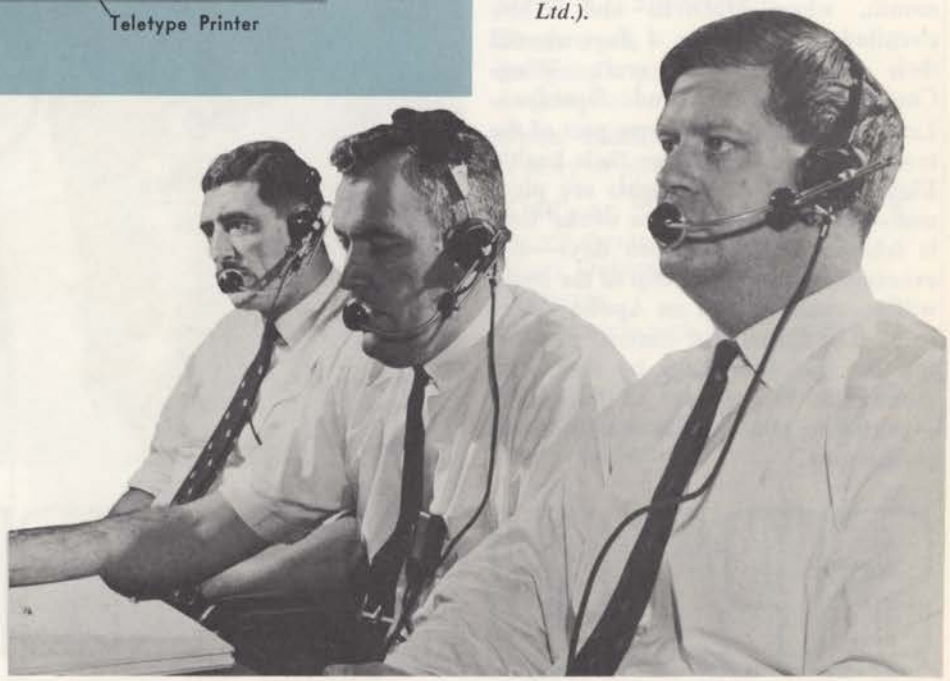
The information is picked up from electrodes fixed to the astronauts' bodies and is transmitted to the ground by telemetry signals.

The respiration and heart signals are also fed into an eight channel recorder situated at the side of the console (together with blood pressure recordings which can be sent, on request, by either astronaut). Selected channels from this recorder are fed into the oscilliscope.

The information is vital. For the heart could react adversely to the state of weightlessness, or to the enforced inactivity of being cramped in a capsule no bigger than two telephone boxes for four days. (Mere bed rest for prolonged periods leads to cardiovascular disturbances, shown by the weakness and dizziness convalescents feel when



Wing-Commander Walsh, Dr. Dick Pollard (United States) and Squadron-Leader Murray-Alston sitting at the medical console at Carnarvon (Picture arranged by courtesy of Amalgamated Wireless (Australasia) Ltd.).



they get to their feet.)

Alongside the oscilliscope are 18 meters which the doctors must also watch.

These indicate temperatures, pressures and many other factors affecting the astronauts' health. Again the information is transmitted from measuring instruments in the space capsule to the ground by telemetry signals (the telemetry equipment at Carnarvon can receive one million "bits" of information a second).

If one of the 18 meters indicates that a particular factor—say the temperature inside the space suit of astronaut No. 2—has moved above or below a pre-determined safety limit, a light flashes on and a horn sounds. Without this warning system a potentially dangerous situation could be overlooked.

Adding to the complexity of the medical console are rows of many coloured lights. These are mostly "on/off" indicators, which show, for instance, whether a particular piece of life-sustaining equipment is functioning or not.

As the doctors watch the lights and meters, a teleprinter receiver on the desk before them busily types out a running "history" of the astronauts' health.

This history is a summary of telemetry signals picked up on each "pass" by more than seven ground tracking stations strung around the globe. At each station, a computer extracts the required information from the signals, flashes a summary to control headquarters in the United States, which in turn passes the information on to all ground stations. The complete process takes approximately one minute.

The history which these summaries provide is torn off the teleprinter chapter by chapter, and pinned to a board, to provide a constantly up-dated record which the doctors can consult at a glance.

Also on the console is a meter describing something more familiar—the time. It shows not local time, however, but Greenwich Mean Time—the time by which all the tracking stations operate so that they can work in unison. Another meter totals up the minutes and hours that the astronauts have been aloft since blast-off. With their patients travelling at over 17,000 miles an hour, time to the doctors is more than usually important.

In addition to the battery of dials, screens and flashing lights, the doctors at Carnarvon can also talk to the astronauts by direct speech—to question them on exercises they have been directed to perform, to check a doubtful dial reading or, more generally, to ask them how they feel.

The doctors can advise the astronauts on what to do should irregularities develop. If the worst happens, and some medical or technical failure indicates that the flight must end, they can recommend this to the flight controller.

Conceivably, they could order that

the astronauts make use of some of the drugs they carry, including antibiotics and pain and nausea relievers.

On alternate days before a space flight starts, Carnarvon, and all other points, are kept on their toes with simulated flights, when every problem any one can think of is tossed into the arena for fast accurate solution.

Solutions are worked out beforehand as far as possible, but there is always the chance that something will happen that no one has thought of. This is why the presence of experienced medical men is so important.

On each "pass" a space capsule is in range of Carnarvon for only six to seven minutes. But these minutes are packed with tense activity.

Even if all goes well and no emergency steps need to be considered, the doctors have important studies to undertake. They have their part in compiling data on the great problems of keeping humans healthy beyond the familiar environment of earth.

Acceleration, for example, and deceleration on landing—how do they change the astronauts' condition? If blood is drained from the brain for too long, this may cause permanent damage. The greatest care is therefore taken in moulding each astronaut's couch and in aligning his form to the lines of force in take-off and flight.

Weightlessness occurs when the speed of the vehicle counter-balances the gravity-pull of earth. In this state nothing has weight, not even the blood within human blood-vessels. The dangers here come with the possibility of fainting, swelling of the feet and ankles and damage to the heart and kidneys. In space journeys so far, weightlessness has not caused serious damage, but for the long journeys of the future much more remains to be known.

Other fields of study include radiation hazards and methods of feeding. Radiation is no great problem at the level of present flights, but when man is shooting to the moon or Mars, the risks may be acute.

This work, to which Australian doctors are making a contribution, is not only of use to the astronaut. Already space medicine has made findings of great value in the understanding and treatment of patients on earth. Important facts have been gathered about heart disease, for example, which might not otherwise have been learned so soon.

TEAMWORK
produces an aid for women

By Miss Angela Gale, senior physiotherapist, Peter MacCallum Clinic, Melbourne

Dr. T. A. Pressley (C.S.I.R.O.) examines wool padding for the improved prosthesis.

A remarkable example of teamwork in Melbourne has produced a new and improved medical aid which will be of great practical and psychological importance to hundreds of women who have undergone successful treatment for breast cancer. The Australian Wool Board, two divisions of C.S.I.R.O. (Protein Chemistry and Building Research), a suburban corset salon, the Peter MacCallum Clinic and the Department of Surgery at Melbourne University, all contributed their skills to the project.

MORE than three women in every hundred develop some form of breast cancer at some time in their lives. Fortunately, many cases are completely cured. However, the treatment usually involves removal of the breast and so a really comfortable and convincing artificial breast, or "mammary prosthesis", is of very real value.

Most of the actual work on the improved mammary prosthesis which we have developed has been done by myself and Dr. T. A. Pressley, principal research scientist with the C.S.I.R.O. Protein Chemistry Division, Parkville.

My concern has been in re-designing, testing and fitting the prosthesis. It is an adaption from an original model, which was "along the right lines", but not entirely satisfactory. Successful results have been achieved after a great deal of experimentation which, for practical testing, has involved the co-operation of 115 patients of the Peter MacCallum Clinic in conjunction with the manufacturers.

I worked in close association with Dr. Pressley, who tested and processed many different types of material to fulfil the specific requirements of the new design, which were that the prostheses should look and feel as natural as possible, should be comfortable to wear and should meet the vital need of being washable.

It was first required that a layered construction be used containing a

Continued on page 8