

Health care by remote direction, an automated disease detector, a voice-controlled wheelchair, a device that enables the blind to read almost anything in print—these are among a wealth of medical spinoffs being transferred from the world of aerospace to the public.

innovations in medicine

Ka Ka, Hickiwan, Vaya Chin, and Gu Vo sound like places in Southeast Asia. They are not; they are as American as Peoria. Villages of the Papago Indian Reservation in Arizona, they rank among America's most out-of-the-way places. As such they have benefited from a significant demonstration that applies space technology to provide health care to people in remote areas.

The demonstration has dual purposes. It is a developmental step toward meeting a future space requirement and at the same time it offers the potential of professional medical care to isolated populations whose access to regular medical service is inadequate or nonexistent.

NASA is planning now toward the day of long-duration flight—manned interplanetary missions for example—wherein routine health care and emergency treatment must be accomplished on-board the spacecraft over periods of months or perhaps even years. Since spacecraft design limits crew size, the medical assignment may be handled by a single astronaut-physician or by a crew member trained as a physician's assistant. In a space emergency demanding surgery, for instance, sophisticated communications equipment, backed by a computerized data processing system, would make it possible for a surgeon on Earth to "examine" the patient. He could study X-rays and other data, specify an in-flight surgical procedure, and guide the astronaut-medic step-by-step through the operation.

All over the world, millions of people live in areas almost as remote as astronauts in space. These people can benefit enormously from a system that

enables a physician to help patients separated by great distances from his own physical location.

Such a system is being evaluated now. It is called STARPAHC (Space Technology Applied to Rural Papago Health Care). NASA technology in space communications and data processing is being applied to remote health services for the Papago tribe. STARPAHC is administered by the NASA Life Sciences Directorate in the Office of Space Sciences. It is a joint program involving NASA's Johnson Space Center, the Indian Health Service of the Department of Health, Education & Welfare, and the Papago's Executive Health Council. Lockheed Missiles & Space Co. is NASA's systems support contractor.

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A key feature of STARPAHC is the Mobile Health Unit, a medical facility on wheels which visits the villages of Arizona's Papago Indian Reservation. STARPAHC employs space communications and data processing technology to provide remotely-directed health care for the Papagos.



The Mobile Health Unit's beat is the sparsely-vegetated, alternately flat and mountainous terrain of the Sonora Desert.

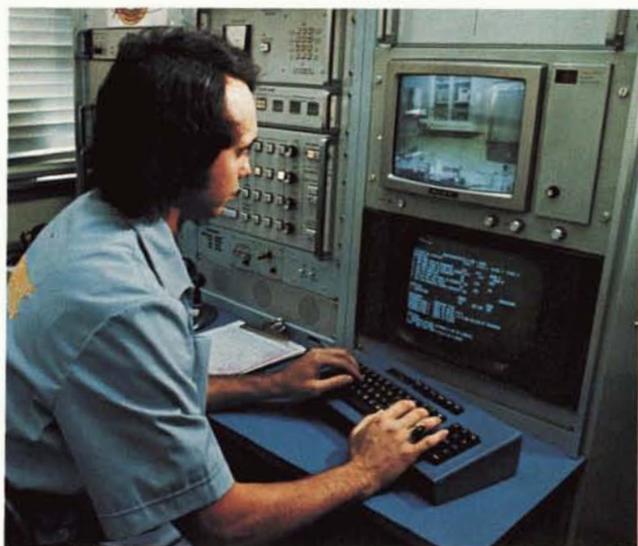
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The Papago Indian Reservation is truly remote, lying in the Sonora Desert, an arid, sparsely-vegetated terrain, alternately flat and humped by clusters of mountains. Sprinkled over some 4,300 square miles are 75 villages where almost 10,000 people live. The principal Papago town of Sells is 70 miles from Tucson. Many of the villages are more remote, even from Sells, but distance is only part of the travel problem. Although there are some paved highways, many roads are unpaved, slow, and hazardous after heavy rains.

A key element in servicing the remote areas of the reservation is the Mobile Health Unit, a large van containing clinical equipment and the communications gear for contact with STARPAHC's base of operations, the Indian Hospital at Sells.

Operating on a pre-announced schedule, and staffed by a Community Health Medic (CHM) and a laboratory technician, the mobile clinic negotiates the rough roads of the reservation, visiting the villages in turn and handling as many as 27 patients daily.

In the van's reception room, the CHM interviews the patient as to complaint, symptoms, and other details. If necessary, the CHM can call up the patient's medical history from records stored in Albuquerque by punching keys on a data terminal.

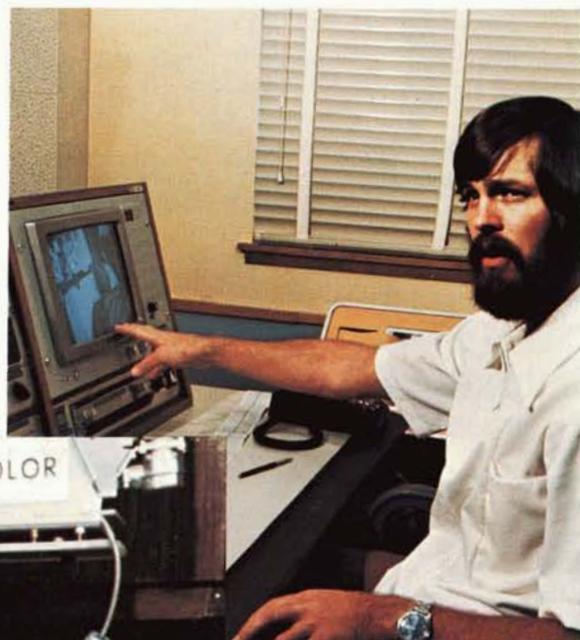


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A patient's medical history is displayed on a console instantly when summoned from stored records.

In the examining room, the CHM conducts the examination under the supervision of a physician at Sells, who may watch on TV and converse on the radio link. If the physician wants to view a particular part of the body, the CHM operates a color TV camera mounted overhead to transmit a close-up picture. When biochemical analysis is indicated, the laboratory room can handle a variety of tests and send the results immediately to the doctor as data or even as microscopic slides transmitted by TV. The mobile clinic can also transmit X-ray pictures.

Supervising physician at Sells Indian Hospital can see, talk with and figuratively "touch" a patient in the Mobile Health Unit miles away.



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In the Mobile Health Unit, a community health medic takes an electrocardiogram. TV camera (top), sends picture of the patient to the Indian Hospital at Sells, STARPAHC's base of operations. The electrocardiogram is also sent to Sells.



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At the Sells hospital, the "mission control center," the supervising physician sits at a console containing both black and white and color TV monitors, together with a number of displays designed to provide him necessary information. A major feature of the console is a control which enables him to direct precisely the movement of the cameras in the mobile clinic many miles away. The physician can see, talk with and, in a figurative sense, "touch" the patient. With the equipment and information available to him, the physician can make timely diagnosis and specify treatment to be carried out by the CHM in the mobile van.

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In addition to the Mobile Health Unit, STARPAHC includes a fixed clinic at Santa Rosa, another town within the reservation perimeter. This clinic, with a CHM, a lab technician, and administrative personnel, operates in the same manner as the mobile van, extending examination and treatment capability.

The STARPAHC network includes two other elements. At Albuquerque, a computer provides access to an established health information data base operated by the Department of Health, Education & Welfare. At the Indian Health Hospital in Phoenix, a staff of medical specialists can be called upon to consult with physicians at Sells when a unique or complex situation occurs.

The space-derived telecommunications network that makes possible this interchange has its focal point at the Sells Hospital. Atop Quijotoa Mountain, near the center of the reservation, a microwave

A major element of STARPAHC's space-derived telecommunications network is this microwave station on Quijotoa Mountain, near the center of the Papago reservation. The station relays TV, voice and medical data between the Sells hospital, the Mobile Health Unit and a fixed clinic in the town of Santa Rosa.

station relays the TV and data signals between Sells, the mobile van, and the fixed clinic at Santa Rosa.

STARPAHC's community acceptance has been exceptional. Residents of the outlying villages depend on scheduled visits of the Mobile Health Unit and the daily services of the fixed clinic.

The system opens up a broad new potential for improving health care. The capability to communicate with remote villages suggests TV instructional programs in areas such as environmental health, sanitation, nutrition, and disease control. STARPAHC's initial success makes it likely that remote care activities will be continued upon conclusion of the two-year evaluation in mid-1977 when the Department of Health, Education & Welfare is expected to sponsor follow-on activities.