

# Infant transport

The roads and skies of North Carolina are today the scene of an innovative and effective infant transport effort which has markedly reduced both the mortality and morbidity rates on high risk infant referrals. The program is effected through the utilization of ground vehicles and military medevac helicopters, radio communications between transport vehicles and hospitals, and a special infant transport team which is based at the North Carolina Memorial Hospital in Chapel Hill.

Plans for the infant transport program were being conceived in 1973, when a public law made it possible for the armed forces to provide medical support by means of a program entitled Military Assistance to Safety & Traffic (MAST) on a nationwide basis wherever states or regional EMS councils desired assistance and military support was available. Originated through the combined efforts of the Department of Health, Education and Welfare, the Department of Transportation and the Department of Defense, MAST in North Carolina operates in conjunction with the Department of Human Resources, Office of Emergency Medical Services.

The North Carolina Office of EMS is one of the largest in the nation with 43 employees and an annual state budget of 2.1 million dollars. The EMS program is funded entirely by the state of North Carolina. Hospitals receive some of these funds for the improvement of emergency services through the purchase of equipment, or capital improvements such as the enlargement of emergency rooms and the construction of heliports.

MAST supplements existing EMS systems by furnishing military medevac helicopters, crew members, medical equipment, and supplies. MAST assistance is provided on call in response to serious civilian medical emergencies; inter-hospital transfers of heart attack, poisoning, trauma and other critical

compatible plan for providing a team of infant transport specialists who would work through the MAST helicopter program.

After presentation to the hospital administration in 1974, the infant transport program was instituted in mid-1975. Unlike other transports which utilize EMT teams, flight medics, and nurses and physicians from the local transporting hospitals, the Chapel Hill infant transport program supplies a team of infant care specialists for transfer whenever possible. The team includes 1) a pediatric house-officer with experience in intensive-care of the premature or distressed newborn, 2) a senior respiratory therapist from the Chapel Hill pediatric respiratory care, and 3) a pre-mature intensive care nurse. The purpose underlying this specialist team technique is not simply to rush an infant to the center hospital but instead to move the team to the infant as rapidly as possible, along with as much specialized equipment as can be conveyed, so that the patient may be stabilized in the referring hospital or clinic and then transported in the best condition that can be achieved and maintained.

In actual practice, the team may be moved to an infant by one of several methods. When hospitals or other outlying sources call the special MAST number and wish to transport an infant, they are referred directly to the Chapel Hill pediatric admitting resident, who, after receiving an explanation of the circumstances, makes a decision, as to whether or not the infant's condition warrants transport and the services of the team. If the decision is that the team is required, the resident speaks immediately to the senior respiratory therapist on call for just such an emergency, he or she, in turn, contacts the premature intensive care nursery to request the nurse team member. Meanwhile, the pediatric admitting hospital resident has assigned a pediatric

# system effective

south by aircraft, the incubator is left in Chapel Hill and the infant stabilized in one of the AIR-VAC transport incubators assigned to the referral hospitals. When the MAST helicopter arrives, it replaces the hospital's unit with its own, transports the team and its patient to Chapel Hill, and picks up the clean, ready-to-use unit left there. If the referring hospital has no unit, the team uses the MAST unit and replaces it. In this way, getting an incubator to the patient location does not become a complicating matter of locating and stopping for a unit. The incubators and cardiac monitor used in the MAST exchange program were purchased by the N.C. Office of EMS and are on loan to the Army and four hospitals.

respect. Air pressure also presents a problem for infants in the non-pressurized cabins of helicopters. Consequently, all MAST pilots fly at just 2,000 feet or less when the team is aboard with a patient.

The number of high-risk infants referred to North Carolina Memorial Hospital has increased dramatically with the implementation of the transport program, but team members have not experienced an infant death during transport in the last year. Steinbach reports that, unofficially, team transports have helped reduce the mortality rate of all high-risk infants referred to the North Carolina Memorial Hospital down to approximately 17% in the year they have been in operation.

# MAST INFANT TRANSPORT

The role of the respiratory therapist in the Chapel Hill infant transport team is an important one—highly important, according to Bruce Steinbach, a frequent team member. The therapist is first responsible for organizing the physical aspects of the transport. Second, he or she is primarily responsible for maintaining oxygenation of the infant before and during transport. This may require maintaining a patent airway which includes the use of endotracheal tubes, setting up appropriate ventilation parameters or putting the infant on CPFB; in short, managing the respiratory aspects of the patient. The respiratory therapist and premature intensive care nurse work together in suctioning the patient's airway and providing other life support procedures. The nurse is also responsible for the general assessment of the infant, glucose testing, IV fluid administration and drug therapy as prescribed by the physician.

The respiratory therapy administered is somewhat different than that given in

A survey of the whole MAST program was conducted in 1975 by Stephen Acari and Dr. Herbert J. Proctor, Head, Trauma Department, North Carolina Memorial Hospital, and Clinical Director for NC OEMS, and reported in the November, 1975 issue of the Journal of the American College of Emergency Physicians. They found that, at the time of the survey, the year-old MAST program was being readily accepted by physicians and its use was almost universally appropriate. Although they reported that the mortality rate seemed unaffected by the program, there was a reduction in overall morbidity of 38% of cases evacuated, most often in conjunction with cardiac problems, improved medical training, better monitoring equipment, faster response time, better preparation of the patient prior to evacuation, and referral of patients to closer hospitals were cited as factors that might lead to improved patient care. The survey also indicated that patients would benefit if hospitals had

ventions, and high-risk infants; and evacuation of patients from remote or inaccessible areas of the state where ground transport is not feasible.

The North Carolina MAST program is supported by the U.S. Army, 18th Airborne Corps, Lt. Gen. Henry B. Emerson, Commander at Fort Bragg near the center of the state. The helicopters operate within a 100-mile nautical radius of Fort Bragg, encompassing eighty-nine community hospitals. If the transferring hospital is located outside of the operating radius, one of the state's 427 ambulance providers who have a steadily growing number of employees trained as Emergency Medical Technicians, can bring a patient with in reach of the MAST program. From its official inception in November, 1973, through the summer of 1976, MAST has flown some 550 missions.

In the original state EMS plan utilizing MAST, five hospitals at the periphery of the operation area were designated as major receiving hospitals: Baptist Hospital, Winston-Salem; New Hanover Hospital, Winston-Salem; New Hanover Hospital, Chapel Hill; Duke University Medical Center, Durham; and Charlotte Memorial Hospital, Charlotte. To request MAST service, hospitals within the 100-mile radius call a central number for the MAST coordinating physician at North Carolina Memorial Hospital. The medical aspects of the case are reviewed between the transferring physician and the MAST coordinating physician and if air transport is deemed necessary, the Army is brought in on the call and helicopter dispatch arrangements made immediately. Once in the air, helicopter teams can communicate with the five major receiving hospitals via radio in addition to six other hospitals.

The special program in infant transport emerged from independent sources, but meshes well with the overall MAST effort. As state planning for MAST was being finalized under the direction of Stephen A. Acai, Jr., Assistant Chief for Transportation of the North Carolina Department of Human Resources Office of Emergency Medical Services, Dr. Ernest Kraybill, Director of Neonatal Services at North Carolina Memorial Hospital in Chapel Hill, and R. Bruce Steinbach, Director of Respiratory Therapy at the same hospital, were forming a

house officer to the effort, and all are ready to move within 30 minutes. The admitting resident and respiratory therapist have also made a decision as to whether to transport by land or air. The team's land radius is between 71 and 75 miles. Approximately 70% of all referrals, some 400-500 in the last year, come from inside this radius.

In cases of land transport, the team is picked up by a contracted ambulance service and rushed to the scene. When the emergency occurs beyond the land radius to the north, a MAST helicopter transports the team to and from the scene. When it is to the south, the team is dispatched in a University twin engine plane, meets the MAST helicopter at the scene, and is transported back in it along with the pa-

the hospital, primarily because of equipment availability, but also as a result of the fact that team members are practicing in a moving vehicle that may be 2,000 feet in the air.

Says Steinbach, "If we are on an air-lift, we do not have the capability to administer the varying FIO<sub>2</sub>'s with our ventilation equipment. We're pretty much bound to the 21%, 50%, 100% FIO<sub>2</sub>, and must use a pressure cycled rather than a volume cycled ventilator which the pediatrician is probably much more familiar with. All ventilation and CPPB techniques are performed by endotracheal tube rather than nasal cannula or molded nasal mask because of stability. And cardiac monitoring is difficult because of high noise and vibration levels, thus we have to use a special

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voice communication with helicopters, and that the infant transport equipment was inadequate. As a result, eleven hospitals were equipped with aviation radios purchased by NC OMEs and the five infant transport AIR-VAC incubators were purchased. The units are mounted on collapsible stands and are easily clamped to stretcher mounts in conventional ambulance vehicles. Each is complete with battery pack and its own heat and humidity system as well as a self-contained oxygen supply.

While the MAST program and the special Chapel Hill infant transport phase have been compiling good records, the public has been simultaneously informed of their existence and those records. Steinbach and other members of the infant transport team have appeared on television to inform the North Carolina public about the increased appearance of military helicopters and to gain further support for the regional EMS councils and their goals, and to aid a statewide educational effort on prenatal health care.

Looking ahead, Steinbach and others primarily responsible for the operation of the infant transport effort see room for improvement in their system and also feel that they can make recommendations to those contemplating or planning similar programs within the state.

In addition to existing EMS ambulance regulations, they would like to see regulations requiring installation of specific types of equipment, for instance piped-in oxygen and air, in all vehicles used for transportation of high-risk infants. Otherwise, they feel that personnel not highly trained and unaware of the physiological effects which may be induced in premises with high FIO<sub>2</sub> might be inclined to turn oxygen up full in incubators. They would also like to see guidelines for adequate and dependable equipment for monitoring of infants, especially cardiac and thermal status, in both ground and air vehicles. And they would welcome more training in infant care as part of EMT training, since it is different from that required for adults.

Concludes Steinbach, "We feel that if transport facilities are inadequate, without proper oxygen administering equipment, heating and monitoring equipment, and properly trained transport personnel, the high-risk infant might be better off in the referring hospital."

# MAST Is Saving Lives

By BONITA M. OGILVIE

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Northeastern New York, Vermont, and northwestern New Hampshire encompass a rugged, mountainous area. Snow and ice-covered roads in the wintertime can make driving extremely dangerous. Hospitals and rescue squads that are miles apart make the saving of lives of accident victims and the critically ill difficult. But thanks to MAST, the precious time element that is so important in saving lives in an emergency has been decreased.

MAST is an acronym for Military Assistance to Safety and Traffic—a program in which military helicopters speed the ill and injured to distant hospitals.

Started as a pilot program at three Army and two Air Force sites early in 1970, MAST programs are now in operation at 23 military bases in the United States, mostly in southern and western states. The program came to our area in 1974 when a MAST program was approved for the 39th Aerospace Rescue and Recovery Wing at Plattsburgh Air Force Base, New York—the only MAST program in the northeastern part of the nation.

## Military-Civilian Cooperation Essential

Military equipment and trained military personnel are, of course, the main components of any MAST program. But the active support of the civilian communities to be served by a MAST program is extremely important. It's more than that; it's a *requirement* before any MAST program is approved for implementation by the Secretary of Defense—as we learned at our first orientation meeting in 1972, a meeting attended by area doctors, nurses, hospital administrators, ambulance and rescue attendants and local government leaders, including all local civil defense directors.

After this first meeting, we formed a North County Committee for the Coordination of Emergency Health Services—a steering committee to prepare the MAST application, lay out a plan of operation, obtain any needed equipment not normally provided by the military to Plattsburgh Air Base, and to work closely with the military in the entire MAST program.

In addition to the hours of work preparing the application to justify a MAST program for our area, members of the steering committee and other dedicated volunteers worked hard to obtain extra equipment needed for civilian missions—equipment not provided by the Defense Department for regular military missions. For example, from local donations we were able to buy a paging system for alerting off-duty MAST crew members of a mission. (The Rescue Detachment at Plattsburgh Air Force Base does not have enough personnel to handle on-base duty around-the-clock; thus the need for a paging system for the alert crews.) The committee also was able to buy a transport isolette for the transportation of critically ill infants, thanks to a generous donation from the Lockformer Foundation.

## Equipment Also is Donated

Not all donations were money. Many were in the form of equipment, such as radios for communications between the helicopters and local State police, rescue squads, and hospitals. Other donations included a Greene Splint System for persons with back or neck injuries; a portable suction unit that can be used for either adults or infants; miscellaneous monitoring equipment for infants; telethermometer for premature infants; cardio beepers; and an ultrasonic blood pressure manitor.

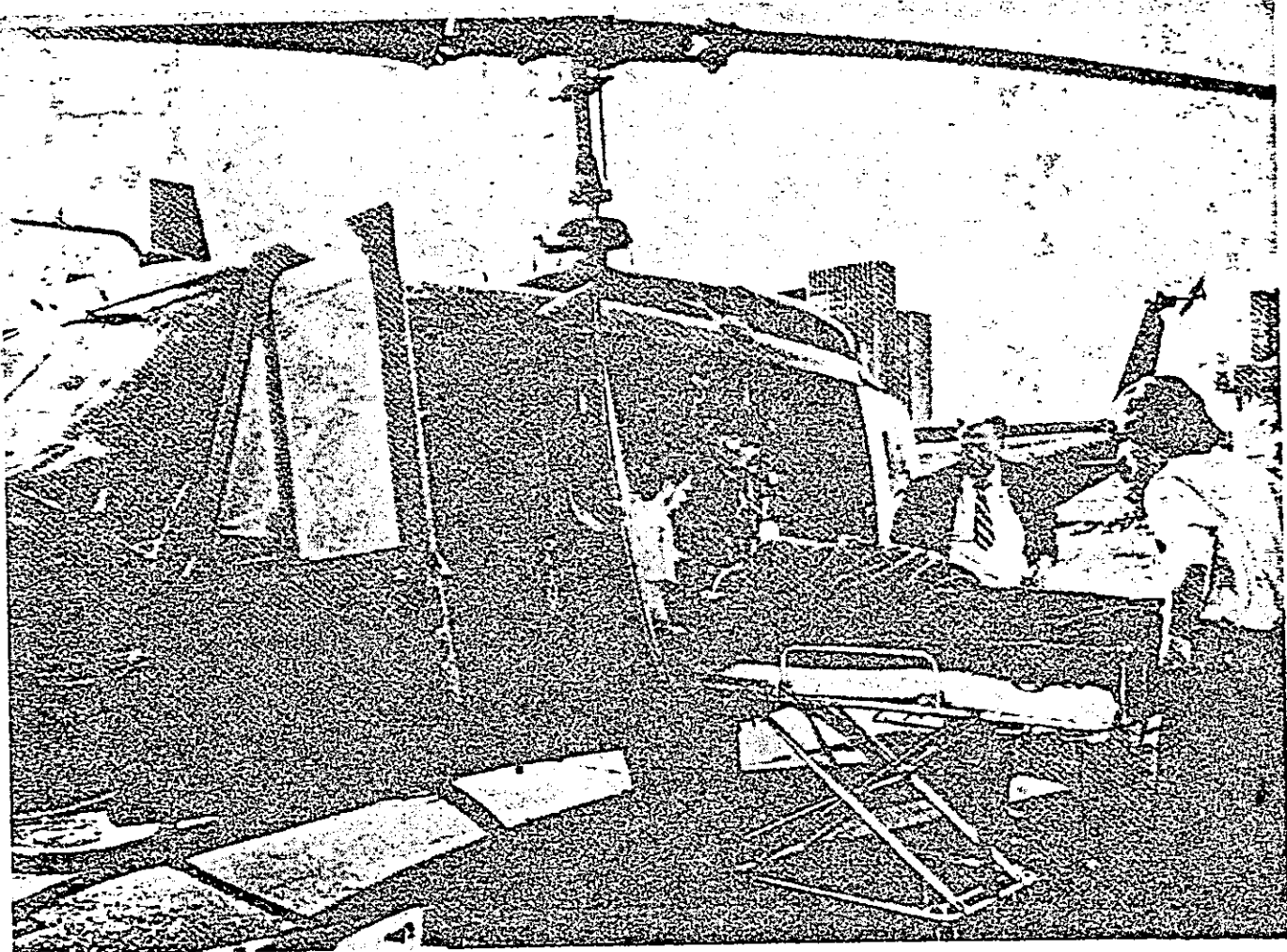
This equipment, valued at approximately \$7,500, is owned by the committee and housed with the Air Rescue Detachment.

In addition to the specialized equipment, hospitals in the area cooperated by providing helicopter landing sites near their emergency entrances. The hospitals also were required to sign an agreement stating that, in addition to the helipad, they would provide adequate site identification, especially at night, a wind indicator close to the helipad, adequate fire protection, and security.

The MAST resources available from Plattsburgh Air Force Base include two helicopters, each of which can handle three litter patients and two ambulatory patients in addition to the crew. The helicopters are equipped with a rescue hoist, cargo sling, searchlights, and other features which make them excellent rescue vehicles. They can handle missions within a 100-mile radius of Plattsburgh Air Force Base without refueling.

A MAST helicopter crew normally consists of a pilot, co-pilot, flight mechanic, and a pararescue recovery specialist. The pilots, most of whom served in Southeast Asia, are train specially for rescue missions. Flight mechanics are proficient operating the rescue hoist, deploying smoke-marker devices, and cargo sling hook-up. The pararescue recovery specialist are extensively trained in parachuting, scuba diving, mountain climbing and in all climatic conditions, and emergency medical treatment. Each pararescue recovery specialist receives well over 600 hours of medical training, and each year receives 160 hours of additional and refresher training to continue his assignment. In addition, pararescue recovery specialists at the Plattsburgh Air Force Base receive specialized training in the care of premature infants at Montreal Childrens Hospital in Canada (a large percentage of the premature infant transfers are to this hospital) and at the Medical Center Hospital of Vermont.

A number of lives have been saved as a result of our MAST program, and many of these involve children. Early this year, for example, a child was born in the Malone, New York, hospital with a diaphragmatic hernia and Respiratory Distress Syndrome. Her doctor gave her a one-in-ten chance of living if she made it to the Neo Natal In-



U.S. Army photo

tensive Care Unit at Montreal Childrens Hospital. Thanks to our MAST helicopter and crew, the baby was in surgery in Montreal within two hours of birth to correct the problems.

In another transfer from Saranac Lake, the MAST helicopter transported a woman who had had four previous pregnancies with no living children. She was transferred by helicopter in the early stage of labor to the Medical Center Hospital of Vermont for Caesarean Section, where the baby might be born and immediately be put in the High Risk Neo Natal Care Unit for specialized care. After five

tries, the parents are very proud of their healthy "rotor baby."

In less than two years of operation, our MAST program at Plattsburgh Air Force Base carried out 184 emergency missions, involving 199 patients. Throughout the United States, the 23 MAST units have flown more than 7,800 emergency missions, involving more than 8,250 patients.

Thousands of Americans owe their lives today to the MAST program—a living example of how military and civilian talents can be combined to help people overcome emergencies.

*Credit: Department of Defense*

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