

Chapter 17

AEROMEDICAL ASPECTS OF THE AEROSPACE RESCUE AND RECOVERY SERVICE

The Aerospace Rescue and Recovery Service, a subordinate of the Military Airlift Command, is charged with the responsibility to search, locate, afford medical or survival aid, and recover distressed persons or predetermined valuable space hardware on a worldwide basis. Operating from approximately 90 locations throughout the world, the Aerospace Rescue and Recovery Service maintains a daily alert of various highly skilled rescue specialists who meet this challenge. The local flight surgeons who afford medical support to tenant Aerospace Rescue and Recovery Service units have played an important part in many successful rescue missions.

History of Rescue in the Air Force

The need for an organized rescue effort was recognized in the Battle of Britain during World War II, when it was evident that many "downed" fliers could be retrieved from the English Channel with boats and seaplanes using systematic communications, search, location, and recovery techniques. US Forces formed several Air Rescue Squadrons whose primary mission was to save lives and thus minimize the loss of expensively trained professional aircrewmembers. The need for the conservation of specialized manpower, which was, and has continued to be, a subject of prime importance, and the morale and confidence boosts gained by aircrews through knowledge of the rescue effort, stimulated the continuation and expansion of this program.

These squadrons were trained to perform aerial and surface rescue operations in all areas of the world and under all climatic conditions. They were originally placed

under the control of the respective theater commander, to be employed in support of a rescue mission as he directed. The termination of hostilities in World War II gradually brought all of these rescue forces into a unified Air Rescue Service, which was a subordinate command of the Military Air Transport Service.

Further expansion of the rescue mission by the helicopter and longer range fixed-wing search aircraft gradually occurred. The need for trained combat aircrew recovery units, using specialized equipment, techniques, and aircraft, grew from experiences in Korea and Vietnam. The requirement to afford contingency recovery support for our manned space program and primary recovery responsibility for many unmanned and hardware recovery space missions, dictated a need for greater proficiency in all areas. Extensive familiarity with specialized tracking equipment, spacecraft egress systems, toxicity of rocket propellants, and techniques for the aerial delivery and installation of space capsule flotation collars became mandatory. The acquisition of this expanded mission responsibility led to the new designation, Aerospace Rescue and Recovery Service.

Organization

The Aerospace Rescue and Recovery Service is structured from a command headquarters through five Aerospace Rescue and Recovery Centers to Aerospace Rescue and Recovery Squadrons and Local Base Rescue Detachments. The headquarters of Aerospace Rescue and Recovery Service exercises command jurisdiction, administrative supervision, and technical control of all field rescue

activities. It represents the standardization authority for rescue and recovery procedures, insuring that these procedures are accomplished in the same manner on a worldwide basis. It also maintains direct control of four rescue squadrons affording a capability for immediate operational response and mission flexibility.

The Aerospace Rescue and Recovery Center represents an extension of the headquarters that exercises direct supervision and control of rescue and recovery operations within a specific geographic area. An elaborate communication network enables the Center to control and coordinate an effective and rapid search and rescue mission, using not only the forces of the Aerospace Rescue and Recovery Service, but also those of the US Coast Guard, Army, Navy, Marine Corps or Civil Air Patrol, and, on occasion, those of other nations.

The Aerospace Rescue and Recovery Squadron is the workhorse for the worldwide search, locate and rescue mission. Equipped with long-range, fixed-wing aircraft, it also provides the contingency landing area coverage for the manned space program. The Local Base Rescue (LBR) units are detachments of the Aerospace Rescue and Recovery Centers. They are equipped with rotary-wing aircraft and are strategically located at both CONUS and oversea air bases to provide prompt short-range rescue and recovery of personnel involved in aircraft/missile accidents or incidents, and to participate in medical evacuation and civilian disaster support missions. Additionally, they provide an emergency fire suppression crash rescue capability by using an air transportable fire suppression kit and expeditious use of helicopter rotor downwash. Operational control of the LBR is retained by the local base commander (see figure 17-1).

Equipment

Any portion of the worldwide military or civilian communication network may be used for the notification and coordination of rescue missions. A variety of aircraft are available to support a rescue effort ranging

from long-range, fixed-wing search planes through fixed-wing amphibians to both intermediate and short-range helicopters. The addition of surface-to-air and air-to-air retrieval systems to the fixed-wing aircraft and the mid-air refueling capability to the helicopter will extend rescue and recovery potential to all areas of the world.

Pararescue

The Aerospace Rescue and Recovery Service pararescueman is a vigorous, highly motivated, rescue specialist, trained to enter any disaster area, regardless of location, by the most practical method, using parachute, surface or helicopter transport. He is a precision parachutist, qualified SCUBA diver (equipped to parachute with SCUBA into any body of water), survival specialist, and emergency medical care technician, and is proficient in current techniques for spacecraft and combat aircrew recovery. The pararescueman exists primarily to deliver competent, semiprofessional emergency medical care and survival knowledge to distressed persons in any geographic location. He has been required to provide this care for up to 48 hours, when immediate casualty evacuation was not practical. Through direct radio communication he can represent an extension of a physician's hands to render aid at a remote disaster site.

Operation of a Rescue Mission

Alert. If a communications search is being made or a distress transmission is received by an appropriate flight-following agency, normally, the Aerospace Rescue and Recovery Service is notified. When the result of this communications search is negative, the flight-following agency declares the aircraft overdue.

Search. Upon receipt of a distress transmission or "May Day," the closest rescue aircraft are immediately launched to intercept the position of the distressed aircraft. Following receipt of an "overdue aircraft" message, the Aerospace Rescue and Recovery Service unit involved initiates action to conduct an extended communications search by contacting all facilities not served by normal

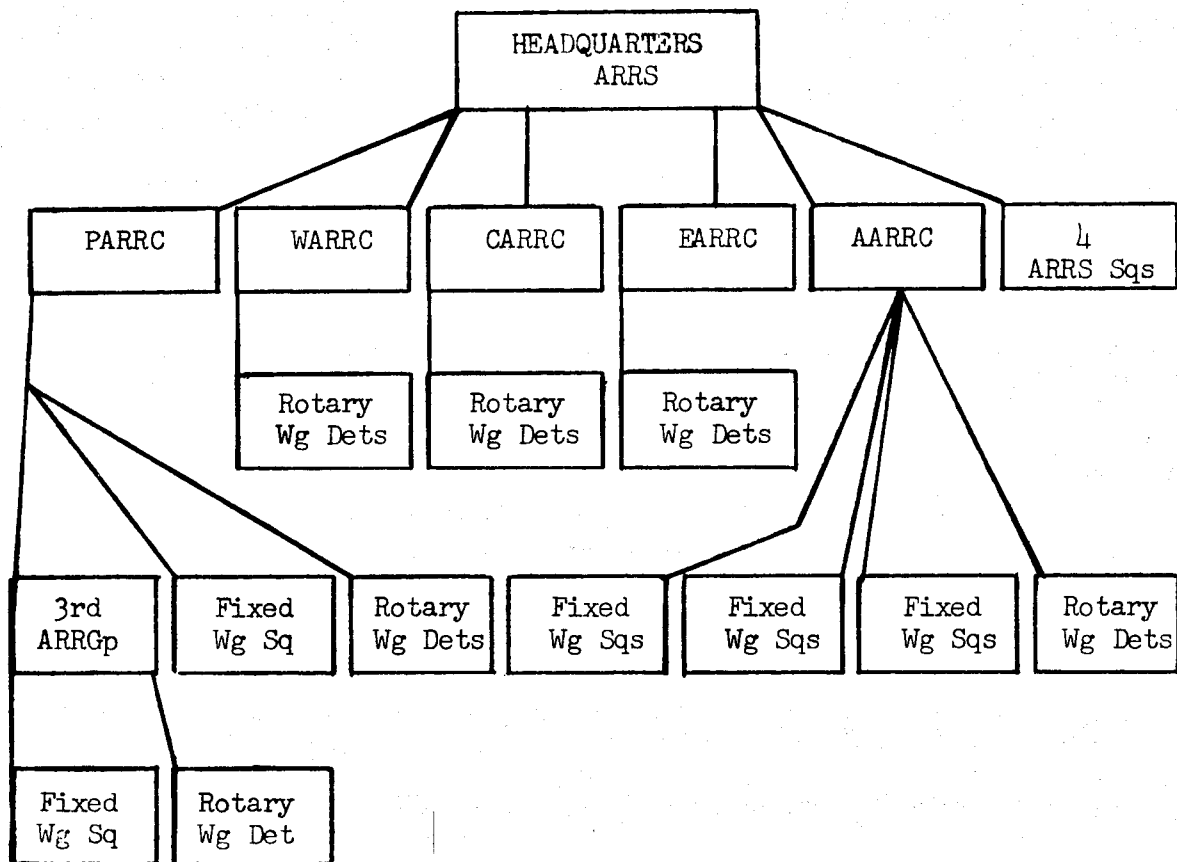


Figure 17-1. ARRS Organizational Structure.

flight service or Federal Aviation Administration (FAA) communications systems. An aircraft is declared missing when the result of this extended communications search is negative and predicted fuel exhaustion time is reached. When the aircraft is reported as "missing" or is known to have crashed, rescue aircraft are dispatched to search the most probable area. The rescue mission commander will assign individual search areas to the Rescue Crew Commander (RCC) of each aircraft participating in the mission.

Rescue. Once the disaster site is located, the commander of the first arriving rescue aircraft becomes the On-Scene Mission Commander. He will determine how the rescue will be effected, using his extensive rescue knowledge and training background. Access time, remoteness or hostility of the disaster

site, area resources available, and the existence of survivors will guide his decision to deploy pararescue, helicopter or surface recovery forces.

Flight Surgeon's Role and Responsibilities in the ARRS Mission

Each member of a rescue aircrew is a highly trained professional in his individual job. Rescue or recovery missions that may require professional medical care or advice necessitate that the local Flight Surgeon become an integral part of the rescue team. His assessment of the medical urgency of a particular situation for the rescue unit commander often will determine the need for or type of mission to be conducted.

One rated Flight Surgeon, who is also a qualified paraphysician on parachute status, is assigned to Headquarters, Aerospace

Rescue and Recovery Service. In addition to supervising an Aerospace Medicine Program for all rescue personnel, he is responsible for the various medical training programs and the standardization and development of medical equipment and techniques used by Aerospace Rescue and Recovery Service pararescuemen.

The local base Flight Surgeon or Flight Medical Officer assigned to support a rescue unit is requested to insure that his rescue personnel (aircrew and maintenance alike) are proficient in first aid and are knowledgeable in the pertinent aspects of preventive medicine, occupational health, and field sanitation. In addition, he is called upon to conduct continuing medical training for the pararescuemen on a recurring basis. The following is an abbreviated outline of the emergency medical care instruction required:

PARARESCUE MEDICAL TRAINING

- I. Recognition and Treatment of Respiratory Distress
 - A. Signs and symptoms
 - B. Treatment emphasizing resuscitative procedures
 - C. Special considerations—the various chest injuries
- II. Shock
 - A. Types
 - B. Symptoms and clinical signs
 - C. Principles for general and specific therapy
 1. Venipuncture technique
 2. Fundamentals of fluid replacement
 3. Adjunctive drug therapy—vasopressor
- III. Control of Hemorrhage and General Principles of Wound Care
 - A. Methods for hemorrhage control
 - B. Wound care
 1. Basic debridement procedures
 2. Aseptic technique under field conditions
 3. Suture techniques
 4. Management of the contaminated wound
 - C. Drug therapy consideration
 1. Antitoxin and toxoid usage
 2. Antibiotics
- IV. Thermal Injury
 - A. Burns
 1. Identification of types and degree
 2. Rule of Nines
 3. Therapy
 - a. Shock
 - b. Suppression of contamination
 - c. Fluid replacement—Brooke Army Hospital Formula
 - d. Principles for administration of sedation, analgesia, and antibiotics
 - B. Cold injury
 1. Types
 2. Therapy
- V. Fractures
 - A. Identification of various clinical types
 - B. Therapy
 1. Principles and methods of immobilization
 2. Care of the compound fracture
 3. Management of the traumatic amputation
- VI. Head Injuries
 - A. Diagnosis
 - B. General guidelines for initial clinical management
 1. Need for continuous record of patient's condition
 2. Airway procedures
 3. Principles governing judicious use of sedation and analgesia
 4. Indications for use of systemic antibiotics
 - C. Signs and symptoms of increasing intracranial pressure
- VII. Spinal Injuries
 - A. Diagnosis
 - B. Proper methods of patient transport
 - C. Principles governing use of sedation and analgesia
 - D. Problem of urinary retention and procedure for urethral catheterization
- VIII. Ocular Injuries
 - A. Guides for assessment of injury
 - B. Emergency therapy

IX. Basic Principles for the Management of an Uncomplicated Obstetrical Delivery

This curriculum is designed to give the pararescueman a complete medical training review in each 12 calendar-month period. A minimum of 24 formal training hours should be allocated for its completion. The outline may be divided to assign 4 hours every 2 consecutive months for the completion of each of the first five sections (I through V). The remaining sections (VI through IX) may be combined in the 4-hour period allocated to the final 2-month interval.

The comprehensive pararescue medical training guideline is published in Air Rescue and Recovery Service Manual (ARRSM) 55-1. Also, a complete listing of all medical equipment contained in the pararescue medical/jump kit is specified in ARRSR 167-1. Through close contact with the pararescueman and his local rescue unit's operation, the Flight Surgeon can make full and better use of the Aerospace Rescue and Recovery Service medical and rescue capability—"That Others May Live."

AEROMEDICAL ASPECTS OF SURVIVAL

The survival training and personal equipment familiarization programs of the Air Force must represent more than an academic exercise in selfpreservation to the physician. Naturally, the personal benefit derived from any survival training program is a positive psychologic background of security and self-confidence. The Flight Surgeon and other aircrewmembers who, through training experiences, have been afforded exposure to many of the problems of a simulated survival situation, become mentally confident that they will be able to overcome these problems and survive. However, the Flight Surgeon and other Air Force medical officers should have a deeper interest in the survival training and personal equipment familiarization and development programs. The physician must insure that his unit aircrew are knowledgeable and proficient in first aid and capable of caring for themselves and other sur-

vivors. The aircrewman must also be familiar with the basic principles of survival medicine if he is to make the utmost use of survival kit items and thus protect his own well-being. Minor illnesses may become major problems in a survival situation.

Achievement of the proper psychological attitude for survival is probably the most important single factor. A person's fear and anxiety may be the greatest hazard in a survival situation. Fear will destroy man's ability to cope with problems in an intelligent manner. Those who make an emergency descent into strange terrain usually experience some "mental shock" or confusion which is the resultant of fear of the unknown, indecision, the experience of initial bailout, and the inability to organize a sensible plan of action. If a combat or hostile environment exists, this confusion state is usually magnified. Persons who, in the past, have been exposed to simulated survival situations, will rally in a short time. Those who have not been prepared will react slowly and in a disorganized manner, and are likely to jeopardize their prospects for survival and rescue.

Precautionary Survival Procedures

Survival kits and equipment must be appropriate for the area of mission operation (climate, geography). They must be readily available to flying personnel and they must be checked daily and inspected at scheduled intervals to make certain that individual items are not missing. Survival kits not worn on the person must be properly stowed aboard the aircraft. They should be secured in a manner that will permit rapid availability and removal. In large aircraft, they should be distributed in several locations.

Where possible, clothing, shoes, and equipment appropriate to ground survival in the area should be worn in flight. In flights over arctic areas, the wearing of heavy clothing necessitates keeping the interior of the aircraft sufficiently cool to avoid perspiration and overheating. Under some circumstances, as when the full pressure suit is worn or when flight missions are over both hot and

cold temperature extremes, clothing appropriate for ground conditions cannot be worn. In these cases, supplemental clothing should be carried in survival kits.

Flying personnel should be trained in the use of their survival equipment as applicable to the areas covered by their missions. A single briefing is not satisfactory. Demonstration to and active participation by aircrew personnel in the use of all items of personal equipment are highly recommended. Participation by flying personnel in water, arctic, jungle, and desert survival training at schools conducted by the Air Force and the various commands is a highly desirable goal. Applicable training films are listed in AFM 64-5. In addition to normal preflight briefing on the availability and use of survival equipment, the Flight Surgeon, working with the unit survival training and equipment officer, should monitor and participate in periodic realistic refresher survival training to ascertain whether the training and equipment are adequate for the unit mission.

Personal Equipment

Frequent visits to the personal equipment section will afford the Flight Surgeon firsthand knowledge of all survival and personal equipment items available to his aircrews. He should review the various medical items contained in the kits to insure that they are adequate and timely for current mission support. Only when the Flight Surgeon is familiar with the survival and personal equipment needs of his aircrews can he intelligently initiate requests for the deletion of unnecessary items or the development of more compact and effective products.

AFSC System Program Office (SPO), Life Support System 412A

The AFSC System Program Office (SPO), for Life Support System (LSS) 412A, at Wright-Patterson AFB, Ohio, was established to meet the requirements of Specific Operational Requirement (SOR) 218 for a life support system, dated 28 August 1964. This Life Support SPO has assumed the functions of the former USAF Personal

Equipment Advisory Group (PEAG) as a developer and monitor of personal and survival equipment.

The Life Support SPO is a centralized agency responsible for the development, standardization and integration of skills and techniques required to equip aircrews with the best possible functional and emergency/survival equipment. The objective is to enable the aircrewman to become a part of his weapon, to remain functional in its environment, and to sustain himself in an emergency/survival situation in any global environment.

The fields of survival and personal equipment are so broad and varied that additional reading is mandatory for their complete treatment. Principles for survival, current techniques, and the proper use of all available survival equipment are most effectively discussed in AFM 64-5. The subject of survival education is well stated in AFM 64-3, and there is a detailed account of available personal equipment for all types of aircraft and mission support in AFM 64-4. Most Flight Surgeons read and digest AFM 64-5 several times. It is interesting, informative, well-written, and, most of all, contains information and ideas on the essentials for selfpreservation.

REFERENCES

The reader should insure the currency of listed references.

Armstrong, H. G., *Escape, Survival and Rescue*, Chapter 20, *Aerospace Medicine*, Baltimore, Williams and Wilkins Co. (1961).

AFM 2-36, *Search, Rescue, and Recovery Operations*.

AFM 64-2, *National Search and Rescue Manual*.

AFM 64-3, *Survival—Training Edition*.

AFM 64-4, *Handbook of Personal Equipment*.

AFM 64-5, *Survival*.

AFM 64-6, *Aircraft Emergency Procedures Over Water*.

AFM 64-15, *Survival Uses of the Parachute*.
 AFR 23-19, *Aerospace Rescue and Recovery Service (ARRS)*.

*ARRSM 55-1, *Aerospace Rescue and Recovery Service Operations Manual*.

ARRSR 167-1, *Medical/Jump Kit for Pararescue Personnel*.

Arctic, Desert, Tropic Information Center Publications:

A-107 *Man in the Arctic—The Changing Nature of His Quest for Food and Water as Related to Snow, Ice, and Permafrost*.

D-100 *Afoot in the Desert*.

D-102 *Sun-Sand and Survival—An Analysis of Desert Survival Experiences During WW II*.

D-104 *The Desert Survival Field Test*.

G-104 *Airmen Against the Sea—An Analysis of Sea Survival Experiences*.

G-105 *Analysis of Survival Equipment*.

G-107 *Water Survival Field Tests*.

* Not available through HQ USAF PDOs.

G-110 *Annotated Bibliography of Survival, Series 1*.

G-110A *Annotated Bibliography of Survival, Series 2*.

G-110B *Annotated Bibliography of Survival, Series 3*.

G-110C *Annotated Bibliography of Survival, Series 4*.

G-111 *Survival on Film*.

G-112 *Cold and Wet—Estimated Survival Time in Global Waters*.

T-100 *999 Survived—An Analysis of Survival Experiences in the Southwest Pacific*.

T-101 *The Jungle Survival Field Test*.

Information Bulletins:

1 *Sharks*.

2 *Poisonous Snakes of North America*.

3 *Poisonous Snakes of Central and South America*.

4 *Poisonous Snakes of Europe, Africa, and Near East*.

5 *Poisonous Snakes of Southeastern Asia*.

6 *Poisonous Snakes of Australia, New Guinea, and the Pacific Islands*.

