

# Fire and Aviation

USDA Forest Service

• Technology and Development Program •

5100 Fire, 5700 Aviation



*Dick Mangan,  
Fire and Aviation Program Leader*

Dick has been Program Leader for Fire, Aviation, and Residues at MTDC since 1989. Before coming to the center, he spent more than 20 years working on Ranger Districts and National Forests in Oregon and Washington, participating in the full range of wildland fire activities. He serves on the National Wildfire Coordinating Group (NWCG) Fire Equipment and Safety and Health Working Teams and is chairperson of the National Fire Protection Association (NFPA) 1977 Technical Committee for Wildland Fire Personal Protective Clothing and Equipment. Dick remains active in the field, representing MTDC on fire entrapment investigations and serving as Operations Section Chief on a National Type 1 Overhead Team.

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## Technical Services— Fire and Aviation Management

Technical services provided by MTDC's Fire and Aviation Management Program are used to transfer information and technology from specialists to the field units. MTDC personnel stay current on technologies and issues that affect the wildland firefighting

community through their involvement in groups such as the National Fire Protection Association (NFPA), National Wildfire Coordinating Group, and National Fire Equipment Systems (NFES) committee. By maintaining a close relationship with workers in the field—those folks in the yellow shirts—MTDC anticipates new needs, enabling the Forest Service to provide a safer, more productive work environment.



*Dick Mangan (left) provides technical services in many field settings.*

## National Wildfire Coordinating Group

The National Wildfire Coordinating Group (NWCG) is an organization whose membership includes the National Association of State Foresters, National Fire Protection Association, the U.S. Fire Administration, and all Federal agencies responsible for wildland fire management. NWCG provides national



coordination for training techniques and the latest technologies affecting fire management. Specific areas of concern are handled by working teams and subcommittees comprised of experts from across the country. MTDC fire management personnel serve as advisors to several teams, including the Fire Equipment Working Team (FEWT), the Safety and Health Working Team (SHWT), and the National Fire Equipment System (NFES) Subcommittee. Center Specialists offer expert technical advice to these groups and often work on specific projects assigned by them. Recent projects in which MTDC fire management personnel have played a major part include:

- Maintenance of the national fire entrapment data base
- Review of the 100-person first aid kit stocked by the fire caches
- Leadership in the continuing study of the Health Hazards of Smoke.

## General Services Administration

The Fire Program at MTDC coordinates with the General Services Administration to provide quality wildland firefighting equipment at a reasonable cost. The specifications and drawings for many items are produced at MTDC, then sent to GSA, where large numbers are procured under contract. Articles produced during the first production run are carefully inspected by MTDC technicians before GSA stocks contractors' fire equipment.



*Close inspection of the fire shelter provides clues of temperature ranges experienced during an entrapment.*

## Fire Entrapment Investigations

MTDC Fire Program personnel are often involved with onsite investigations when fire entrapments occur. They collect tools, personal protective equipment, and other personal effects. In addition, they record extensive photographic evidence. Many times these examinations lead not only to improvements in equipment, but also give insights into the effectiveness of firefighter training and the actions firefighters take when faced with life-threatening incidents. In 1995, MTDC published a technical report on investigations, *Investigating Wildland Fire Entrapments* (9551-2845-MTDC).

## Vehicle Entrapment Studies

For many years, wildland firefighters have debated what to do when entrapped with a vehicle (engine, tender, pickup, sedan): is it best to "ride it out" in the vehicle, or abandon the vehicle and get into a fire shelter? There have been lots of gut-feeling responses, and some real-life experience on both sides of this question, but little hard data to compare conditions under similar situations. MTDC has conducted a study to quantify what really happens—inside the cab of a vehicle and inside a fire shelter—when a burnover occurs. The study was conducted in cooperation with the Florida Division of Forestry, the Montana Depart-



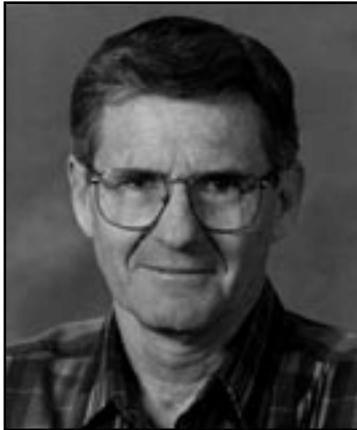
*These vehicle entrapment tests in Dillon, MT, provided field comparisons of the effects of heat on fire shelters and engines.*

ment of Natural Resources and Conservation, the Beaverhead National Forest, and the Los Angeles County Fire Department.

The study measured radiated heat and maximum temperatures inside a variety of vehicles. The vehicles, which were no longer in use, were

subjected to direct flame and were burned over in conjunction with prescribed burns. Data were collected from three field tests around the country in several fuel types. Several fire shelters and shelter prototypes were outfitted with instrumentation and set up adjacent to the vehicles. Gases

collected from selected vehicles and fire shelters were analyzed. In 1997, MTDC published a technical report documenting this project, *Comparing Conditions Inside Vehicles and Fire Shelters During Fire Entrapments* (9751-2817-MTDC). 



Brian Sharkey

Brian Sharkey completed a Ph.D. in exercise physiology at the University of Maryland before coming west to join the faculty of the University of Montana and begin a long association with MTDC. His work for the Forest Service has included research and development on fitness tests and programs, heat stress, hydration, nutrition, protective clothing, tools, work/rest cycles, employee health (wellness), and more.

A researcher, author of several books, and past president of the American College of Sports Medicine, Dr. Sharkey practices what he preaches, participating regularly in running, mountain biking, cross-country skiing, backpacking, canoeing, and other pursuits. His work has recently been honored with a USDA Distinguished Service Award, and a Forest Service Technology Transfer Award.

## Job-Related Work Capacity Tests

In response to a need for a work capacity test that reflected the physical demands of wildland fire-fighting, Dr. Sharkey and MTDC began a process to replace the Step Test with something more suitable, that would be just as easy to administer throughout the nation. The result is a new job-related work capacity test, the Pack Test. It has received extensive laboratory and field testing and is being recommended for adoption in 1998.

## Fitness and Work Capacity

*Fitness and Work Capacity* (9751-2814-MTDC), a booklet published by MTDC in 1977 under the direction of Dr. Sharkey, was intended to provide employees with the information they needed to maintain the level of physical fitness required by wildland workers. The publication has been

updated with the latest fitness and work performance information, and incorporates many of Dr. Sharkey's other publications, giving firefighters and other employees an easy-to-use reference tool.

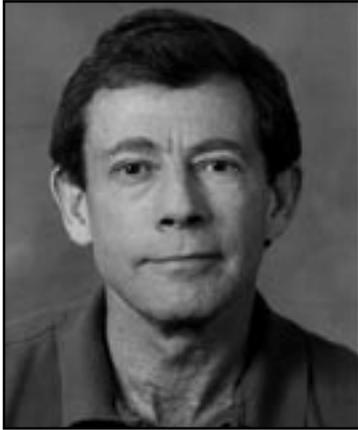
## Health Hazards of Smoke

Dr. Sharkey's role in this long-term study has been to coordinate national efforts for ongoing and future studies on the effects of wildland fire smoke on firefighters. He conducts lab and field studies, works with regulatory and standard-setting organizations, and fosters communication among fire managers, firefighters, researchers, manufacturers, organizations, and others with a semiannual report (*Health Hazards of Smoke*), visual presentations, displays, and personal communications. This effort culminated in April 1997 with a symposium at Missoula, MT. All the findings were presented, and a risk management plan outline was developed for field use. ☹



The new edition of *Fitness and Work Capacity* will help Forest Service workers keep fit for work.





*Bob Hensler*

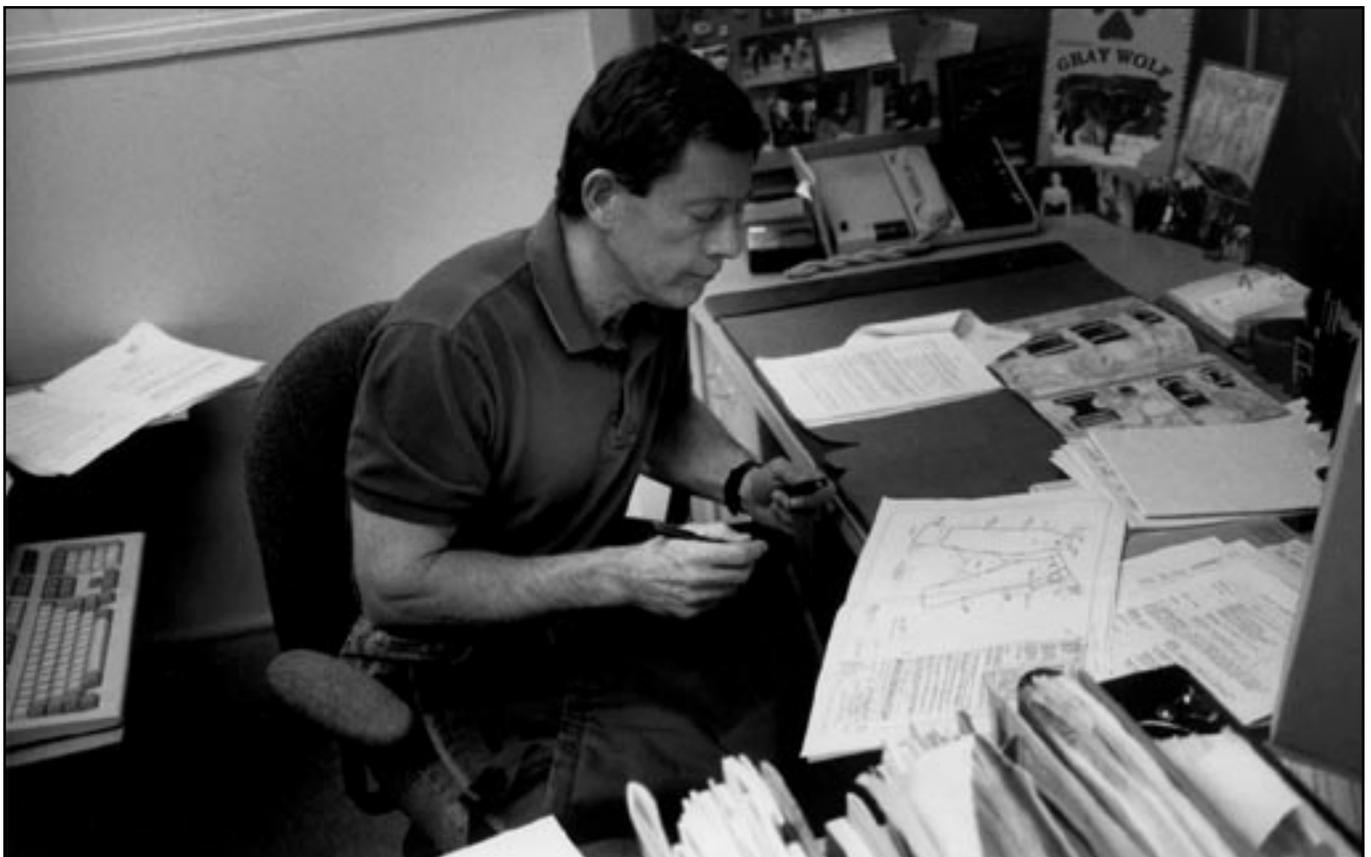
Bob has worked at the Center since 1974. He served as the Center's senior writer-editor until 1987. During that period he edited the Center's fire and safety publications, and audiovisuals. In 1987 he became a Project Leader working on fire and safety topics and assumed duties for Centerwide technology transfer. He took over the specifications program in April 1990.

## Specifications

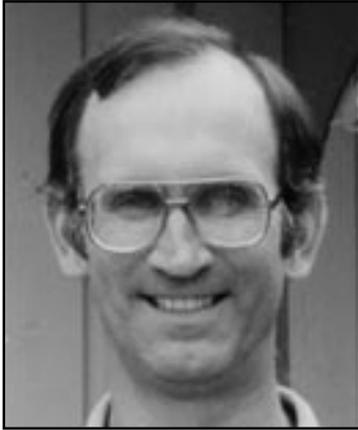
The specifications maintained at MTDC include major personal protective items used by wildland firefighters, such as the fire shelter, Nomex clothing, and chain saw chaps. Other MTDC specifications include fireline handtools, such as the Pulaski and the Combi tool. Many other items used by firefighters and other wildland resource workers must meet the specifications kept at the Center. Sleeping bags, first aid kits, waterbags, and field packs are just a few items whose specifications are established and monitored at MTDC.

These specifications serve as the technical requirements in General Services Administration (GSA) pro-

curement contracts. The GSA will not award contracts to suppliers unless their products meet the specifications maintained at the Center. This process assures that affordable, safe, and functional equipment specially designed for the needs of wildland firefighters is made available to the agencies that require it. Twenty or more contracts may be ongoing at any one time, and MTDC works closely with GSA contracting and quality assurance people around the country to facilitate this process. In a typical fire season, Federal and State resource agencies buy more than \$15 million of fire items controlled by MTDC specifications. Before that equipment reaches the GSA shelves, it must first pass a stringent physical inspection by technicians at MTDC. ☞



*Bob Hensler maintains specifications for more than 50 items used by wildland firefighters.*



Pat Wilson

Pat Wilson, Project Leader for Smokejumper Technical Services, joined MTDC in 1997 after spending more than two decades working in fire management. His career began in 1974 on an engine crew for the Idaho Department of Lands. In 1978 he became Assistant Crew Foreman for the Coeur d'Alene Hotshot Crew. Pat became a smokejumper at Missoula in 1980. He transferred to Grangeville, ID, in 1982, where he was Smokejumper Unit Manager from 1987 until joining MTDC. Pat is the leader of a group developing the *Interagency Smokejumper Operations Guide*, and is a member of the National Aerial Delivered Fire Fighter Study. He is a master parachute rigger and a designated parachute rigger examiner for the Federal Aviation Administration. Pat graduated from the University of Montana in 1981 with a degree in Forest Resource Management. He will work alongside Dave Pierce (Project Leader for Smokejumper Technical Services since 1980) for 6 months while training to replace Pierce when he retires.

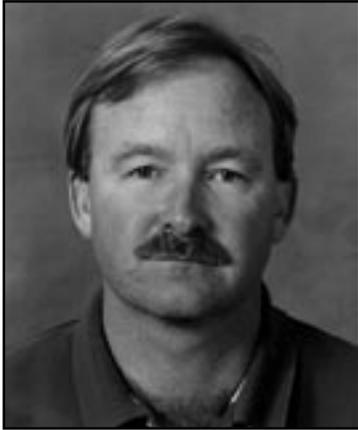
## Smokejumper Technical Services

From the broadest perspective, little has changed in more than 50 years of smokejumping. Fires are reported, jumpships take off, and jumpers parachute into areas where the response time or terrain preclude any other response. A closer look reveals a system under continuous scrutiny, change, and improvement. Changes are driven by the desire to reduce the risks of this unique and time-honored method of initial attack. A better parachute canopy, a more protective jumpsuit, or advanced training techniques are some of the areas that Smokejumper Tech Services pursues to reduce those risks.

Past projects have included developing a computerized parachute manipulation simulator for smokejumper training and preparing training videos for smokejumper pilots and spotters. The unceasing effort to improve the smokejumper parachute's characteristics and performance has culminated in development of the FS-14, a canopy with greater stability and a slower descent. The new canopy is expected to decrease injuries related to landings. As it becomes available for operational jumps, the canopy may be modified for additional fine-tuning, keeping the process current and the technology cutting edge. ☺



Test jumps during development of the new FS-14 canopy.



*George Jackson*

As an equipment specialist with a strong textiles background, George has helped develop many of the items used by the wildfire community. A former smokejumper, George remains actively involved with wildland firefighting as an Air Attack Group Supervisor. His more than 20 years of firefighting experience gives him the insight required to design equipment for firefighters that is safe, functional, and durable. George is Project Leader for chain saw chaps development, and for the wildland firefighter helicopter rappelling program.

## Helicopter Rappelling Technical Services

The use of helicopter rappelling for initial attack has increased over the past several years. MTDC supports field operations at helicopter bases across the country with technical standards, equipment specifications, and training techniques consistent with the

helicopter rappelling program's needs. This support is intended to increase safety and productivity in the program. Standards for rappelling accessories like the harness, helmet, spotter tether, and cargo letdown equipment are developed under the supervision of MTDC, which is responsible for providing the technology transfer to the field.



*These firefighters are relying on expertise provided by the Helicopter Rappelling Technical Services project.*

### Personal Gear Carrier Retrofit

The red-bag personal gear carrier has been in the system since the mid-1970's. With a change in weight restrictions for organized crews (maximum allowable weight was increased from 35 to 45 lbs) and the firefighters' desire to include personal tents with their gear, a larger carrier is needed. Rather than completely redesigning the present bag, an accessory system is being developed for use with the current personal gear carrier.

### Fire Shelter Containers for Heavy Equipment Operators

The present container for the fire shelter is intended to be worn on the belt or attached to the firefighter's fieldpack. This container is impractical for operators of bulldozers, tractor plows, and other heavy equipment used on the fireline. In the past, when dozer operators left their machine because a fire was overrunning them, they often left their fire

shelter behind. This project is testing a prototype chest-mounted carrying system that will not interfere with the normal operation of heavy equipment.

### Bus Seat Restraints for Tools and Equipment

School buses are the most common vehicle used to transport wildland firefighting crews. The Department of Transportation (DOT) regulations prohibit hauling unsecured gear inside school buses. Agencies must provide chase vehicles to carry firefighters' personal gear and tools, at a substantial cost to the Agency.

By the end of 1997 this project will develop a cargo restraint system that will secure gear and equipment without blocking emergency exits. The system will be presented to the NWCG National Fire Equipment System Subcommittee for possible inclusion in the National Cache System. ☺



*Firefighters' personal gear bags, known as red packs, will be redesigned to include a strap so firefighters can carry a tent as well as their personal belongings.*



*Jerry Jeffries*

Jerry, the Project Leader for Safety and Health, has been involved with fire management his entire career. He served as Northern Region Safety and Health Specialist for Fire and Aviation Management before coming to MTDC. One of his primary responsibilities is to oversee revision of the Forest Service's Health and Safety Code, which includes all aspects of wildland fire safety and health concerns. In addition, Jerry heads up the fireline dozer and tractor plow safety project and the wildland fire driving program. His duties also include assisting wildland fire accident and fatality investigations and developing firefighter training programs, especially in the area of chain saw safety. He serves as a member of the Forest Service's Safety and Health Advisory Council.

## Health and Safety Code

Jerry Jeffries oversees the rewriting of the Health and Safety Code Handbook. This requires many updates and clarifications in addition to incorporating new information. Jerry coordinates information sent in by many contributors involved with health or safety concerns for Forest Service employees. The handbook is critical to the wildland firefighting community. Jerry's strong background in fire suppression helps ensure complete treatment of the subject.

## Tractor/Dozer Plow Safety

The safe and effective use of bulldozers to construct fireline is of critical importance. Many times, the operator may have very little experience working in the wildfire environment, and may be unfamiliar with the Incident Command System. This can lead to dangerous

situations where communications breakdowns may result in life-threatening events. The Tractor/Dozer Plow Safety Project is intended to address the problems inherent to heavy equipment use on the fireline, adopting procedures and creating solutions that will produce a safer work environment. The risk to dozer operators can be greatly minimized through education, training, and information sharing.

## Fireline Driving Video

The Fireline Driving video is an offshoot of the Mountain Driving video, emphasizing the dangers one might expect when driving on a wildfire. It is not intended for firefighters, but for others who might find themselves working on fires, such as caterers, or National Guard troops. Jerry is compiling interviews to be used in the video, and is planning followup interviews with many of the subjects this fire season. The video is to be finished in Fiscal Year 1998. 



*This field test considered the effects of sprinklers inside the dozer's rollover cage. The sprinklers were designed to protect the operator if a fire burns over.*