Fire Management notes

Volume 59 • No. 1 • Winter 1999

The Future of National Shared Resources

United States Department of Agriculture
Forest Service

Guidelines for Contributors

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Fire Management Notes (*FMN*) is an international quarterly magazine for the wildland fire community. *FMN* welcomes unsolicited manuscripts from readers on any subject related to fire management. (See the subject index of the first issue of each volume for a list of topics covered in the past.)

Because space is a consideration, long manuscripts are subject to publication delay and editorial cutting; *FMN* does print short pieces of interest to readers.

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Paper Copy. Type or word-process the manuscript on white paper (double-spaced) on one side. Include the complete name(s), title(s), affiliation(s), and address(es) of the author(s), as well as telephone and fax numbers and e-mail information. If the same or a similar manuscript is being submitted elsewhere, include that information also. Authors who are affiliated should submit a camera-ready logo for their agency, institution, or organization.

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This issue of *Fire Management Notes* is the second in a series of two focusing on wildland fire aviation management. Many thanks to all contributors for sharing their experience and expertise with the wildland fire community.

Fire Management Notes is published by the Forest Service of the U.S. Department of Agriculture, Washington, DC. The Secretary of Agriculture has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department.

Subscriptions ($8.50 per year domestic, $10.65 per year foreign) may be obtained from New Orders, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. A subscription order form is available on the back cover.

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On the Cover:

Counterclockwise from upper right to lower right: A Lockheed P3–A Orion (Aero Union T–00) under national contract to the USDA Forest Service making a retardant drop on a wildfire in Arizona in 1996. Recommendation 2 of the 1996 National Airtanker Study *specifies that the P3's, along with C–130E models, should be part of the future large airtanker fleet (see related story by Don Carlton and Michael Dudley). Photo: Courtesy of Tom Story, Tempe, AZ, ©1998. John Day Helitack, Malheur National Forest, Pacific Northwest Region, conducting rappel training for new crewmembers, part of the national shared resources being examined under the* National Aerial Delivered Firefighter Study. *Photo: Brad Gibbs, USDA Forest Service, Malheur National Forest, John Day, OR, 1998. An Erickson S–64 type 1 helicopter making a drop on a fire in Malibu, CA, in 1996. This is one of the helicopter types evaluated under the 1992* National Study of Type I and Type II Helicopters to Support Large Fire Suppression, *updated in 1997 (see related story by Joe Krish). Photo: Courtesy of Tom Story, Tempe, AZ, ©1998.*

The FIRE 21 symbol (shown below and on the cover) stands for the safe and effective use of wildland fire, now and in the 21st century. Its shape represents the fire triangle (oxygen, heat, and fuel). The three outer red triangles represent the basic functions of wildland fire organizations (planning, operations, and aviation management), and the three critical aspects of wildland fire management (prevention, suppression, and prescription). The black interior represents land affected by fire; the emerging green points symbolize the growth, restoration, and sustainability associated with fire-adapted ecosystems. The flame represents fire itself as an ever-present force in nature. For more information on FIRE 21 and the science, research, and innovative thinking behind it, contact Mike Apicello, National Interagency Fire Center, 208-387-5460.

FIRE 21

Firefighter and public safety is our first priority

Contents

Short Features

Planning National Shared Forces for the 21st Century

Michael Dudley

National shared resources—firefighting resources that are funded directly by the USDA Forest Service's Washington Office, such as airtankers, smokejumpers, and lead planes—are essential to successful wildland fire management across the Nation. In 1991, the Forest Service began planning the future of national shared resources with a report prepared by a team led by Jim Mann, at the time the regional fire and aviation director for the Forest Service's Northern Region.

Mann's report on how to manage the analysis process for planning national shared resources led the Forest Service to convene a group of wildland fire managers to develop a process and blueprint to guide the Forest Service into the 21st century through a series of studies on national shared resources for large wildfire suppression. The resulting *National Shared Forces Task Force Report* (NSFTFR), completed in 1991, recommended a specific schedule of interagency studies to determine the most efficient staffing levels for national resources, including airtankers, helicopters, smokejumpers, improvements to their support facilities, and the most cost-effective methods for their procurement.

Mike Dudley is an aviation management specialist for the USDA Forest Service's Washington Office, Washington, DC.

The results of these four studies will help guide the Forest Service and its interagency partners into the year 2000 and beyond.

National Helicopter Study

The first study, completed in 1992, was the *National Study of Type I and Type II Helicopters to Support Large Fire Suppression*. The study recommended the most efficient quantity of, and staffing for, type 1 and type 2 helicopters to place under national exclusive-use contract for supporting extended attack and large wildland fire suppression. Since 1993, based on recommendations from this report, national staffing for type 2 helicopters has resulted in substantial annual savings to the Federal Government. Currently, staffing for the 1999 fire season stands at seven national type 2 helicopters. The 1992 study was recently reviewed and updated with regard to type 1 helicopter needs (see related article by Joe Krish).

Airborne Firefighter Study

The second study chartered by the NSFTFR Steering Committee, the *National Aerial Delivered Firefighter Study*, is in progress. The study is designed to provide managers with information, guidance, and decision support regarding the mix, numbers, and locations of smokejumper, helitack, and rappel crews in the context of other initial-attack resources.

National Airtanker Study

The third study, the *National Airtanker Study* (NATS), was completed in two phases. Phase I, completed in 1995, recommended a national fleet of 41 large airtankers. Phase II, completed in 1996, gave 16 recommendations to guide the airtanker program for the next 20 years (see related article by Don Carlton and Mike Dudley). A key conclusion of NATS phase II—that airtanker base facilities are as important as the aircraft themselves—resulted in the National Airtanker Support Base Improvement project for fiscal year 1999.

Tactical Aerial Resource Management Study

The fourth study, the *Tactical Aerial Resource Management Study* (TARMS), was drafted in April 1998 and is scheduled for completion in fall 1998. The study is designed to provide managers

with information, guidance, and support for national and geographic-area decisions affecting the National Leadplane, Air Tactical Group Supervisor, and Helicopter Coordinator Programs.

The results of these four studies will help guide the Forest Service and its interagency partners into the year 2000 and beyond. By following the recommendations in these studies, we will be better prepared to meet the challenges ahead in 21st-century wildland fire management. For more information on the national shared resources studies, contact Mike Dudley, Aviation Management Specialist, USDA Forest Service, Fire and Aviation Management, P.O. Box 96090, Washington, DC 20090-6090, tel. 202-205-0995, fax 202-205-1272, e-mail: mdudley/wo@fs.fed.us. ■

The aviation management triangle reflects the essential elements of sound, professional aviation management. Aviation management is a service function. Our objective is to provide safe, cost-effective, and appropriate aviation services.

- *The foundation of aviation management is safety. If the mission cannot be accomplished without compromising safety, say "No!" Ensure that there is an acceptable level of risk through sound risk management.*
- *Strive for cost-effective aircraft use. Question requests that are not cost-effective—explain why and recommend a better solution.*
- *Use the right aircraft tool for the job. Question inappropriate requests—explain why and recommend a better way. Do what's right!*

"October Fury": Documentary on 1947 Maine Wildfires

Jim Downie

In October 1947, drought conditions, high winds, and heavy fuel loads combined to drive dozens of wildfires across 220,000 acres in southern Maine. The fires damaged more than 36 communities, virtually wiping out 9 towns and leaving more than 2,500 people homeless. During one week alone, 15 separate fires burned at least 5,000 acres each. Property damages exceeded $70 million, nearly $3 billion in today's dollars.

Jim Downie is the fire prevention specialist for the Maine Forest Service.

On the 50th anniversary of these disastrous wildfires, the Maine Forest Service, along with WGME Television in Portland, ME, produced the documentary "October Fury." Featured on the WGME and Maine Public Broadcasting Television stations in October 1998, the documentary gives firsthand accounts of what it was like to fight and escape the 1947 conflagrations.

The Maine Forest Service is now offering this 23-minute documentary for sale on a limited number of videotapes. Included on each VHS tape is old film footage from "Then It Happened," an earlier documentary. To purchase a copy, send a check or money order for $26.15 (which includes tax) to Bronson Communications, Inc., 141 North Maine Street, Brewer, ME 04412. Sales proceeds go to support the fire prevention programs sponsored by the Maine State Federation of Firefighters and the Maine Fire Chief's Association. For more information, contact Jim Downie at 207-827-6191. ■

National Airtanker Study: An Overview

Donald W. Carlton and Michael Dudley

Large airtankers play a vital role in supporting initial and extended attack on wildfires nationwide. The *National Airtanker Study* (NATS) was chartered in 1994 to provide information, guidance, and support to managers for national and regional decisionmaking that will affect the national airtanker program and its supporting components over the next 10 to 20 years. In this context, "national" refers to the Federal airtanker fleet and base structure that together support wildland fire suppression and use.

Study Overview

Purpose. The NATS had two phases, each with a different purpose:

- Phase 1, completed in April 1995, determined the most efficient number of large airtankers and their most effective initial staffing locations for supporting both initial attack and extended suppression on large wildfires. The goals were to optimize use of the existing available large-airtanker fleet and to find the best airtanker base locations. By providing a foundation for determining short-term agency needs, the phase 1 study laid the basis for the 1996–98 large-airtanker contract solicitations by the USDA Forest Service and the U.S. Department of the Interior (USDI).

- Phase 2, completed in November 1996, was designed to determine long-term agency needs for large airtankers to support wildland firefighting. Accordingly, phase 2 will form the basis for large-airtanker contract solicitations by the Forest Service and USDI from 1999 to 2015, or until the study is revised. The goal for phase 2 was to optimize all reasonable airtanker base and fleet possibilities for the national airtanker program to guide its modernization in a way that balances airtanker supply with agency demand. The phase 2 study made recommendations regarding optimum airtanker numbers, sizes, and performance criteria by location, specifically focusing on airtanker size and performance in relation to economic efficiency and suppression effectiveness.

Both phases of NATS provided analytical support and model development for decisionmaking. Both displayed the interrelationships and tradeoffs among different airtanker capabilities and locations in support of initial and extended attack. The difference is that phase 1 focused on the short term, particularly on Federal large-airtanker contract solicitations for 1996–98, whereas phase 2 focused on the long term and future solicitations.

Methods. Both phases examined historic large-airtanker uses and trends on an interagency basis. Initial-attack data taken from the National Fire Management Analysis System (NFMAS) were added to data on use of airtankers to support large wildland fire suppression. Forces used for initial attack are analyzed and justified using the NFMAS and the Fire Management Activity Plan employed by the USDI Bureau of Land Management (BLM) and Bureau of Indian Affairs. For this reason, the Interagency Initial Attack Assessment (IIAA) model was applied to help analyze the impact that different airtanker platforms and/or airtanker base alternatives might have on expected acres burned, fire suppression costs, and net value change costs (that is, the costs used to describe the algebraic sum of the positive and negative effects of a wildland fire). For study purposes, local initial-attack forces remained constant as airtanker staffing and locations changed. Where the IIAA model was outdated or unused for an area, an equivalent process was allowed, as long as consistency was maintained.

With the proposed fleet of airtankers, average aircraft speed and retardant capacity will increase, enhancing the Nation's capability for initial and extended attack.

Don Carlton, who served as the committee chairperson for the National Airtanker Study, *is a fire protection planning consultant and a retired fire protection planning specialist for the USDA Forest Service, Fire and Aviation Management, Pacific Northwest Region, Portland, OR; and Mike Dudley is an aviation management specialist for the Forest Service's Washington Office, Washington, DC.*

Study Recommendations—Phase 1

Phase 1 used initial-attack efficiency analysis to recommend staffing for 38 large airtankers nationally. These 38 airtankers, as staffed in the 1996–98 National Airtanker Contract, came from the existing fleet, which had retardant tanks that range in capacity from 2,000 to 3,000 gallons (7,570 to 11,360 L). Goals for phase 1 were to optimize the existing available large airtanker fleet and to find the best airtanker base locations. Accordingly, the optimum number of 38 airtankers was determined based on an aggregate of geographic-area analyses called "scenarios." In each scenario, the number of large airtankers was increased and decreased from existing levels to determine the number within the geographic area that minimized total airtanker program costs (fire suppression costs plus net value change costs).

In addition, the phase 1 report addressed the tradeoff between effective initial attack and efficient suppression support on large wildland fires. The phase 1 study determined that, for all agencies from 1993 to 1994, the average quantity of retardant delivered per fire was 30,392 gallons (115,043 L) for fires ranging in size from 100 to 5,000 acres (40 to 2,000 ha), and 202,205 gallons (765,407 L) for fires 5,000 acres (2,000 ha) or larger in size. The study also analyzed and displayed, on a biweekly basis, Forest Service fire occurrence for wildland fires greater than 100 acres (40 ha) (size classes D through G) from 1970 to 1993, and the same type of data for the BLM from 1980 to 1993. Taken together, this information allowed calculation of the expected number of airtanker plane-days needed to support suppression on large wildland fires from 1980 to 1993.

Based on this calculation, the phase 1 report recommended staffing for 3 additional large airtankers—for a total fleet of 41 large airtankers. The additional three airtankers will augment the Nation's capability for large wildland fire suppression while freeing aircraft for initial attack.

Study Recommendations—Phase 2

The phase 2 study made 16 recommendations, some of which are shown here by number in the order they appear in the study.

Airtanker Procurement. A goal of the phase 2 study was to optimize all reasonable airtanker base and fleet possibilities for the national program. To do so, the study identified potential fixed- and rotor-wing aircraft platforms that, when tanked, would have a retardant capacity of 1,000 gallons (3,790 L) or more.* These aircraft were evaluated based on factors such as aircraft cost per gallon of retardant delivered. Some aircraft were highly rated when analyzed in a particular situation, but did not perform as well as others when viewed from a national perspective, where mobility and efficiency within a wide range of fuel and topographic situations are critical.

Based on such considerations, the phase 2 report made several recommendations pertaining to aircraft procurement, including:

- *Recommendation 1:* Procure excess military aircraft, the most cost-effective way of acquiring airtanker platforms.
- *Recommendation 2:* Establish a future fleet of 20 P3–A aircraft, 10 C–130B aircraft, and 11 C–130E aircraft (fig. 1).

Figure 1—*A C–130 dropping retardant on a 1994 wildfire in southern California. C–130's are part of the new generation of large airtankers specified in recommendation 2 of the* National Airtanker Study, *phase 2. Photo: Cecil Stinson, Jr., USDA Forest Service, Shasta–Trinity National Forest, Redding, CA, 1994.*

** The 1,000-gallon (3,790-L) lower limit was set by the study's charter. Aircraft with lesser capacities should be considered as part of NFMAS analysis within local areas, such as national forests or BLM districts.*

For initial attack on wildland fires, aircraft speed has a high value. The average distance from an airtanker base to a wildland fire will be 91 miles (146 km) for the airtanker bases recommended for implementation in the phase 2 report. With the proposed fleet, average aircraft speed will increase, in terms of true air speed, from 221 to 260 knots and retardant capacity will increase from about 2,450 gallons (9,270 L) to about 3,300 gallons (12,940 L).

Peak-Period Demand. During peak periods of fire activity, airtankers needed to support initial attack might already be engaged in suppression support on large wildland fires. To address this concern, the phase 2 report made the following recommendation:

- *Recommendation 5:* Use Mobile Airborne Fire Fighting Systems (MAFFS) during peak periods when all available commercial aircraft are committed. Upgrade eight MAFFS units. Commit funds to designing, developing, and acquiring MAFFS units to meet established performance and effectiveness criteria.

Airtanker Bases. Efficient airtanker use is predicated on fully functional airtanker bases. The airtanker base support facilities are therefore just as important as the aircraft themselves. However, as products and aircraft have changed over the years, airtanker bases have evolved in response to short-term needs rather than long-term planning. As a result, facilities and equipment have sometimes failed to meet acceptable standards for safety, health, and sanitation.

The phase 2 study solicited information from each existing airtanker base on its physical status and on the capital improvements needed to meet the standards set forth in the 1995 *Interagency Retardant Base Planning Guide, Fixed and Rotor Wing*. For each airtanker base, the study determined fire suppression and net value change costs and considered several alternatives, including closing the base. The phase 2 report then made two recommendations:

- *Recommendation 7:* Restructure airtanker base locations and numbers to support the future airtanker fleet and to provide for the most efficient use of the capital investment and maintenance dollars available for physical facilities. Close 11 airtanker bases, relocate 2 bases, and establish 2 new bases (fig. 2).
- *Recommendation 8:* Develop a national initiative to fund improvements and investments at airtanker bases.

In 1998, the Forest Service started an Airtanker Base Support Initiative to obtain funding for fiscal year 1999. The initiative has secured $8 million in funds (from the "Fire, Construction, and Other" budget line item) for three new bases and improvements to airtanker bases in seven regions, including new construction at six bases and planning and design at seven bases. The Forest Service will pursue the initiative in subsequent years to obtain the funding needed to complete all Forest Service priority 1 and priority 2 bases. The BLM is also working on a capital improvement project for fiscal year 1999.

Figure 2—*Airtankers in the pits, working a southern California fire out of Hemet Airtanker Base (ATB), Hemet, CA. Hemet ATB has been replaced by a new Forest Service ATB currently under construction at San Bernardino International Airport (the former Norton Air Force Base), where a temporary base is operating until the new base is completed. These changes result from recommendations 7 and 8 of the* National Airtanker Study, *phase 2. Photo: Bob Will, USDA Forest Service, San Bernardino National Forest, San Bernardino, CA, 1996.*

Airtankers are a unique resource that can be quickly mobilized to fly long distances in short periods of time to provide high fireline production rates on wildfires.

Airtanker Mobility. Successful initial attack depends on maintaining mobile firefighting resources on days when many wildland fires ignite. Fires tend to ignite in clusters, mainly due to lightning storms. These episodic ignitions are highly correlated to wildfires in size classes D through G. Figure 3 shows the correlation for one geographic area in 1 year. The situation is similar in other geographic areas and in most years. During such episodes, wildland firefighting agencies require a ready staffing of airtankers, lead planes, and air tactical group supervisor aircraft. Any constraints that restrict aircraft mobility hamper initial-attack efforts, especially during episodic wildland fire outbreaks.

To meet the demand for aerial firefighting resources during episodic fire occurrences, airtankers must be as wide ranging as possible. Airtankers are a unique resource that can be quickly mobilized to fly long distances in short periods of time to provide high fireline production rates on wildland fires. To keep airtankers mobile, the flow of airtankers must be managed at the highest practical level of coordination. Effective strategic management is best achieved at Geographic Area Coordination Centers and the National Interagency Coordination Center in Boise, ID. Airtanker mobility is greatest when costs for airtanker bases and availability are met through interagency funding.

To maximize airtanker mobility, the phase 2 report made these recommendations:

- *Recommendation 10:* Fund, manage, and control airtankers in a manner consistent with their status as national aerial firefighting resources.
- *Recommendation 14:* Provide funds on an interagency basis to meet the costs of airtanker bases and availability.

For additional information on all 16 recommendations in the phase 2 study or for a copy of the NATS, phase 2, contact Mike Dudley, Aviation Management Specialist, Fire and Aviation Management, USDA Forest Service, P.O. Box 96090, Washington, DC 20090-6090, tel. 202-205-0995, fax 202-205-1272, e-mail: mdudley/wo@fs.fed.us. ■

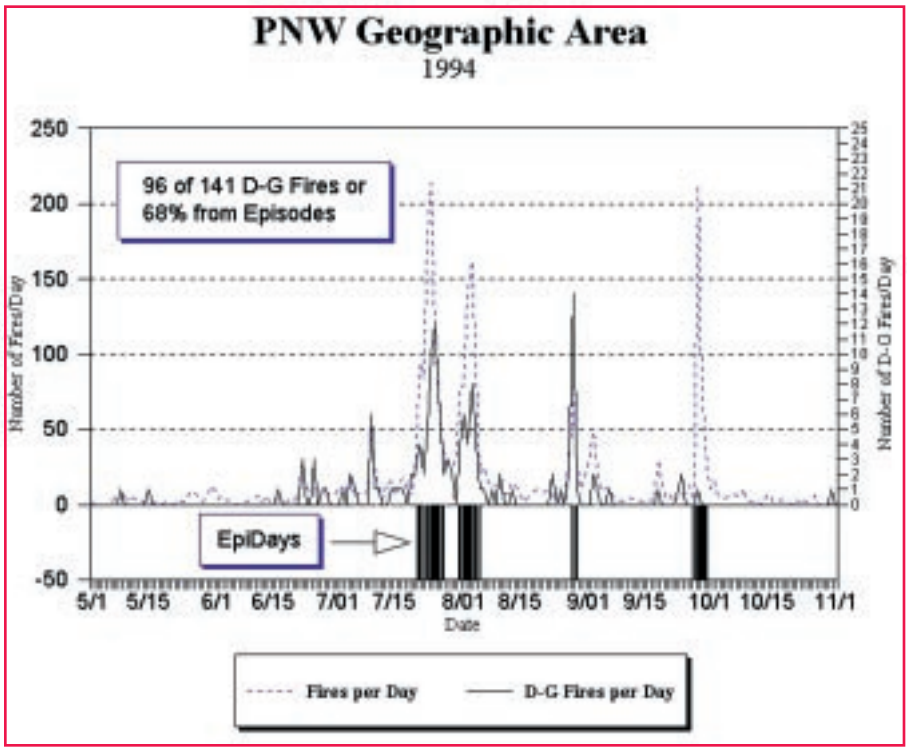

Figure 3—*Correlation between the total number of wildfires per day and the number of class D through G wildfires per day on Federal lands in the northwestern geographic area in 1994. "EpiDays" are days with a large number of wildfires, usually due to episodic ignitions. Note the high correlation between EpiDays and days with a high number of class D through G wildfires. Sixty-eight percent of class D through G wildfires are from episodic ignitions.*

Followup on the 1992 National Type 1 Helicopter Study

Joseph F. Krish

Helicopters for wildland fire aviation operations, though expensive to buy and maintain, are invaluable in supporting large wildfire suppression. Wildland firefighting agencies therefore contract each year for helicopter services. Although fire seasons differ in severity, each year a certain quantity of helicopters will be needed. Contract costs can be reduced if the quantity of helicopters needed on a steady basis can be reliably estimated in advance.

Purpose of the Study

Estimating the steady quantity of helicopters needed was the purpose behind the *National Study of Type I and Type II Helicopters to Support Large Fire Suppression*, completed in 1992. The study examined historical fire records and previous demand for type 1 and type 2 call-when-needed helicopters and recommended the most cost-effective quantity of these helicopters to place under national exclusive-use contracts. The study concluded that up to $4 million per year could be saved by contracting 2 type 1 helicopters and 7 to 13 type 2 helicopters. Thanks to the 1992 study, there are now 7 type 2 helicopters under national exclusive-use contracts for the 1998 fire season (see sidebar). However, there are still no type 1 helicopters under a standard exclusive-use contract.*

Joe Krish is the helicopter manager at the Prescott Fire Center and Henry Y.H. Kim Aviation Facility, USDA Forest Service, Prescott National Forest, Prescott, AZ.

> The demand for type 1 helicopters to support large wildfire suppression has more than tripled since 1992.

In 1997, I followed up on the 1992 study as a partial graduation requirement for a course in technical fire management. The goal of the 1997 followup was to review the resource orders from 1993 to 1997 and use the same methods and procedures as in the 1992 study to determine whether there had been an increase in the demand for type 1 helicopters.

Methods

The 1992 study and the 1997 followup both had two parts: data collection and data evaluation.

Data Collection. All requests for type 1 helicopters go through the National Interagency Coordination Center (NICC) in Boise, ID. The NICC records the resource orders for type 1 helicopters from all agencies. From the NICC, I obtained copies of resource orders for type 1 helicopters from 1993 to 1997, along with mobilization and demobilization dates, vendor information, "N" number of the assigned helicopter, information on whether the order was canceled or filled, name and size of the fire, and name of the requesting agency.

** During the 1997 fire season, an exclusive-use type 1 helicopter was contracted for the USDA Forest Service's Pacific Southwest and Southwest Regions through regional/local funding. However, unlike the national exclusive-use contracts for type 2 helicopters, this contract awarded no daily availability to the contractor and is therefore ignored here.*

National Exclusive-Use Helicopter Contracts

Currently, there are no nationally funded type 1 helicopters under the exclusive-use contracts called for in the 1992 *National Study of Type I and Type II Helicopters to Support Large Fire Suppression*. However, there are seven type 2 helicopters under national exclusive-use contracts that are funded under the guidelines set forth in the study. These helicopters are located in:

- Region 1—Dillon, MT; and St. Regis, MT.
- Region 2—Durango, CO.
- Region 4—Challis, ID; and Ogden, UT.
- Region 6—Chelan, WA; and John Day, OR.

Helicopter N1168U with helitack crew, stationed at John Day, OR. The funding for this S–58T type 2 helicopter under national exclusive-use contract resulted directly from the 1992 National Study of Type I and Type II Helicopters to Support Large Fire Suppression. *Photo: Brad Gibbs, Malheur National Forest, John Day, OR, 1998.*

Helicopter 68U filling its Bambi bucket from a 3,000 gallon (11,350-L) "pumpkin" to help suppress a 1997 wildfire on land managed by the USDI Bureau of Land Management in southern Nevada. This helicopter is one of the seven type 2 helicopters funded nationally as a result of the 1992 National Study of Type I and Type II Helicopters to Support Large Fire Suppression. *Photo: Tim Lynch, Malheur National Forest, John Day, OR, 1998.*

In addition, the Southwest Region's fire planner provided me with information on all fires, class C and above, in the National Interagency Fire Management Integrated Database (NIFMID). By cross-referencing the NIFMID data with the resource orders, I was able to fill in some of the missing data. This allowed me to assign a fire name and size and even a cost to the resource order for every type 1 helicopter.

The figures for both the 1992 study and the 1997 followup were conservative. Even though all requests for type 1 helicopters must travel through the NICC, after a type 1 helicopter is assigned to a Geographic Area Coordination Center (GACC), it may be reassigned within the GACC without transmittal of the new incident information back to the NICC. New requests for type 1 helicopters can therefore go unrecorded. This was the case, for example, during the severe 1994 fire season, when type 1 helicopters were in unusually high demand.

Data Evaluation. The second part of the study evaluated the data to determine the most cost-effective quantity of type 1 helicopters to place under national exclusive-use contracts. A computer modeling program was used to establish the total program cost of meeting the demand for type 1 helicopters under exclusive-use contracts. Models were devised for quantities of exclusive-use-contract helicopters ranging from 0 to 20, with the remaining demand met through call-when-needed helicopters. One variable in calculating each model was length of the contract—the shorter the contract, the larger the quantity of type 1 helicopters needed to meet the demand.

Results

Data. From 1989 through 1991, 102 requests were made for type 1 helicopters, including:

- 88 percent by the USDA Forest Service;
- 8 percent by the other Federal wildland fire management agencies (the USDI Bureau of Indian Affairs, Bureau of Land Management, National Park Service, and U.S. Fish and Wildlife Service); and
- 4 percent by various State agencies.

From 1993 through 1997, 518 requests were made for type 1 helicopters. Ninety percent of the requests came from the Forest Service.

The 1992 study found that the number of requests for type 1 helicopters averaged 34 per year. The 1997 followup found that this figure had more than tripled to 104 per year for the 1993–97 period. The average number of days that a contractor could expect to remain on an incident rose from 6.5 days during the 1989–91 period to 8 days during the 1993–97 period.

Evaluation. The model that most closely resembled the actual demand for the 5-year period from 1993 to 1997 was 6 type 1 helicopters under 105-day contracts. The peak period of demand was from about the third week in June through the first week in October.

Conclusion

Contracting for helicopters to support large wildfire suppression is very expensive for the American taxpayer. Call-when-needed rates for type 1 helicopters range from $12,000 per day to more than $30,000 per day. In 1996, the Federal Government paid more than $26 million to one helicopter company alone. To save costs, these resources must be utilized in the most effective and efficient manner.

The facts are these:

- The need for type 1 helicopters, in terms of both demand and duration, has risen substantially since 1992. Demand has more than tripled.
- Relying solely on call-when-needed helicopters costs the Government considerably more than placing an appropriate quantity of type 1 helicopters under national exclusive-use contracts.
- Large wildfires are not going away. Until the problem of fuel buildups is solved, there will continue to be large wildfires.
- The need for wildfire suppression is not diminishing. Current policy is to extinguish all wildland fires unless a fire management plan is in place.

The original 1992 study recommended placing two type 1 helicopters under national exclusive-use contract. This recommendation was cautious because there are no reliable data on actual availability costs. Beginning with two type 1 helicopters under national exclusive-use contract would accomplish two things:

1. It would establish a baseline for a cost analysis using actual versus estimated dollars.
2. It would reduce financial risk in the event of a slow fire season.

The most critical time period (when large wildfires are most likely to occur) could be covered by staggering the start dates for the helicopters. The helicopters could follow the normal pattern of fire seasons by beginning in the South, then moving to the Southwest, then to the northern Rockies and Pacific Northwest, and finally to the Pacific Southwest.

For more information on the national helicopter studies, contact Joe Krish, Prescott Fire Center/Henry Y.H. Kim Aviation Facility, 2400 Melville Dr., Prescott, AZ 86305, tel. 520-771-6168, IBM: jkrish/r3,prescott; e-mail: jkrish/r3_prescott@fs.fed.us. ■

Airspace Coordination During Florida's 1998 Wildfires

Julie Stewart

The 1998 fire season was exceptionally severe in Florida due to unusual drought conditions. Thousands of wildfires burned almost half a million acres (200,000 ha). Aircraft poured in from across the Nation to support firefighting efforts and disaster relief.

Through teamwork, the number of dangerous intrusions into airspace needed for aerial support to fight Florida's wildfires was kept very low.

Challenging Airspace Conditions

The influx of aircraft put airspace coordination over Florida to the test in what many aviation personnel consider one of the most complex cases ever. Several factors contributed to the complexity of Florida's airspace:

- Local geography played a significant role. Because the terrain is flat, Florida's general aviation pilots are used to flying at relatively low altitudes—usually at 2,000 feet (610 m). As a result, the Federal Aviation Administration (FAA) was reluctant to issue any temporary flight restrictions (TFR's) for airspace above 2,500 feet (760 m) (see sidebar at the end of the article). Many disaster relief aircraft were therefore initially forced to fly above the TFR.
- Florida's skies were already heavily trafficked. Large numbers of aircraft are routinely flown by military pilots, general aviation pilots, and pilots for commercial operations such as flight schools, skydiving schools, airports, banner towing, and the media. For example, many future airline pilots go to central Florida to find various types of basic training offered by commercial enterprises (a large industry that, within the TFR's, was all but suspended during the wildfires). The arrival of numerous disaster relief aircraft in Florida enormously complicated an already difficult job of airspace coordination.
- The many TFR's established to facilitate wildfire aerial suppression and disaster relief overlapped and needed tracking and coordination.

Special Airspace Coordination

Area Command brought in an airspace coordination specialist, Julie Stewart, regional airspace coordinator for the USDI Bureau of Land Management in Portland, OR, to manage the TFR's and coordinate with the FAA and Department of Defense (DOD). In addition, the airspace coordinator had to plan the evacuation of airports, establish temporary air traffic control towers, help arrange international approach and departure routes, and deal with the shutdown of many major flight schools and skydiving facilities due to the TFR's.

Tanker–63, a C–130 on standby at the Lake City temporary retardant base in Florida, one of four such bases set up across Florida to meet suppression needs during the 1998 Florida wildfires. At the height of the wildfires, a total of 157 tactical aircraft were operating in highly complex airspace. Photo: Dale Alter, USDA Forest Service, Winema National Forest, Klamath Falls, OR, 1998.

Julie Stewart is the regional interagency airspace coordinator, USDI Bureau of Land Management, Fire and Aviation Management, State Office/Regional Office, Portland, OR.

All the TFR's affected numerous airports within their boundaries, but TFR's issued under Federal Aviation Regulation (FAR) 91.137(a)(2) do not close airports. General aviation is allowed to continue flying from one airport to another within a TFR. Many pilots took advantage of this but were upset when they discovered that the TFR would not allow them to practice flying traffic patterns at airports (an important part of pilot training).

The Area Command's airspace coordinator consolidated numerous small TFR's into one large TFR reaching from St. Augustine to Melbourne, FL. Ongoing teamwork with the FAA built mutual trust, especially during President Clinton's visit, when FAA regional headquarters personnel worked with the airspace coordinator in planning the President's visit. Coordination culminated in a "need-to-know" conference call involving Area Command, the FAA, and affected air operations directors, who received careful instruction on the protocol associated with Presidential movements.

The White House was very sensitive to the need to continue wildland fire aviation operations over Florida without interference from the President's visit. Unexpectedly, the Presidential Protection Division did not invoke the Presidential TFR, a moving TFR that goes wherever the President goes. Instead, Area Command placed an air operations liaison, Dennis Brown, an air tactical group supervisor for the USDA Forest Service on the Klamath National Forest in Yreka, CA, in the Daytona Beach Tower. By keeping the Secret Service and FAA briefed on fire suppression flights, the air operations liaison prevented their disruption.

Lessons Learned

Several procedures worked extremely well in facilitating airspace coordination:

- A central point of contact streamlined the process by acting as focal point for all FAA and TFR coordination for the entire State.
- A national transponder code (1255) for identifying airborne suppression resources was put to the ultimate test, and numerous FAA controllers raved about its success.
- Morning pilot briefings, evening air operations conference calls, and daily TFR briefs were faxed to the FAA, air operations directors, DOD, and dispatch centers. The reports firmly established the locations of the TFR's.
- Air operations directors facilitated airspace coordination through their willingness to reduce or modify TFR's in size, configuration, and altitude to accommodate local commercial traffic for such activities as banner towing, flight school, and media overflights.

Coordination with DOD was extraordinary. With few exceptions, DOD aircraft maintained altitudes at 13,000 feet (4,000 m) or higher and stayed away from wildfires. For general aviation traffic, the FAA issued press releases reminding all pilots, before flying, to check their Notices to Airmen for information on TFR's. As a result, the number of intrusions was very low (by mid-July, less than 20 had been reported).

Coordination with the FAA was consistently outstanding. The FAA professionals were proactive and generous with their assistance and advice. Area Command established good teamwork with staff in several FAA facilities, including the FAA Washington Office, Regional Headquarters, Jacksonville Center, Gainesville Flight Service Station, and Flight Standards District Office.

A key player was the liaison officer named by the FAA Washington Office to assist in coordination efforts, Lacy Wright, from the FAA's Southern Regional Headquarters. The FAA has suggested continuing the liaison with Area Command during future coordination efforts on large wildfires. As the Florida wildfires were ending, wildland fire aviation personnel (including Julie Stewart, the airspace coordinator for Area Command; Tim Elder, an airspace coordinator trainee for the Florida Division of Forestry; and Mike Dudley, an aviation management specialist for the Forest Service's Washington Office who was representing Area Command) met with FAA personnel at the Jacksonville Center and Daytona Beach Tower to ease the way for future coordination. Issues discussed included:

- The need for a national memorandum of understanding between wildland fire aviation agencies and the FAA to address—
  - Activating temporary towers in a way that standardizes their use nationally, and
  - Initiating and training air traffic controllers.

- Constraints in the regulations governing TFR's. The intent of FAR 91.137(a)(2) is to provide a safe environment for disaster relief aircraft. However, the FAR permits five exceptions for aircraft operating inside the TFR (see sidebar), which can create safety problems. Future coordination with the FAA will include discussions on improving implementation of FAR 91.137(a)(2). For example, the FAA is scrutinizing the clause in the law that allows general aviation pilots to continue to fly from airport to airport within the TFR.

Airspace coordination is an essential part of wildland fire aviation. The Florida wildfires challenged our capabilities for safe and efficient airspace coordination, highlighting our strengths and weaknesses. As we continue to build our airspace program within our agencies, we can learn lessons from this experience for future training and in revising the current Interagency Airspace Coordination Guide.

For additional information on airspace coordination, contact Julie Stewart, Regional Airspace Coordinator, Bureau of Land Management, Fire and Aviation Management, State Office/Regional Office, 333 Southwest 1st Street, P.O. Box 3623, Portland, OR 97208, tel. (503) 808-6728, e-mail: j5stewar@or.blm.gov ■

Federal Aviation Regulation Governing Temporary Flight Restrictions for Wildland Fire Aviation

Temporary flight restrictions (TFR's) necessary for wildland fire aviation operations are governed by title 14, Code of Federal Regulations (14 CFR), section 91.137(a)(2). Paragraph 91.137(c) describes the particular circumstances under section 91.137(a)(2) that allow certain exceptions that could pose a risk to suppression aircraft unless managers are aware of the aircraft operating under these exceptions. Text follows.

§91.137 Temporary flight restrictions.

(a) The Administrator will issue a Notice to Airmen (NOTAM) designating an area within which temporary flight restrictions apply and specifying the hazard or condition requiring their imposition, whenever he determines it is necessary in order to—

…

(2) Provide a safe environment for the operation of disaster relief aircraft;

…

(c) When a NOTAM has been issued under paragraph (a)(2) of this section, no person may operate an aircraft within the designated area unless at least one of the following conditions are met:

(1) The aircraft is participating in hazard relief activities and is being operated under the direction of the official in charge of on scene emergency response activities.

(2) The aircraft is carrying law enforcement officials.

(3) The aircraft is operating under the ATC [air traffic control] approved IFR [Instrument Flight Rules] flight plan.

(4) The operation is conducted directly to or from an airport within the area, or is necessitated by the impracticability of VFR [Visual Flight Rules] flight above or around the area due to weather, or terrain; notification is given to the Flight Service Station (FSS) or ATC facility specified in the NOTAM to receive advisories concerning disaster relief aircraft operations; and the operation does not hamper or endanger relief activities and is not conducted for the purpose of observing the disaster.

(5) The aircraft is carrying properly accredited news representatives, and prior to entering the area, a flight plan is filed with the appropriate FAA [Federal Aviation Administration] or ATC facility specified in the Notice to Airmen and the operation is conducted above the altitude used by the disaster relief aircraft, unless otherwise authorized by the official in charge of on scene emergency response activities.

News Helicopter Partnership Model

Robert W. Kuhn

The advent of turbine airtankers in 1990 changed the world of wildland fire aviation. Airtanker base support systems, procedures for airtanker loading, airtanker use over a fire, and even airtanker tracking by dispatch offices all had to be modified to accommodate the new capabilities and requirements of the Lockheed P3–A Orion and C–130 Hercules airtankers. Aerial firefighting operations had to be overhauled to exploit this new aerial firefighting resource.

The news helicopter partnership provides a way for media pilots to get the news footage they need without risking lives.

Near Collision in Midair

The operational changes were keenly felt when, in June 1990, a news helicopter came a few rivet heads away from colliding with a P3 airtanker that was entering an incident. The helicopter pilot had acquired seasonal experience in wildland firefighting operations before working full-time for the news media. Having flown for several different Federal agencies, he was familiar with the type and level of aviation activity over incidents. He was also familiar with the standard temporary flight restriction (TFR) on flying below 2,000 feet (610 m) above ground level (AGL) within a 5-mile (8-km) radius of an incident.

As he had done so often before, the pilot settled in at 500 feet (150 m) above the TFR ceiling—that is, at 2,500 feet (750 m) AGL—to avoid incursion into the restricted airspace. He then established a link to his news station and began filming the lumbering piston-powered airtankers as they struggled over the hot desert floor far below.

Suddenly glancing up, he saw a vibrant orange streak followed by a flash of white, then the familiar rust color of fire retardant that dries in the slipstream on the belly of an airtanker. In another instant, blue sky reappeared. Recalling later that the colors in this sequence had completely filled his range of vision, the pilot wondered how his helicopter's rotor system had missed hitting the turbine airtanker that passed within feet of his aircraft.

News Footage and Aerial Risk

Media pilots are constantly driven by the need to obtain better footage than their competitors. If they don't, they are soon replaced. To get what they need to win ratings for their news programs, they are well funded—their annual budgets often exceed $1 million. With so much at stake, media pilots are expected to take risks, although this is rarely acknowledged by the industry.

But in this particular case, the helicopter pilot saw little risk. Intimately familiar with aerial firefighting operations as he supposed he was, he thought he could position his helicopter in a safe zone without violating Federal Aviation Administration regulations. What had changed, as the pilot so suddenly and dramatically learned, was that a new type of airtanker was working the incident using new operational procedures. Instead of lumbering far below like the piston-driven airtankers the pilot well knew, this turbine airtanker swooped down from its cruising altitude high above, where its turbine engines are most efficient, at speeds reaching 250 knots directly into the TFR on the incident.

After his narrow escape, the helicopter pilot realized that he would no longer be able to safely obtain dramatic shots of aerial firefighting. Moreover, his level of risk would skyrocket if his method of operating didn't change. Concerned, the pilot contacted the local national forest, which arranged a meeting with five local media pilots, their camera operators and producers, and representatives from the interagency fire aviation community. The goal of the meeting was to find a way for the media pilots to get the footage they needed to please their news stations without risking lives. In exchange, the news programs would agree to publicize the

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Local news media pilots pose with Smokey Bear in the spirit of cooperation between the media and the wildland fire aviation community. With Smokey at the Forest Service ramp in Phoenix, AZ, are (from left) Bruce Haffner, KTVK TV 3; Scott Clifton, KPHO TV 5; Rick Crabbs, KSAZ TV 10; Mike McDonald, KPNX TV 12; and Fritz Holley, KNXV TV 15. Photo: Courtesy of Tom Story, Tempe, AZ, ©1998.

wildland fire community's prevention message.

Partnership for Safe Aerial News Coverage

Meeting planners realized that open communication and flexible management would be key to addressing the media pilots' concerns. The planners asked local agencies to establish special phone numbers for the news media in their dispatch centers and to provide the names of fire information specialists who would act as media contacts. Before the meeting, the organizers contacted air tactical group supervisors (ATGS's) to review and modify initial aircraft call-in procedures on incidents to accommodate the needs of news helicopters. After compiling the information, planners presented it at the meeting to the media pilots in the form of an interagency directive. The package included:

- A map showing local jurisdictional boundaries.
- Special phone numbers for the news producers and pilots to use in contacting dispatch centers to obtain radio frequencies used on an incident and to request entry into an incident area, whether or not a TFR was in place.
- The types of requests by the news stations (flying over the incident, landing on the incident, or both) that would be accepted for relay by the controlling agency for approval by the ATGS or lead plane.
- A description of the time typically needed for the dispatcher to contact the ATGS or lead plane for approval of a media pilot's entry request.
- Instructions on how to use incident radio frequencies and on procedures to follow in contacting the ATGS or lead plane 10 miles (16 km) from the incident.
- For each station's news desk, phone numbers (office and pager) for fire information specialists (with the caveat that if a news desk called the dispatcher instead of the fire information specialist to obtain fire information, the dispatcher might abruptly terminate the call).

Media representatives at the meeting welcomed these initiatives and agreed to abide by the airspace restrictions outlined in the package, for the safety of all concerned. In the spirit of cooperation and

collaboration, a news helicopter partnership was born. To cement the partnership, the agency representatives then met with the fire incident dispatchers so that the agreed-upon operational procedures could be implemented at each fire management office.

The following day, there was an incident that attracted media coverage because it was on the wildland–urban interface boundary between the national forest and the city of Phoenix. As agreed in the meeting, the media helicopter pilots called the incident dispatcher, who initiated the procedures in the directive. The new system worked!

The first partnership meeting, held on June 26, 1990, established a framework for continuing dialog between media pilots and the wildland fire aviation community. Meetings are now held annually during the first week of the airtanker contract. Participation has expanded to include representatives from the three local law enforcement agencies that operate helicopters, municipal fire departments, the Federal Aviation Flight Standards District Office, the U.S. Air Force Air Space Coordinator, Air National Guard units, local air taxi vendors, and agency and contract rotor- and fixed-wing pilots. The format of the meeting has changed little since that first encounter in 1990 between the P3 airtanker and the news helicopter. Only once in 8 years of cooperation has a media pilot landed unannounced on a large incident (due to a communication error).

Partnership Benefits

Local agencies now operate with the media as part of the team over an incident. Through experience, the news helicopters now blend easily into the traffic flow directed by the lead plane or ATGS, who places them where they can swiftly obtain the footage they need for their news editors without endangering other aircraft. For its part, the local wildland fire community now has a potent partner in communicating the fire prevention message by showing the State's 4 million television viewers the destruction caused by human-ignited fires. In addition, local news coverage of airtanker bases, helicopter rappelling, fire crew movements in and out of State, and even campground openings has increased dramatically since the inception of the program, enhancing the public's understanding of the challenges facing wildland fire managers. Through flexible management and open communication, the media, incident commanders, aerial supervisors, and dispatchers can all work together to accomplish their goals in a safe flying environment over wildfires.

For more information on the news helicopter partnership model, contact Robert W. Kuhn, USDA Forest Service, Tonto National Forest, 2324 E. McDowell Road, Phoenix, AZ 85006, tel. 602-225-5356, e-mail: rkuhn/r3-tonto@fs.fed.us. ■

NARTC Course Catalog for 1998–99 Available

Hutch Brown

The 1998–99 course catalog for the National Advanced Resource Technology Center (NARTC) is now available. The catalog describes 12 courses on topics including fire effects, fire behavior, fire area growth, fire risk assessment, aerial retardant use, fire in ecosystem management, fire management leadership, advanced incident management, area command, the National Fire Management Analysis System, the Multiagency Coordination Group, and the Interagency Aviation Management and Safety system. Courses lasting several days each will be held from October 1998 to April 1999 at the NARTC facility in the Sonoran Desert near Tucson, AZ.

To obtain the catalog, contact the National Advanced Resource Technology Center, Pinal Air Park, Marana, AZ 85653, tel. 520-670-6414, fax 520-670-6413, e-mail: NARTC_R3_Coronado @fs.fed.us. ■

Hutch Brown is the editor of Fire Management Notes in Arlington, VA.

Minnesota's New Mix of Fire Aviation Resources

Sheldon Mack

For years, wildland firefighting agencies in Minnesota relied primarily on light helicopters and on large airtankers with a capacity of 2,000 gallons (7,600 L) or more to support ground personnel during fire suppression. We used a conventional mix of aircraft segregated by altitude: helicopters flew between ground level and 500 feet (150 m); lead planes prepared for their next runs at 1,000 feet (300 m); large airtankers moved in racetrack patterns at 1,500 feet (450 m); and air attack orbited at 2,000 feet (600 m).

Today, a new set of aircraft has joined the mix. DeHavilland Beavers on floats now drop water on fires, deliver cargo, and deploy firefighters (fig. 1). Two Canadian CL–215's, each with a water-scooping capability of 1,400 gallons (5,300 L), work at up to 200 feet (60 m) above lake level (fig. 2). Canadian "bird dogs," various types of aircraft used in lead-plane and air-attack roles, share the airspace over Minnesota's fires. A single-engine airtanker (SEAT), with its reduced payload but dramatically increased turnaround time, works the flanks of fires (fig. 3).

Medium and large helicopters, Beavers, Twin Otters, SEAT's, and CL–215's help fill the gap between light helicopters and large airtankers.

Creating the New Mix

The new mix does not alter the role of wildland fire aviation. Firefighting still happens primarily on the ground—it's still the folks on the firelines who stop most wildland fires. Aviation assets are primarily to make life a little easier for these folks; that hasn't changed.

What has changed are budgets. As agency budgets have shrunk, the number of permanent agency employees has decreased. Vacancies are left unfilled, and the average age of our firefighters has increased. We are often asked to do more with less at a time when costs are rising. In 1997, contracts for large airtankers exceeded the number of airtankers available. In response, the cost of airtankers shot up, once again proving the law of supply and demand.

With leaner budgets and increasing costs, what's an agency to do? Continuing our old mix of aircraft was not the answer. In 1984, the wildland firefighting agencies in Minnesota joined to form the Minnesota Incident Command System (MNICS) partnership, a big step toward combining wildland firefighting assets. MNICS partners include the Minnesota Department of Natural Resources (DNR) and Division of Emergency Management; the USDA Forest Service; and the USDI Bureau of Indian Affairs (BIA), National Park Service (NPS), and U.S. Fish and Wildlife Service. MNICS working agreements have created a system whereby Federal and State resources can be easily borrowed, exchanged, and mixed. Today, it doesn't really matter whether you're a BIA suppression crew foreman, a DNR squad boss, a Forest Service SEAT coordinator, or an NPS airtanker base manager: you're first and foremost an MNICS resource available to all MNICS partners.

Figure 1—*A USDA Forest Service DeHavilland Beaver making a water drop. The highly versatile Beaver can also haul cargo and transport personnel. With its floats, it can turn a lake into an instant landing zone. Photo: Minnesota Department of Natural Resources, Grand Rapids, MN, 1997.*

Sheldon Mack is a helicopter operations specialist for the Minnesota Interagency Fire Center, Grand Rapids, MN.

In addition, Minnesota participates in the Great Lakes Forest Fire Compact (GLFFC), which also includes the States of Wisconsin and Michigan and the Provinces of Manitoba and Ontario. Established in 1989, the GLFFC allows wildland firefighting resources to be shared among participating States and Provinces.

The MNICS and GLFFC agreements added instant diversity to our fire aviation toolbox. Type 1 helicopters, OV–10's, Beavers, SEAT's, and more are now readily available through our Federal partners; helicopters, CL–215's, bird dogs, and more are now available through our Canadian partners. The result has been increased sharing of a wide variety of aviation resources as well as traditional caches and ground forces.

Training for the New Mix

The new water-scooping and other aircraft now available added complexity to the task of managing the airspace over fires. A lot of training was needed to make aviation managers feel comfortable with the new mix. It didn't happen overnight. Canadian CL–215's were added to the training mix only in 1996, with SEAT's following in 1997. Agencies within MNICS took the lead by individually sponsoring particular courses. With assistance from out-of-State instructors, most training was conducted at the Minnesota Interagency Fire Center in Grand Rapids, MN. Since 1996 alone, 194 students from various States and Provinces have spent a total of 3,712 hours improving their aviation skills.

Figure 2—*A Canadian CL–215 scooping water from a lake. This aircraft, with its 1,400-gallon (5,300-L) water-scooping and optional foam injection capabilities, is an excellent tool for firefighting support in the Lake States. Photo: Minnesota Department of Natural Resources, Grand Rapids, MN, 1997.*

Formal courses are taught using National Wildfire Coordinating Group (NWCG) standards. Although training to national standards can be difficult, it is essential for full integration of all aviation assets across agencies. The payoffs come when you can easily and safely incorporate help from other agencies into your fire program.

Refresher training for air tactical group supervisors (ATGS's) headed the list of new training requirements. Water-scooping and float aircraft create a unique challenge for airspace management. Aircraft such as the CL–215 and Beaver operate at altitudes that commonly separate our more conventional aircraft. The usual vertical separation of fixed- and rotor-wing aircraft into upper and lower zones of operation doesn't work for these aircraft. Horizontal as well as vertical separations are clearly imperative, and aviation managers had to learn how to apply them. To add to the depth of our ATGS's, we made sure that they met the national requirements detailed by the NWCG in its Wildfire Qualification Guide, 310–1.

Next, we invited our Canadian partners to a controlled training session. Minnesota shares a border with both Manitoba and Ontario, making it easy to look north when aviation resources are in short supply. But before we could exploit this opportunity, we needed to synchronize operations with our Canadian partners. In discussions with CL–215, bird-dog, and lead-plane pilots and with air-attack and other personnel, we talked about differences in operating procedure and terminology, and we conversed about tactics and communication. After everyone felt comfortable together, we conducted a joint controlled training operation, followed by a detailed debriefing. The final product was a combined operating plan and written agreement.

Other types of training included:

- Specialized manager training to safely and efficiently integrate SEAT's into our fire aviation operations. Minnesota is new to the SEAT business, but so far the SEAT has met with approval from the folks on the ground, who value its help in suppressing wildfires.
- Mixmaster and fixed-wing base manager refresher training for all airtanker base personnel, including general training on SEAT operations and techniques for filling a Canadian CL–215 with water or foam.
- Training on operations for our upgraded mobile retardant plant and for two newly developed SEAT support vehicles to make the SEAT even more versatile.

Figure 3—*A single-engine airtanker (SEAT) working a fire. What the SEAT lacks in payload it makes up in shortened turnaround time. Photo: Minnesota Department of Natural Resources, Grand Rapids, MN, 1997.*

- Training for air operations branch directors and air support group supervisors. It is imperative that incident commanders and incident management teams understand their aviation options, risks, and opportunities.

For agencies thinking about expanding their training: Go for it. You must be prepared to help yourself, but once you get started, you'll find a lot of assistance throughout the national system, including numerous instructors who love to help.

What's Next?

Safety, efficiency, and cost-effectiveness remain essential ingredients for a successful aviation program. Large airtankers will continue to be an important and integral firefighting tool, but as they become bigger, faster, and costlier, the gap between light helicopters and large airtankers will continue to grow (fig. 4). In the "Land of 10,000 Lakes," medium and large helicopters, Beavers, Twin Otters with tanked floats, SEAT's, and CL–215's are all excellent tools to help fill this gap.

What about other kinds of mixes? They are certainly possible, particularly in view of the growing need for aviation assets to supplement ground forces. The military continues to release numerous aircraft of various types, and the Federal Excess Personal Property program does an excellent job of tracking the aircraft available to State firefighting agencies. Meanwhile, private enterprise continues to seek out new customers, trying to fill market gaps by offering creative solutions and taking financial risks.

What will the future hold? The answer may be as varied as aircraft makes and models. Whatever might be in store, stay tuned, stay informed, stay trained—and be prepared to "mix it up"!

For more information on MNICS and its wildland fire aviation program, contact Sheldon Mack, Minnesota Interagency Fire Center, 402 SE 11th Street, Grand Rapids, MN 55744, tel. 218-327-4573, fax 218-327-4527, e-mail: sheldon.mack@dnr.state.mn.us, DG: S.Mack:R09F09B. ■

Figure 4—*Although firefighting happens primarily on the ground, fire aviation support is vital today, especially on large wildland fires. But as large airtankers become bigger, faster, and costlier, the gap in fire aviation between light helicopters and large airtankers will continue to grow, inviting the use of a new mix of aircraft.*

Privatizing Aerial Wildfire Detection in South Carolina

Ken Cabe

Aircraft used as high, mobile observation platforms offer many advantages in detecting wildfires. However, aircraft are notoriously expensive to acquire, operate, and maintain. Today, wildland fire managers face the challenge of utilizing the advantages of aerial wildfire detection while keeping costs to a minimum.

Over the past 5 years, the South Carolina Forestry Commission (SCFC) has met this challenge by successfully applying the concept of privatization in its aerial wildfire detection program. Our experience has shown that using private contractors for aerial wildfire detection, if done prudently and judiciously, can promote efficiency and reduce costs.

Now in its fifth year, South Carolina's system of contracting for aerial wildfire detection has reduced costs and improved efficiency in fire detection and suppression.

Hard Choices

South Carolina's wildfire detection system has evolved along the same lines as in many other Southern States:

- During the 1930's, a network of fire towers was established to support what was then a purely ground-based wildfire detection system.
- In the 1950's, contract aircraft carrying fire-trained agency observers began to supplement fire tower detection.
- In the 1980's, fire-trained agency pilots flying Federal excess aircraft were added to the mix.

In 1993, when the SCFC finally closed its tower system in favor of total reliance on aerial detection, the agency faced some hard choices. Should it add planes and pilots and handle the job internally? Should it contract for planes and pilots but have trained agency observers accompany them? Or should it contract the entire operation for aerial detection and firefighting support to the private sector?

In making its decision, the SCFC considered these tradeoffs:

- Handling the entire job internally would provide highly skilled, fire-trained pilots for both general wildfire detection and assistance to firefighters on the ground during an incident. However, it would also be very expensive in terms of personal services and fleet maintenance.
- Using agency observers in contracted aircraft would reduce costs for fleet maintenance but would keep personal-service costs high.
- Contracting the entire aerial firefighting support effort would reduce costs but eliminate fire-trained observers needed to assist ground forces on an active incident.

A Mix of Public and Private Resources

The answer was to use a combination of agency and contracted private resources. "We decided to train contractors to handle routine detection work on their own," said Paul Watts, the aviation manager for the SCFC. "This approach eliminated the need for ride-along observers and reserved our fire-trained staff pilots for work on active incidents."

Quality Controls on Contractors. According to Watts, contracting for aerial detection involves a lot more than just hiring a plane and pilot. Prospective bidders must submit qualifications, including references, and must specify the number of qualified pilots and planes available and the home base and ownership of those planes.

"We're looking for dependability, availability, and quality," said Watts. Each qualification item is evaluated on a point basis, and contractors who measure up are asked to submit bids. When bids are received, the prices are factored

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A contract detection plane located and sized up this South Carolina wildfire. Photo: South Carolina Forestry Commission, Columbia, SC.

South Carolina Forestry Commission planes continue to help ground forces suppress wildfires like this one. Photo: South Carolina Forestry Commission, Columbia, SC.

into the grading system, and each contractor is evaluated once again. "Cost is important, but it's only one part of the equation," Watts noted. "This is not a low-bid decision."

Performance requirements under the wildfire detection contract specify that planes and pilots will be available on 1 day's notice, 365 days per year. To ensure availability, providers must have one pilot and one backup for each plane under contract. Contract flights must be totally dedicated to wildfire detection and may not be used for pilot training, passenger ferrying, or courier service.

Every pilot operating under a detection contract must be trained in radio procedure, dispatch operations, and basic fire sizeup. Field training and flight tests administered by staff pilots are required before a contract pilot is certified to perform detection service. Additionally, each plane must be equipped with an external antenna and a contractor-provided radio that operates on SCFC frequencies.

Are contractors interested in bidding on such a demanding contract, and can they offer the service at a reasonable price? Absolutely. Here's the key: every annual contract guarantees a minimum number of paid flight hours. "We get lots of interest in our contracts," observed Watts, "and hourly rates are essentially the same as they've always been."

Ongoing Role for Agency Pilots. Operationally, SCFC staff pilots still handle aerial wildfire detection when fire danger is low. As danger increases, contractors are called into service and staff pilots are reserved for use in handling incident reconnaissance in support of firefighters on the ground. This combination of resources makes 20 planes available for dispatch on any given day.

General detection routes are predetermined for each plane but may be modified based on fire danger and occurrence. Routes are circuits rather than point to point, allowing pilots to check suspicious smokes that lie off their immediate line of flight. The area of responsibility assigned to a single detection plane ranges from 1,400 square miles (3,600 km^2) to about 4,000 square miles (10,000 km^2), depending on the day's wildfire conditions.

When a suspected wildfire is located, the pilot uses a prepared checklist to provide its specific location and sizeup information to the dispatch center. Upon completion of the report, the detection plane immediately resumes flying its assigned route. Decisions on dispatch of suppression forces are handled by the dispatch center.

Benefits of Privatization

Since 1996, the SCFC has provided contract detection service for national forest lands in South Carolina. "We had already discontinued our towers and were using contracted aerial detection," said Charlie Kerr, the USDA Forest Service's fire management officer for South Carolina. "Since the SCFC was flying the entire State, it just made good sense for us to use their system."

Now in its fifth year of operation, the system is working well for South Carolina. According to Watts, it provides fire managers with flexibility in assigning appropriate aerial resources when and where needed. That flexibility translates into significant cost savings and improved efficiency in both fire detection and fire suppression.

For more information on South Carolina's aerial wildfire detection system, contact Ken Cabe at the South Carolina Forestry Commission, P.O. Box 21707, Columbia, SC 29221, tel. 803-896-8820, fax 803-798-8097, e-mail: kcabe@forestry.state.sc.us. ■

Florida Modifies FEPP for Incident Command Communications

George L. Cooper

In 1997, the Fire Resource Section of Florida's Division of Forestry, Forest Protection Bureau, received funding to convert an 8-foot by 30-foot (2.4-m by 9.1-m) Federal Excess Personal Property (FEPP) office trailer into a communications center for an incident command post. The command post will be used by interagency fire and emergency services command teams for incidents statewide.

All modifications and improvements cost less than $50,000. Work was accomplished primarily at the Division of Forestry's White City Work Center and the Fabrication Shop in Lake City, FL. Modifications include:

New incident command post following ribbon-cutting ceremony officially inaugurating it into service. Photo: George L. Cooper, Florida Division of Forestry, Forest Protection Bureau, Fire Resource Section, Tallahassee, FL, 1997.

- A state-of-the-art communications center, featuring:
  - A telescoping 75-foot (23-m) antenna tower, mounted at the rear;
  - Two remote radio kits,
  - UHF, VHF, 800-MHz, and FAA radios;
  - Telephone, cellular phone, and fax and copy machines;
  - A computer and printer;
  - Mobile and base station antenna masts; and
  - Two ergonomic chairs, a workstation, and storage facilities for forms.
- Roof-mounted air conditioning and wall-mounted thermostatically controlled propane heat.
- A 75-foot (23-m) power cable with a commercial power hookup as well as a self-contained generator.
- All new paneling, floor tiles, and carpeting.
- Corkboards and whiteboards for strategic planning sessions.
- A conference table and four chairs in the command section.
- Interior and exterior storage compartments.
- An 8-foot by 20-foot (2.4-m by 6.1-m) rollup awning.
- Exterior flood lights and an incident command post strobe light. ■

George Cooper is a fire resource manager for the Florida Division of Forestry, Forest Protection Bureau, Fire Resource Section, Tallahassee, FL.

Small-Format Aerial Photography*

Gary E. Laudermilch

Fire management personnel have found small-format aerial photography useful in making wildland–urban interface plans.

The Bureau of Forestry in the Pennsylvania Department of Conservation and Natural Resources has a huge need for updated map data. The Bureau's fire protection, insect suppression, recreation, and timber management activities all demand extensive use of reliable, up-to-date maps. This requires constant updating of map data.

Primarily to support its insect suppression projects, the Bureau sought a cost-effective and timely alternative to traditional map upgrade techniques. Traditional large-format mapping photography, though very precise, was prohibitively expensive, and satellite imagery lacked sufficient detail. Early experiments with small-format aerial photographs indicated that they are the most practical means of acquiring timely data and that they can provide reasonable precision when manipulated with software that takes advantage of recent developments in computer technology.

Acquiring the Data

In 1992, the Bureau discovered and purchased ACCUPHOTO™, a system manufactured by Genisys Research and Development, Inc., of Utica, NY. Based on global positioning system (GPS) data, the system is specifically designed for small-format photography. A complete system costing about $8,000 has a flight control unit that houses a 12-channel GPS receiver and serves as an interface between a laptop computer and a standard 35-mm SLR camera. Using raw GPS data, photo mission plans created on the computer permit a photo center to be targeted to within 300 feet (91 m). Significantly closer tolerances can be achieved with the addition of a real-time differential correction radio link.

In flight, the system navigates the pilot of a light aircraft equipped with a camera port to the target location. At the planned photo center coordinates, the system automatically fires the camera. A computer file is generated that records, for each camera firing, the actual position of the antenna, which roughly equates to the photo center on the ground. Additional data recorded include date and time, exposure number, flight line number, and photo index number along the flight line. These data make it possible to catalog the resulting photographs and relate them to a position on the Earth's surface. After cataloging, it is easy to retrieve the correct photo for a point of interest within the photo coverage area.

Digitizing the Data

However, acquiring the photographs is only part of the equation. Although the photographs themselves hold a great deal of useful information, they must be converted to digital format to realize the full potential of the data they contain. Eastman Kodak Company developed a process for converting a traditional 35-mm film negative into digital data and installing them onto a compact disk, which makes the data usable in a computer environment. This service bridges the gap between photography and the digital world, where the options for handling and manipulating data are almost endless. The cost of digitizing a photograph is less than $1 per frame, and the turnaround time is approximately 1 week. The service is available through most photo-processing vendors.

Now that photographic images can be viewed on a computer, several producers have created computer software that allows photographic images to be referenced to a location on a digital map, and thereby to a position in the real world. In effect, the computer is supplied with the information it needs to calculate the geographic position of all points on the photograph based on the position of a few known ground locations.

Gary Laudermilch is a forest entomologist for the Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, Division of Forest Pest Management, Wellsboro, PA.

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Called registration, this process involves the correlation to a common geographic location of features that can be seen on both the digital map and the digital photo, such as road intersections. Sounds complicated, and it is—but that is the beauty of today's super-fast computers. Thousands of complex mathematical calculations are performed on the photograph during the registration process, which essentially projects or stretches the photograph onto the same plane as the base map. Once registered, a photograph assumes the same degree of precision that was inherent in the base map used for registration.

A Cost-Effective Technology

The Bureau now spends about $6 per image to acquire aerial photographs using contracted aircraft and to digitize the photographs for use in a computer. That price includes costs for:

- The camera film,
- Mission planning,
- Aircraft rental (including pilot fee),
- Wages for the camera system operator (a Bureau employee), and
- Digitizing services provided by Kodak.

In addition, the photographs can be acquired within a few days after establishing the need for them. No other source of photography can provide data in such a timely manner.

As Bureau managers become acquainted with the capabilities of small-format aerial photography, more and more applications are being discovered. Although this technology was originally intended for use in insect suppression activities, fire management personnel have found it useful in making wildland–urban interface plans (fig. 1). In addition, wildlife managers are using the data to map wildlife habitat, and timber managers have identified numerous uses besides forest cover mapping. The list of potential applications is almost endless. Although small-format aerial photography will never replace large-format photography, it has definitely found a niche in Pennsylvania resource management.

For more information on small-format aerial photography, contact Gary E. Laudermilch at the Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry, 1 Nessmuck Lane, Wellsboro, PA 16901, tel. 717-724-2868, fax 717-724-6575, e-mail: laudermilch@pader.gov. ■

Figure 1—*One of many applications for small-format aerial photography is tracking the wildland–urban interface to improve plans for fire management. Left: A 35-mm aerial photograph shows new roads and housing not depicted on topographic maps. Right: Using these data, a 7.5-minute U.S. Geological Survey map can be marked to show the new roads and housing. Illustration: Gary E. Laudermilch, Pennsylvania Bureau of Forestry, Wellsboro, PA, 1995.*

Modular Airborne Fire Fighting Systems Succeed in Indonesia

Joe Madar and Ginger Brudevold

In 1997, wildfires covered large parts of Indonesia, producing immense amounts of smoke and haze. The nations worst affected were Malaysia and Indonesia. Both suffered unprecedented levels of air pollution, exacerbated by the low rainfall and unusual wind patterns associated with El Niño.

Faced with this challenge, the U.S. Department of State coordinated an interagency working group to prepare a technical assistance package, including:

- Humanitarian relief,
- Firefighting support,
- Air quality monitoring,
- Analysis of the health effects of the smoke and haze, and
- Weather forecasting.

In addition to the State Department, eight U.S. Government entities were involved in providing this support: the Agency for International Development; Centers for Disease Control; U.S. Department of Defense (DOD); U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior; Environmental Protection Agency; National Oceanic and Atmospheric Administration; and National Aeronautics and Space Administration.

Joe Madar is a retired aviation management specialist and Ginger Brudevold is the international fire specialist for the USDA Forest Service, Fire and Aviation Management, Washington Office, Washington, DC.

In the absence of ground backup, the only feasible application tactic was to make multiple drops until a fire was extinguished.

Mobilizing Firefighting Support

Firefighting support came from Modular Airborne Fire Fighting System (MAFFS) units assembled from Forest Service and Air National Guard resources and coordinated by the National Interagency Fire Center (NIFC) in Boise, ID. MAFFS originated in a DOD project to develop modular tank units capable of dispensing 3,000 gallons (11,000 L) of liquid fire retardant at rates of 0.5 to 3.0 gallons per 100 square feet (20 to 120 L per 100 m^2). These modular units can be installed in C–130's, instantly turning them into airtankers.

In 1973, the Forest Service purchased its first seven MAFFS units. The agency continues to maintain an active MAFFS program, training and qualifying military crews to operate MAFFS airtankers. The MAFFS Operations Plan, a memorandum of understanding between the Forest Service and DOD, specifies when and how MAFFS may be activated through NIFC.

Successful aerial fire suppression in Indonesia required rapid mobilization of aircraft capable of operating from Indonesian military facilities. The need for full cooperation with the Indonesian military influenced the decision to activate MAFFS. Specially trained and qualified contingents of the Wyoming Air National Guard's 153rd Airlift Wing were selected to operate the MAFFS airtankers. Two Forest Service MAFFS units were installed in two of the 153rd Airlift Wing's C–130H aircraft, and a third military C–130 was used to transport the portable airtanker base, equipment, and technical and military personnel. In addition to the MAFFS units, the Forest Service contributed a fire assessment team and a support team of lead pilots and MAFFS mechanics to guide fire suppressant drops and to keep the MAFFS units operational. Altogether, about 60 personnel were mobilized for the MAFFS operation.

Deploying MAFFS

The fire assessment team traveled to Southeast Asia on October 15, 1997, and was joined by the rest of the MAFFS contingent on October 18. That same day, the U.S. Embassy in Jakarta hosted a meeting attended by representatives of the BPPT (the Indonesian Government agency in charge of forestry), the

Indonesian Armed Forces, the 153rd Airlift Wing, and the fire assessment team. Objectives were established, major concerns addressed, and partnerships formed to ensure close cooperation during MAFFS deployment (fig. 1).

Information from the BPPT and several United Nations scientific teams indicated that peat fires on Kalimantan (the Indonesian part of the island of Borneo) were primarily responsible for the smoke drifting over Malaysia. A general situation report for southern Sumatra suggested that the largest fires were burning in almost the same fuel types as on Kalimantan. Fire management recognized that MAFFS units would have limited value in fighting this type of fire burning in the ground. However, surface fires in the mountainous areas of eastern Java could be fought using MAFFS. Moreover, the Java fires were much smaller and more isolated than the vast peat fires burning on Kalimantan and Sumatra, which covered tens of thousands of acres along fire fronts 20 to 50 miles (30 to 80 km) long—far too large an area for two aircraft alone to attack effectively. It therefore made sense to begin in eastern Java.

Eastern Java. On October 18, reconnaissance flights began to evaluate potential staging areas and water sources and to determine the best location for the operation. More than 70 fires were mapped in an area from Mt. Liman to Mt. Argapuro, a distance of about 100 miles (160 km). The area lies about 20 miles (30 km) south of Surabaya, a city in eastern Java. The fires were burning in mixed hardwoods at 2,500 to 4,500 feet (760 to 1,400 m). The average fire size was estimated to be 5 to 10 acres (2 to 4 ha), although some fires were larger. The fires were the remnants of much larger fires from agricultural land clearing and burning.

Figure 1—*Standing in front of a MAFFS C–130 airtanker at Surabaya on the island of Java in Indonesia are representatives of parties to the MAFFS agreement, including (from left to right) an Indonesian Government representative; a member of the Forest Service fire assessment team; an Indonesian army major; a U.S. Air Force liaison officer; and another Indonesian Government representative. Close collaboration among the parties was key to their success. Photo: Joe Madar, USDA Forest Service, Fire and Aviation Management, Washington Office, Washington, DC (retired).*

Most of the larger fires were burning on Mt. Arjuna, which was chosen as an excellent starting point due to its proximity to Surabaya, about 29 miles (47 km) to the north. At Surabaya, the Indonesian military made a section of its naval aviation training base available for use as a staging area. A large irrigation canal adjacent to a taxiway held enough water to sustain continuous MAFFS operations from the portable airtanker base (fig. 2). Turnaround time for the C–130's from Surabaya to the target area averaged about half an hour.

The first sortie to drop fire suppressant (water) was flown on October 21 over Mt. Arjuna. For the next 4 days, the C–130's dropped nearly 100,000 gallons (380,000 L) of water on numerous fires in eastern Java, including fires on Mt. Butak, Mt. Bromo, Mt. Argapuro, and Mt. Liman. The two planes flew together, dropping suppressant on the same area to multiply its effect. To provide tactical direction, the lead-plane pilots flew inside the cockpits of the C–130's rather than in separate planes, as they normally do in the United States. Their presence was appreciated by the military flight crews, who lacked knowledge about fire behavior. After 9 days of operation, about 70 fires had been extinguished in eastern Java, including most of those initially counted in the target area south of Surabaya. Rain and high humidity helped put out the last of the fires in this area.

Southern Sumatra. On October 30, the MAFFS operation moved to Jakarta, again to military airbase facilities. A reconnaissance flight

Figure 2—*The MAFFS portable airbase operating at the Indonesian naval air station in Surabaya. The depression in the ground on the right contains an irrigation ditch that supplied the suppressant (water) dropped by the C–130 MAFFS airtankers throughout operations in eastern Java. Photo: Joe Madar, USDA Forest Service, Fire and Aviation Management, Washington Office, Washington, DC (retired).*

detected numerous large fires on both the eastern and western sides of the southern Sumatra peninsula. Turnaround time for the C–130's from Jakarta to the target areas in southern Sumatra averaged about 1 hour.

Primary target fires were located on the western side of the peninsula, where they were burning in mountains similar to those in eastern Java. These fires were at about the same elevations and of similar size and intensity as those in eastern Java.

Much larger fires were burning in southeastern Sumatra in predominately peat areas with islands of mixed hardwoods and tropical brush. The understory was a dense grass similar to saw grass, and ground litter was medium to heavy. These fires stretched northward for miles along the southeastern coast, producing great quantities of smoke that severely limited visibility (fig. 3).

Although an agreement to use long-term fire retardant was slowly taking shape, MAFFS operations still had to rely on water for fire suppression. In the absence of ground backup, the only feasible application tactic was to make multiple drops until a fire was extinguished. From November 1 to 14, the C–130's dropped about 300,000 gallons (1.1 million L) of water over southern Sumatra, beginning in the mountains of southwestern Sumatra. When weather conditions forced operations to move to the eastern side of the peninsula, the C–130's focused on fires in a sensitive coastal area near the Way Kombos Nature Reserve. Results on both sides of the peninsula were surprisingly successful: large fires were 90 percent contained, and smaller fires were extinguished. The weather helped, providing periods of rain and high humidity.

Chemical fire retardant (Phos-Check D–75) finally became available on November 15. Multiple applications were needed on the higher intensity fires, but only half

Figure 3—*Fire approaching the Java Sea in southeastern Sumatra. Extensive fires in this area were burning predominately in peat and were difficult to fight effectively from the air. Photo: Joe Madar, USDA Forest Service, Fire and Aviation Management, Washington Office, Washington, DC (retired).*

the quantities were needed as when dropping water. By December, fire activity had greatly decreased due to continuous aerial attack and, in the later stages of the effort, rain and humidity.

Evaluation

The success of the MAFFS mission can be measured in terms of the large number of fires suppressed in both eastern Java and southern Sumatra—more than 140 in about 6 weeks, using only two MAFFS C–130's carrying mostly water. Key to this success were high levels of cooperation throughout the operation among all participants at all levels. The Indonesian Government was exceptionally cooperative, providing assistance whenever and wherever required.

MAFFS operations concluded on December 1, 1997, and all MAFFS staff and equipment returned to the United States within 1 week. The Indonesian Government has expressed its profound appreciation for a job well done.

For more information on the MAFFS operation in Indonesia, contact Ginger Brudevold, USDA Forest Service, Fire and Aviation Management, 201 14th Street, SW., P.O. Box 96090, Rm. 2SW AUD, Washington, DC 20090-6090, tel. 202-205-1500, fax 202-205-1272, IBM: gbrudevold/wo, Internet: gbrudevold/wo@fs.fed.us. ■

New Fire Safety Web Site for Children

Hutch Brown

As part of its "Fire Stops With You" public education campaign, the Federal Emergency Management Agency's United States Fire Administration (USFA) has released the "Kids Page," a new World Wide Web site dedicated to teaching children fire-safe behavior. Each year, children set more than 100,000 fires, including (historically) 6 to 7 percent of all wildland fires; and children make up 20 to 25 percent of those killed in fires each year. Much of this problem is due to a lack of education, guidance, and supervision. The "Kids Page" is designed to help reduce the incidence of fire and its consequences for the Nation.

Through the use of child-friendly graphics, games, and an interactive cartoon fire extinguisher named Exty, children learn the importance of leaving fire use to adults. They also learn about home fire escape plans and smoke detector use and maintenance—key to staying safe from fire. Pre- and postquizzes show children how much they have learned by visiting the "Kids Page." After finishing the postquiz, a child receives a certificate of completion signed by the U.S. Fire Administrator.

> Each year, children set more than 100,000 fires, including (historically) 6 to 7 percent of all wildland fires.

A section for parents and teachers explains how to walk children through the site. It also provides discussion points for talking about fire safety and prevention, and it contains the pre- and postquiz answers as well as instructions on how to print the completion certificate. There is an additional area for providing feedback to USFA.

The USFA "Kids Page" can be accessed at <**http://www.usfa.fema.gov/kids**>. ■

Home page of the U.S. Fire Administration's new fire safety Web site for children. Photo: Federal Emergency Management Agency, Washington, DC, 1998.

Hutch Brown is editor of Fire Management Notes, *Arlington, VA.*

Fire Management Partnership Leads the Way in Utah

STATE OF UTAH
NATURAL RESOURCES
Division of Forestry, Fire & State Lands

Gary Cornell

A new partnership—the Utah Wildfire Training Association—is moving wildfire management forward in the State of Utah. Established in 1996, the partnership is designed to ensure the safety of firefighters and the public while providing effective response to wildfires. Partners include the Utah Division of Forestry, Fire and State Lands (DFF&SL), the USDA Forest Service Intermountain Region, the USDI Bureau of Land Management (BLM) Utah State Office, and Utah Valley State College's Utah Fire and Rescue Academy. Together, they have established a contract with funding assistance to provide wildland fire training, certification, and resources to career and volunteer fire service personnel (see sidebar).

Voluntary Standards

The DFF&SL worked with local fire services, the Forest Service, and BLM to develop the following voluntary wildfire suppression standards for local fire services:

- For training and experience, the standard is National Fire Prevention Association (NFPA) 1051, Wildland Fire Fighter I through IV. For a qualification higher than Wildland Fire Fighter IV, local fire service members must meet the minimum standards of National Wildfire Coordinating Group (NWCG) 310-1.
- For physical fitness, the minimum standard is annual certification by a general practitioner of medicine, following a physical fitness examination, that the individual is fit and capable of working on a fireline.
- For personal protective equipment, the standard is Protective Clothing and Equipment for Wildland Fire Fighting, NFPA 1977.

Incentives

To meet these minimum standards, the partnership provides two kinds of incentives for local fire services—grant assistance and equipment placement.

Grant Assistance. The DFF&SL administers a cost-share grant in conjunction with the Utah Fire and Rescue Academy and the Forest Service. Funding for the grant program comes from Rural Community Fire Protection money and from the Utah Fire and Rescue Academy. To qualify for grant assistance, fire departments must provide documented proof of their efforts to meet the wildfire suppression standards.

Equipment Placement. The DFF&SL acquires Federal Excess Personal Property (FEPP) through agreement with the Forest Service and places it with local fire services. To qualify for FEPP, Utah requires that a local fire service must demonstrate that it trains and equips its personnel to meet the wildfire suppression standards.

The Utah Wildfire Training Association—Basis for Partnership

The Utah Wildfire Training Association was formed in 1996 through a complex web of agreements:

- The Division of Forestry, Fire and State Lands (DFF&SL) signed a Memorandum of Understanding with the Great Basin Coordinating Group (GBCG). The GBCG is a regional interagency organization created to improve communication, cooperation, and coordination among agencies working in Utah, Nevada, southern Idaho, and western Wyoming.
- The DFF&SL signs a yearly contract with Utah Valley State College, which operates the Utah Fire and Rescue Academy.
- An annual operating plan for the partnership is determined in conjunction with the Utah Zone Wildfire Training Committee, an interagency group that identifies wildfire training needs and sets priorities for training.

Gary Cornell is the fire management coordinator for the Utah Division of Forestry, Fire and State Lands, Salt Lake City, UT.

The partnership provides incentives for local fire services to meet minimum standards for training, physical fitness, and protective equipment.

FEPP equipment transformed in Utah Fire and Rescue Academy shops. Photo: Jim Springer, Utah Division of Forestry, Fire and State Lands, Salt Lake City, UT, 1997.

Diverse Instructors

The Utah Fire and Rescue Academy trains local, State, and Federal firefighting personnel in accordance with wildfire suppression standards. The Academy's training cadre consists of personnel from local fire services, the DFF&SL, the Forest Service, BLM, and the USDI National Park Service and Bureau of Indian Affairs. Each agency developed and provided a list of qualified instructors. Personnel from the DFF&SL who assist with fire training are partially funded through the Rural Fire Prevention and Control program.

Training needs are separately established for different firefighting organizations: the Utah Zone Wildfire Training Committee identifies courses that State and Federal firefighting personnel should take, and the DFF&SL works with local fire services to identify their training needs. Of course, to promote interaction at all levels, we encourage all firefighting personnel, whether from local fire services or from State and Federal agencies, to attend any of the training sessions.

Mobile Training

We must go to far-flung local fire services to get local firefighters the training they need. To this end, the DFF&SL has acquired FEPP and placed it with the Utah Fire and Rescue Academy. Utilizing FEPP, the Academy has built equipment to meet specific needs at a relatively low cost, including mobile training props that are unavailable from any other source. Using the mobile props, trainers are able to reach local fire services across the State.

In return for FEPP, the Academy assists the DFF&SL in transporting acquired FEPP from its point of origin to its new destination, whether at the Academy's own facility, the DFF&SL's temporary holding yard, or a receiving cooperator's installation. The Academy works with Utah Valley State College's Professional Driving School to provide student drivers with hands-on experience loading and hauling FEPP for the DFF&SL.

Interagency Cooperation

Utah's wildfire training partnership is key to advancing the wildfire management program on an interagency basis. This contractual partnership is founded on the basis of the cooperative fire management goals that all agencies share, condensing them into a few critical objectives. The end result is a well-trained, properly equipped fire service that works as a team to provide safe and effective fire protection.

For additional information on the partnership, contact Gary Cornell, Fire Management Coordinator, or James Springer, Public Affairs Officer, Utah Division of Forestry, Fire and State Lands, 1594 West North Temple, Suite 3520, P.O. Box 145703, Salt Lake City, UT 84116, telephone 801-538-5555, e-mail nrslf.jspringe@email.state.ut.us. ■

Gary Cornell, fire management coordinator for the Utah Division of Forestry, Fire and State Lands, descends from a mobile training module for hazardous materials that was created from FEPP equipment. Photo: Jim Springer, Utah Division of Forestry, Fire and State Lands, Salt Lake City, UT, 1997.

Seventeen Smokey Bear Awards Presented for 1997

Judy Kissinger

The Cooperative Forest Fire Prevention (CFFP) program presented 17 Smokey Bear Awards to honor sustained, outstanding contributions to wildfire prevention in 1997. The awards include 3 Golden Smokeys, the highest award; 3 Silver Smokeys; and 11 Bronze Smokeys. All the awards recognize sustained wildfire prevention activities over at least 2 years, the use of creative techniques for communicating the wildfire prevention message, and efforts beyond the scope of each nominee's job. The awards, which consist of Smokey Bear statuettes, were presented by the USDA Forest Service, the National Association of State Foresters, and The Advertising Council at various ceremonies throughout the Nation.

The Golden Smokey Awards

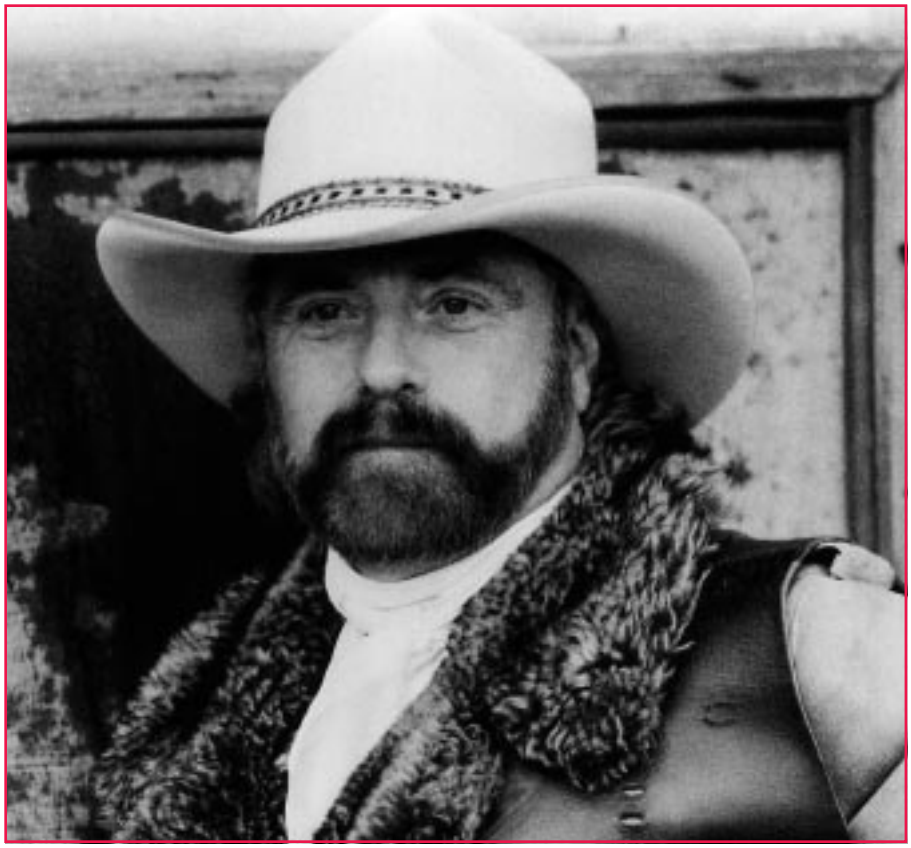
The Golden Smokey Award is presented for a sustained commitment to, and exemplary effort in, wildfire prevention on a national level for 2 years or more. The three winners for 1997 are Alfred E. and Sylvia Grimes, Michael Martin Murphey, and Nancy Lyn Porter.

Alfred E. and Sylvia Grimes of Madbury, NH, have been active in wildfire prevention for many years. They have one of the largest collections of Smokey Bear memorabilia in the United States. They have catalogued the collection and built an exhibit trailer that they have taken to fairs, programs, and exhibits all over the country since 1993 to communicate the wildfire prevention message. In the first

Francis Pandolfi (left), chief operating officer for the USDA Forest Service, presents the Golden Smokey Award to Sylvia and Alfred E. Grimes. Photo: Karl Perry, USDA Forest Service, Washington Office, Washington, DC, 1998.

Francis Pandolfi, chief operating officer for the USDA Forest Service, presents the Golden Smokey Award to Nancy Lyn Porter, wildfire prevention specialist for the Forest Service's Pacific Southwest Region. Photo: Karl Perry, USDA Forest Service, Washington Office, Washington, DC, 1998.

Judy Kissinger is the fire account manager for the USDA Forest Service, Office of Communication, Washington Office, Washington, DC.



Michael Martin Murphey,"America's number 1 cowboy singer" and winner of the Golden Smokey Award. Photo: Courtesy of Wildfire Productions, Taos, NM, ©1998.

3 years of their traveling exhibit, they visited 20 States and attracted about 1.1 million viewers. They have also assisted the Forest Service with its Smokey Bear poster collection and provided information to help update Ellen E. Morrison's book *Guardian of the Forest: A History of Smokey Bear and the Cooperative Forest Fire Prevention Program*. Alfred E. Grimes is a retired forest ranger with the New Hampshire Division of Forests and Lands and was active in wildfire prevention work during his career.

Michael Martin Murphey, a country and western singer, has raised the "Keep It Country, Keep It Green" wildfire prevention campaign to a national level. Murphey, assisted by his wife Mary, has been in partnership with the Forest Service since 1994, donating his time and talent to promote wildfire prevention. Murphey has recorded public service announcements, appeared on wildfire prevention posters, been featured in *Fire Management Notes* (Chambers 1997), and given the Forest Service the opportunity to participate in the events he has been involved in.

Nancy Lyn Porter, a wildfire prevention specialist for the Forest Service's Pacific Southwest Region, Mather, CA, has been a national wildfire prevention leader and communicator for several years. In addition to her many other activities over the years, she managed the national "Keep It Country, Keep It Green" campaign with Michael Martin Murphey; served as an active member of the National Fire Prevention Group; developed national wildfire prevention training courses, signs, campaigns, handbooks, and CFFP catalogs; worked with private entities, States and territories, and other agencies on wildfire prevention programs; helped develop consistent Smokey licensing guidelines; and served on the national planning committee for Smokey's 50th anniversary celebration.

The Silver Smokey Awards

The Silver Smokey Award is presented for contributions to wildfire prevention in regional or multistate areas for at least 2 years. For 1997, Silver Smokeys went to Timothy J. Banaszak, Malcolm Gramley, and Ann and David Lang.

Timothy J. Banaszak, a forestry technician with the Wisconsin Department of Natural Resources, Waupaca, WI, takes a Smokey Bear day pack, a Smokey doll, the comic book *The True Story of Smokey Bear*, and a diary to schools and campgrounds to communicate the wildfire prevention message. One at a time, the kindergarten and first-grade children take the items home overnight and involve parents in reading the comic book and writing in the diary so that parents also receive the message. The project has expanded to nine counties in the area Resource Conservation and Development district, has been adapted by the Minnesota Department of Natural Resources, and is being considered by other States' natural resource agencies.

Malcolm Gramley, a fire protection specialist with the Forest Service's Southern Region, Atlanta, GA, has been a key participant in pulling together materials and providing assistance in producing items with wildfire prevention messages for use in the Southern States. His work provided a cost-effective way

Smokey awards recognize sustained wildfire prevention activities beyond the scope of each nominee's job.

for States to share successful materials on a regional basis, such as Smokey calendars, fact sheets for children's notebooks, Christmas tree tags, door hangers with fire prevention and safety messages, and messages for grocery bags. He was also on the national team for Smokey's 50th anniversary celebration and provided leadership on the Southern Forest Interface Council and in the Southern CFFP Campaign.

Ann and David Lang of Georgetown, CA, have been wildfire prevention volunteers with the Forest Service and the California Department of Forestry and Fire Prevention for 11 years. They have an extensive collection of Smokey Bear memorabilia, which they have built into a display that they take to town festivals and other events, including Smokey's 50th anniversary celebration in 1994 on the Mall in Washington, DC. Since 1987, they have averaged 14 shows annually, reaching thousands of individuals with wildfire prevention messages. They have also long been involved in the multistate Sierra Front Wildfire Cooperators programs.

The Bronze Smokey Awards

The Bronze Smokey Award is presented for outstanding contributions to local or statewide wildfire prevention efforts for 2 years or more. The 1997 award winners are Patrick Costales, David Filmon, the High Desert Fire Prevention Association, Nancy Jemmett, Danny Jones, the Kootenai County Fire Prevention Cooperative, Tom Ninneman, Louis Norvell, Oregon State University, the Shoshone County Fire Prevention Cooperative, and Denise Tomlin.

Patrick Costales, branch manager of the Hawaii Division of Forestry and Wildlife, Honolulu, HI, has been involved in wildfire prevention for more than 20 years. He coordinated Smokey's 50th anniversary celebration in Hawaii, organized Scout troops to help spread the wildfire prevention message, worked with the University of Hawaii and the Honolulu Fire Department, and has had a statewide influence on wildfire prevention programs by supporting activities on the islands of Hawaii, Kauai, Maui, Molokai, and Oahu.

David Filmon, a lawyer in Winnipeg, Manitoba, has provided ongoing free legal advice to the Canadian Forestry Association on the delivery of the Smokey Bear prevention education program in Canada. His advice and expertise have been crucial to ensuring that the program's implementation benefits the Canadian Forestry Association (which holds the Smokey Bear trademark in Canada) while preserving the program's integrity.

The High Desert Fire Prevention Association, headquartered on the Sequoia National Forest, Kernville, CA, is an interagency group organized to convey an annual fire prevention message to children. Members of the association include the Forest Service, the USDI Bureau of Land Management, the U.S. Navy's China Lake Naval Air Weapons Station, and the Kern County Fire Department. Through skits, movies, and sing-alongs, schoolchildren learn about fire safety. The Association also sponsors essay and poster contests, entries in parades, and displays and programs at annual county fairs.

Nancy Jemmett of Grangeville, ID, began her efforts to improve community and agency cooperation in the wildland–urban interface in Prescott, AZ. She invented a realtor awareness program and coordinated its development for two counties, heightening local awareness of the wildland–urban interface issue. She also spearheaded the establishment of neighborhood action groups that implemented wildfire prevention projects in the community and has assisted groups and communities in other States with their prevention efforts in the wildland–urban interface.

Danny Jones, an assistant forest dispatcher on the Sierra National Forest, Clovis, CA, has been involved in wildfire prevention for more than 20 years. He chaired the national Fire Prevention Effectiveness Evaluation Task Force, helped develop the Pacific Southwest Region's wildfire prevention planning process and associated workshops, and has been part of the effort to develop and implement a national wildfire prevention analysis process.

The Kootenai County Fire Prevention Cooperative, comprising members from the Forest Service,

Idaho Department of Lands, and 13 fire departments, began its wildfire prevention activities in 1987 in the area of Coeur d'Alene, ID. The Cooperative created "Captain Keep Safe" to convey fire prevention messages to schoolchildren and has worked with several other fire cooperatives to sponsor fire prevention workshops and develop fire safety skits targeted at children. The Kootenai group also developed a fire education school curriculum and contributed to a publication on safeguarding suburban homes from wildfire.

Tom Ninneman, a teacher for Teton County Schools in Jackson, WY, has for the past 7 years been dedicated to producing "Fire and Recreation Reports" for more than 20 radio and television stations in northwestern Wyoming and southeastern Idaho. These reports have helped foster an awareness of the need for wildfire prevention among local citizens as well as among visitors bound for recreation in the popular Jackson Hole area.

Louis Norvell, a forestry technician on the Shawnee National Forest, Murphysboro, IL, has supported the Smokey Bear program for more than 25 years. He conveys Smokey's message through displays and presentations in parades, at State fairs and fire departments, and before school groups, special-needs children, and Boy and Girl Scouts. Every October, he spends an entire week on programs for children and civic organizations during Illinois' State fire prevention week.

Oregon State University in Corvallis, OR, participated in a pilot project to test the concept of conducting a fire prevention program on college campuses. Among the communication techniques used were distributing football player trading cards with fire prevention messages; having Smokey attend sports events to participate in the coin toss, present awards, and interact with spectators; and using public address systems, reader boards, and billboards to convey fire prevention messages. This concept has now extended to other campuses across the Nation, and Oregon State University continues to host Smokey and fire prevention events.

The Shoshone County Fire Prevention Cooperative in Kingston, ID, another interagency group, is active in community awareness and education efforts. Each spring, the Cooperative visits every elementary school in the county and sponsors a radio announcement contest for children from kindergarten through the third grade, with the winning announcements aired throughout the summer on a local station. The Shoshone group collaborates with other cooperatives, including the Kootenai group, with which it combined forces to create a fire prevention program using clowns. The Cooperative also contributed to a school curriculum and publication on precautions for safeguarding suburban homes from wildfire.

Denise Tomlin, the prevention coordinator for the Forest Service's Rocky Mountain Region in Denver, CO, developed and implemented a process for informing the public and other agencies about fire restrictions, thereby reducing confusion among forest users. She also hosted the first regional wildfire prevention training session, has taught and facilitated wildfire prevention courses, and adopted the fire protection assessment model for use over a five-State area. Her work has promoted clear communication within the Forest Service as well as between the Forest Service and the public.

Nominations

Nominations for Smokey Bear Awards are due each year in the fall. Anyone wishing to submit a nomination should complete a nomination form and attach supporting materials, such as news clippings and photographs. Nominees must have:

- Demonstrated success in the geographical area for which they are being nominated.
- Completed activities reflecting at least 2 years of commitment to wildfire prevention (activities in the planning or development stages do not qualify).
- A proven record of service beyond the normal scope of their jobs.

Nomination forms and instructions, including the exact due date, are available from Forest Service regional coordinators. The completed forms and supporting documentation should be submitted to those coordinators. For more information, contact Nancy Lyn Porter, Prevention Specialist, USDA Forest Service, Fire and Aviation Management, 3735 Neely Way, Mather, CA 95655, tel. 916-364-2855.

Literature Cited

Chambers, T. M. Campaign reminds us to be responsible stewards of the land. Fire Management Notes. 57(1): 15–17.

Author Index—Volume 58

Contributors Wanted

We need your fire-related articles and photographs for *Fire Management Notes*! Feature articles should be about 1,500 to 2,000 words in length. We also need short items of about 100 to 200 words. Subjects of articles published in *Fire Management Notes* include:

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Fuels Management
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Incident Management
Information Management (including Systems)
Personnel
Planning (including Budgeting)
Preparedness
Prevention
Safety
Suppression
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To help prepare your submission, see "Guidelines for Contributors" in this issue.

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