Fire Tech Tips

United States Department of Agriculture
Forest Service
Technology & Development Program

December 2006
5100 0651–2350P–MTDC

A Helmet for ATV Operators With Fireline Duties

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Highlights...

- Forest Service employees are required to wear motorcycle helmets when operating all-terrain vehicles (ATVs).
- Motorcycle helmets have foam liners that are not designed for the high temperatures that could be experienced in a fire environment.
- ATV operators conducted field tests of helmets with Nomex liners.
- The helmets are suitable for operating ATVs in a fire environment, but work is needed to adapt voice-activated radios for the helmets.

All-terrain vehicles (ATVs) are commonly used while lighting prescribed fires and fighting wildland fires. Although the U.S. Department of Agriculture, Forest Service requires ATV operators to wear motorcycle helmets (figure 1), the foam liners could melt if exposed to high temperatures. The Missoula Technology and Development Center (MTDC) was asked to find a helmet that would meet safety requirements for ATV operators working in a fire environment.

The Forest Service *Health and Safety Code Handbook* (FSH 6709.11) specifies helmet standards for ATV operators and personnel working on the fireline. ATV operators are required to wear a three-quarter or full-face motorcycle helmet that meets U.S. Department of Transportation (DOT), American National Standards Institute (ANSI), or Snell Memorial Foundation (SMF) standards. Firefighting

Figure 1—Firefighters working on the fireline with ATVs.

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personnel are required to wear a Forest Service-approved hardhat that meets NFPA (National Fire Protection Association) 1977 standards when on the fireline.

Motorcycle helmets and firefighters' hardhats are designed and tested differently, based on different safety requirements. The motorcycle helmet has a rigid outer shell with an interior foam liner. The hard outer shell prevents objects from penetrating the helmet. The foam liner absorbs energy when it crushes on impact. The chinstrap on the motorcycle helmet is strong enough to keep the helmet on, even during an impact.

A firefighter's hardhat has an adjustable headband that suspends the shell over the wearer's head. The suspension system spreads the impact energy to the attachment points on the headband. The gap between the shell and the wearer's head helps provide protection. The chinstrap on the firefighter's hardhat will keep the hardhat on during high winds, but not during an impact.

Protective helmets used with motorized equipment must undergo a series of controlled tests before being certified. Motorcycle helmets are tested for impact resistance by dropping them (attached to a headform) onto a fixed metal anvil. The velocity and distance of the helmet's fall must meet detailed specifications. The helmet must survive this impact for DOT, ANSI, or SMF certifications.

The hardhat is tested to controlled standards by dropping an object onto the hardhat (attached to a headform) while the hardhat is stationary. The velocity and distance of the object's fall must meet detailed specifications. The hardhat must resist penetration and not contact the headform to pass the test.

MTDC distributed 14 auto racing pit crew helmets manufactured by Simpson Performance Products, Inc., for field testing. These helmets use flame-resistant Nomex liners and meet DOT standards. There are two styles: a three-quarter face helmet, the Fire-Resistant (FR) Cruiser (figure 2), and a helmet that does not protect the face, the Over-the-Wall (OTW) Shorty (figure 3).

Field testers were asked to wear each style of helmet while operating an ATV in a fire environment. They filled out a questionnaire afterward.

Field testers ranked each helmet based on a scale from 1 to 5 (1 being the lowest or not at all, to 5 being the highest or very much).

Figure 2—The Fire-Resistant (FR) Cruiser, a three-quarter face helmet designed to handle higher temperatures than ordinary helmets.

Figure 3—The Over-the-Wall (OTW) Shorty, a helmet designed to handle higher temperatures than ordinary helmets.

The questions included:

- Were radio communications heard?
- Was peripheral vision adequate?
- Was the operator uncomfortably hot when wearing the helmet?
- Was there adequate protection?
- How comfortable was the helmet?

Five responses were received from operators who wore the FR Cruiser helmet and nine responses were received from those who wore the OTW Shorty helmet. The responses were based solely on the operators' perceptions.

ATV operators could not hear radio communications while they were wearing either style of helmet. Three respondents who had integrated radio communications in their helmets heard all communications. Protection and peripheral vision were rated "good" for both styles of helmet. Respondents said that the OTW Shorty helmet was slightly more comfortable and was cooler.

The three-quarter face FR Cruiser style helmet can be used by ATV operators in a fire environment. This helmet meets Forest Service safety standards when used with recommended mouth protection (FSH 6709.11).

Because the OTW Shorty is not a full-face or three-quarter face helmet, the job hazard analysis (JHA) for a fire environment must include justification for its use. In the JHA justification, the following limitations for wearing the OTW Shorty helmet need to be spelled out:

- Distance to the fireline—Such as staying within ¼ mile of the fireline.
- Recommended speed—Such as limiting speed to 10 miles per hour or less.
- Type of terrain—Such as avoiding extremely rough and steep terrain.

Job hazard analysis software can be ordered from MTDC.

Motorcycle and automotive (Nomex-lined) helmets are available from Simpson Performance Products, Inc., (*http://www.simpsonraceproducts.com*). The FR Cruiser (a three-quarter face helmet) costs $260, about the same as a full-face motorcycle helmet. The OTW Shorty that does not protect the face costs $100, slightly less than a three-quarter face motorcycle helmet ($130).

MTDC is adapting standard Forest Service Bendix King radios for voice-activated communication using the FR Cruiser and OTW Shorty helmets. Prototypes should be ready for field testing in 2007.

About the Author

Mary Ann Davies received a bachelor's degree in mechanical engineering with a minor in industrial and management engineering from Montana State University. She worked in the Pacific Northwest Region as a facility engineer and as a tramway engineer. Davies has worked in fire management as a crewmember and as a crewboss. She worked 5 years for the Rocky Mountain Research Station with the fire chemistry and fire behavior groups before coming to MTDC in 1999.

Acknowledgments

Thanks to Joe Ferguson, Region 8, National Forests in Florida, for submitting this project proposal. A special thanks to all of the field testers.

Library Card

Davies, Mary Ann. 2006. A helmet for ATV operators with fireline duties. Tech Tip 0651–2350P–MTDC. Missoula, MT: U.S. Department of Agriculture Forest Service, Missoula Technology and Development Center. 4 p.

The Forest Service's *Health and Safety Code Handbook* (FSH 6709.11) requires ATV operators to wear motorcycle helmets. The foam liners in these helmets are not designed for the high temperatures operators could experience in the fire environment. The Missoula Technology and Development Center recruited ATV operators to test helmets used by persons working in pit crews for race car drivers. Those helmets, manufactured by Simpson Performance Products, Inc., had flame-resistant Nomex liners and met requirements of the U.S. Department of Transportation. The helmets worked satisfactorily, but noise prevented the ATV operators from maintaining radio communications. A prototype helmet that includes a voice-activated radio is being prepared for field testing during 2007.

Keywords: fire fighting, firefighting, Nomex, prescribed fires, radios, safety at work, Simpson Performance Products Inc., voice-activated radios

Additional single copies of this document may be ordered from:

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Electronic copies of MTDC's documents are available on the Internet at:

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Forest Service and Bureau of Land Management employees can search a more complete collection of MTDC's documents, videos, and CDs on their internal computer networks at:

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