



**International Association  
of Wildland Fire**

# **Eighth Wildland Fire Safety Summit**

**The Human Factors Workshop – 10 Years Later**



April 26-28, 2005  
The University of Montana,  
Missoula, MT

# **Proceedings of the Eighth International Wildland Fire Safety Summit**

April 26-28, 2005

Missoula, MT

Produced by:

## **International Association of Wildland Fire**

Edited by:

Bret Butler  
Marty Alexander

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## **FOREWORD:**

### **Why “Human Factors Ten Years Later”?**

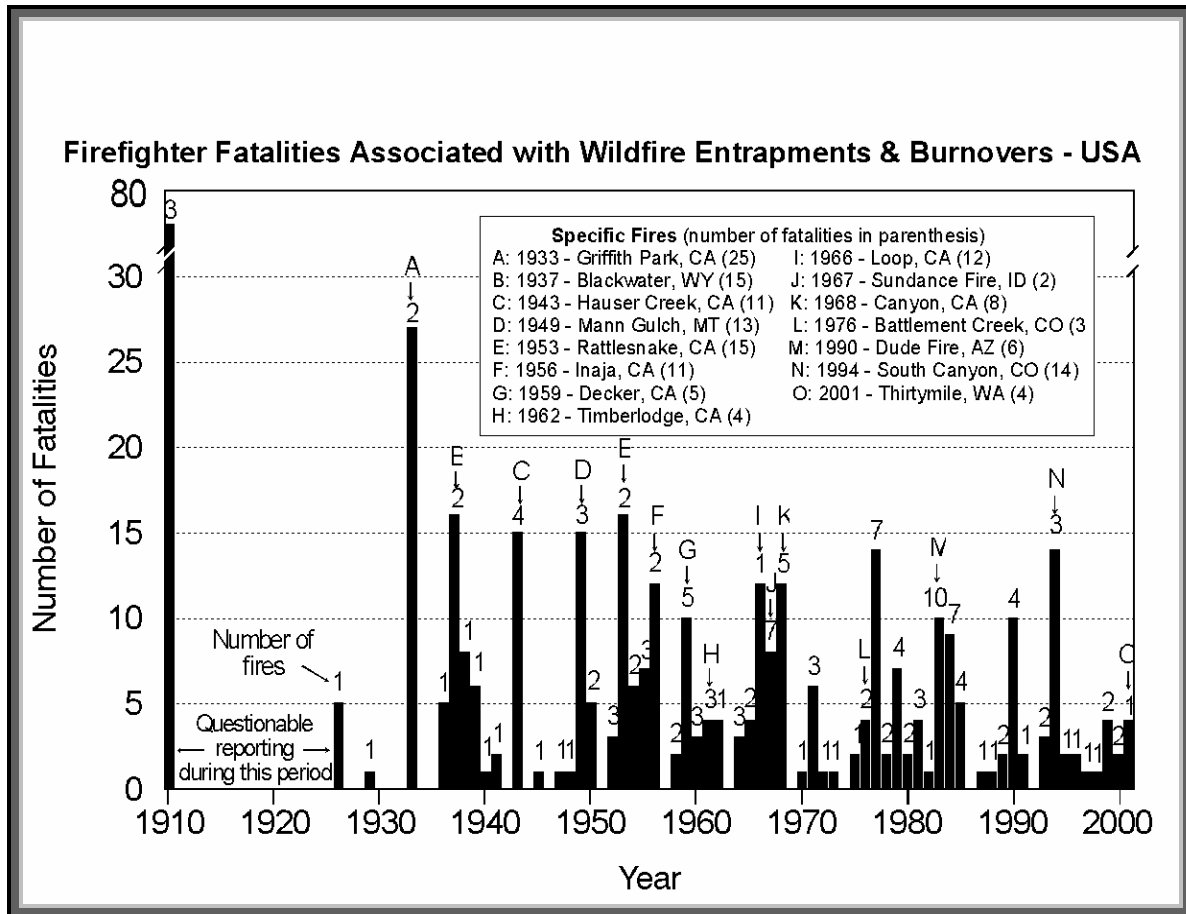
In 1997 the International Association of Wildland Fire (IAWF) held the first international wildland fire safety summit in Rossland, British Columbia, Canada, from September 29 to October 2. Six additional summits have been held since that time:

- Winthrop, Washington, USA, October 26-29, 1998
- Sydney, New South Wales, Australia, November 2-5, 1999
- Edmonton, Alberta, Canada, October 8-10, 2000
- Missoula, Montana, USA, November 6-8, 2001
- Luso, Portugal, November 18-23, 2002
- Toronto, Ontario, Canada, November 18-20, 2003

The general goal of the IAWF international wildland fire safety summits has been to bring together wildland firefighters and managers from different countries, agencies, and levels to discuss common problems and determine a variety of approaches to solving them.

Proceedings have been produced in one form or another from all of the summits except the second one in Winthrop (Greenlee 1998; IAWF and NSW Rural Fire Service 1999; Butler and Shannon 2000; Butler and Mangan 2001; Viegas 2002; IAWF and OMNR 2003). We have endeavored to include as much written documentation (e.g., recommendations, breakout group discussions) of these past summit in the proceedings from this the eighth safety summit, including the program and abstracts for the Winthrop summit, in the interest of creating an institutional memory for the IAWF and in turn the entire global wildland fire community.

Unfortunately the U.S. wildland fire services have a long history firefighter fatalities associated with burnovers and entrapments as evident by the graph adapted from Thorburn et al. (2000) presented below covering the period 1910-2001 representing 419 fatalities over 92 years. On July 6, 1994, 14 wildland firefighters were overrun and subsequently killed by the major “blowup” on the South Canyon Fire in western Colorado. This incident represented the single highest fatality fire in North America in 40 years (i.e., since the 1953 Rattlesnake Fire in California involving 15 firefighter fatalities). The entire global wildland fire management community mourned the loss. An assessment carried out by U.S. Forest Service fire researchers concluded that the extreme fire behavior associated with the South Canyon Fire was normal given the prevailing fire environment conditions (Butler et al. 1998). The South Canyon Fire, coupled with the deaths of 20 additional firefighters during the 1994 fire season, probably more than any event finally brought to light the role that “human factors” or the people dimension play in firefighter fatalities. Some of the human factor issues surrounding the South Canyon Fire were documented in a book by John Maclean (1999).



Less than a year after the South Canyon Fire the USDA Forest Service's Missoula Technology and Development Center (MTDC) hosted a 5-day "Wildland Firefighters Human Factors Workshop" in Missoula, Montana (Putnam 1995). The theme of the workshop was "Improving Wildland Firefighter Performance Under Stressful, Risky Conditions: Towards Better Decisions on the Fire and More Resilient Organizations". This workshop explored firefighter psychology, interactions among firefighters and among fire crews, and better ways to organize firefighters.

After several days of discussions and a field trip to the scene of the 1949 Mann Gulch Fire, the workshop participants developed a series of recommendations for beginning to implement changes that would improve fire organizations and firefighter safety. A copy of the workshop report/proceedings (Putnam 1995) is included within these proceedings; the publication can also be downloaded from the USDA Forest Service's Technology and Development Program website (<http://www.fs.fed.us/eng/t-d.php>) -- after requesting and subsequently receiving your user name and password go to "T&D Pubs", then "Fire" and then scroll down to Putnam (1995).

Human factors and wildland firefighting are not new subjects. For example, Kowski and Walker (1953) discussed the importance of effective leadership to safe and productive fire suppression more than 50 years. What is new is the acceptance and growing recognition of the importance of human factors to ensuring the safety of wildland firefighters rather than just blaming a fatality fire on Mother Nature.






*Scene from the field trip to site of the 1949 Mann Gulch Fire in northwestern Montana on June 14, 1995, associated with the original Wildland Firefighters Human Factors Workshop (from Putnam 1995). The workshop organizer, Ted Putnam is located at centre (seated) and the workshop moderator, Dave Thomas is located on the left. The person to the right is Dave Turner, who served as local guide/interpreter during the field trip.*

United States  
Department of  
Agriculture

Forest Service

Technology &  
Development  
Program

5100-F&AM  
November 1995  
9551-2855-MTDC  
Updated July 1996



## Findings From the Wildland Firefighters Human Factors Workshop

*Improving Wildland Firefighter Performance Under Stressful, Risky Conditions: Toward Better Decisions on the Fireline and More Resilient Organizations*

Current IAWF President Dick Mangan, who was the MTDC Fire Program leader at the time of the original 1995 Wildland Firefighters Human Factors Workshop, has pointed out that “The Workshop, and its resulting Proceedings, were not only well received by the fire community, but became the benchmark for all other efforts looking at the Human Dimension of fighting wildland fires” (Mangan 2004). Following the 7<sup>th</sup> International Wildland Fire Safety Summit in Toronto, the newly elected IAWF President suggested that it would be appropriate to mark the occasion of the tenth anniversary of the original 1995 Missoula workshop by featuring the theme “Human Factors Ten Years Later” for the 8<sup>th</sup> International Wildland Fire Safety Summit in 2005 and to also hold it again in Missoula. The IAWF Board of Directors conceded that this was indeed appropriate for a “... professional association representing members of the global wildland fire community” whose purpose it is “... to facilitate communication and provide leadership for the wildland fire community”.

As Mangan (2004) has also pointed out in the preliminary conference notice, the 2005 summit will provide an opportunity to “... look at progress that has been made over the past 10 years, and develop a course of action that will incorporate the concepts of “Human Factors in Wildland Firefighting” into the wildfire culture around the world well into the 21<sup>st</sup> Century”.

This year’s summit is a continuation of IAWF’s efforts in aiding communication concerning wildland fire safety issues since the first summit was held in Rossland, British Columbia, Canada, back in 1997. As presented in the conference program, the 8<sup>th</sup> International Wildland Fire Safety Summit featured some 28 oral presentations and 19 poster presentations covering topics pertaining the culture of wildland firefighting, the role of leadership in wildland firefighting, the physiological and sociological aspects of wildland firefighting, liability and legal implications, recent initiatives, best practices, and new tools and technology for wildland firefighting. Invited presentations from Dr. Karl Weick, Dr. Ted Putnam, Dave Thomas and Attorney Mike Johns provided conference attendees with a broad perspective of the many facets of wildland fire and human factors.

Undoubtedly one of the highlights of the summit will be Author John N. Maclean’s banquet presentation taking about change or the lack of it since the 1994 South Canyon Fire. The interactive panel discussion led by Mike DeGrosky will provide the opportunity for the conference attendees to voice their opinions and help to formulate a set of recommendations for the future as they are asked to comment on the following:

- What is the single most pressing human factors issue facing wildland fire agencies today?
- What needs to be done to address this issue?
- Who needs to act (e.g., USFS Washington Office, NWCG—Safety & Health Working Team)?

These proceedings contain the papers as submitted by the authors. Except for some editing to try and instill a common format, these papers are as submitted by the authors and have not gone under any peer-review by the IAWF other than undertaken by the authors themselves prior to submittal. As stated previously, we have attempted to include

as complete a collection as possible of records from previous safety summits. As with any written document of this length and complexity we acknowledge that errors will exist, we have attempted to keep the manuscripts as close as possible to the original form submitted by the authors while formatting within a general set of guidelines. We apologize ahead of time for any errors that may be due to our negligence. We did have problems with some of the files from the 2002 safety summit. As a result not all of the papers can be accessed through this document. We apologize to the authors of those papers, but due to time constraints were not able to secure uncorrupted files.

In closing we would like to acknowledge the following individuals and organizations who contributed to the success of this summit. Five scholarships of \$100 each were provided by The National Center for Landscape Fire Analysis to assist with registration costs for five applicants. Additional financial support was provided by The National Center for Landscape Fire Analysis, the National Fire Protection Association, The Northern Rockies Coordinating Group and the National Wildfire Coordinating Group-Safety and Health Working Team. Special thanks go to those who served on the Steering Committee and support group for the 8<sup>th</sup> International Wildland Fire Safety Summit: they include Dick Mangan (Chair), Wayne Cook, Colleen Finneman, Michelle Ekstrom, Diane Trethewey, Dan Jimenez, Ian Grob, Paul Sopko, Bill Gabbert, Howard Dupuis, Mike DeGrosky, Leslie Anderson, Rick Gale, Mike Apicello, Don Sari and Jim Tidwell. International supporters included Keith Harrap, Tony Blanks, and Domingos Viegas. We are also grateful for the willingness of Kathy McAllister, Dick Rothermel, and Tim Love to serve as session chairs and to Ted Mead of the Montana DNRC for welcoming the Eighth Safety Summit to Missoula. Appreciation is also extended to Chuck Bushey who chaired the IAWF standing committee to select the recipient of the 2005 IAWF International Wildland Fire Safety Award.

B.W. Butler and M.E. Alexander  
Editors  
8<sup>th</sup> International Wildland Fire Safety Summit

### References

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**Foreword - Eighth International Wildland Fire Safety**

**2005 Conference Proceedings / 2005 Poster Abstracts**

**2003 Conference Proceedings / Observations and Recommendations**

**2002 Conference Proceedings / Poster Presentations**

**2001 Conference Proceedings / Conference Findings**

**2000 Conference Proceedings**

**1999 Conference Summary**

**1998 Conference Proceedings**

**1997 Conference Recommendations / Abstracts**

**1995 Human Factors Workshop Proceedings**

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**2005 Conference Proceedings**

**Foreword – Eighth International Wildland Fire Safety Summit**

Bret Butler and Marty Alexander

**A Dream, A Team, A Theme: Your Portal to Zero Defect Wildland Fire Safety**

Robert W. Mutch

**TEFF: The Ten Essential Factors in Firefighting**

Patrick Withen

**Wildland Fire Leadership Development Program**

Jim Cook

**Five Years of SAFENET**

John Gould

**Portals to increased firefighter awareness**

Paul Chamberlin

**Integral Leadership for High Reliability Organizing**

Jim Saveland

**Back to Basic's for the Fire Program manager**

Greg Vergari

**10 Years of Progress: Research and Development in Human Performance**

Brian J. Sharkey, Brent Ruby, Steven Gaskill

**Cedar Fire review and analysis**

Dan Northern

**Staff Rides: An interactive tool for wildland firefighter education**

Dave Thomas

**A Progress Report on the Entrapment Avoidance Project: Solving Crew Cohesion**

**Problems on Fires: Leader's Stories**

Jon Driessen, Lisa Outka-Perkins, Leslie Anderson

**Wisdom in the Lessons Learned Library: Work Ethics and Firefighter Identities in the Fire Orders**

Jennifer A. Thackaberry

**Effective Communications in Wildland Firefighting: Can Wildland Fire Organizations Really Walk the Talk?**

Jules Leboeuf

**Developing a Comprehensive Operational Performance Improvement Program**

Greg Esnouf

**Firefighter Safety in France**

Col. Eric Peuch

**Use of Human Factors Analysis for Wildland Fire Accident Investigations**

Michelle Ryerson and Chuck Whitlock

**Identifying why good firefighters make unsafe decisions**

Mary Omodei, Jim McLennan, Chris Reynolds

**High Tech versus Low Tech Training**

Larry Sutton

**Eruptive Fire Behavior in Past Fatal Accidents**

D.X. Viegas, L.P. Pita, L. Ribeiro and P. Palheiro

**Liability Issues Related to Wildland Fire: Personal, Civil and Criminal**

Mike Johns

**Organizational Learning in Fire: Moving towards a learning culture**

P. Nasiatka and D. Christenson

**Improving After Action Review (AAR) Practice**

Mike DeGrosky

**Deep Psychology**

Ted Putnam

**Environmental Conditions as Indicators of Potential for Rapid Rate of Spread in Wildland Fires**

Tom Leuschen

**Changes in Crew Lead Attitudes About Organizational Culture and Safety Since 1998**

Lark McDonald and Larry Shadow

**Fire Behavior vs. Human Behavior – Why Lessons from Cramer Matter**

Kelly Close

**Organizing and Wildfire: Second-generation Human Factors Issues**

Karl Weick

## **2005 Poster Papers**

### **Protection of Firefighting Vehicle Crews**

David Nichols, Jim Gould, Ian Knight, and Justin Leonard

### **Human Behavior Associated with Fatal Accidents of 2003 in Portugal**

D.X. Viegas and M.T. Viegas

### **Networked Fire Chief: A research and training tool that targets the human factors causes of unsafe decision making in wildfires**

Mary Omodei, Glenn Elliott, Matthew Walshe and Alex Wearing

### **A compact device to monitor and report firefighter health, location and status**

Robert L. Kremens, Jason Faulring, and Dan Phillips

### **Firefighter Safety Management: An Annotated Bibliography**

Greg Larson, Ph.D., Kelly Rossetto, Cade Spaulding and Vita Wright

### **Building Group Cohesion In Type II Fire Crews**

Bill Lee

### **Travel Rates of Alberta Wildland Firefighters Using Escape Routes**

Marty Alexander, Greg Baxter and Gary Dakin

### **Using Surveillance Cameras on Remote Fires: Safety and Cost Containment**

J. Riddering, S. Holbrook, C. Teske, D. Helmbrecht, N. Johnson, L. Queen, C. Comstock, and L. Macholz

### **Fireline Fitness**

Bequi Livingston

### **“A Blackwater Comparison” – How Can We Blend the Best of Two Worlds for Fire Safety**

Karl Brauneis

### **Wildland Firefighters and Injury**

Charles Palmer

### **In Pursuit of a Human Factors Tool for Wildland Firefighters**

Brad Mayhew

### **Thermal Responses to Exercise While Wearing Industrial Protective Headwear**

Stewart Peterson, Brian Maraj, Nel Eves, Michael Stickland, Michael Gilpin and Randy Dreger

### **Situational Awareness Poster**

George Solverson and Jim Kautz

### **10 Standard Fire Orders and Watch Out Situations: There is a Better Way**

Craig S. Goodell

### **New Technology for Fuel Breaks and Green Strips in Urban Interface and Wildland Areas**

Jennifer Vollmer

### **Communicating With the Community: Walk the Talk**

G.J. McKay and T.J. Maher,

### **Flexibility in the Air: Multi-purpose Aircraft Provide for Prescribed Fire Security, Wildfire Detection and Air Attacks Using High-winged Single Engine Aircraft in Western Australia**

TJ Maher and G.J. McKay

### **Detailed wind information and at its application to improved firefighter safety**

B. Butler, R. Stratton, M. Finney, J. Forthofer, L. Bradshaw and D. Jimenez

## **2003 Conference Proceedings**

### **Wildland Fire Operations Safety – A Comprehensive Program to Change a Culture**

Edward D. Hollenshead

### **Redesigned Fire Shelter Now Available for Wildland Firefighters**

Leslie L. Anderson

### **Assessing the Need for Footwear with Protective Toecaps for Wildland Fire Operations in Alberta**

Gary Dakin and Ray Ault

### **Loggers and Logging Equipment to Fight Wildland Fires: Issues and Opportunities in Oregon**

Christopher Bielecki & Dr. John Garland

### **Hazard Tree and Snag Safety**

Paul Chamberlin

### **Aviation Safety on the Fire Line**

Ken Wong

### **The Safe and Economic Structural Health Management of Airtanker and Lead Aircraft Involved in Firebombing Operations**

Stephen R. Hall, Richard Perry and Joseph F. Braun

### **Improving Aerial Operations Safety Knowledge Management in the Wildland Fire Community**

Ernie Ptok

### **Knowledge Management in the Wildland Fire Community**

David Christenson

### **Predicting Spatially Explicit Burn Probabilities Across Forest Landscapes Under Extreme Weather Conditions**

Wenbin Cui and David L. Martell

### **High Resolution Surface Wind Simulations in Complex Terrain**

B. W. Butler, Jason M. Forthofer, K. S. Shannon, M. A. Finney, L.S. Bradshaw

### **A Low Cost Weather/Situation Monitor for Wildland Firefighter Safety**

Robert Kremens, Jason Faulring, Andrew Gallagher

### **Keeping it Fresh: Fire Behaviour Safety Messages During Extended Fire Situations**

William N. Droog

### **Improved Pulaski and a Safer Hand Tool System & Strategic Positioning to Eliminate Loss in the Interface**

Troop Emonds

### **The Use of Leading Indicators to Measure the Performance of the Occupational Health and Safety System**

Stephen C. Oakley

### **Fire Behaviour/Safety in Mountain Pine Beetle Killed Stands in British Columbia**

David Marek and Mike Dittaro, BCFS, Protection, Smithers and Vanderhoof, B.C., Canada

## **2003 Key Observations and Recommendations**

### **Key Observations & Recommendations**

6<sup>th</sup> Annual International Wildland Fire safety Summit  
November 19-21, 2003, Toronto, Ontario, Canada

## **2002 Conference Proceedings**

### **Study of fireman thermal sensation nearby a fire front: Evaluation of human and clothing thermal responses**

E. Z. E. Conceição, ADF - FCT – University of Algarve, Campus de Gambelas, 8000 Faro, Portugal

### **Wildland fire-related fatalities in South Africa – A 1994 Case study and looking back at the year 2001**

C. de Ronde Silva Forest Services, Bredasdorp, South Africa

### **Major wildland fire incidents Fire management – Fire safety, essential partners**

Phil Koperberg, NSW Rural Fire Service, NSW Australia

### **Safety and awareness of people involved in forest fires suppression**

N. Raffalli, C. Picard & F. Giroud Centre d'Essais et de Recherche de l'Entente, Gardanne, France

### **Rethinking firefighting for the XXI century: A new firefighter model, fires of design, and fire ecology**

Marc Castellnou, Manel Bosch Serch & Lluís Rodríguez Velimelis Cos de Bombers, DGESC, Departament Interior, Generalitat de Catalunya, Spain

### **Development of an improved wildland fire shelter**

Leslie Anderson, USDA Forest Service, Missoula Technology and Development Center, Missoula, MT, USA

### **Analysis of the behaviour of wet porous media used as thermal protection against high intensity surface heat fluxes**

A.R. Figueiredo & J.J. Costa, Department of Mechanical Engineering, University of Coimbra

### **Criteria for determining the safe separation between structures and wildlands**

Guy Gettle & Carol L. Rice, Wildland Resource Management, Inc., Alamo, CA, USA

### **Wildland / urban interfaces and fire risk An automatic mapping**

Marielle Jappiot, Sébastien Sauer, Nathalie Alibert & Christophe Philibert-Caillat Cemagref, Le Tholonet BP 31, 13612 Aix-en-Provence Cedex 1, France

### **FireSmart management of flammable wildland urban interface landscapes**

M. Sanchez-Guisandez, W.B. Cui & D.L. Martell, Fire Management Systems Laboratory. Faculty of Forestry. University of Toronto. Canada

### **Analysis of S. Domingos accident**

D.X. Viegas, L.M. Ribeiro. A.J. Silva & P. Palheiro, CEIF-ADAI, University of Coimbra, Portugal

### **Learning to be at risk: Are we victims of our own success?**

A.K. Beaver, Yukon Fire Management Division, Yukon Territory, Canada

## **2002 Poster Presentations**

### **Selection and training process in forest fire fighting: Response to socio-economic changes**

Felipe Aguirre Briones, Forest Fires Department, TRAGSA, Madrid, Spain

### **Prescribed fire to improve wildland interface protection in front of wildfires**

E. Martínez & S. Leonart, Bombers GRAF, DGESC, Catalonia, Spain



**Mitigating the risk of wildfire in the wildland urban interface, Anchorage, Alaska, USA**

M.J. Weston York & S.U. Rodman, Wildfire Mitigation Office, Anchorage Fire Department, Municipality of Anchorage, AK, USA J. See, Division of Forestry, Department of Natural Resources, State of Alaska, AK, USA C.M. Rose, Integrated Pest Management Program, Cooperative Extension Service, University of Alaska Fairbanks, AK, USA C.E. Barnwell, GIS Resources Division, Management Information Technology, Municipality of Anchorage, AK, USA

**Preliminary analysis of wildland-urban interface fire prone areas in Italy**

A. Camia, R. Marzano, G. Bovio, Dept. Agroselviter, University of Turin, Italy

**Albiol fire: Did we learn at the third time?**

Ricard Exposito & Tomas Cordero, GRAF, Cos de Bombers, DGESC, Catalonia, Spain

**Changing the extinction model: Escala Fire and Central Catalonia Fires**

Ramon Valls, Ignasi Doll, Emili Dalmau, Pere Alzina, Enric Oliva, Sebastià Massagué & Isaies Sanchez, GRAF, Cos de Bombers, DGESC, Catalonia, Spain

**2001 Conference Proceedings**

**Conference Keynote Address**

Jerry Williams, Chief of Fire and Aviation Management, USFS

**Evaluating Risk and Reward Relationships in Wildland Firefighter Safety**

Al Beaver, Fire Management Planning Supervisor, Yukon Fire Management Division

**Cardiovascular Risks of Wildland Firefighting**

Brian J. Sharkey, Ph.D. USDA Forest Service Technology & Development Center, Missoula, MT

**The Campbell Prediction System (CPS)**

Doug Campbell, Ventura County Fire Dept. USFS retired

**Huelva Fatalities. Alajar Forest Fire. June 30, 1999: Description of the Explosive Phenomenon that caused the Death of four Andalusia Firefighters**

FCO. Rodríguez y Silva, Ph.D., Universidad de Córdoba., Forest Engineering Department, Forest Fire Research Unit

**Looking for Local Solutions to the Wildland-Urban Interface Problem**

G. Scott Waldron, Chief Frenchtown Rural Fire District, Frenchtown, MT

**The determination of ground rates of travel by fire crews using escape routes in variable fuel types and terrain factors.**

Gary R. Dakin, Forest Engineering Research Institute of Canada, Wildland Fire Operations Research Centre

**An Overview of the Development and Implementation of Ontario Ministry of Natural Resources Physical Readiness Evaluation For Initial Attack Forest Fire Fighters (PRE-FIT)**

Howard Dupuis, Provincial Fire Operations Program Officer, Ministry of Natural Resources, Aviation and Forest Fire Management Branch

**Wildland-Urban Fire—A different approach**

Jack D. Cohen, Research Physical Scientist, Missoula Fire Sciences Laboratory  
Rocky Mountain Research Station, USDA Forest Service

**Fire Behavior Assessment for Fireline Safety, Using *FLAME*, the *FireLine* Assessment *METHOD***

Jim Bishop, CDF Fire (ret.), FBAN; Oroville, CA

**Turn Down? Now What? Development of “How to properly refuse risk”**

Author: Jim Cook, Support: Greg Vergari, Mastermind: Greg Overacker

**Concow Fire, September 19-20, 2000**

John R. Hawkins, Assistant Chief, California Department of Forestry and Fire  
Protection, Butte County Fire Rescue, Magalia, CA

**Project Report – Fireline Leadership**

Lark S. McDonald, Mission-Centered Solutions, Inc., Parker, CO

**NERON PROJECT: Firefighters safety in urban interface**

Marc Castellnou, Manel Pardo, Moises Galán, Marta Miralles, Santi Lleonart,  
Etel Arilla i Eduard Martinez. GRAF, Cos de Bombers, Direcció General  
d'emergències i Seguretat Civil. Generalitat de Catalunya

**Achieving Safe and Effective Fire Operations – A Five Point Strategy**

Michael T. DeGrosky, The Guidance Group, Inc., Jackson, Wyoming

**Networked, autonomous field-deployable fire sensors**

R. Kremens<sup>A</sup>, A. Seema, A. Fordham, D. Luisi, B. Nordgren, S. VanGorden, A.  
Vodacek, Rochester Institute of Technology, Center for Imaging  
Science, Rochester NY

**The Ten Standard Firefighting Orders: Can Anyone Follow Them**

Ted Putnam, USFS Retired, Missoula, MT

**Reversing the Trend: Taking Medical Care to the Firefighter Medical Care at the Fireline**

Thomas F. Pedigo, PA-C, NREMT-P, MEDL, Pridemark Wildfire/Medical  
Support Team

**LACES versus LCES: Adopting an “A” for “Anchor Points” to Improve Wildland Firefighter Safety**

W.R.Thorburn<sup>A</sup> and M.E. Alexander<sup>B</sup>

**Wildland Fire – Safety on the Fireline: A New CD-ROM Based Wildland Firefighter Safety Training Course**

W.R. Thorburn<sup>A</sup>, A. MacMillan<sup>B</sup>, M.E. Alexander<sup>C</sup>, D. Campbell<sup>D</sup> and J.  
McLevin<sup>E</sup>

**2001 Conference Findings**

**Findings of the Wildland Fire Safety Conference  
6-8 November, 2001**

## **2000 Conference Proceedings**

### **An Introduction to the International Crown Fire Modelling Experiment**

M.E. Alexander, R.A. Lanoville, B.M. Wotton and B.J. Stocks

### **A Pocket Card for Predicting Fire Behavior in Grasslands Under Severe Burning Conditions**

M.E. Alexander and L.G. Fogarty

### **An Update on Fire Shelter Research and Design**

Leslie Anderson

### **BCFS Physical Fitness Standards – Challenges, Changes and Lessons Learned**

S. Bachop

### **Non-Traditional Resources in Wildland Fire Management During the Florida Fires of 1998-2000**

Jim Brenner

### **An Analysis Method Applied to Firefighter Escape Routes**

B.W. Butler, J.D. Cohen, T. Putnam, R.A. Bartlette, and L.S. Bradshaw

### **Field Verification of a Firefighter Safety Zone Model**

B.W. Butler and J.D. Cohen

### **LCES Workshop, Do Basic Things Very Very Well**

P. Chamberlin

### **Examination of the Home Destruction in Los Alamos Associated with the Cerro Grande Fire July 10, 2000**

Jack D. Cohen

### **1998 Results from the International Crown Fire Modelling Experiment Performance of Safety Equipment**

Mark Y. Ackerman and Gary Dakin

### **Toward a Healthier and Safer Wildland Firefighter Workforce**

Richard J. Mangan

### **Management of Safety on the Fireground**

Paul Macmichael

### **Non-Traditional Resources and Safety in Wildland Fire Management: The Unified Command Safety Team**

Gene Madden

### **Dangerous Tree Assessment- British Columbia's Wildland Fire Safety Module**

T. Manning, P. Taudin-Chabot, M. Dunleavy, D. Rowe, and N. Densmore

### **H2S (Sour Gas Awareness in Regards to safety of Crews on the Fireline**

Steve Matlashewski

### **Application of Aviation Human Factors to the Fire Service: A New Opportunity for Safety**

Randy Okray and Thomas E. Lubnau, II

### **Vehicle Burnovers: Design of Protective Fire Curtains and Enclosures for Crew Protection**

Dr. Bruce R. Paix and Jim E. Roth

### **Wildland Firefighter Load and Carriage: Effects on Transit Time and Physiological Responses During Simulated Escape to Safety Zone**

B.C. Ruby, G.W. Leadbetter III, and D. Armstrong

**Effective Firefighter Safety Zone Size: A Perception of Firefighter Safety**

Jim Steele

**The Wildland Fire Problem in Strathcona County, Alberta and Its Impact on Firefighter Safety**

Stewart, L., P.M. Woodward, K. Hirsch, D. Polinski, and L. Burton

**Wildland Fire-Safety on the Fireline: An Application of Interactive Multimedia CD-ROM Technology to Wildland Firefighter Safety Training**

R.W. Thorburn, A. MacMillan, M.E. Alexander

**Analysis of Three Fatal Accidents Involving Portuguese Firefighters**

D. Xavier Viegas, A.J. Matos Silva, M. Gomes Cruz

**1999 Safety Summit**

**Proceedings**

**Fourth International Wildland Fire Safety Summit  
Sydney, Australia, 2-5 November, 1999**

**Recommendations**

**Fourth International Wildland Fire Safety Summit  
Sydney, Australia, 2-5 November, 1999**

**1998 Safety Summit**

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**Recommendations-not available**

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