



**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

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FOREWORD:

Why “Human Factors Ten Years Later”?

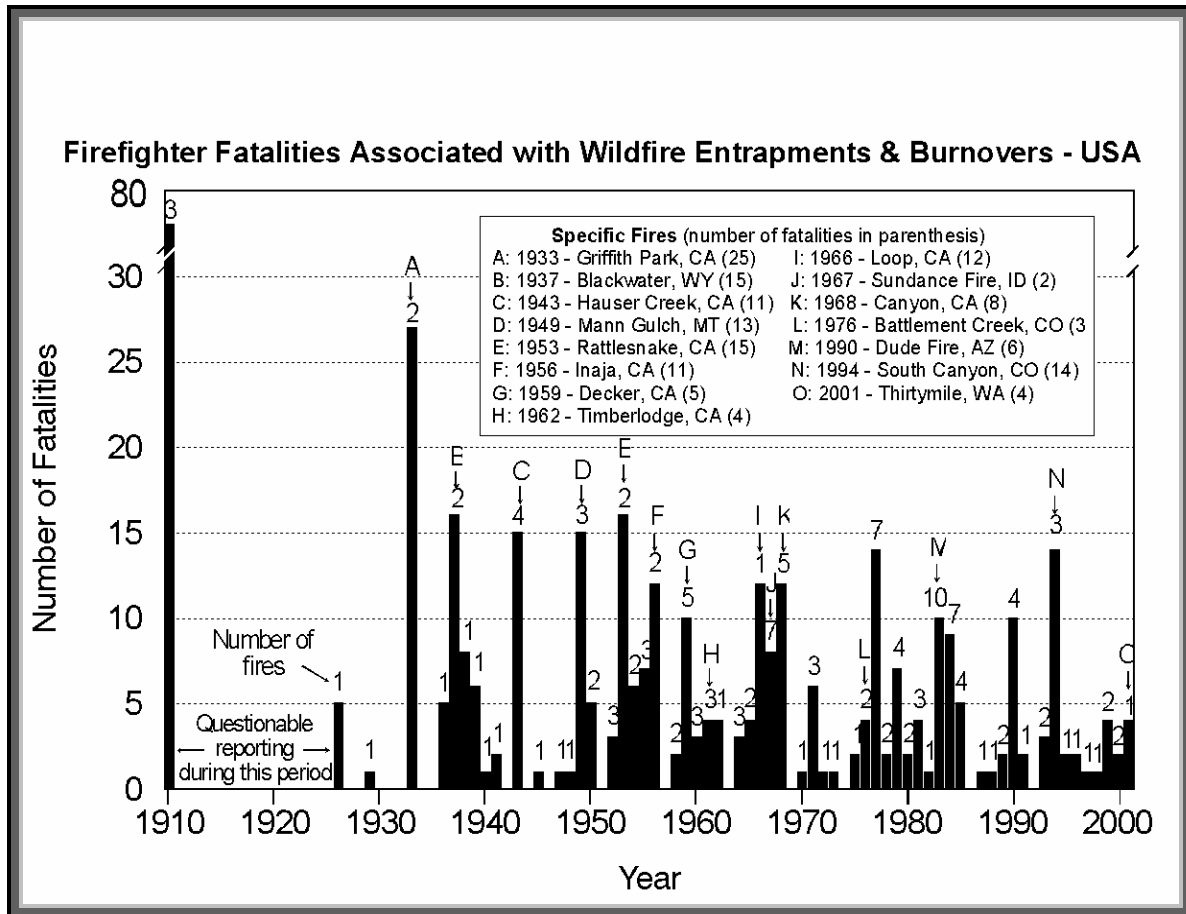
In 1997 the International Association of Wildland Fire (IAWF) held the first international wildland fire safety summit in Rossland, British Columbia, Canada, from September 29 to October 2. Six additional summits have been held since that time:

- 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 7th 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 8th 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 21st 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 8th 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 8th 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
8th International Wildland Fire Safety Summit

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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

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

6th 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. Martinez & 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^A, 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^A and M.E. Alexander^B

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

W.R. Thorburn^A, A. MacMillan^B, M.E. Alexander^C, D. Campbell^D and J.
McLevin^E

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

Proceedings—not available

Book of Abstracts

**Third International Wildland Fire Safety Summit
Winthrop, WA 26-29 October, 1998**

Recommendations-not available

1997 Safety Summit

Proceedings

**Canada/US Wildland Fire Safety Summit, A Chance to Learn From One Another
September 29 – October 2, 1997, Rossland, B.C.**

Recommendations

**Canada/US Wildland Fire Safety Summit
September 29 – October 2, 1997, Rossland, B.C.**

1995 Human Factors Workshop Proceedings

Findings From the Wildland Firefighters Human Factors Workshop

Publications from FERIC referenced in 2005 proceedings

Baxter et al. 2004

Dakin 2002

Petersen et al. 2002

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America West Environmental Supplies, Inc.

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