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Spacecraft Fire Detection and Extinguishment: A Bibliography

Nora H. Jason

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AND EXTINGUISHMENT: A BIBLIOGRAPHY Final
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U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
National Engineering Laboratory
Center for Fire Research
Gaithersburg, MD 20899

February 1988

Contract No. C-32000-J



Prepared for
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U.S. DEPARTMENT OF COMMERCE, C. William Verity, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

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Abstract

Pertinent fire detection and extinguishment references have been identified to further the knowledge of spacecraft fire safety. To broaden the scope of the bibliography, other unusual environments, e.g., aircraft, submarine, ship, have been included. In addition, for a more comprehensive view of the spacecraft fire safety problem, selected subjects are included, e.g, materials flammability, smoke, human behavior. The references will provide the research worker with access to state-of-the-art works and to historic works. Selected references from the 1960s have been included, but the emphasis is on references published from 1975 to 1987. The references are arranged by very broad categories. Often a paper will cover more than one topic, but for the purposes of this bibliography it will be cited only once.

1. Introduction

A NASA Lewis Spacecraft Fire Safety Workshop, held in Cleveland, Ohio, on August 20 and 21, 1986, reviewed the state of the art and assessed the needs for spacecraft fire safety. In addition, one of the suggestions was to develop bibliographic resources to aid an on-going study on fire safety technology development experiments for the Space Station.

This bibliography is an outgrowth of that Workshop. It is a compilation of references to assist the researcher in resolving the problem of fire detection and extinguishment in a spacecraft environment and other environments that might be related to it. To develop a more comprehensive view of the spacecraft fire safety problem, additional subjects are included, e.g., materials flammability, smoke, human behavior. As these subjects are interrelated, references will be cited in the most appropriate category although they may ideally be cited on several categories. Cited references are from the 1960s, but the emphasis is on works published from 1975 to 1987.

The following automated bibliographic databases were searched, using a broad array of keywords to include not only the spacecraft environment, but other unusual environments, e.g., submarines, aircraft, ships, to identify potential references for this bibliography. In turn, references cited within the selected references were reviewed. When appropriate, these references also were included. Center for Fire Research (CFR) experts made valuable contributions, as well as several other experts in the fire research field. The combination of machine and human input data made this bibliography a reality.

The databases queried on Dialog Information Services, Inc. were:

- Aerospace
- Chemical Abstracts
- Engineering Index
- Ei Engineering Meetings
- Inspec
- National Technical Information Service
- Textile Technology Digest
- World Textiles

Other data systems queried were:

- Defense Technical Information Service
- FIREDOC (a National Bureau of Standards fire research database)
- NASA/RECON

Pertinent references were incorporated into the FIREDOC database. Each record contains the full bibliographic reference, keywords, and abstract. To assist the user, in-depth indexing was instituted to compensate for short abstracts. An identifier was assigned to each record for the purpose of developing the bibliography and it corresponds to those sections noted in the Table of Contents. The identifiers are intentionally broad, e.g., Microgravity and Zero Gravity, Extinguishing Agents. Each reference only appears once in the bibliography, in the most appropriate identifier category. However, to access a reference in FIREDOC any combination of keywords and/or identifiers may be used.

FIREDOC is the automated database of the National Bureau of Standards, Fire Research Information Services (FRIS) bibliographic collection. The collection, started in 1971, reflects the programmatic interests of the CFR. It contains national and international fire research reports, books, journal articles and conference proceedings. FIREDOC contains the complete bibliographic reference (e.g., author, title, corporate source, journal name, volume number, pagination, date of publication) and, if appropriate, abstract, keyword(s) and identifier(s). The full text of the document is not included in the database. FIREDOC is growing daily; it currently contains information on 9000 of the 30,000 documents in the FRIS collection. Documents added to the FRIS collection since 1983 are included, as well as some older CFR documents. If you are interested in accessing FIREDOC, please contact Nora H. Jason; the telephone number is (301)975-6862 during normal work hours, Eastern Time.

U. S. Government reports, e.g., NASA CP-2476, may be purchased directly from the National Technical Information Service, Port Royal Road, Springfield, VA 22161. Conference proceedings, if not published in a U. S. Government report series, may be obtain from the sponsoring organization. Complete citations are provided for the journal articles and they may be obtained from the journal, the author, or a library.

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2.1 AEROSOLS AND DROPLETS

- Mulholland, G. W. and Ohlemiller, T. J.
Aerosol Characterization of a Smoldering Source.
National Bureau of Standards, Gaithersburg, MD
Aerosol Science and Technology, Vol. 1, 59-71, 1982.
- Williams, F. A.
Ignition and Burning of Single Liquid Droplets.
Princeton Univ., NJ
Acta Astronautica, Vol. 12, No. 7/8, 547-553, July/August
1985.

2.2 AIRCRAFT

- Blake, D. R. and Hill, R. G.
Fire Containment Characteristics of Aircraft Class D Cargo
Compartments. Final Report. August 1981-September 1983.
Federal Aviation Admin., Atlantic City Airport, NJ
FAA/DOT/CT-82/156, 40 P. June 1983.
- Botteri, B. P.
Aircraft Fire Protection Technology.
Air Force Aero-Propulsion Lab., Wright-Patterson AFB, OH
Advisory Group for Aerospace Research and Development
(AGARD). Aircraft Fire Safety. April 11, 1975,
Rome, Italy. AGARD CP-166, 18/1-15 pp., 1975.
- Botteri, B. P.
Aircraft Fire Safety Research.
Air Force Wright Aeronautical Labs., Wright-Patterson AFB, OH
National Aeronautics and Space Administration. Spacecraft
Fire Safety. August 20-21, 1986, Cleveland, OH.
NASA CP-2476, 65-72 pp., 1987.
- Bruggink, G. M.
Uncontrollable Cabin Fire.
International Journal of Aviation Safety, Vol. 1, 261-266,
December 1983.

2.2 Aircraft (cont)

- Chicarello, P. J. and Shpilberg, D. C.
Minimum Extinguishment Area Required for Safe Escape of
Aircraft Occupants During a Fuel Spill Fire.
Factory Mutual Research Corp., Norwood, MA
Fire Technology, Vol. 12, No. 4, 276-289, November 1976.
- Davis, R. A.
Concorde Fire Protection.
Graviner Mfg. Co., Ltd., Colnbrook, England
Aircraft Engineering, Vol. 43, 26-30, May 1971.
- Enders, J. H. and Wood, E. C.
Special Aviation Fire and Explosion Reduction (SAFER)
Advisory Committee. Final Report. Volume
II-A. June 26, 1978-June 26, 1980.
Department of Transportation, Washington, DC
FAA-ASF-80-4-Vol-IIA, 373 P. June 26, 1980.
- Enders, J. H. and Wood, E. C.
Special Aviation Fire and Explosion Reduction (SAFER)
Advisory Committee. Final Report. Volume
II-B. June 26, 1978-June 26, 1980.
Department of Transportation, Washington, DC
FAA-ASF-80-4-Vol-IIB, 193 P. June 26, 1980.
- Federal Aviation Administration
Engineering and Development Program Plan Aircraft Cabin Fire
Safety.
Federal Aviation Administration, Atlantic City Airport, NJ
FAA-ED-18-7-REV and FAA-NA-80-159-REV, 55 P. February 1983.
- Goonan, T. E.
Hazards Assessment and Protective Clothing Requirements.
Veterans Admin., Washington, DC
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967. Brooke AFB, TX. AMD-TR-67-2,
148-154 pp., 1967.
- Hill, I. R.
Immediate Problems of Aircraft Fires.
London Hospital Medical College, England
American Journal of Forensic Medicine and Pathology, Vol.
7, No. 4, 271-277, December 1986.

2.2 Aircraft (cont)

- Johnston, W. L. and Cahalane, P. T.
Examination of Fire Safety of Commercial Aircraft Cabins.
Texas A & M Univ., College Station
SAFE Journal, Vol. 15, No. 2, 4-9, Summer 1985.
- Jones, J. and Sarkos, C. P.
Design Calculations for a Halon 1301 Distribution Tube for
an Aircraft Cabin Fire Extinguishing System.
Final Report. June 1972-August 1972.
Federal Aviation Admin., Atlantic City, NJ
FAA-RD-73-32 and FAA-NA-73-3, 35 P. April 1973.
- Kourtides, D. A., Parker, J. A., Gilwee, W. J., Jr., Lerner, N. R.,
Hilado, C. J., LaBossiere, L. A. and Hsu, M.
Composite System Approach to Aircraft Cabin Fire Safety.
San Francisco Univ., CA
San Jose State Univ., CA
NASA TM X-73126, 45 P. April 1976.
- Kourtides, D. A., Parker, J. A., Hilado, C. J., Anderson, R. A.,
Tustin, E., Arnold, D. B., Gaume, J. G., Binding, A. T.
and Mikeska, J. L.
Fire Safety Evaluation of Aircraft Lavatory and Cargo
Compartments.
National Aeronautics and Space Admin., Moffett Field, CA
San Francisco Univ., CA
Boeing Commercial Airplane Co., Seattle, WA
McDonnell-Douglas Corp., Long Beach, CA
Journal of Fire and Flammability, Vol. 7, 125-159, January
1976.
- Kourtides, D. A., Parker, J. A., Leon, H. A., Williamson, R. B.,
Hasegawa, H., Fisher, F., Draemel, R., Marcussen, W. H.,
and Hilado, C. J.
Fire Containment Tests of Aircraft Interior Panels.
National Aeronautics and Space Admin., Moffett Field, CA
California Univ., Berkeley
San Francisco Univ., CA
Journal of Fire and Flammability, Vol. 7, 257-278, April
1976.

2.2 Aircraft (cont.)

Kubin, R. F.

Thermal Characteristics of 3501-6/AS and 5208/T300 Graphite Epoxy Composites.
Naval Weapons Center, China Lake, CA
NWC-TP-6104, 18 P. May 1979.

Madgwick, T.

Aircraft Post Crash Fire Reduction/Survivability Enhancement From a Manufacturer's Viewpoint.
British Aerospace, Bristol, England
Advisory Group for Aerospace Research and Development (AGARD). Aircraft Fire Safety. June 7-8, 1982, Oslo, Norway and June 10-11, 1982, London, England and June 15-16, 1982, Washington, DC. AGARD LS-123, 7/1-23 pp., 1982.

Miniszewski, K. R., Waterman, T. E., Campbell, J. A. and Salzberg, F.

Fire Management/Suppression Systems/Concepts Relating to Aircraft Cabin Fire Safety. Final Report.
September 26, 1980-February 28, 1982.
IIT Research Inst., Chicago, IL
Gage-Babcock and Associates, Elmhurst, IL
DOT/FAA/CT-82/134, 154 P. July 1982.

Mott, D. R., Spruance, W. W., Danaher, D., McGuire, R., Kourtides, D. A., Bigelow, A. and Ault, R.

Cabin Interiors/Smoke and Fire Panel.
National Aeronautics and Space Admin., Moffett Field, CA
Annual Conference and Trade Exhibit of the Survival and Flight Equipment Association, 12th. Proceedings,
September 1974, 114-120 pp., 1974.

Parker, J. A., Kourtides, D. A., Fish, R. H. and Gilwee, W. J., Jr.
Fire Dynamics of Modern Aircraft From a Materials Point of View.

National Aeronautics and Space Admin., Moffett Field, CA
Journal of Fire and Flammability, Vol. 6, 534-553, October 1975, and Advisory Group for Aerospace Research and Development (AGARD). Aircraft Fire Safety. April 11, 1975, Rome, Italy.
AGARD CP-166, 10/1-11 pp., 1975.

2.2 Aircraft (cont.)

- Parker, J. A. and Kourtidis, D. A.
Fireworthiness of Transport Aircraft Interior Systems.
National Aeronautics and Space Admin., Moffett Field, CA
Advisory Group for Aerospace Research and Development.
(AGARD). Aircraft Fire Safty. June 7-8, 1982, Oslo, Norway
and June 10-11, 1982, London, England and June 15-16,
1982, Washington, DC. AGARD LS-123, 5/1-17 pp., 1982.
- Payne, G. C.
Aircraft Fire Detection and Suppressant Systems.
Graviner Colnbrook Ltd., Colnbrook, England
Tech Air, Vol. 33, 2-6, May 1977.
- Pelouch, J. J., Jr. and Hacker, P. T.
Bibliography on Aircraft Fire Hazards and Safety. Volume 2.
Safety. Part 1. Key Numbers 1-524 (NASA).
National Aeronautics and Space Admin., Cleveland, OH
NASA TM X-71553, 397 P. May 1974.
- Ramsden, J. M.
Fire-Hard Airliner.
Flight International, Vol. 129, No. 4011, 27-30, May 17,
1986.
- Reeves, J. B. and MacArthur, C. D.
Dayton Aircraft Cabin Fire Model. Volume 1. Basic
Mathematical Model. Final Report. July 1974-March 1976.
Dayton Univ., OH
FAA-RD-76-120, I, 143 P. June 1976.
- Sarkos, C. P., Hill, R. G. and Howell, W. D.
Development and Application of a Full-Scale Wide Body Test
Article to Study the Behavior of Interior
Materials During a Postcrash Fuel Fire.
Federal Aviation Admin., Washington, DC
Advisory Group for Aerospace Research and Development (AGARD).
Aircraft Fire Safety. June 7-8, 1982, Oslo, Norway and June
10-11, 1982, London, England and June 15-16, 1982,
Washington, DC. AGARD LS-123, 6/1-21 pp., 1982.
- Stevens, J. R.
Fire Protection for the Concorde.
Graviner Mfg. Co., Ltd., Colnbrook, England
Industrial Electronics, Vol. 6, 396-398, October 1968.

2.3 DETECTION SYSTEMS

- Alvares, N. J. and McKee, R. J.
Response of Smoke Detectors to Pyrolysis and Combustion Products From Aircraft Interior Materials.
Stanford Research Inst., Menlo Park, CA
National Research Council. Fire Detection for Life Safety.
March 31-April 1, 1975. Washington, DC Proceedings, 128-150 pp., 1975.
- Blumke, R. E.
Aircraft Cargo Compartment Fire Test Simulation Program.
Final Report. October 1974-January 1977.
McDonnell Douglas Corp., Long Beach, CA
NASA CR-151951 and MDC-J7471, 77 P. January 1977.
- Bricker, R. W.
Test Results from a Comparative Evaluation of a Condensation Nuclei Fire Detector.
Webb, Murray and Associates, Inc., Houston, TX
NASA CR-3874, 62 P. March 1985.
- Bukowski, R. W.
Detection of Fires in Electrical Cables.
National Bureau of Standards, Gaithersburg, MD
National Academy of Sciences-National Research Council, Flammability, Smoke, Toxicity, and Corrosive Gases of Electric Cable Materials. Report of the Task Force., Washington, DC. NMAB-342, 139-142 pp., 1978.
- Bukowski, R. W.
Techniques for Fire Detection.
National Bureau of Standards, Gaithersburg, MD
National Aeronautics and Space Administration. Spacecraft Fire Safety. August 20-21, 1986, Cleveland, OH.
NASA CP-2476, 9-29 pp., 1987.
- Bukowski, R. W. and Istvan, S. M.
Survey of Field Experience with Smoke Detectors in Health Care Facilities. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBSIR 80-2130, 36 P. October 1980.

2.3 Detection Systems (cont.)

Conforti, F.

Upgraded UL Standards Trigger Smoke Detector Improvements.
BRK Electronics, Aurora, IL
Specifying Engineer, Vol. 47, No. 5, 66-70, May 1982.

Custer, R. L. and Bright, R. G.

Fire Detection: The State-of-the-Art.
National Bureau of Standards, Gaithersburg, MD
NBS TN 839 and NASA CR-134642, 191 P. June 1974.

Delaney, C. L.

Technology Forecasting: Aircraft Hazard Detection.
Air Force Aero Propulsion Lab., Wright-Patterson AFB, OH
Technological Forecasting and Social Changes, Vol. 5, No. 3, 249-252, 1973.

Duston, D. K.

Laser Smoke Detection.
Espey Mfg. and Electronics Corp., Saratoga Springs, NY
U.S. Patent 3,924,252, 16 P. December 2, 1975.

Eggleston, L. A., Herrera, W. R. and Commerford, G. E.

Automatic Fire Protection System for Manned Hyperbaric Chambers. Phase 1. System Development.
Final Report. June 13, 1968-August 1, 1970.
Southwest Research Inst., San Antonio, TX
NCEL-CR-70-003, 114 P. August 1, 1970.

Fox, D. G.

Aircraft Hazard Detection and Control Utilizing an Aircraft Data Acquisition System. Final Report. July 1970-July 1974.
Air Force Aero Propulsion Lab., Wright-Patterson AFB, OH
AFAPL-TR-77-77, 89 P. December 1977.

Fox, D. G.

Development of Feasibility Demonstration Hardware for an Integrated Fire and Overheat Detection System.
Final Report. June 1970-December 1971.
Air Force Aero Propulsion Lab., Wright-Patterson AFB, OH
AFAPL-TR-72-105, 31 P. May 1973.

2.3 Detection Systems (cont.)

Grabowski, G. J.

Fire Detection and Actuation Devices for Halon Extinguishing Systems.

Fenwall, Inc., Ashland, MA

National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 299-311 pp., 1972.

Griffin, R. E.

In-Mine Evaluation of Underground Fire and Smoke Detectors.

Bureau of Mines, Twin Cities, MN

IC 8808, 27 P. 1979.

Hawkins, R. L. and Rao, K. N.

Standard Aircraft Diffusion Flame: Spectral Characteristics and a Feasibility Study for Developing an Alternate Calibration Source for Aircraft Optical Fire Detection

Systems. Final Report. March 31, 1983-September 30, 1984.

Ohio State Univ., Columbus, OH

AFWAL-TR-84-2080, 23 P. December 30, 1984.

Heitmann, H.

Design and Testing of the Ultraviolet Flame Radiation Detectors for Automatic Fire Detection.

Duisburg Univ., West Germany

Fire Safety Journal, Vol. 6, No. 3, 183-191, 1983.

Horvath, Z. J.

High Reliability IREDS, Custom Designed for Fire Protection Detectors.

Cerberus Ltd., Maennedorf, Switzerland

Reliability in Electrical and Electronic Components and Systems. 5th European Conference on Electrotechnics.

EUROCON 1982, June 14-18, 1982.

Johnson, J. E.

How to Specify Effective Smoke and Fire Detection.

Pyrotronics, Cedar Knolls, NJ

Actual Specifying Engineer, Vol. 33, No. 4, 64-69, April 1975.

Johnson, L. C., Spinweber, C. L., Webb, S. C. and Muzet, A. G.

Dose Level Effects of Triazolam on Sleep and Response to a Smoke Detector Alarm. Final Report. 1979-1985.

NAVHLTHRSCHCH-85-44, 23 P. November 1985.

2.3 Detection Systems (cont.)

- Kamath, A. R. R., Keller, A. Z. and Wooliscroft, M.
Reliability Assessment of Smoke Detectors.
Bradford Univ., West Yorks., England
DHSS Works Group Directorate of Operations, London, England
Reliability Engineering, Vol. 2, No. 4, 283-288,
October/December 1981.
- Linford, R. M. F.
Experiments With the Skylab Fire Detectors in Zero Gravity.
McDonnell-Douglas Corp., St. Louis, MO
Institute of Environmental Sciences, American Institute of
Aeronautics and Astronautics, American Society
for Testing and Materials and the National
Aeronautics and Space Administration. Space
Simulation. New York, NY, May 1-3, 1972. NASA SP-298,
Paper No. 8, 41-56 pp., 1972.
- Linford, R. M. F.
Integration of a Fire Detector into a Spacecraft.
McDonnell Douglas Corp., St. Louis, MO
Journal of Spacecraft and Rockets, Vol. 9, No. 9, 697-701,
September 1972.
- Litton, C. D.
Mathematical Model for Ionization-Type Smoke Detectors and
the Reduced Source Approximation.
Bureau of Mines, Pittsburgh, PA
Fire Technology, Vol. 13, No. 4, 266-281, November 1977..
- Litton, C. D.
Optimizing Ionization-Type Smoke Detectors.
Bureau of Mines, Pittsburgh, PA
Fire Technology, Vol. 15, No. 1, 25-42, February 1979.
- Litton, C. D. and Hertzberg, M.
Principles of Ionization Smoke Detection. Development of a
New Sensor for Combustion-Generated Submicrometer Particulates.
Bureau of Mines, Pittsburgh, PA
RI 8242, 24 P. 1977.
- Lundstrom, I., Shivaraman, M. S., Stibler, L. and Svensson, C.
Hydrogen in Smoke Detected by the Pd-Gate Field-Effect
Transistor.
Chalmers Univ. of Technology, Gothenburg, Sweden
Review of Scientific Instruments, Vol. 47, No. 6, 738-740,
June 1976.

2.3 Detection Systems (cont.)

- Matthews, J. D. and Walker, F. K.
Assessment of the Effects of Ceiling-Mounted Destratification Fans on the Performance of "Products of Combustion" Type Fire Detectors. Final Report. April-September 1983.
Naval Civil Engineering Lab., Port Hueneme, CA
ESL-TR-8366, 36 P. January 1984.
- McCormack, R. G.
Optical Fire Detection System. Patent Application.
Department of the Army, Washington, DC
PAT-APPL-446-143, 21 P. December 1982.
- McGuingle, R. D., Jackson, H. W. and Beavers, R. R.
Applicability of Fiber Optics to Aircraft Fire Detection Systems. Final Report. May 15-August 15, 1978.
HTL Industries Inc., Santa Ana, CA
AFAPL-TR-78-84 and HTL-K-WEST-D-1530, 73 P. October 1978.
- Mulholland, G. W. and Liu, B. Y. H.
Response of Smoke Detectors to Monodisperse Aerosols.
National Bureau of Standards, Gaithersburg, MD
Minnesota Univ., Minneapolis
Journal of Research of the National Bureau of Standards,
Vol. 85, No. 3, 223-238, May/June 1980.
- Pomroy, W. H.
Spontaneous Combustion Fire Detection for Deep Metal Mines.
Bureau of Mines, Pittsburgh, PA
RI 9144, 29 P. 1987.
- Rajan, K. S., Snelson, A., Schechter, H. R., Mniszewski, K. R.,
Waterman, T. E., Yamate, G. and Harpe, S. W.
New Concepts of Fire Detection.
IIT Research Inst., Chicago, IL
Underwriters Laboratories, Northbrook, IL
Project J6391 and Project 77NK1309, 97 P. December 1978.
- Raskauskas, B. J.
Integrated Fire and Overheat Detection System for Aircraft.
Technical Report. November 15, 1968-September 15, 1969.
General Motors Corp., Kokomo, IN
AFAPL-TR-69-97, 77 P. December 1969.

2.3 Detection Systems (cont.)

Schade, O. H., Jr.

BiMOS Micropower IC's.

RCA, Somerville, NJ

IEEE Journal of Solid-State Circuits, Vol. SC-13, No. 6,
791-798, December 1978.

Scheidweiler, A.

Distribution of Intelligence in Future Fire Detection
Systems.

Cerberus AG, Mannedorf, Switzerland

Fire Safety Journal, Vol. 6, No. 3, 209-214, 1983.

Senturia, S. D.

Chromatographic Analysis of the Response of Polymeric
Fire Detection Devices to Combustion Products.

Final Report. May 1, 1975-February 28, 1977.

Massachusetts Inst. of Technology, Cambridge

NASA CR-154845, 23 P. May 1977.

Shigiyama, K., Miura, K., Yoshida, T., Shimura, T. and Niii, Y.
Japanese Patent for a Fire Detector.

Matsushita Communication Industrial Co., Ltd., Yokohama,
Japan

Japanese Patent 54-998 and ORNL/tr--86/56, 13 P. January 6,
1979.

Simon, F. N. and Rork, G. D.

Ionization-Type Smoke Detectors.

Honeywell Corporate Research Center, Bloomington, MN

Review of Scientific Instruments, Vol. 47, No. 1, 74-80,
January 1976.

Springer, R. J. and Sheath, P. H., Robinson, S. P. and
Smith, D. J. V.

Advanced Ultra-Violet (UV) Aircraft Fire Detection System.

Volume 1. System Description and Flight Test.

Final Report. December 15, 1977-October 26, 1981.

General Dynamics Fort Worth Div., TX

AFWAL-TR-82-2062, 160 P. August 1982.

Springer, R. J., Sheath, P. H., Robinson, S. P. and Smith, D. J. V.

Advanced Ultra-Violet (UV) Aircraft Fire Detection System.

Volume 2. System Hardware Design, and Test.

Final Report. December 1977-October 1981.

General Dynamics Fort Worth Div., TX

AFWAL-TR-82-2062, 512 P. December 1981.

2.3 Detection Systems (cont.)

- Springer, R. J., Sheath, P. H., Robinson, S. P. and Smith, D. J. V.
Advanced Ultra-Violet (UV) Aircraft Fire Detection System.
Volume 3. Ground Support Equipment (GSE) for
System Checkout. Final Report. December
1977-October 1981.
General Dynamics Fort Worth Div., Fort Worth, TX
AFWAL-TR-82-2062, 208 P. August 1982.
- Street, T. T., Lawrence, K. D., Williams, F. W. and Alexander, J. I.
NRL Processor-Aided Fire Detection System.
Naval Research Lab., Washington, DC
NRL Report 8341, 116 P. September 14, 1979.
- Suminski, G., Riemer, O. and Hankey, F.
Integrated Fire and Overheat Detection System. Final
Report.
McGraw-Edison Co., Manchester, NH
AFAPL-TR-76-64, 321 P. June 1976.
- Thomas, E. C.
Pneumatic Sampling Fire Detection System in an Underground
Haulageway.
Brunswick Corp., Costa Mesa, CA
IEEE Transactions on Industry Applications, Vol. IA-19, No.
3, 440-444, May/June 1983.
- Transue, R. E. and Hall, C.
Fire Safety and Electronics.
Rolf Jensen & Assoc., Deerfield, IL
Pyrotronics, Cedar Knolls, NJ
Specifying Engineer, Vol. 49, No. 5, 92-94, May 1983.
- Trumble, T. M.
Smoke Detection System for Manned Spacecraft Applications.
Final Report. July 1970-July 1974.
Air Force Aero-Propulsion Lab., Wright-Patterson AFB, OH
AFAPL-TR-74-97, 108 P. June 1975.
- Unger, E.
Problems of the Operating Reliability in Control and
Indicating Equipment.
Friedrich Merk Telefonbau G.m.b.H., Munich, Germany
Fire Safety Journal, Vol. 6, No. 3, 241-250, 1983.
- Von Tomkewitsch, R.
Fire Detector Systems With 'Distributed Intelligence'. The
Pulse Polling System.
Siemens AG, Munich, F.R.G.
Fire Safety Journal, Vol. 6, No. 3, 225-231, 1983.

2.4 EXTINGUISHING AGENTS

- Affens, W. A.
Effect of Halon 1301 Fire Extinguishing Agent on the Response of Combustible Gas Indicators. Final Report.
Naval Research Lab., Washington, DC
NRL-MR-4150, 20 P. January 18, 1980.
- Altman, R. L.
Extinction of In-Flight Engine Fuel-Leak Fires With Dry Chemicals.
National Aeronautics and Space Admin., Moffett Field, CA
American Institute of Aeronautics and Astronautics, Inc. Flames, Lasers, and Reactive Systems. Volume 88. Progress in Astronautics and Aeronautics.
Bowen, J. R., Manson, N., Oppenheim, A. K. and Soloukhin, R. I., Editors, 273-290 pp., 1983.
- Atallah, S. and Crowley, D.
Novel Fire Suppression Materials for Advanced Aircraft. Arthur D. Little, Inc., Cambridge, MA
JTCG/AS-76-T-011, 95 P. March 1978.
- Atallah, S. and Stricoff, R. S.
Evaluation of the Auxiliary Agents and Systems for Aircraft Ground Fire Suppression. Phase 2. Final Report. August 9, 1972-December 10, 1973.
Little (Arthur D.), Inc., Cambridge, MA
ADL-C-74159-2 and ASD-TR-73-41, 116 P. May 1974.
- Auck, S. E.
Short History of Halogenated Fire Extinguishing Agents. Underwriters Laboratories Inc., Northbrook, IL
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 7-12 pp., 1972.
- Back, K. C. and Van Stee, E. W.
Cardiovascular and Nervous System Effects of Bromotrifluoromethane: A Short Review.
Aerospace Medical Research Lab., Wright-Patterson AFB, OH
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 91-113 pp., 1972.

2.4 Extinguishing Agents (cont.)

- Botteri, B. P., Cretcher, R. E. and Kane, W. R.
Aircraft Applications of Halogenated Hydrocarbon Fire Extinguishing Agents.
Wright-Patterson Air Force Base, OH
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 215-238 pp., 1972.
- Call, D. W.
Human and Rat Exposures to Halon 1301 Under Hypobaric Conditions.
Naval Air Station, Miramar, CA.
National Research Center. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 127-135 pp., 1972.
- Carhart, H. W. and Fielding, G. H.
Applications of Gaseous Fire Extinguishants in Submarines.
Naval Research Lab., Washington, DC
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 239-256 pp., 1972.
- Carter, D. I.
Fire Extinguishment and Protective Clothing Evaluations.
Aerospace Medical Div., Brooks AFB, TX
Aerospace Medical Div. Fire Hazards and Extinguishment Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2, 70-105 pp., 1967.
- Charno, R. J.
Evaluation of High Expansion Foam for Spacecraft Fire Extinguishment.
E. W. Bliss Co., Swarthmore, PA
NASA CR-99580, 110 P. February 1969.
- Clark, D. G.
Toxicity of Halon 1211.
Imperial Chemical Industries Ltd., Cheshire, England
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 60-66 pp., 1972.
- Coulston, F. and Griffin, T. B.
Study of Toxicological Evaluation of Fire Suppressants and Extinguishers. Final Report.
Albany Medical College, NY
NASA CR-147658, 209 P. March 31, 1975.

2.4 Extinguishing Agents (cont.)

de Ris, J.

Fire Extinguishment and Inhibition in Spacecraft Environments. Final Report.
Factory Mutual Research, Norwood, MA
National Aeronautics and Space Administration. Spacecraft Fire Safety Conference. August 20-21, 1986, Cleveland, OH.
NASA CP-2476, 43-49 pp., 1987.

Desmarais, L. A. and Tolle, F. F.

Integrated Aircraft Fuel Tank Inerting and Compartment Fire Suppression System. Volume 1. Preliminary Design, Optimization, and Integration. Final Report. August 1979-October 1982.
Boeing Military Airplane Co., Seattle, WA
AFAPL-TR-83-2021, Volume 1, 107 P. April 1983.

Desmarais, L. A. and Tolle, F. F.

Integrated Aircraft Fuel Tank Inerting and Compartment Fire Suppression System. Volume 2. Evaluation of Nitrogen-Enriched Air as a Fire Suppressant. Final Report. August 1979-October 1982.
Boeing Military Airplane Co., Seattle, WA
AFAPL-TR-83-2021, Volume 2, 227 P. April 1983.

Energy and Minerals Research Co.

Feasibility Study of Thixogelled Fire Extinguishant for Submarines. Final Report.
Energy and Minerals Research Co., Exton, PA
10 P. December 1983.

Fiala, R.

Aircraft Post-Crash Fire Fighting/Rescue.
Institut fur Antriebstechnik, Kolon-Porz, Germany
Advisory Group for Aerospace Research and Development.
Aircraft Fire Safety. June 7-8, 1982, Oslo, Norway and June 10-11, 1982, London, England and June 15-16, 1982, Washington, DC. AGARD LS-123, 8/1-27 pp., 1982.

Fiala, R. and Winterfeld, G.

Investigation of Fire Extinguishing Powders by Means of a New Measuring Procedure.
Deutsche Forschungs- und Versuchsanstalt fur Luft- und Raumfahrt E. V., Institut fur Luftstrahlantriebe, Germany
Advisory Group for Aerospace Research and Development (AGARD). Aircraft Fuels, Lubricants, and Fire Safety. May 10-14, 1971, The Hague, Netherlands.
AGARD CP-84-71, 24/1-12 pp., 1971.

2.4 Extinguishing Agents (cont.)

Fohlen, G. M., Parker, J. A., Riccitiello, S. R. and Sawko, P. M.
Intumescence: An In Situ Approach to Thermal Protection.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
12/1-6 pp., 1970.

Ford, C. L.
Extinguishment of Surface and Deep-Seated Fires With Halon
1301.
E. I. du Pont de Nemours and Co., Wilmington, DE
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 158-172 pp., 1972.

Gassmann, J. J. and Marcy, J. F.
Application of Halon 1301 to Aircraft Cabin and Cargo Fires.
Federal Aviation Admin., Atlantic City, NJ
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 173-187 pp., 1972.

Gassmann, J. J. and Hill, R. G.
Fire-Extinguishing Methods for New Passenger/Cargo Aircraft.
Final Report. July 1969-February 1971.
National Aviation Facilities Experimental Center, Atlantic
City, NJ
FAA-RD-71-68 and FAA-NA-71-23, 45 P. November 1971.

Geller, I., Garcia, B. A., Gleiser, C., Haines, R., Jr.,
Hamilton, M., Hartmann, R., Jr., Mendez, V., Samuels, A.
and Miguel, M. S.
Evaluation of the CNS and Cardiovascular Effects of
Prolonged Exposure to Bromotrifluoromethane (CBrF₃).
March 1, 1980-May 1, 1981.
Southwest Foundation for Research and Education, San
Antonio, TX
NASA CR-161078, 237 P. May 1981.

Grenich, A. F. and Tolle, F. F.
Electrostatic Safety With Explosion Suppressant Foams. Final
Report. March 1980-September 1982.
Boeing Military Airplane Co., Seattle, WA
AFWAL-TR-83-2015, 161 P. March 1983.

2.4 Extinguishing Agents (cont.)

- Griffin, T. B., Byard, J. L. and Coulston, F.
Toxicological Responses to Halogenated Hydrocarbons.
Albany Medical College of Union Univ., NY
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 136-147 pp., 1972.
- Harris, W. S.
Cardiac Effects of Halogenated Hydrocarbons.
University of Illinois Hospital, Chicago, IL
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 114-126 pp., 1972.
- Hill, R.
Evaluation of a Halon 1301 System for Aircraft Internal
Protection From a Postcrash External Fuel
Fire. Final Report. September 1975-March 1976.
Federal Aviation Admin., Atlantic City, NJ
FAA/RD-76/218 and FAA-NA-76-42, 28 P. March 1977.
- Jamison, H. H.
Evaluation of Bromotrifluoromethane as a Fire Extinguishing
Agent for Apollo Hypergolic Propellants.
National Aeronautics and Space Admin., Houston, TX
NASA TM X-64349 and MSC-EP-R-68-18, 35 P. November 1968.
- Johnson, A. M. and Grenich, A. F.
Vulnerability Methodology and Protective Measures for
Aircraft Fire and Explosion Hazards. Volume 2.
Aircraft Engine Nacelle Fire Test Program.
Part 1. Fire Detection, Fire Extinguishment
and Surface Ignition Studies. Final Report.
February 1981 to October 1984.
Boeing Military Airplane Co., Seattle, WA
AFWAL-TR-85-2060, 292 P. January 1986.
- Kuchta, J. M. and Burgess, D.
Effectiveness of Halogenated Agents Against Gaseous
Explosions and Propellant Fires.
Bureau of Mines, Pittsburgh, PA
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 257-277 pp., 1972.

2.4 Extinguishing Agents (cont.)

MacEwen, J. D.

Toxicology of Pyrolysis Products of Halogenated Agents.
SysteMed Corp., Dayton, OH
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 53-59 pp., 1972.

McDaniel, D. E.

Evaluation of Halon 1301 for Shipboard Use.
Coast Guard, Washington, DC
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 196-214 pp., 1972.

Plugge, M. A., Wilson, C. W., Zallen, D. M. and Walker, J. L.
Fire Extinguishing Agents for Oxygen-Enriched Atmospheres.
Final Report. April 1982-November 1985.
New Mexico Engineering Research Inst., Albuquerque, NM
ESL-TR-85-26 and NMERI-TA3-19, 98 P. December 1985.

Rainaldi, N.

Appraisal of Halogenated Fire Extinguishing Agents.
Montecatini-Edison, Porto Marghera, Italy
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 79-90 pp., 1972.

Reichelt, E. F., Walker, J., Vickers, R. N. and Kwan, A. J.
Report of Test Results: Halon 1301 vs Water Sprinkler Fire
Protection for Essential Electronic Equipment.
Final Report. November 1980-June 1982.
Air Force Engineering Services Center, Tyndall AFB, FL
AFESC/ESL-TR-82-28, 186 P. July 1982.

Reinhardt, C. F. and Reinke, R. E.

Toxicology of Halogenated Fire Extinguishing Agents Halon
1301 (Bromotrifluoromethane).
E. I. du Pont de Nemours and Co., Wilmington, DE
National Research Council. Appraisal of Halogenated Fire
Extinguishing Agents. April 11-12, 1972,
Washington, DC. Proceedings, 67-78 pp., 1972.

Scheichl, L.

Extinguishants for Use in Aviation Fires.
Airport Forum, Vol. 6, No. 3, 45-46+, June 1976.

2.4 Extinguishing Agents (cont.)

- Seshadri, K. and Williams, F. A.
Effect of CF₃Br on Counterflow Combustion of Liquid Fuel
with Diluted Oxygen.
San Diego Univ., CA
American Chemical Society Symposium Series No. 16.
Halogenated Fire Suppressants. Chapter 5.
1975. Washington, DC. Proceedings, 149-182 pp., 1975.
- Seeger, P. G.
Laboratory Test Method of Evaluating the Extinguishing
Efficiency of Dry Powders.
Forschungsstelle fur Brandschutztechnik an der Universitat
Karlsruhe, West Germany
Advisory Group for Aerospace Research and Development
(AGARD). Aircraft Fire Safety. April 11, 1975,
Rome, Italy. AGARD CP-166, 24/1-9 pp., 1975.
- Smith, D. G. and Harris, D. J.
Human Exposure to Halon 1301 (CBrF₃) During Simulated
Aircraft Cabin Fires.
Naval Air Test Center, Patuxent River, MD
Aerospace Medicine, Vol. 44, No. 2, 198-201, 1973.
- Stewart, R. D., Newton, P. E., Wu, A., Hake, C. L. and
Krivanek, N. D.
Human Exposure to Halon 1301.
Medical College of Wisconsin, Milwaukee
20 P. June 1978.
- Thomas, A. A.
Pathology Report on the Toxicity of the Pyrolysis Products
of Freon 1301.
Aerospace Medical Research Lab., Wright-Patterson AFB, OH
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
118-119 pp., 1967.
- Vernot, E. H.
Inhalation Toxicity and Chemistry of Pyrolysis Products of
Bromotrifluoromethane.
Aerojet-General Corp., Dayton, OH
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
107-117 pp., 1967.

2.4 Extinguishing Agents (cont.)

- Walker, J. L., Vickers, R. N. and Kwan, A. J.
Test and Evaluation of Commercially Available Halon 1211 Hand-Portable Fire Extinguishers for Use in Habitable and Cargo Compartments of USAF Aircraft. Final Report. August 1980-February 1981.
Air Force Engineering and Service Center, Tyndall AFB, FL AFESC/ESL-TR-81-22, 109 P. May 1981.
- Wands, R. C.
Toxicology of Halogenated Agents (Halon 2402).
National Research Council, Ottawa, Ontario, Canada
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 323-325 pp., 1972.
- Wickham, R. T.
Engineering and Economic Aspects of Halon Extinguishing Equipment.
Wickham Associates, Marinette, WI
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 290-299 pp., 1972.
- Yamashika, S.
Dependence of Extinction Time and Decomposition of Halogenated Extinguishing Agent on Its Application Rate.
Fire Research Inst., Tokyo, Japan
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1972, Washington, DC. Proceedings, 326-335 pp., 1972.
- Zikria, B. A.
Inhalation Injuries in Fires.
Columbia-Presbyterian Medical Center, New York, NY
National Research Council. Appraisal of Halogenated Fire Extinguishing Agents. April 11-12, 1971, Washington, DC. Proceedings, 42-52 pp., 1972.

2.5 HUMAN BEHAVIOR

- Knapp, S. C. and Knox, F. S., III
Human Response to Fire.
Army Aeromedical Research Lab., Fort Rucker, AL
Advisory Group for Aerospace Research and Development.
Aircraft Fire Safety. June 7-8, 1982, Oslo, Norway and
June 10-11, 1982, London, England and June 15-16,
1982, Washington, DC. AGARD LS-123, 2/1-19 pp., 1982.
- Knight, D. R.
Fire-Related Medical Science.
Naval Submarine Medical Research Lab., Groton, CT
National Aeronautics and Space Administration. Spacecraft
Fire Safety. August 20-21, 1986, Cleveland, OH. NASA
CP-2476, 59-64 pp., 1987.
- Nober, E. H., Peirce, H. and Well, A.
Waking Effectiveness of Household Smoke and Fire Detection
Devices. Final Report.
Massachusetts Univ., Amherst
NBS-GCR-83-439, 92 P. July 1983.
- Nober, E. H., Peirce, H., Well, A., Johnson, C. C. and
Clifton, C.
Waking Effectiveness of Household Smoke and Fire Detection
Devices.
Massachusetts Univ., Amherst
Fire Journal, Vol. 75, No. 4, 86-91,130, July 1981.
- Pezoldt, V. J. and Van Cott, H. P.
Arousal from Sleep by Emergency Alarms: Implications from
the Scientific Literature. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBSIR 78-1484, 37 P. June 1978.

2.6 MATERIALS FLAMMABILITY

- Babrauskas, V.
Bench-Scale Methods for Prediction of Full-Scale Fire Behavior of Furnishings and Wall Linings.
National Bureau of Standards, Gaithersburg, MD
SFPE TR 84-10, 25 P. 1984.
- Babrauskas, V.
Fire-Related Standards and Testing.
National Bureau of Standards, Gaithersburg, MD
National Aeronautics and Space Administration. Spacecraft Fire Safety. August 20-21, 1986, Cleveland, OH. NASA CP-2476, 31-41 pp., 1987.
- Babrauskas, V., Levin, B. C. and Gann, R. G.
New Approach to Fire Toxicity Data for Hazard Evaluation.
National Bureau of Standards, Gaithersburg, MD
ASTM Standardization News, Vol. 14, No. 9, 28-33, September 1986 and Fire Journal, Vol. 81, No. 2, 22-23+, March/April 1987.
- Babrauskas, V. and Walton, W. D.
Simplified Characterization of Upholstered Furniture Heat Release Rates.
National Bureau of Standards, Gaithersburg, MD
Fire Safety Journal, Vol. 11, No. 3, 181-192, December 1986.
- Bass, R. S. and Hirasaki, J. K.
Fire-Safety Design of a Mobile Quarantine Facility.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA Conference on Materials for Improved Fire Safety. May 6-7, 1970, Houston, TX.
NASA CR TM X-14330, 17/1-5 pp., 1970.
- Benz, F. J., Shaw, R. C. and Homa, J. M.
Burn Propagation Rates of Metals and Alloys in Gaseous Oxygen.
National Aeronautics and Space Admin., Las Cruces, NM
Lockheed/EMSCO, Las Cruces, NM
Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres. Volume 2. April 23-24, 1985, Washington, DC.
American Society for Testing Materials, Philadelphia, PA,
Benning, M. A., Editor, ASTM STP 910, 135-152 pp., 1986.

2.6 Materials Flammability (cont.)

Benz, F. J. and Zhu, S.

Ignition and Combustion of Metals in Oxygen.
NASA JSC White Sands Test Facility, Las Cruces, NM
National Aeronautics and Space Administration. Spacecraft
Fire Safety. August 20-21, 1986, Cleveland, OH. NASA
CP-2476, 92-102 pp., 1987.

Bukowski, R. W.

Introduction to Fire Hazard Modeling.
National Bureau of Standards, Gaithersburg, MD
NBSIR 86-3349, 102 P. March 1986.

Christopher, A. J.

Some Aspects of Smoke and Fume Evolution From Overheated
Non-Metallic Materials.
Royal Aircraft Establishment, Farnborough, England
Advisory Group for Aerospace Research and Development
(AGARD). Aircraft Fire Safety. April 11, 1975,
Rome, Italy. AGARD CP-166, 13/1-12 pp., 1975.

Craig, J. W.

Apollo Spacecraft Nonmetallic Materials Application.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
14/1-7 pp., 1970.

Dawn, F. S.

Nonmetallic Materials Development for Spacecraft
Applications.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety,
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
6/1-6 pp., 1970.

Dawn, F. S. and Jarboe, R. L.

Apollo Space Suit Materials.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety,
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
16/1-4 pp., 1970.

2.6 Materials Flammability (cont.)

- Dawn, F. S. and Morton, G. P.
Cotton Protective Apparel for the Space Shuttle.
National Aeronautics and Space Admin., Houston, TX
Cotton Inc., Raleigh, NC
Textile Research Journal, Vol. 49, 197-201, April 1979.
- Denison, D. M.
Further Studies on the Problems of Fire in Artificial Gas
Environments.
Royal Air Force Institute of Aviation Medicine, Farnborough
Hants., England
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
155-167 pp., 1967.
- Dorr, V. A.
Fire Studies in Oxygen-Enriched Atmospheres.
Ocean Systems, Inc., Tarrytown, NY
Journal of Fire and Flammability, Vol. 1, 91-106, April
1970.
- Duncan, W. C.
Evaluation of Materials Proposed for Use in Space Flight.
Final Report.
Baylor College of Medicine, Houston, TX
NASA CR-167357, 4 P. August 1981.
- Einhorn, I. N., Chatfield, D. A. and Mickelson, R. W.
Analysis of the Products of Thermal Decomposition of an
Aromatic Polyamide Fabric Used as an Aircraft
Interior Material.
Utah Univ., Salt Lake City, UT
Advisory Group for Aerospace Research and Development
(AGARD). Aircraft Fire Safety. April 11, 1975,
Rome, Italy. AGARD CP-166, 14/1-13 pp., 1975.
- Godfried, L. M.
Critical Evaluation of Today's Fireproof Testing of Aerospace
Materials.
Fokker-VFW B.V., Schiphol-East, The Netherlands
Advisory Group for Aerospace Research and Development
(AGARD). Aircraft Fire Safety. April 11, 1975,
Rome, Italy. AGARD CP-166, 11/1-10 pp., 1975.
- Grand, A. F. and Valys, A. J.
Assessment of Burning Characteristics of Aircraft Interior
Materials.
Southwest Research Inst., San Antonio, TX
NASA CR-166390, 200 P. April 1982.

2.6 Materials Flammability (cont.)

- Gross, D., Loftus, J. J., Lee, T. G. and Gray, V. E.
Smoke and Gases Produced by Burning Aircraft Interior
Materials. Final Report.
National Bureau of Standards, Gaithersburg, MD
NBS BSS 18, 90 P. June 1968.
- Harris, E. S.
Toxicology of Spacecraft Materials.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire
Safety. May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
25/1-3 pp., 1970.
- Hilado, C. J.
Evaluation of the NASA Animal Exposure Chamber as a
Potential Chamber for Fire Toxicity Screening Tests.
San Francisco Univ., CA
Journal of Combustion Toxicology, Vol. 2, 298-314, November
1975.
- Hilado, C. J.
Fire Response Test Methods for Aerospace Materials.
San Francisco Univ., CA
Journal of Fire and Flammability, Vol. 9, No. 2; 217-228,
April 1978.
- Hilado, C. J., Barnes, G. J., Kourtides, D. A. and Parker, J. A.
Use of the High Flux Heater in the Smoke Chamber to Measure
Ignitability and Smoke Evolution of Composite Panels.
San Francisco Univ., CA
National Aeronautics and Space Admin., Moffett Field, CA
Journal of Fire and Flammability, Vol. 8, 324-331, July
1977.
- Hill, R. G. and Speitel, L. C.
In-Flight Aircraft Seat Fire Extinguishing Tests (Cabin
Hazard Measurements). Final Report. June 1981-December 1981.
Federal Aviation Admin., Atlantic City Airport, NJ
DOT/FAA/CT-82/111, 48 P. December 1982.
- Hillenbrand, L. J. and Wray, J. A.
Full-Scale Fire Program to Evaluate New Furnishings and
Textile Materials Utilized by the National Aeronautics
and Space Administration. Final Report.
Battelle, Columbus, OH
NASA CR-2468, 142 P. July 1973.

2.6 Materials Flammability (cont.)

- House, P. A. and Berner, W. E.
Environmental Aging of Candidate Fire Suppressant Dry Bay
Area Materials for Aircraft. Technical Report.
Dayton Univ., OH
AFML-TR-73-283, 87 P. December 1973.
- Huggett, C.
Estimation of Rate of Heat Release by Means of Oxygen
Consumption Measurements.
National Bureau of Standards, Gaithersburg, MD
Fire and Materials, Vol. 4, No. 2, 61-65, June 1980.
- Johnston, R. S.
Flammability Test Methods and Protective Clothing
Development.
National Aeronautics and Space Admin., Houston, TX
Aerospace Medial Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
168-189 pp., 1967.
- Judd, M. D. and Meehan, J.
Flammability Testing of Materials for the European Spacelab.
ESTEC, Noordwijk, The Netherlands
Marconi Space Systems, Hants, England
International Conference of Flammability. INTERFLAM 1985.
Conference Workbook. March 26-28, 1985,
Guildford, England. Proceedings, 243-250 pp., 1985.
- Kanury, A. M.
Theoretical Analysis of Fire and Flammability Tests. Part 3.
Limiting Oxygen Index Test.
Stanford Research Inst., Menlo Park, CA
Edinburgh University. Fire Safety of Combustible Materials.
International Symposium. October 1975, Edinburgh, UK.
Proceedings, 187-198 pp., 1975.
- Kline, H. F.
Development of Nonflammable Potting Compounds for Spacecraft
Usage.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
9/1-5 pp., 1970.

2.6 Materials Flammability (cont.)

Lawrence, W. H.

Relative Toxicity Testing of Spacecraft Materials. Part 1. Spacecraft Materials. Annual Report. November 10, 1978-November 9, 1980.

Tennessee Univ., Memphis

NASA CR-160908, 83 P. November 6, 1980.

Lawrence, W. H.

Relative Toxicity Testing of Spacecraft Materials. Part 2. Aircraft Materials. Annual Report. November 10, 1978-November 9, 1980.

Tennessee Univ., Memphis

NASA CR-160907, 111 P. November 6, 1980.

Lawrence, W. H.

Toxicity of the Pyrolysis Products of Spacecraft Materials. Annual Report. August 1, 1973-November 30, 1974.

Tennessee Univ., Memphis

NASA CR-14197, 72 P. November 25, 1974.

Lawrence, W. H.

Toxicity of Thermal Degradation Products of Spacecraft Materials. November 10, 1980-May 9, 1982.

Tennessee Univ., Memphis

NASA CR-167615, 138 P. May 7, 1982.

Ledoux, P. W.

Spacecraft Material Flammability Testing and Configurations.

McDonnell Douglas Astronautics Co., Houston, TX

National Aeronautics and Space Administration. Spacecraft Fire Safety. August 20-21, 1986, Cleveland, OH.

NASA CP-2476, 95-98 pp., 1987.

Marcy, J. F. and Johnson, R.

Flaming and Self-Extinguishing Characteristics of Aircraft Cabin Interior Materials.

Department of Transportation, Atlantic City, NJ

NA-68-30 and DS-68-13, 71 P. July 1968.

Naimer, J.

Apollo Applications of Beta Fiber Glass.

National Aeronautics and Space Admin., Houston, TX

National Aerospace and Space Administration. NASA Conference on Materials for Improved Fire Safety.

May 6-7, 1970, Houston, TX. NASA CR TM X-14330, 15/1-3 pp., 1970.

2.6 Materials Flammability (cont.)

- Olson, S. L. and Sotos, R. G.
Combustion of Velcro in Low Gravity.
National Aeronautics and Space Admin., Cleveland, OH
NASA TM 88970, 17 P. March 1987.
- O'Neill, J. H., Sommers, D. E. and Nicholas, E. B.
Aerospace Vehicle Hazard Protection Test Program: Detectors;
Materials; Fuel Vulnerability. Final Report.
Federal Aviation Admin., Atlantic City, NJ
FAA-NA-73-63 and AFAPL-TR-73-87, 64 P. October 1973.
- O'Neill, T. J. and Punderson, J.
Toxicity Tests and Fire Safety.
E. I. Du Pont de Nemours and Co., Inc., Wilmington, DE
QMC Industrial Research Ltd. and Fire Research Station.
Smoke and Toxic Gases From Burning Plastics.
January 6-7, 1982, London, England. Proceedings,
12/1-12/3 pp., 1982.
- Primeaux, G. R.
Flammability Testing of Components.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
4/1-4 pp., 1970.
- Quintiere, J. G.
Assessment of Correlations Between Laboratory and Full-Scale
Experiment for the FAA Aircraft Fire Safety Program.
Part 2. Rate of Energy Release in Fire.
National Bureau of Standards, Gaithersburg, MD
NBSIR 82-2536, 24 P. July 1982.
- Quintiere, J. G.
Assessment of Correlations Between Laboratory and Full-Scale
Experiments for the FAA Aircraft Fire Safety
Program. Part 4. Flammability Test.
National Bureau of Standards, Gaithersburg, MD
NBSIR 82-2525, 21 P. July 1982.

2.6 Materials Flammability (cont.)

- Quintiere, J. G. and Harkleroad, M. F.
New Concepts for Measuring Flame Spread Properties.
National Bureau of Standards, Gaithersburg, MD
NBSIR 84-2943, 154 P. November 1984, and
American Society for Testing and Materials. Fire Safety:
Science and Engineering. Harmathy, T. Z.,
editor. June 26-27, 1984, Denver, CO.
ASTM STP 882, 239-267 pp., 1985.
- Quintiere, J. G., Babrauskas, V., Cooper, L. Y., Harkleroad, M.,
Steckler, K. D. and Tewarson, A.
Role of Aircraft Panel Materials in Cabin Fires and Their
Properties. Final Report.
National Bureau of Standards, Gaithersburg, MD
Factory Mutual Research Corp., Norwood, MA
DOT/FAA/CT-84/30, 109 P. June 1985.
- Radnofsky, M. I.
New Materials for Manned Spacecraft, Aircraft, and Other
Applications.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
10/1-4 pp., 1970.
- Radnofsky, M. I.
Nonflammable Clothing Development Program.
National Aeronautics and Space Admin., Houston, TX
NASA TM X-60897, 37 P. 1867.
- Ramsden, J. M.
Burning Questions.
Flight International, 121-125, June 13, 1987.
- Reynolds, J. R.
Fire and Safety Materials Utilization at the John F. Kennedy
Space Center.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
18/1-2 pp., 1970.

2.6 Materials Flammability (cont.)

- Sarkos, C. P., Spurgeon, J. C. and Nicholas, E. B.
Laboratory Fire Testing of Cabin Materials Used in
Commercial Aircraft.
Federal Aviation Admin., Atlantic City, NJ
Journal of Aircraft, Vol. 16, No. 2, 78-83, February 1979.
- Sauers, D. G.
Development and Application of Flame-Resistant Polymers and
Composites.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
8/1-3 pp., 1970.
- Sauers, D. G.
Special Flammability Test Techniques.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
21/1-4 pp., 1970.
- Sibulkin, M. and Little, M. W.
Propagation and Extinction of Downward Burning Fires.
Brown Univ., Providence, RI
Combustion and Flame, Vol. 31, No. 2, 197-208, 1978.
- Simpson, C. G.
Interrelationship of FAA-DOT-NASA Programs Relating to
Aircraft Cabin Materials Fire.
Federal Aviation Admin., Washington, DC
FAA-RD-73-146, 21 P. September 1973.
- Steinthal, M. W.
Nonmetallic Material Configuration Control in the Apollo
Spacecraft.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
13/1-3 pp., 1970.

2.6 Materials Flammability (cont.)

- Stevens, M. R., Fisher, H. D. and Breen, B. P.
Investigation of Materials Combustibility, Fire and
Explosion Suppression in a Variety of
Atmospheres. Final Report. November 15, 1964-
December 30, 1967.
Dynamic Science Corp., Monrovia, CA
AFAPL-TR-68-35, 103 P. May 1968.
- Summerfield, M. and Messina, N.
Smoldering Combustion in Porous Fuels.
Princeton Combustion Research Labs., NJ
Combustion Experiments in Zero-Gravity Laboratory. Progress
in Astronautics and Aeronautics. Volume 73.
American Inst. of Aeronautics & Astronautics, New York, NY,
Cochran, T. H. and Summerfield, M., editors, 129-194 pp., 1981.
- Supkis, D. E.
Development and Applications of Fluorel.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
7/1-4 pp., 1970.
- Tewarson, A.
Flammability of Polymers and Organic Liquids. Part 1.
Burning Intensity.
Factory Mutual Research Corp., Norwood, MA
FMRC Serial 22429 and RC75-T-6, 78 P. February 1975.
- Wardell, A. W.
Manned Spacecraft Electrical Fire Safety.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
20/1-5 pp., 1970.
- Wickstrom, U. and Goransson, U.
Prediction of Heat Release Rates of Surface Materials in
Large-Scale Fire Tests Based on Cone
Calorimeter Results.
Swedish National Testing Inst., Boras, Sweden
Journal of Testing and Evaluation, Vol. 15, No. 5, 364-370,
November 1987.

2.7 MICROGRAVITY AND ZERO GRAVITY

- Altenkirch, R. A., Eichhorn, R. and Brancic, A. B.
Buoyancy Induced Extinction of Laminar Gas Jet Diffusion
Flames.
Kentucky Univ., Lexington
Combustion Institute. Central States Section. Spring
Technical Meeting. March 28-30, 1977. Cleveland, OH,
17 P., 1977.
- Altenkirch, R. A., Eichhorn, R. and Shang, P. C.
Buoyancy Effects on Flames Spreading down Thermally Thin
Fuels.
Kentucky Univ., Lexington
Combustion and Flame, Vol. 37, No. 1, 71-83, January 1980.
- Andracchio, C. R. and Aydelott, J. C.
Comparison of Flame Spreading Over Thin Flat Surfaces in
Normal Gravity and Weightlessness in an Oxygen
Environment.
National Aeronautics and Space Admin., Cleveland, OH
NASA TM X-1992, 25 P. May 1970.
- Berlad, A. L., Huggett, C., Kaufman, F., Markstein, G. H.,
Palmer, H. B. and Yang, C. H.
Study of Combustion Experiments in Space.
State Univ. of New York, Stony Brook
National Bureau of Standards, Gaithersburg, MD
Pittsburgh Univ., PA
Factory Mutual Research Corp., Norwood, MA
Pennsylvania State Univ., University Park
NASA CR-134744, 110 P. November 1974.
- Bonne, U.
Radiative Extinguishment of Diffusion Flames at Zero
Gravity.
Honeywell Corporate Research Center, Hopkins, MN
Combustion and Flame, Vol. 16, 147-159, 1971.
- Calcote, H. F.
Combustion Experiments in Orbiting Spacecraft. Final
Report. June 3, 1974-December 30, 1974.
AeroChem Research Labs., Inc., Princeton, NJ
TP 316, 58 P. December 1974.

2.7 Microgravity (cont.)

- Cochran, T. H. and Masica, W. J.
Investigation of Gravity Effects on Laminar Gas-Jet
Diffusion Flames.
National Aeronautics and Space Admin., Cleveland, OH
Combustion Institute, Symposium (International) on
Combustion, 13th, August 23-29, 1970, Salt Lake City, UT.
Combustion Institute, Pittsburgh, PA, 821-829 pp, 1970.
- DeWitt, R. L.
Combustion Experimentation Aboard the Space Transportation
System.
National Aeronautics and Space Admin., Cleveland, OH
Combustion Experiments in Zero-Gravity Laboratory. Progress
in Astronautics and Aeronautics. Volume 73.
American Inst. of Aeronautics & Astronautics, NY,
Cochran, T. H. and Summerfield, M., Editors, 245-258 pp, 1981.
- Illinois University
Behavior of Lean Methane-Air Flames at Zero-Gravity. Final
Report for Period November 1983 - December 1984.
Illinois Univ., Urbana
42 P. February 1985.
- Kanno, H., Okajima, S., Iinuma, K. and Kumagai, S.
Measurement of Slow Burning Velocity by Zero-Gravity Method.
Hosei Univ., Tokyo, Japan
Tokyo Univ., Japan
Archivum Combustionis, Vol. 5, No. 3-4, 279-287, 1985.
- Kanury, A. M.
Burning of Liquid Pools in Reduced Gravity. Final Report.
March 1976-February 1977.
Notre Dame Univ., IN
NASA CR-13524, 140 P. June 1977.
- Kanury, A. M.
Liquid Pool Burning.
Notre Dame Univ., IN
Combustion Experiments in Zero-Gravity Laboratory. Progress
in Astronautics and Aeronautics. Volume 73.
American Inst. of Aeronautics & Astronautics, NY,
Cochran, T. H. and Summerfield, M., Editors, 195-244 pp, 1981.

2.7 Microgravity (cont.)

Kimzey, J. H.

Flammability During Weightlessness.
Manned Spacecraft Center, Houston, TX
NASA TM X-58001, 12 P. May 1966, and
Institute of Environmental Sciences. 12th Annual Technical
Meeting. April 13, 1966, San Diego, CA, 1966.

Kimzey, J. H.

Skylab Experiment M479 Zero Gravity Flammability.
National Aeronautics and Space Admin., Houston, TX
3rd Space Processing Symposium on Skylab Results. M-74-5.
Volume 1. April 30-May 1, 1974, Marshall
Space Flight Center, AL. NASA TM X-70252, 115-130 pp., 1974.

Kimzey, J. H., Downs, W. R., Eldred, C. H. and Norris, C. W.

Flammability in Zero-Gravity Environment.
Manned Spacecraft Center, Houston, TX
NASA TR R-246, 49 P. October 1966.

Kumagai, S.

Survey of Research on Gravitational Effects on Combustion.
Iwate Univ., Morioka, Japan
Combustion Institute. Central States Section. Spring
Meeting. March 28-30, 1977, Cleveland, OH 7 P. 1977.

Noe, K. A. and Strehlow, R. A.

Behavior of the Lean Methane-Air Flame at Zero-Gravity.
Final Report. November 1983-December 1984.
Illinois Univ., Urbana
NASA CR-175586 and UILU-ENG-85-0502, 48 P. February 1985.

Okajima, S., Iinuma, K., Yamaguchi, S. and Kumagai, S.

Measurement of Slow Burning Velocities and Their Pressure
Dependence Using a Zero-Gravity Method.
Hosei Univ., Tokyo, Japan
Combustion Institute, Symposium (International) on
Combustion, 20th. August 12-17, 1984, Ann Arbor, MI.
Combustion Institute, Philadelphia, 1985.

Okajima, S. and Kumagai, S.

Further Investigations of Combustion of Free Droplets in a
Freely Falling Chamber Including Moving Droplets.
Tokyo Univ., Japan
Combustion Institute, Symposium (International) on
Combustion, 15th, August 25-31, 1974, Tokyo, Japan.
Combustion Institute, Philadelphia, PA, 1975.

2.7 Microgravity (cont.)

- Pearce, J. P., Kimzey, J. H. and Pippen, D. L.
Effects of Gravity on Flammability.
Manned Spacecraft Center, Houston, TX
National Aeronautics and Space Admin. Materials for
Improved Fire Safety. May 6-7, 1970, Houston, TX.
NASA CR TM X-14330, 137-139 pp., 1971.
- Pentecost, E.
Microgravity Science and Applications Bibliography. 1986
Revision.
National Aeronautics and Space Admin., Washington, DC
NASA TM 89608, 95 P. January 1987.
- Pentecost, E.
Microgravity Science and Applications Bibliography. 1985
Revision.
National Aeronautics and Space Admin., Washington, DC
Universities Space Research Assoc., Washington, DC
NASA TM 88178, 106 P. October 1985.
- Pentecost, E.
Microgravity Science and Applications Bibliography--1984
Revision.
Universities Space Research Assoc., Washington, DC
NASA TM 86651, 71 P. September 1984.
- Ronney, P. D.
Effect of Gravity on Halocarbon Flame Retardant Effectiveness.
National Aeronautics and Space Admin., Cleveland, OH
Acta Astronautica, Vol. 12, No. 11, 915-921, November 1985.
- Ronney, P. D. and Wachman, H. Y.
Effect of Gravity on Laminar Premixed Gas Combustion I:
Flammability Limits and Burning Velocities.
Massachusetts Inst. of Technology, Cambridge
Combustion and Flame, Vol. 62, No. 2, 107-119, November 1985.
- Ronney, P. D.
Effect of Gravity on Laminar Premixed Gas Combustion II:
Ignition and Extinction Phenomena.
Massachusetts Inst. of Technology, Cambridge
Combustion and Flame, Vol. 62, No. 2, 121-133, November 1985.

2.7 Microgravity (cont.)

Sacksteder, K. R.

Microgravity Combustion Fundamentals.
NASA Lewis Research Center, Cleveland, OH
NASA CP-2476,
National Aeronautics and Space Administration. Spacecraft
Fire Safety. August 20-21, 1986., Cleveland, OH.
NASA Conference Proceedings 2476, 89-94 pp., 1987.

Strehlow, R. A. and Reuss, D. L.

Effect of a Zero g Environment on Flammability Limits as
Determined Using a Standard Flammability Tube
Apparatus. Final Report.
Illinois Univ., Urbana
NASA-CR-3259, 30 P. June 1980.

Strehlow, R. A. and Reuss, D. L.

Flammability Limits in a Standard Tube.
Illinois Univ., Urbana
General Motors Research Laboratories, Warren, MI
Combustion Experiments in Zero-Gravity Laboratory. Progress
in Astronautics and Aeronautics. Volume 73.
American Inst. of Aeronautics & Astronautics, New York, NY,
Cochran, T. H. and Summerfield, M., editors, 61-89 pp, 1981.

Vedha-Nayagam, M. and Altenkirch, R. A.

Gravitational Effects on Flames Spreading Over Thick Solid
Surfaces.
Kentucky Univ., Lexington
Acta Astronautica, Vol. 12, No. 7-8, 565-572, July/August 1985.

Wherley, B. L. and Strehlow, R. A.

Behavior of Fuel-Lean Premixed Flames in a Standard
Flammability Limit Tube Under Controlled
Gravity Conditions. Final Report. January 1875-December 1985.
Illinois Univ. at Urbana-Champaign
NASA CR 177132, NASA NCC 3-35, and UILU ENG 86-0503, 143 P.
July 1986.

Williams, F. A.

Droplet Burning.
Princeton Univ., NJ
Combustion Experiments in Zero-Gravity Laboratory. Progress
in Astronautics and Aeronautics. Volume 73.
American Inst. of Aeronautics & Astronautics, New York, NY,
Cochran, T. H. and Summerfield, M., editors, 31-60 pp, 1981.

2.8 ATMOSPHERES, OXYGEN ENRICHED AND MODIFIED

- Alger, R. S. and Nichols, J. R.
Survey of Fires in Hypobaric and Hyperbaric Chambers.
Naval Ordnance Lab., Silver Spring, MD
NOLTR-71-128, 43 P. July 20, 1971.
- Botteri, B. P.
Fire Protection for Oxygen Enriched Atmospheres
Applications.
Air Force Aero Propulsion Lab., Wright-Patterson AFB, OH
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
39-69 pp., 1967.
- Carter, D. I.
Fire Prevention and Protection in Oxygen Enriched
Atmospheres.
Air Force Systems Command, Brooks AFB, TX
Advisory Group for Aerospace Research and Development.
Pattern Recognition; Body Armour and Aircrew
Equipment Assemblies; Current Space Medical Problems;
Aeromedical Evacuation. 25th Meeting of the Aerospace
Medical Panel. October 15-17, 1968, London, England.
AGARD CP-41, C5/1-8 pp., 1968.
- Denison, D. M.
Further Studies on the Problems of Fires in Artificial Gas
Environments.
Royal Air Force Institute of Aviation Medicine, Farnborough,
Hants., England
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
155-167 pp., 1967.
- Dorr, V. A.
Fire Studies in Oxygen-Enriched Atmospheres.
Ocean Systems, Inc., Tarrytown, NY
Journal of Fire and Flammability, Vol. 1, 91-106, April 1970.

2.8 Atmospheres (cont.)

- Durfee, R. L. and Spurlock, J. M.
Quenching and Extinguishment of Burning Solids in
Oxygen-Enriched Atmospheres. Final Report.
Atlantic Research Corp., Alexandria, VA
NASA CR-101970, 55 P. September 22, 1969.
- Fisher, H. D. and Gerstein, M.
Investigation of Materials Combustibility and Fire and
Explosion Suppression in a Variety of Atmospheres.
Summary Report.
Dynamic Science Corp., Monrovia, CA
SN-6401, 60 P. May 1966.
- Holley, M. D. and Bachman, S.
Flammability Control in the Oxygen Environment of the Apollo
Guidance and Navigation Equipment.
Manned Spacecraft Center, Houston, TX
National Aeronautics and Space Admin. NASA Conference on
Materials for Improved Fire Safety. May 6-7, 1970,
Houston, TX. NASA CR TM X-14330, 211-217 pp., 1971.
- Huggett, C.
Habitable Atmospheres Which Do Not Support Combustion.
Atlantic Research Corp., Alexandria, VA
Combustion and Flame, Vol. 20, No. 1, 140-142, February 1973.
- Johnson, J. E. and Woods, F. J.
Flammability in Unusual Atmospheres. Part 1. Preliminary
Studies of Materials in Hyperbaric Atmospheres Containing
Oxygen, Nitrogen, and/or Helium. Interim Report.
Naval Research Lab., Washington, DC
NRL 6470, 28 P. October 31, 1966.
- Johnston, R. L. and Pippen, D. L.
Development of Materials Screening Tests for Oxygen-Enriched
Environments.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
3/1-3 pp., 1970.

2.8 Atmospheres (cont.)

Knight, D. R.

Feasibility of Lowering Oxygen Concentrations Aboard
Submarines in Order to Improve Fire Safety. Position Paper.
Naval Submarine Medical Research Lab., Groton, CT
NSMRL Report 84-5, 54 P. April 8, 1985.

Knight, D. R.

Medical Research Programs, Past and Future, for Designing
Submarine Atmospheres to Retard Fires.
Naval Submarine Medical Research Lab., Groton, CT
MSMRL-MEMO-87-2, 9 P. February 7, 1987.

McHale, E. T.

Habitable Atmospheres Which Do Not Support Combustion.
Atlantic Research Corp., Alexandria, VA
Institute of Environmental Sciences, American Institute of
Aeronautics and Astronautics, American Society for Testing
and Materials and the National Aeronautics and Space
Admin. Space Simulation. May 1-3, 1972, New York, NY.
NASA SP-298, Paper No. 30, 331-336 pp., 1972.

Robertson, A. F. and Rappaport, M. W.

Fire Extinguishment in Oxygen Enriched Atmospheres.
National Bureau of Standards, Gaithersburg, MD
NASA-CR-121150, 60 P. February 1973.

Voss, K.

Oxygen Environment--A Peril in Space?
National Aeronautics and Space Admin., Cocoa Beach, FL
Technology Week, 12-17, February 6, 1967.

Woods, F. J. and Johnson, J. E.

Flammability in Unusual Atmospheres. Part 2. Selected
Materials in Oxygen-Nitrogen and Oxygen-Helium Mixtures
at Pressures Up to 315 PSIA.
Naval Research Lab., Washington, DC
NRL 6606 and RR 010-01-44-5850, 24 P. September 22, 1967.

2.9 SHIPS

Callahan, J. T.

Shipboard Fire Detection System Selection and Installation
Guidance. Interim Report.
Naval Ship Systems Engineering Station, Philadelphia, PA
A-1623-2, 48 P. July 8, 1981.

Carhart, H. W.

Inerting and Atmospheres.
Naval Research Lab., Washington, DC
National Aeronautics and Space Administration. Spacecraft
Fire Safety. August 20-21, 1986, Cleveland, OH.
NASA CP-2476, 51-57 pp., 1987.

Cook, G. A.

Combustion Safety in Diving Atmospheres.
Union Carbide Corp., Tonawanda, NY
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX, AMD-TR-67-2,
139-147 pp., 1967.

Fu, T. T.

Smoke Detection in Hyperbaric Chambers: An Experimental
Study.
Naval Civil Engineering Lab., Port Hueneme, CA
NCEL-TN-1294, 30 P. July 1973.

Harter, J. V.

Review of the Navy Chamber Fire Safety Program.
Washington Navy Yard, Washington, DC
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX, AMD-TR-67-2,
128-138 pp., 1967.

Lugar, J. R.

Water Mist Fire Protection.
David W. Taylor Naval Ship R&D Center, Bethesda, MD
DTNSRDC Letter 2843 and JRL Series 9555, 25 P. December 1979.

2.10 SMOKE

- Baum, H. R., Rehm, R. G. and Mulholland, G. W.
Prediction of Heat and Smoke Movement in Enclosure Fires.
National Bureau of Standards, Gaithersburg, MD
Fire Safety Journal, Vol. 6, No. 3, 193-201, 1983.
- Foster, W. W.
Attenuation of Light by Wood Smoke.
Torry Research Station
British Journal of Applied Physics, Vol. 10, 416-420,
September 1959.
- Miyama, J. and Saito, F.
Fire Detection and Smoke Property.
Sophia Univ., Tokyo, Japan
Building Research Inst., Tokyo, Japan
U.S./Japan Cooperative Program in Natural Resources. Fire
Research and Safety. 5th Joint Panel Meeting.
October 15-24, 1980, Gaithersburg, MD. National Bureau of
Standards NBS SP 639, 31-38, 1981.
- National Academy of Sciences, National Materials Advisory Board
Fire Safety Aspects of Polymeric Materials. Volume 3.
Smoke and Toxicity (Combustion Toxicology of Polymers).
Publication NMAB 318-3. 1978.
- Quintiere, J. G.
Assessment of Correlations Between Laboratory and Full-Scale
Experiments for the FAA Aircraft Fire Safety Program.
Part 1. Smoke.
National Bureau of Standards, Gaithersburg, MD
NBSIR 82-2508, 53 P. July 1982.
- Van Luik, F. W., Jr.
Characteristics of Invisible Particles Generated by
Precombustion and Combustion.
Environment One Corp., Schenectady, NY
23 P. May 17, 1973.

2.11 SPACECRAFT

- Berlad, A. L. and Joshi, N. D.
Gravitational Effects on the Extinction Conditions for Premixed Flames.
San Diego Univ., CA
New York State Univ., Stony Brook
International Astronautical Federation. International Astronautical Congress, 35th. October 7-13, 1984, Lausanne, Switzerland. IAF-84-151, 9 pp., 1984.
- Bricker, R. W., Crabb, J. P. and Spiker, I. K.
Flammability Tests for Apollo Command Module and Lunar Module Mockup.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA Conference on Materials for Improved Fire Safety. May 6-7, 1970, Houston, TX. NASA CR TM X-14330, 5/1-6 pp., 1970.
- DeMeis, R.
Safety in the Space Station.
Aerospace America, Vol. 24, No. 5, 26-29, May 1986.
- Friedman, R.
Fire Safety Concerns in Space Operations.
National Aeronautics and Space Admin., Cleveland, OH
NASA TM 89848 and E-3511, 11 P. 1987.
Joint Army-Navy-NASA-Air Force (JANNAF) Safety and Environmental Protection Subcommittee Meeting.
May 4-7, 1987, Cleveland, OH, 1987.
- Friedman, R. and Sacksteder, K. R.
Science and Technology Issues in Spacecraft Fire Safety.
National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH
NASA TM 88933, 29 P. January 1987 and
American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 25th. January 12-15, 1987, Reno, NV. AIAA-87-0467, 1-30 pp., 1987.

2.11 Spacecraft (cont.)

- Gartner, R.
Spacelab Environmental Control/Life Support System-Design
Safety.
Dornier System GmbH, Friedrichshafen, Germany
Journal of the Astronautical Sciences, Vol. 23, No. 3,
205-224, July/September 1975.
- Gibb, J.W., McIntosh, M. E., Heinrich, S. R., Thomas, E.,
Steele, M. and Schubert, F.
Other Challenges in the Development of the Orbiter
Environment Control Hardware.
Fairchild Control Systems Co., Manhattan Beach, CA
Brunswick Corp., Costa Mesa, CA
Life Systems, Inc., Cleveland, OH
National Aeronautics and Space Administration. Space
Shuttle Technical Conference. June 28-30,
1983, Houston, TX. NASA CP 2342, 465-479 pp., 1985.
- Johnston, R. S.
Combustion Safety in the Spacecraft Environment.
National Aeronautics and Space Admin., Houston, TX
Aerospace Medicine, Vol. 40, No. 11, 1197-1202, November
1969.
- Katsikas, C. J. and Levine, J. H.
Manned Spacecraft Nonmetallic Materials Flammability
Selection Criteria and Requirements.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety.
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
2/1-6 pp., 1970.
- Kring, G. and Spintig, J.
SPACELAB Flight Unit Environmental Control/Life Support
System.
Dornier System GmbH, West Germany
78-ENAs-14, 13 P. 1978.
American Society of Mechanical Engineers. Intersociety
Conference on Environmental Systems. July
10-13, 1978, San Diego, CA.

2.11 Spacecraft (cont.)

Krupnick, A. D.

Proposed Incipient Fire and Toxic Gas Caution and Warning for Shuttle.

National Aeronautics and Space Admin., Huntsville, AL
National Aeronautics and Space Admin. Space Shuttle Technology Conference. Volume 1. Operations, Maintenance, and Safety. March 16, 1971, Phoenix, AZ. Proceedings, 261-276 pp., 1971.

Kubicki, D. J.

Fire Protection and Rescue Planning for the NASA Space Shuttle.

National Aeronautics and Space Admin., Washington, DC
Fire Journal, Vol. 75, No. 4, 34-40, 127, July 1981.

Lautenbach, P., Vaeth, R. and Swider, J. E.

Spacelab/Orbiter Atmosphere Revitalization Subsystem Commonality and Flight Experience.

Hamilton Standard, Windsor Locks, CT
Centre National d'Etudes Spatiales (CNES) and European Space Agency (ESA). Environmental and Thermal Control Systems for Space Vehicles. International Symposium. October 4-7, 1983, Toulouse, France. ESA-SP-200, 271-279 pp., 1983.

McAlevy, R. F., III and Magee, R. S.

Criterion for Space Capsule Fire Hazard Minimization.

Stevens Institute of Technology, Hoboken, NJ
Journal of Spacecraft and Rockets, Vol. 4, 1390, October 1967.

Pearson, O. L.

Facility and Test Support Equipment for the Manned Thermal Vacuum Tests of the Apollo-Soyuz Docking Module.

National Aeronautics and Space Admin., Houston, TX
National Aeronautics and Space Administration. 8th Conference on Space Simulation. November 3-5, 1975, Silver Spring, MD. Proceedings, Paper 41, 505-532 pp., 1975.

Preiss, H. and Padwater, A. D.

Spacelab Cabin Loop.

Hamilton Standard, Windsor Locks, CT
European Space Agency and the Technical University of Munich. Spacecraft Thermal and Environmental Control Systems. International Symposium. October 10-12, 1978, Munich, Germany. ESA-SP-139, 109-117 pp., 1978.

2.11 Spacecraft (cont.)

Prewo, K. M.

Graphite Fiber Reinforced Glass for Spacecraft Applications.
United Technologies Research Center, East Hartford, CT
Composites Technology Review, Vol. 3, 152-153, Winter 1981.

Raasch, R. F., Peercy, R. L., Jr. and Rockoff, L. A.

Space Station Crew Safety Alternatives Study. Volume 2.
Threat Development. Final Report..
Rockwell International, Downey, CA
NASA CR-3855, 238 P. June 1985.

Rockoff, L. A., Raasch, R. F. and Peercy, R. L., Jr.

Space Station Crew Safety Alternatives Study. Final Report.
Volume 1. Final Summary Report.
Rockwell International, Downey, CA
NASA CR-3854, 146 P. June 1985.

Rockoff, L. A., Raasch, R. F. and Peercy, R. L., Jr.

Space Station Crew Safety Alternatives Study. Final Report.
Volume 3. Safety Impact of Human Factors.
Rockwell International, Downey, CA
NASA CR-3856, 74 P. June 1985.

Schulze, N. R. and Prichard, R. P.

Occupant Safety in the Space Shuttle.
National Aeronautics and Space Admin., Washington, DC
Society of Automotive Engineers, Inc. Congress and Exposition,
February 27-March 3, 1978, Detroit, MI. Technical Paper
780021, 14 P. 1978.

Swan, A. G.

Two Man Space Environment Simulator Accident.
Aerospace Medical Div., Brooks AFB, TX
Aerospace Medical Div. Fire Hazards and Extinguishment
Conference. May 23, 1967, Brooks AFB, TX. AMD-TR-67-2,
4-38 pp., 1967.

Velupillai, D.

Europe Creates a Workplace in Space.
Flight International, Vol. 121, No. 3810, 1211-1216,
May 15, 1982.

2.12 STANDARDS

- American Society for Testing and Materials.
Annual Book of ASTM Standards. Section 4. Volume 04.07.
Building Seals and Sealants; Fire Standards; Building
Constructions. ASTM, Philadelphia, PA, 1987.
- American Society for Testing and Materials
Proposed Test Method for Heat and Visible Smoke Release
Rates for Materials and Products Using an
Oxygen Consumption Calorimeter.
ASTM E-5 Proposal P 190.
ASTM, Philadelphia, PA, 1986.
- American Society for Testing and Materials
Standard Method for Measuring the Minimum Oxygen
Concentration to Support Candle-Like Combustion of Plastics
Combustion of Plastics (Oxygen Index). ASTM D2863.
ASTM, Philadelphia, PA, 1987.
- American Society for Testing and Materials
Standard Test Method for Heat and Visible Smoke Release
Rates for Materials and Products. ASTM E906.
ASTM, Philadelphia, PA, 1986.
- American Society for Testing and Materials
Standard Test Method for Resistance of Electrical Wire
Insulation Materials to Flame at 60 deg. ASTM F777.
ASTM, Philadelphia, PA, 1982.
- American Society for Testing and Materials
Standard Test Method for Resistance of Materials to
Horizontal Flame Propagation (For Aerospace Vehicles,
Standard Conditions). ASTM F776.
ASTM, Philadelphia, PA, 1982.
- American Society for Testing and Materials
Standard Test Method for Specific Optical Density of Smoke
Generated by Solid Materials. ASTM E662.
ASTM, Philadelphia, PA, 1986.
- European Space Agency
Flammability Testing for the Screening of Space Materials.
ESA PSS-01-721 Issue 1, 42 P. October 1982.
European Space Agency, Noordwijk, The Netherlands

2.12 Standards (cont.)

International Maritime Organization

Revised Recommendation on Fire Test Procedures for Surface
Flammability of Bulkhead and Deck Finish
Materials. Assembly Resolution. Annex 13.
A.564(14) and MSC 51/21, 37 P. 1986.
International Maritime Organization, London, England

National Aeronautics and Space Administration

Flammability, Odor, and Offgassing Requirements and Test
Procedures for Materials in Environments that Support
Combustion. National Aeronautics and Space Admin.,
Washington, DC. NHB 8060.1B, 141 P. 1981.

National Fire Protection Association

Standard for Portable Fire Extinguishers.
National Fire Protection Assoc., Quincy, MA
NFPA 10. 51 P. 1986.

National Fire Protection Association

Standard on Halon 1301 Fire Extinguishing Systems.
National Fire Protection Assoc., Quincy, MA
NFPA 12A. 52 P. 1985.

National Fire Protection Association

Standard on Carbon Dioxide Extinguishing Systems.
National Fire Protection Assoc., Quincy, MA
NFPA 12. 46 P. 1985.

Underwriters Laboratories Inc.

Single and Multiple Station Smoke Detectors. Standard for
Safety. Third edition.
Underwriters Labs., Inc., Northbrook, IL
UL 217. 80+ P. October 8, 1985.

Underwriters Laboratories Inc.

Smoke Detectors for Fire Protective Signaling Systems.
Standard for Safety. Second Edition.
Underwriters Labs., Inc., Northbrook, IL
UL 268. 63+ P. June 9, 1981.

2.13 SUPPRESSION

- Alpert, R. L.
Calculated Spray Water-Droplet Flows in a Fire Environment.
Factory Mutual Research, Norwood, MA
FMRC J.I. OJOJ1.BU and RC86-BT-6, 56 P. October 1986.
- Ault, W. E. and Carter, D. I.
Influence of Hyperbaric Chamber Pressure on Water-Spray
Patterns.
Automatic Sprinkler Corporation of America
Fire Journal, Vol. 61, No. 6, 48-49, November 1967.
- Beaudry, J. P., Trujillo, T. M., Zallen, D. M., Campbell, P.
and Walker, J. L.
Selective Automatic Extinguisher for Computer Cabinets Class
A, B, or C With Notification (SAFECOMP).
Final Report. Ctober 1984-February 1986.
New Mexico Univ., Albuquerque
ESL-TR-86-14 and NMERI-WA3-5-(3.01), 148 P. July 1986.
- Blake, D. R.
Suppression and Control of Class C Cargo and Compartment
Fires. Final Report. August 1983-June 1984.
Federal Aviation Administration, Atlantic City, NJ
DOT/FAA/CT-84/21, 31 P. February 1985.
- Cole, M. B.
Space Station Internal Environmental and Safety Concerns.
NASA Lyndon B. Johnson Space Center, Houston, TX
National Aeronautics and Space Administration. Spacecraft
Fire Safety. August 20-21, 1986, Cleveland, OH.
NASA CP-2476, 73-87 pp., 1987.
- Davies, D.
Naval Fire Protection for the 1990's.
Graviner, Ltd., United Kingdom
Fire International, No. 105, 39,42-43, June/July 1987.

2.13 Suppression (cont.)

- Dressler, D. P., Robinson, R. S., Gann, R. G., Stone, J. P., Williams, F. W. and Carhart, H. W.
Biological Effect of Fire Suppression by Nitrogen Pressurization in Enclosed Environments.
Harvard Medical School, Cambridge, MA
Naval Research Lab., Washington, DC
Journal of Combustion Toxicology, Vol. 4, No. 3, 314-324, August 1977.
- Fiala, R.
Contribution to the Selection of Fire Extinguishing Systems and Agents for Aircraft Fires.
Deutsche Dorschungs- und Versuchsanstalt fur Luft- und Raumfahrt E. V., Institut fur Luftstrahlantriebe, Germany
Advisory Group for Aerospace Research and Development (AGARD). Aircraft Fuels, Lubricants, and Fire Safety. May 10-14, 1971, The Hague, Netherlands. AGARD CP-84-71, 18/1-10 pp., 1971.
- Fiala, R., Dussa, K. and Winterfeld, G.
On the Applicability of Reticulated Foams for the Suppression of Fuel Tank Explosions.
Advisory Group for Aerospace Research and Development (AGARD). Aircraft Fire Safety. April 11, 1975, Rome, Italy. AGARD CP-166, 16/1-12 pp., 1975.
- Fish, R. H.
Performance of Lightweight Plastic Foams Developed for Fire Safety.
National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA Conference on Materials for Improved Fire Safety. May 6-7, 1970, Houston, TX. NASA CR TM X-14330, 11/1-3 pp., 1970.
- Gann, R. G., Stone, J. P., Tatem, P. A., Williams, F. W. and Carhart, H. W.
Suppression of Fires in Confined Spaces by Nitrogen Pressurization. Part 3. Extinction Limits for Liquid Pool Fires.
Naval Research Lab., Washington, DC
Combustion Science and Technology, Vol. 18, No. 5&6, 155-163, 1978.

2.13 Suppression (cont.)

Kimzey, J. H.

Fire Extinguishment in Hypobaric and Hyperbaric Environments.

National Aeronautics and Space Admin., Houston, TX
National Aerospace and Space Administration. NASA
Conference on Materials for Improved Fire Safety,
May 6-7, 1970, Houston, TX. NASA CR TM X-14330,
19/1-4 pp., 1970.

Krasner, L. M.

Study of Hand-Held Fire Extinguishers Aboard Civil Aviation
Aircraft. Final Report. February 1981 to December 1981.
Factory Mutual Research Corp., Norwood, MA
FMRC J.I. OGON9.RG, 66 P. June 1982.

Kuchta, J. M., Cato, R. J., Martindill, G. H. and Spolan, I.

Ignition and Fire Suppression in Aerospace Vehicles.
Technical Report. January 1, 1970-November 30, 1971.
Bureau of Mines, Pittsburg, PA
AFAPL-TR-71-93 and PMSRC Report 4164, 49 P. December 1971.

Kung, H. C.

Cooling of Room Fires by Sprinkler Spray.
Factory Mutual Research Corp., Norwood, MA
Journal of Heat Transfer, Vol. 99, No. 3, 353-359, August
1977.

Martindill, G. H., Spolan, I. and Kuchta, J. M.

Fire Suppression for Aerospace Vehicles. Technical Report.
Bureau of Mines, Pittsburgh, PA
AFAPL-TR-70-39 and SRC Report S4137, 35 P. July 1970.

Sarkos, C. P.

Characteristics of Halon 1301 Dispensing Systems for
Aircraft Cabin Fire Protection.
Federal Aviation Admin., Atlantic City, NJ
Advisory Group for Aerospace Research and Development
(AGARD). Aircraft Fire Safety. April 11, 1975,
Rome, Italy. AGARD CP-166, 23/1-16 pp., 1975.

Slusher, G. R., Wright, J. and Demaree, J.

Halon Extinguisher Agent Behavior in a Ventilated Small
Aircraft. Final Report.
Federal Aviation Admin., Atlantic City Airport, NJ
DOT/FAA/CT-86/5, 58 P. June 1986.

2.13 Suppression (cont.)

- Slusher, G. R., Wright, J. A. and Speitel, L. C.
Halon Extinguishment of Small Aircraft Instrument Panel
Fires. Final Report.
Federal Aviation Admin., Atlantic City Airport, NJ
DOT/FAA/CT-86/26, 34 P. December 1986.
- Washington Univ.
Thermal Model of Fire Suppression by Nitrogen Pressurization.
Washington Univ., Seattle
39 P. November 22, 1983.
- Wilson, C. W., Trujillo, T. M. and Zallen, D.
Selective Automatic Fire Extinguisher for Class A with
Notification (SAFE CAN). Volume 1. Technical Report.
Final Report. May 1981-March 1983.
New Mexico Univ., Albuquerque
ESL-TR-83-07 and NMERI-TA3-VOL-1, 82 P. May 1983.
- Wilson, C. W., Trujillo, T. M. and Zallen, D.
Selective Automatic Fire Extinguisher for Class A with
Notification (SAFE CAN). Volume 2.
Appendices. Final Report. May 1981-March 1983.
New Mexico Univ., Albuquerque
ESL-TR-83-07 and NMERI-TA3-1-VOL-2, 383 P. May 1983.
- You, H. Z., Kung, H. C. and Han, Z.
Spray Cooling in Room Fires.
Factory Mutual Research Corp., Norwood, MA
NBS-GCR-86-515, 45 P. July 1986, and
Combustion Institute, Symposium (International) on
Combustion, 21st. August 3-8, 1986, Munich,
West Germany, 1986.

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16. Abstract Pertinent fire detection and extinguishment references have been identified to further the knowledge of spacecraft fire safety. To broaden the scope of the bibliography, other unusual environments, e.g., aircraft, submarine, ship, have been included. In addition, for a more comprehensive view of the spacecraft fire safety problem, selected subjects are included, e.g., materials flammability, smoke, human behavior. The references will provide the researcher with access to state-of-the-art works and historic works. Selected references from the 1960s have been included, but the emphasis is on references published from 1975 to 1987. The references are arranged by very broad categories. Often a paper will cover more than one topic, but for the purposes of this bibliography it will be cited only once.					
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