

UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF COLUMBIA

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TRIPOLI ROCKETRY ASSOCIATION, INC.,	)	)
and NATIONAL ASSOCIATION OF	)	)
ROCKETRY,	)	)
	)	)
Plaintiffs,	)	)
	)	)
v.	)	)
	)	)
U.S. BUREAU OF ALCOHOL, TOBACCO,	)	Civil Action No. 00-273 (RBW)
FIREARMS, AND EXPLOSIVES,	)	)
	)	)
Defendant.	)	)
	)	)
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AFFIDAVIT OF MARK BUNDICK

Mark B. Bundick, being duly sworn, deposes and says:

1. My name is Mark B. Bundick. I am the President of the National Association of Rocketry (“NAR”). I am also familiar with our sister organization, the Tripoli Rocketry Association, Inc. (“Tripoli”). I am a high-powered rocketry hobbyist, and I am familiar with the high-powered rocketry hobby.

2. Tripoli and NAR are both non-profit organizations classified by the Internal Revenue Service as Section 501(c)(3) tax exempt organizations. The two organizations are devoted to the advancement and operation of non-professional high-powered rocketry and to the promotion of safety and education of sport rocket hobbyists. Together, the two organizations have about 7,500 members.

3. The high-powered rocketry hobby involves the design, construction, launch, and recovery of aero-vehicles that ascend into the air without the use of aerodynamic lifting forces against gravity (i.e., rockets), using motor engines classified in the “H” through “O” size range (i.e., having more than 62.5 grams of propellant) that typically use ammonium perchlorate composite propellant (“APCP”) as the fuel source.

4. The APCP utilized in high-powered hobby rockets consists of approximately 70 percent ammonium perchlorate as the oxidizer, and the remainder consists of supplemental metal such as aluminum for fuel, various other chemicals serving as burn rate catalysts and antioxidants, and a synthetic rubber binder. The rubber binder effectively passivates the ammonium perchlorate, allowing the APCP to burn in a controlled, predictable, and focused manner. For this reason, APCP is ideal for use in rocket motors and, in fact, APCP has no other known use.

5. Individuals pursuing the high-power rocket hobby are subject to comprehensive regulations of other federal, state and local governments and numerous industry codes and certifications. For example, the U.S. Department of Transportation (“DOT”) regulates the storage, transport, and containerization of motors used by the hobbyists. The U.S. Federal Aviation Administration (“FAA”) regulates launches, flight locations, , rocket and propellant weight, and requires various governmental notifications. The U.S. Consumer Product Safety Commission (“CPSC”) also regulates the hobby by prohibiting minors from purchasing motors and propellants used in high-powered rockets. Local and county ordinances as well as state regulations address fire protection issues and launch locale restrictions. In addition, the hobby is extensively monitored for compliance with codes promulgated by the National Fire Protection Association

("NFPA"), which are incorporated by reference into many state laws. As a result of all these regulations already applicable to sport rocketry, no one has ever been fatally or seriously injured as a result of the use of APCP in sport rockets.

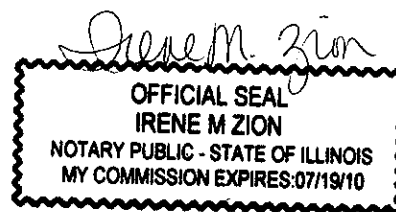
6. Many county and local municipal ordinances altogether prohibit the storage of materials that have been classified as "explosives" by ATFE no matter what precautions are taken. Thus, ATFE's final determination that APCP used in sport rocket motors are "explosives" precludes possession of such motors by many hobby rocketeers even if they otherwise comply with ATFE's regulations or obtain a Low Explosive Users Permit from BATFE. In addition, ATFE's exercise of regulatory jurisdiction over the hobby is resulting in a precipitous decline in the purchase and use of sport rockets, a precipitous decline in the number of individuals that can afford to participate in the hobby (in either time or money or both), and a dramatic increase in costs and administrative burdens for sport rocketeers. In short, ATFE's classification of the APCP in high-powered hobby rocket motors as an "explosive" injures NAR, Tripoli, and their members.

7. No person has ever been fatally or seriously injured as a result of use of APCP in hobby rockets.

I declare under penalty of perjury that the foregoing is true and correct.

*Mark B. Bundick*

Mark B. Bundick



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TRIPOLI ROCKETRY ASSOCIATION, INC.,  
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U.S. BUREAU OF ALCOHOL, TOBACCO,  
FIREARMS, AND EXPLOSIVES,

Defendant.

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Civil Action No. 00-273(RBW)

AFFIDAVIT OF DR. TERRY McCREARY

Dr, Terry McCreary, being duly sworn, deposes and says:

1. My name is Terry McCreary. I am an Associate Professor of Chemistry at Murray State University in Murray, Kentucky. I received a Ph.D. in Analytical Chemistry from Virginia Polytechnic Institute, and I have conducted research and authored papers on solid rocket propellants. A more complete summary of my education and expertise is attached hereto.

2. The APCP utilized in high-powered hobby rockets consists of approximately 70 percent ammonium perchlorate as the oxidizer, and the remainder consists of supplemental metal such as aluminum for fuel, various other chemicals serving as burn rate catalysts and antioxidants, and a synthetic rubber binder. The rubber

binder effectively passivates the ammonium perchlorate, allowing the APCP to burn in a controlled, predictable, and focused manner. For this reason, APCP is ideal for use in rocket motors and, in fact, APCP has no other known use.

3. The APCP used in high-powered hobby rockets, classified in the H through O size range, is composed of chemicals that prevent the APCP from detonating when used in hobby rockets.

4. In its calculation of hobby rocket APCP burn rates by dividing the total length of the specimen (the dividend) by the burn duration (the divisor), the Hawk-Dinan Report (referenced by the October 13, 2006 Decision by the Bureau of Alcohol, Tobacco, Firearms, and Explosives ("ATFE")) necessarily assumed that the APCP in hobby rockets burned in a direction normal to the top and bottom surface of the propellant grains and parallel to the length of the specimen in the rocket motor. This assumption was wrong.

5. The APCP rocket motor grains tested in the Hawk-Dinan Report have hollow cores that are ignited almost instantaneously along the entire length of the propellant grain or grains. As a result, the APCP in the tested hobby rocket motors burns along the entire length from the inside surface (the surface of the hollow core) to the outside surface, a much shorter distance than the total length of the motor or the propellant grains. Calculating a scientifically valid burn rate for this hobby rocket APCP would therefore entail dividing the measured burn durations by the difference between the inside and the outside diameter of the fuel grain or grains (thickness), not the length of the grain or grains (or motor). Since the Hawk-Dinan Report used the wrong dividend, its reported burn rates are scientifically invalid.

6. Scientifically valid burn rates for the hobby rocket APCP tested in the Hawk-Dinan Report can be calculated in a straightforward manner using the burn duration times from that Report and the manufacturer's specifications for the tested hobby rocket grains, which provide the necessary inside and outside fuel diameters. These validly calculated rates are markedly different from those in the Hawk-Dinan Report. The average rates are from 4.25 to 7.33 mm/s, not the 36-145 mm/s relied on by ATFE. These validly calculated average rates of from 4.25 to 7.33 mm/s are generally consistent with the burn rates (at the standard testing pressure of 1000 pounds per square inch ("psi")) provided by the manufacturer of from 0.11 inches per second (or 2.79 mm/s) to 0.33 inches per second (or 8.38mm/s).

7. There are numerous kinds of "safety fuses." One can readily purchase safety fuses that burn at rates from 5.08 mm/s to 101.6 mm/s.

8. There are many thousands of different materials with both fuel and oxidizer. Relatively few are on ATFE's explosives list. Various carbonates and sulfates, such as calcium carbonate (chalk), magnesium sulfate (Epsom salt), barium sulfate, and other substances can act as an oxidizer. Barium sulfate is commonly used as an additive to some types of paper to give it weight and gloss.

9. I attempted to determine the burn rate of heavy paper, of the sort treated with barium sulfate. The paper was ignited as my in previous tests, reported in my paper entitled "Burn Rates of Common Materials Compared to Ammonium Perchlorate Composite Propellant." In each case, the paper went "out" after a few seconds. It simply did not appear to sustain combustion, even after repeated ignition at the edge.

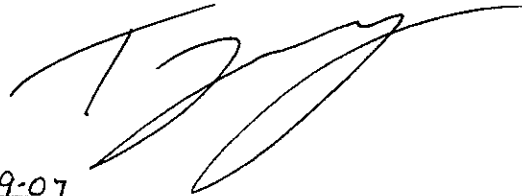
10. ATFE's October 17, 2006, Decision included the following discussion at p. 4:

"It is significant to note that a G40-10 W rocket motor catastrophically failed on the test apparatus, explosively propelling the rocket motor casing and propellant fragments away from the test apparatus."

There is a video record of this motor's failure on the CD-ROM included in the Administrative Record. The vertical testing apparatus used for this particular test was non-standard and induced mechanical stresses (much like those from a vice) on the rocket motor far in excess of normal rocket flight conditions. Therefore, motor failure during the testing is not surprising (indeed, it is logical). The video shows that the APCP immediately stopped burning when the motor casing ruptured, something clearly not characteristic of an explosive.

I declare under penalty of perjury that the foregoing is true and correct.

Terry McCreary



Rhonda F. Rogusa 1-29-07  
Notary KY State-At-Large

My commission expires: 4/21/09

# Terry W. McCreary

Department of Chemistry  
Murray State University  
Murray, KY 42071  
Phone: (270) 809-8499  
Email: terry.mcCreary@murraystate.edu

## EDUCATION

- 1989 Ph.D., Analytical Chemistry, Virginia Polytechnic Institute, Blacksburg.  
Dissertation: "Some Aspects of Rapid Analysis of Coal Slurries by Direct Current Plasma Emission Spectrometry", under Gary L. Long
- 1981 M.S., Analytical Chemistry, University of Georgia, Athens.  
Thesis: "Design and Evaluation of a Double Beam-in-Time Photoacoustic Spectrometer", under Geoffrey N. Coleman
- 1977 B.S., Chemistry, St. Francis College, Loretto, PA

## EMPLOYMENT

- 1995- Associate Professor, Murray State University  
1988-95 Assistant Professor, Murray State University. Tenure awarded 1994

Undergraduate and graduate courses I have taught include:

- Consumer chemistry (non-science majors) [MSU course: CHE 101]
- General/Organic/Biochemistry (nursing/tech) [CHE 105/106]
- General chemistry, for majors and pre-professionals [CHE 201/202]
- Analytical chemistry (quantitative analysis) [CHE 305]
- Basic instrumental analysis (non-calculus background) [CHE 352]
- Glassblowing [CHE 545]
- Instrumental analysis at both undergraduate and graduate levels [CHE 519/672/689]

I have directed or assisted over two dozen undergraduate students in research projects and independent study in chemistry. Two graduate students have completed M.S. degrees in chemistry under my direction, and I have served on graduate committees of fourteen M.S. students.

I took a sabbatical leave in Fall 2000 to teach and write at Southern Illinois University at Carbondale.

- 1986-88 Project Assistant, Department of Chemistry, Virginia Polytechnic Institute  
As a graduate student I directed technicians and performed research for Department of Energy project, "Rapid Analysis of Coal Slurries", which led to my Ph.D. dissertation.
- 1985-86 Teaching Assistant, Virginia Polytechnic Institute  
As a graduate student I supervised undergraduate chemistry laboratories in general chemistry.

1979-85 Instructor/Assistant Professor, Cumberland College, Williamsburg, KY.  
I taught undergraduate courses in chemistry, including general chemistry, quantitative analysis, instrumental analysis, organic laboratory, and qualitative organic analysis; and I directed undergraduate research.

Tenure was granted and I was promoted to assistant professor in May 1984.

1977-79 Teaching Assistant, University of Georgia  
I supervised undergraduate chemistry laboratories in general chemistry and instrumental analysis.

### RESEARCH INTERESTS AND SELECTED PUBLICATIONS/PRESENTATIONS

#### Chemistry education

Solid propellant formulation and characterization.

Fundamental studies of combustion of pyrotechnic mixtures

Diagnostic studies of sample transport and fundamental processes in plasmas

Improved sample introduction in flames and plasmas

Chemical instrumentation and method development

2006 **Textbook: *Chemistry for Changing Times* 11<sup>th</sup> edition, John Hill and Doris Kolb (T. W. McCreary, Contributing Author) Prentice Hall, ISBN 0-13-228084-1.** Previous editions of this textbook for "consumer chemistry" (non-science majors) have made it the best-selling consumer-chemistry text worldwide. Dr. Kolb was unable to participate in this edition, so although I was listed as a contributing author, the workload and responsibilities were those of a full coauthor. This textbook was released in June 2006.

2004 **Textbook: *General Chemistry* 4<sup>th</sup> edition. John Hill, Ralph Petrucci, Terry McCreary, and Scott Perry, Prentice Hall 2005, ISBN 0-13-140313-3.** A general chemistry textbook for science and engineering majors; 1144 pp. Unlike many textbooks with multiple authors, there was no assignment of chapters. Instead, each author fully reviewed each chapter and suggested changes and comments. In addition to normal author's responsibilities I prepared a complete set of PowerPoint presentations—25 chapters, approx. 1200 slides—to accompany the text. I also prepared all annotations—literature citations, demonstration suggestions, clarification commentary—for the Instructor's Annotated Edition. My contract for this textbook extends through a possible 8<sup>th</sup> edition.

2004 **Instructor's Manual: Instructor's Resource Manual to accompany *General Chemistry* 4<sup>th</sup> edition; Terry McCreary and Marie Hankins, Prentice Hall 2005, ISBN 0-13-140316-8.** 397 pp. I was solely responsible for revising and updating this manual, completed over a period of just seven weeks.

2002 **Textbook: *Chemistry: An Integrated Approach*, 3rd edition, John Hill and Ralph Petrucci (T. W. McCreary, Contributing Author) Prentice Hall 2002, ISBN 0-13-098471.** Contributions included special essays, art review and construction of macro-micro figures, review of all 25 chapters of the text itself, development of new problems, construction of the index, and review of the

website questions (approximately 1500 multiple-choice questions with individualized feedback to each response).

- 2000 **Monograph: *Experimental Composite Propellant*, T. W. McCreary 2000. 243 pp** A monograph on the technical and practical aspects of preparation, properties, and characterization of composite ammonium perchlorate solid rocket propellant and simple motor construction.
- 1996 **"Catalysis of PSAN-Based Composite Propellant"**, Crystal Daniels, Amber Walker, and T. W. McCreary, presented at Kentucky Academy of Science, Frankfort, KY.
- 1996 **"Comparison of Gasometric and Gravimetric Determination of Magnesium in Propellant Mixtures"**, Kim Newman and T. W. McCreary, presented at Kentucky Academy of Science, Frankfort, KY.
- 1994 **"Nonrefractory Slurries in the ICP: Size Control and Recovery"** Chuenyuan Chen and T. W. McCreary, *Applied Spectroscopy* 48, 410 (1994)
- 1991 ***Laboratory Techniques and Experiments In Chemistry***, General Chemistry Laboratory Manual, MSU University Press. Originally published in 1991, revised in 1999 and in 2002. This manual for first-semester majors-level chemistry has been used for fourteen years at Murray State.

#### SELECTED GRANTS

- 2003 Principal Investigator for "PARTNERSHIPS IN PROPULSION: Research, Design and Testing of Alternative Rocket Propellants and Motors", Research Incubation Grant for \$10,000, funded in December 2003.
- 2001-03 Co-Principal Investigator for "Establishing New Traditions in Chemistry at Murray State University". National Science Foundation CCLI-Adaptation and Implementation Grant for \$307,960.
- 1988-2004 Eight grants from the Committee for Institutional Studies and Research, Murray State University, for propellant research and study, totaling approximately \$16,000.

#### SELECTED SERVICE/PROFESSIONAL ACTIVITIES

- Faculty advisor for SAACS, the Student Affiliates of the American Chemical Society at Murray State University, five years. Included trips to the Pittsburgh Spectroscopy Society Conference; various social activities, picnics, parties, and pot-lucks; two Area Collegiate Chemistry Meetings hosted by MSU SAACS and three hosted by U.T. Martin; attendance at ILS-ACS; aid to the MSU Scholarship Tournament Examination. During my service, MSU-SAACS was awarded its first Outstanding Chapter award.

- One year as President-Elect and one year as President of the Kentucky Lakes Section of the American Chemical Society (KLS-ACS).
- Two years as Senator-At-Large, MSU Faculty Senate; currently chair of the Handbook and Personnel committee of the Faculty Senate.
- Four years as member of the Board of Directors of the Tripoli Rocketry Association, a 501(c)3 not-for-profit organization promoting noncommercial rocketry worldwide. [www.tripoli.org](http://www.tripoli.org). We have been awarded three small grants under my directorship.
- Preparation and grading of the MSU annual Chemistry Scholarship Tournament Examination for fourteen years.
- Two times Special Awards Judge for Chemistry at the International Science and Engineering Fair in Louisville.
- Four years moderator in the Science Bowl at MSU.
- Five years as the faculty advisor to the MSU Humanist Student Association, which meets every other week; I have attended almost all of the meetings.
- Two years member of the collegiate curriculum committee.
- One semester as a replacement collegiate representative to the University Tenure Committee.
- As Technical Editor for the *Journal of Pyrotechnics* I have reviewed eight manuscripts submitted for publication.
- I carried out a number of *pro bono* consulting tasks for various companies including Estron Chemical, GAF, Aerotech, BioMicro Systems, and others including two attorneys. Most involved spectroscopic analysis (IR, AA, or DCP).
- To date I have met with 86 prospective chemistry students to inform them of the department and provide departmental tours.

#### PERSONAL

- DOB 13 October 1955
- Address: 1606 Wiswell Road, Murray, KY 42071. (270)759-1552
- Married (Geniece); two children (April Yvette, 15; Aiyca Corinne, 18)
- Hobbies and Interests: Most involve "making things". Astronomy and telescope making, cooking, gardening, rocketry, pyrotechnics, metalworking and foundry, woodworking, carpentry and house renovation, reading. I have had articles published in *Projects in Metal*, *High Power Rocketry*, and *Extreme Rocketry* magazines.