# Tripoli Research Safety Code
# February 2006

## Chapter 1 Administration

### 1.1 Scope

**1.1.1** This code shall apply only to non-commercial individuals who wish to participate in Tripoli Research Launches.

**1.1.2** This code shall apply to design, construction, limitation of propellant mass and power, and limitation of propellants to be used at Tripoli Research Launches.

**1.1.3** This code shall not apply to any group or individual acting on their own, or to individuals who are not engaged in Tripoli Research activities.

**1.1.4** This code shall not apply to the self-manufacture or process of manufacture of rocket motors or propellants for an individual's own use.

### 1.2 Purpose

**1.2.1** The purpose of the Tripoli Research Program is to foster the research and development of payloads, electronics, recovery devices, air frame design, construction materials and to provide members of TRA with a venue in which they can static test and use their own composite or hybrid motors.

**1.2.2** It is the purpose of Tripoli to sanction and insure legal Tripoli Research activities as set forth in the *Articles of Incorporation*, Article III (a), (b), and (f).

**1.2.3** The purpose of this code is to provide reasonable safety guidelines for the use of research rocket motors by members of the Tripoli Rocketry Association at Tripoli Research Launches.

**1.2.4** It is the purpose of this code to provide a means to introduce new technology or to include currently prohibited technology into Tripoli Research activities as the ability and expertise of TRA to include these technologies becomes available.

### 1.3 Enforcement

**1.3.1** This code shall be enforced according to the provisions set forth in the *Articles of Incorporation and Bylaws* of the Tripoli Rocketry Association, Inc., and the operating rules approved by the Board of Directors (BOD).

## Chapter 2 Referenced Publications

### 2.1 General

**2.1.1** Some of the documents or portions thereof listed in this chapter are referenced within this code and shall be considered part of the requirements of this document except for such requirements modified or waived in this code.

**2.1.2 TRA Publications.** Tripoli Rocketry Association, Inc., P.O. Box 970010, Orem, UT 84097-0010.

*Articles of Incorporation and Bylaws*, 1999 edition. *High Power Rocketry Safety Code*, 1998 edition. *Tripoli Research Safety Code*, March 2002 edition.

**2.1.3 NFPA Publications.** National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 1125, *Code for the Manufacture of Model Rocket Motors and High Power Rocket Motors*, 2001 edition.

NFPA 1127, *Code for High Power Rocketry*, 1998 edition.

**2.1.4 U.S. Government Publications.** Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

(Note: The following references are not referred to in this code. They are referenced in NFPA 1125 and are provided for

your convenience. Some of these requirements may not apply to Tripoli Research participants.)

Title 16, *Code of Federal Regulations*, Parts 1500.85 (8) and (9).

Title 18, *United States Code*, Chapter 40, "Importation, Manufacture, Distribution, and Storage of Explosive Materials," Regulation of Explosives, of the Crime Control Act of 1970, Title XI.

Title 27, *Code of Federal Regulations*, Part 55, Bureau of Alcohol, Tobacco, and Firearms, U.S. Department of the Treasury.

Title 29, *Code of Federal Regulations*, Part 1910.119.

Title 40, *Code of Federal Regulations*, US EPA, Superfund Appropriation and Reauthorization Act (SARA), Title III.

Title 49, *Code of Federal Regulations*, parts 100 to end (Hazardous Materials Regulations, U.S. Department of Transportation).

DOT-E-7887, Exemption to Title 49, *Code of Federal Regulations*, Parts 106, 107, and 171-180.

## Chapter 3 Definitions

### 3.1 General

**3.1.1.** The definitions contained in this chapter shall apply to the terms used in this code. Where terms are not included, common usage of the terms shall apply.

### 3.2 Tripoli Research Definitions

**3.2.1 BOD.** Board of Directors of the Tripoli Rocketry Association, Inc.

**3.2.2 Certified Motors.** Any motor, which has been certified by Tripoli Motor Testing (TMT) and/or NAR Standards and Testing (S&T), or at one time was certified and has expired, or has been decertified.

**3.2.3 Commercial Motor Manufacturer.** An individual, partnership or company who possesses a Low Explosive Manufacturing Permit (LEMP) and who also has Department of Transportation (DOT) UN classification and can legally transfer, ship, or sell motors to others.

**3.2.4 Rocket Motor.** As used in this code, Rocket Motor shall refer only to Composite Propellant, Sugar Propellant, and Hybrid Rocket Motor.

**3.2.5 Composite Propellant Rocket Motor.**

**3.2.5.1** Any device as defined under Rocket Motor that utilizes a propellant charge consisting primarily of an inorganic oxidizer dispersed in a carbonaceous polymeric binder. (NFPA 1125, *Code for the Manufacture of Model Rocket Motors and High Power Rocket Motors*, section 3.3.26.1)

**3.2.5.2 Sugar Propellant Rocket Motor**. A propellant charge containing potassium nitrate as the primary oxidizer, and containing either dextrose or sorbitol as the primary fuel and binder.

**3.2.6 Research Motor.** Any non-certified, non-commercial motor, made by individuals for their own personal, non-commercial use.

**3.2.7 Research Rocket.** Any rocket containing one or more certified or research motors.

**3.2.8 Flight/Launch/Test Area.** An area or areas designated by the Launch Director or Range Safety Officer from which research rockets are launched or research motors are static tested.

**3.2.9 Group.** Two or more individual Tripoli members involved in the same project, including planning, preparation, flight, and recovery.

**3.2.10 Hybrid Rocket Motor.** A rocket motor in which the fuel exists in a different physical state (solid or gaseous) than the oxidizer and that derives its force or thrust from the combination thereof.

**3.2.11 Range Safety Officer (RSO).** A Tripoli Level 2 or Level 3 member who is responsible for the safety of the launch.

**3.2.12 Launch Director (LD).** A Level 2 or Level 3 Tripoli member who has overall administrative responsibility for the launch.

**3.2.13 Launch Site.** The primary parcel of land from which research activities are conducted and all adjacent parcels which are owned by the same property owner, or other property owners, and who have granted written permission for Tripoli Research Launch activities to be conducted on their property.

**3.2.14 Non-Certified Motor.** Any motor which has not been certified by Tripoli Motor Testing (TMT) and/or NAR Standards and Testing (S&T).

**3.2.15 Non-Commercial Motors.** Any motor made by an individual(s) for their personal, non-commercial use.

**3.2.16 Preparation Area.** An area designated by the Launch Director or Range Safety Officer in which research motors, research rockets, or electronic components for research rockets are prepared for launching or static testing.

**3.2.17 Regular Tripoli or Certified Launch.** Any Tripoli sanctioned and insured launch where only certified motors may be flown.

**3.2.18 Shall.** Indicates a mandatory requirement.

**3.2.19 Tripoli (TRA).** Tripoli Rocketry Association, Inc.

**3.2.20 Tripoli Research Committee (TRC).** A committee appointed by the BOD to oversee and manage the Tripoli Research program.

**3.2.21 Tripoli Research Flight.** Any flight containing one or more research activities such as motors, electronics testing, etc..

**3.2.22 Tripoli Research Launch.** Any Tripoli Research sanctioned and insured launch where only research activities may be conducted.

## Chapter 4 Limits of Liability

### 4.1 Use

**4.1.1** The use of research motors at Tripoli Research Launches shall be conducted in accordance with this code.

### 4.2 Disclaimer

**4.2.1** The Tripoli Rocketry Association does not in any way participate in the manufacturing or fabrication process of Research Rocket Motors or propellants.

**4.2.2** The Tripoli Rocketry Association does not regulate, approve, or officially support or endorse any propellant manufacturing or fabrication process, or in any way imply such approval.

**4.2.3** The Tripoli Rocketry Association does not endorse or provide any safety codes for the self- manufacture of any propellant.

**4.2.4** The Tripoli Rocketry Association does not regulate the storage of research motors.

**4.2.5** The publishing or reporting of any research rocketry activity in any publication shall not imply TRA endorsement of any research activity or endorsement of any research manufacturing or fabrication procedure.

### 4.3 Legality

**4.3.1** The Tripoli Rocketry Association does not claim Research Rocketry to be legal in every municipality or in every state.

**4.3.2** Participants in the Tripoli Research program shall comply with all local, municipal, state, and federal regulations where said activities are conducted.

### 4.4 Insurance

**4.4.1** The Tripoli Rocketry Association supports Tripoli Research activities where said activities are conducted legally.

**4.4.2** Tripoli Research activities are only insured when the provisions of this code are followed.

**4.4.3** No Tripoli member shall imply to any authority or landowner that Tripoli Research activities are insured when, due to not following the provisions of this code, they are not.

**4.4.4** When false claims are made about Tripoli or insurance coverage, the BOD shall contact those to whom false claims have been made.

## Chapter 5 Exclusions

### 5.1 Black Powder Rocket Motors

**5.1.1** Black powder-based motors shall not be included as composites, regardless of binder and/or formulation modifications.

### 5.2 Liquid Rocket Motors

**5.2.1** With the exception of nitrous-oxide hybrid rocket motors, liquid rocket motors are prohibited at Tripoli Research Launches. BOD approval may be given for very well documented liquid motor projects.

### 5.3 Additional Prohibited Propellants

**5.3.1** The following propellants shall also be excluded from Tripoli Research launches: double- and triple- based propellants, and micro-grain propellants, including zinc/sulfur propellants.

## Chapter 6 Process of Inclusion

### 6.1 General

**6.1.1** A proposal for the introduction of new technologies and the inclusion of currently prohibited technologies into the Tripoli Research program shall be submitted, in writing, by one or more Tripoli Research members to the Tripoli Research Committee (TRC) for review, after which the proposal is forwarded to the BOD.

**6.1.2** The originator(s) of the proposal shall provide any and all technical documents that may be requested by the TRC and/or the BOD.

**6.1.3** Following review, the TRC and BOD may set a time and location for a demonstration of the requested technology, as is deemed necessary by the TRC and BOD.

**6.1.4** After demonstration and testing, the TRC and BOD shall determine whether or not to introduce the requested technology into the Tripoli Research program.

**6.1.5** Acceptance of new technology shall be based on technical data, and/or on review of any federal regulations that may impact the association or the hobby with the inclusion of any new technology, and/or on the impact of said technology on TRA insurance coverage.

**6.1.6** If the requested technology is introduced, the TRC shall recommend any necessary changes to this code to safely introduce said technology for Tripoli Research use.

**6.1.7** Any new technology approved shall be used in accordance with this code and any future requirements that may be added to this code.

## Chapter 7 Commercial Motor Manufacturers

### 7.1 General

**7.1.1** A person is determined to be a Commercial Motor Manufacturer if he meets the definition of a

Commercial Motor Manufacturer as set forth in this code.

### 7.2 Commercial Motor Manufacturers at Tripoli Research Launches

**7.2.1** Commercial Motor Manufacturers are welcomed at Tripoli Research Launches provided they follow all the provisions of this code.

### 7.3 Commercial Motor Manufacturer Demonstrations

**7.3.1** Commercial Motor Manufacturers shall use only motors that are not yet commercially available for the purpose of research and development at Tripoli Research Launches.

**7.3.2** Commercial Motor Manufacturers shall launch their own motor(s) either in their own rocket(s) or in a designated representative's rocket(s) only if the designated representative is physically present.

**7.3.3** A Commercial Motor Manufacturer's representative that is not actually on the company payroll does not meet the requirement of **7.3.2**.

**7.3.3.1** The LD or RSO may require proof (pay check stub, etc.) that a person is a Commercial Motor Manufacturer's paid representative before allowing the representative to demonstrate any product at a Tripoli Research Launch.

### 7.4 Commercial Motor Manufacturers and Group Projects

**7.4.1** A Commercial Motor Manufacturer may participate in Tripoli Research group projects if he/she is an official member of said group, and may collect only the exact costs (without profit) for the raw materials used to produce the motor(s) for use in the group project.

**7.4.2** A Commercial Motor Manufacturer must be personally in attendance at all Tripoli Research group project flights with which he/she is involved. (see also **7.3.3** and **7.3.3.1**)

**7.4.3** A Commercial Motor Manufacturer shall keep the rocket motor(s) for the group project in his/her possession until it is time to install the motor.

**7.4.4** The Commercial Motor Manufacturer participating in any group project shall install the motor in the rocket him/herself and shall remain with the rocket and project crew until the rocket is launched.

## Chapter 8 Tripoli Research Group Projects

### 8.1 Group Project Participants

**8.1.1** Any member of Tripoli can participate in a Tripoli Research group project providing all the requirements of this code are met, per Chapter 9, Tripoli Research Launches. All participants in a group project shall be Tripoli members in good standing.

**8.1.2** A person who makes the research motor(s) for a Tripoli Research group project may do so only if he/she is an official member of said group, and may collect only the exact costs (without profit) for the raw materials used to produce the motor(s) for use in the group project.

**8.1.3** The person who makes the research motor(s) for a Tripoli Research group project shall be physically present at that Tripoli Research group project flight.

**8.1.4** The person who makes the research motor(s) for a Tripoli Research group project shall keep the rocket motor(s) for the group project in his/her possession until it is time to install the motor.

**8.1.5** The person who makes the research motor(s) for a Tripoli Research group project shall install the motor(s) in the rocket him/herself and shall remain with the group until the rocket is launched.

## Chapter 9 Tripoli Research Launches

### 9.1 Participants

**9.1.2** All flyers at a Tripoli Research Launch shall be members of Tripoli in good standing and shall have achieved Tripoli Certification Level 2 or greater.

**9.1.2.1** All flights and static tests conducted by the member shall be within the member's certification level.

**9.1.2.2** The member shall provide proof of membership and certification status by presenting their membership card to the LD.

### 9.2 Attendance by Non-Tripoli Members (Invited Guests and Spectators)

**9.2.1** Non-Tripoli members are invited guests or spectators.

**9.2.2** Tripoli members shall be responsible for the conduct of their invited guests.

**9.2.3** An invited guest may be in the motor/rocket preparation areas but may not be present at the launch site (pad area).

**9.2.3.1** Spectators, who are neither TRA members nor invited guests, are confined to the spectator areas as designated by the RSO and shall not be present in the motor/rocket preparation areas nor at the launch site.

**9.2.3.2** Invited guests or spectators who meet all the other requirements of this code may have access to these restricted areas if they join TRA and have the permission of the RSO and the person or group personnel involved in a project.

### 9.3 Age Requirements

**9.3.1** Only Tripoli members 18 years of age or older shall be allowed to participate in Tripoli Research activities.

**9.3.2** The LD/RSO has the right to restrict access of anyone under the age of 18 to any Tripoli Research activity, including motor preparation, launch or test firing areas.

### 9.4 Prohibitions

**9.4.1** All Tripoli Research activities defined herein, *including static firings*, are prohibited at Regular Tripoli or Certified Launches as defined at 3.2.17.

**9.4.2** Research motors shall not be used for certification flights.

**9.4.3** Research motors shall not be fabricated of steel.

**9.4.3.1** Cases, front and rear closures, and nozzles shall not be fabricated of steel.

**9.4.3.2** Screws, washers, compression rings and related closures, and sealing devices shall be exempt from requirement 9.4.3.1.

**9.4.4** The ignition of a research rocket motor shall not be initiated by any of the following:

- A switch that uses mercury to complete a circuit
- "pull wires" that disconnect or complete a circuit
- "pressure roller" switches.

**9.4.5** No range activity shall be conducted when a thunderstorm has been sighted within ten miles or less of the launch site or if audible thunder or lightning is present.

### 9.5 Modification of Commercially-Manufactured Motors

**9.5.1** Modifying a commercially manufactured motor in any way shall not make said motor a research motor.

### 9.6 Impulse Limits

**9.6.1** BOD approval shall be required for any research rocket/flight where the total installed impulse is equal to or greater then 81,920.01 N-Sec (Q and above).

### 9.7 Recovery Requirements

**9.7.1** All flights with total installed impulse greater than 1,280 Newton-Seconds (K-class motors and above) shall use at least one electronic recovery device as the primary means of actuating vehicle recovery.

### 9.8 Launch Scheduling

**9.8.1** All Tripoli Research launches shall take place at a time which is to be separated from any other Tripoli Regular or Certified launch at that same site by no less than 8 hours.and a date change.

**9.8.2** Operating separate range heads at separate locations on the same or adjacent property shall not meet this requirement unless launch/firing times for Tripoli Regular and or Certified and Tripoli Research flights are separated by at least 8 hour and a date change.

**9.8.3** This rule shall apply to all operations conducted at the launch.

### 9.9 Distances

**9.9.1** The maximum launch altitude of a research flight shall be 75% of the waiver altitude established for the launch.

**9.9.1.1** The BOD may waive this requirement when it can be demonstrated (by past performance, actual thrust curves, etc.) that the performance of the motor(s) to be used shall not exceed the limits of the waiver.

**9.9.1.2** Computer simulations without actual thrust data derived from one or more actual test stand firings shall not satisfy the requirements of **9.9.1.1.**

**9.9.2** The minimum safe stand off distance for any research flight and or research static test shall be as per the table below

| Minimum Safe Standoff Distances | | | | |
|---|---|---|---|---|
| | | | | |
| Total Installed Impulse | | Motor | Non Complex | Complex |
| N-Secs | N-Secs | Type | Feet | Feet |
| 0.01 | 320 | A-H | 200 | 250 |
| 320.01 | 640 | I | 200 | 250 |
| 640.00 | 1,280 | J | 200 | 250 |
| 1,280.01 | 2,560 | K | 250 | 350 |
| 2,560.01 | 5,120 | L | 375 | 500 |
| 5,120.01 | 10,240 | M | 625 | 725 |
| 1,024.01 | 20,480 | N | 1,250 | 1,500 |
| 20,480.01 | 40,960 | O | 1,875 | 2,250 |
| 40,960.01 | 81,920 | P | 2,000 | 2,500 |
| 81,920.01 | 163,840 | Q | 2,000 | 2,500 |
| 163,840.01 | 327,680 | R | 2,250 | 2,750 |
| 327,680.01 | 655,360 | S | 2,250 | 2,750 |
| 655,360.01 | 890,000 | T | 2,500 | 3,000 |

**9.9.2.1** The Launch Director or Range Safety Officer may at their discretion require greater stand off distances.

**9.9.3** All research flights shall be flown away from spectators and the rocket and motor prep areas by an angle of no less than 2 degrees from vertical.

### 9.10 Tripoli Certifications

**9.10.1** Tripoli certifications shall not be attained at a Tripoli Research launch

### 9.11 Launch Director and Range Safety Officer

**9.11.1** The LD/RSO may, for any reason, refuse to allow the launch or static testing of any research rocket motor or rocket that he or she deems to be unsafe.

**9.11.2** Decisions of the Launch Director and/or the Range Safety Officer shall, in every case, be final.

### 9.12 Approved Motors

**9.12.1** Research motors or research motor static test(s) and commercially available certified motors shall be allowed at a Tripoli Research Launch.

**9.12.2** Motors which have been manufactured by a Commercial Motor Manufacturer and which are not yet in the process of being certified and are not yet intended to be available to Tripoli members commercially, shall be deemed "research" and shall be flown or static fired only at Tripoli Research Launches.

**9.12.2.1** Motors manufactured by a Commercial Motor Manufacturer are allowed at a Tripoli Research launch only if they meet with all provisions of **Chapter 7** of this code.

### 9.13 Launch Approval and Insurance Coverage

**9.13.1** The Tripoli Research launch approval application form, available from the Tripoli web site, shall be submitted at least fifteen (15) calendar days in advance of the launch date to the TRC Chairman.

**9.13.2** It is the responsibility of the Launch Director to insure that the Tripoli Research launch is insured. All Tripoli Research launches must be insured.

### 9.14 Record Keeping

**9.14.1** A flight card shall be filled out for each research flight or static firing.

**9.14.1.1** The flight card shall contain the following minimum information:

(A) Motor(s) - type (composite, etc.), total impulse, propellant type, average (calculated or measured) thrust, burn time.
(B) Recovery - number and size of parachutes. number and type of electronic ejection devices (altimeters, R/C, timers, etc.).
(C) Flight/static test results - a narrative of how the motor, rocket and flight performed.

**9.14.2** Upon the request of the BOD or the TRC Chairman, flight cards shall be made available to the TRC for study and review.

### 9.15 Other Applicable Codes

**9.15.1** *The High Power Rocketry Safety Code* (1998) shall be in effect, except as modified herein, at all Tripoli Research Launches.

## Chapter 10 Waived Rules and Exceptions

### 10.1 Application for Waiver or Exceptions

**10.1.1** Application for exceptions to any provision of this code shall first be submitted in writing to the TRC and then to the BOD.

**10.1.2** The TRC and the BOD shall require sufficient reason for any waiver or exclusion to any provision of this code.

**10.1.3** The BOD shall first determine any legal or regulatory impact that may be caused by granting a waiver or exception to any provision of this code.

**10.1.4** The BOD shall determine if granting a waiver or exception to any provision of this code will deny insurance coverage.

**10.1.5** Any provision of this code waived or excluded by the BOD shall be on a case-by-case basis.

**10.1.6** In the event that BOD approval for waiver or exclusion from any provision of this code is granted, said approval shall apply only to a single event, at a single location.