Discussion of Using Risk Management Principles in Model Rocket Activities in Texas and Oklahoma

Bottom Line Up Front:
Burn bans, both in Texas and Oklahoma, do NOT prohibit model rocket flight operations. We should conduct our own risk analysis in deciding whether or not to launch. Local and state analysis of the fire danger conditions plays a key role in our risk analysis. We should base our decision on an understanding of the state and local statues, scientifically determined fire danger, and thorough risk analysis. We should choose whether or not to fly from an over abundance of caution. Flying rockets is not worth hurting a person or damaging property. Being a good neighbor is a good reason to not fly. However, we should have a defined process for making that decision rather than just saying it doesn't feel right.

Background:
The Texas National Guard plays a significant role in fighting wildfires in the state. I'm involved with that on a daily basis. Just as the Oklahoma Forestry Services (OFS) is your lead state agency for wildfires, the Texas Forest Service (TFS) is ours. Each business day at 10am, the Texas Military Forces participates in a wildfire operations conference call hosted by the TFS which includes local fire and other officials as well as state and federal weather specialists.

In Texas, the County Judge or Commissioners Court declares a county burn ban. In Oklahoma, the county can declare a ban or the governor can do so.
"Legal authority for a ban on outdoor burning is located in Title 2 of the Oklahoma Statutes. Article 16 Section 16-26 of the Oklahoma Forestry Code authorizes the Governor to declare a ban on outdoor burning based upon drought conditions and the recommendation of the Forestry Division, in order to reduce the threat of wildfire. Senate Bill 1816, signed into law June 3, 2008, modified Section 16-26 to authorize county commissioners to exercise similar authority at the county level, under certain conditions and with certain restrictions. A burn ban proclaimed by the Governor will supersede a county ban on burning."
http://www.forestry.ok.gov/Websites/forestry/Images/County%20Burn%20Ban%20Guidelines%20Information2011%20Corrected1%20.pdf

Discussion:
Title 2 section 2-16-26 Oklahoma statutes states that "A. 1. It is unlawful for any person to set fire to any forest, grass, range, crop, or other wildlands, or to build a campfire or bonfire, or to burn trash or other material that may cause a forest, grass, range, crop or other wildlands fire in any county, counties or area within a county where, because of emergency drought conditions, there is gubernatorially proclaimed extraordinary danger from fire, unless the setting of any backfire during the drought emergency is necessary to afford protection as determined by a representative of the Division of Forestry, or unless it can be established that the setting of the backfire was necessary for the purpose of saving life or property. ..."

The statute does NOT prohibit model rocket flight operations. It DOES prohibit setting fire to grass.

The OFS posts current fire danger conditions on its web site: http://www.forestry.ok.gov/

The OFS tracks county and governor initiated bun bans: http://www.forestry.ok.gov/burn-ban-information

The OFS posts daily wild fire situation reports: http://www.forestry.ok.gov/situation-reports

Example Risk Analysis for Flight Operations During Periods of Extraordinary Danger from Fire:
See: http://ojames3.tripod.com/tccrangesafety/RiskManagementForRockets.pdf

Step 1: Identify Hazards - Conditions conducive to wildfire and wildfire itself. Consider county and state burn bans as well as OFS daily wild fire situation reports.

Step 2: Assess Hazards and Determine Risk - If dangerous conditions exist, what is the probability of model rocket flight operations starting a grass fire and what is the potential loss and/or cost. Consider model rocketry's historic safety record, your groups experience level and safety record, conditions at the launch site, and conditions in the recovery area. A grass fire could result in property damage, personal injury or death.

While it is rather simple to preclude the possibility of stating a grass fire in the launch and recovery areas under normal operations, we must also consider abnormal operations. What is the probability of a motor exploding on the pad? What loss would result? What is the probability of a rocket malfunctioning so that it lands on the ground with its motor still functioning? What is the loss? What is the probability of a motor's ejection charge functioning on the ground? What is the loss? What is the probability of delay systems and/or ejection systems malfunctioning so that the rocket is on the ground while the motor is still functioning? What is the loss?

For normal flight operations, the probability of damage or loss is unlikely. The severity of damage or loss could be catastrophic. Should the unlikely occur, we would have at best bad publicity or loss of a launch site. At worst, high property damage and/or personal injury or death.

Step 3: Develop Controls and Make Risk Decisions - Controls are actions or processes that reduce the severity and/or probability of a Hazard. The NAR Model Rocket Safety Code is your first and best control. Item 6 "**Launcher.** I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use." Item 9 "**Launch Site.** I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires. " Other controls are to obtain and make available fire fighting equipment such as water, beaters (brooms and rakes), fire resistant blankets, etc. Use blankets to cover grass next to the launcher and/or wet the launch area to preclude a fire's starting.

Consider the recovery area. NAR MRSC item 10 "**Recovery System.** I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket. " Ensure each motor's delay is short enough so that ejection occurs well above the ground. Remember that APCP motors continue to pose a fire hazard after the ejection charge functions.

Consider abnormal flight operations. NAR MRSC item 1 "**Materials.** I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket. ", item 2 "**Motors.** I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.", item 5"**Launch Safety.** I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance. "

Consider the likely flight trajectory and potential recovery area based on launch site, wind direction and speed, launch angle and predicted performance. Select a motor and launch angle that presents the least risk. For example, don't fly over or recover near spectators or fire danger areas.

Step 4: Implement Controls that Eliminate the Hazard or Reduce Their Risks - ENFORCE THE SAFETY CODE. Everyone is a safety officer and anyone can and should call attention to potentially unsafe acts. Have at least one trained and experienced person whose sole function is to watch for and prevent unsafe acts. Appoint a fire warden who is responsible for watching for fire at the launch site and in the recovery area and for deploying

fire suppression such as blankets and water in the launch area. Designate fire teams who will respond to a fire or potential fire at the direction of the fire warden. The Launch Control Officer will ensure that all flight trajectories are safe. The Safety Check Officer will ensure that all models are safe and have a motor that will permit a safe flight and recovery. Rocket owner/operators will position themselves in the recovery area prior to launch and will carry fire suppression equipment with them sufficient to deter a fire until help can arrive. Allow only one flight at a time so that safety personnel can concentrate on their responsibilities. The Range Safety Officer has overall responsibility for safe operation of the range. Anyone who does not cooperate with safety personnel or violates safety protocol may be required to stop their flight operations. The land owner/site will be listed as an insured with the National Association of Rocketry and/or the Tripoli Rocket Association. Only current members of the NAR and/or TRA will fly so that all individuals, the section and the land owner are covered by insurance. Individuals will fly only their own rockets.

Based on the Hazards you identified, use the definitions and matrix in the Risk Management Matrix to determine inital risk levels, residual risk levels, and the overall risk level.
http://ojames3.tripod.com/tccrangesafety/RiskManamgementMatrix.pdf

1. List the Hazards you identified in Block 5 of the Risk Management Worksheet.
   http://ojames3.tripod.com/tccrangesafety/RiskManagementWorksheet.pdf
2. Determine the Inital Risk Level (Block6).
3. Apply the Control for the Hazard (Block 7) and determine the Residual Risk (Block 8).
4. The highest Residual Risk Level in Block 8 is the Overall Risk Level. Cirlce that level in Block 9.

For example, a Hazard might be "under burn ban, motor exhaust strikes ground and starts grass fire". Severity might be Critcal (from the Risk Management Matrix). Probability might be "Likely" because a spark or flame touching dry grass would likely cause the grass to burn. Initial Risk Level (from the Risk Mangement Matrix) would be HIGH. Controls would be SAFETY CODE blast defelctor and clear launch site, fire resistant blankets under launcher, wet down grass for three feet radius arount launcher. Consider how the Controls will change the Probability and/or severity of the Hazard. Use the changed Probability and Severity in the Risk Management Matrix and determine the Residual Risk Level. The highest Residual Risk Level is the Overall Risk Level.

If, based on this risk analysis, the Overall Risk Level is LOW to MODERATE, the section flight operations officer will decide whether or not to fly. If the risk is HIGH, the section president or board of directors will make the decision. If the risk category is EXTREMELY HIGH, flight operations are cancelled.

Step 5: Supervise and Evaluate - The Range Safety Officer has final authority for all range operations. All section officers will serve as assitants to the RSO. The RSO will designate or appoint the Fire Warden, LCO, SCO and Fire Teams. The RSO will develop a schedule of operations to ensure that all safety positions are filled. The RSO will curtail flight operations if a safety position is not filled, if weather or other conditions require or at any time controls are no longer effective. Within five business days after the close of flight operations, the RSO will conduct an after action review with the section officers. Section officers will determine the effectiveness of the controls and make modifications are necessary.

Conclusion:
For all model rocket activities, our first and best risk management control is the NAR Model Rocket Safety Code. For periods of extreme fire danger, item 9 will quickly preclude flight operations. If you can't find a launch site that "does not present risk of grass fires", you can't fly.

The Risk Management Process does not have to be a long, drawn out affair. We all perform Risk Management every day. You get up in the morning and look out of the window. Seeing rain, you say to yourself "The roads will be slick today and people are crazy." You've identified a hazard. "Better leave early today so I can drive slower yet avoid the rush." You've implemented a control. You get to work safely but five minutes late. "I'll leave earlier next time." Congratulations! You've used Risk Management!

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