



Safety in Sport Rocketry

NAR Safety Committee



Pop Quiz

1. How many people have died as a result of sport rocketry over the past 15 years?
 - A. No one has ever died doing sport rocketry.
 - B. One.
 - C. At least four.



Pop Quiz

2. A 40 pound rocket returning under an open chute at under 30 feet per second descent rate has about the same kinetic energy as
- A. A bullet from a .357 magnum revolver.
 - B. A batted baseball.
 - C. A bowling ball dropped on your foot.
 - D. An Alpha III lawn dart.



Pop Quiz

3. Repeated instances in which large rockets descend under full chute into the parking area, missing all the cars, demonstrate that
 - A. The safety code works!
 - B. Wind is too unpredictable to worry about.
 - C. Insurance is a good thing to have.
 - D. We may be flirting with disaster.



Pop Quiz

4. Fill in the blank:

If someone on our club flies a rocket that kills someone, what would be the impact on the member, on our club and on our hobby?



Clusters of Incidents Require *Action*

- The sort of incidents which occur on a sport rocket range (e.g., unstable rockets, failed recovery systems) do occasionally lead to accidents.
- This hobby has had an excellent safety record; *vigilance* is required to maintain it.

- **Yes, rocketry is safe!**
- **But, is rocketry as safe as it can be?**



Near Misses Cause Concern

J forward closure failure
(missed the car)

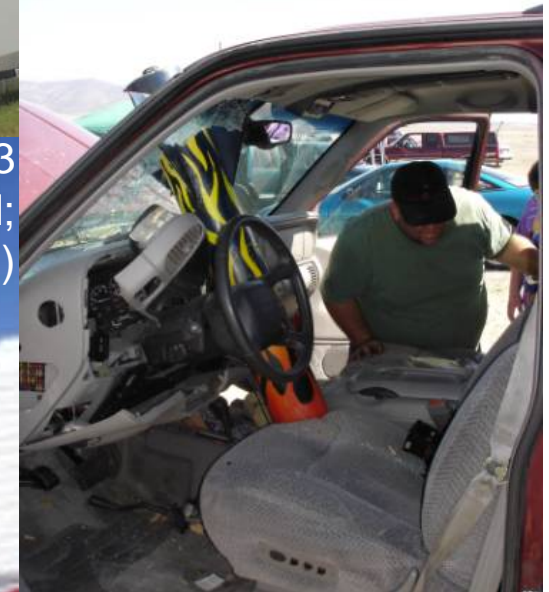


Late ejection in PMC (missed
the truck; hit the trailer)



No ejection, ballistic return
(missed the occupants)

No ejection, ballistic return of L3
rocket (missed the crowd;
more on page 19)



Skidmark-caused fire at NARAM



Best Practices Concept

- When a safety problem occurs, change the practice that let it happen
 - ***STOP*** and conduct a post-event review of significant safety incidents (including frightening near-misses)
 - Lessons forgotten or unimplemented from safety incidents may be relearned the hard way at the wrong time



Range Safety Officer

- The RSO is the single person responsible for ensuring that fliers' "right to fly" is limited by their "duty of safety" to others
 - Must just say NO: if a rocket is not safe don't let it fly; if a situation does not look safe, ***STOP and take action*** to change it



Historical Risks

- Electrocution from power lines
 - Four *fatalities* in past ten years due to attempts to retrieve rockets from power lines
- Fires
 - More attention to prevention is required
- Being struck by rockets
 - Probability may be on our side, but adverse consequences in the event of injury are huge!



Power lines: Follow the Safety Code!

STAY AWAY!

Call the power company; let them recover the rocket (even the models you don't want back might attract kids.) Even if it costs you, it is money well spent!



Shorted power line causes arc



Injury Risk From Being Struck



A potentially lethal event:
Failed L3 attempt with
ballistic return to range
head.

Three frames from:
<http://www.youtube.com/watch?v=bfcud62ct6M>

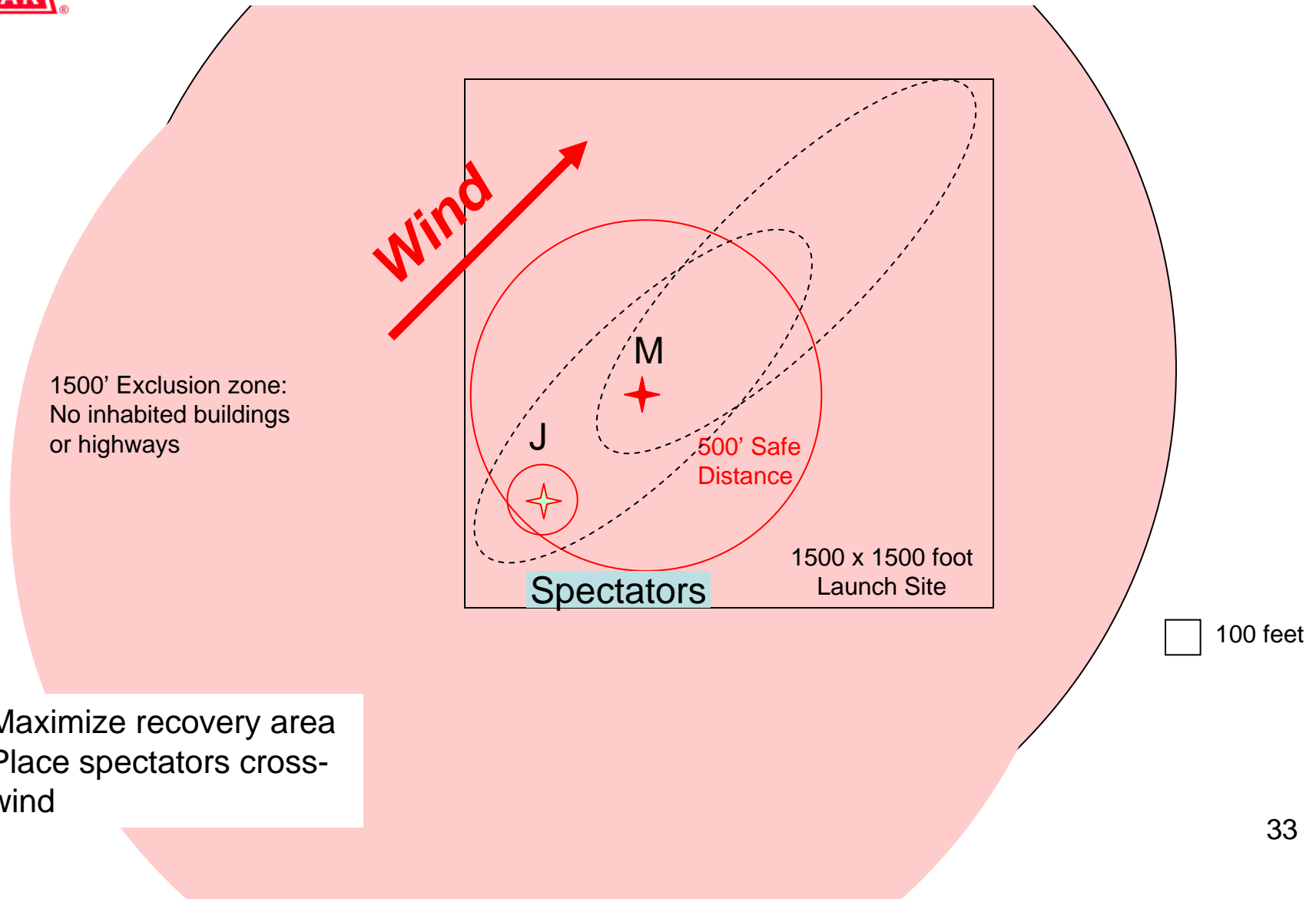


Injury Risk From Being Struck

- Risk of injury depends on kinetic energy and how it is absorbed by body: No fixed danger level.
 - Batted baseball: ~150 joules
 - .357 Magnum: ~750 joules
 - 40-pound rocket under chute at 30 ft/sec: 759 joules
 - Adult falling out of a second story window: ~3,500 joules
 - The rocket that penetrated the SUV: ~7,700 joules
 - The rocket on the previous page: >15,000 joules
- Impacts *must* occur where people are not.



Ideal launch site layout for small fields





Summary

- Safety occurs only when responsible people understand the risks of their activities and make mature, informed decisions to manage them.



Answer Key: Pop Quiz

1. How many people have died as a result of sport rocketry over the past 15 years?

A. No one has ever died doing sport rocketry.

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C. At least four.

[All from electrocution by power lines]



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It is up to us to make sure we never have to answer this question!