

RSO - Range Safety Officer

- Responsible for safe operation of the rocket launch range
- Has final authority to approve or deny launch of any rocket
- May also act as rocket check-in officer.
- May also act to assign rockets to launch pads.

References: NAR Safety Officer Training Program, NAR Model Rocket & High Power Rocket Safety Codes, NFPA 1122 (model) and 1127 (HPR), FAR Part 101
MASA launches require volunteers for both RSO & LCO positions. Each volunteer usually serves for one shift (45min to 1 hour) during a launch.

MASA RSO Checklist

As RSO, you have the authority to deny any rocket for flight if, in your judgement, it is not sufficiently flightworthy, violates the safety code or launch site rules, or if it poses a general safety risk. You are under NO obligation to allow a potentially unsafe rocket to fly! If you are not comfortable RSO'ing a particular rocket (for example, it may be outside the realm of your personal rocketry experience), you may ask for assistance from another MASA member on a case-by-case basis.

Under MASA rules, RSO inspection is not required for model rockets (less than 1 lb, single motor - "D" or smaller, or, 2-stage with both motors "C" or smaller, built from a commercially-manufactured kit.) However, the RSO may inspect any such rocket at his discretion or upon flyer request. The following cases require RSO inspection & approval before flight: clusters, 2-stage rockets using "D" or larger motors, 3-stage rockets, all rockets weighing more than 1 lb, all rockets using an "E" or larger motor, any scratchbuilt, unusual, or unproven design making its first flight. **This approval must come before the flyer signs up for a launch pad.**

- Flight card or sign-up sheet filled-out completely, correctly, and legibly.

Weights

- Rocket weight 1 lb or less? (at Elk River and White Bear Lake fields)
- Rocket over 1 lb? Check if flier is a MASA member. (at Blaine field only)
- Rocket weight 3.3 lb or less? (at Blaine field only)

Motors

Note: to use "G" motors, high power motors, or reloadable motors of any size, the flyer must be 18 years of age or older. If under 18, the flyer may use "G" and reloadable motors if he/she is accompanied by a parent or legal guardian.

- Total propellant weight from all motors is less than 114 grams / 4 ounces (at Elk River and White Bear Lake fields)
- Total propellant weight from all motors is less than 125 grams / 4.4 ounces (at Blaine field only)
- Motor of size "E" or larger? Check if flier is a MASA member.
- Motor of size "H" or F/G motor with average thrust greater than 80 Newtons or propellant weight greater than 62.5 grams? Check if flier holds a current level 1 high power certification. If flier is attempting a level 1 certification with this flight, check that they have gone over the rocket with their witness(es) and that their paperwork is in order.
- Motor is certified.

- Motor type & average thrust are appropriate for rocket.
- Delay length is appropriate for rocket.
- Anticipated model maximum altitude will not penetrate any cloud cover.
- If motor is a reloadable type, confirm that the ejection charge was installed.
- Sufficient wadding or wadding-equivalent (Nomex) installed? Make sure wadding is NOT tissue-paper type (Estes, Quest)
- Appropriate motor retention? (especially for large motors and/or reloadable casings)
- Motor block and/or thrust ring present to prevent "fly-through"?

Rocket Construction

- Overall construction acceptable?
- Stability? (Is CG in front of CP? Ask rocketeer to identify CP location if necessary.)
- Nose cone and/or payload section fits are not too loose or too tight.
- Launch lugs and/or rail guides properly installed, positioned, and aligned.
- Fins attached securely and in a manner that will not cause an unsafe flight.
- Appropriately-sized recovery system installed & attached?
- For high and/or fast flying rockets, is there at least one vent hole in the body?

Multi-Stage Rockets

- Do lower stages have actual booster motors in them? (0 second delay)
- Are all motors pointing the correct way? (not upside down - it happens!)
- If gap-staged, are there vent holes between the motors?

Clusters

- No open-holes between motor tubes. No open / unblocked motor tubes.
- Igniters should be checked, matched, and wired in parallel. For more than 2 motors, a "clip whip" should be used.

Warnings - clusters that mix black powder and composite motors are risky and require special care. Steps should be taken to ignite the composite motor before the black powder motor. A cluster of more than 3 black powder motors or 2 composite motors may require extra "booster" power beyond what the regular controller can provide.

At the Launch Pad

- Blast deflector used.
- Launch rod diameter & length are appropriate for rocket size & motor used.
- Rocket slides freely on rod or rail and does not stick or bind.
- No flammable materials around pads.
- Pad angle safe and appropriate for situation.
- Worst-case rocket trajectory will not cause a hazard to spectators.
- Pad size & type appropriate for rocket.
- Tower launcher (if used) is properly set up for the rocket diameter.
- Flight-critical electronics armed before launch.
- Any radio control equipment is turned-on and functioning properly before launch.

During Launching

- Is the pad area clear of people?
- Watch for shifting of rockets on pads and launch angle changes due to slippage.
- Are the winds below safety limits? (20 mph or less)
- Are the skies clear of aircraft?

Be on the lookout for: fires, falling parts, falling lower-stage boosters, any object heading towards spectators, children running into the range area.

For any "heads up" flight, make sure that everyone is on their feet with their eyes on the rocket.

LCO - Launch Control Officer

- Keeps the launch range running smoothly.
- Assists RSO in maintaining safe range operations
- Operates the launch controller(s).
- Controls whether a launch range is open or closed.
- May act to assign rockets to launch pads.
- Makes announcements over PA system.

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MASA LCO Checklist

General

Whenever it doesn't interfere with their primary duties, the LCO should: assist RSO as necessary, assist flyers in signing up for pads, assist flyers at the pads with launch rods, connecting igniters, etc. Several times during the launch day, the range rules should be announced over the PA. These include rules about smoking, field limitations on rocket weight & motors used, the need to watch for aircraft, not entering a closed range, etc.

Two Range Operations

At larger MASA launches, two separate groups of pads are commonly used. Each group has its own launch control system. The "near" or "low power" group is used only for model rockets, the "far" or "high power" group is used for larger and complex rockets. People may be at the far group loading rockets on pads while rockets are being launched from the near pads. However, those people must stop, stand and watch the launches. In addition, there should NEVER be people at the near pads while rockets are being launched from the far pads.

Loading a "Rack"

- Announce over the PA "The range is open" or "The near/far pads are open"
- Make sure that the safety key is removed and the launch controller is disarmed.
- Retrieve the sign-up sheet or board of flight cards for this new rack.
- Announce over the PA "Rack number such-and-such is now loading on the near/far pads." Remind people that it's their turn. "Joe Jones is on pad 1, Suzy Smith is on pad 2, etc."
- If other duties permit, assist those people with loading their rockets on the pads, changing launch rods, connecting igniters, setting the pad angle, etc.
- Once all rockets are loaded, if other duties permit, the LCO (or RSO) should quickly look at each rocket/pad for obvious problems.

Launching a "Rack"

- Announce over the PA "The range is closed" or "The near/far pads are closed"
- Check to see that the range is clear and that everyone is behind the safety lines.
- Check that there are no aircraft above or around the launch site.
- Check that wind speeds are below safety code limits.
- Check with the RSO that the range is ready for launching.
- Insert the safety key and arm the launch controller.
- Arm the first pad to be launched. Make sure that ONLY that pad is armed!

- If the launch controller has continuity checking, make sure that the pad's continuity light is on.
- For each flight, announce the flyer's name, rocket name, motor type, and any comments or RSO warnings. "On pad 1, Joe Jones has his Alpha on a B6-4"
- If the rocket has any electronics, confirm that they have been armed.
- If the RSO has indicated it as a "heads up" flight, make everyone get on their feet and watch the rocket.
- Quick check the range area again for safety problems. Double check that the rocket is being launched at a safe angle.
- Give a countdown and push the button to launch the rocket. "Launching pad number one in 5, 4, 3, 2, 1"
- Watch the rocket until you have observed the safe deployment of the recovery system.
- If there are problems of any type that might pose a hazard to spectators, give a specific warning over the PA.
- If the recovery system fails or any parts are falling in an uncontrolled fashion (lower stages, or pieces from a shred or separation), warn the spectators and watch the parts until they are safely on the ground before launching any other rockets.
- For a nominal rocket flight, you may now disarm that pad and move on to launching the next rocket.
- If the motor fails to ignite, at your discretion, you may recycle the countdown and try again. If the rocket fails to launch, remind the rocket's owner that they will need to remove the rocket (once the range is open), fix the problem, and sign up again for a pad. Then, move on to launch the next pad.
- Write "go" or "no go" for that rocket on the pad signup sheet. Also write any appropriate comments. If using flight cards, write any comments on the card and then remove it from the board (if the rocket flew). Leave cards on the board for rockets that failed to launch.
- After launch attempts have been made for all pads, start all over again by opening the range to load a new rack.

In the case of any safety hazard, fire, incident or accident, etc, stop the launch and "work the problem" calmly. Ask for assistance as necessary.

Resume the launch only if and when safe (normal?) conditions have been restored.