



LEVEL:	Middle School / High School
NUMBER OF TEAMS:	Regional Design Day - up to 3 teams per school MESA Day - 1 team per school
TEAM MEMBERS:	2 to 6
SCORING:	Tournament Performance - 75 points Engineering Design Poster - 25 points
OBJECTIVE:	Design a remote-controlled robot that mimics a real animal (living or extinct) in appearance, shape, and attack/defense.

ENGINEERING DESIGN & ORIGINAL WORK

The MAV must be the original work of the team. Teams may use parts from kits, but the majority of the MAV must represent the original work of the team, as determined by judges.

Teams will document their engineering work using Arizona MESA's simplified engineering design process:

EXPLORE → DESIGN → TEST → ITERATE. Teams are encouraged to maintain an engineering notebook with design iterations and testing data throughout the project.

DESIGN PARAMETERS

1. The MAV may weigh no more than 1.25 kg (1250 g).
2. The MAV may be no larger than 50 cm × 50 cm × 50 cm. Attack mechanisms may extend beyond these dimensions.
3. The MAV must be remote-controlled. Acceptable approaches include, but are not limited to, radio control, microprocessors, and wireless gaming controllers.
4. The MAV must mimic a real animal, living or extinct, and include distinguishing physical features. Mythical creatures such as unicorns and dragons are not permitted. Judges must be able to identify the animal without being told by the team.
5. The MAV must have a visible light indicating that all systems are ready.
6. The MAV must be battery powered. Allowed battery chemistries are alkaline; Nickel-Cadmium (Ni-Cd), with required protection; and Nickel-Metal Hydride (NiMH), with required protection. Lithium-ion (Li-ion), Lithium-polymer (LiPo), wet-cell batteries, and any chemistry not specifically permitted are prohibited.
7. The MAV must include at least one functional attack mechanism that represents a natural weapon or defensive feature of the animal it is designed to mimic. A team may incorporate more than one attack mechanism. For example, an MAV could use a claw, a stinger, or both, provided each mechanism is consistent with the animal represented.
8. Forbidden weapons and materials include untethered projectiles, electrical-interference weapons, weapons that significantly damage the arena or require significant cleanup, and hazardous materials. All attack mechanisms are subject to judge inspection for safety.
9. All batteries must be securely mounted and completely enclosed within a rigid, impact-resistant protective housing. The housing must protect the battery from direct impact, puncture, crushing, and contact with moving or attack components, including those of an opposing MAV. No portion of the battery may be exposed or directly accessible to an opposing MAV. The housing must remain securely closed during competition but be accessible to judges for inspection.



LEGAL / ILLEGAL MATERIALS

Legal Materials: Kits that have been changed by at least 50% so the MAV represents the original work of the team; batteries specifically permitted under Design Parameter 6; other safe materials not prohibited by these specifications.

Illegal Materials: Forbidden weapons or hazardous materials identified in Design Parameter 8; battery chemistries prohibited under Design Parameter 6.

ARIZONA MESA PROVIDED MATERIALS

- 6-foot round table.
- Barrier to encircle the table.

All other materials are the team's responsibility unless Arizona MESA announces otherwise.

SPECIFICATION & SAFETY CHECK

Before testing or match play, each MAV must pass a specification and safety check. Judges will verify:

- Maximum weight of 1.25 kg (1250 g).
- Permitted battery chemistry.
- Secure and impact-resistant battery enclosure.
- Animal identity without prompting from the team.
- At least one attack mechanism consistent with a natural weapon or defensive feature of the represented animal.
- General safety of the MAV and attack mechanism.

A MAV with a safety concern may not be operated, tested, or placed in the arena until the concern is corrected and the MAV passes reinspection.

If a team cannot meet a non-safety specification requirement after the correction opportunity provided by event officials, the team will receive zero tournament/performance points but remains eligible for poster points. Serious or intentional rule violations may result in full disqualification at the discretion of event officials.

MATCH PLAY & JUDGING

1. Teams will be informed of their group and/or tournament placement.
2. When called, teams must bring their MAV to the battle arena and follow the judge's start count.
3. Each match has a maximum duration of 3 minutes (180 seconds). The objective is to disable the opposing MAV.
4. A MAV is considered disabled only when it has lost both functional mobility and the ability to operate its attack mechanism.
5. When a MAV appears disabled, the judge may begin a 10-second count. If during the count the MAV cannot demonstrate either controlled mobility or operation of its attack mechanism, it will be declared disabled and the match will end.
6. Teams may not win by pushing an opponent out of the arena.
7. Damage resulting from legal attacks is part of the competition. A team is not penalized solely because its MAV damages an opponent.
8. Judges may pause the match when a MAV is trapped in or against the ring barrier for 3 seconds; MAVs are entangled and cannot free themselves for more than 5 seconds; one MAV has entrapped another in its attack mechanism for more than 10 seconds; or the judge determines a pause is necessary.
9. Judges will immediately pause or stop a match if damage creates an unsafe condition, including an exposed or damaged battery, hazardous exposed electrical components, sharp or broken components, or another condition deemed unsafe. A damaged MAV may not return to competition until it passes safety reinspection.

10. A penalty or disqualification may be assessed when damage results from a prohibited weapon, prohibited action, intentional rule violation, or continuing an attack after a judge has called for the match to stop.
11. Teams will be given time to repair their MAV between matches when necessary and consistent with the event schedule.
12. All judging decisions are final. Judges reserve the right to declare a tie.

IF NEITHER MAV IS DISABLED

If neither MAV is disabled at the end of 180 seconds, judges will determine the winner based on overall match performance using the following factors:

Factor	What Judges Consider
Visible Damage	Observable damage inflicted on the opponent through legal attacks.
Attack Effectiveness	How successfully and consistently the MAV uses its animal-inspired attack mechanism.
Functional Impact	The extent to which attacks reduce or interfere with the opponent's mobility or attack capability.
Control of the Match	Which MAV more consistently initiates engagement, dictates the action, and places the opponent in a defensive or disadvantaged position.

TOURNAMENT / EVENT SCORING - 75 POINTS

The tournament structure and advancement process may be adjusted by Arizona MESA based on the number of participating teams. Tournament placement is converted to the Performance Score below:

Tournament Placement	Performance Points
1st	75
2nd	70
3rd	65
4th	60
5th	55
6th	50
7th	45
8th	40
9th and below	35

To earn tournament performance points, an MAV must pass specification and safety inspection and participate in tournament competition. The Engineering Design Poster is scored separately for up to 25 points.

TL;DR

- Build a remote-controlled MAV that looks like a real animal and uses at least one attack mechanism consistent with a natural weapon or defensive feature of that animal.
 - Maximum weight: 1.25 kg (1250 g). Maximum body dimensions: 50 cm × 50 cm × 50 cm; attack mechanisms may extend beyond those dimensions.
 - Use only permitted battery chemistries and fully protect the battery from opponent contact and battle damage.
 - A MAV is disabled only when it loses both mobility and attack capability; judges use a 10-second count to confirm disability.
 - If neither MAV is disabled after 180 seconds, judges consider visible damage, attack effectiveness, functional impact, and control of the match.
 - Legal battle damage is part of the competition; unsafe damage causes a safety stoppage and reinspection.
 - Tournament performance = 75 points; Engineering Design Poster = 25 points.
 - Poster = 36 in high × 48 in wide, landscape, submitted as a PDF by 5:00 p.m. at least two weeks before MESA Day.
- READ THE FULL SPECIFICATIONS. The TL;DR is a quick reference and does not replace the complete rules.**



ENGINEERING DESIGN POSTER - 25 POINTS

Poster size: 36 inches high × 48 inches wide, landscape. Posters must be submitted digitally as a PDF by 5:00 p.m. at least two weeks before MESA Day; Arizona MESA will announce the specific deadline.

Poster Template: Teams are encouraged to use the [Arizona MESA Engineering Design Poster Template](#). Use of the template is recommended, but not required.

Include the project/prototype name, school name, team-member names, school logo, MESA logo, and the engineering story described below.

EDP Area	Pts	MAV Poster Evidence
Explore	5	Show understanding of the challenge, criteria and constraints; investigate the animal/natural weapon and relevant design possibilities; identify ideas considered.
Design	5	Clearly communicate the selected design, important features, materials/components, and how the MAV and attack mechanism were developed.
Test	6	Provide meaningful testing evidence and data. Show what was tested, how it was tested, and what the team learned from the results.
Iterate	6	Use testing evidence to explain changes, refinements, retesting, tradeoffs, or specific next improvements. A first design does not have to fail to demonstrate iteration.
Communicate	3	Organize the poster so it is understandable; include required identifying information; use visuals/data effectively to communicate the engineering work.



FINAL SCORE

Tournament Performance Score (75) + Engineering Design Poster (25) = 100 points

ROUND JUDGING SHEET

For matches that reach the 180-second limit, judges use the four factors below to determine the MAV with the stronger overall match performance.

Judging Factor	MAV A Notes	MAV B Notes
Visible Damage		
Attack Effectiveness		
Functional Impact		
Control of the Match		
Winner / Tie		

COMPETITION SCORESHEET

School Name: _____

Team Members: _____

Prototype Name: _____

Judge: _____

Score Component	Score
Tournament Placement	_____
Tournament Performance Score	_____ / 75
Engineering Design Poster	_____ / 25
FINAL SCORE	_____ / 100