CONTESTANT BRIEFING

2024 American Rocketry Challenge

National Finals

May 17, 2024

Welcome

2024 American Rocketry Challenge
Co-Sponsored by:

Aerospace Industries Association

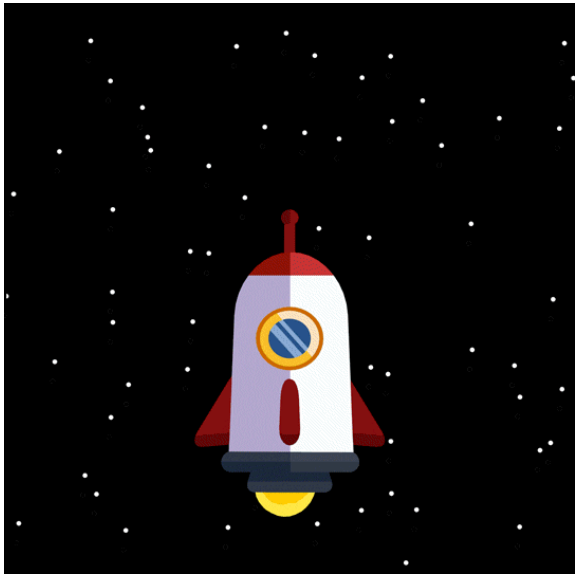
Savannah Horton, Strategic Initiatives Manager

National Association of Rocketry

Trip Barber, NAR
American Rocketry Challenge Manager

CONGRATULATIONS!

You are finalists in the world's largest rocketry competition



The Propulsive Force of Rockets

Dan Tani

Former NASA Astronaut


43


United States

Thrust / weight = 1.8 lbf/lb

Thrust / weight = **9.4 lbf/lb!**

Good Luck!

Have Fun!

You Represent the Best

- 922 teams and 5,538 students registered from 45 states

- 100 teams from 28 states were selected to come to this fly-off (that's you!)

Your Predecessors

- This is the 22nd year of competition
  - 21st Finals – missed one thanks to COVID
  - First time we've had to postpone to Sunday due to weather
- 16,149 teams and more than 95,000 student participants

A Future in Aerospace

- Rocket contest alumni are building passenger jets, telescopes and, yes, rockets to the Moon and Mars
- Working at NASA, RTX, Northrop Grumman, Boeing, U.S. Space Force & more
- In the astronaut corps (Woody Hoburg, 10th at the 2003 Finals)
- Median salary for aerospace engineers: $115,220

Supporters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AEROSPACE
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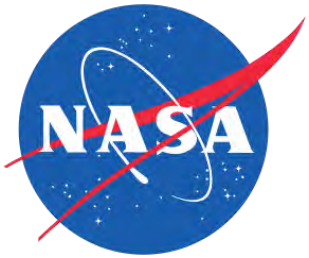
GREAT MEADOW
FOUNDATION


NAR


NASA


DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA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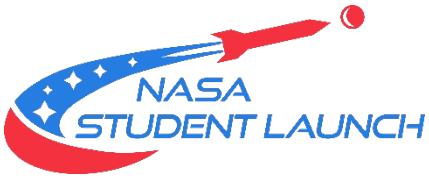
ADMINISTRATION


NASA
STUDENT LAUNCH


EMBRY-RIDDLE
Aeronautical University


WIA


SPACE FOUNDATION


ESTES
education


SBE


AEROSPACE
SPECIAL INTEREST GROUP


AIAA
SHAPING THE FUTURE OF AEROSPACE

2024 Sponsors

Program Partners

–Diamond Level–

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COLLINS AEROSPACE | PRATT & WHITNEY | RAYTHEON

–Platinum Level–

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–Gold Level–

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HOWMET AEROSPACE FOUNDATION

L3HARRIS

–Silver Level–

accenture

CLICK BOND

COMPOSITES ONE

–Education Partner–

EMBRY-RIDDLE Aeronautical University

Activities

10:00 AM: Team Rocket-Building Competition

12:30 PM: NAR high power rocket demonstration

9 AM – 3 PM: Exhibit Area

Activities

Aerospace Jeopardy

Activities

Sign-Up for Aerospace Jeopardy

AM Time Slots

9:15 AM
9:45 AM
10:15 AM
10:45 AM
11:15 AM

PM Time Slots

12:15 PM
1:30 PM
2:00 PM

- Winning team from each round will win a prize.
- Top scoring team of the day receives **FREE 2025** American Rocketry Challenge Registration.

Meals

11:00 am – 2 pm: Rolling Lunch

4:45 pm: Ice Cream Social after the awards

- Free to student participants and team advisors
- **Your credentials are your meal ticket!**
- Free bottled water (NAR Info Tent & other areas on site)

Meals

We will have two food tucks on-site during breakfast and lunch to purchase food from:

Cactus Taqueria

Two Smooth Dudes

Awards Ceremony

- Starts at 3:45 PM in the dining tent
- No pre-assigned seats – but allow students to sit in the tables closest to stage
- You have to be there to find out who won!
- We will announce the **2025 American Rocketry Challenge Rules.**

T-Shirts and Souvenirs

- T-shirts ordered in advance picked up Sunday on the field from the T-Shirt vendor – not tonight
- Vendor will custom-print additional T-shirts on the field
- Program souvenirs (magnets, totes, posters, and water bottles) for sale Saturday at the NAR Information tent

AMERICAN ROCKETRY CHALLENGE

2024 FINALS MERCH

2024 FINALS POSTER
$10

INSULATED WATERBOTTLE
$15

TOTE BAG
$10

2024 FINALS PENNANT
$10

ARC MAGNET
$5

TSHIRT
$10

HOODY
$20

Prizes

- $100,000 in prizes to top teams
- Winning team gets trip to Farnborough Air Show in England in July courtesy of RTX
- Special award plaques or medals plus $500 cash:
  - Northrop Grumman Best Rocket Craftsmanship
  - Boeing Spirit Award
  - Best-Dressed Team
  - Northrop Grumman Most Innovative Approach to Mission
- Presentation competition (which was held virtually)
- Rocket-building competition
- Marketing competition (judged pre-finals)
- Outstanding Advisor/Mentor Awards

Best Dressed Booth

- Be sure to show up at Great Meadow decked out in team uniforms/costumes to be considered for this year's award!
- **Where:** AIA Information Booth (in the exhibit area)
- **When:** 12:00 pm – 2:00 pm

- Take your own photos and share them on Instagram and Twitter @RocketContest! (#rocketchallenge)
- Winning team will be announced at the awards ceremony at the end of the day -- $500 prize.

Social Media – Connect with the American Rocketry Challenge

Share your experience with the rest of the American Rocketry Challenge teams on our social media platforms!

Tag **@RocketContest** with **#rocketchallenge**

Follow **@RocketContest** and tag **#rocketchallenge**

Media, Photographers & Camera Crew

- **MEDIA:** Members of the press will be there tomorrow - have your best foot forward!
- **PHOTO:** AIA and NAR photographers will be on-site taking photos - smile! ☺
- **VIDEO:** A camera crew will be filming and may ask about this year's competition and about your experience

Media, Photographers & Camera Crew

- **Remember:** You don't have to talk to the press but giving the American Rocketry Challenge exposure and telling your story is pretty cool!

- **Questions?** Tweet/DM us with @RocketContest

EVENT OPERATIONS

Event Ground Rules

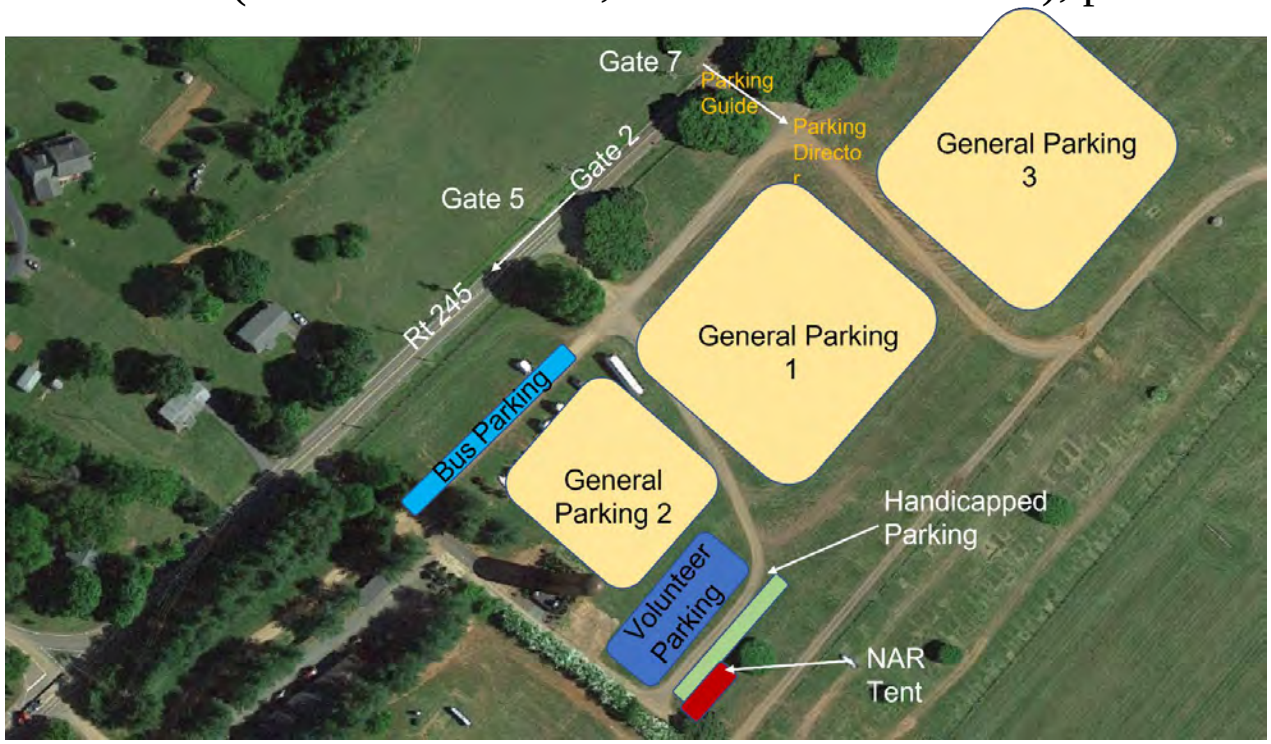
- Safety is paramount – flight and recovery
- The rules are the rules for everyone
- Only the student team members prep or fly the rocket, or go inside the prep area or flying field
- The flying field is a "heads up" flying zone; no sports, running, games, or earplugs
- Good sportsmanship is expected
- Scheduled events happen exactly at scheduled times
- Everybody stays for the awards ceremony and seating priority up front goes to student teams
- Treat Great Meadow gently and leave it cleaner than you found it

NAR Event Operations Staff

- Contest Director: Trip Barber
- Registration: Craig Beyers
- Range Operations: Jonathan Rains
- Range Equipment: Adam Martin
- Results: Dr Chris Kidwell
- Awards Ceremony: Dr John Hochheimer
- Range Safety Officers: Mark Bundick & Dr John Langford
- Chief Timer: Dr Jim Gearhart
- Public Address Announcer: James Duffy
- Rocket-building Competition: Dr Carl Curling
- And 100 others -- all volunteers

Getting to Great Meadow

- Our normal route (exit 31 westbound) is closed due to construction
- Follow “detour” signs at exit 31; go out I-66 West to exit 28 and turn left at the offramp to get back onto I-66 eastbound
- Take exit 31 off I-66 eastbound and turn right -- Great Meadow is two miles down the road, on left
- Enter Gate 7 (buses enter Gate 2, further down the road); park as directed



Special Notes

- **We will not be posting scores from fly-off round, the winner will be a surprise**!
- Due to the weather postponement, only 1 flyoff round (24 teams) will be held so we can finish early on Sunday
- Emergency replacement Perfectflite Pnut altimeters available at NAR booth on the field
- NAR booth selling American Rocketry Challenge souvenirs – also serves as "Lost & Found"
- Teams do not stay in the student "prep area" or the flying field after they have flown, make room for follow-on teams
- No glass, cooking devices, drones, or dogs
- Do not eject non-bio-degradable material from your rocket

Rocket-Building Competition

- Optional event, two $500 prizes courtesy of Northrop Grumman, plus trophies
- 36 teams each have 70 minutes to build a rocket solely from the bag of parts provided
  - Done at a tent up in the spectator area
  - 12 teams at a time in 3 “windows” starting at 10:00
  - Basic building supplies provided, may bring own tools
  - Sign up Friday night with Dr. Carl Curling, standbys taken for teams that end up making the flyoff round
- Judged by NAR for creativity of design (1 prize) and quality of workmanship (1 prize)

Topics

- Safety
- Schedule
- Flight Procedures
- Event Rules

Safety First

- Follow the Range Safety Officer (RSO) directions and watch every liftoff
  - Don't make us shout!
- Listen to the Public Address system
- No one within 30 feet (4 pads) of a liftoff
- No one on the flying field unless flying, and no earplugs or recreational activities on the field
- Do not tilt launch rails toward spectators
- Do NOT try to recover rockets from power lines, or from trees above where poles reach

NAR Safety Code

- Key to the hobby's safety – always in effect
- Lightweight non-metal nose, body & fins
- Certified, unmodified commercially-made motors
- Everyone 30 feet or more away at launch
- Launch electrically within 30 degrees of vertical
- No launches near aircraft or with winds >20 mph
- Wait 60 seconds to approach pad after a misfire
- All rockets must have a recovery system

Students Only

- This Challenge is a competition among student teams only
  - Parents, teachers, mentors: stand back and watch the students you supported all year show what they learned and make you proud

- Once a student team enters the check in area, they must be fully self-sufficient until they have flown and returned their rocket – no further coaching, advice, or help
  - Rockets may not be taken out of this area once they are brought in, until after flight

- Students **may not have or use cell phones** or radios at any point from when they enter the check in area until after they have returned their rocket post-flight
  - We will escort any student who violates this off the field, take their credentials, and return the credentials at 1630 at the NAR tent

Key 2024
American Rocketry Challenge Changes

- 1 egg, flown in any orientation and located at any place in the rocket
- Rocket must not separate into unattached pieces at any point in flight
  - All must be recovered together by parachute (one or more)
- Rocket must use body tubes of two different diameters
  - Upper section no greater than 2.25 inch diameter
  - Lower section no less than 2.50 inch diameter
  - Each section no less than 6 inches long (total rocket length minimum 25.6 inches)
- Flight goal is 800 feet or 850 feet and 43-46 sec (regardless of altitude)
  - Coin toss tonight decides which one is 1st round goal
  - 2nd round goal will be the other one
- Any exterior surface made of wood, paper, or fiber (but not plastic, fiberglass, or carbon) must have decorative coating applied, or take a 5-point penalty
- Only one flyoff round (24 teams) due to weather postponement to Sunday

Event Schedule

6:45	Egg issue opens
7:00	Check-in opens for rockets (first launch window)
7:30	Pads begin loading (Goddard)
8:15	Opening ceremony
8:30 – 12:15	Contest flying (5 “windows”, 45 min each)
10:00 – 2:00	Rocket-building competition (exhibit area)
12:30	High power rocket flight demonstration

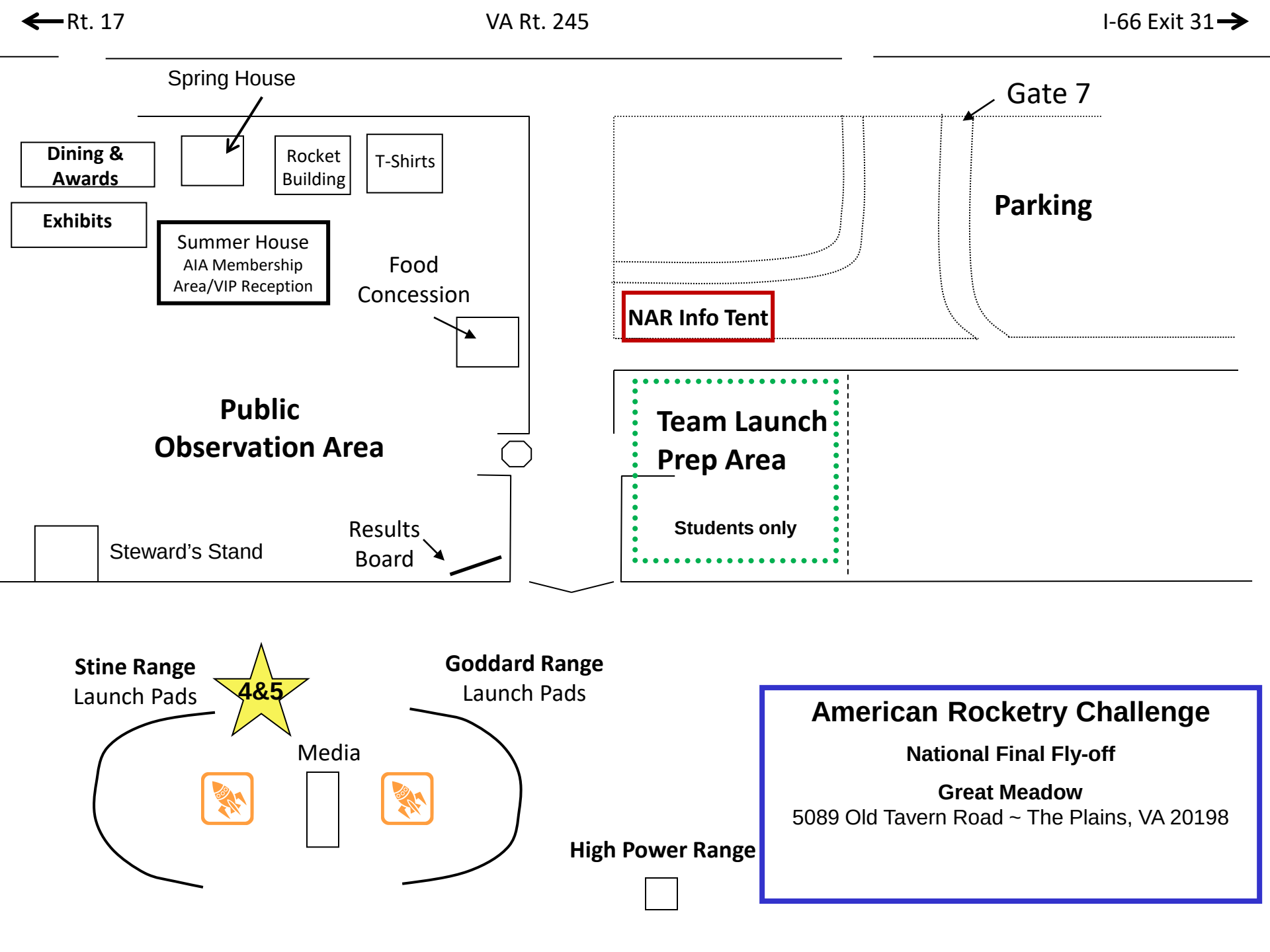
Event Schedule (cont.)

1:00	Deadline for rocket returns from 1st rounds
1:15 or earlier	Notification of 24 teams selected for flyoff
2:00 – 2:45	Flyoff round 2nd flights for 24 teams (1 round)
3:00	Deadline for rocket returns from flyoff round
3:45	Award ceremony (dinner tent)
4:45	Ice cream social

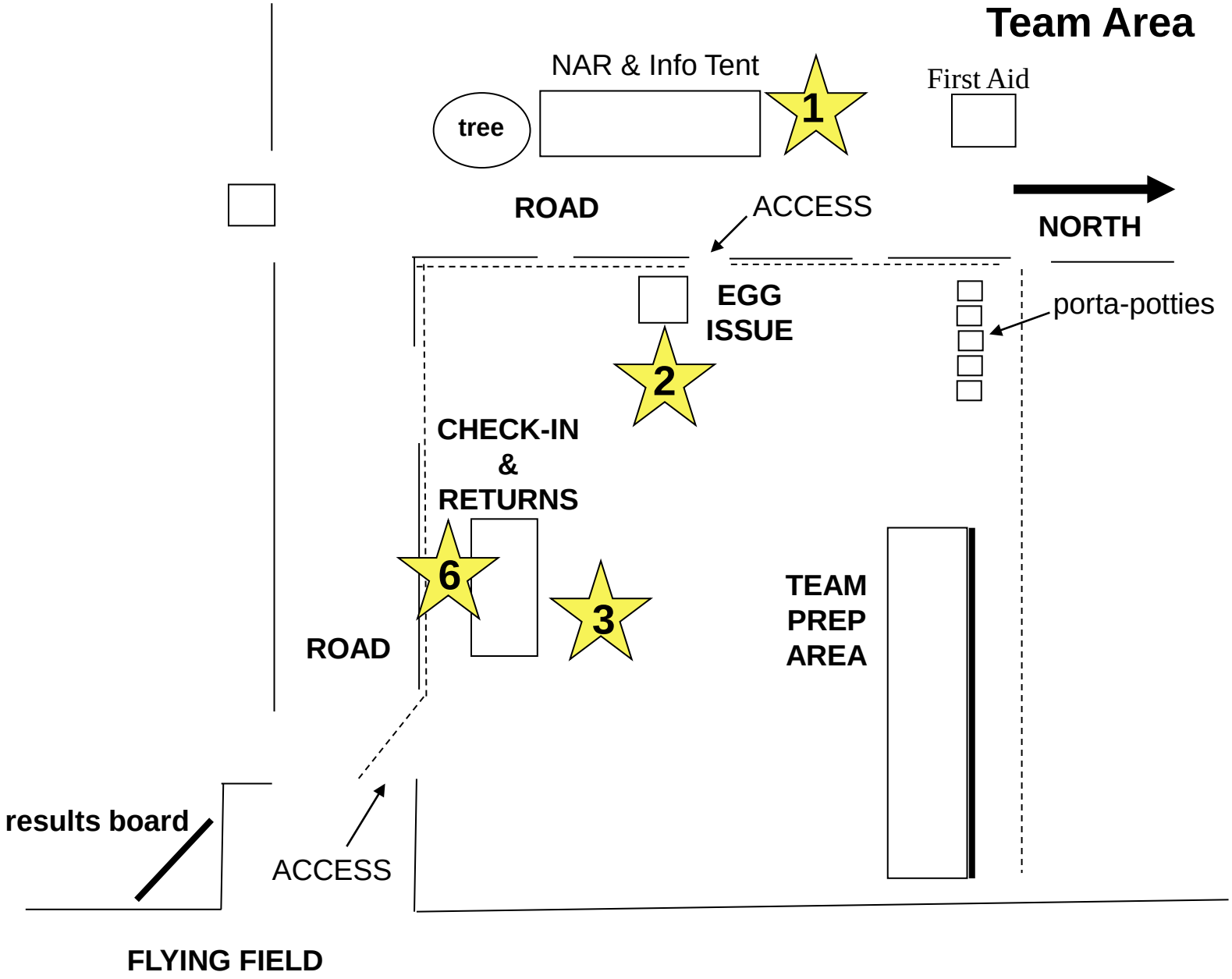
Flight Windows

- Check rocket in before “load time” for “flight window”
- May not load rocket on pad until previous round on that range is over
- Must fly during assigned 45-minute “window”

Round	Checkin Time	Load Time	Flight Window
Goddard 1	**7:00 AM**	**7:30 AM**	**8:30 AM – 9:15 AM**
Stine 2	**7:45 AM**	**8:15 AM**	**9:15 AM – 10:00 AM**
Goddard 3	**8:30 AM**	**9:15 AM**	**10:00 AM – 10:45 AM**
Stine 4	**9:15 AM**	**10:00 AM**	**10:45 AM – 11:30 AM**
Goddard 5	**10:00 AM**	**10:45 AM**	**11:30 AM – 12:15 PM**
Flyoff Goddard 6	**1:00 PM**	**1:00 PM**	**2:00 PM – 2:45 PM**


Rt. 17
VA Rt. 245
I-66 Exit 31
Spring House
Gate 7
Dining & Awards
Rocket Building
T-Shirts
Exhibits
Summer House
AIA Membership Area/VIP Reception
Food Concession
Parking
NAR Info Tent
Public Observation Area
Team Launch Prep Area
Students only
Steward's Stand
Results Board
Stine Range
Launch Pads
4&5
Goddard Range
Launch Pads
Media
High Power Range
American Rocketry Challenge
National Final Fly-off
Great Meadow
5089 Old Tavern Road ~ The Plains, VA 20198

American Rocketry Challenge
Team Area



Flight Procedures 1

- First: go to REGISTRATION, get team materials
  - Name badges, food tickets – but not T-shirts
  - Registration today until 9:30, Saturday on the field
- Performance Hobbies motor pre-orders available tonight for pickup
- Rockets, motors, and launchers shipped ahead to Aurora Flight Sciences available for pickup tonight

Flight Procedures 2

- When teams arrive at the field Saturday, please park in the General Parking area – special parking area if you are coming in a bus
  - Can get eggs and get into prep area starting at 6:45 AM but do not go to Check-In earlier than 7:00 AM
- Second: teams go to EGG ISSUE and select 1 egg
  - Each has its weight written on it, 55-61 grams
  - Each is measured to be no bigger around than 45mm
- Only student team members from this point on
  - All rocket prep, check-in, pad loading, etc. by students only
  - Rocket may not leave student prep area once you begin check-in
  - No student cell phones or radios
  - No one else in prep area or on the flying field
  - OK to have help for recovery outside flying field

Flight Procedures 3

- Third: Starting at assigned "check in time" for your flight round (but no later than 15 minutes before round closes) take complete rocket, with egg inside, altimeter outside, to CHECK IN: **with your team number on your rocket**
  - Certify that your team (students) and no one else built rocket, and it has flown before
  - Rocket will be weighed and measured in flight-ready configuration, with engine(s) & egg: <650 grams, >650 mm, 2 body diameters, parachute recovery, positive physical motor retention
  - Show your altimeter
    - If it is a Pnut make sure the jumper plug is tight and your battery is charged (3.7V minimum for Pnut)
    - If it is an Altimeter ONE or TWO, all previous flight data must be zeroed out
  - State exactly what motors from our list are in the rocket; do not exceed 80 N-sec in combined total impulse
  - Launch pad number has been pre-assigned

Flight Procedures 4

- Fourth: At assigned "load time" for your flight round students (only) go to assigned LAUNCH PAD and set rocket up
  - Pads are "hot" until the round before yours starts, do not go out if your range is still flying its previous round
  - OK to use your own rail/pad; we provide a 6-foot 1010 rail (no launch rods permitted) with 2 clips (12 VDC/18 amp) on an adjustable base
  - NAR "pad managers" will help and direct you and have devices to help you measure launch rail angle
  - Do not angle launch rail toward the spectators but can rotate the pad base and/or tilt rail to get the angle you want otherwise
  - If you have your own launch equipment, go to the pad early
- We have weather station data readouts at each range
- Be ready to fly when your flight window time begins

Flight Procedures

Each pad has a launcher base

- Adjustable in angle but not in rotation, OK to rotate the whole base for that
- Must use rail provided
- NAR pad manager will help adjust

Flight Procedures 5

- Fifth: Fly it! Do this anytime during your assigned flight window, your choice
  - Stand by your pad, hold up numbered "paddle" when ready to fly
  - Once Range Safety Officer designates your pad for next launch, step behind the banners and wait – wave to the crowd!
  - People at adjacent pads (four in each direction) must step back when a pad is being flown – 30-foot standoff
  - If no flight by the end of "window," you're out
    - If your paddle is up by then and delay is ours, you can still fly

Flight Procedures 6

- Sixth: Return the rocket by 1:00 PM
  - Take rocket to RETURNS before you leave the flying field, even if your flight is a "DQ"
  - Leave egg & altimeter in rocket, remove when told
  - You "own" the egg until you remove it from the rocket and place it in the NAR returns official's hand
  - Sign your flight card once your score is recorded
  - If your rocket is on a power line or in a tree LEAVE IT and come to checkin to get an NAR "returns judge"
  - Re-flight if rocket is seen but is not safely reachable due to being in a tree (or on a power line)

Flight Procedures 7

- 24 teams from first flights will fly a 2nd flight in a "fly-off" round: top team from each 1st round plus next 19 best
  - Top 24 places awarded based on sum of 2 flight scores
  - Remaining 76 places awarded based on 1st flight scores
  - 1st through 24th place from first round are in Fly-off Round 6 on Goddard Range
  - Remember that the altitude goal for 2nd flight is different!
- Top 24 teams posted on scoreboard and jumbotron by 1:00 PM
  - Check in opens as soon as these teams announced
  - Flight windows open starting 2:00 PM, returns close at 3:00
  - Can keep original egg (preferred) or get new one but you **must go through egg issue again** in either case

Key Event Rules

- Rocket must not separate into unattached pieces at any point in the flight – everything must stay tethered together all the way to the ground
- Parachute must come out of the rocket body during recovery
- Rocket must land without being caught
- Ejected motor = DQ

Event Rules: Reflights

- Allowed if a rocket motor suffers a “catastrophic failure”, as judged by RSO/CD
  - Crashes or partial ignition of clusters are not “catastrophic failure”
  - Neither are delay time errors or reload mis-assembly
- Allowed if the rocket lands in a place too dangerous to recover, as judged by NAR
- Allowed if an altimeter is judged by NAR to have failed to function despite being used properly
- No other reasons for 2nd flights, no 2nd flights in flyoff
- Flown as soon as a pad is available, must be returned by 1:00.
- All reflights must be personally approved by the CD

Event Rules: Disqualification

- "DQ" means flight score does not count
- Judged by RSO, can be appealed to NAR Contest Director
  - Decision by CD on the field is final
- Based on one of three major factors:
  - Involvement in the flight or its preparation by people other than student team members
  - Performance of rocket – sections separate, motor ejects, dangerous recovery, unstable, egg broken
  - Non-compliance of rocket with event rules – but we try to catch this pre-flight so it can be corrected

Summary

- Safety is paramount – flight and recovery
- The rules are the rules for everyone
- Only the student team members prep or fly the rocket, or go inside the prep area or flying field
- Students may not have cell phones or radios in the prep area or on the flying field
- The flying field is a “heads up” flying zone; no sports, running, games, or earplugs
- Good sportsmanship is expected
- Scheduled events happen at scheduled times
- Everybody stays for the awards ceremony
- Treat Great Meadow gently and leave it cleaner than you found it