

# **CONTESTANT BRIEFING**

## **2023 American Rocketry Challenge**

### **National Finals**



**May 19, 2023**

# Welcome

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2023 American Rocketry Challenge  
Co-Sponsored by:



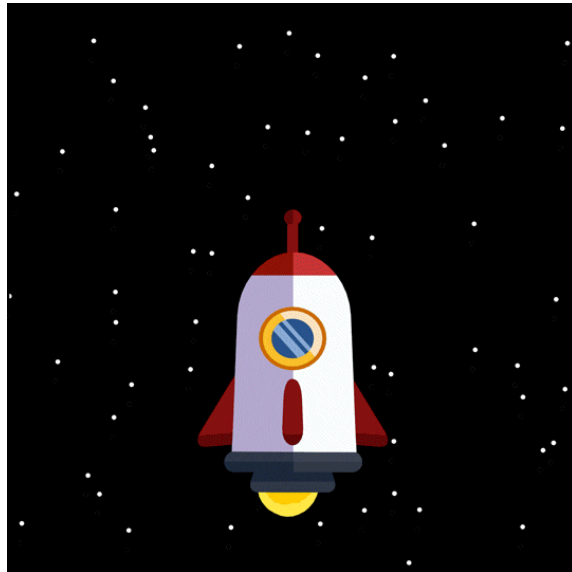
Aerospace Industries Association  
Katrina M. Hill, AIA Program Director



National Association of Rocketry  
Trip Barber, NAR  
American Rocketry Challenge Manager

# CONGRATULATIONS!

You are finalists in the world's largest rocketry competition





**Daniel M. Tani**

Program Manager, Northrop Grumman Space Systems

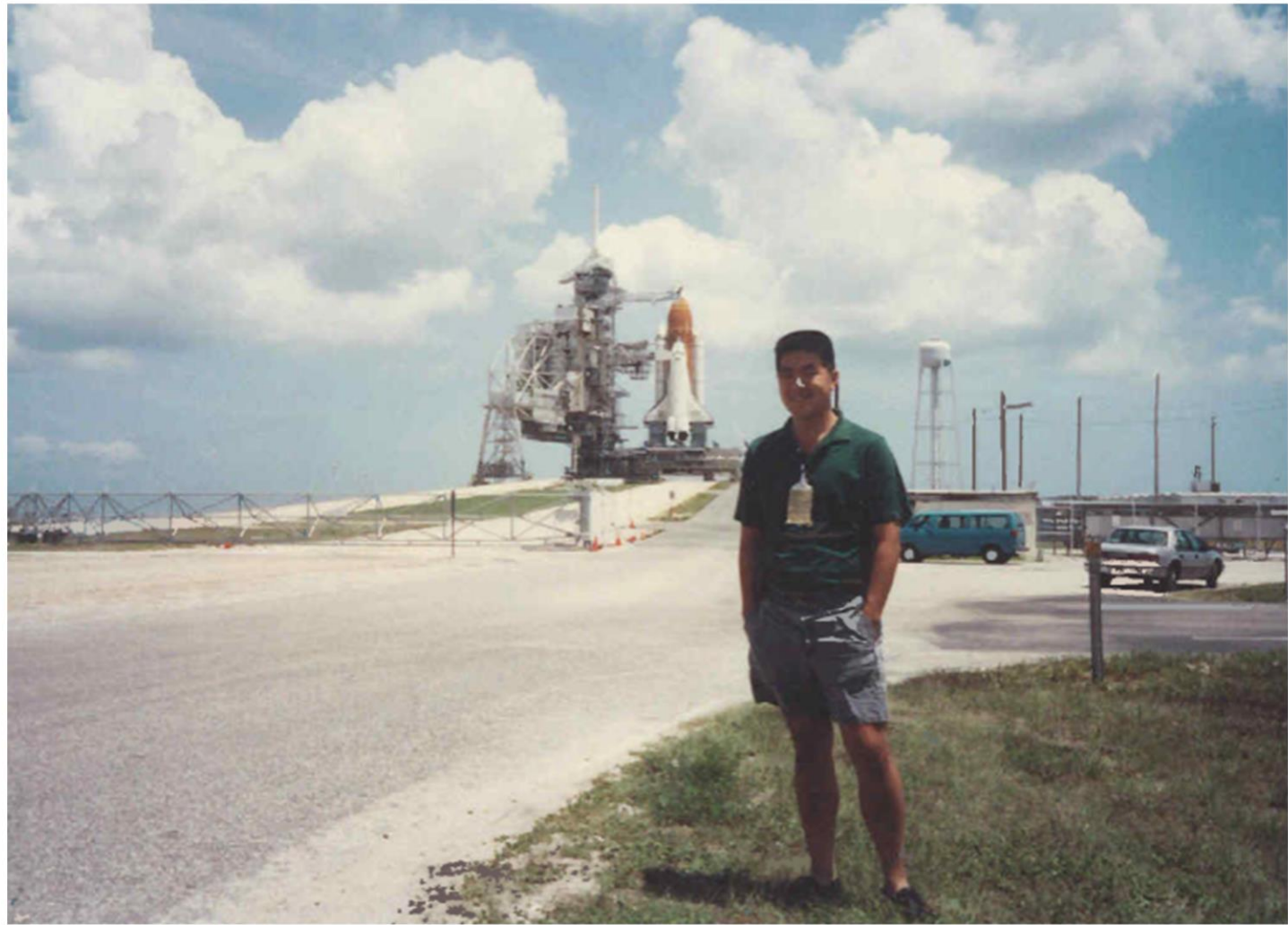
# My Life with Rockets!

Dan Tani













# You Represent the Best

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- 798 teams and 5,000 students registered from 45 states
- 100 teams from 27 states were selected to come to this fly-off (that's you!)

# Your Predecessors

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- This is the 21<sup>st</sup> year of competition
  - 20<sup>th</sup> Finals – missed one thanks to COVID
- 15,227 teams and more than 90,000 student participants

# A Future in Aerospace

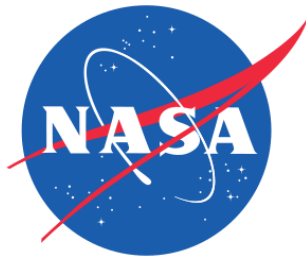
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- Rocket contest alumni are building passenger jets, telescopes and, yes, rockets to the Moon and Mars
- Working at NASA, Boeing, Raytheon Technologies, Northrop Grumman, U.S. Space Force & more
- In space onboard the ISS (Woody Hoburg, 10<sup>th</sup> at the 2003 Finals)
- Median salary for aerospace engineers: \$115,220

# Supporters



**GREAT MEADOW**  
FOUNDATION



**EMBRY-RIDDLE**  
Aeronautical University™



**SPACE FOUNDATION**



**AIAA**  
SHAPING THE FUTURE OF AEROSPACE

# 2023 Sponsors

## –Diamond Level–



## –Platinum Level–



## –Gold Level–



## –Silver Level–



# Activities

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**10:00 AM:** Team Rocket-Building Competition

**12:45 PM:** NAR high power rocket demonstration

**4:00 PM:** NAR high power rocket demonstration

**9 AM - 4 PM:** Exhibit Area

# Activities

## Aerospace Jeopardy



"Oh Sn... 16



# Activities

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## 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  
2:30 PM  
3:00 PM

- Winning team from each round will win a prize.
- Top scoring team of the day receives **FREE 2024 American Rocketry Challenge Registration.**

# Meals

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**11:00 am – 2 pm:** Rolling Lunch

**2:15 pm – 4 pm:** Ice Cream Social

**6:00 pm – 8 pm:** BBQ Dinner

- Free to student participants and team advisors
- **Your credentials are your meal ticket!**
- BBQ dinner tickets for others purchased in advance at registration/check-in
- Free bottled water (NAR Info Tent & other areas on site)

# Meals

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

**Cactus Taqueria**



**Ashton Family Restaurant**



# Awards Ceremony

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- Starts at 5:00 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 **2024 American Rocketry Challenge Rules.**

# T-Shirts and Souvenirs

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- T-shirts ordered in advance picked up Saturday 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

# Prizes

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- \$100,000 in prizes to top teams
- Winning team gets trip to Paris Air Show in June courtesy of Raytheon Technologies
- Special award plaques or medals plus \$500 cash:
  - Best Rocket Craftsmanship
  - Spirit Award
  - Best-Dressed Team
  - 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

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- 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! (#RocketContest23)
- 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

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



Tweet **@RocketContest** with **#RocketContest23**



Follow **@RocketContest** and tag **#RocketContest23**



# Media, Photographers & Camera Crew

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- **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

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- **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

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- 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

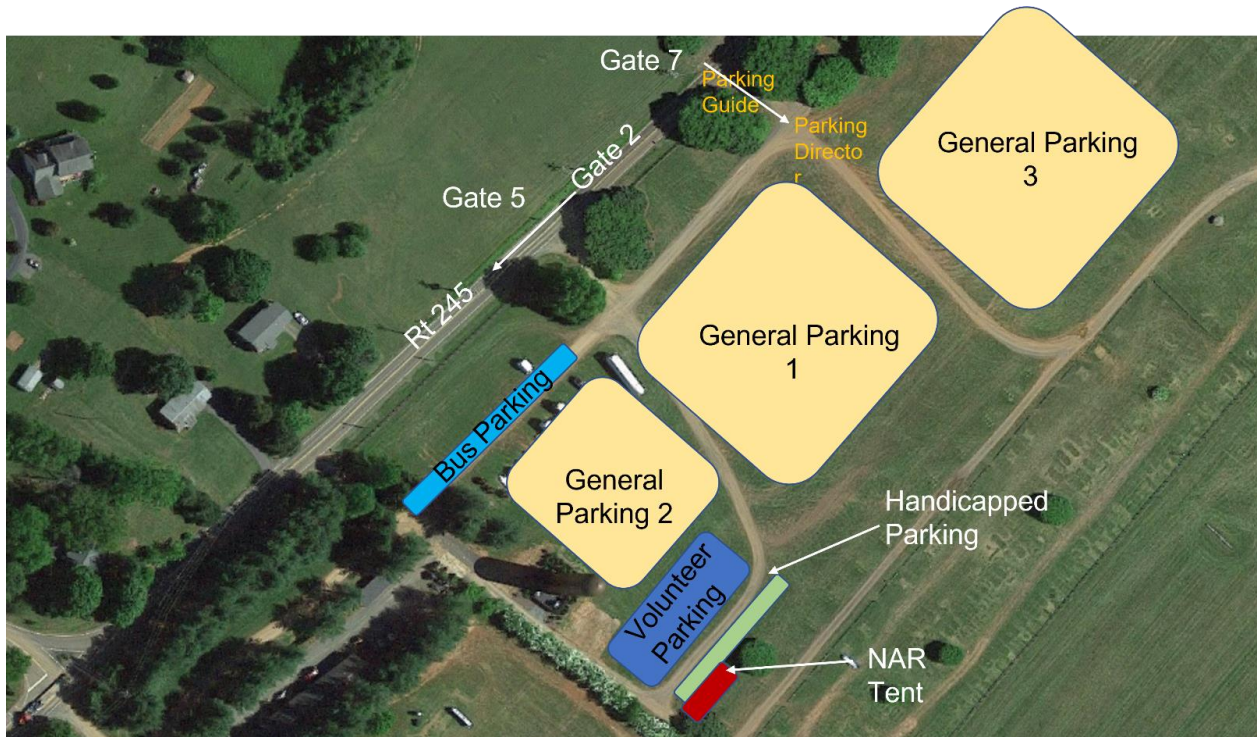
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- Contest Director: Trip Barber
- Registration: Craig Beyers
- Range Operations: Jonathan Rains
- Range Equipment: Adam Martin
- Results: Dr Chris Kidwell
- Awards Ceremony: Dr John Hochheimer
- Range Safety Officers: Dr Ted Cochran & Dr John Langford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

# Getting to Great Meadow

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- Go out I-66 West to exit 31 and turn left at the offramp
- Great Meadow is two miles down the road, on left
- Enter Gate 7 (buses enter Gate 2, further down the road)
- Park where directed – it's free



# Special Notes

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- **We will not be posting scores from fly-off rounds, the winner will be a surprise!**
- If there are afternoon thunderstorms that force suspension of flying, only 1 flyoff round (24 teams) will be held
  - Everyone must go to their cars for safety, listen to FM 92.9
- Emergency replacement Perfectflite Pnut altimeters available at NAR booth on the field
- NAR booth selling American Rocketry Challenge souvenirs and last year's "20<sup>th</sup> Anniversary" T-shirts – 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 unleashed dogs
- Do not eject non-bio-degradable material from your rocket

# Rocket-Building Competition

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- Optional event, two \$500 prizes courtesy of Northrop Grumman, plus trophies
- 40 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
  - 10 teams at a time in 4 “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 flyoffs (who must yield their spot if in the 1:30 “window”)
- Judged by NAR for creativity of design (1 prize) and quality of workmanship (1 prize)



# Topics

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- Safety
- Schedule
- Flight Procedures
- Event Rules

# Safety First

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- Follow the Range Safety Officer (RSO) directions and watch every liftoff
  - Don't make us shout!
- Listen to the PA and FM radio 92.9 MHz
- 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

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- 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

# Key 2023

## American Rocketry Challenge Changes

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- 1 egg, flown in any orientation
- Rocket must separate into two sections for recovery sometime before landing
  - Each must have a parachute that comes out of the body
  - One must contain egg and altimeter – this is the one we time
  - Team must provide one person to stand with timers to identify which one to time
- Flight goal is 825 feet/41-44 sec or 875 feet/44-47 sec
  - Coin toss tonight decides which one is 1<sup>st</sup> round goal
  - 2<sup>nd</sup> 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
- Two flyoff rounds (42 teams total) planned if weather is good
  - Only one round if there is a weather delay during the day

# Event Schedule

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- 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 – 3:00** Rocket-building competition (exhibit area)
- 12:45** High power rocket flight demonstration

# Event Schedule (cont.)

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- 1:00**            Deadline for rocket returns from 1<sup>st</sup> rounds
- 1:15**            Notification of 42 teams selected for flyoff
- 2:00 – 3:30**    Flyoff round 2<sup>nd</sup> flights for 42 teams (2 rounds)
- 4:00 – 4:30**    High-power rocket flight demonstration
- 4:30**            Deadline for rocket returns from flyoff rounds
- 5:00**            Award ceremony (dinner tent)
- 6:00**            BBQ dinner

# Flight Windows

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- 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”

<u>Round</u>	<u>Checkin Time</u>	<u>Load Time</u>	<u>Flight Window</u>
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	2:15 PM – 3:00 PM
Flyoff Stine 7	1:45 PM	1:45 PM	3:00 PM – 3:45 PM

Spring House

Gate 5

Dining & Awards



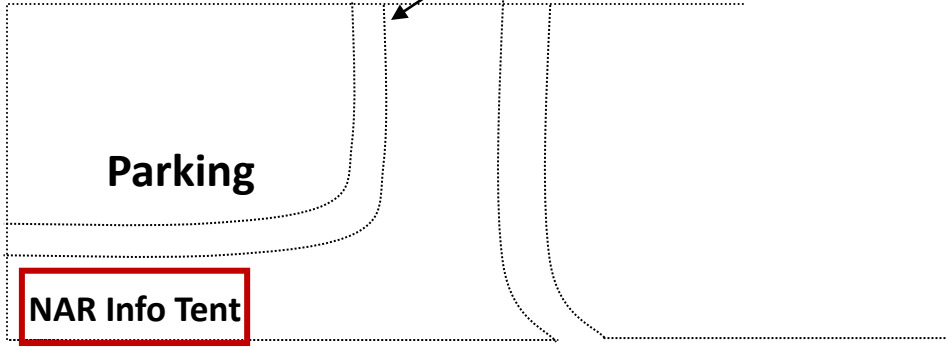
Rocket Building

T-Shirts

Exhibits

Summer House  
AIA Membership  
Area/VIP Reception

Food Concession



Public  
Observation Area



Steward's Stand

Results Board

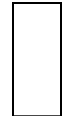


Stine Range  
Launch Pads



Goddard Range  
Launch Pads

Media



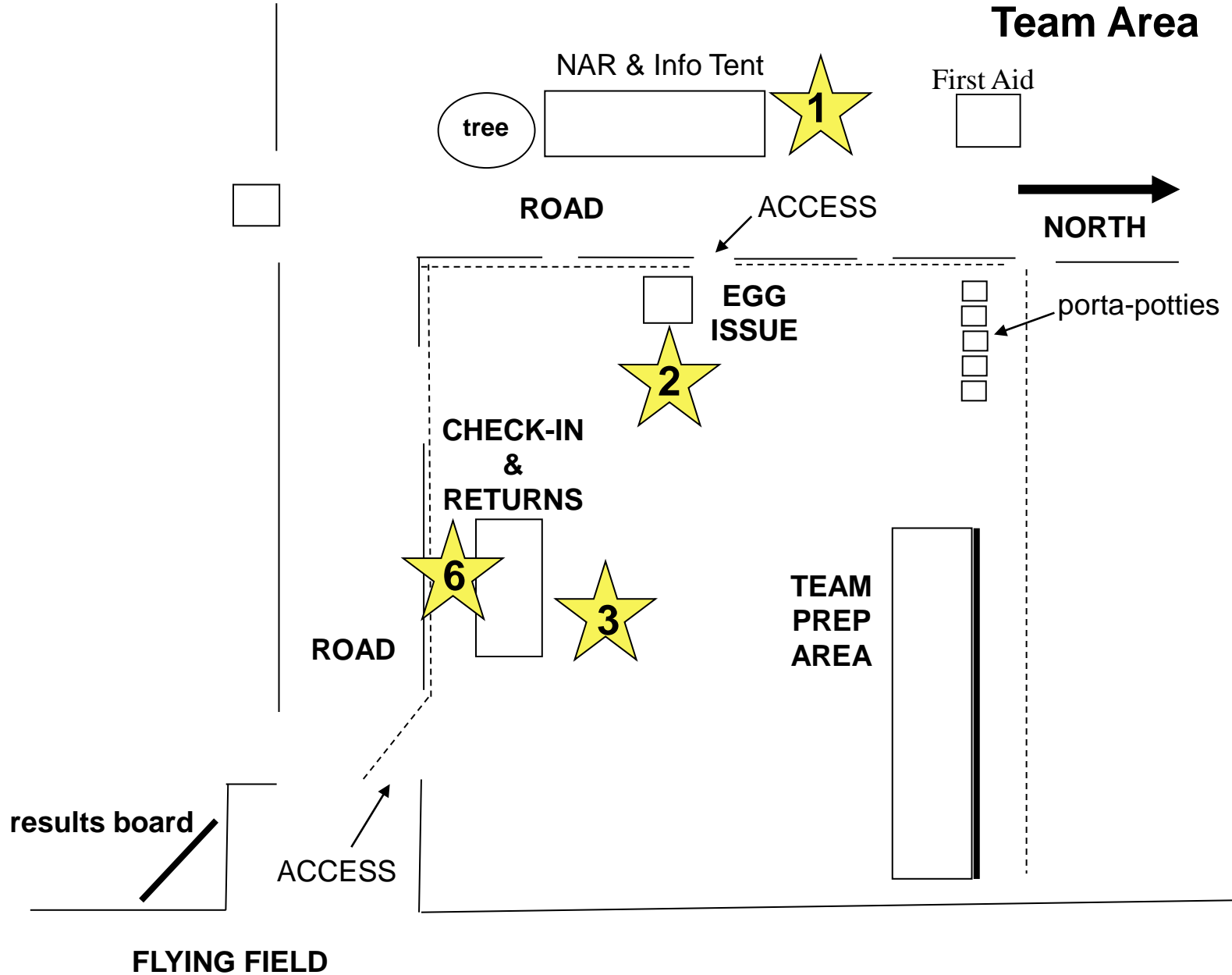
Raytheon Range  
High Power Pads



**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

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- 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

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- 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 – no advice by cell phone!
  - Rocket may not leave student prep area once you begin check-in
  - No one else in prep area or on the flying field
  - OK to have help for recovery outside flying field

# Flight Procedures 3

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- 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 sections with parachute recovery, positive physical motor retention
  - Show your altimeter – make sure the jumper plug is tight and your battery is charged (3.7V minimum for Pnut)
  - 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

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- 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
  - 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

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## **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

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- 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
    - Verify your altimeter is still beeping “flight ready” signal just before countdown starts
  - 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

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- Sixth: return all parts of the rocket by 1:00 PM
  - Take both sections to RETURNS before you leave the flying field, even if your flight is a “DQ”
  - Leave egg & altimeter in rocket, remove when told
  - 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

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- 42 teams\* from first flights will fly a 2<sup>nd</sup> flight in two “fly-off” rounds: top team from each 1<sup>st</sup> round plus next 37 best
  - Top 40 places awarded based on sum of 2 flight scores
  - Remaining 60 places awarded based on 1<sup>st</sup> flight scores
  - 1<sup>st</sup> through 24<sup>th</sup> place from first round are in Fly-off Round 6 on Goddard Range; 25<sup>th</sup>-42<sup>nd</sup> in Fly-off Round 7 on Stine Range
  - Remember that the goals for 2<sup>nd</sup> flight are different!
- Top 42 teams posted on scoreboard and jumbotron by 1:15 PM
  - Check in for first round opens as soon as these teams announced
  - Flight windows open starting 2:15 PM, returns close at 4:30
  - Can keep original egg (preferred) or get new one but you **must go through egg issue again** in either case

\* If afternoon thunderstorms interrupt the flying schedule there will be only one fly-off round of 24

# Key Event Rules

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- Rocket must come down in 2 separate sections, each with a parachute
- Rocket's payload section (with egg) is the part we time and it must land without being caught
- Ejected motor = DQ

# Event Rules: Reflights

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- 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

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- “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 fail to 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

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- 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 at scheduled times
- Everybody stays for the awards ceremony
- Treat Great Meadow gently and leave it cleaner than you found it