2017 SC 4-H Engineering Challenge

Egg Lofter Rocket Challenge

Each individual/team will design and build an egg-bearing rocket to carry a medium-sized egg to a height of 480 feet without breaking the egg upon landing. Any broken egg is disqualified.

What to bring:

Individuals/Teams must supply pre-built rocket, motor, and packing materials.

Medium sized egg and launcher will be provided on site.

This challenge is open to individuals and teams of 2 to 3 people.

Competition Instructions:

Each rocket will have the chance to fly twice, time permitting. The best altitude will be used for scoring.
Each rocket will be inspected for safety before each launch.
The launch area will be declared open to start the completion and those that are ready may load their rockets on the launch racks and bring their scorecard to the launch control. Each rocket will be launch individually. After all rockets are launched and landed the range will be declared open and the next round of rockets will be loaded while the ones previously launched are retrieved. Each team must retrieve their own rocket. DO NOT RETRIEVE ANOTHER TEAMS ROCKET!!! Retrieved rockets will be brought to the judging table to be scored on height and to ensure egg is not broken. Range will then be closed and the next batch of rockets can be launched.

Rocket Requirements:

- Rocket weigh less than 2 pounds.
- No metal is allowed to be used in the construction of the rocket other than the motor retention.
- No motor larger than an F may be used. Any certified motor or motors can be used.
- Rocket may be a stock rocket kit or one of your own design.

Altitude Scoring:
Rockets will be tracked with the Estes App on Iphone by two 4H officials and the average of the two will be the recorded altitude for the rocket. The altitude score for every flight will be the absolute difference in feet between the 480 feet target altitude and the reported actual flight altitude in feet (always a positive number or zero).

Facilitator Recommendations:

- **Practice flights are highly recommended.**
- Participant may use a stock rocket kit or they can design a rocket themselves.
- See TARC (Team America Rocket Challenge) guide for helpful advice: http://rocketcontest.org
- OPENRocket is a freeware Rocket simulator to assist in design of rocket and motor choice. Other software is available and can be used.

2017 SC 4-H Engineering Challenge

Egg Lofter Rocket Challenge

Certified Motors:

Designation	Manufacturer	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
1/4A3-3T	Estes	13x45	0.8	0.62
1/2A3-2T, -4T	Estes	13x45	2.0	1.25
1/2A6-2	Estes	18x70	2.6	1.25
A3-2T, -4T	Quest	13x55	3.6	1.71
A3-4T	Estes	13x45	3.3	2.50
A6-4	Quest	18x70	3.0	2.30
A8-0, -3, -5	Estes	18x70	3.3	2.50
A10-0T	Estes	13x45	3.6	1.88
A10-3T, PT	Estes	13x45	3.8	2.50
B4-2, -4	Estes	18x70	6.0	5.00
B6-0	Estes	18x70	5.6	4.90
B6-2, -4, -6	Estes	18x70	5.6	5.00
B6-0, -2, -4	Quest	18x70	6.5	5.00
C6-0, -3. -5, -7	Estes	18x70	10.8	9.00
C6-0	Quest	18x70	11.0	8.80

2017 SC 4-H Engineering Challenge

Egg Lofter Rocket Challenge

Certified Motors:

Designation	Manufacturer	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
E9-4, -6, -8, P	Estes	24x90	35.8	28.50
E11J-3 (R)	Aerotech	24x70	25.0	31.70
E12-0, -4, -6, -8	Estes	24x95	35.9	27.20
E15W-4, -7, P	Aerotech	24x65	20.1	35.00
E16-0, -4, -6, -8	Estes	29x114	40.0	33.4
E16W-4, -7 (R)	Aerotech	29x124	19.0	40.00
E18W-4, -8 (R)	Aerotech	24x70	20.7	39.00
E20-4, -7, -10	Aerotech	24x65	16.2	35.0
E22SS-13A (R)	Cesaroni	24x69	13.4	24.2
E23T-5, -8 (R)	Aerotech	29x124	17.4	37.00
E28T-4/5. -7/8 (R)	Aerotech	24x70	18.4	40.00
E30T-4, -7	Aerotech	24x70	17.8	33.60
E30-4, -7	Estes	24x70	17.8	33.60
E31WT-15A	Cesaroni	24x69	11.2	26.1
E75VM-17A (R)	Cesaroni	24x69	10.4	24.80

2017 SC 4-H Engineering Challenge

Egg Lofter Rocket Challenge

Certified Motors:

Designation	Manufacturer	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
F10-4, -6, -8	Apogee	29.93	40.0	74.30
F12J-2/3, -5 (R)	Aerotech	29x93	30.0	45.00
*F15-0, -4, -6, -8	Estes	29x114	60.0	49.60
F20W-4, -7	Aerotech	29x73	30.0	51.80
F22J-4/5, -7 (R)	Aerotech	29x124	46.3	65.00
F23FJ-4, -7	Aerotech	29x83	30.0	41.20
F24W-4, -7 (R)	Aerotech	24x70	19.0	50.00
F25W-4, -6, -9	Aerotech	29x98	35.6	80.00
F26FJ-6, -9	Aerotech	29x98	43.1	62.20
F26FJ-6	Estes	29x98	43.1	62.20
F27R-4, -8	Aerotech	29x83	28.4	49.60
F29-12A (R)	Cesaroni	29x98	30.9	54.80
F30-4, -6, -8	Aerotech	24x90	31.2	47.00
F30WH/ LB-6A (R)	Cesaroni	24x133	40.0	73.10
F31CL-12A	Cesaroni	29x98	25.7	55.50
F32T-4, -6, -8	Aerotech	24x90	25.8	56.90

2017 SC 4-H Engineering Challenge

Egg Lofter Rocket Challenge

Certified Motors:

Designation	Manufacturer	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
F32WH-12A (R)	Cesaroni	24x98	29.9	52.80
F35W-5, -8, -11 (R)	Aerotech	24x95	30.0	57.10
F36SS-11A (R)	Cesaroni	29x98	29.5	41.20
F36BS-14A (R)	Cesaroni	29x98	25.6	51.50
F37W-S, -M, -L (R)	Aerotech	29x99	28.2	50.00
F39T-3, -6 (R)	Aerotech	24X70	22.7	50.00
F40W-4, -7, -10 (R)	Aerotech	29X124	40.0	80.00
F42T-4, -8	Aerotech	29X83	27.0	52.90
F44W-4, -8	Aerotech	24x70	19.7	41.50
F50T-4, -6, -9	Aerotech	29x98	37.9	80.00
F50T-4, -6	Estes	29x98	37.9	80.00
F51BS-13A (R)	Cesaroni	24X101	22.0	49.90
F51CL-12A (R)	Cesaroni	24x133	33.0	75.00
F52T-5/6, -8, -11 (R)	Aerotech	29x124	36.6	78.00
F59WT-12A (R)	Cesaroni	29x98	26.1	57.00

Egg Lofter Rocket Challenge

Certified Motors:

Designation	Manufacturer	Casing Size (mm)	Propellant Mass (grams)	Total Impulse (N-sec.)
F62T-S, -M, -L (R)	Aerotech	29x89	30.5	51.00
F70WT-14A (R)	Cesaroni	24x101	22.5	52.9
F79SS-13A (R)	Cesaroni	24x133	40.1	67.80

Egg Lofter Rocket Challenge

MODEL ROCKET SAFETY CODE

1. Materials I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.

2. Motors. I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.

3. Ignition System. I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.

4. Misfires. If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.

5. Launch Safety. I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance. When conducting a simultaneous launch of more than ten rockets I will observe a safe distance of 1.5 times the maximum expected altitude of any launched rocket.

6. Launcher. I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.

7. Size. My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound- seconds) of total impulse.

8. Flight Safety. I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.

9. Launch Site. I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.

10. Recovery System. I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.

11. Recovery Safety. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.