



# 6<sup>th</sup> Annual STEM Rotor Day

*Our mission: To inspire the STEM leaders of tomorrow and create an excitement about the STEM fields*

# STEM Rotor Day

Outreach Event

A small white icon of a helicopter is positioned between the words "Rotor" and "Day" in the main title.

This event was made possible by the generous contributions of the LORD Corporation, the Triumph Group, the Vertical Flight Society, and the AERTS Lab.



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## Introduction

The Penn State chapter of the Vertical flight Society held its annual STEM rotor day event on 12 Oct 2019. This event was made possible by the contributions of the LORD Corporation, the Triumph Group, the Vertical Flight Society, and the AERTS lab at Penn State. The purpose of this event is to provide primary and middle school children the opportunity to learn about rotorcraft engineering and Aerospace engineer as a whole. This event, however, was open to children of all ages. This was done via a series of interactive stands and laboratory tours of some of Penn States' facilities. Following registration, children were encouraged to enjoy a multitude of hands on STEM activities, and then attend facility tours while enjoying PSU Berkey Creamery ice cream. Following the event, parents were asked to fill out an exit survey. The survey results were processed to obtain valuable feedback on the event while providing a focus for the efforts for the 2020 event.

This report will outline the event and the event feedback. This event consisted of hands on activities (flight simulator, K-MAX gears, gyroscopic stability, RC quadcopter lessons, high-speed camera, a large RC helicopter exhibit, a QH-50 hub, and a paper helicopter craft) and facility tours (AERTS lab and wind tunnel, Hammond Wind Tunnel, Helicopter Museum). The surveys suggest that the efforts in advertising were successful. They also suggest that the participants enjoy actively engaging activities and were pleased with the activities that could accommodate even the youngest of attendees.

The feedback also suggests that STEM Rotor Day was a complete success, and is succeeding in its mission to inspire the STEM leaders of tomorrow and create an excitement about the STEM fields.

## Hands-on Activities



The event was held in Kunkle lounge. Here all the interactive displays were set up and the lounge also acted the start- and endpoint for the laboratory tours. The following interactive displays were set up:

- **Drone flying:** Here the children were given the task of piloting a small quadrotor drone to take off from one table and then land on a second table which was a few feet away.



- **Flight simulator:** The kids were given the opportunity to fly some flight simulators of both helicopters and fixed wing aircraft.



- **Snap circuit:** Here the children could play with some snap circuits and learn how circuits work.



- **Slow motion camera:** At this station, kids could learn how a slow-motion camera works and how aerospace engineer use these cameras in their line of work.

- **Model aircraft and Lego station:** Here the children could play around and build too their heart's content with some Lego sets. Some plywood airplane models were also provided for the children to play with.



- **Foldable structure station:** At this station kids could learn about currently ongoing research on foldable structures and how they will be used in space stations etc. Some model structures were generously provided by Dr Xin Ning of the Aerospace department.

- **Mini wind tunnel:** Here the kids could see a demonstration of how wind tunnels work and how aerospace engineers use them in their work.

- **Gyroscope:** By using the classical rotating pedestal and bicycle wheel, this station demonstrated the physics of gyroscopic motion.



- **K-MAX Gears:** The main bevel gears of a Kaman K-Max gear box were set up to show how mechanical power is distributed from the engine to the rotors. These large gears were great for the students to play with. They saw how the two main rotors of the K-Max could spin in opposite directions even though it only has one engine



- **Model engines:** At this station several model Sterling engines were on display, including two that are entirely constructed from 3D printed parts.



The laboratory tours stopped at three locations:

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- **AERTS laboratory:** Here the tour group members were shown the facilities and equipment used for rotor and engine icing research.
- **Simulator laboratory:** Here capabilities of the new motion base helicopter simulator were demonstrated. Additionally, the kids were also given the opportunity to fly the simulator.



- **VLRCOE center:** Here the tour group members were shown some of VLRCOE's helicopter artifacts such as the Gyrodyne QH-50 DASH.

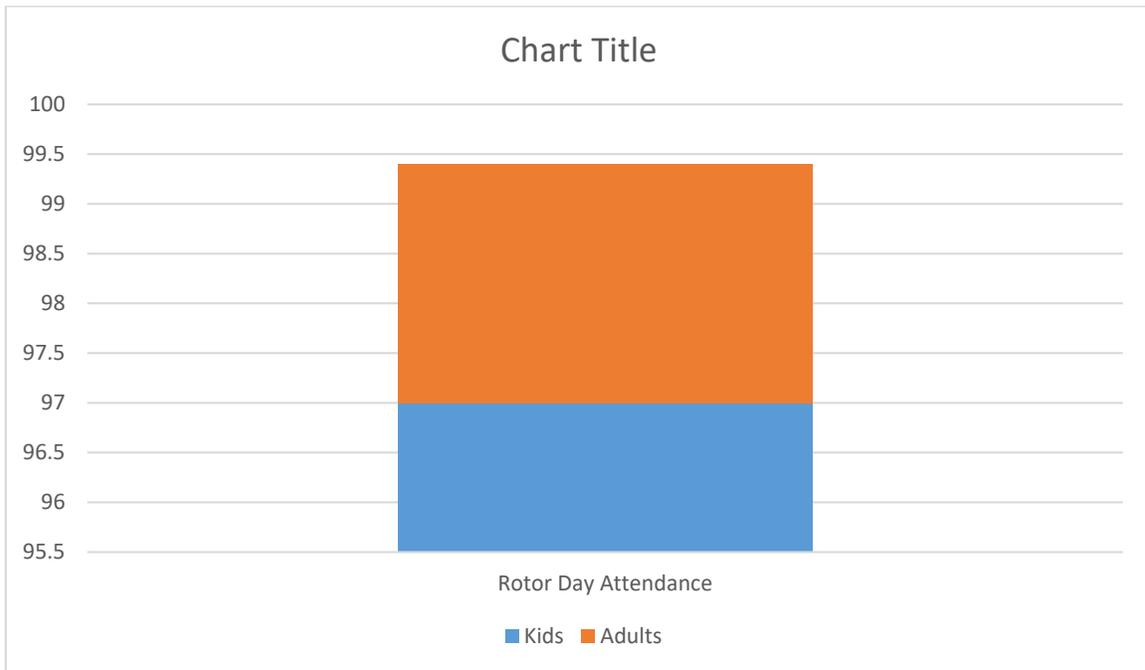
Finally, an ice cream stand was set up to give out complimentary ice cream to the event's attendees.

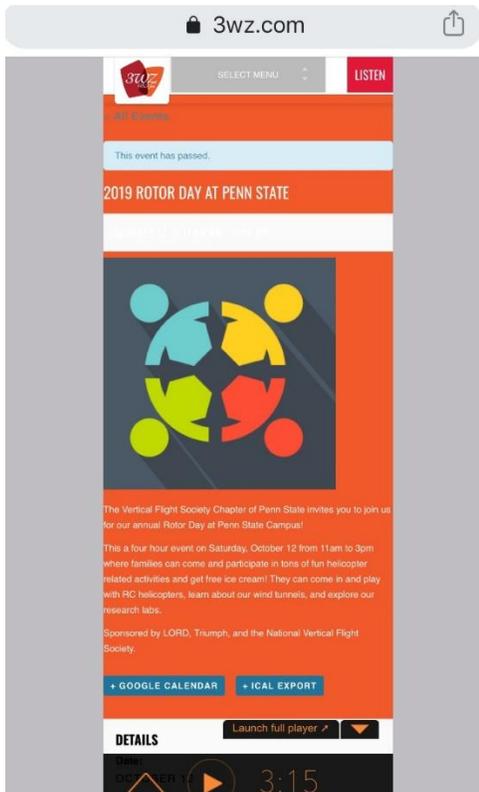




## Attendance Data

The event attendance this year was as expected. A total of 97 children were in attendance throughout the event. The average attendance from previous Rotor Days is 75 children. Parents and adults that attended with children were also counted. 133 adults attended the event this year. This leads to a projected attendance of 230 people! The success in attracting a large attendance can still be attributed to advertising.





## Advertising Efforts

When it came to marketing of the event, a variety of methods were used. These included:

- Sending flyers to all the neighboring schools.
- Sending promotional emails to staff at the Aerospace department.
- Advertising on local radio stations and community websites. On the day of the event an advertising billboard was set up outside the Kunkle lounge on College ave. and flyers were handed out to parties that passed by. Finally, a journalist from a local TV Station also coincidentally attended the event with his children and did an impromptu interview with one of the volunteers about the event.

The flyer was updated from last year, the updated flyer can be seen below.

This flyer was developed with modern, simple

graphics and colors that would draw attention. The flyer was distributed to the information tables of all 11 elementary and middle schools in the State College Area School District, as well as the Our Lady of Victory Catholic School and the Young Scholars of Central PA charter school. The flyers also reached two other nearby school districts, the Bald Eagle Area School District and the Bellefonte Area School District. The event was also advertised on 3wz.com, Penn State VFS Facebook, Twitter, and website. Flyers were handed out at the Fall Festival in downtown State College, two blocks from the event location, which was on the same day of the event.

Vertical Flight Society  
Penn State Chapter

### 6th Annual STEM ROTOR DAY!

Saturday, October 12, 2019  
11 AM to 3 PM  
Kunkle Lounge, Hammond Building  
Penn State University  
*Parental Supervision Required*

Families, don't miss the Penn State VFS STEM Rotor Day!

- Fun, educational & hands-on activities using:
  - RC Quadcopters (children will learn to fly!)
  - High Speed Cameras
  - A Small Scale Wind Tunnel
  - A Gyroscope
  - LEGOs and Paper Helicopters
  - A REAL Helicopter Rotor & much more!
- Tours of aerospace laboratories every hour
- VFS Students in STEM fields run the event
- FREE Penn State Creamery Ice Cream!

It is our mission to inspire the STEM leaders of tomorrow and create an excitement about the STEM fields.  
For more information about AHS and an overview of last year's event, visit our website provided below.

Our Sponsors: LORD Ask Us How, Triumph Group, Inc., Vertical Flight Society

Follow us & Learn More!  
Instagram: @psuvfs, Facebook: Penn State VFS, Twitter: PennState\_AHS, Website: sites.psu.edu/pennstateahs/

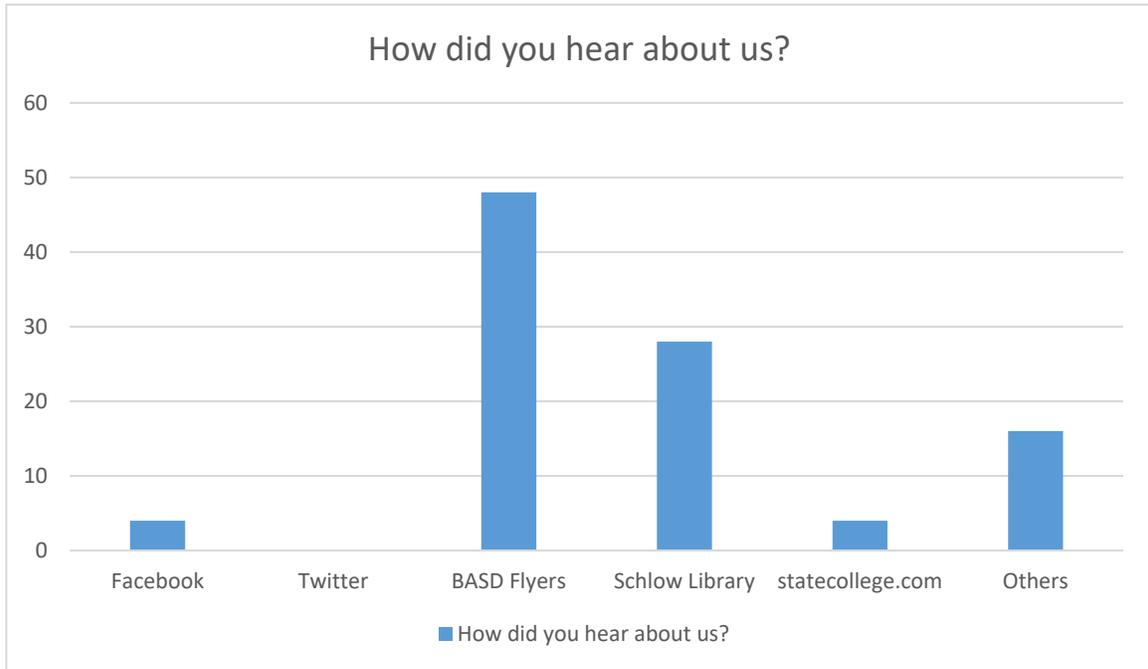
## Event Feedback

An exit survey was provided for the groups to fill out before going home. This addressed advertising, favorite demonstrations, reason for coming, and general comments.

Not all groups filled an exit survey but the information from those who did will help future VFS STEM Rotor Day events. The data is valuable for better advertising, improving demonstrations, and meeting people's expectations.

## Advertising

The question “How did you learn about this event?” was asked on the survey. The results can be found below.

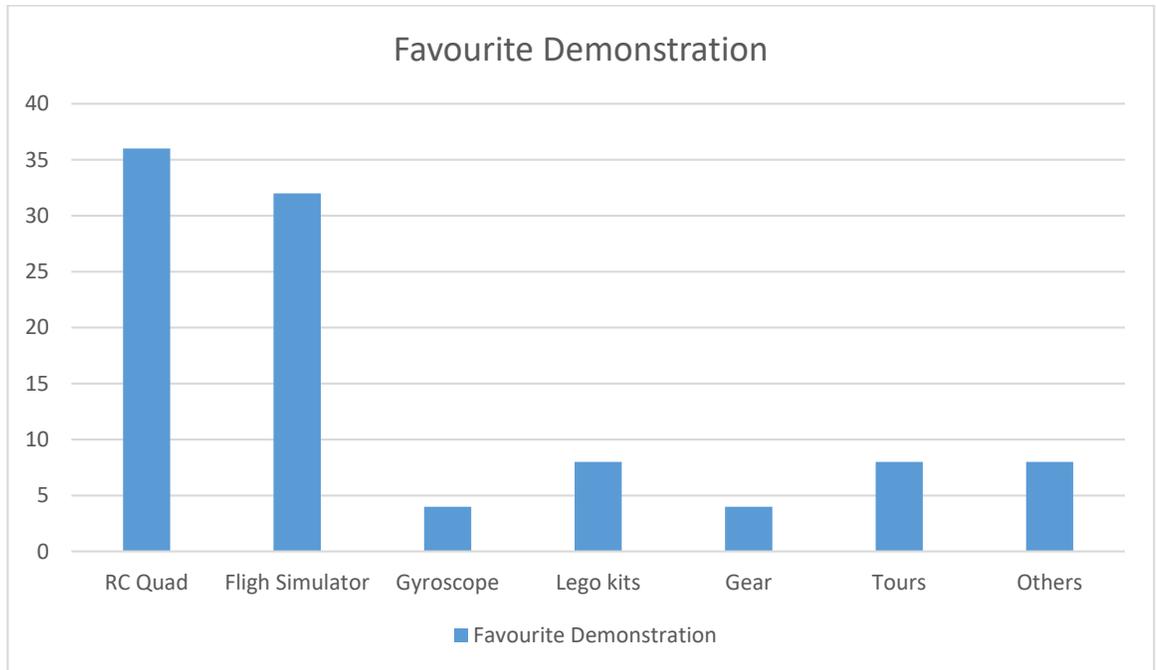


Based on the survey responses, 48 percent of attendees learned about the event from flyers distributed at schools and downtown during the Fall Fest. Schlow Library was the second reason at 28%. 4% people learnt about the event through local websites and Facebook pages each.

Recommendations for advertising for the event next year would be to search for and advertise on more event websites and other STEM events as well as continuing to deliver flyers to all of the local schools.

## Preferred Demonstrations

The question “What was your student’s favorite demonstration?” was asked on the survey. The results can be found below.

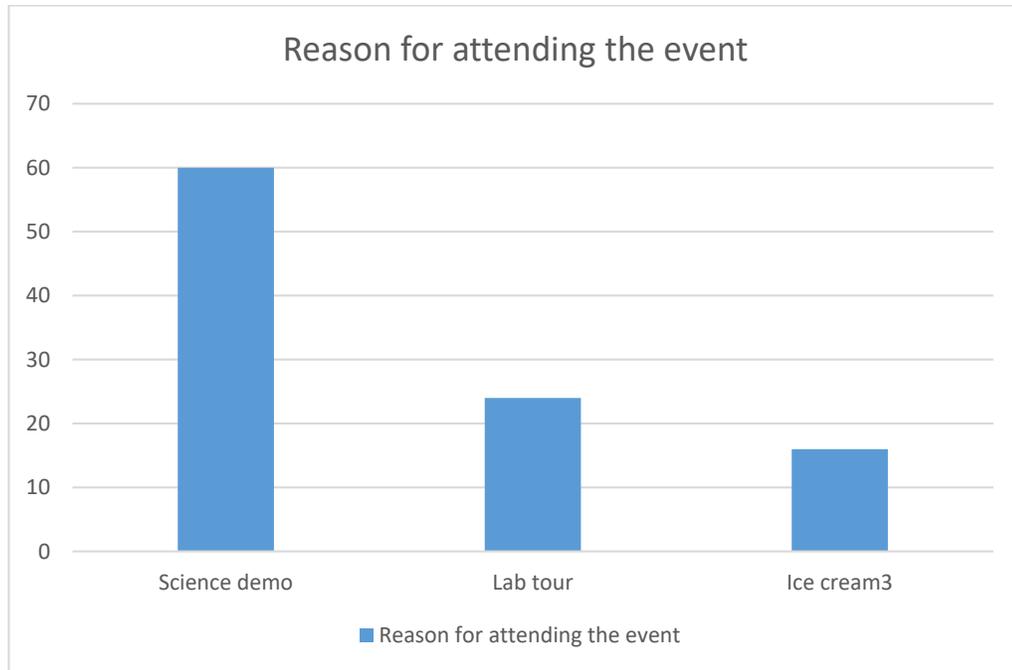


This year, the RC Quadcopter was the favorite by 36 percent of the attendees. 32 percent chose the flight simulator as their favorite demonstration and 8 percent chose the tours and the lego kits. The gyroscope and gears were chosen as next favorites by 4 percent of attendees

This data suggests that VFS should focus its efforts on making all of the activities engaging, exciting, and new for the children.

### Reason for attending

The question “Why did you come to this event?” was asked on the survey. The results can be found below.



A number of attendees came to the event for multiple reasons. The main reason was the science demonstrations at 60 percent. For 24percent of attendees, the reason for coming was the facility tours. 16 percent of attendees responded that they came for the ice cream.

This data suggests that STEM Rotor Day is targeting the proper attendee needs and is serving its designed purpose. This is an event meant to inspire children to enjoy the STEM fields and become interested in STEM education. It is also meant to show children what a career in STEM could look like. Science demonstrations and tours achieve this goal. It is important that the AHS club and sponsor recourses for a STEM activity are not going to an event which people are attending for the ice cream!

## General Feedback

The final question of the survey was “Did you enjoy rotor day?” All 25 survey participants did enjoy Rotor Day! The comments and concerns section also provided very positive feedback addressing two main areas:

1. Thanking AHS for the opportunity
2. Enjoyment of the lab tours and event as a whole

This feedback is encouraging because it both shows that the event was very strong and popular, and the participants are looking to return to next year’s event. The comments predict growth in the event. Few comments requested a summer camp on the topic in future.

## Conclusion

All the displays were quite liked by the attendees. Flying and racing R.C. quadcopters was a big hit. Almost all the kids tried their hands on trying to fly the drones. Kids kept coming back to fly the drones repeatedly. Many parents asked where they could buy such a drone. The flight simulator station was also one of the most well received. As for the laboratory tours, both AERTS and Simulator labs were enjoyed by the tour groups. While some did show interest in the artifacts in the VLRCOE center, it did not have the same amount of engagement as the other stops. Unsurprisingly, the ice cream stand proved to be very popular with the attendees.

The 6<sup>th</sup> Annual STEM Rotor Day was a success in nearly every measurable statistic. Attendance was up to 20% of the previous year's event, 97 children vs 76 children. This increase can likely be attributed to advertising efforts and a new target age group of elementary and middle school based on survey data. Everyone enjoyed rotor day and is looking to come back in future years.

VFS is encouraged by the success of the event this year and is looking to broaden its efforts to expand the event next year. The recommended focus areas for next year's event are listed below:

- Advertise on more local event websites and event pages in the towns surrounding State College, including Bellefonte, Centre Hall, Penns Valley, etc.
- Deliver flyers to more local schools and to more STEM events
- Expand the survey to include party size
- Make surveys more easily accessible upon exit
- Ensure all activities are actively engaging

Implementing these recommendations will ensure that STEM Rotor Day will continue to grow as an event and that VFS can continue to serve the children of the community. It is our mission to inspire the STEM leaders of tomorrow and create an excitement about the STEM fields, and STEM Rotor Day fits this mission.

## Acknowledgments

Penn State VFS would like to acknowledge its sponsors and volunteers.

### Sponsors

Penn State VFS would like to thank the generous sponsorship of the Lord Corporation and Triumph Group Inc. Their contributions continued to make STEM Rotor Day possible and allows us to continually inspire the STEM leaders of tomorrow. We would also like to thank VFS for their support. We also thank the AERTS lab for its contribution to the event. Its contribution makes volunteering time to this event possible and enjoyable.

## Volunteers

This event would not be possible without the hard work and dedication of its volunteers. The volunteers are named below.

Christopher Hendrick

Bhaskar Mukherjee

Jeff Lewis

Vitor Valente

Leah Kiner

Robert Rau

Victor Ouko

Kostandin Gjergo

Colin Baxter

William Torris

Angela Paul

Christopher Doll

Ali Wahab

David Farish

Siti Nur Hannany Binti Md Salehuddin

Joshua Kaewvichien (Outreach Coordinator, VFS Penn State)

Jean-Pierre Theron (Secretary, VFS Penn State)

Belen Bowman (Treasurer, VFS Penn State)

Raja Akif Bin Raja Zahirudin (Vice President, VFS Penn State)

Keerti Parkash (President, VFS Penn State)

Dr. Jose Palacios (VFS Chapter Advisor)

Dr. Edward Smith (VFS Chapter Advisor)