Rev. 8.5 – 2/4/2014

SKUNK WORKS ROBOTICS

TEAM 1983

Management Plan 2014-2015

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RAISBECK AVIATION HIGH SCHOOL

FIRST®

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ABSTRACT

This plan documents the various aspects of the complex Raisbeck Aviation High School (RAHS) Robotics team. This plan also outlines the various ways in which Team 1983 Skunk Works uses Inspiralation to influence not only students with the message of *FIRST* and Science Technology Engineering and Mathematics (STEM) education, but also the community as a whole. In addition, this plan puts forth the organization of the team, the design/build strategy, objectives, and an abbreviation to the business plan.

1.0 Team 1983's Ideals and Objectives

Team 1983's management is driven from the objectives and ideals of interrelated organizations such as:

- *FIRST*
- RAHS
- The *FIRST* brand
- Inspiralation

Skunk Works also has a myriad of objectives that it works on each year:

- Building a robot that fits the game of the year
- Working with the community through Community Outreach
- Preparing students for college and careers

These ideals and objectives are the foundation for Skunk Work's tasks and the way that Skunk Works operates.

1.1 *FIRST Overview/objectives*

FIRST is an organization founded by inventor Dean Kamen in 1989 to develop ways to inspire students in engineering and technology fields. The organization is the foundation for the *FIRST* Robotics Competition, the *FIRST* LEGO League, and the *FIRST* Tech Challenge competition.

FIRST seeks to promote a philosophy of "gracious professionalism," which supports respect towards one's competitors and integrity in one's actions. This term also stands for helping other teams, even ones in direct competition.

1.2 *RAHS Overview/objectives*

Raisbeck Aviation High School (RAHS) is a public school in the Highline School District (HSD) founded on a Gates Foundation Charter. RAHS's aim is to become the premier school of choice for aviation, science, pre-engineering, and technology in the Puget Sound region. RAHS is a small school with a big vision; students are simultaneously prepared for the rigors of college and the performance demands of a high-tech world and workplace. The school is now permanently located in Tukwila, WA (just south of Seattle). Students commute from surrounding districts, some as far away as 35 miles. Students also relocate from other states and countries to attend RAHS. Many students aspire to become scientists, engineers, astronauts, pilots, aviation technicians, and CEOs in the aviation and aerospace fields. Many are drawn by the school's focus on math, science, and technology. Some people are simply drawn by our unique approach to teaching and learning.

District:

<http://www.hsd401.org/>

School:

<http://www.hsd401.org/ourschools/highschools/aviation/>

For additional information about the Skunk Works robotics team see:
<www.RAHSrobotics.us/>

1.3 *FIRST Brand*

The *FIRST* Brand is Skunk Work's most influential component. The *FIRST* Brand represents a tangible thought and correlation between *FIRST* and its inspiration of students, and creating a franchise, where the individual branches are completely independent, at the same time providing support and help for other branches around them, much like a safety net.

1.4 *Inspiralation*

Skunk Works Robotics uses a spiraling process of investing in new students, helping them experience the spark of *FIRST* excitement, resulting in student inspiration. We engage that student in the structure of the team, leading them to be motivated and confident in themselves to a point where they will start the process again by inspiring another student. This process spreads from person to person, creating a spiral of people who are influenced. Throughout the community, this process on Skunk Works is called Inspiralation, and is one of our guiding characteristics.

1.5 *Pertinent Documentation*

The following team documents are prepared and edited by Skunk Works students under the direction and assistance of our mentors.

1. Business Plan: Provides an overview of Skunk Works Robotics, contains the executive summary of the team objectives and provides sponsorship and funding information for the team.

2. Management Plan: (This Document) The master document that defines the organization goals and implementation for the team.

3. Safety and Health Plan: Team involvement, safety analysis, hazard prevention and control, training and education, are all encompassed in this document.

4. Chairman's Award Application: Application to show we are the team that best encompasses and pursues the goals of *FIRST*

5. Bill of Materials: The final list of parts used on the Robot and their cost.

6. Part List and Weight Assessment: The list of all the parts used on the Robot and their weight

7. Driver Operation Training Plan: Processes for training and picking the robot driver, operator, and other field members

8. Scouting Plan: Defines how the team scouts other teams at competitions, pit and field also includes forms for the scouts to fill out, and sample data from scouting

9. System Requirements: Requirements for the robot defined by the Systems Integration team

10. Packing Lists: Checklist of all the tools and materials taken to competition

11. CAD Award Application: Application material submitted for CAD award.

12. Game Checklists: The pre-game checklists filled out by the pit crew previous to the robot's starting play. Each of the checklists filled out are kept in this section.

13. Lessons Learned Form: Sample Lessons Learned Form, used to provide team leaders with constructive feedback from the rest of the team.

14. Rapid Prototyping: photo copies of each large poster generated during the team's early brainstorming sessions can be found here.

15. Outreach: A brief overview of the activities our team has participated in and organized.

1.5.1 FRC

After participating in FTC to get the basics of operating on a robotics team, students at RAHS graduate to working in key roles on the FRC team. Participation in FRC gives students the experience of designing and building on a much larger scale. FRC is also more time-intensive, and requires more organization and pre-build development, giving students an experience that is more similar to a real-world situation than FTC. This real-world experience is heightened by organizing into sub-teams that specialize in specific skills. The goal is to further familiarize students with their prospective careers, allowing Skunk Works to both build a functioning and hopefully competitive robot, and allows the team to meet its goal of exposing students to real-world problems and processes.

1.5.2 FLL

Skunk Works members deploy to middle schools to act as mentors for their FLL teams, and in past years, Skunk Works members have mentored FLL teams at North Hill, Gregory Heights, Bow Lake, Parkside, Rainier Middle School, and Eckstein Middle School.

Skunk Works now hosts a series of Lego Robotics workshops at libraries for elementary and middle school students throughout the greater Seattle area.

1.5.3 Promote Community Support

In addition to getting members involved in *FIRST* and building robots, Team 1983 does numerous activities to engage the surrounding community.

Since 2009, Team 1983 has participated in Challenge Air located in Paine Field. Pilots volunteer their time to take children with physical and developmental challenges for a 20 minute plane ride around Puget Sound. Skunk Works takes our robot and gives small demonstrations as well as helps the children into the planes. Team 1983 also participates in the annual 4th of July Burien parade. Through our Business Outreach program Skunk Works presents our robotics team to over two dozen of businesses. We also host an Annual Spaghetti Dinner and Dessert Auction and invite the public to attend and show support for the team. In the summer and fall of 2014 we supported 10 King County Library FLL Workshops, 3 West Seattle Library FLL Workshops, Vintage Air (a public air show where we demo the robot), 5 Girl Scout Day Camp Robotics Workshops (teaching girls about STEM through workshops and demoing the robot), and 2 NW Harvest (packaging food for the homeless) events.

Each year, Raisbeck Aviation High School holds a PTSA Dinner and Auction. Skunk Works members volunteer their time to help with this important school fundraiser. We also take advantage of the organizations involved with Raisbeck Aviation High School such as: The Museum of Flight, Highline School District Middle Schools and Elementary Schools, and Seattle Robotics Society by speaking to them about how much *FIRST* has made an impact on the student body within Skunk Works.

All of these experiences give us the opportunity to spread the news about *FIRST* and allow us to become more involved within our community. All of these events helps our team become more involved and familiar with members of the community.

1.5.4 Gracious Professionalism

Gracious professionalism is a key component of our team, and we actively promote and apply it to everything we do. Gracious professionalism involves helping out anyone, even if we are in direct competition with them. Our team facilitates numerous events and activities to this end. We have organized, advertised and conducted several workshops for local teams, rookies and veterans alike to show how everyone can achieve success. We host an FRC practice field now at the Highline Robotics Center, helping teams to develop their robot before ship day. (Our team also helps outside of the *FIRST* community; we aid our school in putting on its fundraiser auction.) All of these efforts benefit the community as a whole, rather than just our team.

1.5.5 STEM

Science, Technology, Engineering and Mathematics (STEM) are the four areas of interest Skunk Works seeks to cultivate in its student participants. Because of their exposure to robots, Skunk Works students have a great deal of experience in these areas. Skunk Works not only promotes STEM through student participation, but also through community outreach and publicity. Skunk Works students help out at RAHS events, promoting the team and the school at open houses where prospective students come to investigate the school, allowing the school to raise funds to continue its progress in teaching students in a STEM context. We promote the same things outside of the team itself, traveling to elementary and middle schools to raise awareness of the STEM opportunities available both at the school in general, and on the team in particular.

1.5.6 New team recruitment and mentoring

In the years since the beginning of Skunk Works, Team 1983 has mentored many teams and continues to do so this year. We host sustainability and scouting workshops for new teams in both FTC and FRC. We created the Audio Visual program for *FIRST* WA. For each team that we mentor, we send a couple students to help and supervise the team, allowing the team the opportunity to ask questions and receive feedback prior to deadlines.

As for recruiting new teams to join the experience that *FIRST* provides, Team 1983 has gone to local elementary schools and hosted small classes where the elementary students worked with small tinker toys and K'Nex. At the Seattle Regionals, we encourage other schools along with our own to come and show support for our team and experience the wonders of *FIRST*. Team 1983 also spreads the news of *FIRST* to local schools to influence new teams into starting their own FLL, FTC, or FRC team.
We have already influenced many local schools into starting teams, and now we are looking into sustaining these programs.

1.6 *Prepare Students for college*

The goal at Raisbeck Aviation High School is "To prepare all students for college, careers and citizenship through a personalized, rigorous and relevant learning experience that is facilitated in the context of aviation and aerospace." Skunk Works has taken this mission into serious consideration while in the process of developing the team. Besides being committed to the team, members must also keep their grades at a passing level, a C or higher, as well as sign a code of conduct and commitment form. Team 1983 allows students to experience working within the engineering and business worlds while they are still in high school and allows them to receive hands on experience with our mentors within the engineering, technology, and business areas. Both Raisbeck Aviation High School and *FIRST* seek to provide high academic standards for students to be well prepared for college and a STEM related career.

1.6.1 Support school goals and objectives

Team 1983 provides an intense environment where students spend their whole day at school during build season for six weeks working on the robot and other related items before the bag day. And even after this build season is over, students continue to work on game strategies, fabrication of items, etc.

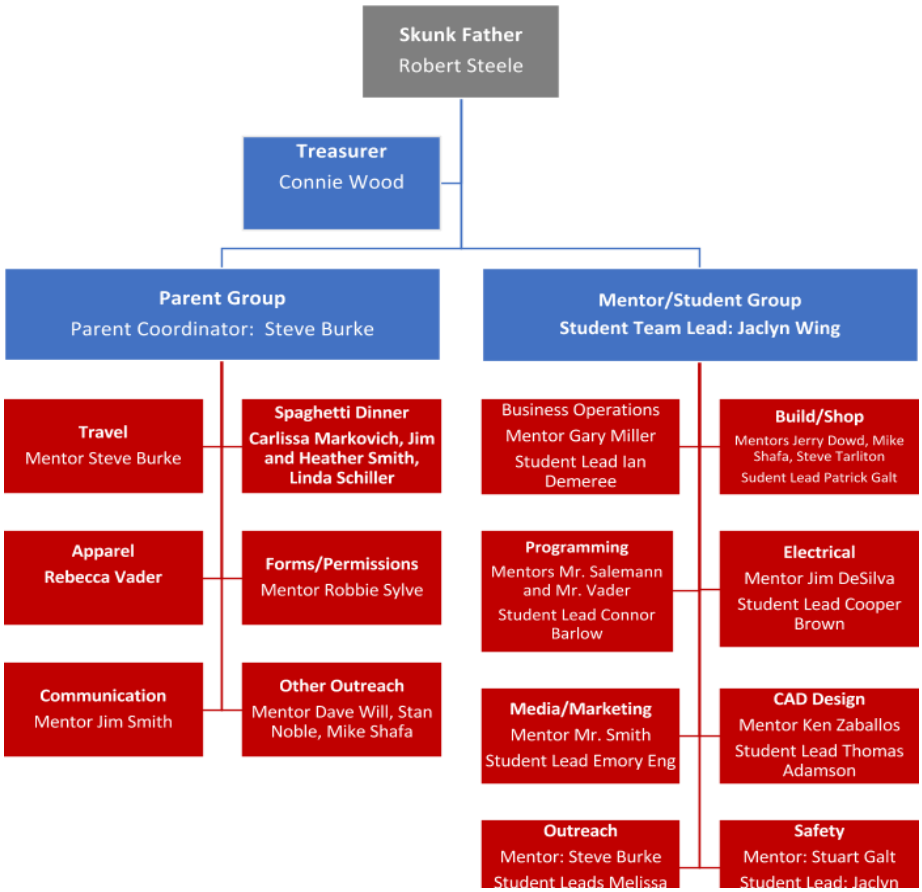
The vision of Raisbeck Aviation High School "is to be the premier public high school of choice for students in King County and the region who wish to pursue their passion for aviation and aerospace in a learning environment that prepares them for higher education, citizenship, and work." Skunk Works puts students in an environment where they can work with mentors and apply the principals of engineering to building a robot to obtain the year's objective. The goal of Team 1983 is to work with students and mentors in order to create a robot that can complete a certain task. We support the school's vision by working together as a team and showing gracious professionalism to other teams while working in a field that pushes our students to the best of their abilities.

1.6.2 Maintain student needs & passing grades

In order to be able to attend competitions, students must have a C or higher in all of their classes. Team 1983 has created study hall after school for students to work quietly on homework or other work that needs to be completed. A parent volunteer is present at Study Hall to ensure that the students are working and the room remains quiet. Study hall attendance is required to participate on the team.

2.0 Team Organization

Raisbeck Aviation High School sponsors the *FIRST* Robotics Team; the team is organized as shown in the figure below. The Parent Team manages all non-technical detail associated with the running of the team, including transportation, food, team activities, setting up fundraisers, and managing team funds. The Mentor Team aids and supports the students in all the technical aspects of the competition, including robot



design, design/build, materials, safety supervision, and award applications.

2.1.1 Student Teams

Students at the beginning of the year organize themselves into sub teams dependent on their interests. The idea behind the team distribution is to get older, more experienced students to teach the younger students about working on the team. Both groups of students learn about how to do their job from mentors who have actual field experience. For instance, the build teams are mentored by engineers who have worked on designing

and making mechanical devices for much of their careers, while business operations has professionals from the business world.

2.1.2 Leadership Team

The leadership team includes our adult leaders; our coach, mentors and parents, and our student leadership team. The students and adults work together to organize the team and help it function as efficiently as possible. They serve to identify the goals and objectives of the team and ensure follow through. The student leads, organized into 10 sub-teams, meet once a week, twice a week during the build and competition season. The leadership team is responsible for continually improving team processes, organization, and communication. One way they do this is by integrating lessons learned feedback from the team.

2.1.3 Safety Team

Skunk Works Robotics' Policy is to provide a safe and healthy working environment for mentors and team members. The team recognizes that it is *FIRST* and foremost the individual team member's responsibility to conduct their work and activities in a safe manner. However, it's understood that if the individual members are going to be responsible for their own safety, it's also the team's responsibility to train them how to work safely.

To ensure a safe environment, the Skunk Works Safety and Health Program was developed. This program consists of six elements: the coach/mentor commitment, team involvement, shop and pit job safety analysis, hazard prevention and control, training, and education. Coach/Mentors commitment is a policy statement by the coach on safety and health, provision for resources to maintain a safety and health program, and disciplinary actions for safety and health infractions. The entire team is expected to participate in safety commitments. Team safety analysis is on-site inspection of shop and pit area, and audits by mentors. Hazard prevention and control is the development of an accident prevention plan, addressing engineering controls such as exhaust and machine guards, procedures on health and safety (including CPR and *FIRST* Aid certification), personal protective equipment, and the *FIRST* team safety manual.

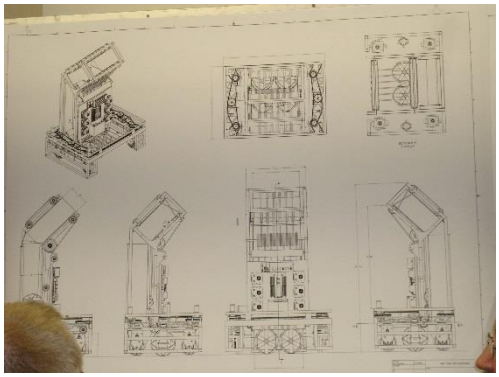
2.1.4 Electrical Team

The Electrical Team is in charge of setting up, maintaining, and documenting the hardware of the robot's control and feedback system, including all motors, sensors, electronics, wires, pneumatics, as well as the operator interface. The Electrical Team contributes to the quality of the robot and to the Innovation in Control award.

2.1.5 Programming Team

Programming is responsible for designing, constructing, and testing the code that makes the robot respond to driver commands. Design consists of finding code that will work for controlling the robot. Constructing involves compiling and configuring the code. Testing makes certain the code does what it is supposed to do, when it is supposed to do it. This is completed before the shipping date, so that all bugs are identified and eliminated from the code before competition.

2.1.6 Design/Build Team



The student Design and Build Team is responsible for the design, fabrication, and assembly of all robot components. During the design process, the robot model is generated by students with mentor guidance and advice using the CAD software Autodesk Inventor. The completed design then serves as blueprints for building the robot and an accurate representation that can be used for documentation. Upon the completion of the design, the team transitions from design to build to fabricate and assemble the robot. This integration of two previous sub-teams allows for quicker turnover times between the completions of the design to the start of building the robot. After the completion of the robot, the design team does routine maintenance throughout the competition season and major repairs when necessary.

Besides designing, building, and maintaining the robot, the Design and Build Team participates in the Engineering Inspiration Award, Engineering Excellence Award, Imagery Award, Industrial Design Award, Innovation in Control Award, and Quality Award by presenting detailed documentation of the robots design and choosing students to represent the team at competitions.

2.1.7 Marketing Team

Visibility is necessary for any team to spread the *FIRST* message to the community. Marketing maintains the Skunk Works brand by creating flyers, buttons, banners and logos as well as spaghetti dinner tickets and programs, Business Outreach brochures, and t-shirts. Marketing also maintains the team's interface with the public. The website connects the team to their sponsors, parents, alumni and fellow *FIRST* teams. With a blog and calendar of events, we keep stakeholders informed of our progress during build season and competition. Community outreach events in which the team participates are also documented on the website. Finally, Marketing maintains various content distribution channels on social media, including Facebook, Twitter, Instagram, and YouTube. Major events are documented real-time using Facebook. Various videos are posted on YouTube, including progress every 2 weeks during build season. Marketing also participates in the media award.

2.1.8 Business Operations

Business Operations writes and submits non-field related awards and develops long term goals for team outreach. One of the most important tasks the Business Operations team performs is preparing for the Chairman's Award. This includes writing the essay and prompts, developing outreach goals to best meet Dean's homework, and creating the in person presentation.

In addition, Business Operations writes and submits the Business Plan for the business organization. This plan describes Skunk Works' budget structure, mission statements and

goals. The last plan is the management plan that lays out the complete sub-team structure, the system interfaces, and deliverables. Finally, a Notebook is the compilation of all of Skunk Work's documentation. It contains documents from every sub-team for the Chairman's judges. Business Operations also competes to win the entrepreneurship award.

2.1.9 Business Outreach Team

Starting in 2012, our team implemented what we call the Business Outreach Program with the intent to engage businesses around our community and provided students the opportunity to learn how to interact with people in the industry. This sub team is in charge of organizing students into pairs and teaching them how to present effectively to businesses. We create the materials students utilize: a PowerPoint presentation, brochure, and sponsor form. We organize all of the details including who is presenting where and we follow up with the students to see progress. The student is responsible for contacting a business and scheduling a time to present. They also need to practice with their partner to prepare. The lead of the sub team is responsible for giving guidance and advice that will enhance the students' presentations. The ultimate goal is to make long term connections with businesses and engage them in the *FIRST* community.

2.1.10 Community Outreach Team

The Community Outreach team is responsible for organizing outreach events, students, mentors, and volunteers. Events include: Seattle Libraries (reaching out to 7th and 8th graders), Concord Elementary (reaching out to an underserved community), Summer King County Libraries (reaching out to elementary kids who don't have the opportunity to learn about STEM), Challenge Air (reaching out to kids who are physically and developmentally challenged), Northwest Harvest (reaching out to people facing food insecurity), Robotics School plan of spring 2015(for teachers and coaches), and Girl Scout Day Camp (reaching out to elementary girls). The lead of the outreach team is also responsible for documenting which students attend what events.

2.1.11 Shop Team

The shop team is responsible for maintaining the shop at our school. It is the shop lead's job to ensure tools and materials are in stock. The shop team works with mentors to help with the organization process of the materials and tools, and to come up with a method to safely certify all of the robotics team members who will be using the shop's machinery during the year.

The latest method of certifying students had them create an aluminum stand that is able to hold a small clock or thermometer. This project taught students over a half-dozen different tools we use in robot construction.

2.1.12 Data Analysis Team

The Data analysis sub-team is in charge of delivering and executing the scouting plan, and securing successful alliances for the final rounds of competition. They produce scouting sheets a scouting app to collect the data, the graphs to analyze the data, and the

pick list for alliance selection. The scouting work Data Analysis gives our team a competitive edge during the finals matches of competition.

The data team is also in charge of collecting and organizing Skunkworks' outreach data. In order to have a good chairman's presentation, we need to be able to show our outreach efforts. We ensure our Chairman's presentations will always be able to pull accurate and in-depth historical outreach data.

2.1.13 Video Production Team

The video production team is responsible for recording and releasing videos of the team. These videos let people who are interested in the team but cannot come to the meetings stay involved. The videos go on YouTube so people all over the world can see our team and that it does. The videos are also used to promote our teams at outreach events. Our major responsibility is the chairman's video, which is an important component of the chairman's award. Other videos made regularly are the weekly update videos, the *FIRST* Girls in STEM video, and videos to explain the game rules.

2.2 Mentor Team

The Mentor team seeks to support the RAHS Robotics students, faculty and parents in the *FIRST* design, build and competition. The mentor team consists of local professionals from the fields of engineering, manufacturing, business, and other professional fields. All mentors have background checks by the Highline School District and the Washington State Patrol before they work in the school with students.

Mentor time commitment varies greatly. Mentors may be involved in student training, and the pre-build, build, and competition activities. During the FRC design/build season, mentors are teamed with students to complete the robot in the 6 week period as well as prepare Chairman's materials. Mentors are also encouraged to participate in the competitions. Their primary function, however, is to always be teaching and ensuring the safety of student participants.

Mentors are unique in that they also make the resources of their company available to the team. These include, but are not limited to, the use of machine tools, professional machinists, and scrap materials used to build the robot. Mentors are critical in helping the students overcome barriers that they face in engineering, programming, designing, and business outreach.

Mentors are easily recruited once parents are involved. If the parents do not have the skills themselves, they often know people who do. Many people with engineering and other technical skills are willing to get involved. However, keeping them involved is more difficult. The key to keeping mentors involved is to keep it fun for them. The parents, coach, and leadership team need to recognize how important maintaining mentor interest is when keeping mentor involvement on the team.

2.2.1 Recruitment

Early in the school year supporters and parents throughout the area are asked to volunteer their time to support the robotics team. RAHS frequently hosts dignitaries from major local industries. Skunk Works presents at these events and generates interest, enticing more mentors. Mentors are in many cases the parents of a student on the team; these mentors then go back to their place of work and recruit other mentors from amongst their co-workers. In this fashion Skunk Works has built-up a considerable number of mentors with numerous areas of expertise.

2.2.2 Workshops

Mentors along with students are responsible for organizing many of the team's various workshops. Most recently our mentors conducted instructional events teaching students from Skunk Works and other teams how to assemble their kit-bot, programming, scouting, data analysis, team sustainability, and marketing. In 2014, we were selected as beta testers for the new Robo-Rio and gave a workshop on its use at the 2015 FRC Kickoff. In February of 2015 a team member gave a *FIRST* Ask an Expert online presentation on data analysis and the use of tableau software which is included in the kit of parts given to all teams. Former shop teachers instruct students on how to use shop equipment safely and mentors who regularly work on mechanical components advise students on how to construct the robotic components.

2.2.3 Judging

While helping our team go through the building process for the FRC challenge, our mentors use their knowledge to volunteer at FLL, FTC, and FRC competitions. Since our mentors have participated in and traveled to FRC, and FTC competitions, they are suited to participate in the judging process.

2.2.4 Lessons Learned

As a means of achieving the goal of continually improving the team, the mentor team uses a system of participant feedback called "Lessons Learned." This consists of each member of the team submitting comments via a form about how they think the team worked in the last season. With the accumulated input the team can determine what changes need to be made in order to make the next year more successful than the last.

2.3 Parent Team

The parent team facilitates all non-technical operational aspects of the team. Parent team task are critical and integral to the success of the team. These include working with the RAHS staff and Parent Teacher Student Association (PTSA), mentor support, fundraising, communications, travel, meals, carpooling, outreach activities, and team study hall. The parent team is made up of student parents/guardians, interested relatives, and friends. The parent team also supports PTSA functions for student experience, team visibility and coordinating PTSA/Skunk Works activities. The parent team is chaired by a parent who assigns tasks, conducts parent meetings, and coordinates communications.

2.3.1 PTSA

RAHS Parent Student Teacher Association (PTSA) provides parent volunteers and leaders, business contact resources and finance for the Parent Team. PTSA processes are used for management of funding, audits, and its non-profit affiliation to enable donations for tax purposes. During our *FIRST* year, PTSA heavily funded RAHS Robotics and continues to provide volunteers and funding.

An RAHS PTSA representative is selected from the parent team. The representative maintains good relations with the RAHS PTSA, communicates the benefits of *FIRST* robotics to the school, and volunteers team staffing power for PTSA events.

2.3.2 Accounting

A team mentor is designated as the team treasurer who is also elected as a PTSA treasurer to enable smooth processing and record keeping of team funds. The treasurer confirms all reimbursements and transactions with the coach, as well as maintains the status of the team budget. They also keep track of various accounts and maintain records of names, donation amounts, addresses, and tax form requests. The treasurer supports the students in all of the fundraising.

2.3.3 Communications

Communications is a critical component of the team. The parent team fulfills this with the Skunk Works weekly team update email, parent meetings held monthly, updates to the entire RAHS student body through the weekly Notice to Airmen (NOTAM) as needed, and activity participation and surveys handled through the team Groupspaces account. Every team meeting opens with an informational update to team members and external communications are handled through the Marketing sub-team.

2.3.4 Travel

To assure all students can participate equally in the competition events, the parent team coordinates travel and lodging costs for the students from the team funds. Travel arrangements include choosing the hotel, arranging team meals, carpools, air travel, and team meetings during competition.

2.3.5 Study Hall

RAHS academic requirements are an important aspect of being a member of Skunk Works Robotics team. We prioritize academic performance above robotics activities.

Study Hall is a critical aspect of maintaining student academic standing. Study Hall is held four days a week for a couple hours after school. Students are required to attend Study Hall two days each week during the build season. Parents donate their time to chaperone Study Hall to ensure students are on task.

With a heavy workload from school, this time allows students to finish their assignments and prevents distractions. Being a member of the team means teamwork. Each student has to make an effort; study sessions allow the students to do their part to keep their grades up and keep their teachers happy. Although robotics is treated like a class, the other core and elective classes take priority.

2.3.6 Student Code of Conduct

To make sure expectations are clearly outlined for both the students and parents, a RAHS Skunk Works Student Code of Conduct is created by Coach and the Student Team Lead. The document highlights the expectations of each student on the team and what is appropriate conduct both at meetings and at competitions.

2.3.7 Resources

The most important team resource is its parent volunteers. Parents are committed to helping their child get the most from the *FIRST* experience, and are willing to assist the team in many capacities. Parents also bring friends and acquaintances in as sponsors and mentors.

Getting volunteer support from parents can be challenging, since many families must balance their time and financial commitments, they may not be able to donate time or money.

Skunk Works is lucky to have the high rates of parent participation. At Raisbeck Aviation High School, which draws from a middle income district, approximately one parent for every ten robotics students is an active participant, attending nearly all the team meetings and accepting major assignments. Approximately another four parents for every ten students will be supporters, attending an occasional meeting and accepting small assignments. These are rough estimates based solely on Skunk Works' experiences; the demographics of each team will vary greatly depending on its situation.

To attract, maintain and motivate supporters, team parents must be informed of the value of *FIRST* and the value of their time. Here are some key methods we use to help parents become involved:

We established an email distribution list and now send emails out frequently about the team. Parents and students are used to reading the emails and we have parent leaders prepare their own emails to continue dialogue and convey team information.

We hold monthly parent meetings to update the parents on the happenings within the team. In the meetings we discuss the team successes, talk about what their children have been working on, update the parents on the schedule, and show them what we need from them as well as the importance of their support.

We seek opportunities to include parents in team events to help break down any perceived barriers to communications between parents and the team leaders.

We identify tasks for parents that will best fit their lifestyle. We try to avoid giving parents large or complex assignments before they are ready and willing.

We choose the lead parent and lead mentor. These people, along with the coach, become the conduit for communications and decisions for the team.

We include active parent volunteers in the leadership team decisions. When parent volunteers feel they can affect the direction of the team, they will be more interested in getting involved. This makes the team more self-supportive as parents help define the team direction and get more involved, bringing in other parents, their friends, family, neighbors and other acquaintances. This is critical to sustain the team as well.

A lead mentor or lead parent with program management experience can focus on running the leadership team and maturing the team resources.

2.3.8 Team Goals

Parent volunteers are key in establishing, growing and maintaining a team. Every team will evolve differently depending on the support and skills of their volunteers. More and more businesses understand the benefits of *FIRST* in regards to their employee development, employee's children, communities, and future workforce, making recruiting mentors much easier. Table 4.3-1 shows possible team goals based on volunteer resources. This table will vary significantly based on the skills of any given volunteer, but is useful to exemplify the decisions regarding team goals.

Table 4.3-1:

1, 3, & 5 Year Plan			
Sustainment	**1**	**3**	**5**
Continue to do business outreach, but make an effort to have them come to competitions	Build and expand business outreach, create extensive documentation on how the process works	Launch Fund *FIRST*, Bring in a huge national *FIRST* sponsor and document process	Work with *FIRST* to identify and bring in high profile companies as sponsors
Continue to do outreach at schools and address students as a core stakeholder group	Work with Highline school district to ensure robotics programs in every school	Approach other school districts with local *FIRST* teams in order to get district wide acceptance	Work with legislature to better support STEM education and get sizeable grants toward education
Ongoing dialog for lessons learned, supporting broadcasting	Develop and research signs of a potentially non-sustainable team by working with *FIRST* to gather data	Create alert system and safety net for potentially non-sustainable teams	Create alert system and safety net for potentially non-sustainable teams
Develop new outreach programs and write plans on how to do them	Get several other PNW teams to join us with our outreach and to adopt our fundraising model, develop plan for giving it away	Have nationwide use of fundraising plan and region wide joint outreach	Have another team help us and take over every single outreach event we currently do

In addition:

- Coach provides authority, leads team, interfaces to school and PTSA.
- Parents become volunteers, create/staff the organization, acquire funding, attract mentors, and communicate leadership which establishes objectives and benefits which attracts more parents and volunteers.
- Mentors provide skills, acquire support resources, and implement team technical objectives.

2.3.9 Fundraising

Fundraising is a very important aspect of running a *FIRST* team. Fundraising starts with getting robotics parents involved. Although they may not have money, they can volunteer time to help fundraise or connect with people that can donate. It is also important to keep your whole community in mind: all the students, teachers, parents, businesses in town,

parents businesses, and all the *FIRST* teams. Reading outside local community to get to a broad base that includes higher income sources.

The following are fundraising strategies that our team has used in previous years and continues to use:

-Business Outreach: Students reach out to businesses for the opportunity to present information about our team in the hopes that they will donate to our team. A pair of students will give a direct, formal presentation to business owners and managers.

- Spaghetti Dinner: The team holds a spaghetti dinner and dessert auction during the pre-season. The team invites the whole school, other robotics teams, family, and friends. The team can ask local restaurants to cater the dinner or have their parents prepare it. Parents, teachers, students, and local businesses are asked to donate desserts. The team sells dinner tickets and then serves dinner buffet style for a reasonable cost. The desserts are sold during the auction.

- Grant Writing: Several companies will offer grants to a non-profit organization. These have the potential to be very successful, but are usually temporary. The internet is a readily available resource for researching which companies offer grants.

- Corporate Matching: Some companies will match employee hours volunteered to a non-profit organization with a matching donation to the organization. Ask parents to check with their employers to see if their company does corporate matching.

- Letter Writing: Students can send letters asking for donations to family members, friends, and anyone that the student is in contact with. A form letter is prepared and given to the students who then add a personal note before sending it out to close family members, extended family members, professionals they know, and professionals that their parents know. Students keep track of where the letters are sent so that after the season is over, they can write thank you letters.

Management Plan Revision Sheet

Revision Numbering

Below is a chart of the revisions of the Skunk Works Management Plan. Starting with Rev 7.1, the business operations team implemented a new numbering system. The *FIRST* digit of the revision number is the year of the team. Since the Ultimate Ascent game is the seventh year of the team, all revisions made within this season will be 7.XX. The two X's in this number are the internal edits, meaning that every time an edit is made within the same season, the X counter will increase. For example, reversion number 2 of year seven would be 7.2, and revision 13 of year 8 would be 8.13.

Rev #	Changes	Author	Mentor	Date
Rev New	Original Document	Cole M	Gary M	1/18/10
Rev 1	Updated for this year, added summary for 2010, added Team Competition History	Drew W	Gary M	1/10/11
Rev 2	Added Web/Marketing Teams, Outreach under SI Team, added Alumni Sheet	Drew W	Gary M	1/16/11
Rev 3	Names of Robots, formatting, added corporate matchmaking, added rev sheet	Drew W	Gary M	1/27/11
Rev 4	Additional Formatting, added colleges for the class of 2010	Drew W Lydia J Roxie R	Gary M	1/29/11
Rev 5	Added colleges for class of 2011, new students, and Team Competition updated, all other sections updated and revised, additional formatting	Grace C	Gary M	3/5/12
Rev 7.1	Sections up to 3.5 edited, New numbering system implemented	Morgen S Ian G	Gary M	10/3/12
Rev 7.2	Finished editing the document for grammar and phrasing	Morgen S.	Gary M	10/18/12
Rev 7.3	Added the History of 2012 in section 4.4. New numbering system created. Implemented starting with Rev 7.1	Ethan H	Gary M	2/23/13
Rev 8.1	Edited the document for grammar, phrasing, accuracy, and pertinence to team modifications. Updated any old information.	Ethan H	Susan H	12/28/13
Rev 8.2	Inserted chairmen's message into the plan	Ethan H	Susan H	1/14/14
Rev 8.3	Reformatted Front Page, incorporated edits	Garnet S	Susan H	
Rev 8.4	Updated out dated information, Re organized the sections, and annexed (former) section four to Appendix A.	Ethan H	Susan H	1/21/1014
Rev 8.5	Updated master schedule, updated marketing summary	Ethan H	Susan H	2/24/2014

Rev 9.1	Updated whole document for this year.	Ailis W	Sue E	2/3/15