Game Design Challenge Finalist Team 1619

Team Name: Up-A-Creek Robotics

Location: Longmont, Colorado USA

Game Name: Air Affair

Game Overview:

Buckle your seat belts and secure your tray tables: Air Affair blends robotics and aeronautics by presenting a birds eye view of the intricacies of air travel to a wider audience. 1619 team members with enthusiasm for aeronautics combined their passions to create this game which they hope will inspire others to climb aboard the exciting and detailed world of the aeronautics industry.

With the clock ticking, Ground Crews rush to prepare the airport for operations before time runs out! Two alliances of three teams each play Air Affair in a 72' by 30' Arena on a 54' by 27' field using standard FRC rules. Each Drive Team, or Ground Crew, is composed of two Robot Operators, one Human Player, and one Coach. Air Affair utilizes three differently sized game pieces for scoring throughout the match; Transmissions, Baggage, and Indicator Cubes. Throughout the match, robots may control up to one Transmission, one Large Baggage, and one Small Baggage at a time, or one Indicator Cube. Robots incur 6 point Fouls or 30 point Tech Fouls for miscellaneous rule violations. Points generated by fouls are added to the opposing Alliance's score.

Each match is 2 minutes and 30 seconds long, starting with a 0:15 preprogrammed Autonomous Period. Ground Crews take control of their robots for the remaining 2:15 Teleoperated Period, which includes a 0:30 endgame. The Alliance with the highest score at the end of the match wins.

To begin the match, robots must be contacting their Alliance's Initiation Line and may preload one Transmission and one piece of either type of Baggage. In Autonomous, Robots who cross the Auto Line earn 4 points and transmitting to the Control Tower or placing Baggage in Stowage earns double points.

During the Teleoperated Period of the match, teams collect Transmissions and Baggage from the field or Alliance Loading Stations. Placing Baggage in Stowage earns four points. Robots earn four points transmitting in the Low Goal, six points in the Mid Goal, and eight points in the High Goal. During qualification matches, transmitting twice into each of the four Alliance goals located on the Control Tower earns the Alliance one "Establish Communication" Ranking Point.

In the last 30 seconds of the match, teams race to populate the Approach Indicator with four Indicator Cubes matching one of six randomly assigned patterns. With 30 seconds remaining, the color pattern is displayed using four colored lights on the Control Tower, visible to Ground Crews, and on flashing LEDs surrounding each scoring position on the Approach Indicator. Human players may now load colored Indicator Cubes onto the field and into robots through Alliance Loading Stations. Robots then place Indicator Cubes into the color-coordinated slots on the Approach Indicator. Each correctly placed Indicator Cube earns 4 points. Populating the correct pattern earns the Alliance one "Approach Indicator Pattern" Ranking Point during Qualification Matches or a 40 point bonus during Elimination Matches.

Describe Notable Field Elements:

The Control Tower (Supplementary Information, Figure 1.3) is a 9ft tall, octagonal tower centered on the Field. Each Alliance's four, 16" circular goals are situated on the three faces of the Control Tower facing their Initiation Line. Goals are surrounded by Alliance colored decals and an LED ring in the Alliance's color, used to indicate progress toward the Establish Communication Ranking Point. Each LED Ring begins flashing when one Transmission is scored in its goal and becomes solid once a second is scored. There is a 2" by 6" vertical strip of Retro-reflective Tape centered vertically on the sides of each goal for Robot alignment. The Approach Indicator Pattern Display, a row of four, square lights located under the

High Goal, communicates the pattern that must be matched in the Approach Indicator to the Ground Crews.

Stowage (Supplementary Information, Figure 1.4) are rectangular containers located inside the Center Zone. The Stowage frame is colored to indicate Alliance ownership. Each Stowage has a raised 72” by 12” frame and net, called a Stowage Net, used as a backboard for Baggage scoring.

Approach Indicators (Supplementary Information, Figure 1.2) are 3ft tall structures spanning each Alliance Wall. Each of the four scoring positions are 16in square openings in the front face of the Approach Indicator. When 30 seconds remain in the match, LEDs bordering each Approach Indicator opening begin flashing, indicating the randomly assigned pattern, until the correctly colored Cube is placed. When placed, the LEDs become solid until the match ends.

Loading Stations (Supplementary Information, Figure 1.5) are located on both sides of each Alliance Wall. Loading Stations feature a Tunnel and Chute, both with 18” square openings. Inside the Loading Station, Transmissions are kept in a 25” by 65” Transmission Storage box.

What are robots expected to do?

During the 15 second Autonomous Period, robots start on the Initiation Line and can cross the Auto Line. Robots can preload one Transmission and one Large or Small Baggage. Robots might pass preloads from robot to robot, or may drop their preloaded game pieces so Alliance robots can pick them up. Robots can collect Transmissions and Baggage from the ground. Robots can transmit into the Low, Mid, or High goal when fully inside the Center Zone, and score both types of Baggage in Stowage when breaking the plane of the Stowage Zone. Robots should be careful not to cross the diagonal Center Line in Autonomous.

During the subsequent 2 minute and 15 second Teleoperated Period, robots can continue transmitting to the Low, Mid, and High Goals of the Control Tower when fully inside the Center Zone. Robots are expected to shoot into the Mid and High Goals, but could place or shoot Transmissions into the Low Goal. Robots may transmit from the triangular Communication Zone to protect themselves from defense. Robots can place Large and Small Baggage in Stowage when breaking the plane of the Stowage Zone. Robots may place Baggage carefully to maximize space, or may quickly toss them in. Robots may collect Transmissions placed along the Initiation Line, or Baggage placed along the Field Wall. Robots can collect Transmissions and Baggage from either of two Alliance Loading Stations, through the ground level Tunnel or 30” high Chute. Robots may play defense against the opposing Alliance. Air Affair encourages defense outside of protected zones: Teams should expect their robots to undergo significant wear throughout the course of a competition. During the 30 second Endgame, robots may collect Indicator Cubes from the Loading Stations to populate the Approach Indicator, matching the randomly generated pattern.

Did you use the Game Design Challenge Element in your concept?

Yes

If yes, how?

Air Affair utilizes Fehr Bros Industries Chain (PN EGSLC2-0). Chains are used in Control Tower Goals to absorb the energy from launched Transmissions at any trajectory. Five (5) Chains are hung in a row inside the Control Tower perpendicular to the Field, 12 in. from the front face of the Low, two Mid, and High Goals. Each Chain is 16 in. long and positioned 4 in. from center to center to form a curtain of Chain.