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Adopting Unmanned Flight Operations into Controlled Airspace

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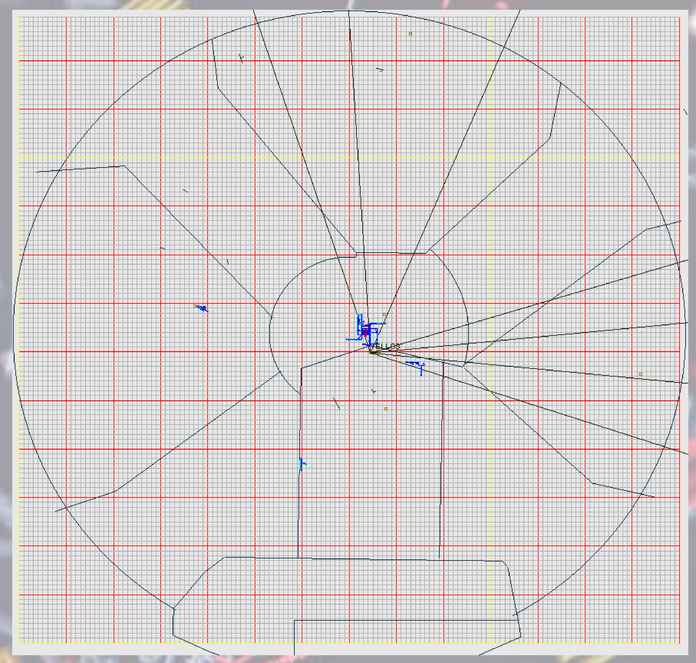
Abstract

- Unmanned aircraft activity is becoming more common within the National Airspace System (NAS) and is expected to dominate the NAS in the near future. Specific procedures for adopting unmanned aircraft into the National Airspace System (NAS).
- A variation of the Military Grid Reference System was developed and digitally overlaid onto the radar display. To incorporate this grid system, a customized flight plan database was created for the storage of operator submitted flight plans. Instead of verbal communication, a computer chat system is used for communication because of the low altitude operations in the field.
- The Federal Aviation Administration (FAA) has made UAS integration a top priority as they projected that the UAS market will reach 7 million systems by 2020. The JUAT is in the process of developing a conclusive solution that will help to safely adopt UAS.

Obstacles

- When testing and designing the ER:GS the JUAT used a radar simulation program called SimScope, created by Metacraft Systems. In order to display the grid on this program every point had to be converted to decimal latitude and longitude and converted to degrees minutes seconds. This was one of the easier obstacles to overcome and an Excel Spreadsheet was created to convert all of the data as required.
- Because the ER:GS is a proprietary system, a custom flight plan database and server was required to contain the filed flight plans and display them to the pilots and unmanned controllers. The JUAT created custom software that does all of this and additionally plots the currently claimed keypads on SimScope.



Grid Reference System

Also known as ER:GS

- Because it is difficult to understand latitude and longitude quickly without using the system extensively, the JUAT developed a custom version of the MGRS for use in simulations. This system uses a series of numbers to identify boxes of airspace. For example: 1A AA 69 62, KDEN Runway 7 numbers
- 1A – 1 Grid Zone equal to 1000 square km
- AA – 1 Grid Pad equal to 100 square km
- 6# – 1 Keybox equal to 10 square km
- #2 – 1 Keypad equal to 1 square km

Conclusions

- The FAA expects about 7 million UAS devices to be sold by the 2020. With the vast increase the research done by JUAT has only began to develop what will be an efficient and safe system for UAS. With our basic simulations we found that we were able to effectively separate UAS and communicate with ATC.
- Use of the ER:GS made it easier to use than latitude and longitude. Because each keypad is 1 km it made it easier to grasp distances and locations quicker.
- The use of our own software, designed from the ground up to integrate with our system, helped us fully understand how we could work within our system. Creating the system with pilots, student controllers, a flight service expert and professional UAS operator helped create an effective research and training environment.

Next Steps

- Moving forward the JUAT would like to explore how emergency situations could play a role in the unmanned air traffic system. When a UAS looses communication with their base station, the system will return via a lost link route. Simulation of these scenarios could lead to more discovery of weaknesses and strengths in our system.
- To make the ER:GS system easier to use for pilots and controllers, the JUAT would like to label the grid lines having the labels move dynamically when the controller scrolls or zooms in or out. This would make it easier to identify each box quickly and easily communicate between controller and pilot.

References

Military Grid Reference System (MGRS) 1km Polygon Shapefile (.shp): Downloads.

United States, Department of Transportation, Federal Aviation Administration. (2017). FAA Aerospace Forecast.