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Hello everyone my name is Becky -- and I am with NASA headquarters at Washington DC and I want to thank you for coming. We would like to have a viral conversation between NASA and JAXA . We have two young researchers, from air traffic management. We will have a discussion, on how the young researchers interact with each other. We ask that you post your questions in the chat, and I will monitor the chat.

Today, we have that director and deputy director. And they will introduce them selves. They will be on the telephone and they will speak later. Right now, we have Dr. Johnson. Before we'd be dead, -- before we get what you like to introduce yourselves?

My name is [Indiscernible] and I am in charge of the international [Indiscernible] . We would like to propose the opportunities in the work environment. This is a new attempt for us. But we do believe this is going to be exciting. Especially for the young researchers. And we hope we have a good discussion. We do have two presenters. They will give you a presentation server. -- soon. We also have the director of [Indiscernible] . We have Dr. [Indiscernible] , who is the director for JAXA .

Thank you.

This is John, I just want to let you know that I am online. And I look forward to your presentation at the discussion -- and the discussion that we will have tonight.

Today teleconferences going to be recorded. This is audio, visual and also the chat. Please feel free to type in your question in the chat feature at any time. And I will send out all of this information and with that I would like to introduce, Dr. Marcus Johnson.

Thank you, Rebecca. And thank you to everyone for having me speak today.

We should be able to see you on the camera but let me figure out why it is not working.

There we are.

Let me give you control.

Thank you.

My name is Marcus Johnson and my area of research is integration [Indiscernible] this is a remotely piloted vehicle. This is a low care definition.

I will try to speak through this as best as I can. The title of my talk, characteristics of a well clear definition and altering criteria for encounters between and manned aircraft in class aerospace. We want to focus on the structure and we want to look at the attributes for the unmanned aircraft. We will talk about the research and the motivation. We will talk about the simulation. There were two different analysis that were conducted. I am providing, Limited results -- and the second analysis we are looking at evaluating a learning criteria. And looking at the characteristics around learning at wet point -- and what point with the pilot had to do a maneuver. Please let me know if you have any questions. To motivate this problem, we have the underlying assumption that [Indiscernible] . Air traffic -- control are separating two aircraft. This is the underlying assumption. What we have in terms of separation provision -- we have several different layers. One is strategic conflict management. That is the structure air space. Separation of probation services. This is a radar separation. And then you have to sell separation -- self separation. This is to avoid collision. When we start talking about applying these rules to the UAS Wii no longer have the pilot on board. So it does become more complicated especially when we have this requirement 119. This is to avoid seeing -- seen aircraft. We had instrument flight rules and we also have the aircraft that are operating under [Indiscernible] . And this becomes complicated because these vehicles are not getting separation vehicles from air traffic control so separating these two vehicles mainly relies on the L separation -- self separation. These are the ones that carry a trance -- transponder. And this will pose a complication. Creating a surveillance -- and I will get into that with the next flight. We are focusing on aircraft that carry a transponder. This is cooperative vehicles. A little bit of background. As I mentioned a man aircraft, they have the pilot looking out of the car -- cockpit. And then the collision avoidance. When we translate this over to unmanned systems, now we have this detect and avoid collision avoidance function. This might be T-CAPS or something along that line. And the analysis that we are doing is looking at the boundaries. Prior to running into a collision avoidance area. The underlining mantra, when you are in a situation you have to be well clear of other aircraft. The second analysis that I mention, is that boundary of self separation. When do you will alert the pilot, so they are clear of other aircraft? We can get into analysis number one which is characterizing encounters as well clear boundaries. Investigate implications of using well clear definition proposed by the community. And there is one definition that has been accepted by the community. And we are looking at the implications went surveillance. Furthermore we will be looking at the metrics related to the rate of loss of flight hours. And this is being developed, [Indiscernible] as well as looking at the encounter characteristics at the loss of well clear [Indiscernible]. This is an overview on how we set up a simulation. This is a US national aerospace platform. It will simulate all aircraft flying in the continental United States. This is a agent-based system so we can attach different attributes. There is a flight plan and procedures. This platform is very powerful. And for the simulation prep -- platform we developed UAS. We also have models, profiles -- by enlisting subject matter experts. To come up with a set of proposed missions that would ideally be operating in the future. This is based on aerial defense data. This is the flight data that we currently have today. This came from our military radar across the continental United States. And it ranges from 700 feet to 30,000 feet.

We will look at the metrics. We will run a simulation and do the analysis. We will do several days of the simulation. And we will use a day of traffic. We will produce the results. And we will put all of the statistics together. Well clear is based on three different definitions or criteria -- we start with the horizontal plane. We have a physical boundary around the aircraft and this is the modification. This is called a threat boundary. And then there is a time portion. And that time portion is calculated is a range over range calculation. It is dictated by from [Indiscernible] . If it is less than a threat threshold, that criterion has been met. Then we do a production -- [Indiscernible] relative state. The range between the two aircraft predicted is less than the value of a horizontal [Indiscernible]. Now it is broken into two pieces. This is similar to their range over range rate with altitude separation at horizontal separation. And there is a physical separation, where the current state is less than the threshold. And if that is met, you have a well clear. There are 24 different simulations. One simulation run is a single day in the US national aerospace system. It is a total of 18,000 flights in the data set. Geographic areas across the US. We also have VFR traffic. This came from the defense radar data. And it was a total of 24 days. There is no separation dedication. And this is collected for UAS versus VFR. Now we can get into the results. The first result was a rate of loss of well clear. This was accepted by the US community.

It has a lower vertical aspect. And the second definition does not have back vertical closure rate. And the third definition is the one that was accepted by the community and that was separation between aircraft. Which is typically 500 feet. And if we look at the plot dust you can see -- and now you can see there is not much variability. These are four different months. We do see an average, one was for a flight hours. And this is loss of well clear per flight error -- hour.

And this is due to the threshold volume. Jumping into heading and distance. And what we see here is 180 anti-intruder would be a head-on intrusion. This comes from 99% of the data. And 99% of the data would be contained [Indiscernible] . Then we have a three different definitions. The one clear thing that we can see, the encounters that happen more with head-on -- and it is with in more nautical -- four nautical miles. This is the last plot. We are looking at the third definition as I mentioned that was accepted by the community. This is the range rate versus separation of loss of [Indiscernible] . On the right we have the frequency. The line -- this corresponds with [Indiscernible] what I mention -- which I mentioned was range over range. We can see cases under in this area correspond to the high range cases. And this is important to know. Because using this definition, and some people in the community propose just using a standard spatial separation just like air traffic control does. And to wrap up, this is corresponding to late mover with intruders. And this is the modification boundaries. And they correspond to aircraft that is actually diverging. What is happening is the definition of the metrics within UAS they are descending to the backend of the boundary. And this is important, because in some cases this might be acceptable for that air traffic controller. The results indicate, once every 40 flight hours, there is an unmitigated loss of well clear. Head-on encounters occur in further surveillance ranges over taking encounters. We recommend that you have the time and definition -- and having a minimum for or five -- four or five [Indiscernible] clearance.

Thank you, Marcus. I do not see any questions in the chat, but if you have a question for Marcus please start typing.

I am not seeing anyone typing.

Marcus, thank you for your presentation. I also want to let everyone know that all of these presentations are going to be archived in a PDF form.

And with that, we are going to move on to Andrew Cohn.

I will let you take it away.

Thank you.

Hello my name is Andrew Cone. My talk is on a researcher's perspective on function allocation and its application to air traffic management. Most of my talk is going to discuss why we are doing this allocation. And what are we looking at -- because I as a researcher can see the problems that we are running into.

To start when, I am going to tie this to a concept that everyone is familiar with. This system is human [Indiscernible] and the air traffic controller's job is to make sure that there is proper separation between aircraft. We are going to run into a situation where the controllers can no longer do that. Because there is a limit to how many aircraft a human can control. Now we're turning to automation. Technology enabling. This is to enabling continuous approach -- and efficiency of the heraldic -- efficiency of the arrivals.

These algorithms, have the underlining concept of operation. You can map this access -- axis of human control and [Indiscernible]. There has been a lot of work in function allocation. They have been looking at bearing portions of the concept by moving certain functions -- having a mixed mode operations. How much automation should be involved? Before it is too distracted? These are all questions that we have looked at in the past. And each of these concepts can be broken down into individual concepts. All of these functions can be moved to a different portion of this axis. So what is the problem? For all of the research that we have -- one thing we do not have is the overall design or what it looks like. If you wanted to move an arbitrary object to a arbitrary location. What would the potential cost, what is the [Indiscernible] and these are the questions that we do not have answers to . We are talking about the overall system. And this is important if we want to make changes to how we operate. Having a good understanding where all of these functions can go to all of the strength and weaknesses. For the research that we are doing right now, we are saying that all of the necessary functions comprising separation assurance system and how and where should the function be performed? The current research goal. Make recommendation about the allocation of separation assurance function in the future for NASA. It does not have to be something for the whole -- for every situation. And this is a large problem and we broken into six questions. We have six for the ground performance and four on human performance. Each question is being addressed by each researcher and we had teams here at Aims and we have a team and Langley. And this can also be used as a reference. And this is my high level overview. We are looking at surveillance, arrivals, Albright -- we are looking at the impact of weather. On the human side, control separation assurance function. How do we transfer responsibilities?

From a researcher's perspective looking at this overall goals, we have taking the in mind. These are the recommendations. And this is relatively fresh. To make a recommendation a broad knowledge bases needed. When we have studies that have various [Indiscernible] . Just because there are so many variables that we are looking at. Some variables are contiguous and others have a specific settings. This is important because we are rolling this into recommendation and a reference material and we need to understand how to attack each problem. And if we can get this into a format -- that we can consolidate. And identifying meaningful results can be complicated. As a researcher I have been here for about seven years, this is the first time I had to approach a problem in this way. We do not care about the numbers themselves -- what we are interested in the variables in the key characteristics. And I will go over two examples that we have been working on. This is currently being worked on at Langley. How does surveillance, flight state information and trajectory and 10 quality affect conflict detection performance? They are looking at the quality and content -- about the performance differences. Quantity of intent. How much of your flight plan argue sharing -- are you sharing? Is it enough to get them information. There are restrictions and I will talk about this later. On the quality of surveillance data. How well do you know the aircraft positioned? -- position.

How well do you know what fits in your system? Do you have a layer safety system. Your surveillance range, it might be hardware limited. It also might be limited because of the bandwidth. What about the conflict detection time? In this example being you have -- we have state information and the cycle rate -- look at the predicted time horizon and track alert rate. The other thing we want this information to be used for -- how sensitive are these parameters to your false a rate -- falls alert rate? Which is more sensitive? Now we have nonparametric study examples. What is the effect of the level of coordination during arrival merging and spacing on schedule conformance and stability? Conflict detection and resolution carried out by automation for this study. Multiple variables for dissected -- discrete setting. The intended output. What we are interested in is -- configuration. As this man tested -- and has this been tested? This is stuff that we do before we start any research study. But the differences, in this particular case, we cannot do this before the simulation. The range of conflict that we are testing -- [Indiscernible] . This is difficult to design a simulation that will give you a fair comparison. We need to identify which characteristics point to this as a simulation difference or we can take a better advantage of the simulation. And what is left over? To give you an example. If you have a concept A with a delay maneuver of 40 an concept B has 65. There could be a difference because of the simulation. What was the restriction? What was your speed constraint? And how do you enforce those? And how to take advantage of the simulation architecture? This points to a functional difference. And this is what we need to hold on -- look at. This is the actual delay. We had a tools -- tool responsible to meet the schedule. We need to understand why are these points in different locations? For example this algorithm -- [Indiscernible] and these are things that we were able to address it in a simulation. And then we can make changes with the -- with our algorithm. We have cases like this. And this is an interaction problem. They -- The tool cannot meet the schedule. We are going to change the code and do this experiment. We are trying to understand, where are the root causes of all of these differences? And see if we can nail this down. To give you a summary. The goal of current function allocation research is to explore the design space of future separation assurance system and provide recommendation. We want to make a recommendation on what the future airspace should look like in terms of function. And if you want to move functions around what are the requirements. We broke this down into 10 questions. We want to separate the characteristics as much as possible. We are not interested in making recommendations. It needs to be presented in a way that [Indiscernible] . We do have different groups working on this. We had people working at Aims an Langley. -- and Langley. And if something changes you want to move the airborne [Indiscernible] . And if you have any questions I will be happy to take them right now.

Thank you so much Andrew.

I do not have any questions at this point. I do want to make sure I have plenty of time for our friends at JAXA . I'm going to give them a moment.

Thank you so much for your presentation.

[Indiscernible--low volume]

How do you filter the requirements? What about the range?

Part of what we are doing, we are leveraging from the tools that we already have. We have a tool that we were able to work with -- and Langley has their own simulators. They had once that are simplistic and once that are significantly more detailed. We have done a lot of research. We are looking at what is available. How much fidelity do we actually need? And which of the variable test set are closest to meeting those needs? And make modifications to those test. We are trying not to design a simulation test from scratch.

Thank you.

Do we have any other questions from JAXA ?

I have one question.

What type of UAS model did you use in your simulation?

There are basically nine different missions that we used in the simulation. We expanded this to 18 different missions. Some of the missions in terms of their objectives -- were things like carrying cargo or flood mapping or monitoring. Or even things along the line of border patrol missions. There were a variety of missions. Some of the characteristics in terms of a flight pattern, are a radiated grant. -- grid .

We also continue point to point mission. And the Rangers -- and the ranges of the aircraft sized, very. -- varied. There was a variety of traffic. Anywhere from 20 missions and a to one a day.

We solicited -- from [Indiscernible] which is a company that is contracted under NASA. We also used subject matter experts.

Do you see any difference [Indiscernible]?

There is some difference in the axis. It had a lot to do where the mission was flying. Things like the border patrol, is not going to interact with a lot of traffic. Their traffic is shorter in nature. And the hope is that if we produce a lot of different missions that have a lot of different characteristics in the airspace -- and we do this with many days of traffic. It will be somewhat representative of what would happen [Indiscernible] and there is some sensitivity to the mission and where the traffic is. The thing that we did not want to do is put the mission in where the traffic is. We analyze what type of encounters that might happen. And again this was normal traffic patterns.

[Indiscernible -- heavy accent]

We actually had a follow-up study. This included cooperative and not cooperative. And we looked at the characteristics on both of those. The overall trend and the geometry tends to be consistent. The range in which the aircraft encounter is closer with not cooperative -- [Indiscernible] and we do see differences. A lot of times we separate those two analysis for that reason. When they detect and avoid system you would have a sensor.

Thank you Marcus and Andrew.

At this point we are going to transition over to the young folks at JAXA .

Thank you.

The first speaker is Dr. Andrew Rhianna.

Today I am going to talk about disaster relief operations. I will be talking about planning can improve the overall efficiency. We happened developing a system for diaster relief for quite a while. The basic requirements, efficient monitoring. Based on this available information you need to plan and execute your rescue mission as quickly as possible. I will not go into the specifics but I do want to mention, this is the first triad -- tryout for manned aircraft and unmanned aircraft. After the analysis, [Indiscernible] . This system of -- has three parts. Here we have information, planning and operation. I am going to focus on the planning section. The development of every [Indiscernible] , had different participants. We do have a lot of collaboration already. We have been working with other organizations and at different levels. What should the system do? What are the requirements?

We had been trying to filter the basics. Right now there would be no infringement for safety. We have to have a safe and efficient operation for a disaster. As mentioned in the previous presentation you have to make sure you cover as much as possible while keeping it doable. And we need to demonstrate against it works. When it comes to disaster relief, -- there is view automation processes. Here we have a simulation. You cannot to employ 100 helicopters in a single disaster drill. In the trail we verify, -- in the drill we verify all of the information. This is a screenshot of support decision-making system. As I mentioned before, we did rely on other partnerships. Because we do have a lot of people using the system. And if it is not accepted all of this research would be in a -- vain.

We have been working to solve how to handle Petri of genus -- heterogeneous vehicle.

We start with a completely unknown place. This place we are going to call, quality one. These are the search options that we can use. Then we have the plying section. -- flying section.

These are areas where people need emergency rescue. Then you have quality of life level III. You have to deliver good -- goods.

This is right after the Japan earthquake margin of 2011. -- March of 2010 There

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And here is a flow chart on what we do. Level number one, we do not have any information about the disaster area. Then you can identify the rescue area and where rescue is needed. You know that someone is waiting to be evacuated but you do not know the state of the evacuees. The helicopter has to decide -- to execute the rescue mission.

These are the three main groups. There are a lot of constraints on this process. The first one, it is hard time limit. We have a 72 hour limit which is three days. This is the most critical time for a disaster relief mission.

Here comes the problem formulation. We are not looking at every single vehicle but we are looking at a higher level resource management. Look at this graph. The blue is the surge and in the green we have the rescue. Now we have the search process. This is being reallocated to the rescue process because we know more about the disaster area already. And the output of such a planning would be something -- like what is on the right. Some of them are vehicles and some of them are operating at night and some of them are operating during the day. This is for search and rescue. The three questions we want to answer. What is the best general resource distribution? For example, looking at this graph. What are the resources and the necessary time? Simulation assumptions. We were focusing on the second largest area in Japan. In this simulation, we had manned aircraft only. We also had some operational constraints. We divided the simulation into two cases. The first one is to fix your aircraft with a [Indiscernible] . The second one, if you keep the search aircraft at 50 -- this is so you can search the whole disaster area. Spirit -- and this is an example of our results. The important -- change that we made was, so priority -- cell priority.

That we can determine which region needs the most help. This is also for strategic planning. This is a quick graph. If you have a aircraft to do your search all of the time, you can explore more regions earlier. And if you do have a decrease in aircraft -- aircraft, -- [Indiscernible] . We assume full knowledge of the rescue. We have been working on probabilities and results -- I can send you this information if you send me a message later.

This is the location of the need -- needs.

Go to the second slide. How do we get there? We not only have to locate where the rescue is needed. And also what kind of rescue type is needed. And the results show, within the first 10 hours -- you will have more aircraft already dedicated to the rescue mission.

However, if you look at the final day. You know where the evacuees are, and you need to bring the to the same place. In this case, the comparison will look like this. In the first case you had less aircraft allocated to the search. You will need a little less than 25 hours to bring them back home. However, if you only have 10 aircraft for rescue -- I am sorry I meant to say seven. You will need 40 hours to bring back every one home. If you allocate more aircraft through your rescue session. You will bring people faster to the base but you will have less knowledge about the disaster area. In this particular case, there were less than 50 search aircraft available. A key to this problem is to have the a -- unmanned aircraft. They are very efficient in monitoring. Uncertainties of considered in the new simulation. If you think back to the graph at the beginning -- and how the blue area was search. This is our final goal. We need to estimate what is the best thing to do at every single point. Overall estimation of search and rescue time.

And now I will ask if you have any questions.

I have a couple. First off excellent talk. I have a question related to -- I guess it was the setup. How was that traffic was managed? And how close was the separation and altitude?

At this point we are not really looking at separation as an issue. Because we manage it during the planning stage. For example in the search, we allocated a certain cell to aircraft. At each area is allocated to one aircraft at a time. However, what you mentioned is a big issue when it comes to the fueling stage. Because at the pace that density becomes quite high. And we need to make sure that the schedule person -- scheduler person will not break into many aircraft in and one time.

I might have missed this -- but what was the search pattern that you used? Was it a straight line?

That is correct. Is this the slide you mention?

Yes. It was the search pattern for each cell.

We have been working on a better algorithm. We did not take into consideration any of the practical considerations -- we went from East to West and North to South. We talked about flying along rivers. We can talk to our rescue personnel and pilots that had been deployed to a disaster. They said to fly along the river and check bridges.

Thank you.

I have a quick question.

Do we have time?

I was just wondering, when you talk about optimizing. Do you consider -- how you deal with secondary shocks -- especially with earthquakes. Because they cause damage again. I am just curious if that is in your plan for future research.

Actually, in the simulation we shout each cell and they have a priority at the very beginning. But with the current model does -- let's say you have a second disaster or another area needs further exploration. We would prioritize them again so the search can begin.

Thank you.

I want to thank you for your presentation.

Are second present or is Mr. Yoshikawa peer

Hello everyone. I will talk about terminal weather systems with fast scanning phases. I will start by giving you a little background information. We will talk about weather in airport operations, research for terminal weather systems and a summary.

Aviation support. It is critical to have support. Technical support is defined as prediction. This is weather scales and observations. By using this algorithm here, we can see the tactical support. We extracted data from weather such as hurricanes.

As you can see, the grade area -- green area we have a local strategy system. It is time to improve tactical support. Is there a need for tactical support system?

Here I have listed, aviation weather issues. Low visibility. And this is a big issue in California. We also have when -- wind and [Indiscernible] but I cannot say much about the icing cloud. Lightning, is not a big issue but it does take time to repair the aircraft.

And finally, accumulated snow. Poor runway conditions by snow. Spigot -- and here is lightning. Hundreds of aircraft have been damaged per year. Windshear and turbulence. This is also a big problem. I think conditions. -- And icing conditions.

This is a problem for the north side of Japan.

All of these have their unique issues.

Let me summarize. These are the results. We looked at the lightning cloud and we also looked at snow. There are many issues with these weather conditions. We are also working on the accumulated snow issues. Secondary support, is for [Indiscernible] . And here I listed promising statistics. Here we have a high speed scanning capability. This is shown by using [Indiscernible] radar. The first operational [Indiscernible] applying digital being farming tech -- forming technology to achieve super fast scanning capability.

We have a new system for lightning detection

These are the new observation devices. In this light I was focusing on icing issues. And with these devices we will see an improvement.

[Indiscernible]

[Indiscernible -- heavy accent]

For prediction, an increase in observation is needed.

This is a demonstration.

As you can see this as indicating [Indiscernible] .

[Indiscernible -- heavy accent]

Magazine that the challenge is to develop a terminal weather system. And we also need a connection between the practical needs and that technology -- [Indiscernible] .

We are focusing on processing [Indiscernible] .

Let me summarize. We want to separate this into strategic support and tactical support.

[Indiscernible -- heavy accent]

You can see there are a lot of issues. You are very welcome to use our research. And if you are interested please email me.

Thank you.

I appreciated your presentation, a few years ago I was flying in a thunderstorm. And the airplane was almost hit by lightning. So I really appreciate your presentation.

At this point we do not have any questions.

I am wondering if we have any questions from NASA?

I have one. I am wondering what the vision for the output system is going to be. Are you going to be looking at getting this to a pilot? Are you looking to block off sections where there is a threshold -- where you can reroute all of the air traffic from the ground?

Did -- to pick up lightning storms.

I am sorry I did not catch all of that.

The goal for the lightning support. We are developing technology -- to manage risk for aviation. We have a profile. We have [Indiscernible] .

We have a profile on lightning risk.

This way they can choose the final approach by using this [Indiscernible] .

Thank you.

Fantastic. Thank you so much for your presentation. I would like to take 25 minutes, we do want and open -- an open discussion. On the assess -- on the NASA Wii have [Indiscernible] -- we have [Indiscernible] .

What I want to propose is that with the executives -- if you have any questions that might provoke a discussion it is very much encouraged. And also if you are a participant you are welcome to ask any of the presenters question via the chat.

Thank you Rebecca.

This is drawn. -- John. I want to make the folks on NASA and JAXA for their fantastic presentation. This is a great opportunity to see clear connection across this research. There is a well clear initial discussion that we heard from Marcus. It has a very critical prediction -- connection to the human machine trade space, what Andrew talked about. I found some interesting thoughts in terms of the route you of the well clear defined by the human perspective. And what that means in terms of how functions should be allocated across airspace. And we certainly talked about the disaster relief work. We understand how the operation that was described -- with respect to the human side. The ability to manage this better for UAS missions. And I think about the weather alerts that Dr. [Indiscernible] mansion and the importance that has in the UAS environment where sensitivity to the weather is [Indiscernible] . And it is so important. And it is relevant and connected to all of this research and I really did enjoy that.

I do have a few questions. Going back to NASA. The definition for, well clear was based on the role of the human. And as we are looking at UAS it has certain characteristics in mind. If you have UAS where you can stop and hover. How does that impact the well clear definition and how that can be addressed? And how that can be automated? Do you have any thoughts?

It is a very complicated topic when you talk about low elevation. Now you are talking about all clear from man -- manned aircraft in UAS and even from the ground. Well clear that was developed for the higher altitude in larger vehicles. There are some of the basic criteria that might be relevant against other traffic. And this was based on a minimum of 60 kn. The nature and which you can however does change the space. And some of the closer race might be drastically different. When we talk about manned vehicle thus -- and when we talk about well clear from UAS and from the ground and from humans it is a different conversation. Mainly from the other UAS , ideally you want to get the UAS closer together so you do not have a loss of life on board. You do not want somebody to crash and hit someone on the ground. I think there is still a lot of research to be done -- whether that is spatial definition. And as I mentioned before, keeping a certain distance away from a man-made structure. And also with people -- we definitely need more research. We do not know how comfortable these people are going to be with a vehicle right above their heads.

Thank you.

Rebecca, I would like to ask each presenter a question.

Andrew, the work in functionality -- is a key interest for the national [Indiscernible] as well as our program. I think the direction that your folks are taking our outstanding -- aare outstanding. And it is challenging -- what do you see ways where these questions might be answered and provide some true architecture are opportunities? In different parts of the airspace? The terminal is very rough. Add in route it might be easier. Or do you think we have to be addressing this in full blown glory?

I think the purpose of separation of space -- beings like the terminal area. Overall I do the guilt will translate. In the area there is more restriction. You have tighter control requirements. I think that some of the questions particularly at the ones that we are looking at -- such as surveillance rate -- might be translatable. Things like terminal area and the ground. But I think we really need to be careful. Because the design you are moving towards is going to be different. In the terminal area do you want the aircraft to have their -- final say on their dissent? I think we can take some lessons learned but I think we will want to look specifically at that so we understand how much of the research will translate. We are going to be able to translate this to some other areas. But some we will have to do other studies. You can look at the different concepts and to the trade study and figure out what are my requirements and what are my technology requirements and [Indiscernible].

Thank you. I appreciate your insight.

I love the application you described. I think what you are doing and Japan with disaster recovery. I think this is great. I think you guys are truly ground breakers in this area. How do you see the challenges of managing the manned and unmanned aerial -- vehicles? What is the [Indiscernible] to bring in UAS ?

As you mention, when this is analysis we have already shown that a man aircraft cannot -- a manned aircraft can get the job done. Let's say you have it -- have the unmanned aircraft you would not be able to talk to them. This was noted earlier especially when it comes to low altitudes. There are a lot of issues that needs to be managed in order to avoid a collision. In such a case -- it will be slightly different from normal operations. Because the worst-case scenario even if you lose the unmanned aircraft, and you do not have any laws on the ground it is not such a big issue for disaster management. You'll have to try to implement all of these [Indiscernible] into one system. And allocating different at -- tasks. Right now we just walk off that area and have the UAS in their only -- there only.

You need to consider the application. Let's say there is a drug delivery or immediate supply delivery. You can use the UAS there.

I do see a lot of industries that are doing that -- segregating data human operated and the UAS -- and I like that a lot. I want to mention the five letters. UMP and PK Third -- and this is a red traffic management. Andrew and Mark is no [Indiscernible] well . In view can talk to PK. Because there is a strong connection to what you are doing. I think you should be able to get a hold of PK.

We have already been talking with Dr. PK peered

You are way ahead of me. That is great.

For the days radar -- phase radar. The capabilities it -- that you are addressing. And remember Bader -- better data is so important. One of the things that I see is very important is the way the data is shared. There is a lot of concepts having the aircraft be a source of weather data and also sharing that in a network fashion among all participants. So you can see -- lookahead and near-term tactical stuff. Is there a way to share the data with the system? With the aircraft as participants in the system?

It is very difficult for me to explain.

Actually we were able -- actually we were just thinking about that. Even with a pilot. This is going to be updated for a high-speed connection. And at that time we will think on how to integrate this data. And have -- and how to use the data for UAS . We can look at the research in the future. Especially if we get high-speed connection. And I think this is going to be interesting.

I know in the US, the systemwide system, is trying to enable some of this sharing. It could be from the cockpit. I look forward to how this is going to progress. Thank you to all of you.

I have a question from the trendy side -- JAXA side.

[No Audio]

I want to thank you for your fantastic presentation. I am also happy to hear about the simulations. [Static or audio cutting in and out]

My first question is for Marcus Johnson. How do you quantify certain metrics [Static or audio cutting in and out]

To address your first question. One of the main things that we were looking at in this study, was allowing the aircraft to fly with out providing any separation assurance. So there was no detective void -- avoid system. We looked at 14 flight hours. Ideally you will have your detective avoidance system in place. Why this is relevant and why we care about what we call the unmitigated profitability -- this is a risk ratio of your detect and avoid system. You would have a loss of well clear. You have to understand when you have a detect and avoid system you would take the same metrics to see how effective the system is. Then you would have a safety threshold that you would have to design, and prove that your system is safe. And you're right that system is very high bit we are not maneuvering the aircraft. You wanted to know if there was a relationship with the alert and loss of well clear test was that -- and was that when you are asking?

Yes.

The way we were alerting on targets was based off of dead reckoning. That is for both UAS and the [Indiscernible] aircraft . We do not know where the VFR vehicle is going. But the UAS aircraft would know where it was going. There is a lot of late maneuvering. When you have this unmitigated situation. There is a relationship between -- you are going to have a larger nuisance alert the further out you are. And because of the accelerating [Indiscernible] trigger you are going to have these alerts. But the closer you are in you may have few were nuisance alerts but you may get a alert but not have enough time to react.

It is difficult to find appropriate [Indiscernible] between nuisance alert and assurance [Indiscernible] .

When you do find that threshold in which you alert you have to take into consideration communication. And when they expect to request any deviation in the flight plan to avoid confrontation. We are doing human loop evaluation using UAS operators as subjects and air traffic control as subjects. This is a good time threshold -- you would not have too many nuisance alerts. Where the operator would be backing the air traffic control. But you are not alerting so late, that you cannot do anything about it. And the conclusion was about -- it was around 90 seconds at the time of the approach. This is when you would alert and have enough time to avoid a loss of well clear. This is using a multiplayer alert system and I do have some papers regarding this and I can provide them if you are interested.

Thank you.

I know we did not have enough time. So I will withdraw my other questions at this time.

Do you have a follow-up question?

I think he was done with his questions.

Thank you. Before we move on, I want to make sure that anyone who wants to ask a question has a chance to ask their questions. I do want to let you know that this is going to be recorded and it will be in our iron cars -- archives. I know we have a few executives who might have more questions.

Do we have any volunteers?

This is my deadly -- Mike Dudley. I want to second, [Indiscernible] . I want to ask Dr. [Indiscernible] she mentioned and prioritization of the rescue they were using force,, -- first come first serve. I am wondering if there is a way to optimize the rescue operation to get to the critical people first.

We do the first column -- come first server only when we are flying in to look at the condition. Then they can decide -- they can prioritize or give an estimation of the condition of the victims. And this is going to optimize the rescue operation. We not only prioritize -- we also deal with a medical team assignments. Because you need the medical team to transport patients to the hospital. And you need to get them back to the base. At the current level of the system, [Indiscernible] you can identify how hard it is to prioritize. Thank you for that clarification.

I want to thank Rebecca for organizing this. And I commend her for all of her efforts. I also want to thank Trent eight -- JAXA and NASA participants.

I want to thank all of our JAXA calling -- colleagues.

Please do not apologize for your English. I want to thank you for accommodating us.

Thank you so much.

I want to leave this open for discussion right now.

I know that some people may have to leave.

But I want to make sure there are -- but I want to make sure that everyone has a chance to ask their questions.

I am not hearing anything else at this point. Semen -- [Indiscernible-- multiple speakers]

Excuse me?

I am very happy to see all of this work done at NASA. We must understand, that it is meaningful for us to have this type of conference. Because we need to share the fruits of our work. So I want to thank Rebecca for coordinating this conference.

Thank you.

I want to thank [Indiscernible] for all of her hard work . I know it was a bilateral collaboration.

Are there any final comments? I encourage you to join [Indiscernible] link. We want to continue this conversation. We anticipate that we are going to have more virtual conferences just like this one. So that we can continue with the discussion. And I do want the executives to be part of that. And we want to hear from our young researchers. Just to get a different perspective and also to get excited.

Does anyone have any last-minute comments?

Thank you, Rebecca.

Thank you so much for putting together this virtual conference.

Thank you.

Before we close does anyone else have any final comments?

If not, thank you so much.

If you are on the computer, you will be asked to fill out a survey about this virtual conference. It will be at the bottom, of the Adobe connect. I would appreciate if you would complete it. Thank you so much. And again have a wonderful day.

Thank you everyone, this was great.

Goodbye.

[Event concluded]
