16 March 2018

**Sudden-Onset Emergency Aerial Reconnaissance for Coordination of Humanitarian Intervention (SEARCH)**

**Organizational Background and Context**

Assisting 80 million people in around 80 countries each year, the World Food Programme (WFP) is the leading humanitarian organization fighting hunger worldwide. WFP is the global lead agency of Emergency Telecommunications Cluster (ETC), a global network of organizations that work together to provide shared communications services in humanitarian emergencies. WFP also leads the Logistics Cluster, coordinating the delivery of humanitarian assistance.

WFP Innovation Accelerator, set up in 2015, has the goal to identify, nurture and scale-up bold solutions to challenges in humanitarian and development contexts. Based in Munich, Germany, the Accelerator brings in hands-on innovation expertise and links teams with experts from across the non-profit and private sectors as well as academia to develop high-impact innovations for a world without hunger.

**Project Background**

When disasters strike, fast dissemination of information is essential for the provision of efficient and effective humanitarian response. WFP’s IT Emergency Preparedness and Response (IT EPR) team is developing an Unmanned Aerial Vehicle (UAV) Unit to lead the integration of the technology into the humanitarian space. In close coordination with key stakeholders, including UNICEF, WFP is developing the Humanitarian UAV Coordination Model, supported by a position paper for the adoption of UAV coordination service, and by a UAV Code of Conduct, protecting affected community’s privacy and dignity. The UAV Coordination model is designed to provide fast and essential information to humanitarian response teams. This project focuses on the use of UAVs’ rapid deployment in the aftermath of emergencies to collect and analyse imagery and live video, then translate the information to identify severity of damage and impact to population, ultimately feeding into emergency humanitarian intervention plans.

UAV use needs to be regulated and efficiently coordinated, particularly in emergencies, where air traffic is often beyond local traffic control capacity. A programme was therefore initiated in 2016 with the support of the Belgian Government, to define operating rules and parameters (with IATA), engage key stakeholders, and establishing specific plans in vulnerable countries. Part of the initial year activity was a series of workshops in Myanmar, Peru, Dominican Republic and Mozambique, where stakeholders from the public and private sector as well as government aviation authorities came together to discuss and test out coordination in emergency simulations. The completion of these exercises led to its expansion into formal country and regional training activities for 2018.

**INNOVATION – Applicability for External Humanitarian Actors**

WFP views this innovation (UAVs, imagery analysis, and regulations development) as a critical step in digitizing the humanitarian space. By integrating UAVs in its operations, emergency managers can rapidly get a clear operational picture, covering the full scope of the emergency. Through this project WFP intends to develop the capacity to generate this information in near real-time and distribute it throughout the cluster system. This activity will reduce costs associated with traditional methods (remote sensing), increase the quality of materials (updated regularly at higher resolution), and will guide decision makers by highlighting critical key points (identifying damaged infrastructure, debris, IDP camps, hazardous areas, and logistics challenges).

In a broader view beyond emergency response, regulations development for the use of UAVs opens the capacity for humanitarian actors to utilize the technology for existing programs. For instance, NGOs focused on food security and agriculture can use UAVs (with proper regulations in place from this project) to detect plant stress through multispectral imagery collection to avoid crop loss at a fraction of the price of satellite imagery or manned aircraft assessment. Similarly, global health actors can utilize the same regulations developed to build up supply chain capacity in areas where infrastructure is compromised and access to people in need is restricted. In the same way, a number of commercial operators are looking at the use of drones for the delivery and re-establishment of connectivity in emergencies, and they can equally benefit from the outputs and outcomes of the WFP-led project.

**Problem**

Coordination. In 2016, WFP connected stakeholders from humanitarian, academic and private sectors to identify priority vulnerable countries. They initiated the definition of standards for data processing, integration with satellite imagery, and reviewed partnership frameworks. Building on experience gained though these rollouts, a process must now be defined and established to coordinate the collection of data using UAVs, to process data to obtain information required by humanitarians, protect that data, and flight regulations must be developed for use of UAVs in humanitarian intervention and development activities. Emergency managers need to become familiar with the tool and its data in advance – so that when emergencies strike, it will be ready for immediate use. The mechanism will only be efficient once it reaches a critical mass of countries at risk of natural disaster with equipment is on the ground, pre-positioned, and ready for use.

Image processing and analysis. Once the Coordination model is in place, drones will be deployed in the aftermath of an emergency, actors will be trained and prepared, and information will flow into the hands of decision-makers within hours of deployment. Turning images and other data into information is a time-consuming process, currently implemented using multiple people – either in the disaster area, adding to the burden of getting and supporting people in the emergency, or remotely, therefore needing complex communication systems to forward them the large files associated with imagery. Increasing the complexity, connectivity is often a challenge in emergencies, the processed information will have to be available locally in order for humanitarian decision makers to be able to access, modify where necessary, and share critical information in a timely manner.

**Solution**

**Objective 1 – UAV Coordination and the Big Data UAV Coordination Kit (Big DUCK)**

The first objective is to create a deployable coordination model for UAVs, including aviation safety mechanisms, data protection, imagery product menu, data storage, hardware for automated data analysis, and regional / country trainings to ensure stakeholder engagement. This will be done through developing the model, toolkit, position paper, code of conduct, and flight regulations at a local level. Through this objective, the UAV & Big Data team at ETC will formalize the initial workshops into a quality and standardized series of modules for Flight, Mapping, and Coordination with all their elements in term of technology and project pillars[[1]](#footnote-1). These modules will then be conducted in 12 priority countries and 3 regional exercises in 2018 through 2019. External resource persons will be utilized to support the events and regional IT EPR personnel will facilitate the workshops. Lessons learned by these activities will be operationalized via testing the model in a new annual OPEX-Delta event and stakeholders in an annual meeting will agree standards. The end state is to have a readily-deployable UAV Coordination service for Sudden-Onset Emergencies, with localized capacity when possible and external support through partners when necessary, in addition to a standardized list of what needs to be deployed to accomplish the coordination, collection, and analysis of data for Emergency Coordinators to use. Standard equipment and coordination materials will be developed and facilitated by ETC partners and stored regionally, through a Big Data UAV Coordination Kit (Big DUCK) that will be rapidly mobilized in future cluster activations.

**Objective 1 – Country Selection and criteria**

Countries will be selected taking into consideration the Belgium Development Cooperation priority countries; Mali, Niger, Nigeria, Chad, DRC, Rwanda, Burundi, CAR, OPT, Syria, Lebanon, Jordan, Iraq and other priority areas of WFP and the Emergency Telecommunications Cluster.

Outside of Belgium priority countries, WFP will also look at ETC priority countries, countries that have expressed interest with regulation development support, active areas where WFP is heavily involved, and countries with a high probability of an emergency within the next two years. Examples of these countries include Cuba, Dominica, Haiti, Indonesia, Madagascar, and the Philippines. This will be done in concert and approval of Belgium project counterparts.

Countries that have expressed interest and are already in ETC priority regions create an opportunity to quickly implement the technology under WFP preparedness initiatives to reduce risk.

Areas where WFP or other relevant humanitarian actors are already involved also creates an area of opportunity where the technology as appropriate may make programs more efficient or effective.

WFP / ETC will target several key groups of stakeholders in regional workshops and country trainings outlined in the Phase 2 proposal. Regional Workshops will focus on humanitarian partners, UN Agencies, and Regional/Country level air regulation authorities to share best practices and identify ways that countries can work bilaterally to strengthen regulations for the use of UAVs in the humanitarian and development space.

Groups and stakeholders targeted for country trainings include government regulators, government agencies, humanitarian partners, development partners, and supply chain stakeholders. The focus on these trainings is to include the work done in initial workshops as well as add modules for flight and mapping. Prior to the workshop (now referred to as the LetsCOORDINATE Training), the LetsFLY and LetsMAP modules ensure that government and humanitarian focal points have a base level of understanding of the technology and where it can assist their operations prior to coming into the coordination portion of the country level training activity.

The WFP strategy for the capacity building of users focuses on three steps; 1) Initial Engagement, 2) resource support, 3) partnering for implementation.

Initial Engagement of users occurs over the three modules hosted from this proposal. Over the course of two weeks participants will build knowledge and capacity in the operation (flight) of drones and the use of products (mapping) in decision making activities. The training culminates in a coordination event and simulation exercise where stakeholders discuss challenges identified in implementation and ways to mitigate those challenges.

Resource support is then provided after the workshop including a knowledge base of UAV projects, guidance documents, the UAV code of conduct, UAV ETC Coordination Handbook, and associated toolkit to assist stakeholders in developing their own potential UAV projects within their programs.

Partnering for implementation when beneficial to affected communities and stakeholders involved will then take place where WFP through regional and country level personnel will build capacity of our counterparts while assisting in program delivery of partnered activities. For example this includes using technology to support small landholder farmers to use UAV data to maximize crop yield or building capacity for CBOs to use UAVs for monitoring and evaluation of projects to reduce costs.

 **Objective 1 – Guidance on UAV use in a conflict and complex emergency context**

As part of the this expanded activity WFP will also work with partners to identify the appropriate use and develop guidance for the use of UAVs in complex emergencies and conflict. The core code of conduct drafted amongst various stakeholders including UAViators, industry experts, NGO’s, and UN agencies was then formalized by WFP and has a specific focus on non-complex humanitarian emergencies in order to solidly gain consensus on appropriate use. Separate to the document, WFP has identified the need to also have clarification with relevant stakeholders on the use of UAVs in conflict as a means to deliver humanitarian assistance when traditional access mechanisms may be compromised (cargo drones). WFP has already begun exploring this use to move critical supplies when access is denied and at one point Aviation Services Division was preparing to deploy K-MAX heavy lift UAVs in Syria until routes were reestablished.

Due to these operational requirements it is in WFPs strategic interest to develop guidance for conflict use. Some aspects that are being considered include ensuring communities are aware whenever possible of the activity, airframes used differ from models used by parties to the conflict, aircraft are clearly marked according to UN Guidelines, and stakeholders are consulted including ICRC. Part of the second phase of the activity includes the creation of a sub-technical working group focusing on this topic, will draft the documents, and evaluate use cases of UAVs in conflict settings.

Lastly, a number of other agencies, NGOs and Governments, particularly in Africa, are exploring and piloting the use of drones for humanitarian and medical deliveries. Potentially, this very broad community can all benefit from WFP’s findings, prototyping and guidelines.

WFP views the Code of Conduct very much as a living document in that the UAV space and the technology itself is rapidly evolving. In order for the code of conduct to remain relevant and for humanitarian actors to ethically use the technology the document will have to be reviewed annually to reflect lessons learned from partners and changes in the technology.

 **Objective 1 – Skill Transfer Opportunities**

WFP sees skill transfer activities occurring on four levels; UN Agencies, Humanitarian Actors, Governments, and Affected Communities. The training activities that will occur under this proposed next phase of the program will utilize the events as a starting point for more enriched engagement within each target area.

UN Agencies will be engaged to identify partners at a country level (GIS mapping department to GIS mapping department etc.) where existing country office staff from WFP can work across agencies on partnered projects or for information sharing purposes. This engagement will allow for skills transfer beyond the initial workshop with time to properly show the various areas involved (technical skills, equipment required, support documentation, reference guidelines, ethics considerations).

Humanitarian Actors will be engaged through WFPs existing country level activities that will integrate the technology in the future. An example of this would be the mVAM WFP Food Security Unit engaging with an NGO focused on agriculture to explain UAV remote sensing operations and the value that the technology adds to the existing operation by increasing coverage areas and reducing cost.

Governments will be engaged for skills transfer through regional and country level activities to develop flight regulations (with Civil Aviation Authorities) and through support of existing units/ministries for disaster risk reduction, agricultural, hydrological, infrastructure, and other core activities involving development, preparedness, and resilience.

Community skill transfer will occur through engagement with country level preparedness and response programming utilizing UAVs. An example of this would be farmers using UAV climate adaptation data to better plan when and what crops to plant for optimum harvest.

**Objective 2 – Rapid UAV’s Data Analysis in Emergencies (RUDA)**

The second, parallel objective is to use machine learning to automate and accelerate analysis of UAV imagery during humanitarian response, providing Emergency Coordinators with the information they need to make rapid, informed decisions. The pioneering approach will pilot the use of Artificial Intelligence (AI) directly in the field for image and footage pre-processing, and then forward results to central image analysis’ engines. As per the intended result, the system will identify a variety of different types of information such as number of people, damaged dwellings, damaged infrastructure, across a variety of different types of emergencies; floods, earthquakes, hurricanes etc. It will also be able to process imagery from various sources including other agencies, NGOs, or remote sensing sources.

Once proven, the analysis provided by the AI system can be used more broadly and shared through the WFP-managed Emergency Telecommunications Global Cluster (ETC) with other stakeholders within the humanitarian community, thus extending the impact and reach of the project beyond WFP.

 **Objective 2 – Analysis of Practical & Ethical Concerns of involving data and privacy**

WFP understands that any new technology integrated into humanitarian activity raises non-negligible practical and ethical issues that must be addressed including community engagement, transparency, privacy, and data security. WFP has developed six strategic pillars as part of the initial Belgium funded activity for the coordination and use of UAVs in the humanitarian context. These pillars build in areas that focus on community engagement, transparency, and privacy/protection/data security. Beyond the initial documents developed including the code of conduct, WFP through this project will bring a full-time data manager in to manage activities, evaluate the ethical use of technology and data, as well as communicate best practices to partners intending on using UAVs for data collection.

A key component built into the year 1 workshops and the year 2 trainings under this proposal is community engagement. Sensitizing communities to the technology, the proposed use in any project, and providing information as well as receiving consent are critical components to any successful UAV operation. The training will focus on this aspect in each of the three modules (LetsFLY, LetsMAP, LetsCOORDINATE) where UAVs provide these services for communities in addition to humanitarians.

This activity will also identify ways in which only the necessary end-product (ie. Number of homes affected, cubic meters of debris, etc.) will be shared and the raw data will be securely stored and disposed of in accordance with internationally accepted guidelines to mitigate risk.

WFP has also established a policy on beneficiary data protection, and all of the project activities will comply with the policy.

**Strategy – Inter-cluster, working group support, and UN Agency coordination for best practices**

The World Food Programme intends to work closely with other UN agencies involved in the field through three key mechanisms; the Inter-Agency Supply-Chain Group (ISG), the Emergency Telecommunications Cluster (ETC), and the Logistics Cluster (LOGS). These Mechanisms along with WFPs internal capacity through the IT Division and the WFP Innovation accelerator are best positioned to affect long term change in the use of UAV technology and how it will be coordinated in emergencies.

ISG – The ISG is a consortium of donors and agencies focused on supply chain in global health in both development and humanitarian intervention. The group is chaired by a neutral secretariat hosted by UNICEF and major participants with a focus on the use of UAVs include the World Bank, UNICEF, UPS Foundation, GABBY, Bill and Malinda Gates Foundation, USAID, DFID, WHO, UNDP, and the World Food Programme. This project intends to coordinate with the ISG in developing a knowledge hub of Global UAV activities as well as support their operations through targeted trainings over this phase of activity allowing for robust regulations development in areas where UAVs could strengthen global health supply chain activities. Over the past five months the WFP UAV focal point has been attending the ISG events and coordinating bilaterally with partners on program activities.

ETC – The ETC is an IASC cluster with over 30 key partners focused on the appropriate and effective deployment of technologies in emergencies to digitally transform the humanitarian space by providing connectivity to humanitarian actors and the communities they serve. The Cluster includes key UN Agency partners such as OCHA, UNDP, UNHCR, UNICEF, IFRC, ICRC, TSF, and the private sector (Erricson, CISCO, Facebook, and various others). The World Food Programme is the chair of the ETC and has created a position paper for the formal adoption of UAV Coordination as a service developed as a result of the initial year 1 activity with Belgium, this will be fully communicated and integrated with the Cluster during the annual plenary meeting in May of this year. Through the cluster, WFP and this project will work with UN Agencies to ensure there will be no redundancy in activities and to actively create strategic partnerships to fast track technology integration. An example of this in practice includes the WFP CIO (and Chair of the ETC) Enrica Pocari formally contacting the head of UNICEF Innovation to integrate UNICEFs UAV activity into the ETC.

LOGS – The LOGS Cluster, chaired by the World Food Programme brings together key partners across the UN system including UNDP (for debris management), UNICEF (for delivery and WASH), UNHCR/IOM/IFRC (for CCCM and Shelter), and other key organizations. WFP intends to use this cluster approach to also keep key agencies informed on the evolving progress of UAV, integration, regulations, and coordination. WFP will use this mechanism to keep informed on partner activity.

WFP intends to continue engagement with other clusters and cross sectoral groups including ETC, Logistics, ISG, and others. WFP over the course of this expanded activity also intends to leverage activities of partners to create a knowledge base of UAV activities, best practices, and guidance. Examples of this include the integration of reports generated by Boston Consulting via USAID funding and by JSI via Bill and Malinda Gates Foundation funding in order to reduce redundancy and focus on areas that have yet to be fully explored.

The ISG under guidance from Bill and Malinda Gates Foundation and USAID intends to create a donor coordination cell. WFP intends for the UAV Coordination Cell to work with all other relevant partners including this proposed ISG unit to share relevant documentation, regulations development, lessons learned, and guidance products. Similarly, ISG intends to reciprocate the exchange of this data.

WFP through the ISG, Logs Cluster, and ETC are working with partners to capture lessons learned from individual drone pilot projects and success implementation of the technology into programs in the field. Part of this analysis includes leveraging partner research to capture the value add that using the technology brings. WFP has already evaluated the use cases for immediate imagery collection and the advantages including:

-Reduction of time from tasking to product delivery

-Reduced connectivity requirement to receive imagery

-Reduced cost compared to satellite imagery emergency tasking

-Increase end-product quality through higher resolution and accuracy

As the coordination model is put into practice in future emergencies over the course of the next year through this proposal WFP intends to capture data regarding speed, deployment costs, comparative quality, and product use in order to fully quantify the impact of the technology in the humanitarian space.

The evidence is currently limited to the financial and speed advantages that are already confirmed due to the lack of field deployments to appropriately establish a baseline. However, WFP is confident that as more use cases and emergency deployments occur that the technology will clearly demonstrate significant advantages in accuracy, efficiency, and quality as compared to traditional data collection and remote sensing methods. WFP now has data on the timing required, will collect data on the new drone based process created through this activity, and publish results as a result of piloting during this project.

 **Strategy – WFP Innovation Accelerator Support**

The World Food Programme, IT Division is collaborating with the WFP Innovation Accelerator in Munich, which is taking the lead on the Artificial Intelligence aspect of the project. While the WFP ETC builds, expands, and implements the coordination model, regulations development (through local, regional, and global partnerships), and a standardized approach to using the technology (through the Code of Conduct) the Accelerator will take the approach of applying the best practices of human-centred design and lean start-up methodology, bringing in hands-on innovation expertise. The two components form a single project to leverage synergies, unify communications with stakeholders, and reduce overlaps and costs. The World Food Programme will also leverage resources from regional bureaus to implement training activities, pre-stage equipment, and support follow-on activities.

 **Strategy – WFP Regional Bureau Support**

WFP also has regional bureaus strategically located in six parts of the world where we operate (Panama, Dhaka, Cairo, Nairobi, Johannesburg, and Bangkok). These regional bureaus provide guidance and technical backstopping to WFPs 80+ country offices and support humanitarian country teams (HCTs) in emergencies by rapidly deploying resources and personnel. As part of the initial phase of the activity with Belgium WFP is procuring UAVs to pre-stage at the regional bureaus to use for training, capacity development, and emergency response.

In addition to emergency deployment with UAVs this proposal also leverages regionally placed IT officers specializing in preparedness to assist in the implementation of the training and workshop activities. The IT Officers will also act as regional focal points for UAV technology and will develop and support country level programs outside of this funded activity. A successful example of this is the Johannesburg regional office who is now working on proposal activities with Malawi, Mozambique, and Madagascar Country Offices, as an outcome of the initial workshop held in Maputo.

**Timeline**

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| November 2017 | * Cleaning and tagging of data in partnership with the Accelerator supported Tech for Food project in Iraq
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| December 2017 | * Colombia workshop and simulation to gather UAV imagery.
* Initiation of Data Privacy and Protection Stakeholders Research
* ETC Position Paper Finalized for ETC Review
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| April 2018 | * Formalize Workshops into Country & Regional training packages
* Begin training AI solution with existing data.
* Finalize Coordination Model.
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| May2018 | * Begin development work with selected technical partner(s)
* UAV Coordination Model adopted at annual ETC plenary meeting
* Implement dry run in Dubai for new training modules w/ Reg IT EPR
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| November 2018 | * First ‘MVP’ ready to test in the field.
* First test in unfamiliar environment during planned simulation.
* UAV Coordination Model adopted at annual ETC plenary meeting
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| February 2019 | * Iteration of existing MVP.
* Technical preparations to deploy at scale.
* Initiate first regional training exercise (1st of 3 in 2018)
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| March 2019 | * Deploy software in high-risk areas with UAV Coordination’s activated
* Continue to engage with new ETC partners for UAV Support
* Guidance material for new country’s and partners developed.
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| April 2019 | * Completion of Big DUCK kits for Regional Deployment with AI
* Capacity for real emergency response to beta-test AI/ML component
* ETC Standby Partnership Developed for UAV flight and Processing
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| May 2019 | * Project integration with the Humanitarian UAV Coordination Model complete and Coordination Model deployable with AI Component.
* Completion of country trainings and regional exercises.
* Final Report on project released.
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**Team**

The project has an existing team led by the UAV & Big Data Coordination Manager in Rome with support from Regional Bureaus in 6 global locations and the Logistics & Emergency Telecommunications Cluster.

**Budget – 1,000,00 EURO­ (SEE ATTACHED EXCEL DOCUMENT FOR ADDITONAL DETAIL)**



**Contact**

Adam Marlatt, Senior Technical Advisor, Unmanned Aerial Vehicles (UAV) and Data Management, IT Division, UN World Food Programme Adam.MARLATT@WFP.org, Mobile +1 603 205 2538

For information on the Emergency Telecommunications Cluster, please visit: [www.ETCluster.org](http://www.innovation.wfp.org)

1. Humanitarian coordination model pillars: Technical standards, partnership, tools and solutions, AAP and community engagement, advocacy in the disaster prone countries and policies. [↑](#footnote-ref-1)