Republic of Zambia

Ministry of Health

Collaboration Program with the Private Sector for Disseminating Japanese Technology for Logistics Service by Unmanned Aerial Vehicle (UAV) in Zambia

Final Report

(Public Version)

February 2018

Japan International Cooperation Agency (JICA)

Aerosense Inc.

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Lists of Abbreviations

Abbreviation	Full Name
CAA	Civil Aviation Authority
DH	District Hospital
GHSCP	Global Health Supply Chain Program
JICA	Japan International Cooperation Agency
MOH	Ministry of Health
MOTC	Ministry of Transport and Communication
MSH	Management Sciences for Health
NGO	Non-governmental Organizations
PCI	Project Concern International
PMO	Provincial Medical Office
PS	Permanent Secretary
RHC	Rural Health Center
SDGs	Sustainable Development Goals
UHC	Universal Health Coverage
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USCDC	United States Centers for Disease Control and Prevention
ZESCO	Zambia Electricity Supply Corporation
ZICTA	Zambia Information & Communications Technology Authority

Executive Summary

1. Background

In Zambia as an inland country, it is indispensable to improve transportation infrastructure for expanding economic activities to other regions and other countries. However, domestic roads are not well developed. The fragile transport infrastructure and restrictions on the supply chain due to the infrastructure are serious issues. Especially in rural areas where the transportation infrastructure is weak, transportation of specimens, test kits, medicines, medical equipment, etc. is also hindered, and the decline in the quality of basic health care services to the inhabitants is a serious problem. Under this circumstance, if rapid transportation of specimens, test kits, medicines and medical equipment using unmanned aerial vehicles (drone) becomes possible, the quality of basic health care services for rural communities of more than 9.3 million people will be greatly improved .

2. Products to be diffused

Products to be diffused are 2 drone models (VTOL (vertical take-off and landing) and multicopter) manufactured by Aerosense. Both products can autonomously take off and landing and flight a route programmed with a simple operation, and it is unnecessary to maneuver with a remote control. In addition, VTOL has the advantage that it can fly long distances at high speed, and multicopter has the advantage of stably flying short distance.

3. Objective

The Program is aimed at promoting understanding of government officials on the possibility of using drone as logistics infrastructure in the health sector in Zambia and creating human network for business development.

4. Contents

The first activity in Zambia (January 2017): Explanation and discussion of the activities of the Program to MOH, MOTC, and CAA, collecting and analyzing local information, participation in the Zambia-Japan Quality Infrastructure Conference, discussion and conclusion of the Memorandum of Understanding of the Program

The second activity in Zambia (April 2017): Explanation and discussion of the activities of the Program to MOH and CAA, holding a product introduction event of Drone (Lusaka City), demonstration flight of drones (Southern Province), participation in the Quality Infrastructure Dialogue between Japan and Zambia, technical examination of the development of power and telecommunication infrastructure related to drone operation, consideration of cooperation possibilities with the other ODA projects

The third activity in Japan (June 2017): Holding seminars on the promotion policy of drone-related industries (Ministry of Economy, Trade and Industry), drone-related legal structure and operation method (Ministry of Land, Infrastructure and Transport), application of drones to logistics (Ministry of Land, Infrastructure and Transport), international cooperation activities in Japan's health sector and drone utilization opportunity (National Center for Global Health and Medicine), flight demonstration of VTOL and operation training of multicopter, wrap-up meeting of the activity in Japan

The fourth activity in Zambia (September 2017): Report on the results of the Program, discussion on the collaboration with the other ODA projects

5. Results

The goal of this project is to increase awareness of drone utilization among local stakeholders including government officials, international donors, private business operators, etc., and to improve the effectiveness of the drone as a solution to the challenges of health sector. Through the activities such as the product introduction event, demonstration flight, seminars conducted in Japan, these goals were fully achieved.

In addition, we also completed the necessary institutional measures in business development in Zambia, grasping key conditions of power and telecommunication infrastructure, and establishing relationships with public/private organizations. As soon as funds are secured, we will begin preparations for the start of pilot activities.

6. Prospect for business development in Zambia

Based on the results and findings obtained in this project, Aerosense is considering the business development of drone logistics to Zambia positively, but has not decided to develop business.

7. Rationale for business prospects

The drone logistics introduced in the Program is highly appreciated by MOH, international donors, NGOs, etc. and is highly evaluated as contributing to solving the problem of logistics in health sector. Aerosense aims to meet such needs through the development of the drone business in Zambia. On the other hand, it is also essential to verify whether sustainable operation of drone or securing of profitability is possible. Therefore, we are now making efforts to realize pilot activities.

8. Issues to be solved for business development

The most important remaining task is securing funding providers for future pilot activities. In addition to continuing to follow the trend of donors and NGOs in Zambia, Aerosense continues to look for funding providers of pilot activities, including private companies, foundations and government organizations. In addition, we will proceed with development to solve technical problems clarified by the demonstration flight. Furthermore, we will promote public and private partnerships to establish rules at the national and international levels in order to establish flight control system and long-distance communication method.

9. Business plan

Aerosense will expand the drone business by (1) preparatory phase: preparation for business development, (2) growth phase: expansion to regions other than Lusaka and Southern province, (3) expansion phase: horizontal development to neighboring countries. In the early stages of this business, we plan to implement small-scale pilot activities in Southern Province with financial support from international donors etc., and to expand activities to other areas based on the results.

10. Collaboration proposal with ODA projects

Firstly, Aerosense proposes to utilize drone logistics by establishing a distribution network of specimens and reagents etc. for rapid diagnosis and treatment in collaboration with ongoing JICA Project (HIV / AIDS and TB control support program). As a result, some remote areas that were difficult to deal with by existing transportation means such as motorbikes and vehicles can be included in the Project. In the future, it will greatly contribute to achieve the global development goals such as the 90-90-90 Target aiming for the end of AIDS and the Global Plan to End TB aiming to reduce the death due to tuberculosis by 95% by 2035.

Secondly, we propose a new technical cooperation project to raise the capacity of CAA to oversee the drone industry to promote the drone-related industries, as well as to set up a public-private partnership organization that follows public and private council in Japan to promote the drone industry in Zambia.

Thirdly, to strengthen fragile power infrastructure in rural areas, we propose a new grant project that introduces solar panels and storage batteries which are independent of national power grid. The project strengthens the power supply system for health care facilities that support the lives of people, and strengthens the power infrastructure supporting drone logistics.

Chapter 1 Background of the Program

1.1. Development issues

In Zambia, restrictions on fragile transport infrastructure and the supply chain resulting from it are a serious problem. Especially in the rural areas, transportation of medicines and medical equipment, etc. has been greatly hindered, and the quality of basic health care services to residents tends to decline. In the example of Southern Province (Figure 1.1-1), the only road connecting the district hospital and the rural health center is often interrupted by the rainy river rise, and it hinders movement of patients and delivery of medical supplies.

Figure 1.1-1 Road to rural health center submerging in the water (Southern Province)

1.2. Products to be diffused

1.2.1. Detail of the products to be diffused

The products to be diffused in the Program are two drones, VTOL (vertical take-off and landing) and multicopter manufactured by Aerosense. Images and specifications are shown in Figure 1.2-1.

Aerosense's drones can autonomously take off and land along the programmed flight path with a simple operation, and no remote control is necessary. In addition, VTOL has the advantage that it can fly long distances at high speed, and multicopter has the advantage of stably flying short distance.

According to CAA supervising the commercial use of drone in Zambia, although there is no precedent for the use of drone aimed at logistics, private companies' drone for aerial photography and sensing survey has been used mainly in the state of Copper Belt etc. Since the drones are used without the permission to CAA in most cases, information such as manufacturers and models of drone is unknown.

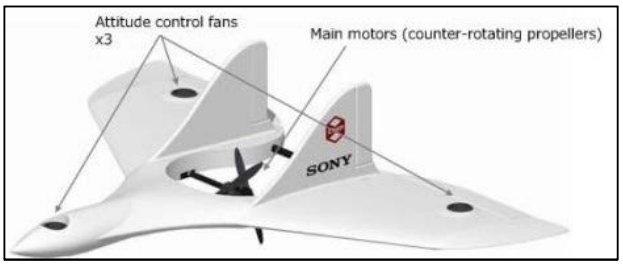
	
Product name: VTOL (Vertical Take-off and Landing) Size: 2,200 x 1,600 x 600 mm Weight: 7kg including battery Flight speed: 130km/h at maximum Flight hours: aiming at 1 hour without changing battery Payload: aiming at 1.5kg	Product name: AS-MC02-TP (multicopter) Size: 500 x 500 x 363 mm Weight: 3.3kg including battery Flight hours: 30 minutes without changing battery Payload: 3.0kg

Figure 1.2-1 Drones to be diffused in the Program

1.2.2. Possible contribution to development issues

As mentioned above, logistics services that can be used even on bad roads and disasters are desired in Zambia. The drone logistics can dramatically increase the quality of basic health care services enjoyed by more than 9.3 million rural residents in Zambia by rapid transportation of specimens, test kits, medicines and medical instruments. It will also contribute to achieve one of the SDGs, eradication of AIDS and tuberculosis by 2030.

Chapter 2 Outline of the Program

2.1. Objective and goal of the Program

2.1.1. Objective of the Program

The Program is aimed at promoting understanding of government officials on the possibility of using drone as logistics infrastructure in the health sector in Zambia and creating human network for business development.

2.1.2. Goal to be achieved in the Program as contributions to development issues

The goal of the Program is that concrete examination of the introduction of drone logistics will be started among related organizations in Zambia as a result of wider understanding of the usefulness of drone as a solution to challenges in health sector.

2.1.3. Goal to be achieved in the Program in view of business development

On the business side, the Program is positioned in the preparatory stage to realize the local pilot activities in the future. In the Program, Aerosense aims to establish the human network for business development, and to formulate a business plan. In addition, we aim to form a cooperative relationship with multiple organizations that will become partner candidates in Zambia, and to strengthen the foundation for cooperation towards business development after the Program.

2.2. Contents of the Program

2.2.1. Implementation schedule of the Program

The first activity in Zambia (January 2017): Explanation and discussion of the activities of the Program to MOH, MOTC, and CAA, collecting and analyzing local information, participation in the Zambia-Japan Quality Infrastructure Conference, discussion and conclusion of the Memorandum of Understanding of the Program

The second activity in Zambia (April 2017): Explanation and discussion of the activities of the Program to MOH and CAA, holding a product introduction event of Drone (Lusaka City), demonstration flight of drones (Southern Province), participation in the Quality Infrastructure Dialogue between Japan and Zambia, technical examination of the development of power and telecommunication infrastructure related to drone operation, consideration of cooperation possibilities with the other ODA projects

The third activity in Japan (June 2017): Holding seminars on the promotion policy of drone-related industries (Ministry of Economy, Trade and Industry), drone-related legal structure and operation method (Ministry of Land, Infrastructure and Transport), application of drones to logistics (Ministry of Land, Infrastructure and Transport), international cooperation activities in Japan's health sector and drone utilization opportunity (National Center for Global Health and Medicine), flight demonstration of VTOL and operation training of multicopter, wrap-up meeting of the activity in Japan

The fourth activity in Zambia (September 2017): Report on the results of the Program, discussion on the collaboration with the other ODA projects

2.2.2. Implementation Structure

Aerosense oversees technical aspects and business planning of Drone. Yachiyo Engineering is in charge of power and telecommunication infrastructure and collaboration with ODA projects. The National Center for International Health and Medicine is in charge of health sector. Three organizations will cooperate in the Program.

2.2.3. Activities

Activities in the Program are shown in Table 2.2-1.

Table 2.2-1 Activities in the Program

#	Activity	Plan				Content	Goal
		1st (Zambia)	2nd (Zambia)	3rd (Japan)	4th (Zambia)		
1	Confirmation of marketability and local needs					• Interview with MOH and rural health center staff on the necessity of drone logistics in health sector • Interview with international donors and others working in health sector • Interview with local companies in the infrastructure sector on the possibility of developing drone business	• Grasping the current status of development issues at target sites • Quantitative estimation of improvement by applying drone logistics • Clarification of willingness to introduce drone logistics by candidate customer organizations • Clarification willingness to introduce drone services other than logistics by local companies
2	Promotion of understanding on drone's technology, products and services by Zambian stakeholders					• Explanation of Aerosense's drones to local stakeholders • Implementation of product introduction event (Lusaka) and demonstration flight of drone logistics (Southern Province) • Implementation of seminars on examples of drone utilization in Japan	• Understanding technology, products, and services of drones by Zambian officials • Understanding effectiveness and necessity of introducing drones by Zambian side
3	Grasping the local law system related to the drone operation, permission and approval					• Interview with CAA on registration and approval procedures of drone and the operational situation of commercial drone in Zambia • Implementation of seminars on Japanese drone-related legal system, supervising organization, public-private partnership system, etc.	• Clarification of methods and procedures for commercial use registration of drone specified by CAA • Proposal of collaboration system between CAA and public and private drone related organizations in Zambia
4	Grasping the current status of power and telecommunication infrastructure related to drone operation and proposing the direction of improvement					• Site survey on the current status of electricity and telecommunication infrastructure in rural health centers and district hospitals where application of drone logistics is anticipated • Examination of conditions of power and telecommunication infrastructure development assuming drone operation	• Grasping the current status of power supply in rural health centers and district hospitals • Grasping the current status of mobile phone connection in rural areas • Proposal of power infrastructure improvement for drone introduction in rural health center and district hospital
5	Proposing collaboration plans with ongoing/future ODA projects					• Information gathering on ongoing technical cooperation project in health sector • Confirmation of areas, organizations, and contents which are considered necessary for technology transfer and human resource development as ODA projects • Examination of the possibility of collaboration between ongoing and new ODA projects and drone business	• Proposal of a collaboration plan to ongoing JICA technical cooperation project in health sector • Proposal of new ODA projects that contribute to both expansion of the drone business and improvement of development issues in Zambia
6	Discovering local customers and partner companies					• Participation in the Zambia-Japan public and private infrastructure conference • Interview with local companies in the sectors where drone business can be developed	• Developing connection with candidate clients and promoting business negotiations • Developing connection with partner companies
7	Examination of income and expenditure model (approximate price, cost, etc.) of drone logistics service					• Estimate of income and expenditure model of drone logistics service assuming introduction to rural health center and district hospital	• Presentation of income and expenditure model of drone logistics to MOH

Chapter 3 Schedule of the implemented activities

3.1. First activity in Zambia (January 2017)

Table 3.1-1 Schedule (1st activity in Zambia)

Date	Day	Activity	Place
8 Jan.	Sun	Trip (Haneda - Dubai - Lusaka)	
9 Jan.	Mon	Courtesy call to PS of MOH, discussion with MOH officials	MOH
		Discussion with MOTC, CAA, Zambia Airport Corporation Limited	MOTC
10 Jan.	Tue	Discussion with PMO of the Southern Province	PMO
		Courtesy call to the Commissioner of Kalomo and Gwembe District	Kalomo District, Gwembe District
		Site visit to Choma District	Choma District
11 Jan.	Wed	Zambia - Japan Public and Private Infrastructure Conference	Intercontinental Hotel
12 Jan.	Thu	Discussion with UNICEF and UNFPA	UN House
13 Jan.	Fri	Signing on the Memorandum of Understanding	MOH
		Report to JICA Zambia Office	JICA Zambia Office
		Courtesy call to the Embassy of Japan in Zambia	Embassy of Japan in Zambia
		Site visit for drone product introduction event scheduled in April	Lusaka
14 Jan.	Sat	Survey for the procurement of necessary equipment and materials in Lusaka	Lusaka
		Trip (Lusaka - Dubai)	
15 Jan.	Sun	Trip (Dubai - Haneda)	

3.2. Second activity in Zambia (April 2017)

Table 3.2-1 Schedule (2nd activity in Zambia)

Date	Day	Activity	Place
8 Apr.	Sat	Trip (Narita - Dubai)	
9 Apr.	Sun	Trip (Dubai - Lusaka)	
10 Apr.	Mon	Customs clearance application	ZEGA
		Discussion and support request for customs clearance	CAA
		Discussion with the PS and other officials of MOH	MOH
11 Apr.	Tue	Zambia - Japan Quality Infrastructure Dialogue (QID)	National Road Fund Agency
		Drone product introduction event	University of Zambia
12 Apr.	Wed	Trip (Lusaka - Choma)	
13 Apr.	Thu	Discussion with PMO, Director of Popota RHC, etc.	PMO, Choma DH, Popota RHC
		Demonstration of drone, site survey on power and telecommunication infrastructure	Choma DH, Popota RHC
15 Apr.	Sat	Trip (Choma - Lusaka)	
		Trip (Lusaka - Dubai) (4 out of 7 project members)	
16 Apr.	Sun	Trip (Dubai - Haneda) (4 out of 7 project members)	
		Internal meeting and reporting	
17 Apr.	Mon	Internal meeting and reporting	
18 Apr.	Tue	Report of the results of the activity	MOH
		Report of the results of the activity	CAA
		Counterpart meeting in health sector	Embassy of the US
19 Apr.	Wed	Re-export application of drones	ZEGA
		Meeting with Contractor for USAID Global Health Supply Chain Program: Procurement and Supply Management (GHSC-PSM)	GHSC-PSM office
		Report to JICA Zambia Office	JICA Zambia Office
		Trip (Lusaka - Dubai) (3 project members)	
20 Apr.	Thu	Trip (Dubai - Haneda) (3 project members)	

3.3. Third activity in Japan (June 2017)

Table 3.3-1 Schedule (3rd activity in Japan)

Date	Day	Activity	Place
5 Jun.	Mon	Zambia Participants visit Japan	
6 Jun.	Tue	Orientation of the activity in Japan and business introduction of Aerosense	Aerosense
		Seminar: UAS Industry Policy in Japan (Ministry of Economy, Trade and Industry)	Ministry of Economy, Trade and Industry
		Seminar: Current status of amendment Aeronautical Act and direction of future institutional design (Ministry of Land, Infrastructure, Transport and Tourism)	Ministry of Land, Infrastructure, Transport and Tourism
		Seminar: Utilization of UAVs for Logistics Business (Ministry of Land, Infrastructure, Transport and Tourism)	
7 Jun.	Wed	Demonstration flight of VTOL	Katsuma radio control airfield
		Operation training of multicopter	
8 Jun.	Thu	Seminar: Usage of Unmanned Aerial Vehicle/UAV for health sector –The Present and the Future – (NCGM)	Yachiyo Engineering
		Wrap-up meeting	
		Zambian participants left Japan	

3.4. Fourth activity in Zambia (September 2017)

Table 3.4-1 Schedule (4th activity in Zambia)

Date	Day	Activity	Place
1 Sep.	Fri	Trip (Narita - Dubai)	
2 Sep.	Sat	Trip (Dubai - Lusaka)	
		Meeting with EQUIP (NGO funded by USAID and other donors)	Stay Easy Hotel
3 Sep.	Sun	Trip (Lusaka - Choma)	
4 Sep.	Mon	Report to PMO of the Southern Province	PMO
		Courtesy call to Choma Fire Brigade	Choma Fire Brigade
5 Sep.	Tue	Report to Director of Choma DH	Golden Pillow Lodge
		Trip (Choma - Lusaka)	
6 Sep.	Wed	Report to MOH	MOH
		Discussion with EQUIP	EQUIP office
		Discussion with USAID-GHSCP	USAID-GHSCP office
7 Sep.	Thu	Report to CAA	CAA
		Discussion with ZICTA	ZICTA
		Discussion with UNICEF	UN House
8 Sep.	Fri	Discussion with PCI (NGO funded by USAID, US Department of Defense, etc.)	PCI office
		Discussion with MSH (NGO funded by USAID, Gates Foundation, etc.)	JICA Zambia Office
		Discussion with USCDC (US Center for Disease Control and Prevention)	Lusaka
		Report to JICA Zambia Office	JICA Zambia Office
		Report to the Embassy of Japan in Zambia	Embassy of Japan in Zambia
		Trip (Lusaka - Dubai)	
9 Sep.	Sat	Trip (Dubai - Narita)	
10 Sep.	Sun	Trip (- Narita)	

Chapter 4 Summary of the Program (evaluation on implementation results)

4.1. Result of the Program (Contribution to Zambia)

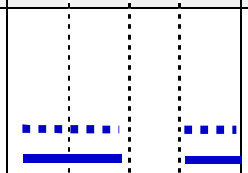
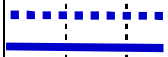
The objectives of the Program, promoting understanding of government officials on the possibility of using drone as logistics infrastructure in the health sector in Zambia and creating human network for business, were fully achieved through the drone introduction event, demonstration flight, various seminars conducted in Japan, and so on.

In addition, the goal of the Program, the introduction of drone logistics is started to be examined by related organizations in Zambia, was achieved by MOH and local donors and NGOs, etc., except for financing issues.

4.2. Result of the Program (business aspects), remaining issues and resolution policies

Result of the Program in view of business aspects are shown in Table 4.2-1.

Table 4.2-1 Result of the Program (business aspects), remaining issues and resolution policies

#	Activity	Plan / Result (1st (Zambia) / 2nd (Zambia) / 3rd (Japan) / 4th (Zambia))	Achievement status and evaluation		Remaining issues and resolution policies
1	Confirmation of marketability and local needs		Fin	・We grasped the current status of the development issues at the target site and quantitatively estimated the degree of improvement when drone logistics was applied. ・We proposed pilot activities of drone logistics to the organizations candidate for customers. ・Regarding the needs of drone other than logistics, we confirmed the intention of the local companies.	
2	Promotion of understanding on drone's technology, products and services by Zambian stakeholders		Fin	・Through the activities in Zambia and Japan, understanding of drone's technology, products, and services by Zambian stakeholders deepened.	
3	Grasping the local law system related to the drone operation, permission and approval		Fin	・We grasped the commercial use registration of drone regulated by CAA and the method and procedure of application for registration of communication equipment prescribed by ZICTA.	
4	Grasping the current status of power and telecommunication infrastructure related to drone operation and proposing the direction of improvement		Fin	・We grasped the current status of power supply and mobile phone connection in rural area. ・We compiled necessary technical condition of power infrastructure as a drone's operating base and the necessary response to advance the infrastructure development in the future.	
5	Proposing collaboration plans with ongoing/future ODA projects		Fin	・We examined the proposals for contributing to the achievement goal of ongoing technical cooperation project in health sector, and for collaboration of drone business with other sectors (agriculture, sensing survey, etc.).	
6	Discovering local customers and partner companies		Issues remained	・Through the Program, we developed a network with local private companies and international donors/NGOs. ・Financial cooperation for the implementation of pilot activities has not been established.	・Continuing to seek for funding providers in both Zambia and Japan
7	Examination of income and expenditure model (approximate price, cost, etc.) of drone logistics service		Issues remained	・We estimated the cost of implementing the pilot activities and the cost required for the development of business in Zambia. ・In the future, it is necessary to verify the validity of the income and expenditure model through on-site pilot projects.	・Verifying the income and expenditure model by implementing pilot projects

4.2.1. Result of the Program (business aspects)

As mentioned above, through the Program, recognition of drones was improved and understanding the effectiveness of the drone as a solution for development issues among stakeholders were promoted. In addition, we are ready for the application of drones for commercial use and building relationship with stakeholders in Zambia. As soon as we are able to secure funds, we will prepare for the start of pilot activities.

Based on the result of the GIS survey by EQUIP, it also estimated that blood samples that can be newly transported when introducing drone logistics will be more than 1.25 million per year.

4.2.2. Remaining issues and resolution policies

In order to secure funding providers for pilot activities in the future, we will continue to search fund providers including not only donors and NGOs in Zambia but also private enterprises and foundations in Japan, government organizations, etc.

In addition, by conducting pilot activities in Zambia, we will examine the details of the income and expenditure model and strive to improve the accuracy of the business plan.

Finally, it is necessary to establish flight control to allow drone to safely fly without conflict with other manned aircraft / drone, and to establish long distance communication method. To develop operation rules at national / international level, we will also promote public and private partnership in Zambia.

Chapter 5 Business development plan after the Program

5.1. Expected outcomes through business (contribution to Zambia)

Our drone business is aimed at contributing to improve the quality of residents' living in Zambia by rapid and stable transportation of goods using drones in areas where logistics restrictions have been imposed beforehand, survey and inspection work requiring a lot of labor and time with existing technology. Benefits of the business include mainly (1) improving the quality of various services (e.g. health services in the Program) by expediting and stabilizing goods transportation, (2) improving the efficiency and quality of operations in infrastructure related sectors and industrial sectors.

5.2. Collaboration proposal with ODA projects

Firstly, Aerosense proposes to utilize drone logistics by establishing a distribution network of specimens and reagents etc. for rapid diagnosis and treatment in collaboration with ongoing JICA Project (HIV / AIDS and TB control support program). As a result, some remote areas that were difficult to deal with by existing transportation means such as motorbikes and vehicles can be included in the Project. In the future, it will greatly contribute to achieve the global development goals such as the 90-90-90 Target aiming for the end of AIDS and the Global Plan to End TB aiming to reduce the death due to tuberculosis by 95% by 2035.

Secondly, we propose a new technical cooperation project to raise the capacity of CAA to oversee the drone industry to promote the drone-related industries, as well as to set up a public-private partnership organization that follows public and private council in Japan to promote the drone industry in Zambia.

Thirdly, to strengthen fragile power infrastructure in rural areas, we propose a new grant project that introduces solar panels and storage batteries which are independent of national power grid. The project strengthens the power supply system for health care facilities that support the lives of people, and strengthens the power infrastructure supporting drone logistics.

Appendices

1. Outline of the Program

2. UAS Industry Policy in Japan (Ministry of Economy, Trade and Industry of Japan)

3. Current status of amendment Aeronautical Act and direction of future institutional design (Ministry of Land, Infrastructure, Transport and Tourism)

4. Utilization of UAVs for Logistics Business (Ministry of Land, Infrastructure, Transport and Tourism)

5. Usage of Unmanned Aerial Vehicle/UAV for health sector －The Present and the Future － (NCGM)

Collaboration Program with the Private Sector for Disseminating Japanese Technology for Logistics Service by Unmanned Aerial Vehicle (UAV)

Kick-off Meeting@Ministry of Health, Zambia
9th January, 2017

エアロセンス株式会社
Aerosense Inc.

Outline

1. Background and Objective
2. Product to be Introduced
3. Activities
4. Target Area
5. Implementing Organization
6. Schedule
7. Benefits to Zambian side
8. Requests to Zambian side

1. Background and Objective

<Background>

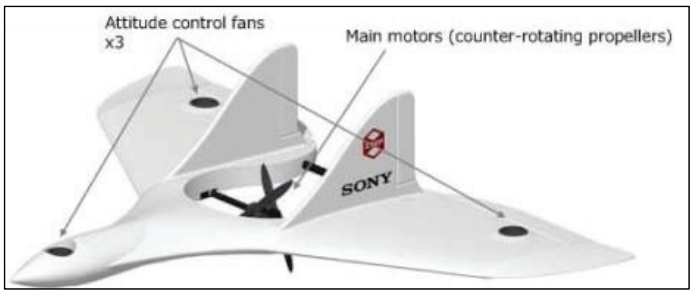
- Vulnerable logistics infrastructure causes the lack of necessary and timely medical examination and treatment to people in rural areas.
- Logistics infrastructure by Unmanned Aerial Vehicle (UAV) can innovatively change the existing logistics system.

Access road to local health center submerging in rainy season (Southern Province)

<Objective>

- To promote understandings of Zambian side on the potential of UAV as logistics infrastructure
- To formulate human network for the future UAV business development in Zambia

2. Product to be Introduced



Product name:
VTOL (Vertical Take-off and Landing)

Size: 2,200 x 1,600 x 600 mm
Weight: 7kg (including battery)
Flight speed: 130km/h at maximum
Flight hours: aiming at 1 hour without battery replacement with payload
Load availability: aiming at 1.5kg

Product name:
AS-MC02-P (MultiCopter)

Size: 431 x 431 x 363 mm
Weight: 3.3kg (including battery)
Flight hours: 20 munutes without battery replacement with payload
Load availability: 0.5kg

3. Activities

(1) Activities in Zambia

<January, 2017>

1) Kick-off and coordination meetings
2) Site visit for demonstration operation of UAV

<April, 2017>

3) Holding a seminar (UAV operation, laws and regulations)
4) Demonstration operation of UAV (VTOL, MultiCopter)
5) Technical examination (power supply, telecommunication)
6) Examination of the possibility of collaboration with ongoing/future ODA projects

<July, 2017>

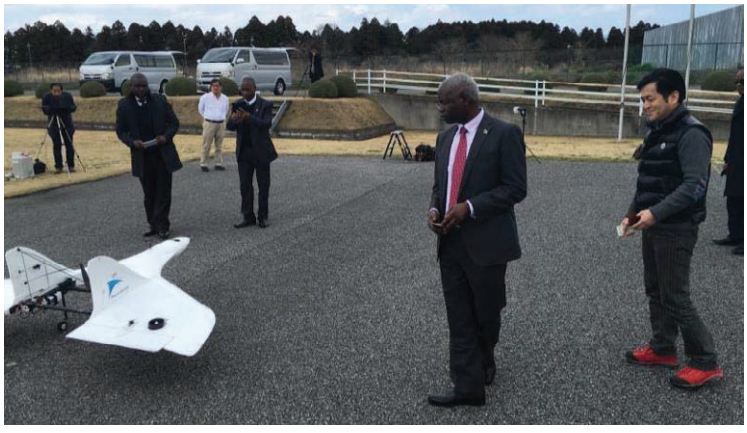
7) Final Report of the Program, discussion on the future ODA projects

MOH: Ministry of Health
MOTT: Ministry of Transport and Telecommunication
ODA: Official Development Assistance of the Government of Japan

3. Activities

(2) Activities in Japan <May, 2017>

1) Holding a seminar (UAV operation, international cooperation in health sector, laws and regulations on UAV operation)
2) Visit to the project site of UAV verification activities by Aerosense Inc.



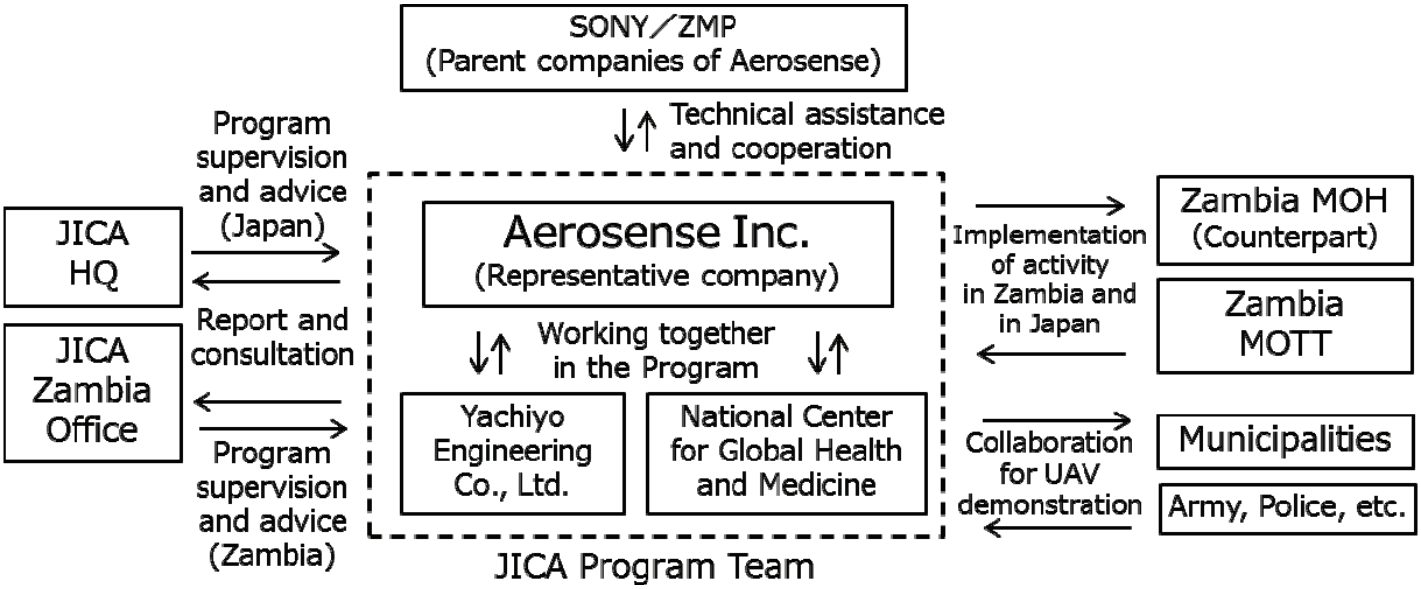
Picture: Demonstration flight implemented in Japan (January, 2016)
High officials of the Embassy of Zambia in Japan, and President of Aerosense. Inc. Mr. Taniguchi

4. Target Area

Target area (proposal): Gwembe District or Kalomo District, Southern Province, Republic of Zambia

Specific target sites in the Program will be fixed through the discussion with the Ministry of Health.

5. Implementing Organization



6. Schedule

Schedule of Program Implementation and Mobilization of JICA Team Members

	Title	Name	Organization	2016 Oct	Nov	Dec	2017 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Man-day Zambia	Man-day Japan
Activities in Zambia	Team Leader/ Senior UAV Engineer	Satoru Shimada	Aerosense Inc.				■			■			■			27	
	UAV Engineer 1/ Seminar in Japan 1	Kohtaro Sabe	Aerosense Inc.							■						8	
	UAV Engineer 2	Sho Murakoshi	Aerosense Inc.							■						8	
	UAV Engineer 3	Masanori Nukada	Aerosense Inc.							■						8	
	Health Service/ Seminar in Japan 2	Naofumi Hashimoto	National Center for Global Health and Medicine				■			■			■			27	
	Chief Advisor/ Collaboration with ODA Projects	Masaya Sugita	Yachiyo Engineering Co., Ltd.				■			■			■			27	
	Power and Telecommunication Infrastructure	Takafumi Kuga	Yachiyo Engineering Co., Ltd.							■						8	
															Total	113	
Activities in Japan	Team Leader/ Senior UAV Engineer	Satoru Shimada	Aerosense Inc.				□			□	□	□					9
	UAV Engineer 1/ Seminar in Japan 1	Kohtaro Sabe	Aerosense Inc.							□							3
	UAV Engineer 2	Sho Murakoshi	Aerosense Inc.														
	UAV Engineer 3	Masanori Nukada	Aerosense Inc.														
	Health Service/ Seminar in Japan 2	Naofumi Hashimoto	National Center for Global Health and Medicine				□			□	□	□					9
	Chief Advisor/ Collaboration with ODA Projects	Masaya Sugita	Yachiyo Engineering Co., Ltd.		□		□			□	□	□		□			19
	Power and Telecommunication Infrastructure	Takafumi Kuga	Yachiyo Engineering Co., Ltd.							□							3
															Total		43
Activity	Activity in Zambia 1: Kick-off meeting, preparation for UAV demonstration						■										
	Activity in Zambia 2: Seminars, UAV demonstration									■							
	Activity in Japan 1: Seminars, site visit of UAV verification project										□						
	Activity in Zambia 3: Discussion on Final Report and future projects											■					
		Report			△ Implementation Plan							△ Draft Final Report		△ Final Report			

Legend ■ Activities in Zambia □ Activities in Japan

7. Benefits of the Program to Zambian side

1. Improving efficiency of supply chain in remote areas in view of expeditiousness and wider coverage of service provision in the future
2. Promoting business expansion of private entities in Zambia in cooperation with Aerosense Inc.
3. Sharing experience and lessons learnt of formulating laws and regulations on UAV operation in Japan, which will contribute to the future policy/law/regulation making for UAV operation in Zambia

8. Requests to Zambian side

1. Cooperation with Aerosense Inc. in assuring the successful implementation of the Program;
2. Securing land or space sufficient for the demonstration of the Product;
3. Nominating appropriate candidates for activities in Japan;
   (2 persons from MoH and 1 person from MOTT)
4. Supporting the procedure of tax exemptions on the temporary import of the UAV; and
5. Provide the JICA Program Team with reasonable supports, including
   (1) Appointment with relevant Ministries/organizations;
   (2) Data provision (statistics, maps, photos, etc.)

Thank you very much for your kind attention.

http://www.aerosense.co.jp

UAS Industry Policy in Japan

June 2017

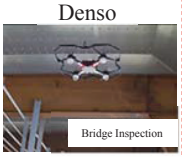
Industrial Machinery Division,
Manufacturing Industries Bureau,
Ministry of Economy, Trade and Industry of Japan

UAV manufacturers in Japan and the world

- The world's first commercial use of a UAV is said to be with an unmanned helicopter made by Yamaha Motor Company, which has been used for agrochemical spraying since the 1980s. However, DJI in Shenzhen, China emerged in the 2000s with the spread of smartphones, which made it possible to create lightweight and inexpensive batteries, acceleration sensors, and GPS modules. Nowadays, drones are sometimes referred to as "flying smartphones," and DJI's UAVs account for approximately 60% of the global total number of UAVs manufactured.
- In Japan, other than Yamaha Motor Company, most manufacturers of UAVs are start-ups. Recently, large corporations such as Denso have started to start to enter the market.

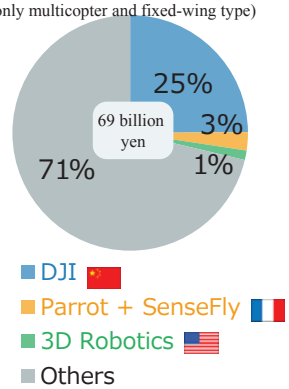
Types of UAVs and Manufacturers

Aerial Imagery: Aerial Imagery: Aerial Imagery: Measurement: Agrochemical Spraying: Aerial Imagery: Solar Panel Inspection: Logistics: Measurement: Agrochemical Spraying: Bridge Inspection: Disaster Response: Volcano Monitoring

		Rotary-wing type *The figure inside brackets is the number of rotor a UAV has.			Fixed-wing type
		Helicopter（1）	Multicopter（4 or more rotors）		
Main Manufacturers	World	–	DJI  Aerial Imagery	Parrot  Aerial Imagery	3D Robotics  Aerial Imagery	SenseFly  Measurement
	Japan	Yamaha Motor Company  Agrochemical Spraying Engine Drive ※Drone is generally driven by battery and motor	Prodrone  Aerial Imagery	enRoute  Solar Panel Inspection	Autonomous Control Systems Laboratory  Logistics	AeroSense  Measurement
			Yokoyama Corportion  Agrochemical Spraying	Denso  Bridge Inspection	Multi-copter labo  Disaster Response	Fuji Imvac  Volcano Monitoring

World UAV Sales by Manufacturer

(Sales in 2014, only multicopter and fixed-wing type)



（Source：Frost & Sullivan, 2015）

Reference：Manufacturers invested in by Japanese companies

- Precision Hawk … NTT docomo, Yamaha
- Skycatch … KOMATSU

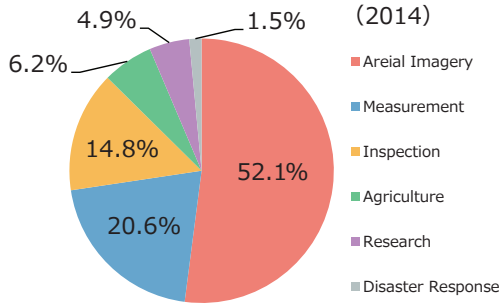
A drone is an unmanned aircraft which operates autonomously or is operated via remote control. The name "drone" comes from the noise it makes when it's flying, which is similar to that of a type of bee called a 'drone'.

World and Japanese drone market

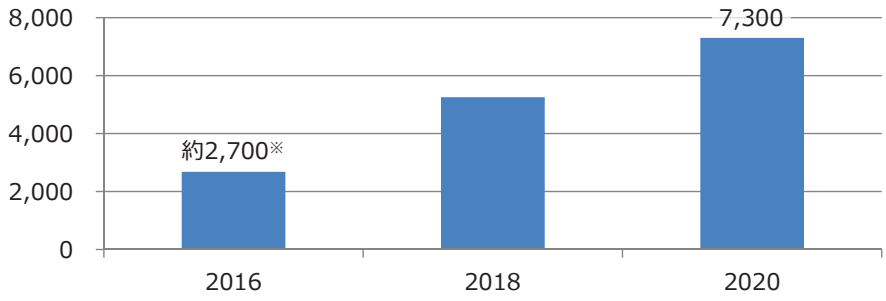
Appendix 2

- According to purpose of using drones in world market, majority is Aerial Imagery.
  Measurement, Infrastructure Inspection and Agrochemical Spraying are increasing.
  From now on, Practical using of drones prospect to spread disaster response by government or delivery without 「Visual Line of Sight (VLOS)」
- The world market is over 700 billion yen in 2020. The Japanese market is expected to exceed 100 billion yen in 2020.
  And about 80% of them are "Service" by using drones, not only drones “aircraft". Social implementation is key.

Proportion of using purpose in world market

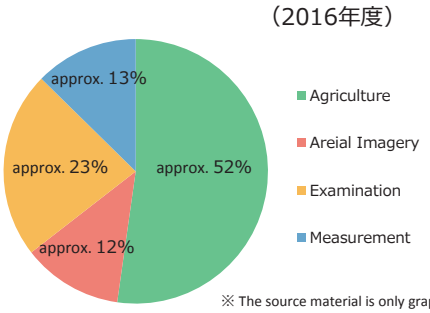


World drone market size (Billion yen) 1dollor＝110yen (Ref. Frost & Sullivan, 2015)



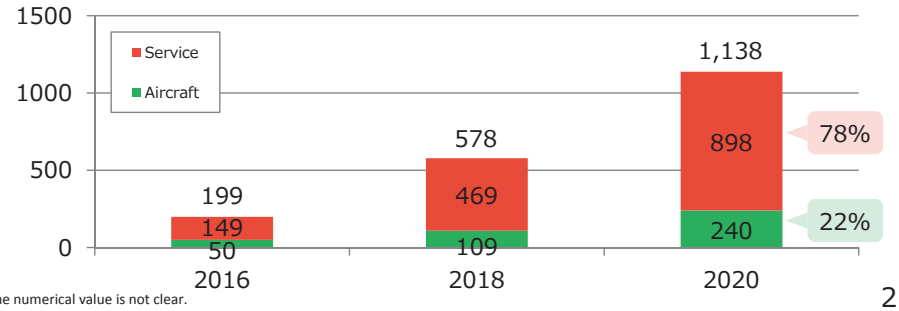
※ 2016 and 2018 are graphs only, the figures are not clear.

Proportion of using porpose in Japanese market ※



※ The source material is only graph, the numerical value is not clear.

Japanese drone market size (Billion yen) (Ref. Impress Corporation, 2016)



2

Drone's body and specifications (example)

Aircraft name	Bebop 2	Phantom 4	ACSL-PF1	Zion AC	PD6B	FAZER R	E-7
Aircraft picture							
Country	France	China	Japan (Chiba Prefecture)	Japan (Saitama Prefecture)	Japan (Aichi Prefecture)	Japan (Shizuoka Prefecture)	Japan (Kanagawa Prefecture)
Manufacturer	Parrot	DJI	Autonomous Control systems Laboratory Ltd. (ACSL)	ENROUTE CO., LTD.	Prodrone Co., Ltd.	Yamaha Motor Co., Ltd.	Fuji Imvac Inc,
Aircraft weight	500g	1.4kg	6.1kg	6.9kg	11kg	71kg	50kg
Maximum loading capacity	–	Hundreds g Under 1 kg	3～4kg	7kg	30kg	40kg	6kg
Flight time	25min.	28min.	25min.	10min.	10～30min.	50min.	9～15hours
Main use	Aerial Imagery	Aerial Imagery	Inspection, Logistics, Agriculture, Measurement	Agrochemical Spraying	Aerial Imagery, Measurement, Logistics	Agrochemical Spraying	Disaster Response, Weather observation, Measurement
Price range (reference)	Approx. 8 ten thousand	Approx. 20 ten thousand	Approx. over 200 ten thousand	Approx. 220 ten thousand	Approx. over 400 to 500 ten thousand	Approx. 1,200 ten thousand	Approx. 3 to 5 ten million

(Note) The price is reference, depend on value and various specifications of the aircraft, existence of accessories, performance, etc.

An amendment to the Aeronautical Act came into effect in Dec., 2015.
Act on prohibition of flying UAVs over important facilities came into effect in April, 2016.

Appendix 2

- A drone was found on the roof of the Japanese Prime Minister's office in April, 2015. Following this incident, a UAVs liaison meeting of concerned prefectures and government ministries and agencies was held. Basic rules were established through the enactment and enforcement of a revised Aeronautical Act (bill by the Cabinet) and Act on prohibition of flying UAVs over important facilities (legislation by Diet members).

April 22, 2015
Drone found on roof of Prime Minister's office

From April 24, 2015

UAVs liaison meeting of concerned prefectures and government ministries and agencies

- Committee for UAV operational rulemaking and its utilization, as well as reviewing relevant laws
- Committee for strengthening security of important facilities against terrorism using UAVs

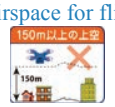
An amendment to the Aeronautical Act (Enacted on Sept. 4, 2015, effective from Dec.10, 2015)

- Regulate prohibited airspace for flight and operational limitations.

<Prohibited Airspace for flight>

※UAV operation in these areas is possible with approval by the Minister of Land, Infrastructure, Transport and Tourism.

Around airports



Airspace above 150 m

Densely populated areas

<Operational limitations> ※These UAVs operation are possible with approval by the Minister of Land, Infrastructure, Transport and Tourism.

UAVs should only be operated in the daytime.

UAV Operation should be within VLOS.

Keep over 30 m operating distance between drone/persons/properties.

Do not operate UAVs over event sites.

Do not transport hazardous materials by UAV.

Do not drop any objects from UAVs.

Act on prohibition of flying UAVs over important facilities
(Enacted on March 17, 2016, effective from May 23, 2016)

- Prohibit flying UAVs over important national facilities

<Designated Facilities> ※These no-fly areas extend to within a 300-m radius of such facilities.

① Important national facilities (the Diet building, the Prime Minister's office building, buildings of designated government agencies that are involved in crisis management, the Supreme Court building, the Imperial Palace and the Crown Prince's Palace, designated political parties' office)
② Designated embassies
③ Designated nuclear facilities

The Public-Private Sector Conference on Improving the Environment for UAVs

- "The Public-Private Sector Conference on Improving the Environment for UAVs" was set following Prime Minister Abe's remarks in the 2nd "Public-Private Dialogue towards Investment for the Future".

The 2nd "Public-Private Dialogue towards Investment for the Future"
(Nov. 5, 2015)

Prime Minister Abe stated, "We will aim to make parcel delivery by drones a reality, as soon as three years from now. For this purpose, the government will immediately establish a Public-Private Council, in which users and the relevant ministries and agencies will discuss the specific structural and systemic requirements. A policy to improve the system should be established by such a council by summer next year."

The public-Private Sector Conference on Improving the Environment for UAVs

Dec. 7, 2015	1st Public-Private Sector Conference
Jan. 5, 2016	1st Meeting for System Design※
Feb. 1, 2016	2nd Meeting for System Design※
Feb. 15, 2016	2nd Public-Private Sector Conference
Mar. 7, 2016	3rd Meeting for System Design※
Mar. 9, 2016	4th Meeting for System Design※
Apr. 6, 2016	3rd Public-Private Sector Conference
Apr. 28, 2016	4th Public-Private Sector Conference
May 30, 2016	5th Meeting for System Design※
Jul. 1, 2016	6th Meeting for System Design※
Jul. 29, 2016	5th Public-Private Sector Conference

※Meeting for system design for further safety of UAVs usage

Summary of Public/Private Sector Conference

Appendix 2

● At the Public/Private Sector Conference on the Current Environment for Small UAVs, the directions for system design were determined for ① Roadmap for the Application and Technology Development of UAVs in Japan (Apr 28, 2016) and ② Directions to Take in Designing Systems to Further Ensure Small UAV Safety （Jul 29, 2016）

Public/Private Sector Conference on the Current Environment for Small UAVs （From Dec. 2015）

Roadmap for the Application and Technology Development of UAVs in Japan

- Flights beyond visual range in uninhabited areas by around 2018 Full-scale implementation of delivery of goods to remote islands and mountainous areas, etc. … ①
- Flights beyond visual range in inhabited areas in the 2020's Full-scale implementation of delivery of goods to inhabited areas including urban areas … ②
- Development of technology needed to realize the above （*Build an operational management system, improve anti-collision function, etc.*） The above items will be done to create the proper foundation for UAV operation

Directions to Take in Designing Systems to Further Ensure Small UAV Safety

1. Further ensure safety of UAV body, operator, operational management

- For ① to the left, introduce necessary systems such as required revisions to Aviation Law review procedures, etc.
- For ② to the left, early review, preparation of items necessary concerning UAV body certification system and licensing system for UAV operator

2． Ensure mutual safety, harmony for airplanes and small UAVs

- Begin meetings soon with participation of operators for small UAVs and airline operators, aim to establish rules by end of FY2016

Japan Revitalization Strategy 2016（Excerpt） （Jun 2016）

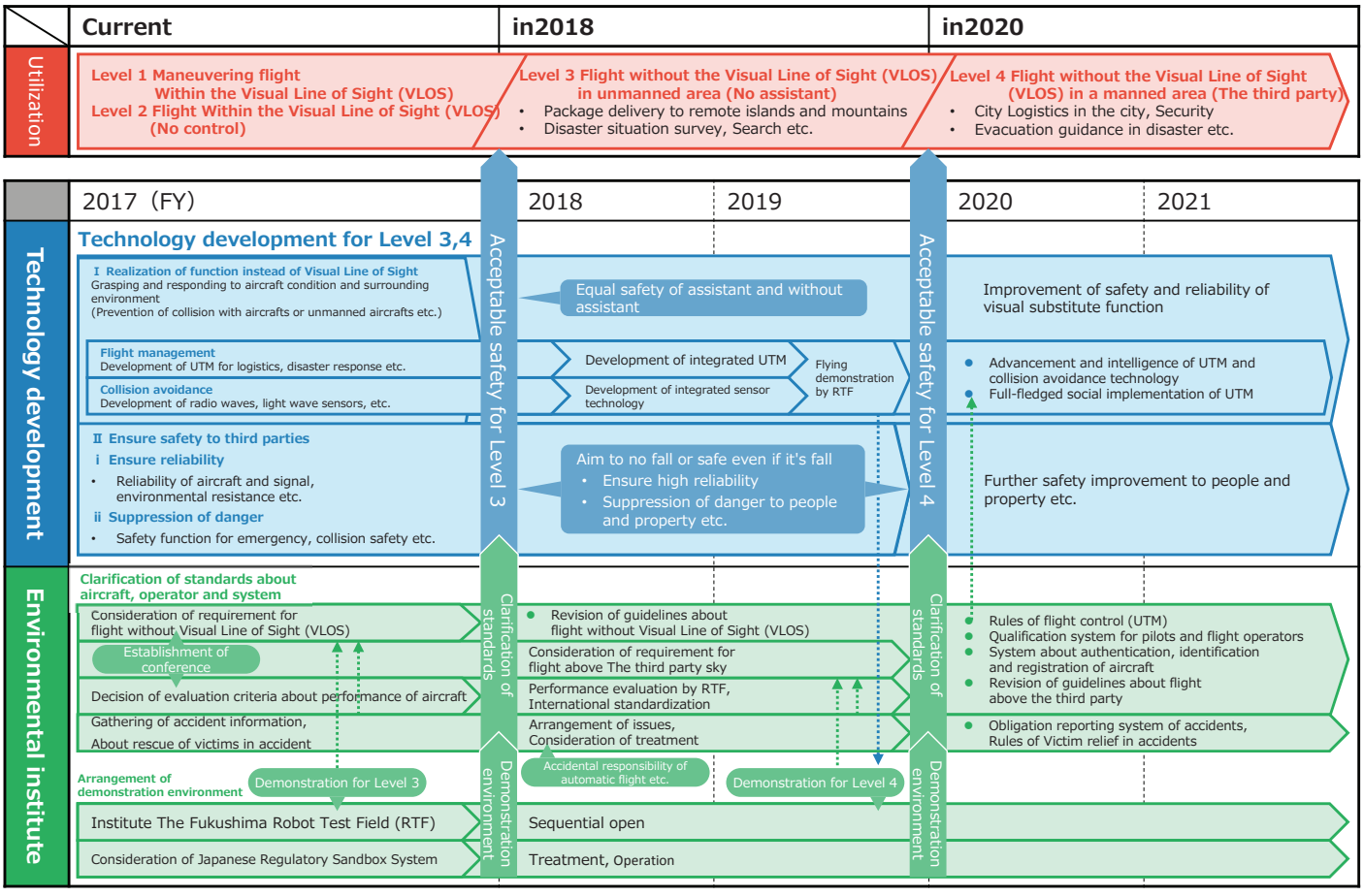
<Preparation of proper environment for expansion of small UAV industry utilization>

In anticipation of an aircraft industrial revolution, public and private sectors will work together to **formulate UAV body performance evaluation standards and build operational management systems**, and along with **supporting the development and verification of technology to improve collision avoidance functions, we will successively review necessary measures (UAV operational management, collision avoidance rules, etc.)** to ensure there is no delay in the social implementation of new technology for which safety has been confirmed.

6

Road map for The Aerial industrial revolution （draft） — **Technology development and environment improvement for safe utilization of Small UAVs**

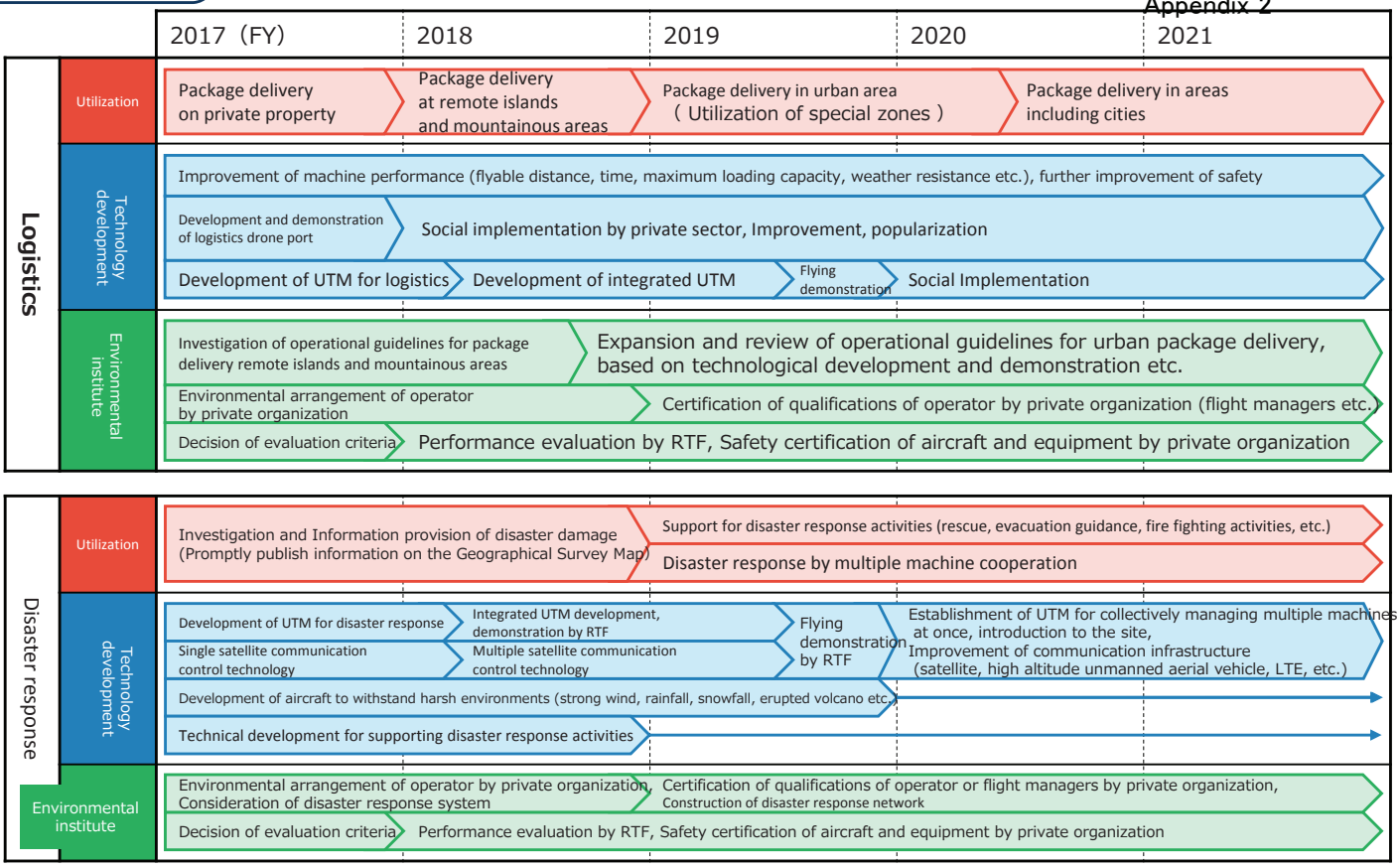
19 May 2017
The Public-Private Sector Conference on Improving the Environment for UAVs



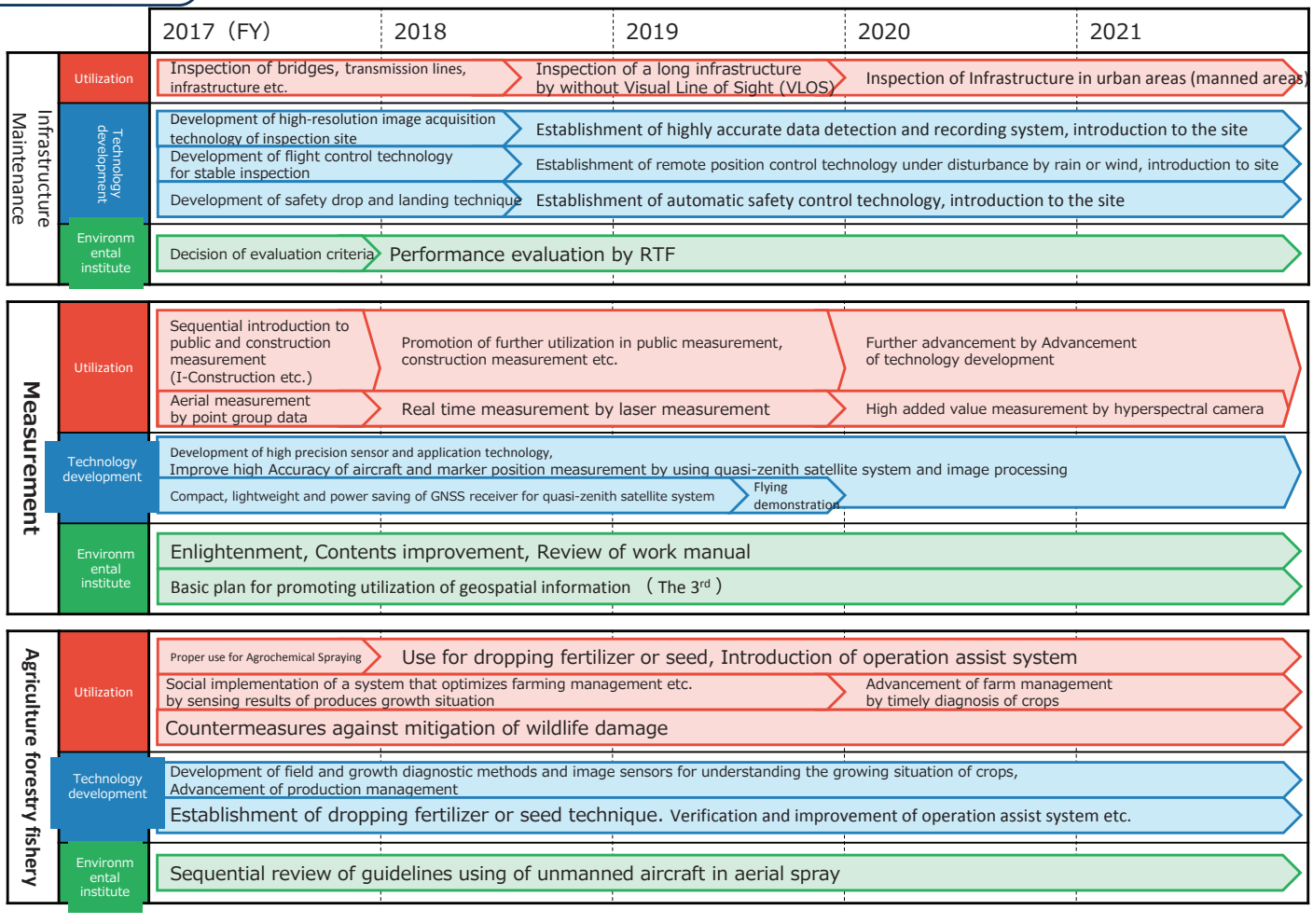
* For details of each item and other matters are reference from supplementary materials (separate sheet).

Appendix 2

Individual field



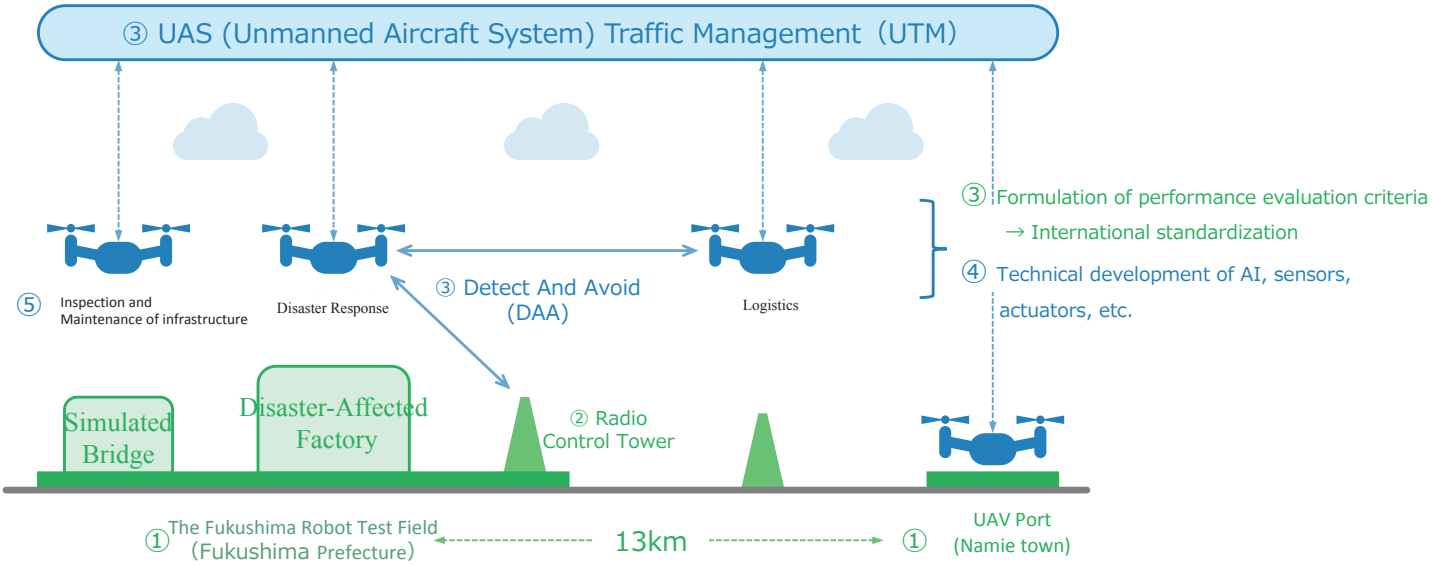
Individual field



Drone's performance evaluation criteria formulation, flight management and technology development for collision avoidance

- The Fukushima Robot Test Field was established for the development and demonstration of UTMs
- Formulate drone's ''performance evaluation standard '' as technology development for infrastructure inspection, disaster response, logistics and aim for international standardization. And develop "collision avoidance technology" that detects and avoids "flight management system" of multiple drones flying in the same airspace and other aircraft or properties on the ground in The Fukushima Robot Test Field.

（Note）数字は、前ページの予算事業のNoに対応。

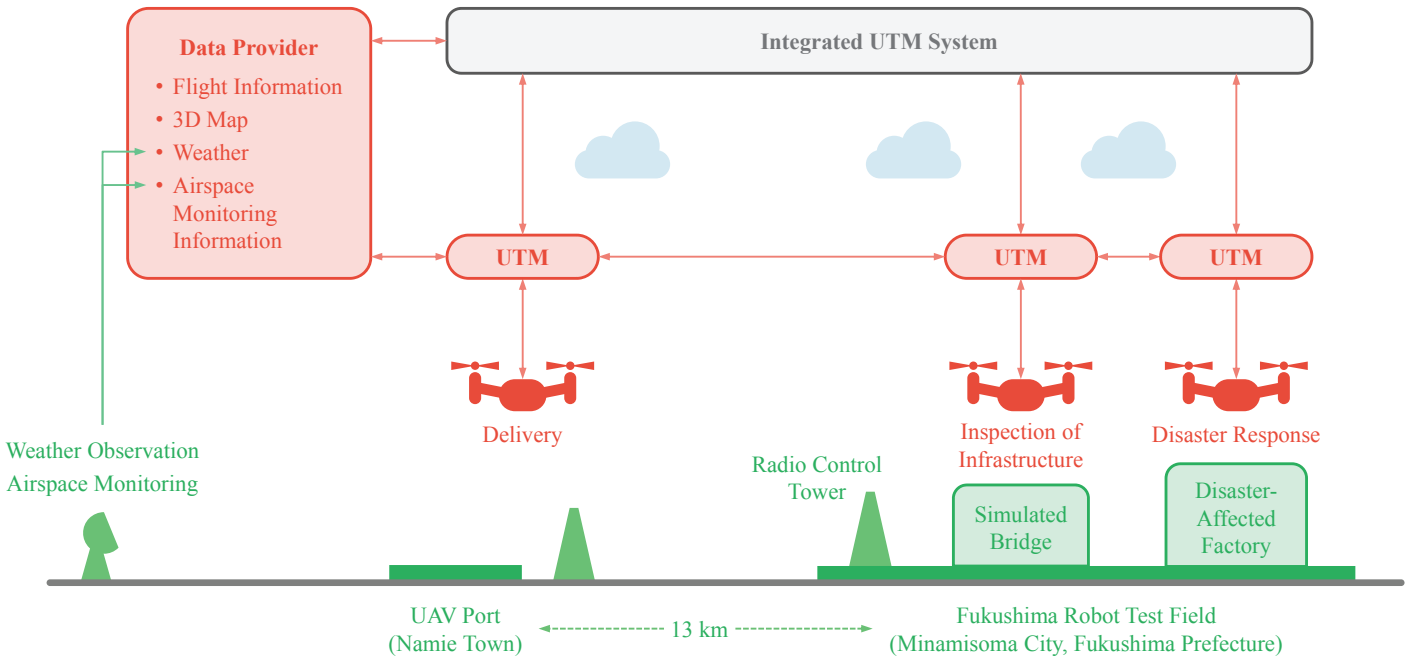


※ UTM：UAS (Unmanned Aircraft System) Traffic Management
※ DAA：Detect And Avoid

UTM Development Project in Japan

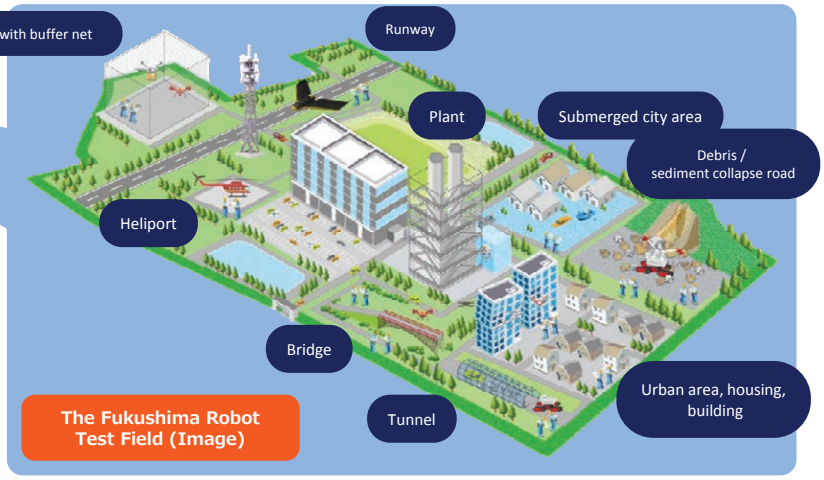
- UTM Development Project is going to start from FY2017 (FY2017's budget: 3.3 billion yen).
- The Fukushima Robot Test Field will be used as a base for the development and demonstration of UTM.

UTM: UAS (Unmanned Aircraft Systems) Traffic Management



Summary of “The Fukushima Robot Test Field” Appendix 2

- It was established in Minamisouma city and Namie Town in 2017 as a test field (total about 50 ha) of a robot drone used in infrastructure inspection, disaster response, logistics and other fields. It will be opened sequentially from 2018.
- We have begun demonstration experiment of drone utilizing the airspace of 13 km between two towns, before maintenance completed.



ふくしまから はじめよう。
Future From Fukushima.

Budget in 2016：51.0 Billion Yen
Supplementary budget in 2016：20.0 Billion Yen
Draft budget in 2017：13.1 Billion Yen

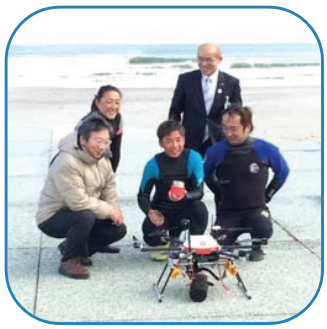
Demonstration of Drone Delivery in Fukushima

- In “Roadmap for the Application and Technology Development of UAVs in Japan” (The Public-Private Sector Conference on Improving the Environment for UAVs, 28th Apr. 2016), drone delivery service is planned to begin in isolated islands and mountainous areas from 2018, and in urban districts from the 2020s.
- To achieve this goal, the Ministry of Economy, Trade and Industry (METI), New Energy and Industrial Technology Development Organization (NEDO), Fukushima Prefecture, Minamisoma City, and Autonomous Control Systems Laboratory Ltd. (ACSL) jointly conducted a demonstration of drone delivery along the shoreline in Minamisoma City, Fukushima Prefecture on January 12 (Thur.), 2017.

A drone took off from Murakami Castle Remains.

Arriving at Kitaizumi Swimming Beach 12 km away from the takeoff site.

Surfers on the beach approached the drone.



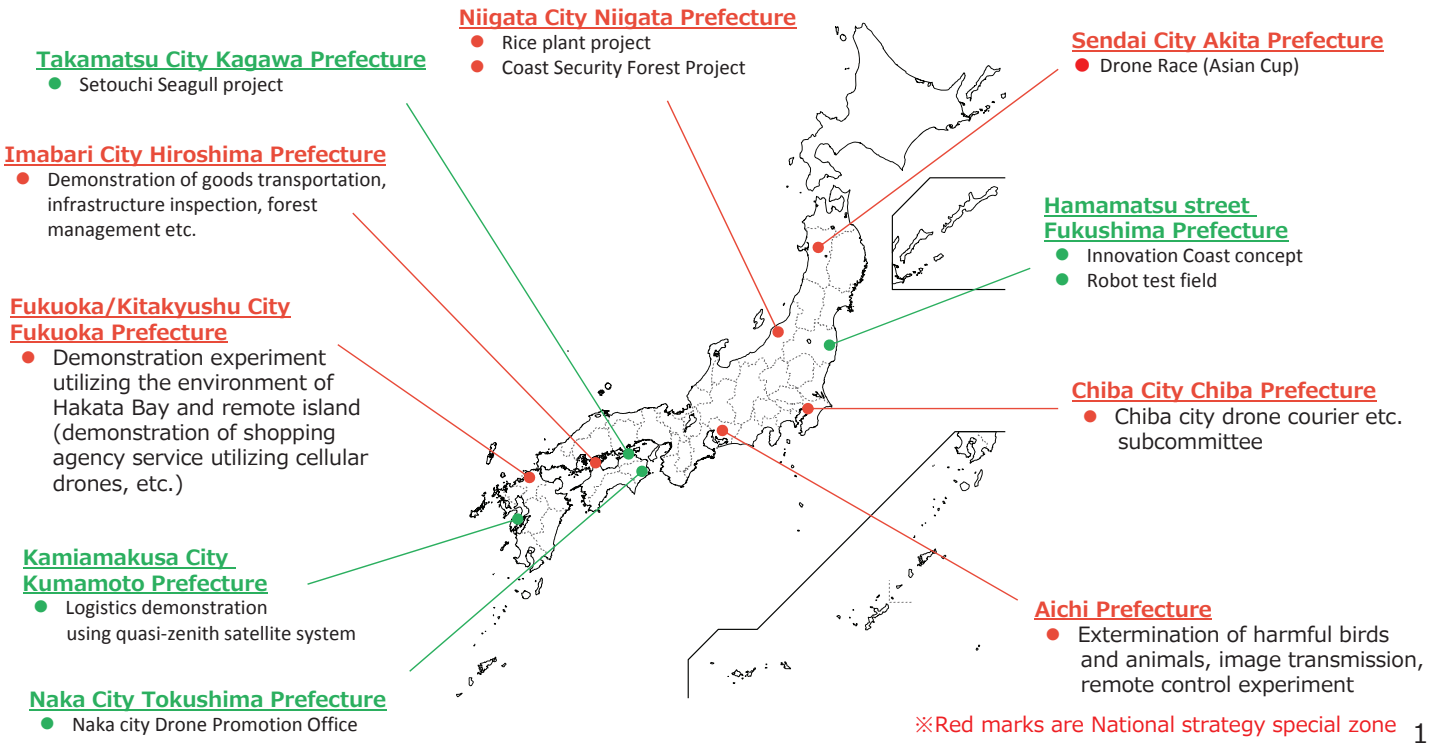
They got hot hot minestrone soup the drone delivered.

＜Reference＞
・Roadmap for the Application and Technology Development of UAVs in Japan
http://www.meti.go.jp/english/policy/mono_info_service/robot_industry/downloadfiles/uasroadmap.pdf

・World’s First Success in Long-distance Air Freight Shipment by a Fully-Autonomous Drone!
http://www.meti.go.jp/english/press/2017/0112_003.html

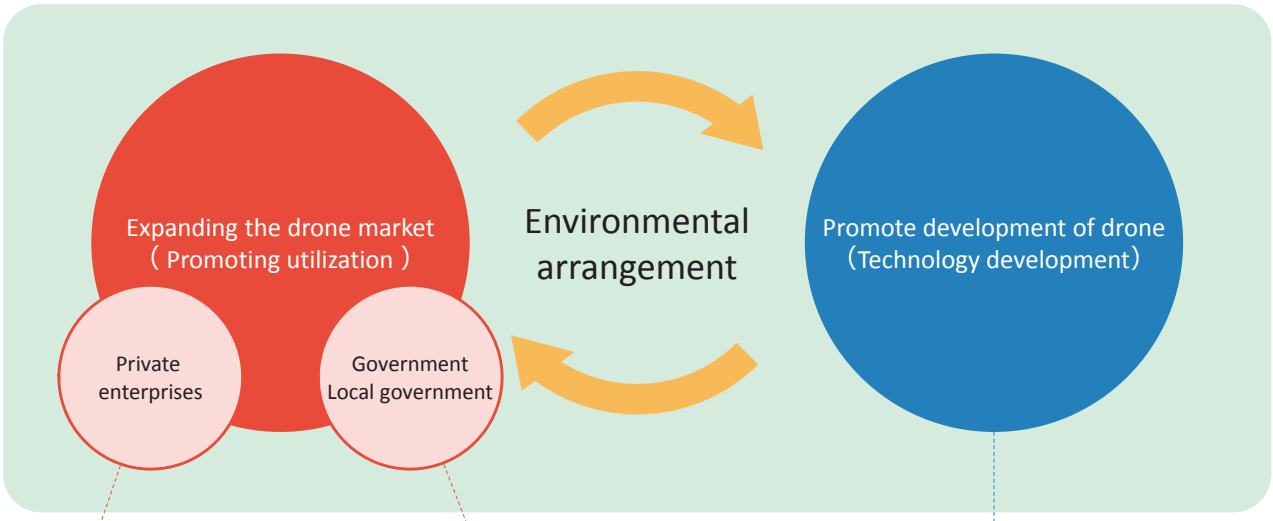
Effort of Local government toward to " the Aerial Industrial Revolution"

- Local governments promote to efforts as a national strategy special zone for industrial promotion of drones.
- It is important to gathering the results in various places for achievement of "the Aerial Industrial Revolution" as Japan.



Towards “the Aerial Industrial Revolution”

- Promote the use of drone in the field of logistics and disaster response by public and private sectors, and expand the drone market.
- Promote the industry of drone leaping to the world by technology development of drones that active above situations.
- Establish an environment ahead of the world to promote the use of drone and technology development.



Practical realization of logistics by drones in urban areas ahead of the world

Utilization of drone in public demand such as disaster response, infrastructure maintenance and surveying

Fostering drone makers lead to the world by Japanese technology

Current status of amendment Aeronautical Act and direction of future institutional design

6 June 2017

Ministry of Land, Infrastructure,
Transport and Tourism

国土交通省
Ministry of Land, Infrastructure, Transport and Tourism

Background

国土交通省

An amendment to the Aeronautical Act was passed on 11 September 2015 to introduce safety rules on unmanned aircraft (UA).

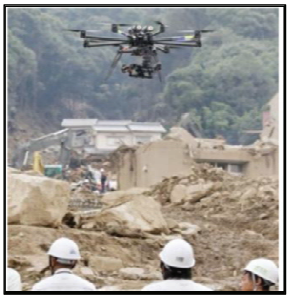
The new rules came into force on 10 December 2015.

The details of the rules are as follows:

Definition

The term “Unmanned Aircraft” means any airplane, rotor-craft, glider or airship which cannot accommodate any person on board and can be remotely or automatically piloted (excluding those lighter than 200g). The weight of an unmanned aircraft includes the weight of its battery.

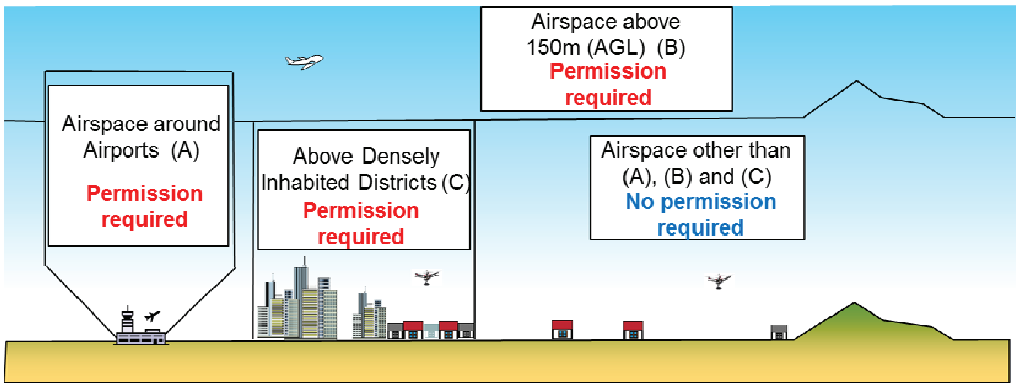
e.g.

Prohibited Airspace for such Flights

Any person who intends to operate an unmanned aircraft in the following airspaces is required to obtain permission from the Minister of Land, Infrastructure, Transport and Tourism.

(A) Airspace above the obstacle limitation surface* around airports.
(B) Airspace over 150m above the ground level.
(C) Above Densely Inhabited Districts (DID), which are defined and published by the Ministry of Internal Affairs and Communications.



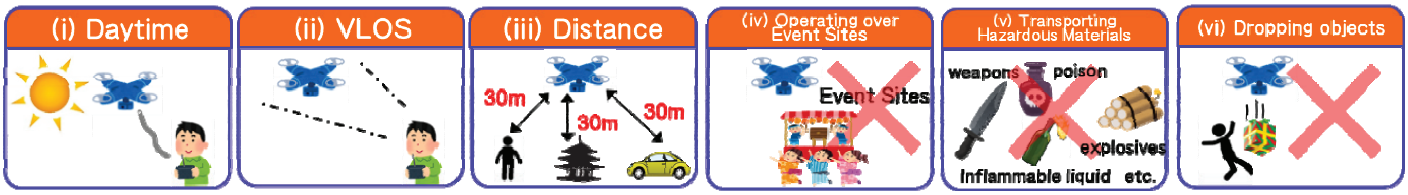
Conceptual Airspace

*Obstacle limitation surfaces: approaching surface, horizontal surface, transitional surface, extended approaching surface, conical surface and outer horizontal surface

Operational Limitations

Any person who intends to operate an UA is required to follow the operational conditions listed below, unless approved by the Minister of Land, Infrastructure, Transport and Tourism.

(i) Operation of an UA during the daytime.
(ii) Operation of an UA within the Visual Line of Sight (VLOS).
(iii) Maintenance of 30m operating distance between an UA and the persons or properties on the ground/ water surface.
(iv) Do not operate an UA over event sites where many people gather.
(v) Do not transport hazardous materials, such as explosives, in an UA.
(vi) Do not drop any objects from the UA.



Exception

Requirements stated in “Prohibited Airspace for Flight” and “Operational Limitations” are not applied to flights during search and rescue operations by public organizations in case of accidents and disasters.

Penalty

If the above rules are violated, the UA operator is liable to fine up to 500,000 yen.

The Public-Private Sector Conference on Improving the Environment for UAVs

国土交通省

Appendix 3

The 2nd "Public-Private Dialogue towards Investment for the Future"(5 Nov. 2015) Prime Minister Abe stated

, "We will aim to make parcel delivery by drones a reality, as soon as three years from now. For this purpose, the government will immediately establish a Public-Private Council, in which users and the relevant ministries and agencies will discuss the specific structural and systemic requirements. A policy to improve the system should be established by such a council by summer next year."

The public-Private Sector Conference on Improving the Environment for UAVs

- ○ **Establishment of The public-Private Sector Conference with members of related departments, agencies, manufacturers, users. (Held 6 times from 7 Dec 2015)**
- ○ **The public-Private Sector Conference reviewed roadmap about technological development on April, also reviewed direction of institutional design on July in 2016. And then they revised roadmap about technological development, made new roadmap for the Aerial Industrial Revolution on May in2017.**

Summary of Public/Private Sector Conference

1.Institutional design for safety of small UAVs

2.Grasp the operation of the revised air law and systematize and share safety measures

3.Improvement of environment for promotion of business · business utilizing by small UAVs

4.Verification of voluntary efforts to ensure safety of small UAVs

5.Improvement of the environment to realize "the Aerial Industrial Revolution"

Member of Public/Private Sector Conference

Cabinet Secretariat

Affiliated government agencies

Manager of related ministries and agencies participate

Cabinet Secretariat（Deputy Minister's Office, Countermeasure Crisis management office, IT Comprehensive Strategy Office, Japan Revitalization Comprehensive Office, Cabinet Cyber Security Center, Regional Creation Promotion Office) The Metropolitan Police Department, Consumer Affairs Agency, Ministry of Public Management , Fire and Disaster Management Agency , Department of Justice , Ministry of Education Culture Sports Science and Technology , Ministry of Health Labor and Welfare, Ministry of Agriculture Forestry and Fisheries, Ministry of Economy Trade and Industry, Ministry of Land, Infrastructure, Transport and Tourism

Affiliated organizations

- **Comprehensive organization consisting of manufacturers and users of small UAVs**
- **Association of makers of small UAVs**
- **User organization in a specific field**
- **Aviation organization**
- **Economic organization etc. 33 organizations · 10 companies**

6

※Established "Meeting for system design for further safety of UAVs usage"

Road map for the Aerial Industrial Revolution — **Technology development and environment improvement for safe utilization of small UAVs**

19 May 2017
The Public-Private Sector Conference on Improving the Environment for UAVs

国土交通省

	Current	in2018	in2020
Utilization	Level 1 Maneuvering flight Within the Visual Line of Sight (VLOS) Level 2 Flight Within the Visual Line of Sight (VLOS) (No control)	Level 3 Flight without the Visual Line of Sight (VLOS) in unmanned area (No assistant) • Package delivery to remote islands and mountains • Disaster situation survey, Search etc.	Level 4 Flight without the Visual Line of Sight (VLOS) in a manned area (The third party) • City Logistics in the city, Security • Evacuation guidance in disaster etc.

	2017（FY）	2018	2019	2020～
Technology development	**Technology development for Level 3,4**			
	Ⅰ Realization of function instead of Visual Line of Sight Grasping and responding to aircraft condition and surrounding environment (Prevention of collision with aircrafts or unmanned aircrafts etc.)	**Equal safety of assistant and without assistant**		Improvement of safety and reliability of visual substitute function
	Flight management Development of UTM for logistics, disaster response etc. Collision avoidance Development of radio waves, light wave sensors, etc.	Development of integrated UTM Development of integrated sensor technology	Flying demonstration by RTF	• Advancement and intelligence of UTM and collision avoidance technology • Full-fledged social implementation of UTM
	Ⅱ Ensure safety to third parties ⅰ Ensure reliability • Reliability of aircraft and signal, environmental resistance etc. ⅱ Suppression of danger • Safety function for emergency, collision safety etc.	Aim to no fall or safe even if it's fall • Ensure high reliability • Suppression of danger to people and property etc.		Further safety improvement to people and property etc.
Environmental institute	**Clarification of standards about aircraft, operator and system**			
	Consideration of requirement for flight without Visual Line of Sight (VLOS)	• Revision of guidelines about flight without Visual Line of Sight (VLOS)		• Rules of flight control (UTM) • Qualification system for pilots and flight operators • System about authentication, identification and registration of aircraft • Revision of guidelines about flight above the third party • Obligation reporting system of accidents, Rules of Victim relief in accidents
	Establishment of conference	Consideration of requirement for flight above The third party sky		
	Decision of evaluation criteria about performance of aircraft	Performance evaluation by RTF, International standardization		
	Gathering of accident information, About rescue of victims in accident	Arrangement of issues, Consideration of treatment		
	Arrangement of demonstration environment Demonstration for Level 3	Accidental responsibility of automatic flight etc.	Demonstration for Level 4	
	Institute The Fukushima Robot Test Field (RTF)	Opening step by step		
	Consideration of Japanese Regulatory Sandbox System	Treatment, Operation（P）		

Acceptable safety for Level 3 / Clarification of standards / Demonstration environment

Acceptable safety for Level 4 / Clarification of standards / Demonstration environment

7

Basic policy of system design toward securing further safety of UA ＜Summary＞

国土交通省

Appendix 3

Basic stance

- Through operation of the amended Aeronautical Act enforced on 10 December 2015, requirements concerning airframe, operator and operation control system have become more concrete ones and formulation of comprehensive rules including guidelines and activities of private associations has also progressed
- In order to correspond to rapidly progressing societal implementation of new technology and diversification of its usage, rules have been made or modified with expedition and flexibility but in a phased manner from where applicable

Basic policy of system design

＜Basic flight rules＞

- Enlighten as to prohibition of operation while drinking and pre-flight check, and prepare rules based on verification result of the effect
- Study to formulate a mandatory reporting system of accidents, a voluntary reporting system of small incidents/hazards, and gathering and analysis system of accident information

<Secure further safety of airframe, pilot and operation control system>

- Pilot training and flight manuals prepared by private associations are to be put on MLIT website provided that they comply with certain standards, and if they are actually utilized, review procedures will be streamlined partly.
- System will be introduced to fully provide goods delivery services in remote islands or mountain areas around 2018.
- In order to fully provide goods delivery services in urban areas in 2020s, type certification and pilot license system will promptly be studied and prepared.
- Even in case that permissions or approvals are not required, safety shall be enhanced through utilization of pilot training and flight manuals.

＜Safety and harmonization between UA and aircraft＞

- Investigative commission with participation of operators of UA and manned aircraft will promptly be launched to prepare rules for collision avoidance between manned aircraft and unmanned aircraft, and amongst UAs as well, by the end of FY 2016.
- Rules and countermeasures will be studied to prevent risks due to malfunction and operation mistake around airports.
- System to share flight information between operators of manned aircraft and unmanned aircraft will be established. NOTAM will be improved.

＜Others＞

- Prerequisite insurances shall be continued and safety awareness shall be maintained or improved.
- Publicity of guidelines and formulation of voluntary rules will be promoted with regard to privacy protection and flight over the land of the third party.
- Voluntary efforts to identify owners of UA will be encouraged.
- Proper frequency system to support flight out of the Visual Line of Sight will be studied.

Utilization of UAVs for Logistics Business

General Policy Bureau Logistics Policy Division in MLIT

6 Jun 2017

国土交通省
Ministry of Land, Infrastructure, Transport and Tourism

About The Public-Private Sector Conference on Improving the Environment for UAVs

国土交通省

The 2nd "Public-Private Dialogue towards Investment for the Future" (on November 2015)
Prime Minister Abe stated (Excerpt version)

We will aim to make parcel delivery by drones a reality, as soon as three years from now.
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The public-Private Sector Conference on Improving the Environment for UAVs

- ○ Establishment of The public-Private Sector Conference with members of related departments, agencies, manufacturers, users on December 2015.
- ○ The public-Private Sector Conference reviewed roadmap about technological development on April, and then we are continuing to examine the details of the system and the promotion of use.

Summary of Public/Private Sector Conference

1.Institutional design for safety of small UAVs

2.Grasp the operation of the revised air law and systematize and share safety measures

3.Improvement of environment for promotion of business · business utilizing by small UAVs

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- Association of makers of small UAVs
- User organization in a specific field
- Aviation organization
- Economic organization etc. 32 organizations · 7 companies

Basic policy of system design toward securing further safety of UA ＜Summary＞

国土交通省

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Road map for the Aerial Industrial Revolution

国土交通省

～Technology development and environment improvement for safe utilization of small UAVs～

○ The public-Private Sector Conference created "road map for utilization of UAVs and technology development" on April 2016. Promotion of technology development and environment improvement to realize the flight without VLOS (level 3) in the unmanned zone around 2018, and the flight without VLOS (level 4) in the manned zone around the 2020s.

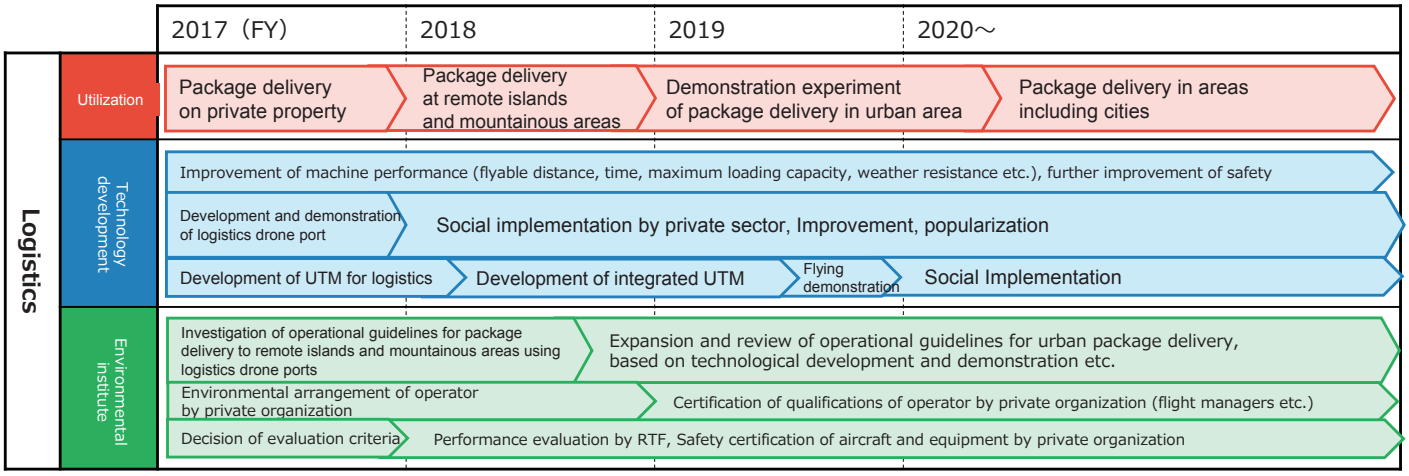
○ The public-Private Sector Conference committee compiled "Technology development and environment improvement for safe utilization of small UAVs" on May 2017, based on changes in the situation surrounding small UAVs of 1 year after roadmap creation.

○The public-private sector conference promotes efforts to safe utilization of small UVAs, according to development of technologies such as operation management and collision avoidance of UAVs, clarification of standards related to aircraft, pilot and flight system.

Road map for the Aerial Industrial Revolution

～Technology development and environment improvement for safe utilization of small UAVs～

（Public-Private Dialogue towards Investment for the Future on May 2017） （ Excerpts in the Logistics ）

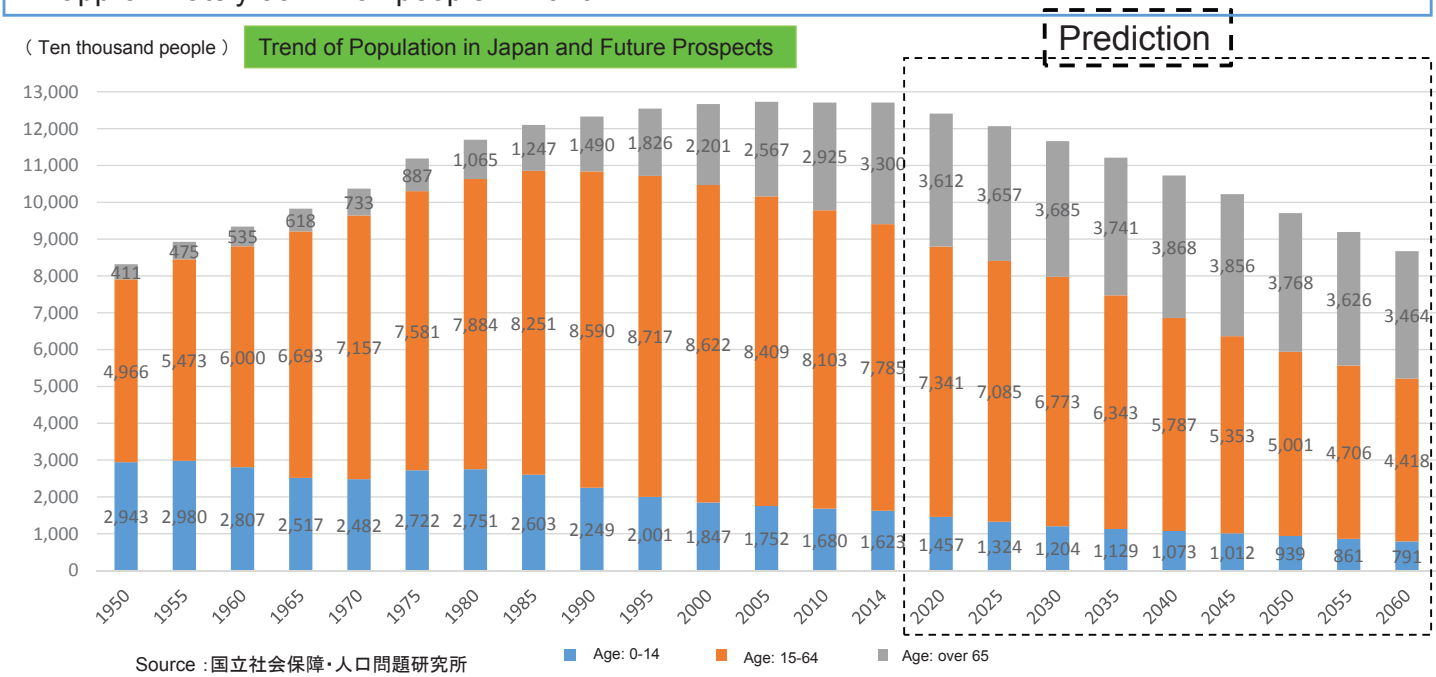


Trend of Population in Japan and Future Prospects

国土交通省

Appendix 4

- The total population has turned to decrease after 2005
- It will be expected to be about 100 million people around 2045
- Declining birth rate and aged society has been progress sharply, 40% of the total population will be expected over 65 years old in 2050,and working age population will be expected to decrease approximately 30 million people in 2010.

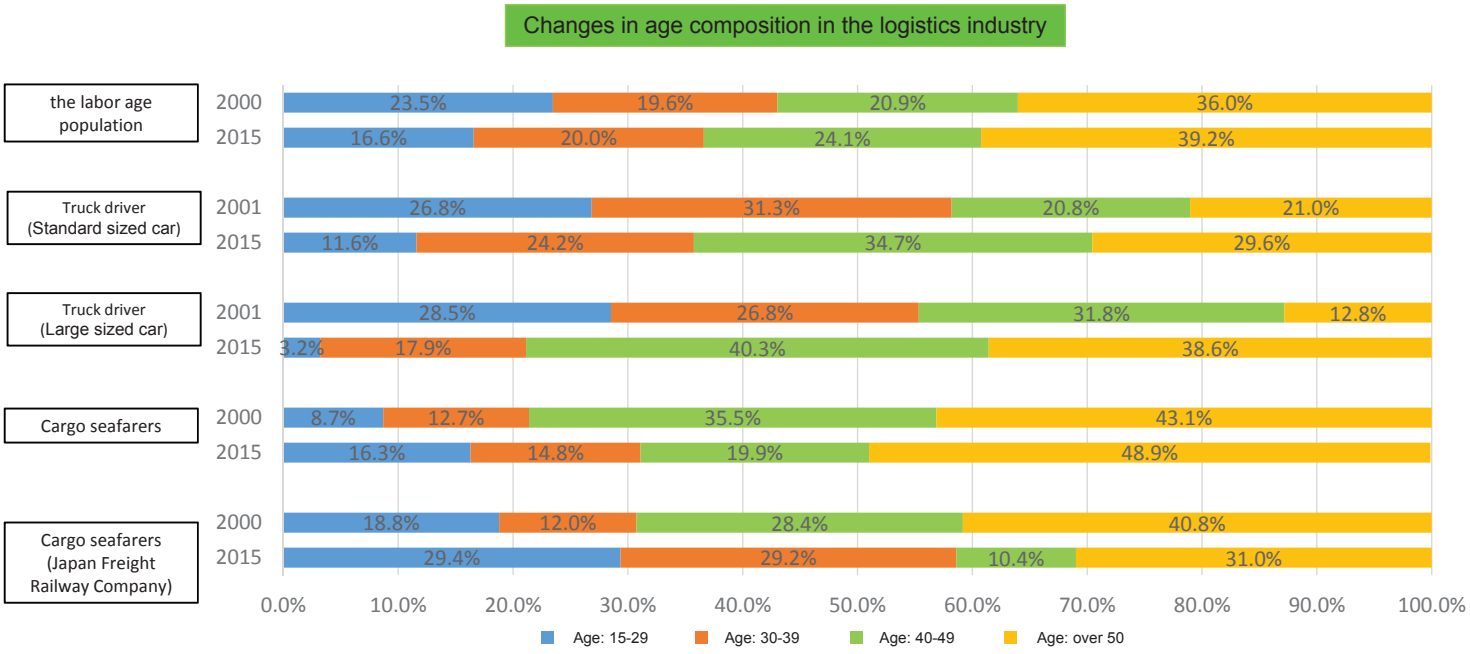


Source：国立社会保障・人口問題研究所
1950年から2014年までの人口推移は、「人口統計資料集2016　年齢（3区分）別人口及び増加率：1884～2010年」
2020年から2050年までの人口予測は、「日本の要来推計人口（平成24年1月推計）　総人口，年齢3区分（0～14歳，15～64歳，65歳以上）別人口及び年齢構造係数：出生中位（死亡中位）推計」

Changes in employee age structure in logistics business

国土交通省

- Population of under 29 years old truck driver are decreasing sharply, compared to changes in the labor age population by age group.
- Population of over 50 years old cargo seafarers are increasing.



Source：我が国の年齢階級別労働力人口比率は、総務省統計局「年齢階級別労働力人口」より作成
トラックドライバーの年齢構成は、厚生労働省「賃金構造基本統計調査」より作成
内航海運における船員の年齢構成は、2000年度は国土交通省「船員労働統計調査」より作成、2015年度は国土交通省海事局作成
JR貨物の年齢構成は、JR貨物提供資料より作成
Note：トラックドライバーの年齢構成は男性の営業用貨物自動車運転者の年齢構成。
JR貨物の年齢階級は、「30歳以下、31～40歳、41～50歳、51歳以上」に区分されている。

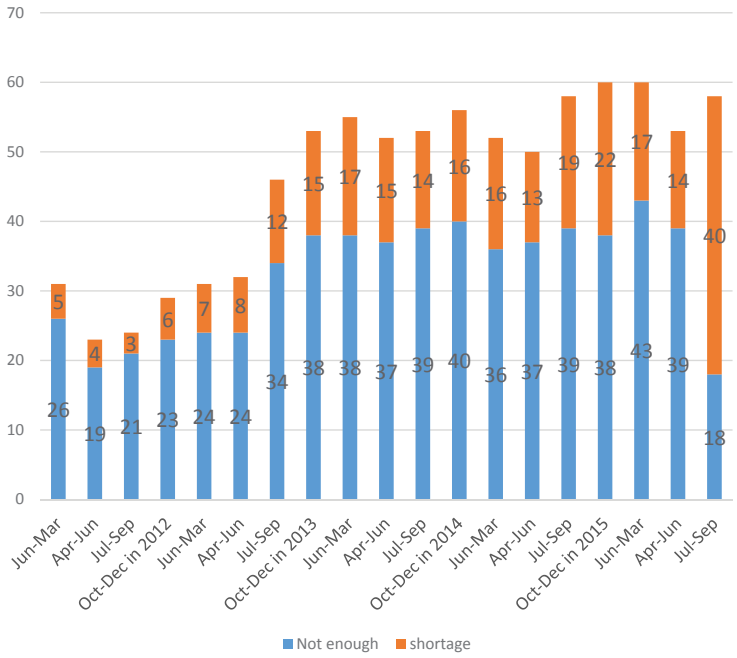
Labor force situation in the road freight transport business

国土交通省

Appendix 4

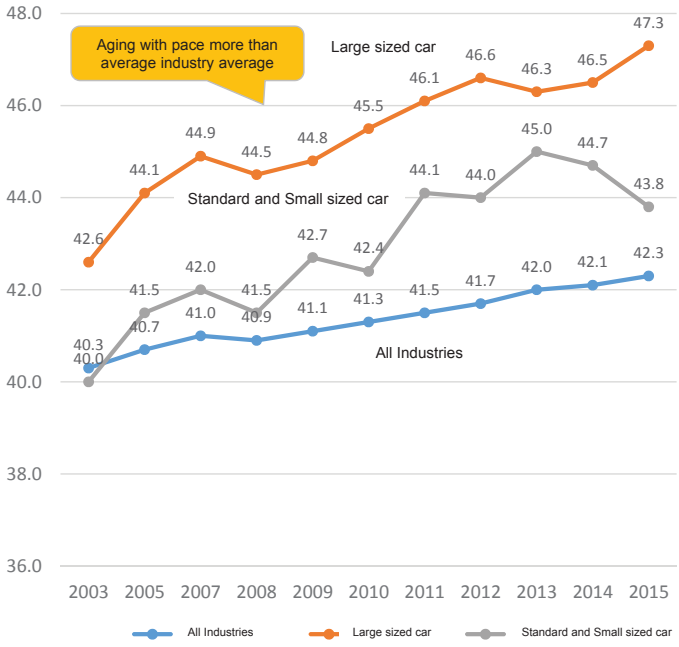
○Labor shortage has been obvious after 2014, and that situation will be increased.
○ Truck drivers are aging at a pace more than average industry average, the labor shortage may become more serious because of retirement by elderly people in the future.

（%） Percentage of companies with shortage of manpower



Source:（公社）全日本トラック協会
「トラック運送業界の景況感」より国土交通省物流政策課作成

Average age of truck drivers



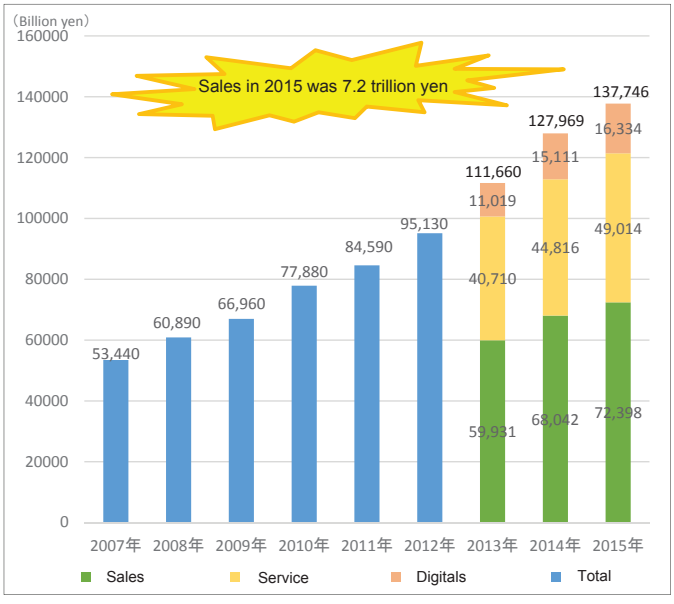
Source：厚生労働省「賃金構造基本統計調査」より国土交通省物流政策課作成

Growth of e-commerce（EC）market and increase of courier service

国土交通省

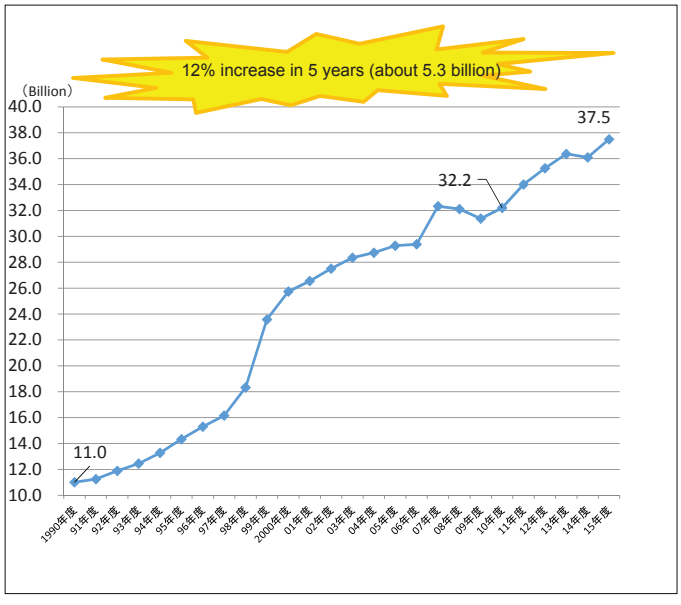
○The e-commerce (EC) market will expand to 13.8 trillion yen in total in 2015 and 7.2 trillion yen in the field of merchandise sales
○The number of home delivery transactions have been increased approximately 5.3 Billion (+ 12%) in 5 years.

【 Changes in EC market size 】



Source：経済産業省「電子商取引実態調査」
Note：分野別規模は2013年度分から調査開始

【 Number of Home delivery record 】



Source：国土交通省「平成27年度宅配便等取扱個数の調査」
Note：2007年度から郵便事業（株）の取扱個数も計上している。

Logistics productivity revolution

～Realization of efficient and high added value smart logistics ～

国土交通省

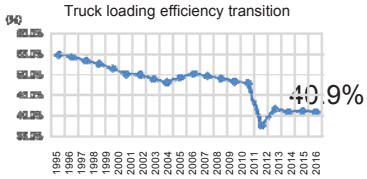
Appendix 4

・Recently logistics is inefficient, the truck loading ratio has been reduced to 41%.
It is necessary to improve productivity, to overcome future labor shortage, and to contribute to economic growth.
・For that purpose, ① Truck business reform of consignor cooperation, "Growing Accelerated Logistics" as early realization of Auto platoon, ② Promote to "Improved living logistics" as easily receive home delivery. Considering the goal with a plan to improve labor productivity of the logistics business about 20%.

Current situation surrounding logistics

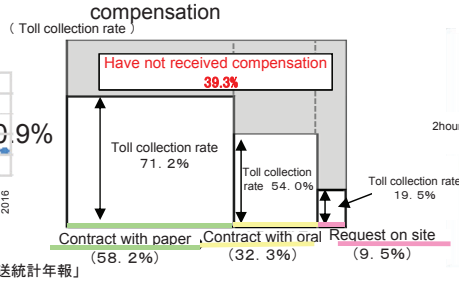
■About 60% of the transport capacity of the truck is unused

Truck loading efficiency transition

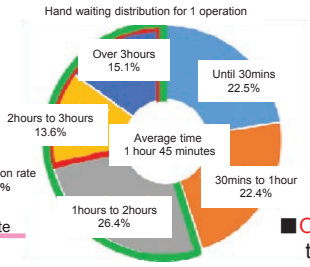


(Source)国土交通省「自動車輸送統計年報」

■About 40% of cargo handling operations have not received compensation



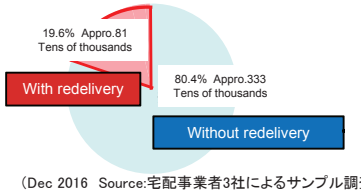
■A hand wait time of less than 2 hours occurs with one operation



(Source: in 2017 全日本トラック協会による実態調査)

■About 20% is redelivered

【 Proportion of redelivery occurrence 】



(Dec 2016 Source:宅配事業者3社によるサンプル調査)

■Over 70% of the trucks are not able to enter the indoor parking at under 3m ceiling height.

Execute "logistics productivity revolution" to greatly improve efficiency and advance logistics by collect all the logistics power of All Japan.

(1) Improve efficiency of various waste such as waste of travel time ・waiting time, waste of space, etc., and improve productivity.
→ Accelerate growth of Japanese industry and economy ("Growing Accelerated Logistics")

(2) Collaboration and advanced technology improve convenience and productivity.
→ Make citizen's life convenient ("Improved living logistics")

【Numerical Goal】(draft)
We will increase about 20% by 2020 with the aim of raising the added value per hour * per employee in the logistics business (Truck ・Inland sea luck ・Freight railway business total)to the same level as the overall industry average in the future.
※ Total of personnel expenses, ordinary income, taxes and fees, interest expense, and facility fee

Utilization of small UAVs for logistics

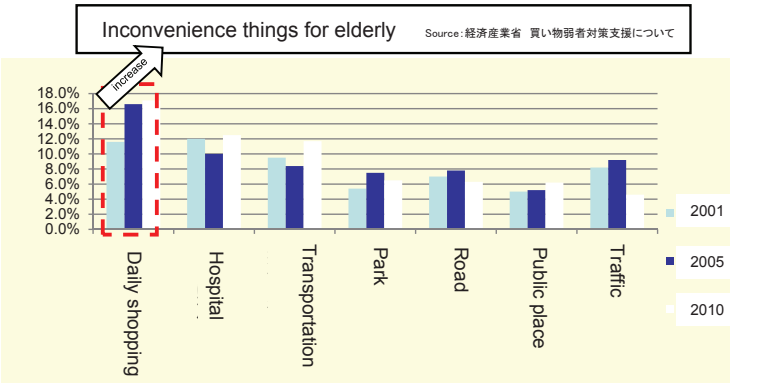
国土交通省

○Small UAVs (drone etc.) are expected to be used for cargo transportation to remote islands, depopulated areas, urban areas, and utilization for logistics under disasters.
○ The Public-Private Sector Conference has been promoted effort to utilization for logistics by UAVs, based on Prime Minister's directive that "We will aim to make baggage delivery using drone within 3 years as soon as possible" (5 Nov 2015) , "Make full-fledged mechanisms to deliver packages to remote islands, mountains, around 2018." (Jul 2016)
○The MLIT has been researched and developed the drone port system for logistics since FY2008, worked on technology development and environment improvement for utilization of logistics by UAVs.

Examples of use for logistics

① Freight transport in non-populated areas as remote islands and depopulated areas
② Freight transport in urban areas
③ Utilization under disaster
④ Freight transport in warehouse

Inconvenience things for elderly Source:経済産業省 買い物弱者対策支援について



Source:内閣府「高齢者の住宅と生活環境に関する意識調査結果」in 2012

On the basic direction of future distribution policy
Source: 社会資本整備審議会・交通政策審議会答申 (Excerpt)

From December 2015, Basic flight rules of UAVs were enforced. It is important to promote to utilization for logistics business, further safety measures, necessary environment improvement.

Comparison of transport efficiency of depopulated areas and urban areas in home delivery service (example) (Logistics provider A company achievements/ Monthly business day)

Area	Truck Mileage	Truck Total number	Package Quantity	Track mileage at 1 Package
depopulated areas	34 ten thousand Km at a Month	100 at a Month	30 ten thousand at a Month	1.2 Km at a package
urban areas	37 Ten thousand Km at a Month	350 at a Month	160 Ten thousand at a Month	0.2 Km at a package

About 6 times

Source:A社実績データより作成

※ Depopulated areas are selected from the area based on the Special Measures for Promotion of Independence of Depopulated Area.

Main domestic efforts related to cargo transportation by small UAVs

Hida City Gifu Prefecture
(Rakuten, Inc., November 2016)
・Concluded collaboration agreement on drone use under disaster or implementation of material transportation test etc.

Chiba City Chiba Prefecture
(National strategy special zone)
(Autonomous Control Systems Laboratory Ltd, April 2017)
・Transport wine from a rooftop of the shopping center to a park near by

(Rakuten, Inc., Autonomous Control Systems Laboratory Ltd, NTT DOCOMO, INC., etc., November 2016)
・ Delivery of internet-order service by remotely controlled in LTE network

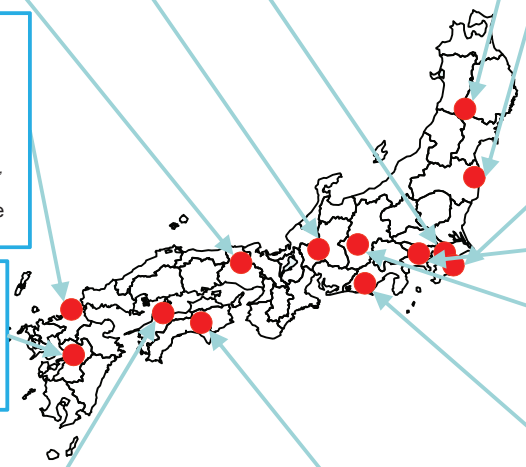
Sendai City Akita Prefecture
(National strategy special zone)
(Sendai city, National Institute of Information and communications Technology, PRODRONE CO., LTD., April 2016)
・Demonstrate Transport books between elementary and junior high schools

Yabu City Hyogo Prefecture
(National strategy special zone)
(Yabu City, MITSUI & CO., LTD., November 2015)
・Transport of medicines at river bed

Minamisoma City Fukushima Prefecture
(Autonomous Control Systems Laboratory Ltd, January 2017)
・Demonstrate Long-distance transport by full autonomous control

Fukuoka City Fukuoka Prefecture
(National strategy special zone)
(MSD, Aero sense Inc., Alfresa Corporation, October 2016)
・Delivery Medicine for disaster to the Remote island

(NTT DOCOMO, INC., MIKAWAYA21, ENROUTE CO., LTD., November 2016)
・Demonstrate Delivery of daily products to remote island residents using a mobile phone line



Onjyuku Town Chiba Prefecture
(Rakuten, Inc., Autonomous Control Systems Laboratory Ltd, May 2016)
・Delivery service of drinks etc. at golf course for 1 month

Akiruno City Tokyo
(Akiruno City, DJI, November 2016)
・Demonstrate Transport relief supplies

Amakusa City Kumamoto Prefecture
(Ministry of Economy, Trade and Industry, Hitachi Zosen Corporation, November 2016)
・Demonstrate Transport of daily products and medicines to remote islands using quasi-zenith satellites

Ina City Nagano Prefecture
(MLIT, Ina city, March 2016)
・Demonstrate Transportation of goods from Road Station to Elderly Housing

Naka Town Tokushima Prefecture
(MLIT, MIKAWAYA21 etc., February 2016)
・ Demonstrate Transport bread and milk etc. to elderly people

Hamamatsu City Shizuoka Prefecture
(Hamamatsu city, December 2016)
・ Demonstration of Logistics, Measurement, Aerial Imagery

Imabari City Ehime Prefecture
(National strategy special zone)
(Rakuten, Energia Communications,Inc., October 2016)
・Demonstrate Delivery of daily products to remote island residents

MLIT: Ministry of Land, Infrastructure, Transport and Tourism

Experiment of cargo transport by small UAVs

（Naka Town Tokushima Prefecture, Feb 2016）

国土交通省

Cargo transport experiments, Measurement of impact, consciousness survey of district residents were conducted in a depopulated area where early commercialization is expected.

Implementation :the MLIT/Nittsu Research Institute and Consulting, Inc./MIKAWAYA21
Maneuvering : BLUE INNOVATION Co., Ltd.
Cooperation : Naka Town Tokushima Prefecture

機体の諸元等	
Name	SORAZOU M-8
Manufacturer	BLUE INNOVATION Co., Ltd.
propeller	8 axis
size	Diameter: 1,470mm Height: 485mm
weight	3.9-5.3 kg Include battery
Loadable weight	Max 6 kg
Cruising time	Max 20 mins
Wind resistance	Max 8 m/s

Subscribed Liability insurance(to people and properties)

①Compact drone and controller

②Exterior of shipping container

③ Inside of container
（ boiled eggs, milk, bread ）

④Take off（Operator）

⑤Image of installed camera

⑥Removing transport container

Utilization of logistics — Toward commercialization —

○ **The MLIT overcomes tasks of below and aims to realize utilization of logistics around 2018.**

Point1 **Secure safety of flight without VLOS, Eliminate citizen's anxiety**

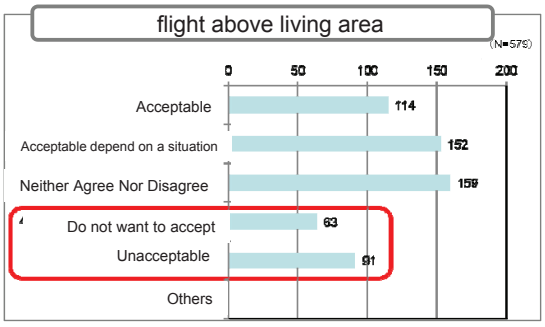
○ Ensure safety equivalent to assistant placement, Securing a space for taking off and landing
○Setting of flight route is necessary to eliminate anxiety about flight above living area

Point2 **Improve basic performance, Securing business profitability**

○Improve flying distance and time, weathering performance
○Reduction of operation cost of small UAVs, Ensuring business profitability by increasing transportable volume

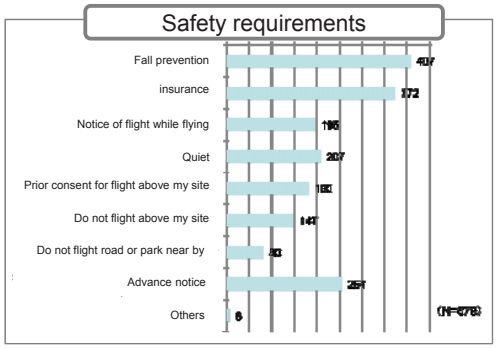
Point3 **Secure transportation as "transportation business" and establish social credibility**

○ Ensuring the certainty of attaching loads to the aircraft
○Establishment of social credibility of damages to shippers, third parties and compensation for damages



Source:2016年3月、国土交通省が全国11箇所の新聞販売店を通じて高齢者等向けに行ったアンケート調査結果より作成

徳島県那賀町での実験では、霧雨により実験開始が2時間程度遅れることとなった。

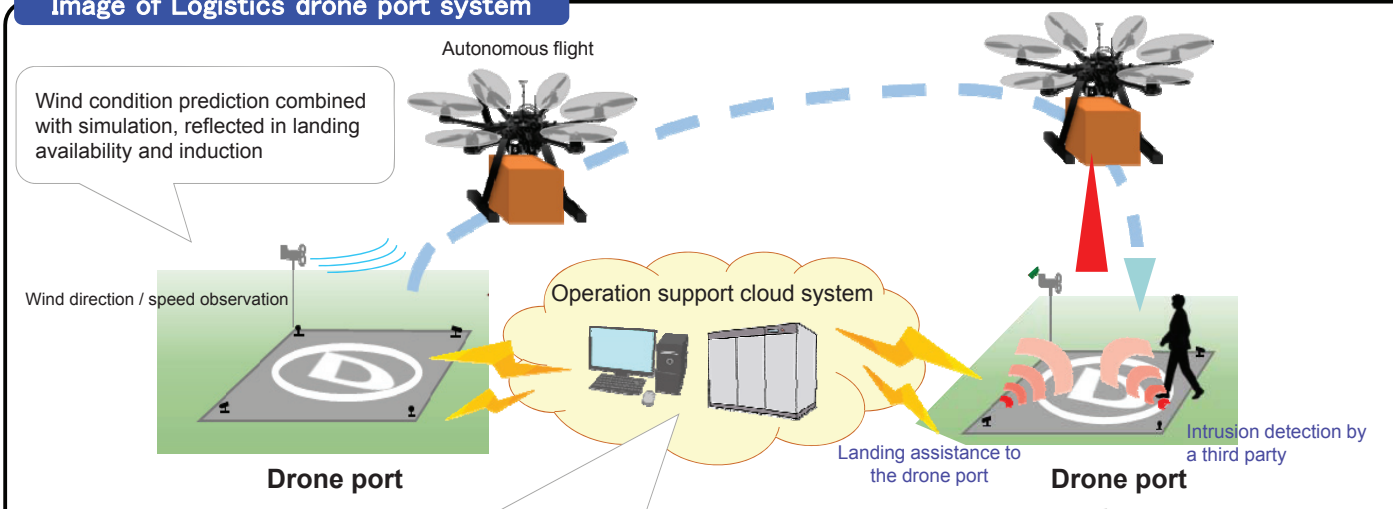


Source:2016年3月、国土交通省が全国11箇所の新聞販売店を通じて高齢者等向けに行ったアンケート調査結果より作成

Logistics drone port system

○ It is necessary to perform complicated processes as flight to the delivery destination and take off and landing related to unloading of cargo with high accuracy and safe without assistant. With current airframe performance, freight distributable cargo is limited, consideration for economy is also required while limiting the weight of the aircraft.
○By developing the drone port system for logistics, It will be able to autonomous and safe take off and landing of small UAVs.

Image of Logistics drone port system



Summary of drone port system for logistics



Autonomous flight

Take off

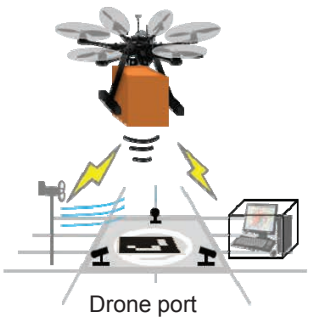
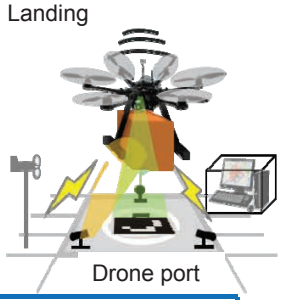

Drone port


Image of Logistics Drone port system


Landing


Drone port

Support safe takeoff and landing of small UAVs

①High accuracy drone automatic takeoff and landing support system	②Real time wind speed / wind direction prediction system around the drone port	③Third party intrusion detection system to drone port	④Operation support cloud system
・A,B support small UAVs with horizontal error of 50 cm or less takeoff and landing. A:Wi-Fi radio wave generator B:Marker	・Real time speed / wind direction makes a judgment on takeoff and landing by matching previously calculated detachable upper limit value.	・Detect invasion by a third person in real time and judge whether to take off and landing.	・Checking about drone port or taking off and landing to drone port by Integrating information on cloud system.

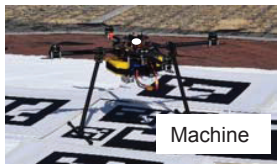
※System configuration will be changed depending on usage environment.

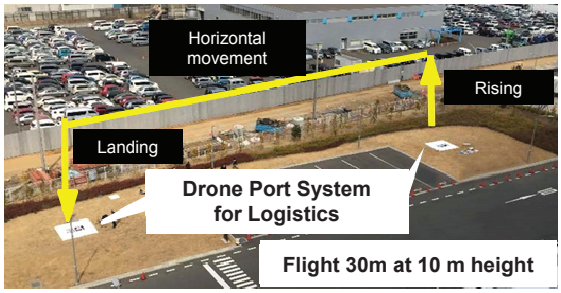
Summary of experiment of drone port system for logistics

○Experiment to verify the function of each system of the drawn port for logistics under development

○Date
28 Feb 2017 10:00 to 13:00
○Place
GLP Zama（Kanagawa Prefecture）
○Cooperation
Global Logistic Properties Inc.
○Machine
BLUE INNOVATION Co., Ltd.
Aircraft specification
Aircraft dimension：1000×1000×580mm
Weight：approx. 2kg
Maximum loading capacity：approx. 1.5kg


GLPZama


Machine



Validation items

①Comparison of landing accuracy by drone port

A:GPS only
B:Dolone port guidance

・A:gaps 1.3m
※Landing gaps in another place (flight test site) : average 3 to 4 m

・B:0.3 to 0.4m

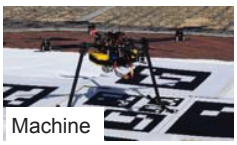
②Function verification of third party invasion to the drone port

・Detects intrusion of a third party inside the drone port in real time.
※In the experiment visualization of the obstacle detection result by the tablet application.

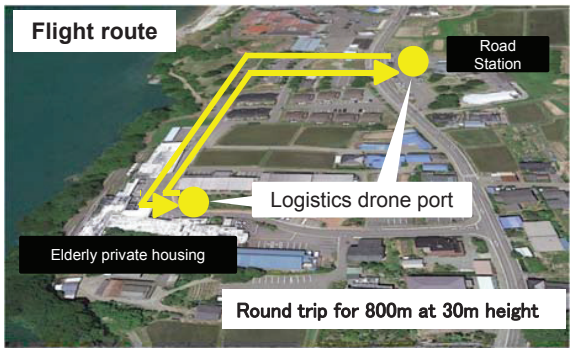
Summary of baggage transport experiment using logistics drone port system

○Demonstration of packaging transport experiments from take-off, landing and returning by small UAV using Logistics Drone Port.

○Date
3 Mar 2017 10:00 to 12:00
○Place
Ina City（Nagano Prefecture）
○Cooperation
Global Logistic Properties Inc.
(Road Station to Elderly private housing)
○Machine
BLUE INNOVATION Co., Ltd.
Aircraft specification
（Aircraft dimension：1000×1000×580mm
Weight：approx. 2kg
Maximum loading capacity：approx. 1.5kg）
○Luggage Weight
about 0.5 kg of millet


Machine


Luggage



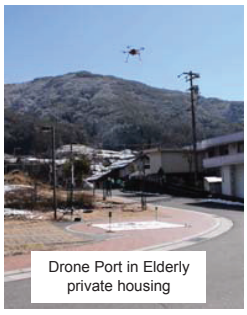
Validation items

○Package transportation by Logistics Drone Port

- Assumed to transport goods of road stations to elderly people by small UAV.
- A series of packaging transport experiments from take-off, landing and returning by small UAV using Logistics Drone Port.

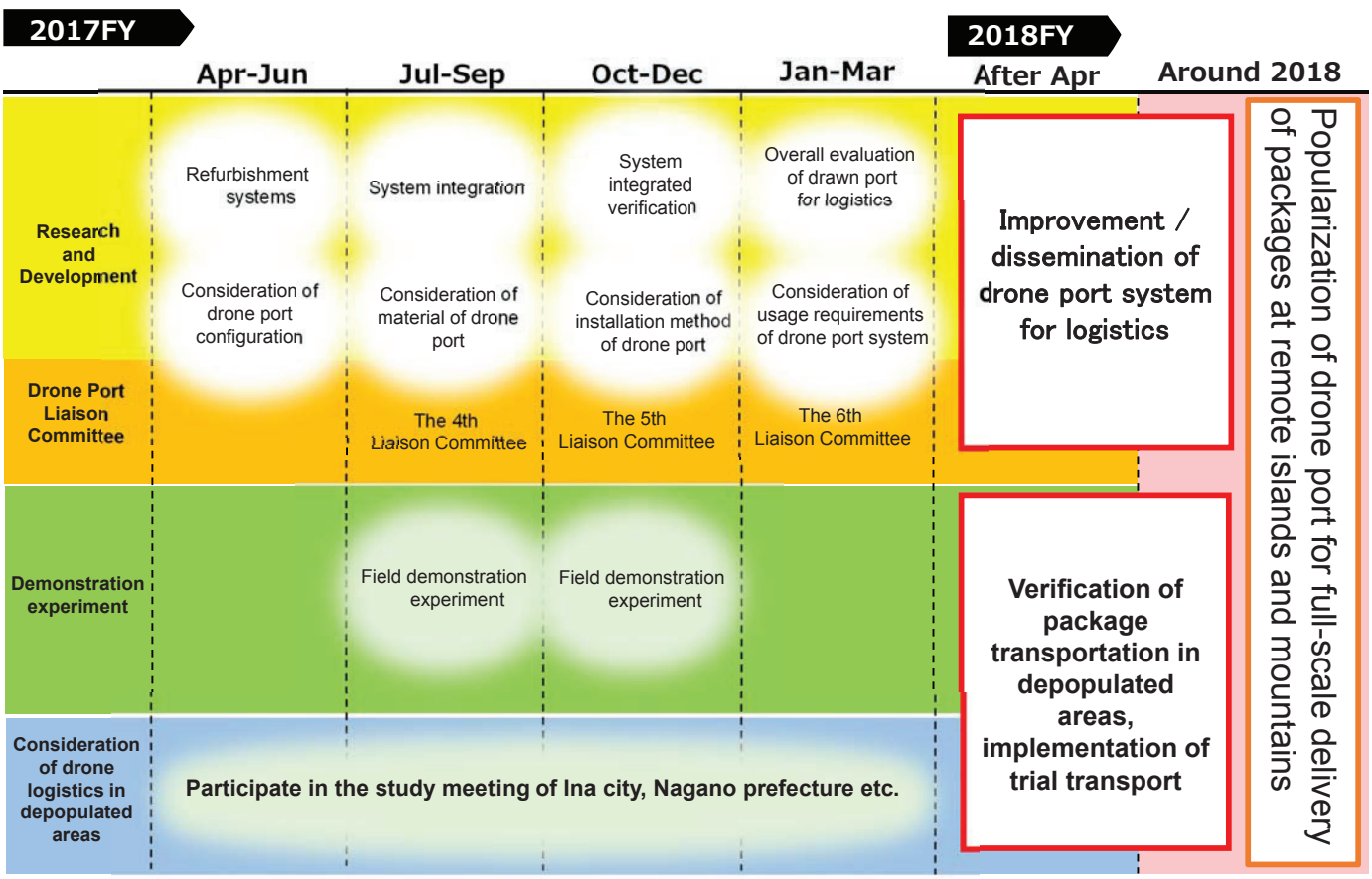
※In this demonstration experiment, Assistants were implemented for ensure safety of flight without VLOS.


Drone Port in Road Station


Drone Port in Elderly private housing


Delivering luggage to the elderly

Future research and development plan



Usage of Unmanned Aerial Vehicle/UAV for health sector –The Present and the Future-

Naofumi HASHIMOTO, MT.MSc
Division of Partnership Development
Department of Global Network and Partnership
Bureau of International Cooperation
National Center for Global Health and Medicine /NCGM
E-mail: n-hashimoto@it.ncgm.go.jp

9:30-11:00 on 8th June 2017
At the conference room of
Yachiyo Engineering Co.,Ltd
in Asakusabashi in Tokyo Japan

Menu

1) Purpose
2) Contents
3) Character on UAV
4) Case Study in other countries
5) Health and UAV – UHC and UAV
6) Health and UAV – SDGs and UAV
7) Technology, Health and Africa
8) Way-forward in Zambia –Practical First Step

Contents

- The suggestion, comments and opinions which were described in this power point slides are reflected by Hashimoto's idea
(NOT reflected by NCGM)

- There is no conflict of interest

National Research and Development Agency,
National Center of Global Health and Medicine/NCGM

Company Profile

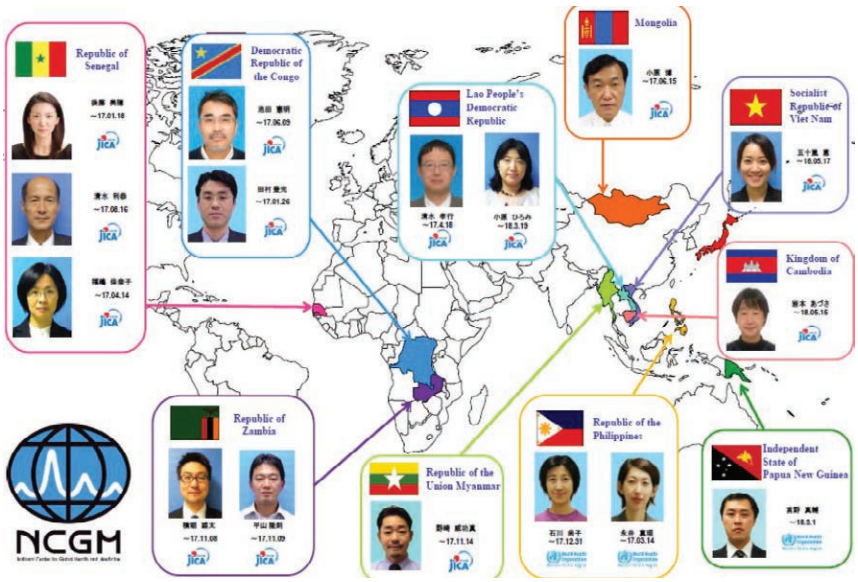
Name in Full :	National Centre for Global Health and Medicine	Head Office:	1-21-1 Toyama Shinjuku-ku, Tokyo, 162-8655
Establishment :	Under Ministry of Health, Labour and Welfare/MHLW	Telephone:	+81-3-3202-7181 (ext2719/2735)
Capital :	NCGM has 781 beds-hospital, research centers , school of Nursing and Bureau of International Health Cooperation	Telefax:	+81-3-3202-7860
President :	Dr. Norihiro Kokudo	E-mail:	tenkaiadvice@it.ncgm.go.jp
Employees	Over1000	Website:	http://www.ncgm.go.jp/index.html
Clients	JICA WHO MHLW MoHs in countries in Asia and Africa		

Providing Services

1. Techical assistance to developing countries and emergency disster relief operation
2. Training personnel for field of global health and mecical cooperation
3. Researches necessary for the effective promotion of international health and medical cooperation
4. Investigative research and evaluation projects
5. Creating international healthcare network
6. Public relations and communication
7. Parthership development with private sector

NCGM Bureau of International Health Cooperation/BIHC

Map of NCGM Staff in overseas dispatch(10 countries) for technical cooperation in health sector in 2016



Purpose of this session

in The project for the diffusion of autonomous Unmanned Aerial Vehicle (UAV) as logistics infrastructure in health sector in the Republic of Zambia Under the scheme of Private Sector Partnership of JICA

To verify the usefulness of usage of UAV as one of alternatives for logistics for health services in rural areas ,especially for laboratory services Especially for samples of TB and HIV (for Infant and related tests)

with Ministry of Health/MoH,
Ministry of Transportation and Communication/MoTC,
Civil Aviation Authority/CAA
in compliance with Zambian regulation on UAV administration

Type of International Cooperation by JICA
⇒Independent Administrative Institution　Japan International Cooperation Agency/JICA
Under Ministry of Foreign Affairs

Conventional aid scheme

- Technical Cooperation
- Training Cooperation
- Official Development Assistance Loans
- Official Development Assistance Grants
  ⇒Free of charge/Payment in kind
- Citizen Participation Volunteers
  ⇒Japan Overseas Cooperation Volunteers/JOCV
- Emergency Disaster Relief

New scheme

- **Private-Public**

The support infrastructure development and improvement of public services through PPP (Public-Private Partnership) in which government and private sector share responsibilities.

- SGDs Business

As a growing awareness of corporate social responsibility (CSR), an increasing number of Japanese companies are implementing social contribution programs and establishing SDGs businesses in developing countries, which call for new partnerships between ODA projects and private sector activities.

Character of UAV- Comparison among 3types of UAV

Reference: Unmanned Aerial Vehicles Landscape Analysis
by US Agency for International Development Feb 2017

Fixed wing type



Multi rotor type



Hybrid type


Character of UAV
Health sector and UAV

Reference: Unmanned Aerial Vehicles Landscape Analysis
by US Agency for International Development Feb 2017

- Supply chain(e.g., Samples for diagnostic testing)
- Survey (e.g., 2D,3D mapping for environmental health)
- Search and Rescue(e.g., at accident and natural disaster)
- Emergency (e.g., heart attack and delivering defibrillator)
- Infectious disease control

  (e.g., carrying sterile mosquitoes into hard-to-reach zones against ZIKA).

Main 4 Influence factors for UAV as a transporter

Distance

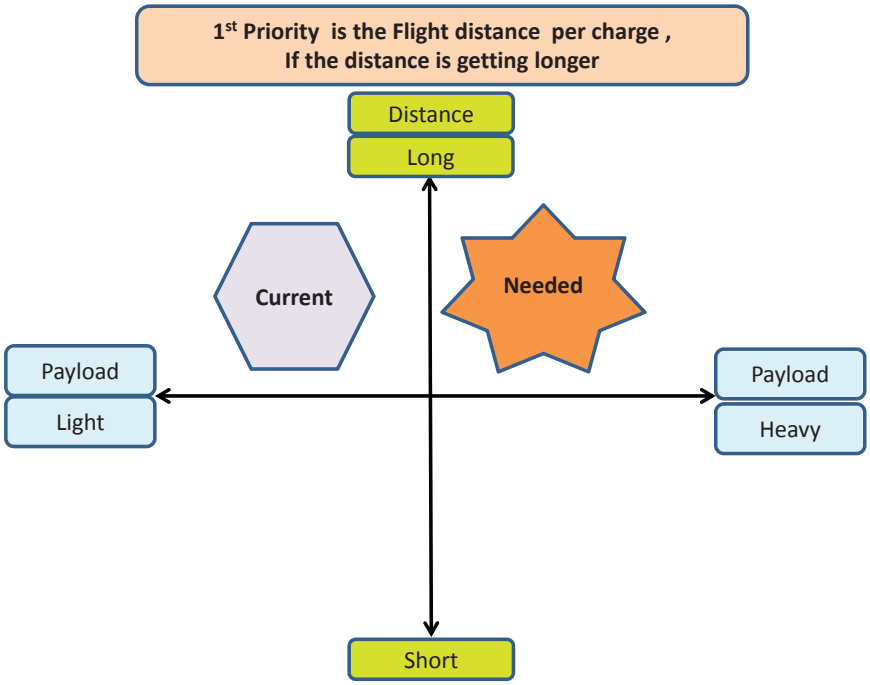
Payload/Load weight

Speed

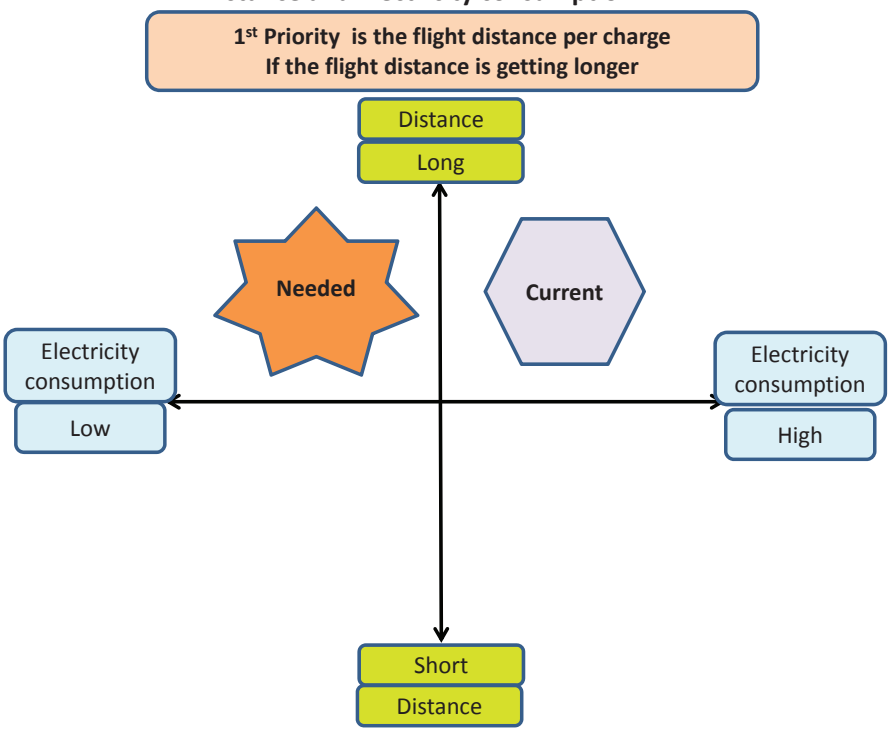
Electricity consumption

Other : Easiness of manipulation, Cost, endurance etc.

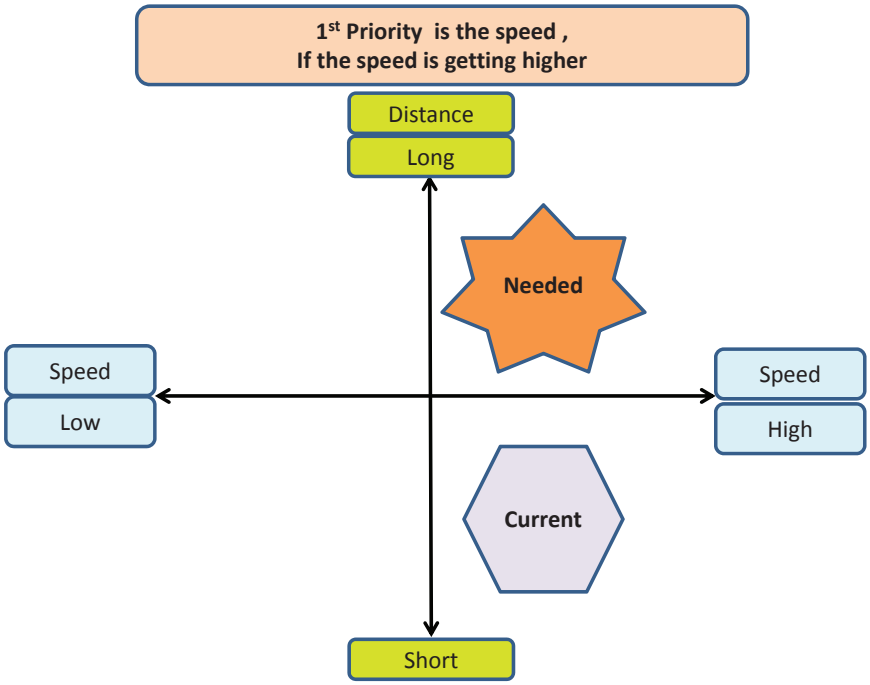
Influence factors for UAV as transporter No1
Distance and Payload



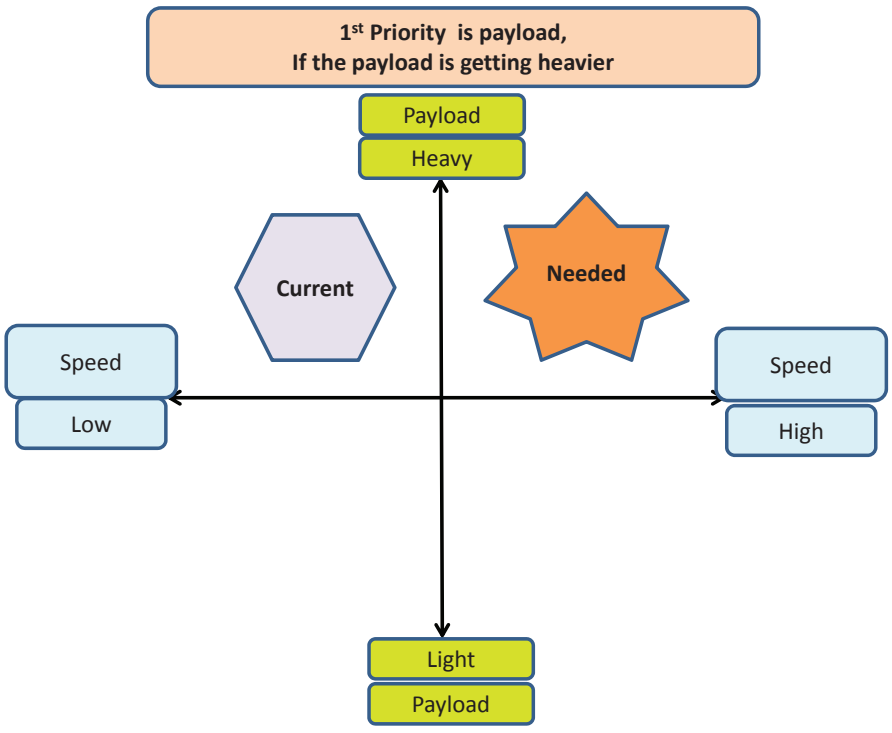
Influence factors for UAV as transporter No3
Distance and Electricity consumption



Influence factors for UAV as transporter No2
Speed and Distance



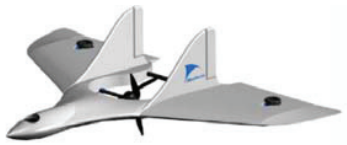
Influence factors for UAV as transporter No 4
Payload and Speed



Character of UAV- Comparison among 3types of UAV

Reference: Unmanned Aerial Vehicles Landscape Analysis
by US Agency for International Development Feb 2017

Fixed wing type



Multi rotor type

Hybrid type

Character of UAV- Comparison among 3types of UAV

Reference: Unmanned Aerial Vehicles Landscape Analysis
by US Agency for International Development Feb 2017

	Fixed wing	Multi-rotor	Hybrid
Range	Up to 160 km	About 20 km	About 80 km
Payload	Up to 5 kg	Up to 2 kg	Up to 5 kg
Launch	Catapult	Vertical	Vertical
Variations	Gas or electric	Gas or electric	Gas or electric
Advantages	• Long range • More efficient • Heavier payloads than multi-rotor • More stable flying • Well established concept with the weight of aerospace engineering behind it	• Maneuverability in small spaces • Vertical takeoff and landing • Generally cheaper • Can fly with a minimum of two rotors	• Vertical take-off and landing but with comparable range to fixed wing • More options for landing and take-off sites • Heavier payloads than multi-rotor • Easier for "safe" emergency landings
Disadvantages	• Large space required for take-off and landing (no VTOL) • Limited maneuverability in small spaces • Emergency landings are generally less easy to control	• Low payload limit • Generally more complex designs (high software requirements to keep in the air) requiring expert maintenance and trained staff at health centers • Limited range • Inefficient in some settings	• Generally more expensive • Neither as long range as fixed wing nor as maneuverable as multi-rotor
Manufacturers	• Zipline • Wings for Aid • UAVaid	• Matternet • Flirtey • Microdrones	• Amazon • Google • DHL • Drones for Development - Dr. One. • Quantum Systems • Vayu
Example of Users	• Government of Rwanda • MOAS	• MSF • World Bank • UNICEF • Swiss Post	• MSF (planned) • We Robotics (planned)

Comparison among 5 types of transportations by Hashimoto

Please see the excel sheet

Case study 1
For TB Sputum samples
Papua New Guinea in Sep 2014

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Country	Papua New Guinea
Environment	Last mile, limited infrastructure, swampy, impassable terrain
Key actors	MSF, Matternet
UAV technology	Multi-rotor
Payload	1 kg (now up to 2 kg possible)
Date of operation	September 2014
Distances	Up to 20 km
Frequency	Unknown
Goal of project	Speed up tuberculosis testing

Case study 1
For TB Sputum samples
Papua New Guinea in Sep 2014

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Practical distance flied :Not described

Lessons Learned : MSF minimum requirements for future uses of UAV for this purpose are

- Control: UAVs need to be easy to control, ideally with standard technology such as tablets and smart phones by MSF staff.
- Maintenance: Should be low and parts should be easily replaced or repaired even in remote environments.
- Range and Maneuverability: Hybrid UAVs were seen as providing both the range and maneuverability that is required in MSF's operations.

Case study 2
For Blood and Stool samples
Madagascar in July 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Country	Madagascar
Environment	Last mile, limited infrastructure
Key actors	Vayu, Stony Brook University, Government of Madagascar, USAID
UAV technology	Hybrid
Payload	2.2 kg
Date of operation	July 2016
Distances	60 km
Frequency	Unknown
Goal of project	Speed up transportation of blood and stool samples

Case study 2
For Blood and Stool samples
Madagascar in July 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Practical distance flied :Not described

Lessons Learned :

> The benefits of hybrid drones seem promising, but as of yet, few cases are available to draw conclusions. Little public information is available from this case study.

Case study 3
For Dried Blood samples on filter papers
Malawi in March 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Country	Malawi
Environment	Last mile, limited infrastructure
Key actors	UNICEF, Malawi Ministry of Health, Matternet
UAV technology	Multi-rotor
Payload	1 kg (now 2 kg)
Date of operation	March 2016
Distances	Up to 20 km per battery (1.5-10 km tested in Malawi)
Frequency	Total of 93 flights during test period
Goal of project	Assess feasibility of transporting laboratory samples for early infant diagnosis of HIV

Case study 3
For Dried Blood samples on filter papers
Malawi in March 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Practical distance flied :10km

Lessons Learned :

> transporting DBS and lab results will not be composed only of UAV or only of motorcycles; it will take advantage of the strengths of both technologies to minimize both costs and transport time. This initial cost study is a key first step in responsible, informed decision-making about implementation of this potentially life-saving technology."

Case study 4
For Transfusion Blood
Rwanda in September and October 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Country	Rwanda
Environment	Last mile, limited infrastructure, mountainous
Key actors	Rwanda Ministry of Health, Rwanda Ministry of ICT, Zipline
UAV technology	Fixed-wing, parachute drops
Payload	1.5 kg
Date of operation	October 2016-present
Distances	150 km round trip
Frequency	15 deliveries per day
Goal of project	Speed up access to essential blood products

Case study 4
For Transfusion Blood
Rwanda in September and October 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Practical distance flied :Not described

Lessons Learned :

The parachute system is unique and provides significant advantages over systems that land to deliver cargo. The drones do not touch down at health facilities; no energy infrastructure, landing/launching equipment, battery charging stations, or staff with knowledge of how to operate the Zips and swap batteries are needed at the remote health facilities. Thus, minimal infrastructure and training are needed at the receiving locations. The health centers only need the ability to send an SMS for on-demand delivery.

Case study 5
For Automated External Defibrillators(AEDs) to Out-of-Hospital Cardiac Arrests(OHCAs)
Sweden in June 2014 and October 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Country	Sweden
Environment	Urban and rural
Key actors	Karolinska Institute, KTH Royal Institute of Technology
UAV technology	Multi-rotor
Payload	1.4 kg
Date of operation	June 2014 and October 2016
Distances	10 km
Frequency	N/A
Goal of project	Decrease emergency response time and delivery of AEDs

Case study 5
For Automated External Defibrillators(AEDs) to Out-of-Hospital Cardiac Arrests(OHCAs) Sweden in June 2014 and October 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Practical distance flied :Not described

Lessons Learned :

In a GIS-simulated model of urban OHCA, the drone arrived before Emergency Medical Service (EMS) in 32 percent of cases, and the mean amount of time saved was 1.5 minutes. In rural OHCAs, the drone arrived before EMS in 93 percent of cases, with a mean amount of time saved of 19 minutes. In test flights to these rural locations, latch-release of the AED from a low altitude (3-4 m) or landing the drone on flat ground was the safest way to deliver an AED and was superior to a parachute release.	The difference in response time for EMS between urban and rural areas is substantial, as is the possible amount of time saved using this UAV system. Use of drones in rural areas to deliver an AED in OHCAs may be safe and feasible. Suitable placement of drone systems can be designed by using GIS models. However, the UAV system needs to fit into the health supply chain, and little is known regarding how productive the system might be in clinical reality.The system remains theoretical.

Case study 6
For Dried Blood samples on filter papers and Blood samples Zambia in April 2017

Country	Zambia
Environment	Last one mile, Rural areas,Samples for lab
Key Actors	MoH,MoTC,CAA,JICA,Aerosense, Yachiyo Engineering and NCGM
UAV Technology	Multi-rotor
Payload	to 2kg
Date of Operation	April 2017
Distances	Up to 7(?) km per full charge
Frequency	Total 7 flights during test period
Goal of Project	To verify the usefulness of usage of UAV as one of alternatives for logistics for health services in rural areas ,especially for laboratory services

Case study 6
For Dried Blood samples on filter papers and Blood samples Zambia in April 2017

Practical distance flied : 0.1km to 6.2km

Lessons Learned :

- Worth/Value as an alternative transportation

  However,
- Operational challenges
- Technical challenges

Needed UAV as a practical air transportation for Zambian and African settings from Lessons and learnt through the experience in Zambia in April

More flight distance per charge and more payload

+

- Simple and easy manipulation
- Robust body and easy to repairing
- Installation of reflectors on the body
- Installation of transponder with independent power

Appreciated more requests or comments from Zambian participants as useres and Japanese side as manufacturer

On VTOL UAV for more heavy payload ,
if necessary, product's design will be reconsidered?
By Hashimoto

Needed UAV as a practical air transportation for Zambian and African settings from Lessons and learnt through the experience in Zambia in April No2

- Dust proof

Cause of failure of the Operation Eagle Claw
(as an operation of hostage rescue at the American Embassy in Tehran, 1980)
By US Air Force, US Navy , US Army and US Marine
Wrong selection of the helicopter Sikorsky Aircraft RH Sea stallion which is a minesweeping aircraft
Not for operation in the desert
No dust proof (different from HH-53)

Out come of the failure
1 helicopter and 1 transport aircraft destroyed
5 helicopters abandoned/captured
8 U.S. servicemen killed & 4 injure

- Auto recognition of obstructions and avoidance system
- More vibration/shock absorbing carrier for UAV

MoH and CAA are partners for improving UAV

Wrapping up
UAV as a transportation in health sector

- UAV as a transportation in health sector appeared in recent years
- UAV as a transportation in health sector has high value
- Still UAVs are prototypes
- There is a need of adaptation of UAV to real environment and practical usage
- There is a high demand of UAV for health sector

Character of UAV

SWOT Analysis of UAVs in the humanitarian supply chain
Reference: Unmanned Aerial Vehicles Landscape Analysis
by US Agency for International Development Feb 2017

Strengths:
1: Faster for diagnostic services and emergency medical supply
2: Increasing access to diagnostics,treatment and essential medicine
3: Contribution to a more responsive and flexible transport infrastructure

Weaknesses:
1: Limited distance
2: Limited payload
3: Limited volume
4: Reliability issues, as many models are prototypes

Opportunities:
1: Additional applications: mapping, data collection, search and rescue, real time surveillance
2: Increasing quality of health service delivery
3: Reducing cost of public health services

Threats:
1: Restrictive or unclear regulatory frameworks
2: Security concerns
3: Criticism for testing new technology/not well developed technology in vulnerable communities

Case study UAV Not for transportation For the usage of Photography and filming of Community Emergency Response Teams Maldives in November 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

Country	Maldives
Environment	Last mile, limited infrastructure, island territory
Key actors	UNDP, DJI, Government of the Maldives
UAV technology	Multi-rotor
Payload	1-6 kg (depending on UAV model)
Date of operation	November 2016
Distances	Up to 5 km (primary use: photography and filming)
Frequency	N/A
Goal of project	Assist emergency response teams in determining issues in the health supply chain

Case study UAV Not for transportation For the usage of Photography and filming of Community Emergency Response Teams Maldives in November 2016

Reference: Unmanned Aerial Vehicles Landscape Analysis by US Agency for International Development Feb 2017

LESSONS LEARNED

Not yet known; full implementation was scheduled to take place in November 2016.

NEXT STEPS

Not yet known. However, DJI recently put a greater focus on serving the humanitarian community by launching the DJI Global Citizenship Program in October 2016 with a focus on further serving projects in the environment, health, and educational sectors.

Technology, Health and Africa

Point Of Care Testing (POCT) + Smart phone

Testing is carried out at or near the person being tested, the results are returned to the person being tested during the same visit and the results can be used immediately for care and referral (by Page 7 WHO Handbook HIV Diagnostics Improving the Quality of HIV-Related Point of Care Testing).









POCT+ Information, Communication and Technology /ICT
⇒Results can be sent to anywhere you like

Technology, Health and Africa

One of future views on the testing for diagnosis
-Flying Testing-
by POCT + Smart phone + UAV

- For helping laboratory logistics through improving transportation of HIV related test samples and test kits in rural areas, swamp areas and mountain areas

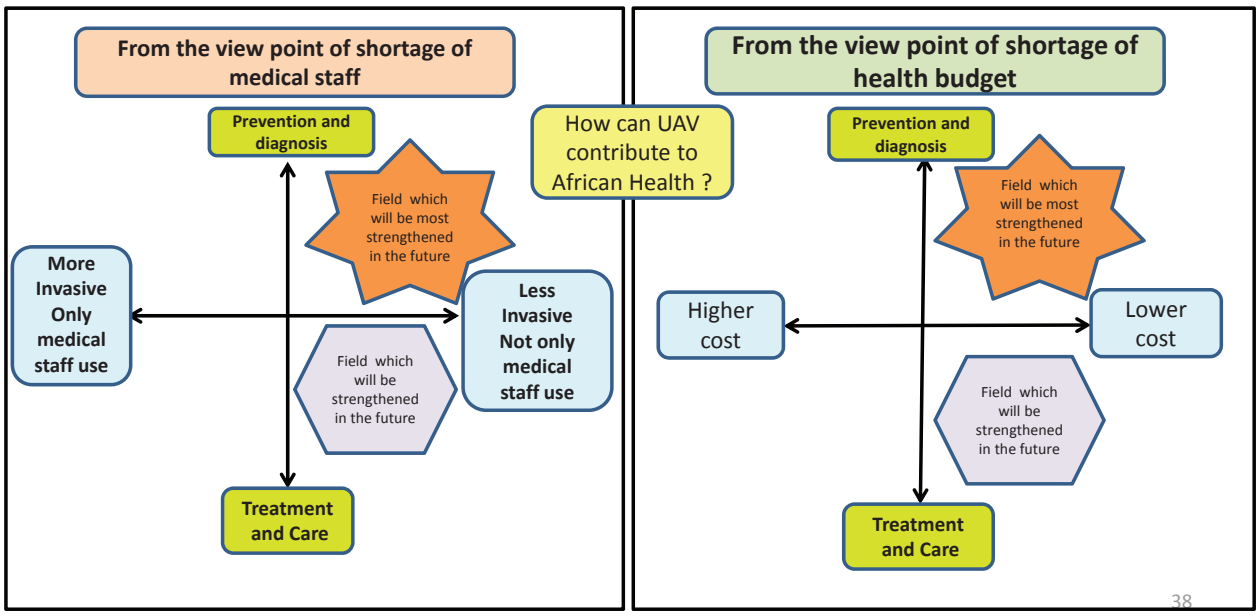
- For DBS of EID,ZN positive sputum, blood for chemistry tests etc..

African Health Future prediction by Hashimoto (However, not only Africa but also Japan)

1: Under the conditions of shortage of financial resources and lack of medical staff, governments in each country aim to optimize health & medical resources by prolonging healthy life expectancy by preventive medicine and preemptive /precise medicine.

2: Prevention and early diagnosis will be conducted in each country using appropriate means according to each country background such as POCT compatible equipment. Furthermore, the necessity for daily monitoring of chronic diseases including HIV / AIDS and lifestyle diseases increases.

3:Such movement will promote the realizing Universal Health Coverage/UHC



Universal Health Coverage/UHC and UAV
What is UHC?

- UHC is a process of progressive realization in which all people receive the quality, essential health services they need, without being exposed to financial hardship.

Reference: Technical note, Developing an index for the coverage of essential health services May 2016
http://www.who.int/healthinfo/universal_health_coverage/UHC_WHS2016_TechnicalNote_May2016.pdf?ua=1

- U.N. member states have agreed to work toward UHC by 2030

How UAV can contribute to UHC ?

Universal Health Coverage/UHC and UAV
Monitoring Indicators for UHC

Table 1. UHC tracer indicators for monitoring progress on health service coverage.

Tracer area	Tracer indicator
Reproductive, maternal, newborn and child health	
a. Family planning	Demand satisfied with modern method among women 15-49 who are married or in a union (%)
b. Pregnancy care	Average coverage of 4 or more antenatal visits and skilled birth attendance (%)
c. Full child immunization	One year old children who have received 3 doses of a vaccine containing diphtheria, tetanus and pertussis (%)
d. Child treatment	Care seeking behaviour for children with suspected pneumonia (%)
Infectious diseases	
a. Tuberculosis treatment	TB cases detected and cured (%)
b. HIV treatment	People living with HIV receiving ART (%)
c. Malaria prevention	Population at risk sleeping under insecticide treated bed nets (%)
d. Improved water and sanitation	Average coverage of households with access to improved water and sanitation (%)
Noncommunicable diseases	
a. Treatment of cardiovascular disease	Prevalence of raised blood pressure (%)[1]
b. Management of diabetes	Prevalence of raised blood glucose (%)[1]
c. Cervical cancer screening	Cervical cancer screening among women 30-49 (%)
d. Tobacco control	Adults age >=15 years not smoking tobacco in last 30 days (%)
Service capacity and access	
a. Hospital access[2]	In-patient admissions per capita (w/ threshold)
b. Health worker density[2]	Health professionals per capita (w/ threshold): physicians, psychiatrists, and surgeons
c. Access to essential medicines	Average proportion of WHO-recommended core list of essential medicines present in health facilities
d. Health security	International Health Regulations core capacity index

There are 16 areas for tracing.

To which areas UAV can contribute?

UAV and SDGs
No1

What is SDGs?

www.undp.org/content/undp/.../sustainable-development-goals.html

- The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.
- These 17 Goals build on the successes of the Millennium Development Goals, while including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities.
- The goals are interconnected – often the key to success on one will involve tackling issues more commonly associated with another.
- The SDGs work in the spirit of partnership and pragmatism to make the right choices now to improve life, in a sustainable way, for future generations. They provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large.
- The SDGs are an inclusive agenda. They tackle the root causes of poverty and unite us together to make a positive change for both people and planet.

UAV and SDGs No2
SDGs 17 Goals

To which goals UAV can contribute?

Goal1. End poverty in all its forms everywhere

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3. Ensure healthy lives and promote well being for all at all ages
The United Nations Sustainable Development Goals that all UN Member States have agreed to try to achieve Universal Health Coverage by 2030. This includes financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all.

Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5. Achieve gender equality and empower all women and girls

Goal 6. Ensure availability and sustainable management of water and sanitation for all

Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all

To which goals UAV related products and technology can contribute?
(e.g., solar power stand in rural areas)

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Goal 10. Reduce inequality within and among countries

Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable

Goal 12. Ensure sustainable consumption and production patterns

Goal 13. Take urgent action to combat climate change and its impacts*

Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

HIV/AIDS Control in SDGs
Goal 3 Combat HIV/AIDS

by On the Fast-Track to end AIDS, UNAIDS 2016-2021 Strategy

Comprehensive and complicated

- Goal 3

Ensure healthy lives and promote well-being for all at all ages

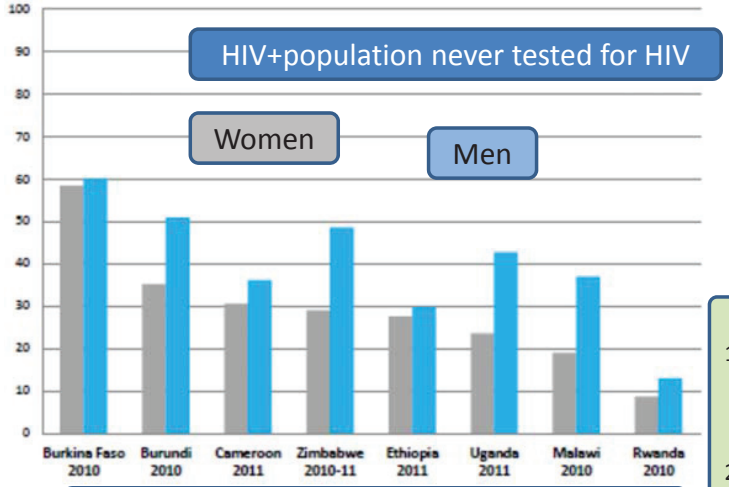
+ related HIV/AIDS control Goals are
5: Gender Equality,
10: Reduced Inequality
16: Peace, Justice and Strong Institutions
17: Partnerships for the Goals

- Target 3-3 in Goal 3

By 2030 end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases

+10 Targets for 2020 as strategic milestones for 2020

UNAID Initiative on HIV/AIDS control : HIV treatment goal 90-90-90



Still many people who are infected HIV, however, they do not know their status

1 : 90% of all people living with HIV will know their HIV status (Diagnosed)

2 : 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy (On treatment)

3:90% of all people receiving antiretroviral therapy will have viral suppression (Virally Suppressed)

90-90-90
HIV Treatment Goal to be achieved by 2020

Viral load and Early Infant Diagnosis Testing Scale-up Implementation Plan 2016-2020
MoH Zambia

End TB Strategy by WHO

SDGs includes ending TB epidemic by 2030 under Goal 3(3.3).
No1 cause of Hospital death in Lusaka district and Southern province

	MILESTONES		TARGETS	
			SDG*	END TB
	2020	2025	2030	2035
Reduction in number of TB deaths compared with 2015 (%)	35%	75%	90%	95%
Reduction in TB incidence rate compared with 2015 (%)	20%	50%	80%	90%
TB-affected families facing catastrophic costs due to TB (%)	0%	0%	0%	0%

End TB Strategy by WHO

SDGs includes ending TB epidemic by 2030 under Goal 3(3.3).
No1 cause of Hospital death in Lusaka district and Southern province

Treatment coverage
Number of people that developed TB, and were notified and treated, out of the total estimated number of incident cases in the same year (%).
≥ 90%

TB treatment success rate
Number of TB patients who were successfully treated out of all notified TB cases (%).
≥ 90%

Preventive treatment coverage
Number of people living with HIV and children who are contacts of cases who were started on preventive treatment for latent TB infection, out of all those eligible (%).
≥ 90%

TB affected households facing catastrophic costs
Number of TB patients and their households that experienced catastrophic costs due to TB, out of all TB patients (%)
0%

Uptake of new diagnostics and new drugs
Number of TB patients who were diagnosed using WHO-recommended rapid tests, out of all TB patients (%).

Number of TB patients who were treated with regimens including new TB drugs, out of those eligible for treatment with such drugs (%).
≥ 90%

End TB Strategy by WHO

On the WHO recommended rapid tests

http://www.who.int/tb/publications/lamp-diagnosis-molecular/en/

- The WHO End TB Strategy calls for the early diagnosis of TB and universal drug susceptibility testing (DST), highlighting the critical role of laboratories for rapidly and accurately detecting TB and drug resistance.
- Molecular assays based on nucleic acid amplification techniques such as polymerase chain reaction (PCR) have been developed for rapid TB diagnosis and are being implemented in developing countries.
- A commercial molecular assay Loopamp MTBC Detection Kit based on loop-mediated isothermal amplification was developed by Eiken Chemical Company Ltd (Tokyo, Japan) for the detection of Mycobacterium tuberculosis complex (TB-LAMP).
- TB-LAMP is a manual assay that requires less than one hour to perform and can be read with the naked eye under ultra violet light.
- Following review of the latest evidence, WHO recommends that TB-LAMP can be used as a replacement for microscopy for the diagnosis of pulmonary TB in adults with signs and symptoms of TB.
- It can also be considered as a follow-on test to microscopy in adults with signs and symptoms of pulmonary TB, especially when further testing of sputum smear-negative specimens is necessary.

Character on the Target for UAV as a transportation in health sector in Zambia and Africa as of Today

- Light
- Low volume
- Perishable

Practical target :

Dried Blood Samples for Early Infant Diagnosis /EID for HIV,

Blood(contained in blood collection tube) for HIV related testing

Sputum for TB testing

UAV
as one of Government's growth strategy "Japan revitalization strategy"

29th May 2017 Japanese Cabinet Office decision
Government's growth strategy "Japan revitalization strategy"
5 Pillars

1) Extension of healthy life:
   A period of independent living and independent of medical care and nursing care
2) Realization of movement revolution,
3) Next generation of supply chain :
   Realization of delivery by UAV in mountain and urban areas in 2022
4) Comfortable infrastructure · city planning,
5) Finetec:
   Financial services that utilize state-of-the-art technology
   such as settlement using smartphones, asset management, big data,
   artificial intelligence (AI)

UAV
as one of Government's growth strategy "Japan revitalization strategy"

Comparison of extension of healthy life between Zambia and Japan
Reference : Atlas of African Health 2016 WHO AFRO and web of MoHLW

Country	Sex	**A** Life expectancy at birth in 2013	**B** Healthy life expectancy at birth in 2013	**C (A-B)** Life expectancy at birth - Healthy life expectancy at birth in 2013	Life expectancy at the age of 60 years old in 2013
Zambia	Male	57	49	8	16
	Female	60	51	9	18
Japan	Male	80	71	9	23
	Female	86	74	12	28

UAV Related environment
Cooperation between Japan MoH and US MoH

May 2017

MEMORANDUM OF COOPERATION
BETWEEN
THE MINISTRY OF HEALTH, LABOUR, AND WELFARE OF JAPAN
AND
THE DEPARTMENT OF HEALTH AND HUMAN SERVICES OF THE UNITED STATES OF AMERICA

The Ministry of Health, Labour and Welfare of Japan (MHLW) and the United States Department of Health and Human Services (HHS), hereinafter referred to as the "Participants":

Guided by the willingness to foster research and innovation and to develop cooperation between their respective countries in the field of healthcare delivery and biomedical and clinical sciences;

Recognizing the importance of international cooperation on health;

Considering the cooperation sustained previously by Japan and the United States;

Recognizing the Participants' desire to sign this Memorandum of Cooperation (MOC) in order to strengthen cooperation in these areas for the benefit of the populations of both countries,

Have reached the following common recognition:

SDGs and UAV
Combating ZIKA and Future Threats – a Grand Challenge for Development-by USAID

USAID

COMBATING ZIKA AND FUTURE THREAT

2016 ZIKA AND FUTURE THREATS INNOVATIONS
Grants awarded to smart and scalable solutions

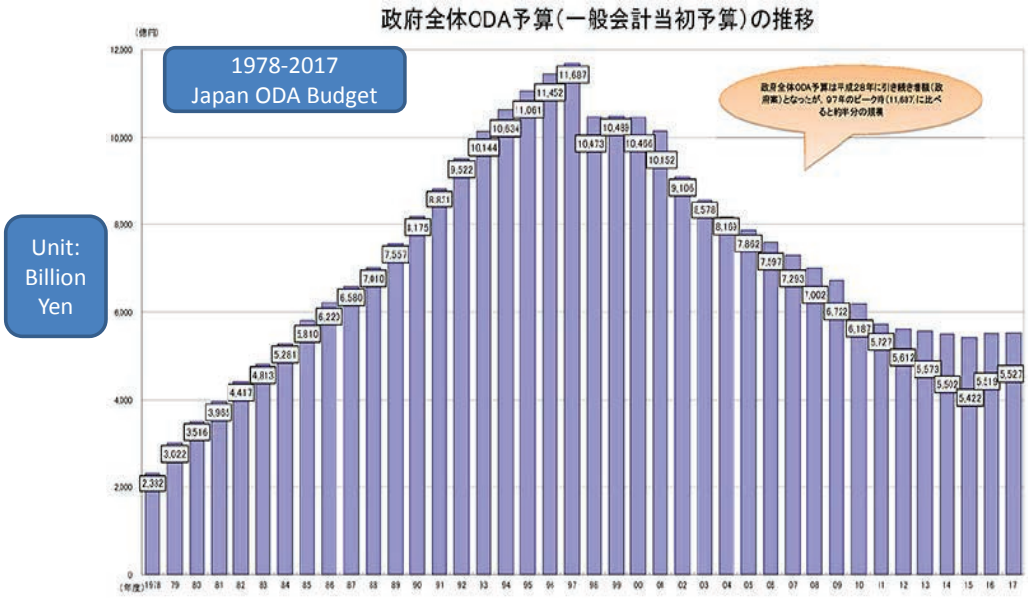
VECTOR CONTROL	Monash University	Scaled deployment of Wolbachia-infected mosquitoes to block disease transmission
	Michigan State University	Wolbachia-infected mosquitoes to suppress population and block disease
	Trustees of Indiana University	Natural yeast-based larvicide
	Johns Hopkins University	Chromobacterium: an environmentally friendly biopesticide
PERSONAL/ HOUSEHOLD PROTECTION	Barcelona Institute for Global Health	Electric force field to repulse mosquitoes
	Ifakara Research Institute	Low-cost treated Sandals to prevent bites
	Liverpool School of Tropical Medicine	Low-tech treated fabric for outdoor use
	QIMR Berghofer Medical Research Inst.	Low-cost treated wall hangings for indoor use
	Johns Hopkins Bloomberg School of Public Health	Human scent mimic mosquito trap
VECTOR SURVEILLANCE	Stanford University	MosquitoFreq: Crowdsourced detection of mosquito species using simple Flip Phones
	University of Queensland	Near infrared spectroscopy to detect transmission hotspots
	Stanford University	VectorChip: Design and testing for pathogen identification tools in wild mosquito populations
	Sao Paolo University	Intelligent trap to enhance Zika surveillance
	Johns Hopkins University	VectorWEB: Low-cost network of cloud connectedovitraps
COMMUNITY ENGAGEMENT	Institute for Global Environmental Studies	Mosquito Challenge Community Campaign: Kid citizen science to combat Zika
	Johns Hopkins Center for Communications Programs	Rapid Habit Optimization Tool (R-SHOT): Field tool for recommending optimal habits and motivational tactics

DISEASE SURVEILLANCE	Premise Data	Citizen-led disease risk mapping and vector monitoring
	Dalberg Data Insights	Monitoring population movement to determine areas prone to disease outbreak
	Dimagi/Mt. Sinai	Big data and machine-based learning to identify data cold spots to forecast disease hotspots
	International Society for Infectious Diseases	Partnership for real-time mapping of disease transmission risk from one country to another
DIAGNOSTICS	J. Craig Venter Institute	Rapid identification of peptides to speed development of Zika diagnostics
	Abbott's Ibis Biosciences Business	Rapid, handheld point of care diagnostic for ZIKV, DENV, and CHKV
	BluSense Diagnostics	Viro-Track: Rapid point of care diagnostics for ZIKV, DENV, and CHKV using blue ray technology
	SystemOne	Aspect™ IoT software and portability pack to diagnose patients in the hardest-to-reach areas
UNMANNED AERIAL VEHICLES	Vayu	Use of UAVs for delivery/pick-up of medical products and samples
	WeRobotics	Mosquito release mechanism on UAVs to support mosquito control

These innovations are in response to the **Combating Zika and Future Threats Grand Challenge** issued by USAID in April 2016 to find smart and scalable ideas that can address the current Zika outbreak and help prevent, detect, and respond to future infectious disease outbreaks.

International Aid Trend

- UHC
- SDGs
- Co-existence of Profit making business and solving social challenges
- Sustainability through profit making business



Sanpo yoshi

Omi ShoNin: Merchants from Omi, who were called 'Omi shonin' (Omi merchants) played active roles in various parts of Japan.

Oumi Merchant Teaching: 'Sanpo yoshi‘ (benefit for all three sides)

Three sides good:Seller side good, buyer side good, society good.

Business is for the society, contribution to people, therefore profit is a rightful reward.

Four sides good by Hashimoto (benefit for all four sides)
Seller side good, buyer side good, society good and future good

A big vision

For making a better and sustainable health services and future in Zambia
(even in Japan)

- Increase of Individual income
- Increase of Employment (Decent work as much as possible)
- Increase of National income
- Need of creation of new industry

⇒Possibility of UAV industry

Usage: for Health, Mining, Agriculture, Livestock Industry, Tourism, Construction, Civil Engineering, Meteorology, Environmental protection, Traffic control and Security

By Zambian: Research, Development, Production and Sales (RDPS)
in adaptation of Zambian background and needs

What kind of future we want to make?

The first and small step for the big vision

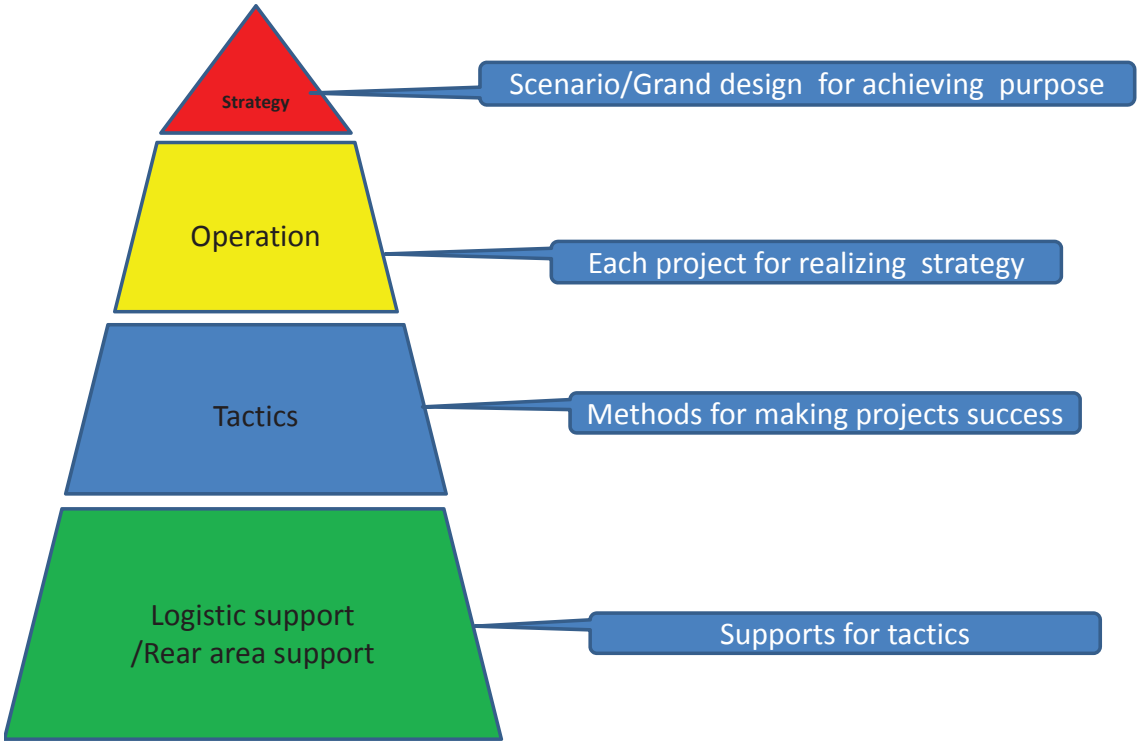
UAV business for health sectors in Zambia
Practically How to do ?
One of most difficult parts

Of course at first ,
we need more proper
products and then

- At least there is a need of an organization which can do necessary activities for UAV business in Zambia
  (Import and clearance, registration, services providing or products selling, maintenance and repairing etc.)
- Collaboration with existing other companies or establishing a new organization?
- How to recruit reliable and staff with proper competency depending job descriptions
- Maybe only business for health sector is not enough for running business
- Optimizing business targets : government organizations and private organizations

Daydream ?
Zamrosense Ltd
in Zambia
CEO Mr. Nukada

For making a plan



Wrapping up

- Character of UAV
- UAV in health sector
- Trend of the World
- How to adapt UAV for your society for better and sustainable health services and future
- The first and small step


Thank you very much !
Simoom Kwanbi-ri !
Natasha !
I welcome your mails
if you have comments or questions n-hashimoto@it.ncgm.go.jp

Memo