

143rd Transport Policy Colloquium

**The Latest Trends in Unmanned Aircraft Systems Policy in the
United States, Edition 2021
- Revision to the Regulations for Further Expansion of Use -**

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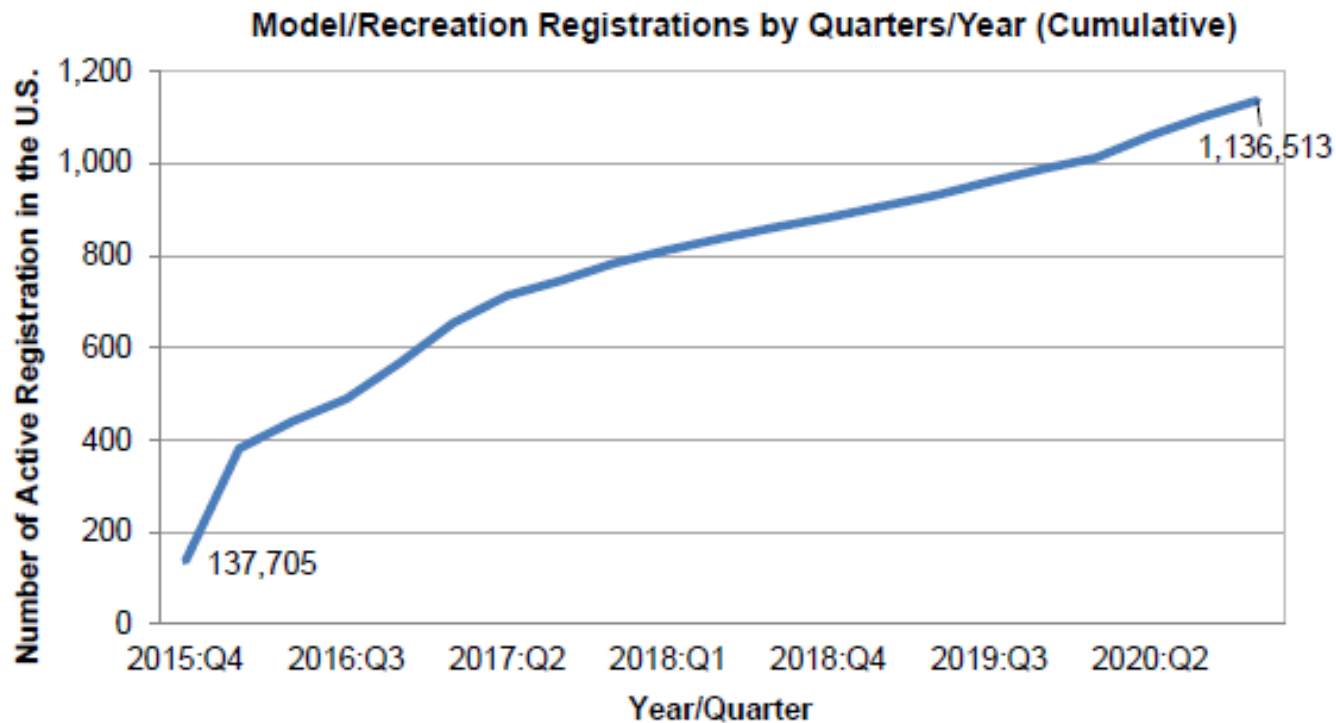
1. The Current **Status** of Unmanned Aircraft Systems (UAS) Policy in the United States
2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States
3. Details of the Regulations for Remote IDs and the Regulations for Night Operations and Operations Over People
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Classification of UAS by Application

Classification	Specific Use
<u>For Recreational Use</u>	Model airplanes, FPV (First-Person View) Drones and the Like
<u>For Commercial Use</u>	Aerial Photography, Surveying Work, Infrastructure Inspections, Agricultural Chemical Spraying, and the Like
<u>For Public Use</u>	To Understand the Situation in the Event of a Disaster, for Fire-fighting Activities, and the Like

UAS Registration Status (For Recreational Use)



Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

1. The Current **Status** of UAS in the United States

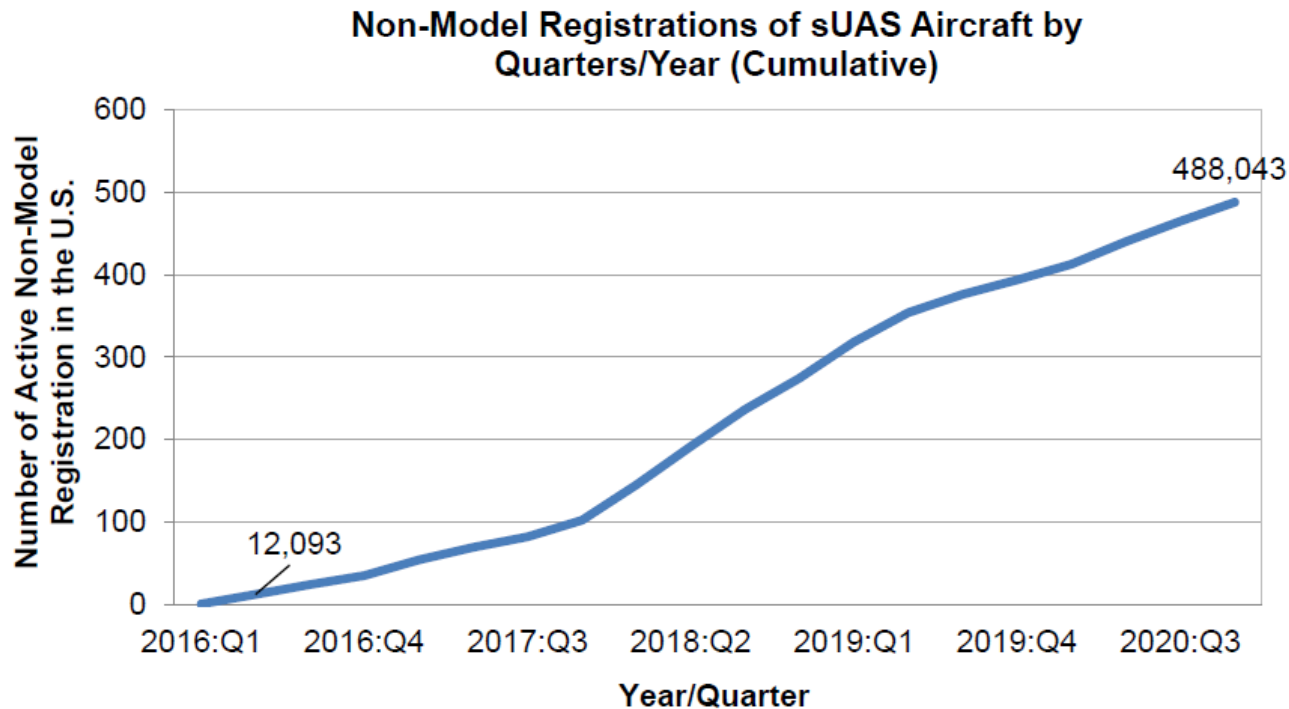
Future Forecast for UAS (For Recreational Use)

Total Recreation/Model Fleet (Million sUAS Units)

Fiscal Year	Low	Base	High
<u>Historical</u>			
2020	1.4365	1.4365	1.4365
<u>Forecast</u>			
2021	1.4544	1.5022	1.5417
2022	1.4668	1.5303	1.5935
2023	1.4708	1.5415	1.6157
2024	1.4719	1.5455	1.6237
2025	1.4724	1.5510	1.6347

Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

Registration Status of UAS (For Commercial Use)



Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

1. The Current **Status** of UAS in the United States

Future Forecast for UAS (For Commercial Use)

Total Commercial/Non-Model Fleet (Thousand sUAS Units)

Fiscal Year	Low	Base	High
Historical			
2020	488	488	488
Forecast			
2021	543	589	691
2022	569	665	871
2023	583	729	1,028
2024	601	784	1,094
2025	614	835	1,144

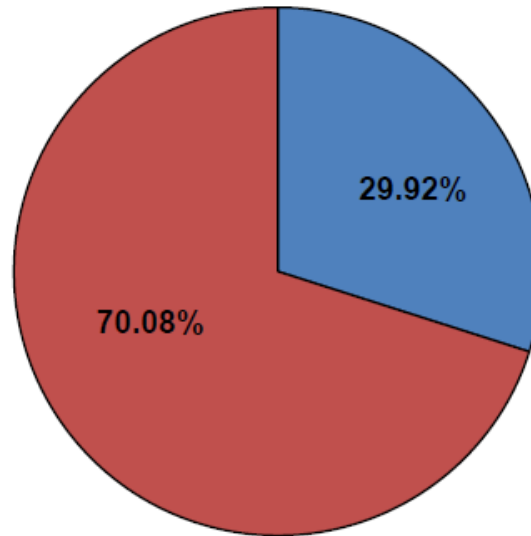
Of these, professional grade (priced at \$10,000 US or more): 8%, approximately 40,000 aircraft

Of which professional grade: 13%, approximately 105,000 aircraft

Source: FAA Aerospace Forecast Fiscal Years 2021-2041

1. The Current **Status** of UAS in the United States

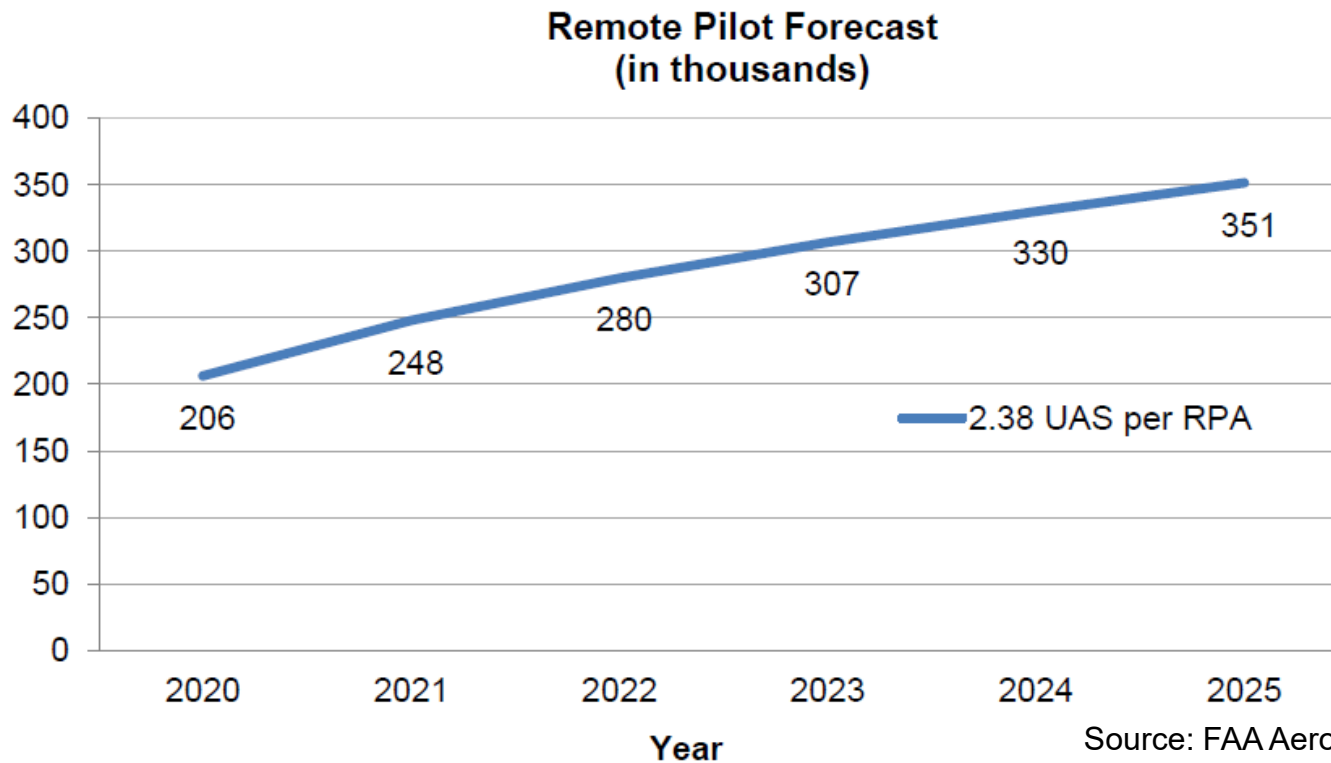
Distribution of Remote Pilots



- Remote Pilot (Part 61 and Part 107 Certificate)
- Remote Pilot (Part 107 Only)

Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

Future Forecast for Pilots of UAS (For Commercial Use)

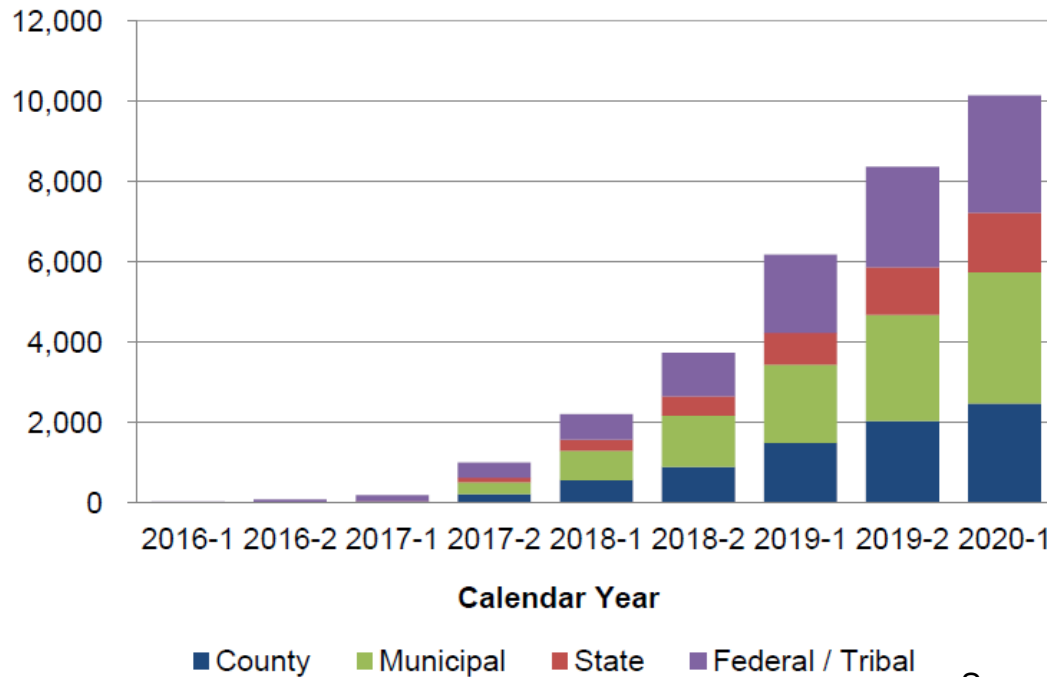


Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

1. The Current **Status** of UAS in the United States

Registration Status of UAS (For Public Use)

Total UAS Registered by Public Safety Agencies



Source: FAA Aerospace Forecast Fiscal Years 2021-2041

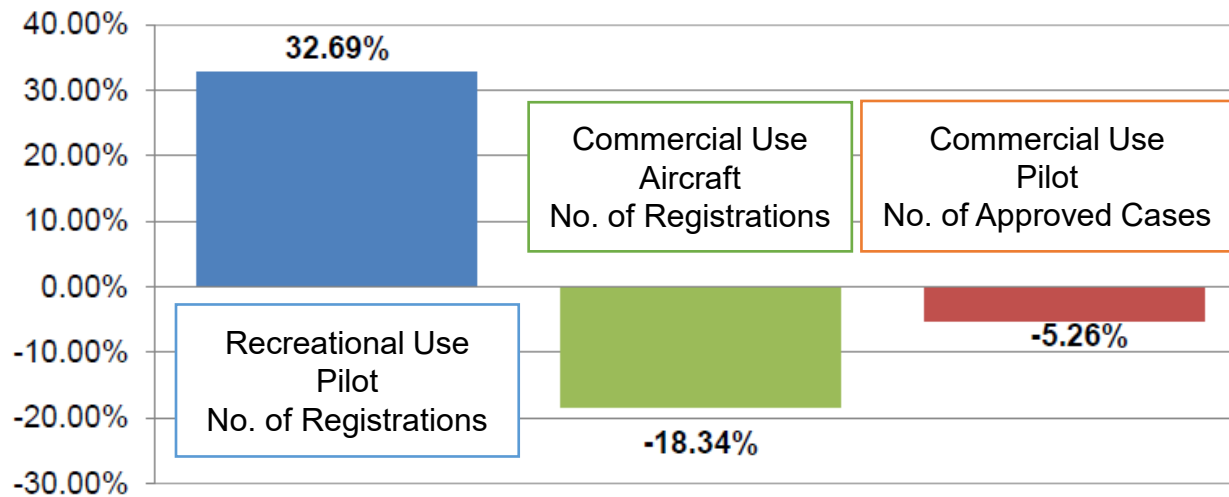
1. The Current **Status** of UAS in the United States

Future Forecast for UAS (For Public Use)

Fiscal Year	Low	Middle	High
Forecast			
2021	11,733	14,127	15,604
2022	13,022	18,098	21,313
2023	14,112	22,069	27,497
2024	15,056	26,040	34,106
2025	15,888	30,011	41,102
CAGR*	9%	24%	32%
Note: Based on extrapolation of registrations of Part 107 UAS by public safety agencies 2018-2020.			
*Compound Annual Growth Rate			

Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

**Trends in Registrations:
March 2nd - December 28th (2020 versus 2019)**



■ Recreational Registrations ■ Part 107 Registrations ■ Remote Pilot Registrations

Source: FAA Aerospace Forecast
Fiscal Years 2021-2041

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History of Regulations for Registration and Identification of UAS



	USA	Japan [Reference]
<u>2015</u>	<p>Regulations on registration and markings for UAS (Requirements for markings for identification numbers on the aircraft)</p>	<p>Creation of a registration system for UAS through a partial amendment to the Civil Aviation Act (including requirements for remote IDs)</p>
<u>2020</u>		
<u>2021</u>	<p>Regulations for remote IDs (remote identification)</p>	

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States
((1) Establishment of Regulations Relating to Remote IDs)

Regulations on Registration of and Markings on UAS (2015)



Source: FAA Website

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States
((1) Establishment of Regulations Relating to Remote IDs)

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States
((1) Establishment of Regulations Relating to Remote IDs)

Comparison of Regulations in Japan and USA Regarding Aircraft Registration and Identification



	USA	Japan
<u>Aircraft registration and identification number marking</u>	Already mandatory	Mandated by a partial amendment to the Civil Aviation Act of 2020
<u>Remote ID</u>	Mandated by regulations relating to remote IDs in 2021	Mandated by a partial amendment to the Civil Aviation Act of 2020 (Planned)
<u>Aircraft subject to regulations</u>	Recreational use: 250 grams or more total weight Commercial Use: All	Recreational and commercial use: 100 grams or more total weight (planned)

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States
 ((1) Establishment of Regulations Relating to Remote IDs)

(Commercial-use Aircraft) History of Regulations for Night Operations and Operations Over People

	USA	Japan [Reference]
<u>2015</u>		Setting flight rules for UAS through a partial amendment to the Civil Aviation Act
<u>2016</u>	<p>Rules relating to commercial-use UAS (As a general rule, night operations and operations over people, and the like are prohibited, and approval is granted individually upon application for waiver from regulations)</p>	
<u>2021</u>	<p>(Commercial use) Regulations for night operations and operations over people (For night operations and operations over people, it is unnecessary to apply for waiver from regulations when certain safety standards are met)</p>	<p>Streamlining of the procedures for permission and approval of flight methods and a lifting of the ban on operations over people through a partial amendment to the Civil Aviation Act</p>

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States ((2) Night Operations and Operations Over People)

Regulations relating to commercial-use UAS (part 107) (2016)



2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States ((2) Night Operations and Operations Over People)

Regulations for Night Operations and Operations Over People (2021)

- Enforced: April 2021
- Among the regulations in the rules relating to commercial-use UAS, for night operations and operations over people, if certain safety standards are met, it is possible to **operate** without applying for **waiver** from the regulations
- For night operations, knowledge is required to be given to pilots and collision-prevention lights are required to be installed on aircraft (details will be described later).
- For operations over people, requirements are set for each category after classifying small UAS into four categories (category 1 to 4) according to the risk in the event of a crash (details will be described later).
- From the content at the time of the proposed regulation, category 4 was added, and requirements relating to remote ID were added

Comparison of Regulations for Methods of Flights (Commercial-use Aircraft) in Japan and the United States



	USA (Before review in 2021 ⇒ after review)	Japan (Before the revision of the Act in 2021 ⇒ after the revision of the Act)
<u>Night Operations</u>	Procedures for waiver from regulations ⇒ Individual procedures not required	Individual Approval Procedures ⇒ individual procedures not required *1
<u>Operations Over People</u>	Procedures for waiver from regulations ⇒ Individual procedures not required	Prohibited ⇒ Individual permission and approval procedures
<u>BVLOS operations</u>	Procedures for exemption from regulations *2 ⇒ (Review under consideration)	Individual Approval Procedures ⇒ individual procedures not required *1

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States ((2) Night Operations and Operations Over People)

Comparison of Regulations for Methods of Flights (Commercial-use Aircraft) in Japan and the United States (Continued)



	USA (Before review in 2021 ⇒ after review)	Japan (Before the revision of the Act in 2021 ⇒ after the revision of the Act)
<u>Flights above a certain altitude</u>	Procedures for waiver from regulations (over 120 m) ⇒ (No changes)	Individual permission procedures (150 m or more) ⇒ (No changes)
<u>Operations from a moving vehicle</u>	Procedures for waiver from regulations ⇒ (No changes)	(Not subject to regulations)
<u>Flights over densely populated areas</u>	(Not subject to regulations)	Individual permission procedures ⇒ Individual procedures not required*
<u>Flights in the vicinity of people and property</u>	(Not subject to regulations)	Individual Approval Procedures ⇒ Individual procedures not required*
<u>Aircraft subject to regulations</u>	All (excluding aircraft that follow rules for recreational use) ⇒ (No changes)	Recreational and commercial use: 200 grams or more total weight ⇒ 100 grams or more total weight (measures planned by ministerial ordinance)

2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States ((2) Night Operations and Operations Over People)

Strengthening of Safety Measures for Recreational-use UAS - Background



2. Summary of Changes According to Regulations to Date and Rules Published This Year in the United States
((3) Strengthening of Safety Measures for Recreational-use UAS)



For Recreational Flyers operating under the exception for limited recreational operations of unmanned aircraft (Title 49 of the United States Code (49 U.S.C.) § 44809), this document is evidence that the holder has passed the aeronautical knowledge and safety test as required by 49 U.S.C. § 44809(a)(7).

- Register your drone if it weighs more than 0.55 pounds
- Fly only for recreational purposes
- Operate in accordance with or within a Community-Based Organization's (CBO's) safety guidelines
- Always fly within visual line of sight
- Do not interfere and give way to any manned aircraft
- Obtain authorization before flying in controlled airspace
- Do not fly higher than 400 feet in uncontrolled airspace

Recreational flyers must make this certificate available to Federal Aviation Administration (FAA) or Law Enforcement officials upon request.

For more information visit faa.gov/uas.

Content of the Knowledge Test for Pilots of Recreational-use UAS



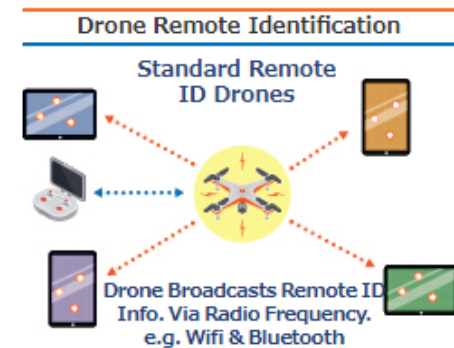
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(1) Regulations for Remote IDs— Background

(1) Regulations for Remote IDs— Summary (Reposted)

(1) Regulations for Remote IDs - Standard Remote IDs



- Remote ID capability is built into the drone
 - From takeoff to shutdown, drone broadcasts:
 - Drone ID
 - Drone location and altitude
 - Drone velocity
 - Control station location and elevation
 - Time mark
 - Emergency status
- Source: FAA Website

(1) Regulations for Remote IDs – Broadcast Module



- Remote ID capability through module attached to drone
- Limited to visual line of sight operations
- From takeoff to shutdown, drone broadcasts:
 - Drone ID
 - Drone location and altitude
 - Drone velocity
 - Takeoff location and elevation
 - Time mark

Source: FAA Website

(1) Regulations for Remote IDs - Identification Areas (FRIA)

FAA-Recognized Identification Area (FRIA)

Drones Without Remote ID



- Drones without Remote ID can operate without broadcasting
- Drones without Remote ID must operate within visual line of sight and within the FRIA
- Anyone can fly there, but FRIAs can only be requested by community-based organizations and educational institutions

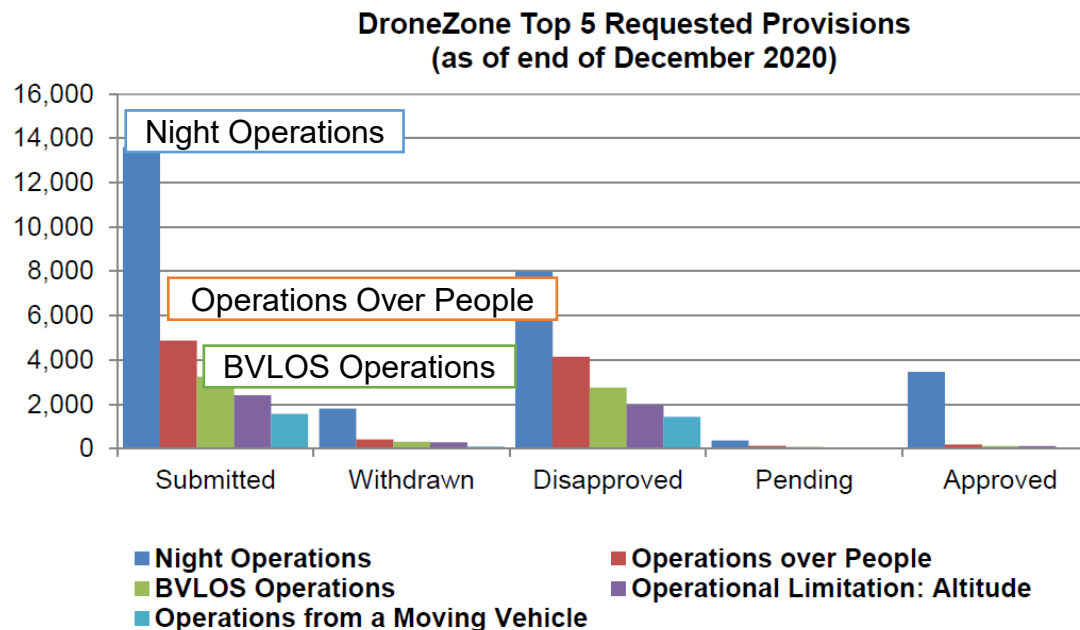
Source: FAA Website

(1) Regulations for Remote IDs - Performance Requirements

(1) Regulations for Remote IDs - Application Date

(2) Regulations for Night Operations and Operations Over People - Background

- Number of applications for **waiver** from the regulations (page 19) relating to commercial-use UAS published in 2016



- In order to ease restrictions on night operations and operations over people which account for most applications, in February 2019, the FAA announced proposed amendments to the regulations and began public comment procedures.
- In January 2021, a portion of the amended proposal was revised, and published as an official version.

(2) Regulations for Night Operations and Operations Over People - Summary (Reposting)

- Enforced: April 2021
- Among the regulations in the rules relating to commercial-use UAS, for night operations and operations over people, if certain safety standards are met, it is possible to **operate** without **waiver** for exemption from the regulations
- For night operations, knowledge is required to be given to pilots and collision-prevention lights are required to be installed on aircraft
- For operations over people, requirements are set for each category after classifying small UAS into four categories (category 1 to 4) according to the risk in the event of a crash.
- From the content at the time of the proposed regulation, category 4 was added, and requirements relating to remote ID were added

(2) Regulations for Night Operations and Operations Over People - Night Operations

- The **giving** knowledge to pilots will be carried out by the following methods
 - (Cases where an approval based on regulations before the amendment has been obtained)
Received online training including contents* relating to night operations
 - (Cases where an approval based on regulations before an amendment has not obtained)
Take the revised test, including the contents* relating to night operations
(*Definition of night, a visual **confirmation** of the aircraft at night (the aircraft itself or the position lights of the **aircraft** must be visible, and it is not **allowed to confirm the aircraft** by using only the collision-prevention lights), effects of sleep rhythm, identification of obstacles before flight, changes in the field of view at night and countermeasures against them, and others)
- The **specific requirements of the collision-prevention lights** to be equipped are shown below.
 - **It must be visible from 3 miles (4.8 kilometers) away and must have an adequate flashing speed to avoid mid-air collisions**

(2) Regulations for Night Operations and Operations Over People - Operations Over People (Category 1)



- Aircraft
 - Must be 0.55 pounds (250 grams) or less in total weight
 - Rotating components must not be exposed to the outside
- Airspace
 - A remote ID is required to fly over outdoor gatherings
- Procedures
 - No FAA approval procedures required

(2) Regulations for Night Operations and Operations Over People - Operations Over People (Category 2)



- Aircraft

- There must be no injury beyond an injury resulting from the impact of kinetic energy of 11 foot-pound force (about 15 joules) caused by the rigid body.
- Rotating components must not be exposed to the outside

- Airspace

- A remote ID is required to fly over outdoor gatherings

- Procedures

- Approval process by the FAA required

(Based on the compliance method recognized by the FAA, compliance with the requirements of the above aircraft must be declared, and FAA approval is required.)

(2) Regulations for Night Operations and Operations Over People - Operations Over People (Category 3)



- Aircraft

- There must be no injury beyond an injury resulting from the impact of kinetic energy of 25 foot-pound force (about 34 joules) caused by the rigid body.
- Rotating components must not be exposed to the outside

- Airspace

- Continuous flights over outdoor gatherings are not possible
- **Operations over people** are only possible under extremely limited conditions, such as in restricted areas, and when all people in the restricted area are notified.

- Procedures

- Approval process by the FAA required

(Based on the compliance method recognized by the FAA, compliance with the requirements of the above aircraft must be declared, and FAA approval is required.)

(2) Regulations for Night Operations and Operations Over People - Operations Over People (Category 4)



- Aircraft

- An airworthiness certificate has been obtained according to Federal Aviation Regulations, part 21.
- If the kinetic energy of the impact **exceeds that of upper limit** in category 3 (25 foot-pound force), it is necessary to comply with category 4.

- Airspace

- A remote ID is required to fly over outdoor gatherings

- Procedures

- Fly in accordance with the **limitations** of the FAA-approved flight **manuals**

(2) Regulations for Night Operations and Operations Over People - Operations Over People (Compliance Method for Aircraft Requirements)

- For the compliance method for aircraft requirements in category 2 and category 3, the FAA presents the following method in Advisory Circular (AC) 107-2A.

$$KE_{\text{impact}} = 0.0155 \times w \times v^2$$

- The maximum speed per aircraft weight according to this method is as follows.


Aircraft Weight	Category 2 Maximum Speed	Category 3 Maximum Speed
1.0 pound (0.45 kg)	26 feet per second (29 km/h)	40 feet per second (43 km/h)
1.5 pounds (0.68kg)	22 feet per second (24 km/h)	33 feet per second (36 km/h)
2.0 pounds (0.91kg)	19 feet per second (21 km/h)	28 feet per second (31 km/h)
2.5 pounds (1.13kg)	17 feet per second (19 km/h)	25 feet per second (27 km/h)
3.0 pounds (1.36kg)	15 feet per second (16 km/h)	23 feet per second (25 km/h)

- Even with aircraft of the same weight, depending on the shape and material, the impact may be smaller than the method on the previous page.
- It is assumed that another compliance method will be formulated around March 2022 by an international standardization organization.

(It is also possible for manufacturers of UAS to propose their own methods)

- **ASTM International is considering amending the standard (F3389) for test methods to evaluate the safety of UAS**
- **The FAA-approved compliance method **will be** published in the Federal register.**
- **After FAA approval, a declaration of compliance with aircraft requirements based on the FAA approved compliance method will be published on the website**

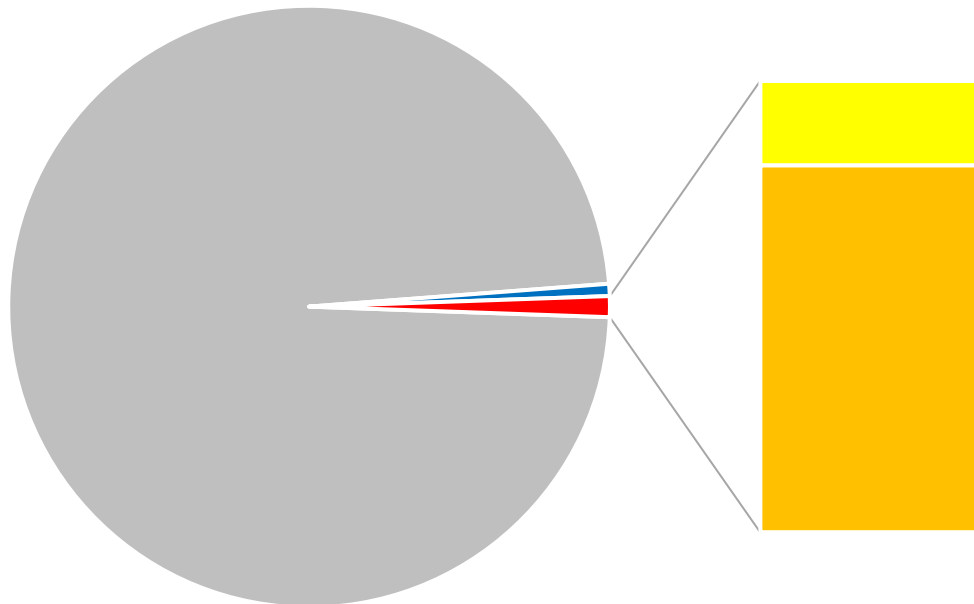
(2) Regulations for Night Operations and Operations Over People - Operations Over People (Summary)

Risks in the Event of a Crash	Category Classification	Aircraft Approval Procedures	Airspace Allowing Operations Over People
	<div style="background-color: #ADD8E6; padding: 10px; text-align: center;">Category 1</div>	Not required	No limitations*
	Total weight: 250 g		
	<div style="background-color: #FFD700; padding: 10px; text-align: center;">Category 2</div>	Required	No limitations*
	Kinetic energy 11 ft-lb		
	<div style="background-color: #FF8C00; padding: 10px; text-align: center;">Category 3</div>	Required	Limited (only possible in very limited conditions)
Kinetic energy 25 ft-lb			
<div style="background-color: #90EE90; padding: 10px; text-align: center;">Category 4</div>	Airworthiness certification is required	No limitations*	

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Status for **Waiver** Relating to BVLOS Operations

Total Number of **Waivers** from Regulations Granted: 4292
 (Source: FAA website; As of August 10, 2021)



- Those Not-related to BVLOS Operations : 4216
- Those That Do Not Include Waiver for Visual Observers for BVLOS Operations : 28
- Those That Include Waiver from BVLOS Operations, Visual Observers and Operations Over People: 9
- Those That Include Waiver from BVLOS Operations and Visual Observers, and do not include Operations Over People: 39

Demonstration Projects for the Expansion of BVLOS Operations



Source: FAA Website

4. Trend in Regulatory Reviews for the Expansion of BVLOS Operations

Place to Study Regulations Toward the Expansion of BVLOS Operations



4. Trend in Regulatory Reviews for the Expansion of BVLOS Operations

Regulations Relating to **Delivery** of Small Cargo for Compensation Using UAS



4. Trend in Regulatory Reviews for the Expansion of BVLOS Operations

Regulations Relating to **Delivery** of Small Cargo for Compensation Using UAS (Continued)



4. Trend in Regulatory Reviews for the Expansion of BVLOS Operations

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- ① Safety standards for type **certification** of small UAS
- ② Traffic control of UAS
- ③ Review of terminology relating to UAS

① Safety Standards for Type Certification of Small UAS— Background



5. Other Topics That are Currently Under Consideration

① Safety Standards for Type Certification of Small UAS - Overview



5. Other Topics That are Currently Under Consideration

① Safety Standards for Type Certification of Small UAS - Requirements



5. Other Topics That are Currently Under Consideration

① Safety Standards for Type Certification of Small UAS— Current Status



5. Other Topics That are Currently Under Consideration

② Traffic Control of UAS - History

5. Other Topics That are Currently Under Consideration

② Traffic Control of UAS - Issues

5. Other Topics That are Currently Under Consideration

③ Review of Terminology Relating to UAS - Background



5. Other Topics That are Currently Under Consideration

③ Review of Terminology Relating to UAS - Examples

Current Terminology	Terminology After Review
Airman / Airmen	Aircrew (or Aviator)
Manned Aviation	Traditional Aviation
Repairman	Technician
<u>Unmanned</u>	<u>Uncrewed</u>
Unmanned Aerial System	Uncrewed Aerial System (or Drone System)

5. Other Topics That are Currently Under Consideration

③ Review of Terminology Relating to UAS - Applications

5. Other Topics That are Currently Under Consideration

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Future Direction Concerning BVLOS Operations

- The FAA utilizes the following formulation process for regulations to respond flexibly to the expansion of UAS operations.

Formulation of regulations that allow for **waiver** from regulations



Limited implementation through regulatory **waivers** and demonstration projects



Review of regulations based on the results of waiver and demonstration projects

- As shown on page 45, for BVLOS operations, there are approximately 3,000 applications for **waiver** from the regulations. However, no more than 3% of applications are permitted.
- To implement a wide range of BVLOS operations will require a review of the regulations based on the findings of the demonstration project and discussions in the advisory committee.

Human Resource **Development** to Support the Expansion of the UAS Industry



6. Future Direction **in the United States** and Recommendations (**Conclusion**)

Human Resource **Development** to Support the Expansion of the UAS Industry (Continued)



6. Future Direction **in the United States** and Recommendations (**Conclusion**)

Conclusion: Towards the Expansion of the UAS Industry in Japan (1)



6. Future Direction in the United States and Recommendations (Conclusion)

Conclusion: Towards the Expansion of the UAS Industry in Japan (2)

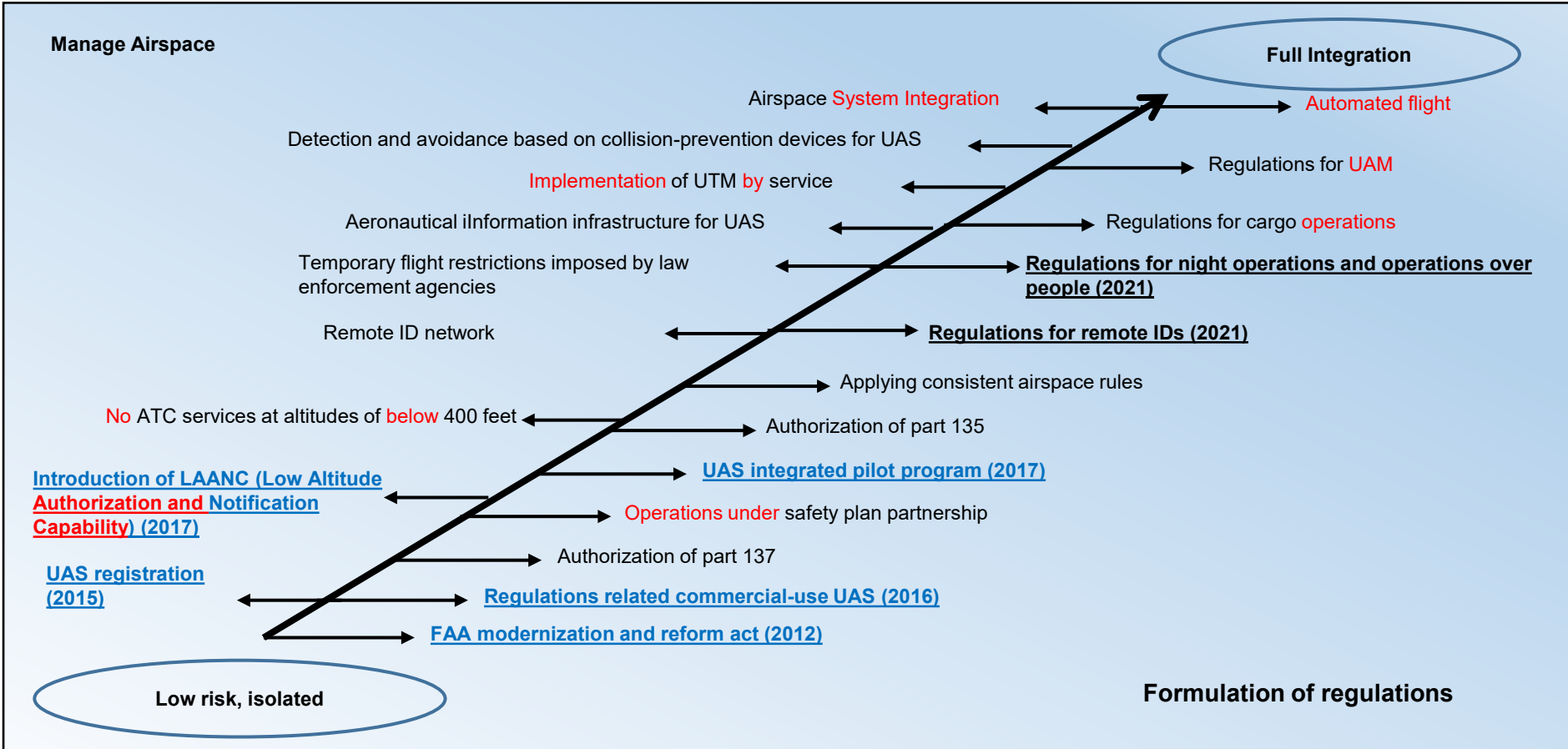


6. Future Direction in the United States and Recommendations (Conclusion)

(Reference) The Transition of Rules, and the Like relating to UAS in the United States

Roadmap for the Integration of UAS into Airspaces

- Full integration of manned and UAS airspaces will provide better medical care, safer working environments, and faster commercial transport and others.



(Reference) The Transition of Rules, and the Like relating to UAS in the United States



(Reference) The Transition of Rules, and the Like relating to UAS in the United States

Regulations on Registration of and Markings on UAS (2015)



Source: FAA Website

Regulations relating to commercial-use UAS (part 107) (2016)



(Reference) The Transition of Rules, and the Like relating to UAS in the United States

Regulations Relating to Commercial-use UAS (part 107) (2016) (Continued)



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Special Permit Procedure in Emergency Situations (2016)



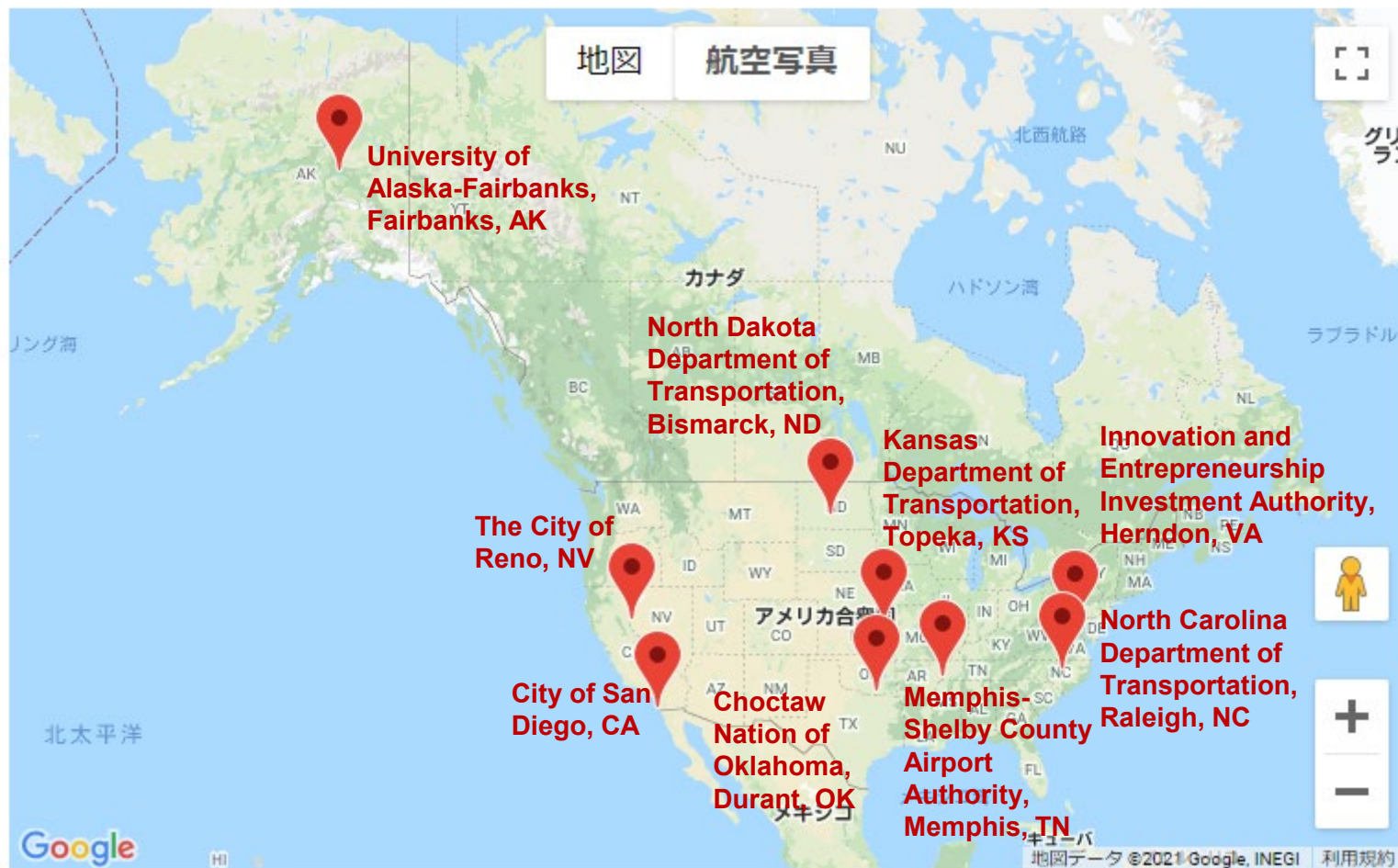
(Reference) The Transition of Rules, and the Like relating to UAS in the United States

UAS Integrated Pilot Program (2017)

- Based on a Presidential Memorandum, the private sector, and state, local, and tribal administrative agencies are collaborating to maximize the benefits of UAS technology and minimize safety and security risks by further integrating UAS into the national airspace system
- Purpose of the program
 - Test and evaluate various models involving state, local, and tribal administrative agencies for the operation of UAS.
 - Encourage owners and operators of UAS to develop new and innovative operating concepts **and test safely**.
 - Use as a reference for determining future federal guidelines and regulations for the operation of UAS throughout the country.

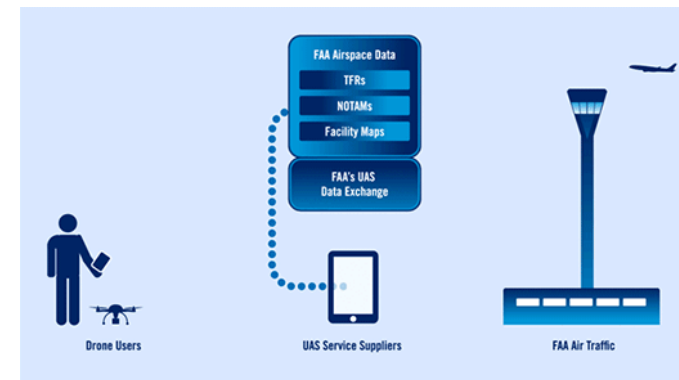
UAS Integrated Pilot Program (2017) (Continued)

- The following nine participating organizations were selected, taking into consideration the geographical location, climate, the administrative agency involved, and the diversity of the operations being conducted.



(Reference) The Transition of Rules, and the Like relating to UAS in the United States

Introduction of LAANC (Low Altitude **Authorization and Notification Capability**) (2017)



Source: FAA Website

Introduction of LAANC (Low Altitude **Authorization and Notification Capability**) (2017) (Continued)



(Reference) The Transition of Rules, and the Like relating to UAS in the United States

Introduction of LAANC (Low Altitude **Authorization** and Notification **Capability**) (2017) (Continued)



Airbus*	AirMap*	Airspacelink*	Aloft*
ANRA Technologies	ATA	Avision	Botlink
Drone Up	FA&A	Project Wing	Simulyze
Skygrid	Skyward*	Thales Group*	UASidekick*

* Offers services for the general public

(Reference) The Transition of Rules, and the Like relating to UAS in the United States