出國報告（出國類別：其他）

「APAC UAS Certification Working Group - Proposed Kick off Meeting Agenda」會議出國報告書

服務機關：交通部民用航空局
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派赴國家：紐西蘭
出國期間：自 106 年 11 月 26 日至 12 月 2 日
報告日期：107 年 1 月 25 日

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壹、目的

有鑒於世界各國遙控無人機之使用蔚為風潮且已發生數起對地面人員造成傷害之事件，未經核准進入空域無人機亦會對軍、民及公務航空器作業產生飛安風險，紛紛立法規管，民航局自 100 年 3 月起發布航空公報(AIC)，對國防、公務及以政府經費實施研究之遙控無人機作業予以規範。然展望未來 5 至 10 年間，無人航空器由軍用進入民用領域後，將對傳統有人航空器作業環境產生衝擊，無人航空器如何與載人航空器共存及可能衍生之各項公共安全議題，急需立法管理，行政院遂於 104 年 7 月指示，以修正「民用航空法」(以下簡稱民航法)方式對我國遙控無人機進行統一規範與管理。行政院於 106 年 10 月 26 日第 3573 次會議決議通過函送立法院審議，立法院交通委員會並於 106 年 12 月 20 日逐條審查通過。

美國聯邦航空總署(FAA)為協調亞太地區各國對遙控無人機管理工作之一致性及增加區域內各國實務經驗交流，並以「Working Group」(工作小組)方式推動，民航局接獲 FAA 駐新加坡亞洲太平洋地區代表通知，將邀集日本、韓國、中國大陸、印度、新加坡、澳洲、紐西蘭及我國等召開第一次工作小組會議，考量我國民航法修正草案已在立法院審議，未來制訂相關管理規亦同步與國際接軌，爰參與亞太地區各國所組成之無人機工作小組對話平臺有利吸收其他國家實務經驗並介紹我國立法現況。

貳、過程

本次出國前往紐西蘭威靈頓參與「APAC UAS Certification Working Group - Proposed Kick off Meeting Agenda」會議，會議行程自 106 年 11 月 26 日至 12 月 2 日止，會議地點在紐西蘭民航局會議室，內容除日本、新加坡、紐西蘭、美國及我國於會議上介紹無人機立法經驗、遙控無人機相關研討會外，與會各國代表共同討論無人機相關註冊、檢驗、人員操作證、活動區域等標準及規定，並做成相關決議及待確認事項。

一、行程概要：

日　期	地點	行 程 紀 要
11 月 26～11 月 27 日	臺北→香港→奧克蘭→威靈頓	搭乘長榮航空由臺灣桃園國際機場前往香港赤臘角國際機場，再搭乘紐西蘭航空轉機前往紐西蘭奧克蘭國際機場後轉機至威靈頓機場
11 月 28 日～12 月 1 日	紐西蘭民航局	出席 APAC UAS Certification Working Group 會議
12 月 1～2 日	威靈頓→奧克蘭→香港→臺北	搭乘紐西蘭航空由威靈頓機場前往奧克蘭國際機場轉機至香港赤臘假國際機場，再搭常長榮航空轉機回臺灣桃園國際機場

二、相關會議議程：

Day 1 – Tuesday, November 28, 2017	
08：45－09：00	Arrive
09：00－09：15	Welcome & Local Logistics
09：15－09：45	Introductions around the room for all APAC UCWG members
09：45－10：15	Review of the Purpose, Scope, and Charter for the APAC UCWG
10：15－10：30	Break
10：30－11：00	Continued Discussion on Goals and How to Get There
11：00－11：30	Presentation of UAS Experience & Lessons Learned – Singapore
11：30－12：00	Presentation of UAS Experience & Lessons Learned – New Zealand
12：00－13：00	Lunch
13：00－13：30	Presentation of UAS Experience & Lessons Learned – China
13：30－14：00	Presentation of UAS Experience & Lessons Learned – Japan

14：00－14：30	Presentation of UAS Experience & Lessons Learned – Chinese Taipei
14：30－14：45	Break
14：45－15：15	Presentation of UAS Experience & Lessons Learned – South Korea
15：15－15：45	Presentation of UAS Experience & Lessons Learned – United States
15：45－16：30	Discussion of Presentations and Approach Needed
16：30－17：00	1st Day Wrap Up and Look Ahead to 2nd Day
Day 2 – Wednesday, November 29, 2017	
08：45－09：00	Arrive
09：00－09：15	Welcome & Plans for Day 2
09：15－10：15	Overall view of RPAS panel, JARUS and associated terminology by ICAO – USA, Singapore and Members that participate in those panels
10：15－10：30	Break
10：30－11：15	Future Technology Adoption – Discuss what' s upcoming and what some of us are doing to incorporate new technology (or not)
11：15－12：00	Identification of Common Challenges, Lessons Learned
12：00－13：00	Lunch
13：00－13：30	Presentation by joint chairs under the charter on the deliverables of this group
13：30－14：30	Discussion on the proposals for the certification approach
14：30－14：45	Break
14：45－16：30	Cont. discussion on the proposals for the certification approach
16：30－17：00	2nd Day Wrap Up and Look Ahead to 3rd Day
Day 3 – Thursday, November 30, 2017	
08：45－09：00	Arrive
09：00	Welcome & Plans for Day 3 – Joint Chairs
09：00－10：15	Continuation of the discussions on the certification approach
10：15－10：30	Break
10：30－12：00	Continuation of the discussions on the certification approach
12：00－13：00	Lunch
13：00－14：30	Continuation of the discussions on certification approach and to break into subgroups where necessary
14：30－14：45	Break

14：45－16：30	Continuation of the discussions on certification approach with subgroups
16：30－17：00	3rd day wrap up and Evening Plan discussion
Day 4 – Friday, December 1, 2017	
08：45－09：00	Arrive
09：00－10：00	Planned deliverables from subgroups for next meeting, Wrap up and Actions
10：00－10：15	Break
10：15－11：00	Wrap up and Actions Cont.
11：00－12：00	Planning and coordination for next face-to-face meeting or teleconference
12：00－13：00	Lunch/Adjourn

參、會議摘要

本次會議由美國聯邦航空總署(FAA)亞太地區駐新加坡代表 Ho-Joon Lim 先生邀請新加坡、紐西蘭、中國大陸、日本、南韓、美國及我國參加本次亞太地區無人機工作小組會議，共同分享各國對於無人機立法經驗及現況，除中國大陸及南韓僅提供簡報資料外，共有 5 國共 16 人與會。

本次會議由新加坡、紐西蘭、日本、美國及我國分享無人機立法經驗及未來課題，中國大陸及南韓雖未出席，但有提供相關簡報資料於會議上供各國討論，並就無人機未來技術及檢驗等議題進行討論，其內容極具參考價值，茲將各國簡報內容摘要及會議討論過程摘敘如下：

一、 新加坡介紹該國經驗及現況

新加坡國土面積約為臺北市 2.64 倍大，但卻有 6 個機場與 10 個禁、限航區及危險區，如圖 1 所示，遙控無人機可活動之範圍顯然已不到國土面積之三分之一。

新加坡針對遙控無人機之規定，可區分為休閒與研究、商業(Commercial)用途等兩類，其中從事商業用途活動前必須申請操作許可(Operator Permit)及活動許可(Activity Permit)，休閒與研究用途之遙控無人機在遵守相關規定下，並且符合下列條件，可不須申請許可而從事活動：

(一) 遙控無人機小於 7 公斤。及

(二) 不在限制區域及機場範圍內活動。

新加坡針對從事遙控無人機活動許可，分為操作許可(Operator Permit)、活動許可(Activity Permit)及其他許可(Other Permit)，說明如下：

(一) 操作許可(Operator Permit)：針對從事遙控無人機活動營運人之組織能力、操作人能力及遙控無人機適航性進行評估後，核發之許可證。

(二) 活動許可(Activity Permit)：對於遙控無人機活動之評估，如機場範圍內活動、高度 200 呎以上之活動、作業類型等。

(三) 其他許可(Other Permit)：對於其他用途，如投擲物體、使用規範外之無線電射頻及功率限制、在限航區、危險區、安全敏感區域、特殊事件區域內活動之許可。

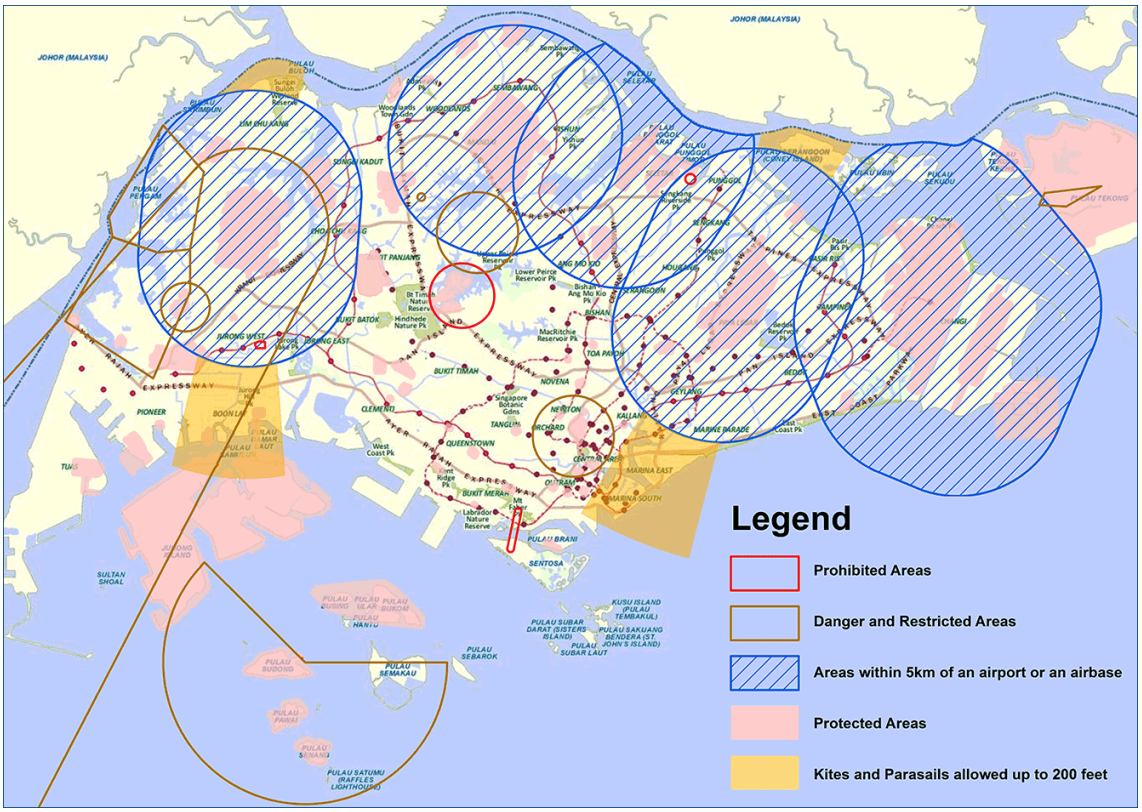


圖 1 新加坡機場範圍與禁、限航區及危險區

二、 紐西蘭介紹該國經驗及現況

紐西蘭針對遙控無人機之法規修法大略可分為兩個階段，第一階段為修訂現有的民航法規，以因應當前及短期內遙控無人機活動之規管理，並已於 104 年 8 月完成立法，係為臨時性的解決方案，卻也是未來再修法的基礎。第二階段為

全面性的規劃法規架構，並將遙控無人機與有人航空器在融合空域內同時作業。該架構將參照國際民航組織(ICAO)之方針而決定。

紐西蘭民航法第 101 編(PART 101)係規範適用於最大起飛重量(下同)25 公斤以下之遙控無人機，操作超過 25 公斤遙控無人機之活動必須遵守第 102 編(PART 102)驗證規定。其中 15 公斤至 25 公斤必須由民航局授權之代表核准其製造或檢驗合格後方得使用。

紐西蘭民航法第 101 編有 12 個主要的規定，如下圖所述：

圖 2 第 101 編 12 個主要規定

另外紐西蘭第 101 編有個比較值得研究的規定，除了獲得航管同意，任何人不得於控制空域(Controlled Airspace)從事遙控無人機活動，但屏蔽操作(Shielded Operation)除外。所謂屏蔽操作係指，遙控無人機活動位置位於任何物體(包括建築物、樹林內)100 公尺以內，且不超過於該物體之頂端。如下圖所示：

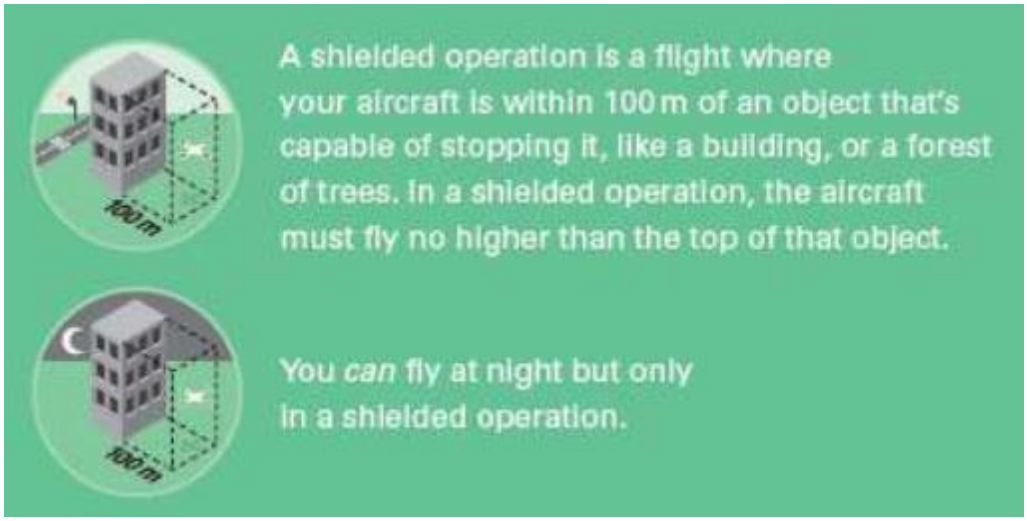


圖 3 屏蔽操作示意圖

紐西蘭自 104 年來共發生 4 起遙控無人機與載人航空器空中接近事件、67 件遙控無人機入侵空域事件。並且也造成遙控無人機與直昇機相撞事故。

圖 4 遙控無人機與直昇機相撞

三、 日本介紹該國經驗及現況

日本在 104 年 4 月 22 日於首相官邸屋頂上發現載有放射性物質的遙控無人機事件，因此國土交通省於同年 9 月 11 日即完成航空法的修訂，規範管理 200 公克以上的遙控無人機。

在區(空)域方面，除非獲得國土交通省同意，不得於機場四周範圍及總務省公告之高密度居住區內從事活動、飛航高度不得超過 150 公尺。

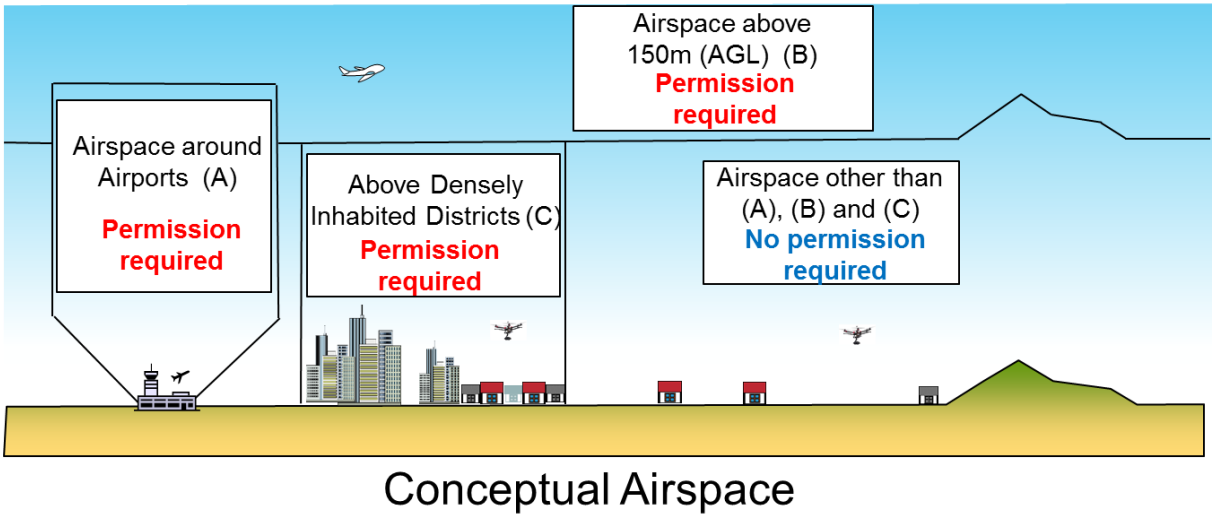


圖 5 日本遙控無人機空域

在操作規範方面，除非獲得國土交通省同意，必須於日間飛航、視距內飛航、距離人群、建築物及車輛 30 公尺、不得飛越活動場所上空、不得攜帶危險物品、不得投擲物件等規定。

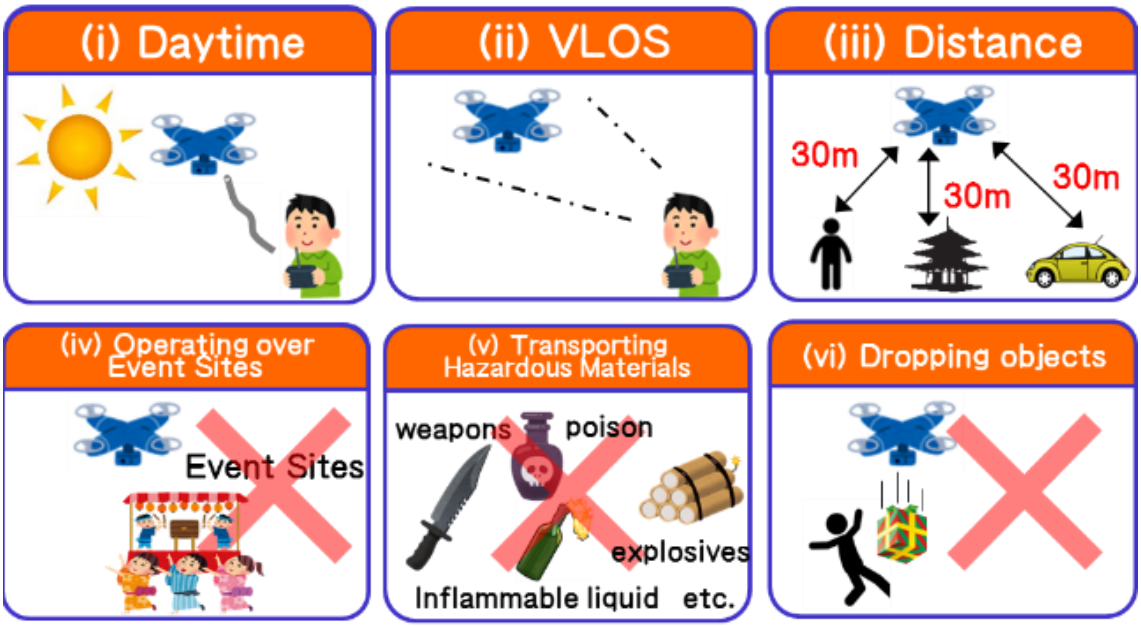


圖 6 日本遙控無人機操作規定

根據日本國土交通省的統計，自 104 年 12 月以來，每月約有 1,000 件的遙控無人機飛航申請案件，到了 106 年之後，每個月平均申請案件數量更突破 1,400 件，再再顯示運用遙控無人機從事相關應用已成趨勢。

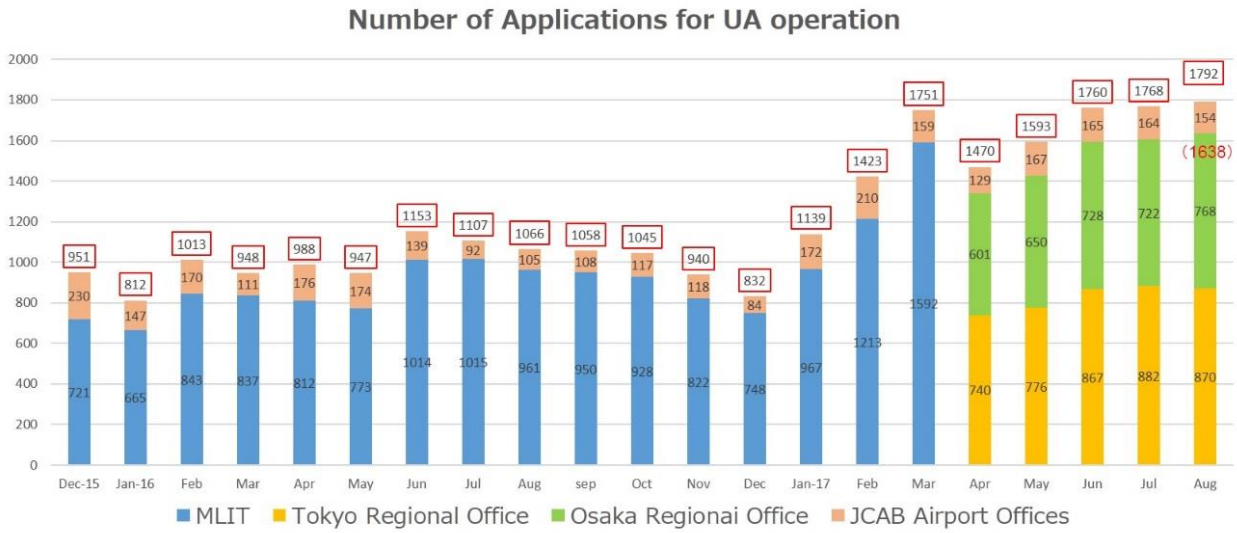


圖 7 日本遙控無人機申請案件數量統計

四、 美國介紹該國經驗及現況

美國目前遙控無人機係依據聯邦航空法規第 101 編及第 107 編管理，其中第 101 編係規範 25 公斤以下之航空模型機、第 107 編規範 25 公斤以下小型商用遙控無人機。如果要使用 25 公斤以上遙控無人機，必須依據 Section 333 提出專案申請。相關之操作人、空域及操作規範如下圖所示。

Current UAS Operations

Increasing Risk	Aircraft Requirements	Pilot Requirements	Airspace Requirements	Types of Operation
Part 101 Model Aircraft	UAS < 25 Kg	Community-Based Organization (CBO) standards	Notification requirement within 5 miles of an airport	Hobby or recreational, VLOS, Part 101 operating rules, CBO standards
Part 107	UAS < 25 Kg	Part 107 remote pilot certificate with small UAS rating	Airspace waiver or authorization for Class B, C, D, E airspace	VLOS, daytime, Class G, 400 ft, not over people OR waiver provisions
Section 333	As specified in exemption	Part 61 airman certificate	Blanket COA or standard COA for specific airspace	UAS > 25 Kg
Public Aircraft	Self-certification by public agency	Self-certification by public agency	Blanket COA or Standard COA for specific airspace	Public Aircraft Operations (AC 00-1.1A); UAS Test Site Operations
Experimental Aircraft	Experimental Special Airworthiness Certificate	Part 61 airman certificate	Standard COA for specific airspace	Research and Development, crew training, and market survey
Type Certificated Aircraft	Restricted type or special class certificate	Part 61 airman certificate	Part 91 airspace requirements	Specified in operating authorization

圖 8 美國聯邦航空法規相關規定

第 107 編雖規範使用遙控無人機應遵守相關規定，例如只能在白天飛行、視距內飛行、不得飛越人群上空、高度不得超過 400 呎、不得從其他移動之載具上起飛等，但也規範可以申請後豁免該等規定，美國聯邦航空總署(FAA)統計申請豁免項目屬申請夜間飛航為最大宗，佔百分之 70 的數量。如下圖所示：

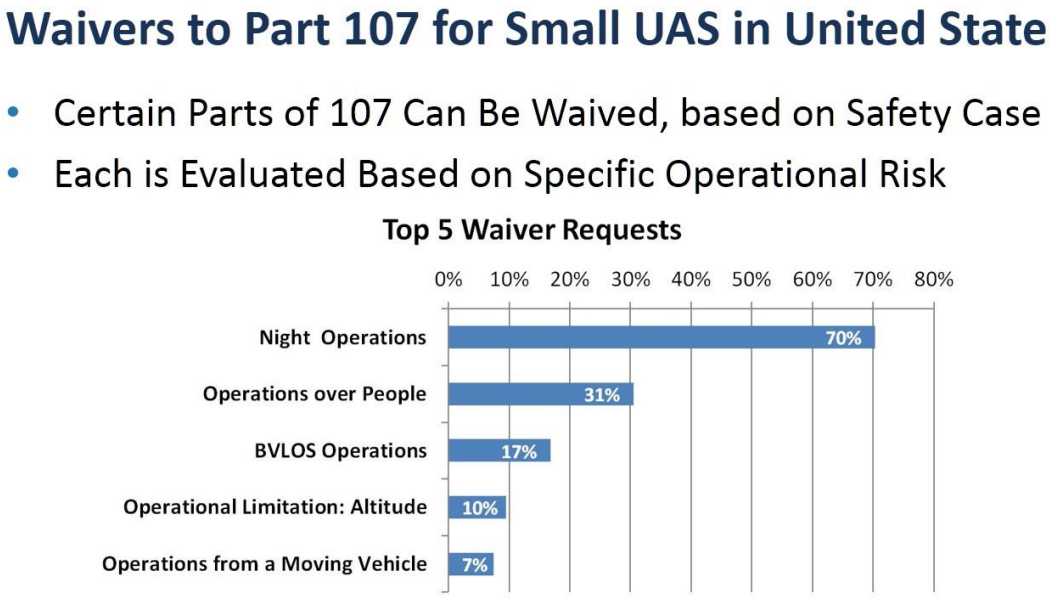


圖 9 美國無人機申請豁免類別統計

美國將航空模型機、遙控無人機、超輕型載具、普通航空業及運輸業航空器依照其風險程度區分為六個等級，如下圖所示：

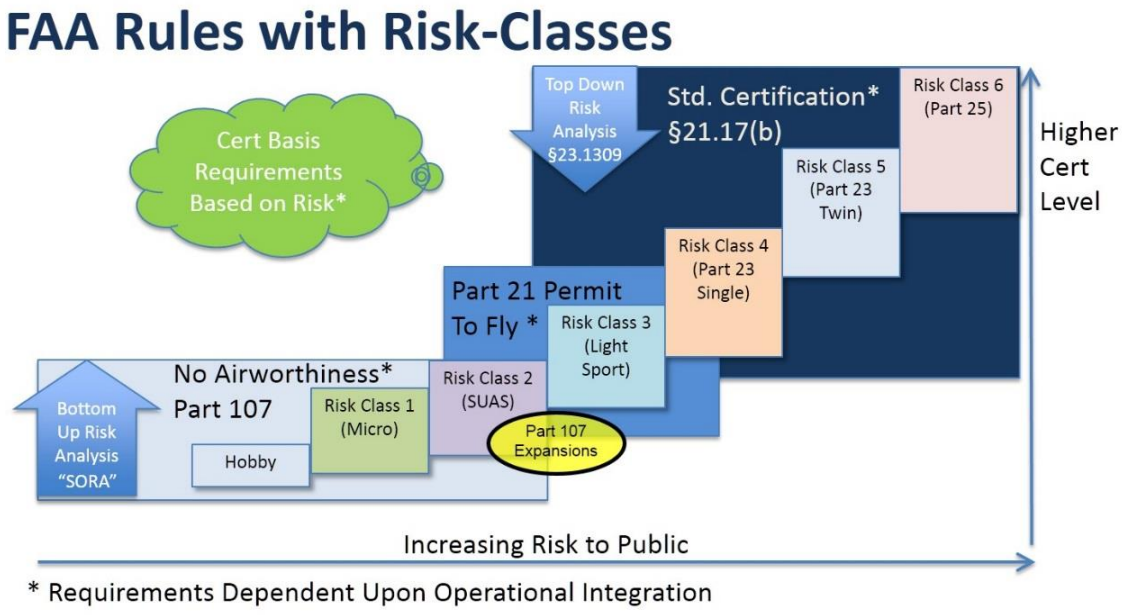


圖 10 法規風險等級程度

在遙控無人機整合計畫中，又可產出 7 個不同等級的操作風險(如下圖所示)，最右邊的旅客運輸行為是美國 FAA 規管最嚴格的。操作風險等級和動能基礎風險等級有著相當的關係，也就是監管結構的基礎。相對的，使用在不同等級的業

務上有著不同特性的要求，因此也只有某些類別的航空器可以完成。在圖 11 可以看到，在較低等級的適航及驗證的遙控無人機上運用於貨物的運輸上是可能的。但在人口稠密的地區要執行這樣的任務，其認證的等級將會提高，用以抵銷潛在的公共風險。

圖 11 操作風險等級程度

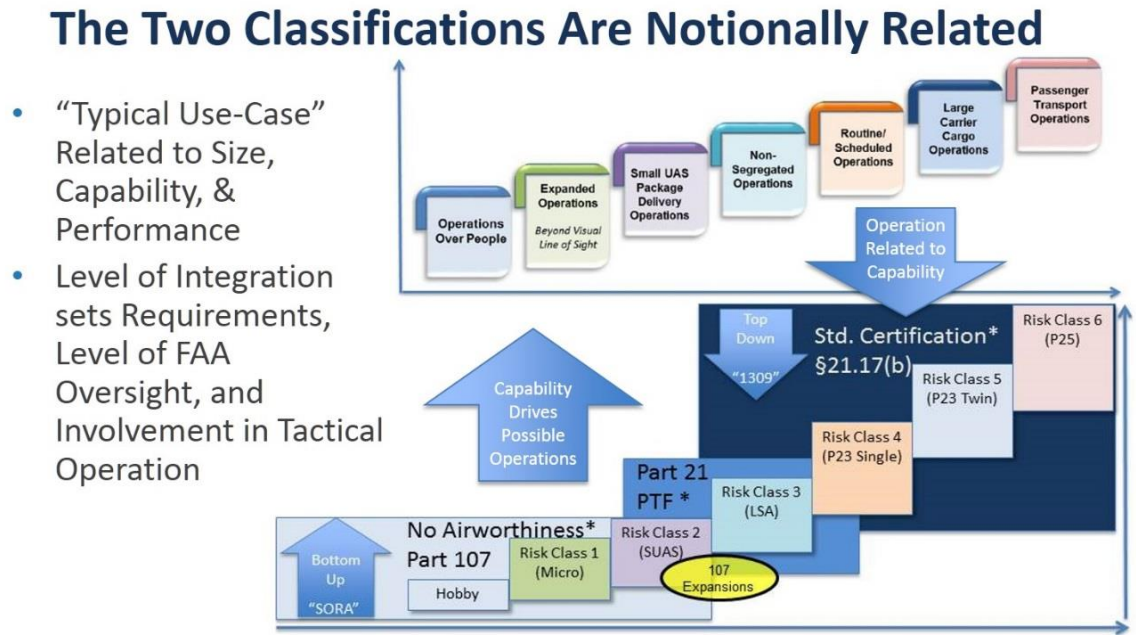


圖 12 法規與操作風險等級對應

在空域融合的部分，可參考圖 13 所示，在第 107 編規範飛航高度為 400 呎，未來無人機空中管制管理(UTM)成熟後，高度可開放到約 1,000 呎，在第 91 編的規範下，則可在 A 類空域中飛航。

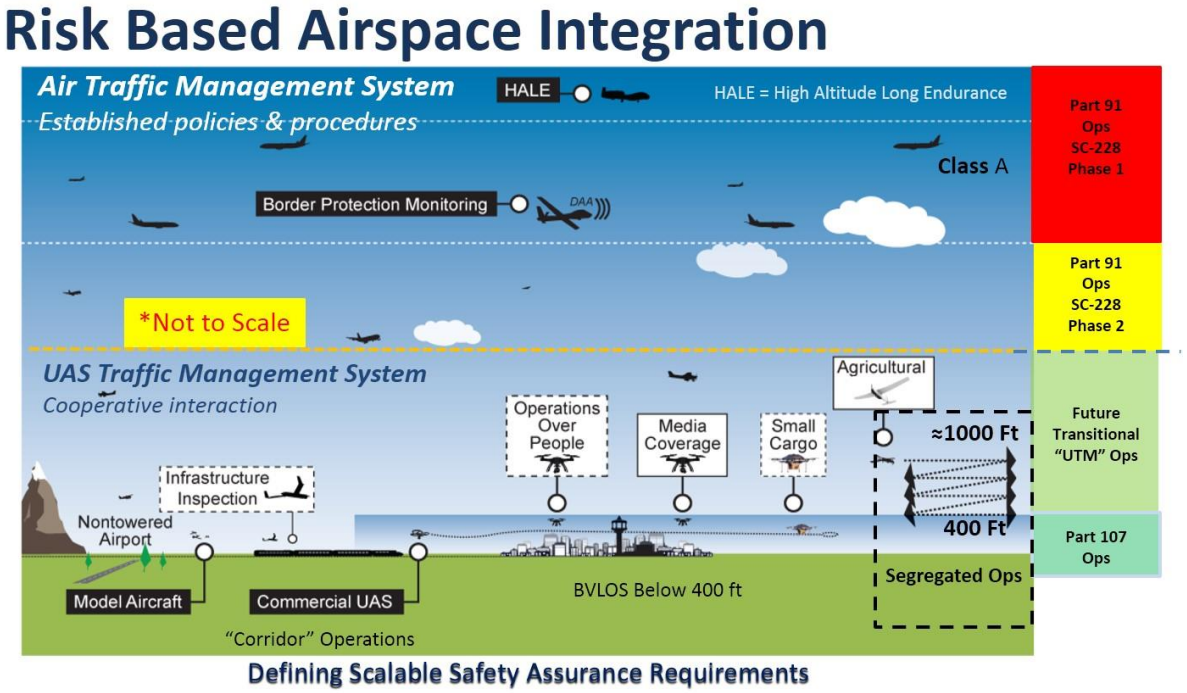


圖 13 融合空域風險等級

五、 南韓介紹該國經驗及現況(簡報)

韓國將遙控無人機分為兩類，空重小於 150 公斤稱為超小型載具(Ultra Light Vehicle)，其中最大起飛重量大於 25 公斤以上至空重小於 150 公斤的遙控無人機必須申請安全認證；第 2 類為空重大於 150 公斤，必須持有特種適航證書(Special Airworthiness Certification)。

在註冊規定方面，最大起飛重量大於 25 公斤以上及最大起飛重量 25 公斤以下商業用途的遙控無人機必須註冊，但是研究用及發展用途為目的之遙控無人機不須註冊。

Weight	Aircraft Registration	Airworthiness Certification	Pilot License	Flight Approval	Remarks
Below Empty Weight 12kg	○*1	X	○*1	X	UAV Category
Empty Weight 12kg ~ MTOW 25kg	○	X	○*1	X	
MTOW 25kg ~ Empty Weight Up to 150kg	○	○ (Safety Certification)	○*1	○*2	
Empty Weight Over 150kg	○	○ (Special CoA)	○	○	GA Category

***1 For Business Purpose Only (Business License Registration Required)**

***2 Not Required for Agricultural Spraying and Preventing Disease in Stockbreeding**

圖 14 韓國無人機相關規定

韓國自 102 年只有 241 架遙控無人機完成註冊，到了 105 年達到 2 千餘架，106 年已經突破 3 千架遙控無人機完成註冊，如圖 15 所示。韓國總共規劃了 7 處供遙控無人機試飛的區域，在這些區域內，遙控無人機可以不經過申請就可以從事試飛活動，對於遙控無人機設計研發有著良性的發展。

▪ Ultra light vehicle

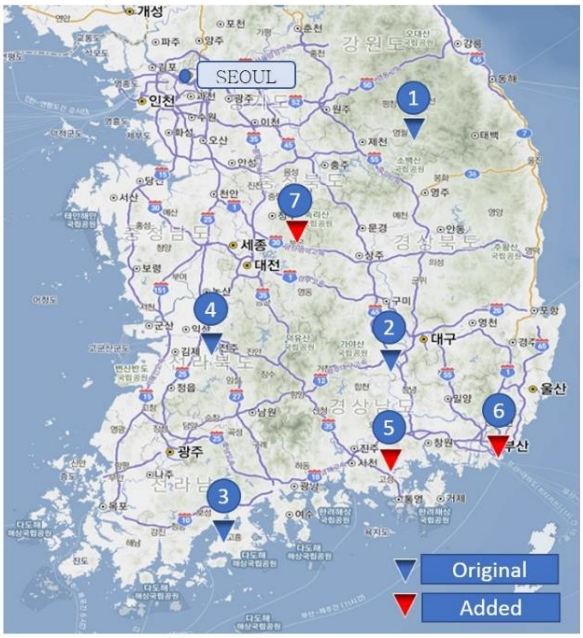
Year	2013	2014	2015	2016	2017.10
Registration	241	395	968	2,227	3,320
Issuance of Safety Certification	189	248	312	525	490

▪ **Since 2002, ROK implementation UAV's Safety Certification**

▪ Certification Check lists

- Performance (flight envelope), Operational/Maintenance manual
- Structural design, Fuel/Battery system(warning system, CE certification)
- Radio Control device(including Ground Control Station)
- Emergency Procedure(Safety landing procedure such as Go-home)
- Power-plant(electric motor, reciprocating engine, hybrid, etc.)
- Vehicle Status(structure, Wing, Propeller/blade, Registration Marking, etc.)

圖 15 韓國無人機註冊數量統計



Zone N.	Diameter	Altitude	Shape
1	11km	450m	Circle
2	7.4km	450m	Circle
3	22km	450m	Circle
4	3.6km	300m	Circle
5	3km	450m	Circle
6	11km	450m	sector
7	6km	300m	Circle

* UAV Operator can test flight everyday with out permit.

▪ Source: Korea Institute of Aviation Safety Technology

圖 16 韓國 7 處無人機試飛場地圖

六、 本次會議重點整理

第一天討論重點內容如下：

(一)美國 FAA 及新加坡民航局：已審視無人機工作小組(UCWG)章程及討論交付成果。UCWG 將向國際民航組織(ICAO)提出建議。

(二)新加坡民航局簡報內容：

1. 在核發適航證書前必須獲得設計許可。
2. 監理沙盒(Regulatory Sandbox)是一個測試區域(地方)，並且評估是否調整為類似美國 FAA 的規定。
3. 服務供應商必須負責遙控鍊路的安全。
4. 遙控無人機視距外飛航會有更嚴格的要求。

(三)紐西蘭民航局簡報內容：

1. 目前共有 4,000 多架飛機註冊，但是遙控無人機卻有 280,000 多架。
2. 位置回報要求仍是未知數。
3. 第 102 編規定允許彈性個案核准適用的規則。
4. 允許延伸視距內飛航。
5. 指定通信頻段的分配，但是頻譜使用是需要解決的長期性問題。
6. 載人之遙控無人機有更高的操作風險，必須申請型式認證(Type Certification)後才可以從事相關飛航活動。

(四)日本民航局簡報內容：

1. 日本民航局考慮將載人之無人機視為有人航空器。
2. 考慮可靠性與事件的影響風險。
3. 日本只開放延伸視距飛航，不開放視距外飛航，特定少數情況除外，如活山口。
4. 日本民航局核准之操作許可是有期限的，所以審核作業的工作量將會持續成長。

(五)我國簡報內容：

1. 自 104 年起著手訂定遙控無人機相關法規。
2. 400 呎以上由中央(民航局)管理，400 呎以下由地方政府管理。
3. 操作限制類似於日本之規定。
4. MIL-HDBK-516 被用作於民航用途的指導方針，但是要求水平太高。
5. 法人之能力審查類似於營運規範。

6. 外國人必須獲得民航局的認可才可以從事活動。

第二天討論重點內容如下：

(一)美國 FAA 簡報：

1. 強調風險之認證方法的重要性，以及必須評估遙控無人機用途及空域使用之要求。
2. 美國聯邦航空法規第 21 編針對遙控無人機的新規定中，使用了”飛航許可”(Permit to Fly)一詞，係因為 FAA 過去在一些飛機上也使用這樣的文字，如軍事用途類別的飛機。
3. 有關於 RTCA SC-228 的標準適合用在大型遙控無人機系統或是用於融合空域的小型遙控無人機上。
4. 無人機交通管制系統(UTM)雖然聚焦於低空作業，但其技術目前仍不成熟。
5. 美國 FAA 曾經被問及有關人口密度的問題，但相關的法律並未對此有定義。新加坡民航局詢問 FAA 代表何謂飛越道路上空？FAA 表示可以用時間來表示，例如不在道路上懸停、不穿越高速公路等。但對於適航性較高的遙控無人機是可以在道路及人口稠密地區從事活動。
6. 風險評估是工作小組未來合作努力共同訂定規範的目標之一。

(二)討論各國對於遙控無人機之管理要求及政策：與會各國針對遙控無人機之操作區域、註冊、重量及高度相關規範綜整如下表 1。

	CAA	JCAB	KOCA	CAAC	FAA	NZ CAA	CAAS
Areas of Operations	Allowable areas dependent on local	Allowable for inhabited districts without control.	Allowable areas for UAS test sites.	Should be allowable	Part 101 & Part 107 rules apply	Allowable anywhere. For operation	Allowable for certain areas

	government publications	Permit required for densely inhabited districts or around airports	Other areas of operations not mentioned	dependent on areas determined by CAAC		near aerodrome >25kg; or >400ft, Part 102 required	
Registration Criteria	Required above 250g	Not required	Required above 25kg if commercial operated	Required above 250g	Required	Not required	Not required
Weight Segregation							
Level 1	Below 250g	Below 200g	Below 12kg	Below 250g	<250g	< 25kg	Below 1.5 ~ 2kg
Level 2	250g to 25kg	200g to 25kg	12 kg to 25kg	250g to Above 25kg	< 25kg	> 25kg	1.5 ~ 2kg to 25kg
Level 3	Above 25kg	>25kg	25 kg to 150kg	-	> 25kg	-	Above 25kg
Level 4	-	-	Above 150kg	-	<25,000 ft-lb to 799,999 ft-lb	-	-
Level 5					800,000 ft-lb		
Typical Ceiling for Lower Risk Operations	400 ft	500 ft	TBA	TBA	400 ft	400 ft	200 ft

表 1 各國無人機相關規範整理

(三)工作小組於第二日討論後，所獲得之共識如下：

1. 型式檢定(Type Certificate)的複雜程度取決於認證等級的不同而有所差別。

2. 工作小組同意載人之無人機必須申請型式檢定。

3. 工作小組針對載貨之無人機之要求如下表 2。

4. 民航主管機關必須開始思考將無人機納入雙邊協議內。

Cargo Carrying Unmanned Aircraft (UA) Requirements

The table below is for ***cargo carrying UAs and not for passenger carrying***. Items highlighted in yellow are subject to changes and require inputs from each member prior to the next meeting for discussion.

Scenario: Cargo carrying UA without passenger	Requirement for Domestic Operations	Requirement for International Operations	Design Requirement	Production Requirement	Maintenance Requirement	Operator Requirement	Airworthiness Certificate (CofA) issued?	Operating rule?
Below 25kg and within Visual Line of Sight (VLOS)	Dependent on each State's domestic needs	To be discussed by States involved in the international operation	Dependent on voluntary use of industry standards by manufacturer	Dependent on voluntary use of industry standards by manufacturer	Managed by the Operator with the potential use of industry standards	Managed by respective authority	No CofA issued	NA
Below 25 kg but with BVLOS	Dependent on each State's domestic needs	To be discussed by States involved in the international operation	Industry standards for basis airframe and BVLOS standards					
Above 25 kg to 600 kg (i.e. 800,000 ft-lb)	Dependent on each State's domestic needs	To be discussed by States involved in the international operation						
Above 600 kg (i.e. 800,000 ft-lb)	Type Certificate and CofA required	Type Certificate and CofA is required unless States otherwise agree	Managed under respective Part 21 requirements	Managed under respective Part 21 requirements	Managed under respective Part 43/145 requirements	Managed by respective authority	CofA based on the Type Certificate	

表 2 載貨無人機相關規範要求

第三天討論重點內容如下：

(一)美國 FAA 將研究建立一個資源共享網路平臺，用來放置工作小組相關的文件，以利所有成員都可以隨時查閱及放至檔案。

(二)審視持有限制類型別檢定證之 SCAN EGLE 無人機的數據規範表(TCDS)，因為操作上及提他使用上的限制，美國 FAA 偏向不再使用限制類型別檢定證。

(三)美國 FAA 提供「Airworthiness Criteria: Special Class Airworthiness Criteria for the FlightScan Corporation Camcopter S-100」資料，並可於 https://www.regulations.gov/document?D=FAA-2017-1058-0001 下載，以供工作小組參考。

(四)鼓勵各國民航主管機關加入美國材料與試驗協會(ASTM)，因為該協會正在建立小型無人機使用系統的基本設計及建造標準，以及於人群聚集上空、視距外飛航、夜間飛航等操作行為之標準。

(五)討論技術/自動化在未來如何能夠結合為一體。美國預計於 107 年 1 月間在華盛頓舉辦會議，討論並規劃針對無人機自動化駕駛及載客無人機的策略方向。

(六)確認工作小組時程規劃，如下表 3。

No	Dates	Item	Action
1	31 Dec 17	Submission of short paragraph on regulatory summary. If possible, try to submit the table titled (2)	All charter group members
2	Mid Jan 18	Circulation of the draft report	Lead – FAA and CAAS
3	End Jan 18	Teleconference to discuss the draft report Tentatively set at 4pm (Wellington, New Zealand)	All charter group members
4	Mid Feb 18	Circulation of report to all members of the Charter.	Lead – FAA and CAAS
5	End Feb 18	Presentation to be delivered at the FAA/APAC dialogue	Lead – FAA and CAAS

6	6 – 8 Mar 18	FAA/APAC Bilateral Partners Dialogue	All charter group members
7	9 Mar 18	Meeting of group members to discuss on the next course of action. - Review of SORA test cases by each group member.	All charter group members
8	Jun 18	Teleconference on the on-going work or face-to-face at RPAS Panel.	All charter group members
9	Sep 18	Submission of second report	All charter group members

表 3 工作小組時程規劃

第四天討論重點內容如下：

(一)未來將討論各國民航主管機關尋求符合規定的方式。

(二)當出口無人機相關產品至其他國家時，可能有著不同的輸入規定要求。

(三)必須思考現有有人駕駛航空器變成無人駕駛航空器的法規規範。美國 FAA 認為必須重新申請新的型別檢定及使用不同的型號，因為這是需要在航空器上做重大的修改。

(四)未來工作小組會議必須定期評估相關的工業標準。

(五)明(107)年亞洲太平洋經濟合作組織(APCA)會議並非所有工作小組的成員都可以參加，因此，本次會議所討論事項、決議或共識必須盡快的完成提案，並協調澳洲民航局可否安排所有工作小組成員皆可與會。

肆、本次會議工作小組同意事項

本次會議經各國與會代表討論後，同意一般性的原則，並將在 107 年 3 月間美國 FAA 及亞太雙邊合作夥伴會議中提出討論並做為最終的決議，相關同意事項臚列如下：

(一) 同意最大起飛重量低於 25 公斤之遙控無人機由各國自行規範管理，並且不會在工作小組上聚焦討論。

(二) 同意超過 25 公斤之遙控無人機必須符合檢定標準，其適航要求將以 JARUS SORA 及/或各國相關程序所評估之風險等級而訂。針對載貨之無人機將要求依適航標準設計並取得型別檢定證書。

(三) 工作小組討論的目的係以載人無人機做為公共運輸工具及保障乘客安全為主，這些無人機必須取得型別檢定證書並且持有適航證書後才可飛航。此外，與現有航空運輸業營運人相比，使用無人機做為運輸工具就必須確保與有人航空器相同的安全等級及限制，以及相同的維護及操作要求。但用於私人和休閒性質的無人機，可以由各國主管機關負責，並且出現不同的要求。

(四) 對於國際間飛航的無人機，必須持有各國主管機關承認之適航證書，方可飛航。對於國內之飛航，依各國主管機關的適航要求而訂。

(五) 工作小組使用的術語將參考國際民航組織對於無人駕駛航空器系統的定義，如果該組織沒有定義到的，將參考 JARUS 的定義。

(六) 針對無人駕駛系統：

1. 國內操作：無人駕駛系統標準現行將包含在目前無人機設計標準中，當技術成熟後，這些標準將分別列為單獨審查流程。

2. 國際操作：將依據國際民航組織附件 8 之發展情況做進一步的討論。無人駕駛系統之管理也將參考國際民航組織之要求而訂。

(七) 無人機之適航要求部分：

1. 無人機之適航標準將從第 23 編或第 27 編相關規定中規範。

2. 電子推進系統。

3. 遙控駕駛系統必須要求操作人員在無人機飛航時必須隨時監控並隨時可以取得操作權之設計。

4. 空域融合技術。

5. 自動駕駛必須依下列事項獲得認證：

(1) 必須定義預期函數(系統該做什麼?)

(2) 能夠明確完成 Pass/Fail 標準及預期性的性能量測。

(3) 無人機必須通過功能測試後，才可以執行自動駕駛。

(八) 工作小組一致認為，開發無人機的檢驗標準可以是一致的，但每個國家亦可以自行訂定額外的規範。工作小組將繼續討論及制定適航要求，並將現行有人航空器的標準轉換為無人機標準，未來無人機將取得型別檢定並且以工作標準為基礎來驗證。

(九) 107 年美國及亞太地區雙邊合作夥伴會議將於 3 月 6 日至 8 日舉行，本工作小組規劃於 3 月 9 日召開會議討論第一次會議尚未有共識項目並做成決議。本局已於 107 年 1 月提供相關資料予美國 FAA 亞太地區代表，並將派員出席。

伍、心得與建議

本次參加第一次亞太地區無人機工作小組會議之心得及建議如下：

一、 持續與工作小組成員協同合作

近年來無人機已從成本高的軍事用途逐漸的轉型為成本低廉的娛樂或商業用途。我國並於 104 年起推動立法，參加工作小組會議除可吸取他國經驗，並可與各國主管機關共同商討國際間之標準，拓展我國在國際間之能見度，對於第一時間取得最新資訊亦有所助益。未來仍將持續與工作小組成員保持密切聯繫合作，以維持與國際接軌及國內無人機相關規範之一致性，提升遙控無人機飛航活動之安全。

二、 掌握國際間之標準並適時調整我國規範

近年來遙控無人機技術發展迅速，惟國際間係各自訂定規範，尚無統一之標準。本局雖自 100 年起發布航空公報(AIC)，受理國防、公務及以政府經費實施研究之遙控無人機作業之申請，但對於一般民間團體卻無專法管理。為提升遙控無人機之活動安全及保障有人航空器之飛航安全，本局自 104 年起推動修正「民用航空法」增訂遙控無人機專章以規範管理遙控無人機，將積極參與國際間之會議或交流以吸取經驗、廣泛蒐集各類相關資訊，並適時調整我國規範。

三、 爭取工作小組會議於我國舉辦

本工作小組雖為任務性小組，並計畫於國際民航組織於 109 年第 2 季完成附錄 8 修正前 1 年完成提交第 4 次的報告書，在此期間，工作小組可能會召開多次會議共同討論，為增加我國於國際間之能見度，除持續參與工作小組會議外，並積極爭取於我國舉辦工作小組會議。

附件 一、新加坡簡報

Agenda

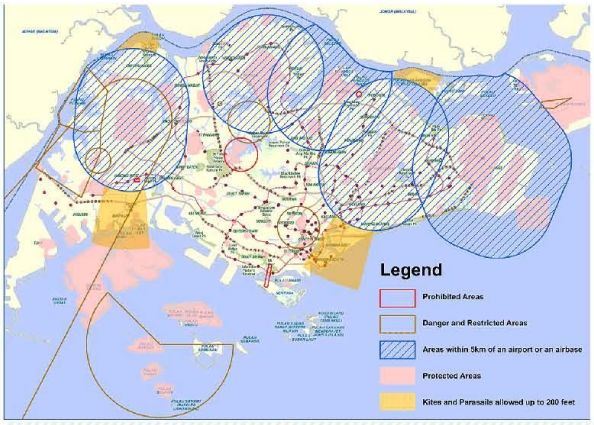
- Current UAS Operations Regime
- Lessons Learnt
- Moving Forward

Current UAS Operations Regime

CAAS
Civil Aviation Authority of Singapore

3

SINGAPORE LANDSCAPE
HIGHLY URBANIZED ENVIRONMENT



CAAS

4

REGULATORY & PERMIT FRAMEWORK

Recreational & Research	Commercial Activities

• No Permit Required **UNLESS**
  • UA > 7kg
  • Within restricted Areas and aerodromes
• Follow Advisory and **Fly it Safe!**
	• Operator Permit
	• Activity Permit

CAAS 5

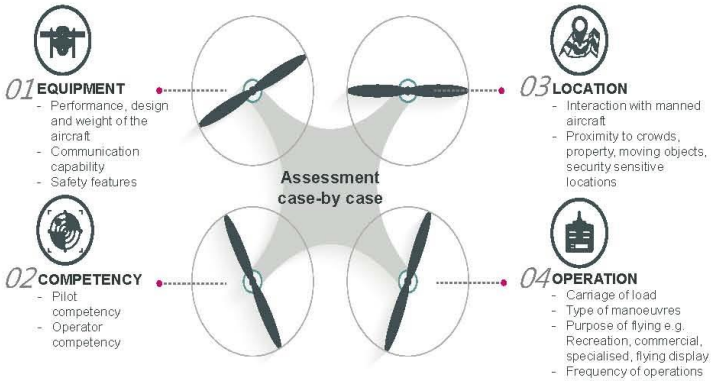
PERMIT FRAMEWORK

Types of Permit(s):

Operator Permit	• For upfront evaluation of operator (at the organisational level) competency, pilot competency, and airworthiness of unmanned aircraft
Activity Permit	• For site-specific evaluation (e.g. within 5km of aerodromes, operating above 200ft AMSL, type of operations etc.)
Other Permits	• For other uses (e.g. discharge of substances, use of radio frequencies and power limits outside of IMDA guidelines, operating in Restricted or Danger Areas, including Security Sensitive Locations (SSLs), Special Event Areas etc.)

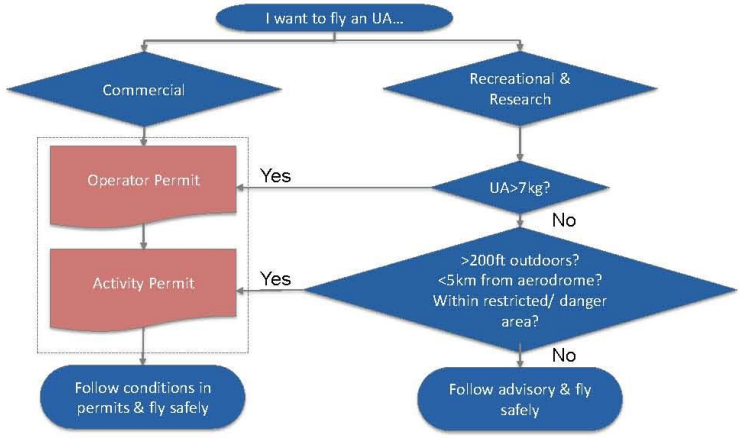
CAAS 6

RISK-BASED APPROACH



CAAS 7

GUIDE TO UAS OPERATIONS



CAAS 8

LESSONS LEARNT

- Challenges in enforcing requirements
  - Non-permit holders
  - Permits holders
- Education of general public is important
  - Industry reach-out


FLY IT SAFE
Advisory on the Safe and Responsible Operation of Unmanned Aircraft
DOs
DON'Ts
For More Information
CAAS


TODAY
CAAS
DON'T TURN "HO HO HO!" INTO "UH OH!"
HAVE FUN WITH YOUR DRONE BUT REMEMBER TO FLY IT SAFE
DO
DO NOT
CAAS

Moving Forward

CAAS
Civil Aviation Authority of Singapore

13

Challenge is how to make these happen...

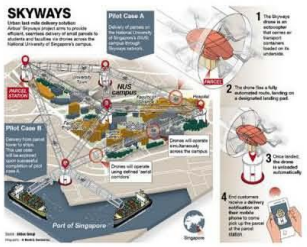
Improve logistics: Eg. Drone delivery	Emergency response: Eg. Oil spill incident	Improve productivity: Eg. Workplace safety inspection	Transport: Eg. Passenger drones
			

CAAS

14

CAAS APPROACH...

1 Facilitating new use cases and trials



2 Carving out regulatory sandbox

3 Call-for-proposal to develop solutions for innovative UAS operations in Singapore

Enabling the innovative use of UAS in Singapore's urban environment

Moving Forward

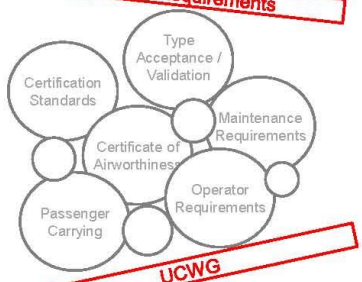
STATE OF OPERATOR / REGISTRY

Operations Permit	Type Certification

ICAO / State Requirements

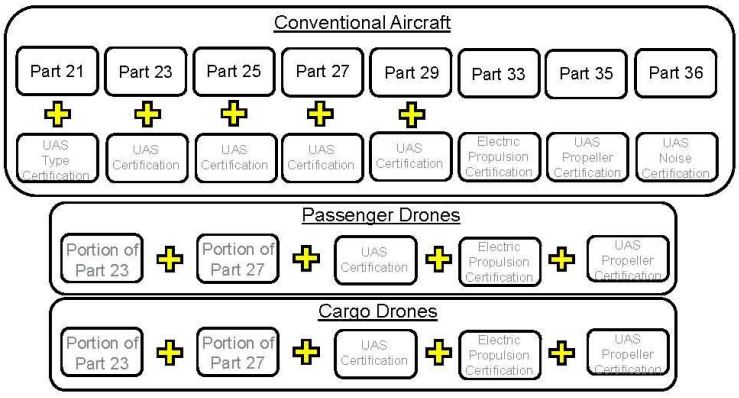
<u>Work in progress to review the current weight threshold of 7 kg</u>
- Determinant for recreational user in whether an Operator Permit is required.
- Subject to more stringent evaluation process

<u>Beyond Visual Line of Sight Operations</u>
- Technical requirements being developed to facilitate such operations in future
- Tiering approach
- Requirements will be validated with on-going projects with the local industry.



UCWG

Moving Forward
TYPE CERTIFICATION

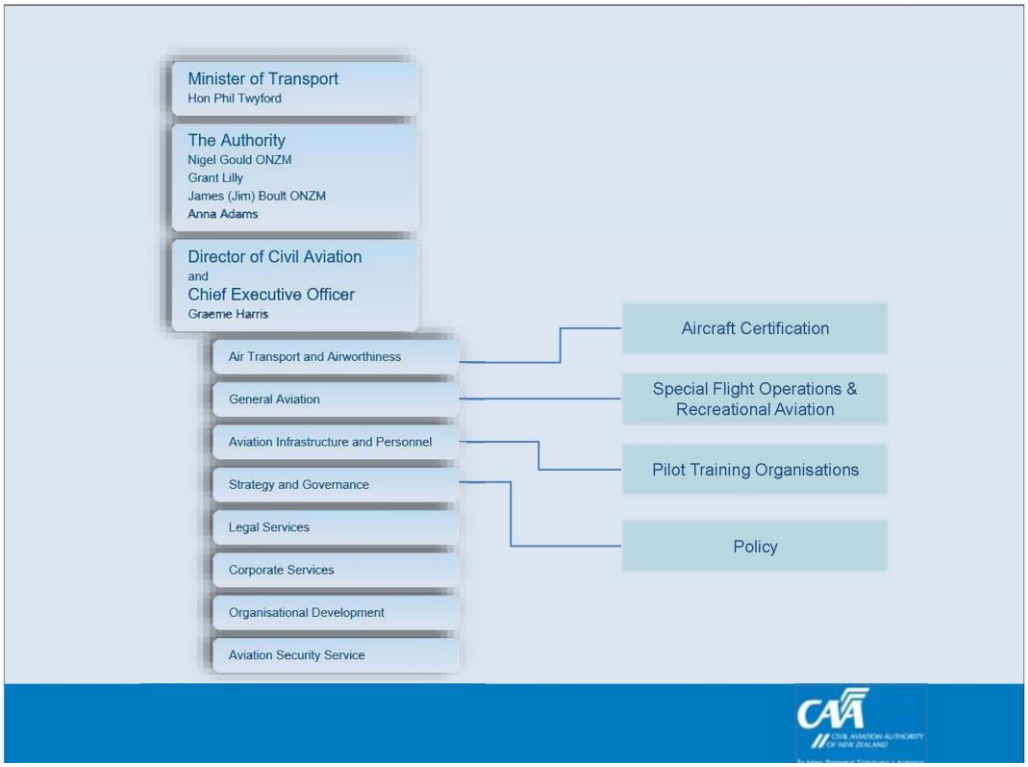


Note: UAS certification include both aircraft and ground systems

Thank you

附件 二、紐西蘭簡報


UAS in New Zealand
November 2017
Greg Baum & Pete Sutherland


Minister of Transport
Hon Phil Twyford
The Authority
Nigel Gould ONZM
Grant Lilly
James (Jim) Boult ONZM
Anna Adams
Director of Civil Aviation
and
Chief Executive Officer
Graeme Harris
Air Transport and Airworthiness
General Aviation
Aviation Infrastructure and Personnel
Strategy and Governance
Legal Services
Corporate Services
Organisational Development
Aviation Security Service
Aircraft Certification
Special Flight Operations & Recreational Aviation
Pilot Training Organisations
Policy

Aviation in New Zealand

UAS Rules in New Zealand

UAV Rule Development

Two phases

- Phase 1 completed Aug 2015 – changes to the then current rules to accommodate current and short-term expected RPAS operations. An interim solution but foundation for the future.
- Phase 2 – Comprehensive rule framework to integrate RPAS with other airspace users. Guided by ICAO SARPS.

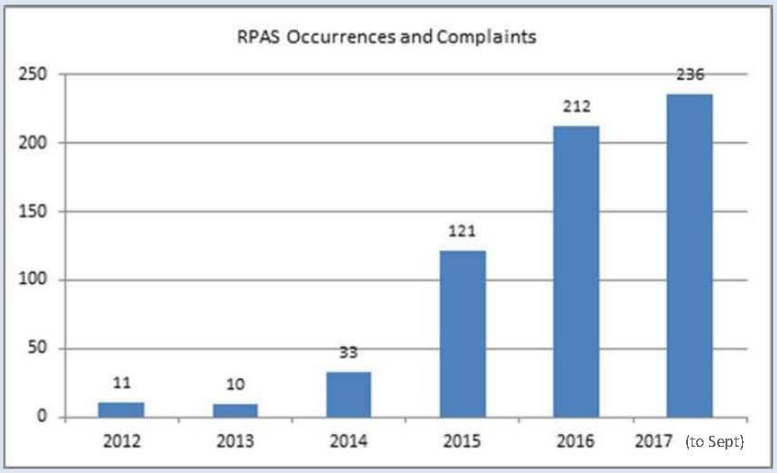
Rule Part 101

Rule Part 101: Shielded Operations

A shielded operation is a flight where your aircraft is within 100 m of an object that's capable of stopping it, like a building, or a forest of trees. In a shielded operation, the aircraft must fly no higher than the top of that object.

You *can* fly at night but only in a shielded operation.

Rise in reported occurrences



Reported Incidents/Accidents

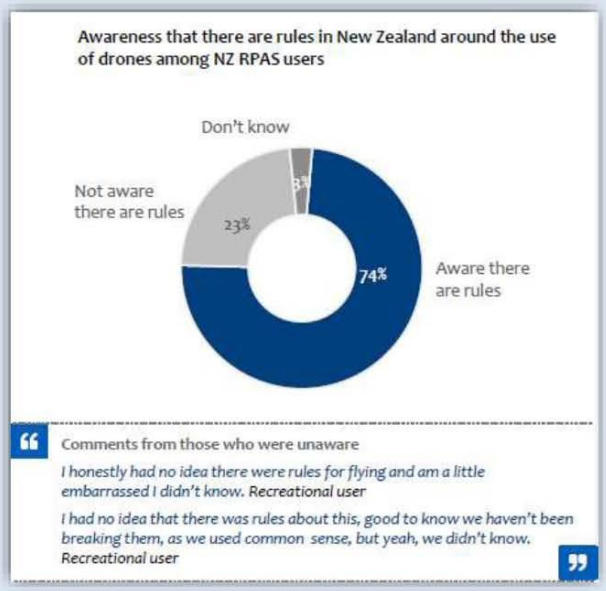
	Near collision	
	Between piloted aircraft	Between RPAS & piloted aircraft
2014	10	1
2015	9	3
2016	9	0

	Airspace incursions	
	Piloted aircraft	RPAS
2014	386	0
2015	365	19
2016	346	48

2016:
Bird Strikes = 573
Laser strikes = 147

Reported Incidents/Accidents

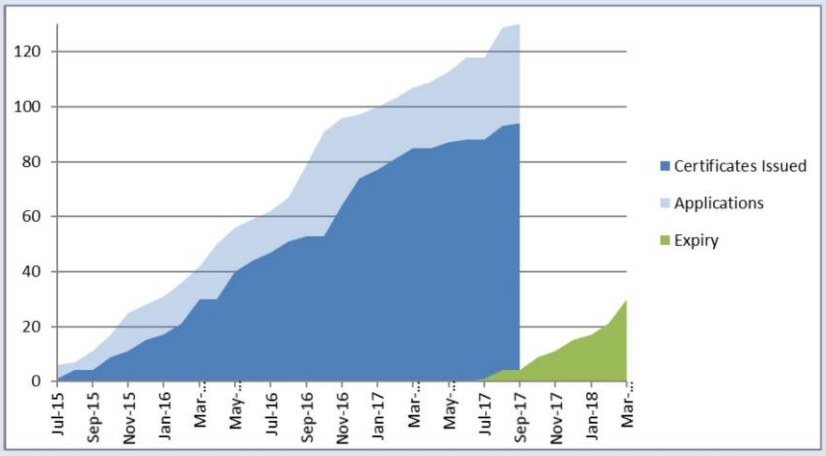
Drone strike on a stationary helicopter, left a dent in the helicopter's engine exhaust.



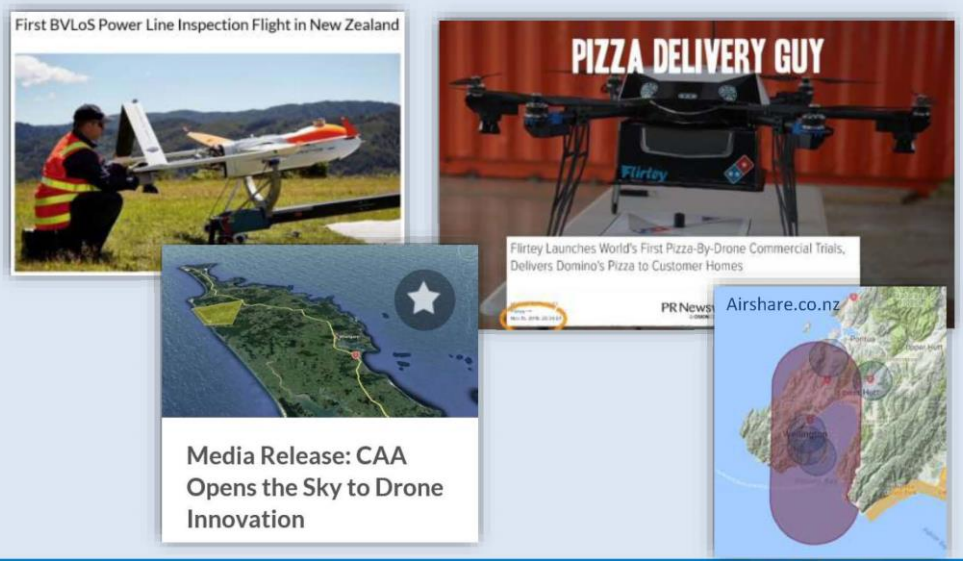
Rule Part 102: Unmanned Aircraft Operator Certificate

- Allows variations to Part 101 (e.g. >25kg, Night, >400ft)
- Non-prescriptive, risk-based certification rule
  - Pilot competency
  - Hazard assessment
  - Standard operating procedures
  - Airworthiness: Initial (if applicable) & Continuing
  - Reporting of incidents/accidents
  - RPAS types

Unmanned Aircraft Operator Certificate



Achievements



Challenges….

- Wide variation in type, performance, size, operation
- Participants new to aviation system
- Few globally recognised, minimum standards
- Performance based rules

Solutions….

- Operational risk assessment
- Output: risk-based mitigations for
  Man / Machine / Environment
- Harmony with global community

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

UAS certification approach

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

Certification approach

- To be added.

Current status of amendment Civil Aeronautics Law and direction of future institutional design

28 November 2017

Ministry of Land, Infrastructure,
Transport and Tourism

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

Overview

国土交通省

- UA Regulation in Japan
- Operational Status of the Regulation
- Future Plan

1

Background

国土交通省

Former Civil Aeronautics Law (CAL) regulation

Civil Aeronautics Law (CAL) restricted certain flights which might affect the flights of aircraft in certain airspaces, such as model airplane operation around airports.

However, there was no flight restriction for most of Tokyo, including the Prime Minister's residence, and local and central government buildings.

Drone accident

On April 22 2015, a drone carrying traces of a radioactive material was found on the rooftop of Prime Minister Shinzo Abe's official residence.

Amendment to CAL

Issue date : Sep 11, 2015
Effective date : Dec 10, 2015

On September 11 2015, an amendment to Civil Aeronautics Law was issued.

The new rule shall comes into force within 3 months from the day of promulgation.

2

Definition of Unmanned Aircraft

国土交通省

Definition of Unmanned Aircraft captured in Amended CAL

UA is defined as *a machine that has no capability to accommodate any person on board, and flies remotely-piloted or autonomously.*

Very light weight UAs of *less than 200g* are *removed* from the applicability.

e.g.

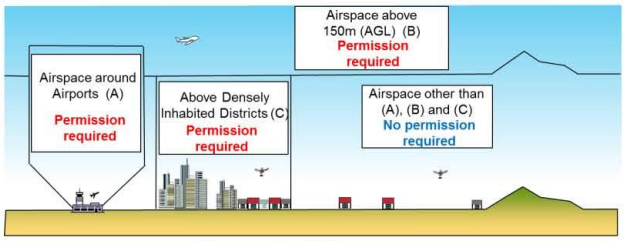
3

Prohibited Airspace for such Flights

国土交通省

Any person who intends to operate an UA 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

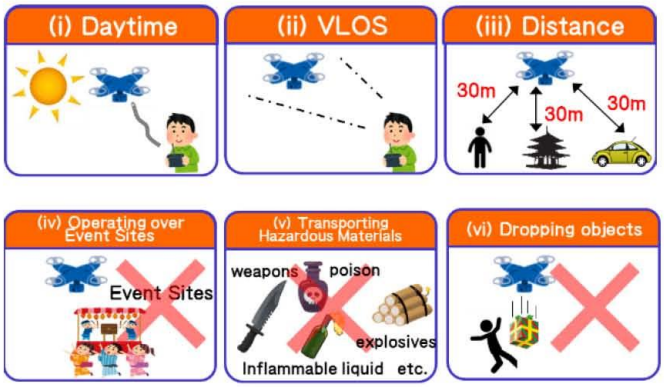
*Obstacle limitation surfaces: approaching surface, horizontal surface, transitional surface, extended approaching surface, conical surface and outer horizontal surface

4

Operational Limitations

国土交通省

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.



5

Exception

国土交通省

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.

6

Permission & Approval

国土交通省

- The operator is required to submit an application seeking permission or approval to the Ministry of Land Infrastructure, Transport and Tourism, at least 10 days (excluding Saturdays, and holidays) before the date the operator wishes to fly the UA.
- Basically, the permission or approval is limited to 3 months. However, if the operator flies the UA constantly, the operator may receive the permission or approval limited to a period of 1 year.

7

Standard

国土交通省

In order to receive a flight permission or approval, the safety standard should be met.

Safety standards are respectively set for

(1)specifications and performances of the UAs,

(2)required skills and knowledge of the operator, and

(3)the systems and procedures for the flight of the UA.

8

Standard (minimum standard)

国土交通省

The minimum standards are outlined as follows:

○ **Specifications and Performances of the UAs**

- Should not have any unnecessarily sharp parts;
- Need to have lights or indications in order to confirm the position and the direction of the UA; and
- The status of fuel and battery can be checked

9

Standard (minimum standard)

国土交通省

○ **For remotely controlled flight**

- Can fly, depart and land stably without any special control skills nor excessive attention requirements;
- The motors or engines can be stopped by turning off the main power or any other equivalent method in order to avoid uncontrollable UA in an emergency situation;
- Controller must be designed to reduce an operation error as much as possible; and
- Can be controlled properly by controller.

○ **For automated flight**

- Can fly, depart and land stably by autopilot system; and
- Allow the operator to intervene in the case of emergency.

10

Standard (minimum standard)

国土交通省

○ **Specifications and Performances of the UAs(equal or grater than 25 kg)**

- Need to have durability for all possible operation
- Need to have durability for over 100 hours of total flight time with proper maintenance
- Signal between UA and controller must not have negative influence on other devices.
- Need to have a structure to prevent the risk of scattering broken parts when a motor, an engine or a propeller is broken.
- Need to have function that can record flight data to determine the causes of an accident.
- Need to have proper fail-safe functions for all possible failure modes.

11

Standard (additional UA standard)

国土交通省

Examples of the additional standards are outlined as follows:

○ **Flights above Densely Inhabited Districts (DID), less than 30m distance from persons or properties, or over event sites where many people gather**

- UA shall be structured to reduce harm (e.g. propeller guard);

○ **Nighttime Flight**

- UA shall be equipped with light to denote the direction;

○ **BVLOS Flight**

- UA shall have automatically piloted system and camera system to monitor surroundings;
- UA shall inform operator of its position and its failure;
- In the case of failure, UA shall automatically run fail-safe function (e.g. autoreturn function);

12

Verification of UA Model

国土交通省

In order to reduce the burden of permission/approval procedure, JCAB is verifying UAs by models, when UAs of a model are expected to be applied frequently.

After verifying a model, an applicant does not have to submit the following documents when applies for a permission/approval of a flight using that model.

Unnecessary Documents
Design drawing or photo of UA and controller
Documents that show operation limit and flight rules
Documents that prove a compliance to the safety standard

13

Verification of UA Model

国土交通省

Inspection Item

- ○UA, Controller, and Actual Flight of UA
  - minimum standards specified in previous slides
  - additional standards specified in previous slides
    （limited to the standards that the applicant specified）
- ○Quality Management System
  - 4 M （Man, Machine, Material, Method ）
- ○Production Volume
- ○Design Drawing
- ○Instruction Manual

14

Overview

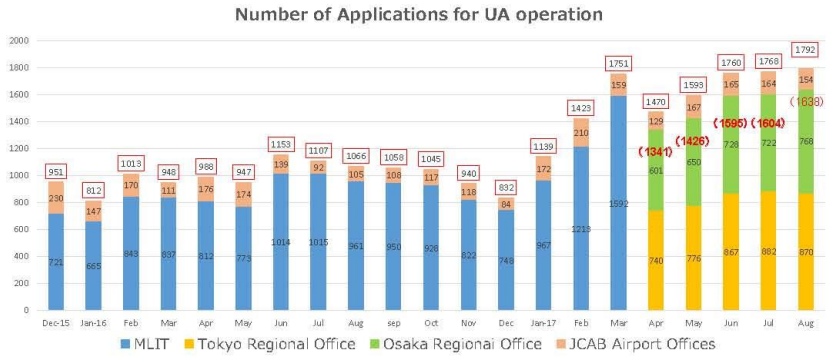
国土交通省

- UA Regulation in Japan
- Operational Status of the Regulation
- Future Plan

15

Recent Trends in the Number of Applications for UA Operation

国土交通省

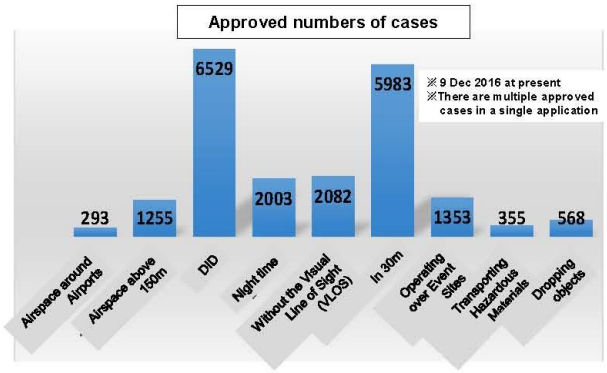


※Counting of respective airport offices
- During the period from December 2015 to August 2017. Months are tracked starting the 10th of the current month through the 9th of the following month.
- As for March 2017, counted from the 9th to 31st of March 2017.
- Note: MLIT transitioned application processing over to JCAB Regional Offices effective April 2017

Operational status of amendment Civil Aeronautics Law

国土交通省

○ Major approved cases are flights situation such as operations above Densely inhabited Districts (DID) or operations within 30m from people or properties.

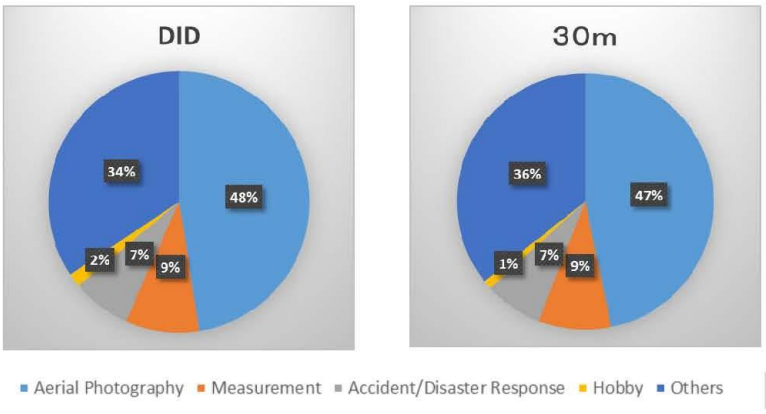


※9 Dec 2016 at present
※Reference to application

Details about Approved numbers of cases

国土交通省

○ Nearly 50% of applications in major cases are for “Aerial Photography”.

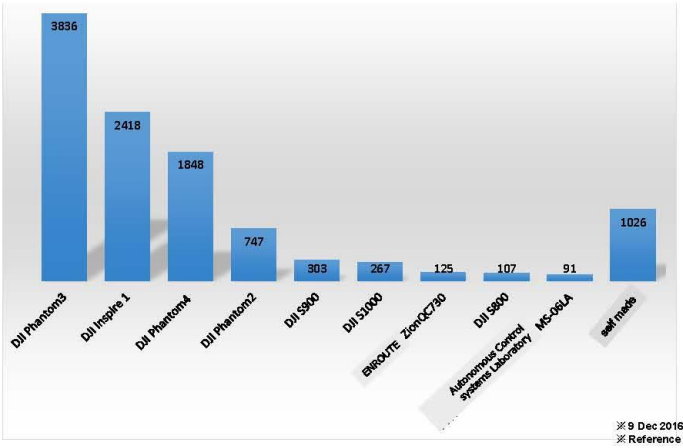


18

Operational status of amendment Civil Aeronautics Law

国土交通省

Approved Numbers of flight by UA Type（TOP10)



※9 Dec 2016 at present
※Reference to application

19

Verified UA Models

国土交通省

Total of 44 UA models have been verified by JCAB (as of Nov 2017)

Manufacturer	Model
DJI	PHANTOM series, INSPIRE series, MAVIC series, MATRICE series, Spreading Wings series, SPARK
Yamaha Motor Co.	RMAX series, FAZER series, AYH-3*, YF390*
Autonomous Control Systems Laboratory	MS-06LA series
3D Robotics, Inc.	Solo
enRoute	Zion series

*Products exclusive for YANMAR's use.

About accidents by UAs

国土交通省

- **MLIT ask them Information provision for further safety when accident is happened by UAs. (Person's death or injury, damage to third-party property, loss of aircraft at flight, collision with aircraft or approach)**
- **There were 67 reports in total (including accidents of flight that did not approve permission) between on December in 2015 and March in 2017, after the revised Air Law came into force. And an operator injured by UA on February in 2017.**
- **MLIT guidance them to take Measures to prevent recurrence, after detailed analysis of the situation and factors of the accident. And MLIT post accident information on the MLIT website, also recommend operator to subscribe to insurances.**

21

About accidents by UAs

国土交通省

Case of damage to related people

●Date：18 Feb 2017
●Place：Kanagawa Prefecture
(Permission required (DID))
An UA (size: about 40 cm, weight: about 1 kg) was uncontrollable by radio disturbance when flight for taking photography of construction site. The automatic return function operated, but it hit the crane and dropped. One construction worker took a cut on his face.

Case of damage to third property

● Date ：28 Jul 2016
● Place ：Shimane Prefecture
(Permission required (Around airport))
An UA (size: about 40 cm, weight: about 1 kg) was uncontrollable by unknown reason and dropped to a parking near an airport when flight for Aerial Imagery, scratched the side door of a car.

Case of approach to aircraft

● Date ：31 Jan 2016
● Place ：Chiba Prefecture
(No Permission required)
Small UAs (radio controlled aircraft) and a doctor helicopter approached. According to a report from a doctor helicopter, radio controlled machine dropped almost vertically on the front left side of the doctor helicopter about 15 to 25 m and passed through.

Other（Fire departments were dispatched）

● Date ：12 Mar 2017
● Place ：Kyoto Prefecture
(No Permission required)
A member of the radio control club dropped an uncontrollable UA (helicopter, about 1.6 m) on the riverbed. The UA flamed and 15 fire trucks and 1 fire helicopter dispatched there, but 23 hectares river beds were burnt.

22

Overview

国土交通省

- UA Regulation in Japan
- Operational Status of the Regulation
- Future Plan

23

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"(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 UAs

○ Establishment of The public-Private Sector Conference with members of related departments, agencies, manufacturers, users.
(Held 6 times from 7 Dec 2015)

Secure further safety of aircraft, pilot, flight control system

国土交通省

Full-fledged of flight without the Visual Line of Sight (VLOS) in unmanned area (Level 3) (in 2018)

Current status/Task

- The principle, Flight without the Visual Line of Sight (VLOS) needs assistant
- However, It is necessary of flight without the Visual Line of Sight (VLOS) without assistant for fully provide goods delivery services by small UAVs in uninhabited areas as remote islands and mountains.

Directionality

Improve safety level through voluntary efforts by organizations

⇩

Introduced a mechanism ensuring the same level of security as assistant and no assistant

Realization of flight without the Visual Line of Sight (VLOS) in a manned area (Level 4) in 2020s

Current status/Task

- **It is unavoidable to flight above third parties that fully provide goods delivery services by small UAs in urban areas.**
- **However, To flight above third parties having high possibilities danger to people and property, It is difficult to overcome that situation with the current technology level.**

Directionality

- Development of "No Fail Aircraft" by progress technology (improvement of collision avoidance function, improvement of resistance to environmental change etc.)
- Review or maintenance of the certification system of the aircraft and the qualification system of the operator.

25

About safety measures promotion project of UAVs (2019)

国土交通省

Regarding the flight of UAVs, establishment of evaluation techniques on technology to ensure safety as a nation, and establish a proper regulatory approval implementation and flight supervision system.

collision avoidance system between manned aircraft, unmanned aircraft, and UAs

○ Introduce a system that can share flight information (flight date / time flight route / altitude etc.) of UAVs with related organizations.

About safety measures concerning flight restrictions within prohibited airspace

○ Using GPS function to restrict the flight of UAVs within prohibited airspace, construct a system that can release the restriction only when they have obtained permission.

Safety measure about flight without VLOS, Night time, Around Airports

○ Establishing an evaluation method about technology to ensure the same level of safety as the assistant's placement, technology for enhancing visibility of the aircraft, technology that can land safely without harming third parties when UAVs is uncontrollable.


(Night time Flight)


(Flight without VLOS)

Strengthening the review and supervision of approval for approval of unmanned aerial vehicles

○ Establish standards for reporting and collection of safety information about UAVs, and conduct research for appropriate approval authorization, establish supervisory system of flight

①Secure appropriate application and review system

②Strengthen supervision of flights after permission approval

③Appropriate review and strengthening of approval criteria

26

(Reference) Pilotless Aircraft

国土交通省

(Pilotless Aircraft)
Article 87 (1) Notwithstanding the provisions of Articles 65 and 66, any aircraft equipped with apparatus which enables it to fly without being boarded by a pilot may, when permitted by the Minister of Land, Infrastructure, Transport and Tourism, engage in flight without being boarded by any pilot under the provisions of the said articles.
(2)

※ Articles 65 and 66 are requirements for pilots

However, there are no provisions about airworthiness specific for pilotless aircrafts.
Therefore, we cannot issue certificate for pilotless aircrafts.

There are only two cases that JCAB permitted a performance flight for a pilotless aircraft.

27

RoboCopter	Fixed Point Flight Test Airship (Non-Rigid Airship)
	
KAWADA INDUSTRIES, Inc.	JAXA
Rotorcraft	Airship
RoboCopter KID-300C	NAL Type SPF-2 Model
9.40m × 1.99m × 2.66m (L × W × H)	68.4m × 17.5m × 21.1m (L × W × H)
930kg	6,400kg

- Thank you for listening.

Asia Pacific Unmanned Aircraft Systems Certification Working Group

Wes Ryan, UAS Certification Policy Lead, Aircraft Certification
FAA Small Airplane Directorate

Day 1 – Tues. 11/28

Federal Aviation Administration

Day 1 Welcome & Logistics

- Joint Chairs and CAA NZ Representatives
  - Mr. Jonathan Tan, Singapore (CAAS)
  - Mr. Wes Ryan, United States (FAA)
  - Mr. Greg Baum, (CAANZ)
  - Mr. Shaun Johnson, (CAANZ)
- Review of Purpose, Scope, and Charter – 3 Year Effort
- Presentations of UAS Experience & Lessons Learned

Federal Aviation Administration

Welcome UCWG Participants

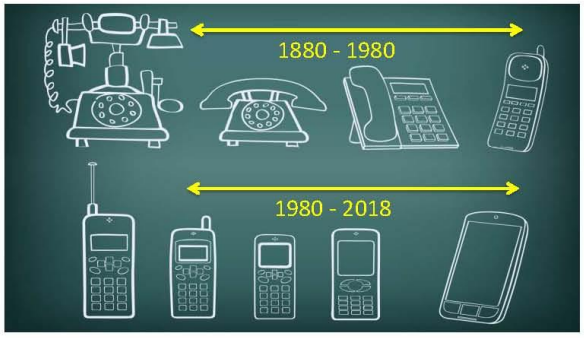
Country/Authority	Name	E-mail Address
Australia (CASA)	Not attending	Mr. Luke GUMLEY Luke.Gumley@casa.gov.au and Cc Mr. Chris MONAHAN Chris.Monahan@casa.gov.au
China (CAAC)	Mr. Zhipeng HAO	haozhp@mail.castc.org.cn and Cc Mr. Zhang Sen zhangsen@caac.gov.cn Ms. Liu Weiwei ww_liu@caac.gov.cn
Chinese Taipei (CAA)	Mr. Hwa KENG Mr. Kuan-Mo WU (Camel Wu)	keng@mail.caa.gov.tw camel@mail.caa.gov.tw
India (DGCA-India)	Not attending	amit.dgca@nic.in and Cc Kaushik Mukhopadhyay kaushik.dgca@nic.in
Japan (JCAB)	Mahito MORIYAMA	moriyama-m2ff@mlit.go.jp and Cc Yoshihiro Fujimaki fujimaki-y107y@mlit.go.jp and Keita Sasaya sasaya-k017a@mlit.go.jp
Korea (KOCA)	Presentation sent, but not attending	Mr. Jong-Moo KIM jwilove@korea.kr Mr. Heungsuk PARK icarus@safety.or.kr
New Zealand (CAANZ)	Mr. Greg BAUM Mr. Shaun JOHNSON Mr. Peter SUTHERLAND Mr. Mark HOUSTON Mr. Bryce WIGODSKY Mr. Seamus BRADY Ms. Kate MADDEN	Greg.Baum@caa.govt.nz and Cc Shaun.Johnson@caa.govt.nz
Singapore (CAAS)	Mr. Jonathan TAN Ms. Chee Wei FOR	Jonathan_TAN@caas.gov.sg FOR_Chee_Wei@caas.gov.sg
United States (FAA)	Ms. Tricia STACEY Mr. Wes RYAN Mr. James FOLTZ Mr. Stephen GEORGE Mr. Ho-Joon LIM	Wes.Ryan@faa.gov James.D.Foltz@faa.gov stephen.george@faa.gov tricia.stacey@faa.gov ho-joon.lim@faa.gov

- Listed Participants for UCWG
- Additional Technical Participation Within Each Authority Encouraged As Topics Are Discussed
- Future Meetings and Workshops Will Expand Participation
- Interface with JARUS, ICAO RPAS Panel Members, etc.

Federal Aviation Administration

Why Are We Here? - Evolution of Technology

- Technology is rapidly changing, Unmanned Systems Are Just Latest Example



- Change the way we live
- Trust in automation is growing, but must be safe
  - GPS Navigation
  - Cell Phone Navigation
  - Self-driving Cars
  - Unmanned Aircraft

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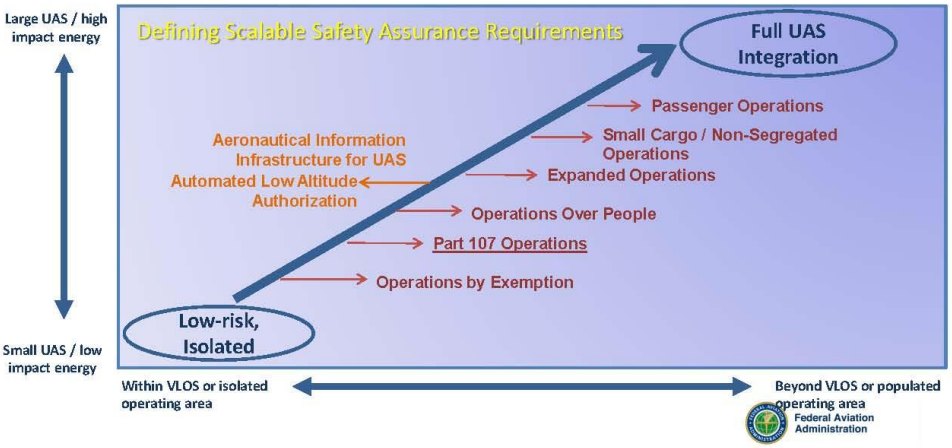
Evolution of Unmanned Aircraft Technology



APAC UCWG Guiding Principles

- Internationally, We All Have Shared Responsibility For Safety & Innovation
- Collaboration Within APAC Will be Mutually Beneficial - Managed Risk Approach to Cert
- Conservative, or "Zero Risk" Concepts Will Not Work – Promote Safe Technology Integration
- Traditional Certification, Risk Assessment, and Mitigations May Need to be Modified to Address Unique UAS Risks

Federal Aviation Administration

APAC UCWG Objectives – 3 Year Effort

- Promote a common understanding of UAS certification
- Harmonize certification approaches to promote seamless exchange and integration of products into our respective national airspace systems
  - Cooperate in the development of new policy,
  - Exchange lessons learned on UAS certification and operational aspects,
  - Coordinate efforts and align strategic goals.
- Use safety continuum concept for airworthiness certification processes, identifying design and production requirements, and other aspects of UAS certification and safe operations in Global Airspace

Federal Aviation Administration

APAC UCWG Deliverables - Next 3 Years

Semi-annual (6 months) report on UCWG progress and activities:

First Report - Current day and planned future regulation and policy, status for each authority and lessons shared

Second Report- Progress report including principles agreed to and framework development incorporating safety continuum

Third Report- Progress report including mutually accepted and compatible classification and certification schemes for UAS, as well as status of each authority's effort to adopt said principles

Fourth Report- Planned recommendation from UCWG to ICAO approximately one year before ICAO RPAS publishes their amendment to Annex 8 in Q2 of 2020

After submission of the fourth report, there will not be much activity until the Annex 8 amendments on RPAS are published. Thereafter, the UCWG will reconvene and put forward the final report to the APAC authorities in the 2021 annual meeting. It is also anticipated that each participating member will share their overall risk-based approach to safety-risk management for UAS certification at the 2021 annual meeting .

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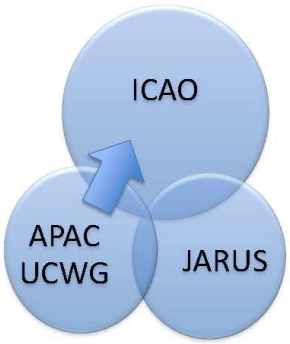
APAC UCWG Input to JARUS and ICAO



- Be Complementary, but Serve APAC Needs – Provide Input to ICAO
- Reinforce important concepts, principles
  - Risk Based Decision Making
  - Safety Risk Management
  - Tiered Acceptable Levels of Safety
- Coordinate work roles & tasks
- Establish new ways to support and influence ICAO

Federal Aviation Administration

Day 1 - Authority Presentation of UAS Experience & Lessons Learned (FAA)

Federal Aviation Administration

Unmanned Aircraft in the United States

- Rapid Growth and Technology Evolution
- Nearly 1 Million Drones in our Registry over past three years vs. 350,000 civil aircraft
- Can Reduce Risk Exposure for High Risk Jobs
- Cannot Allow Them to Disrupt Civil Aircraft Industry

Federal Aviation Administration

Key FAA UAS Strategic Priorities

Safety: *Safe UAS operations with appropriate risk-based requirements for airworthiness and operations*

Adaptability: *Create environment where new technology can be safely and rapidly introduced using risk-based, scalable requirements, i.e. "Safety Continuum"*

Global Leadership: *Shape the global standards and practices, gaining support for **risk-based** certification through international collaboration*

Federal Aviation Administration

Managing Risk for UAS

- Manage Design & Operational Risk to Public
  - Apply FAA Resources/Rigor Based on Risk
- Certification manages risk through **"Safety Assurance"**
  - Confidence a proposed product or action will meet FAA safety expectations to protect the public
- Safety is "No Accident", Does not Rely on Luck
  - Requires Active Risk Management and Risk Based Decision Making

Federal Aviation Administration

Why Is Certification Important?

- Acknowledgement that FAA requirements are met for:
  - Aircraft, Aeronautical Products, Airmen, Mechanics, Controllers, Operators, etc.
- Gain "Safety Assurance"
  - Confidence that a product or operation will meet FAA safety expectations to protect the public
  - Our risk-based processes are well-proven

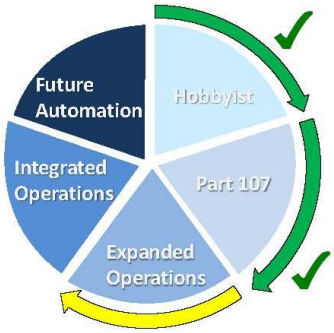
"Safety Assurance" Risk Controls

- Comes from Combination of Established Processes/Factors
  - **Airworthiness** – Condition for safe flight for its intended use
  - **Design** – Verify design, engineering, construction, etc. meet applicable requirements in certification basis
  - **Pilot** – Train for aircraft and level of risk
  - **Maintenance** – Repair/replace prior to failure
  - **Operation** – Limitations sufficient for the expected/acceptable level or risk
  - **Airspace** – Level of Integration, Traffic Exposure, Controller Involvement, and Equipage

Federal Aviation Administration

Safety Assurance By Regulatory Buildup

- Hobbyist/Recreational Operations
- Low Altitude Small UAS (Part 107)
  - In line of sight of operator
- Operations Over People (107 Expansion)
  - Working Regulation Now
- Beyond Visual Line Of Sight (Permit to Fly)
  - Enable Low Risk, Small UAS First
- Integrated/Controlled UAS Ops (TC/PC)
  - Changes to ATM and Mature Technology
- Future Automation – "Pilotless" Ops
  - Only as ATM and Automation Allow



Future Rulemaking and Waivers

Federal Aviation Administration 17

Current UAS Operations

Increasing Risk ▼	Aircraft Requirements	Pilot Requirements	Airspace Requirements	Types of Operation
Part 101 Model Aircraft	UAS < 25 Kg	Community-Based Organization (CBO) standards	Notification requirement within 5 miles of an airport	Hobby or recreational, VLOS, Part 101 operating rules, CBO standards
Part 107	UAS < 25 Kg	Part 107 remote pilot certificate with small UAS rating	Airspace waiver or authorization for Class B, C, D, E airspace	VLOS, daytime, Class G, 400 ft, not over people OR waiver provisions
Section 333	As specified in exemption	Part 61 airman certificate	Blanket COA or standard COA for specific airspace	UAS > 25 Kg
Public Aircraft	Self-certification by public agency	Self-certification by public agency	Blanket COA or Standard COA for specific airspace	Public Aircraft Operations (AC 00-1.1A); UAS Test Site Operations
Experimental Aircraft	Experimental Special Airworthiness Certificate	Part 61 airman certificate	Standard COA for specific airspace	Research and Development, crew training, and market survey
Type Certificated Aircraft	Restricted type or special class certificate	Part 61 airman certificate	Part 91 airspace requirements	Specified in operating authorization

Federal Aviation Administration

FAA - New Technology and UAS Certification

- Our Approach Uses Risk-Based Level of Oversight
  - Making Regulatory Improvements – Part 107 for Small UAS less than 55 lb (25 kg)
  - Regulatory Changes to Airworthiness Part 21, and Part 23
- Performance-based regulations = top-level safety goals
  - Risk-Based, customizable design/certification requirements through collaborative Means of Compliance
- Rely on the Use of Industry Consensus Standards
- Following Safety Continuum Concepts

Federal Aviation Administration

Prescriptive vs. Performance-Based Rules

Prescriptive Regulatory System	Performance-Based Regulatory System
Establishes specific technical requirements that must be met by applicants and approval holders	Establishes *outcomes* that must be achieved; allows flexibility in how the applicant or approval holder achieves those outcomes
Example: Emergency exits must be movable windows, panels, canopies, or external doors…that provide a clear and unobstructed opening large enough to admit a 19-by-26-inch ellipse.	*Example*: The airplane cabin exit design must provide for evacuation of the airplane within 90 seconds in conditions likely to occur following an emergency landing.

Federal Aviation Administration 20

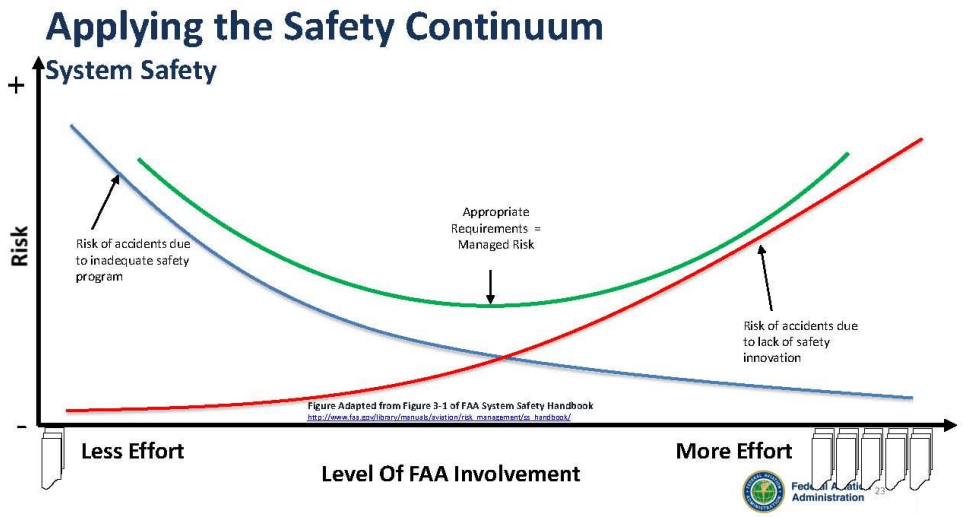
Performance-Based Regulations

Pros and Cons*

Pros	Cons
Stronger focus on achieving the desired safety performance	Defining requirements in terms of performance can be challenging.
Greater agility in accommodating innovation and new technologies	Defining what compliance looks like can be difficult
Improved understanding of risks	Compliance planning requires more effort (potential for increased burden on industry)
Potential for stronger safety culture within regulator and industry	

Industry Consensus Standards

- Working with ASTM, RTCA, SAE, ANSI, ISO, and other groups to develop standards for UAS, equipment, avionics, systems, etc.
- ASTM F38 is focused on Small UAS < 55lb. (25 kg.)
- RTCA, SAE, EUROCAE - UAS Equipment Policy and Safety Risk Analysis
- ANSI and ISO Coordinating Standards Development
- Europe has the EUSTG Coordinating Consumer Standards


Applying the Safety Continuum
System Safety
+
Risk
-
Risk of accidents due to inadequate safety program
Appropriate Requirements = Managed Risk
Risk of accidents due to lack of safety innovation
Figure Adapted from Figure 3-1 of FAA System Safety Handbook
http://www.faa.gov/library/manuals/aviation/risk_management/ss_handbook/
Less Effort
Level Of FAA Involvement
More Effort
Federal Aviation Administration
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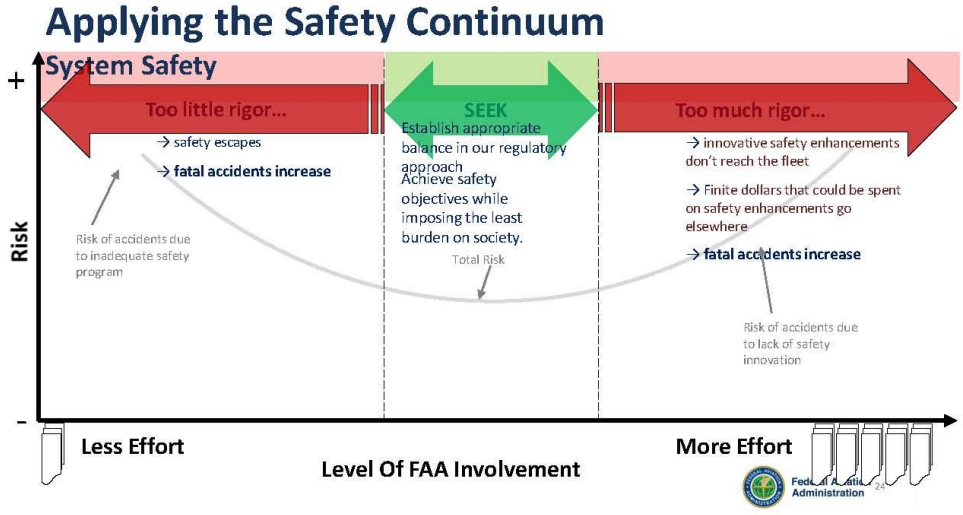
Applying the Safety Continuum
System Safety
+
Risk
-
Too little rigor…
→ safety escapes
→ fatal accidents increase
SEEK
Establish appropriate balance in our regulatory approach
Achieve safety objectives while imposing the least burden on society.
Too much rigor…
→ innovative safety enhancements don't reach the fleet
→ Finite dollars that could be spent on safety enhancements go elsewhere
→ fatal accidents increase
Risk of accidents due to inadequate safety program
Total Risk
Risk of accidents due to lack of safety innovation
Less Effort
Level Of FAA Involvement
More Effort
Federal Aviation Administration
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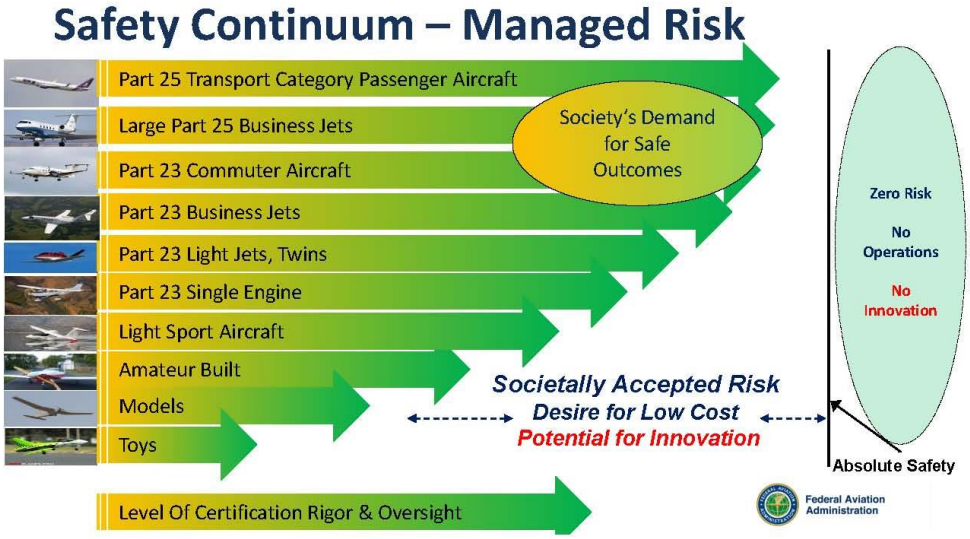
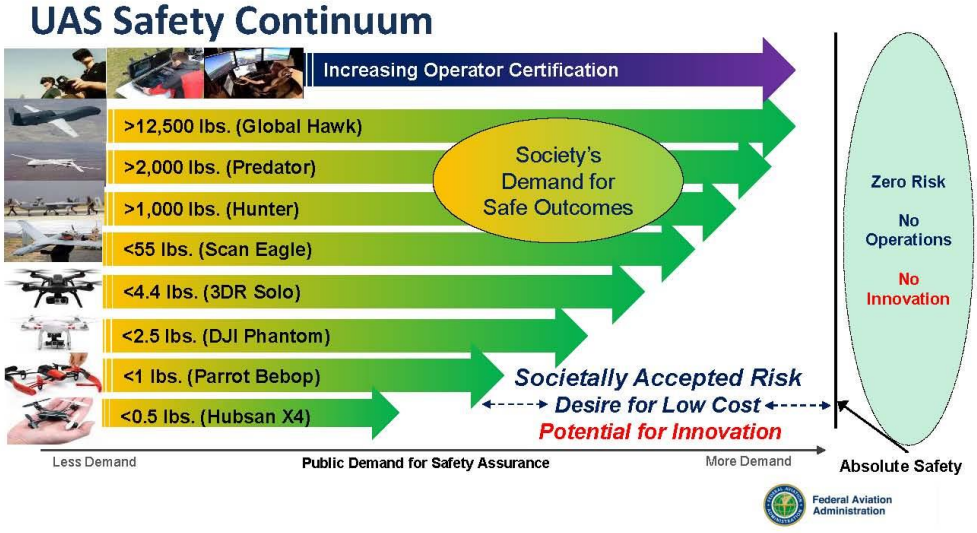

Safety Continuum – Managed Risk
Part 25 Transport Category Passenger Aircraft
Large Part 25 Business Jets
Part 23 Commuter Aircraft
Part 23 Business Jets
Part 23 Light Jets, Twins
Part 23 Single Engine
Light Sport Aircraft
Amateur Built
Models
Toys
Society's Demand for Safe Outcomes
Societally Accepted Risk
Desire for Low Cost
Potential for Innovation
Zero Risk
No Operations
No Innovation
Absolute Safety
Level Of Certification Rigor & Oversight
Federal Aviation Administration


UAS Safety Continuum
Increasing Operator Certification
>12,500 lbs. (Global Hawk)
>2,000 lbs. (Predator)
>1,000 lbs. (Hunter)
<55 lbs. (Scan Eagle)
<4.4 lbs. (3DR Solo)
<2.5 lbs. (DJI Phantom)
<1 lbs. (Parrot Bebop)
<0.5 lbs. (Hubsan X4)
Society's Demand for Safe Outcomes
Societally Accepted Risk
Desire for Low Cost
Potential for Innovation
Zero Risk
No Operations
No Innovation
Absolute Safety
Less Demand
Public Demand for Safety Assurance
More Demand
Federal Aviation Administration

Different Levels of Risk and Certification

Small UAS:

Low risk

Low involvement from Aviation Authority

Limitations: <55 lb.

Visual line of sight, <400 ft. altitude, distance from airports and no ops over people

CFR Part 107

Specific Use Cases:

Increased risk

Operation by Waiver, Certificate of Authorization, Airworthiness

Specific requirements on drone, personnel, equipment based on safety assessment and using industry standards

Waivers/Exemptions/Future Part 21 Changes

Fully Certified

High Risk

Fully Integrated Operations

Risk-based Regulatory Structure similar to manned aviation

FAA Design and Production Certificates

Typical Level of Certification

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UAS Status, As of October 2017

- Thousands of UAS Registrations, Remote Pilots, & Operations Enabled Under Part 107
  - UAS Registrations Surpassed Manned Aircraft Totals in First Year – **Now Over 900K vs. 320K manned aircraft**
- Working To Expanded Operations – Specific Uses
- Roughly Twelve Type Design Certification Programs Underway – Challenge is Operational Integration
  - Prefer to Work Lower Risk First – Learn by Doing
  - Range From 5 to 15,000 lb.

Federal Aviation Administration

Certification Lessons Learned

- Certification Requirements Driven by Aircraft, Intended Concept of Operation, and Airspace/Area it Will Operate in
- Applicant Operational Risk Assessment Must Show They Understand Their Impact on the Pubic/Existing Airspace
- Many Technology/Policy Decisions Still Made on a Case-by-Case Basis – No Single Easy Answer
- Operational Integration is Largest Challenge – §91.113
  - No Single Manufacturer Has Come With Data or Even a Demonstrated Concept to Show They Can Integrate in the NAS
- 10E-9 Probabilistic Model Cannot Apply to ALL UAS

Federal Aviation Administration

Exciting Future Opportunities

- UAS could safely prototype technology to revolutionize flight
  - Automation & Flight Controls
- Passenger carrying, highly-automated aircraft
  - Private Funding vs. Govt. R&D
- Planning Workshop for Automation Strategy – Planned Steps to Future
  - Federal, State, Local, and Industry Collaboration (FAA, NASA, FEMA, HLS, academia, municipalities, UBER, Amazon, insurance providers, etc.)

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Questions?

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816-329-4127
wes.ryan@faa.gov

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Supporting Slides
Day 1 & Discussions:
FAA UAS Regulatory/Certification Principles

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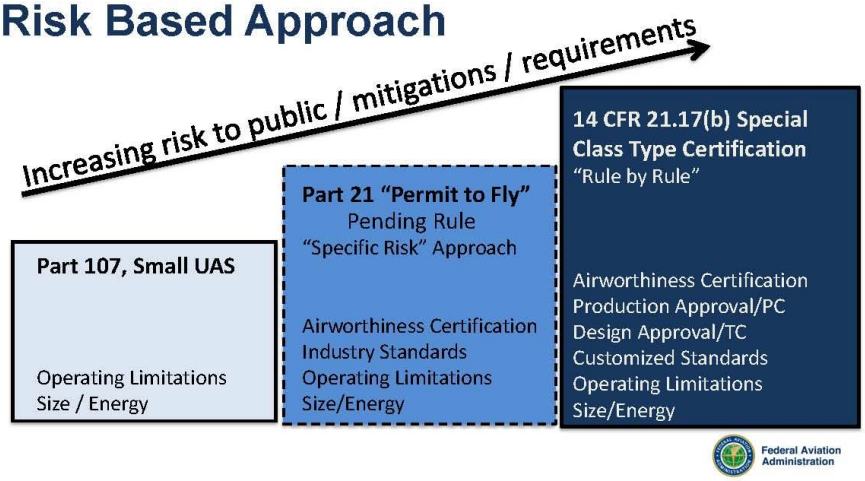
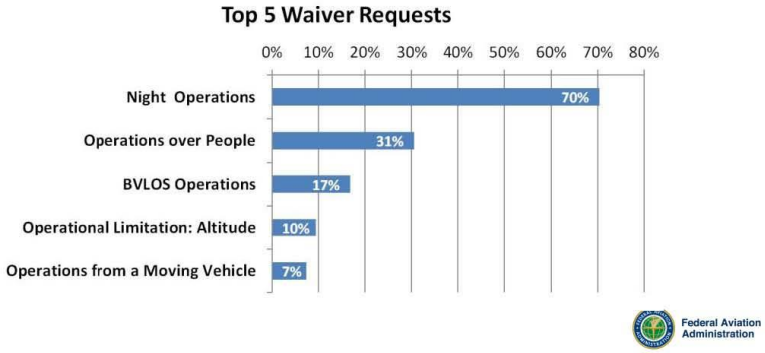
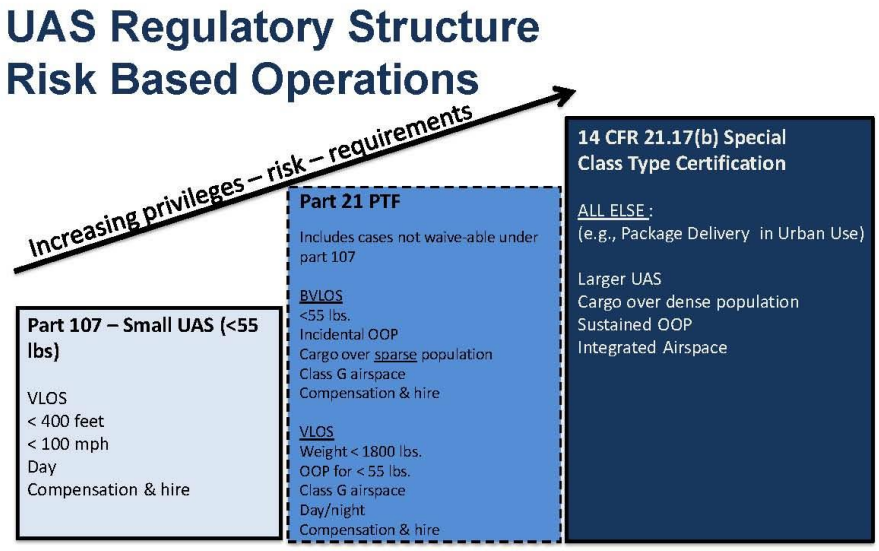
FAA Regulatory Structure
Risk Based Approach

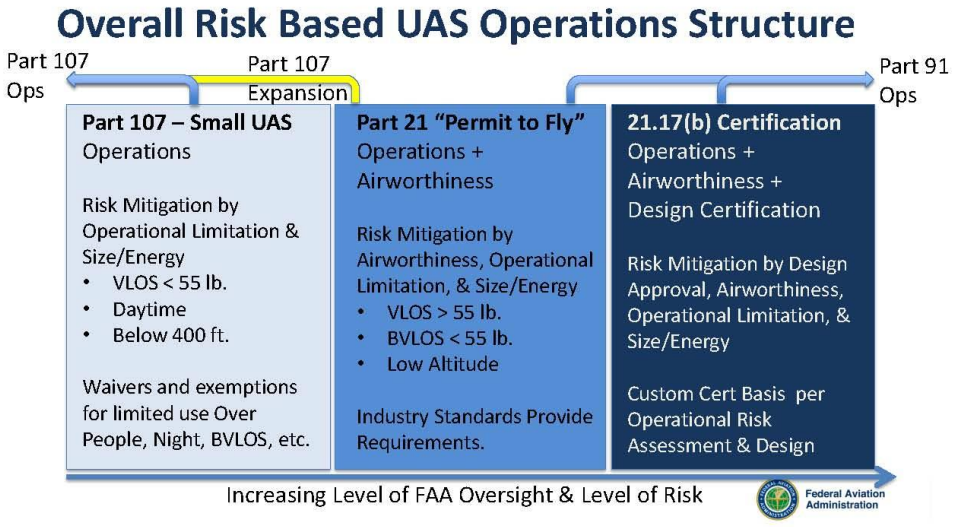


Waivers to Part 107 for Small UAS in United States

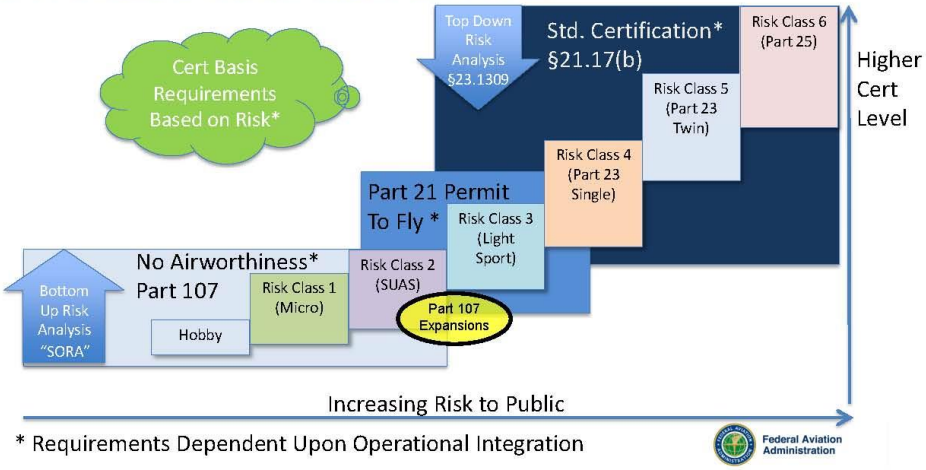
- Certain Parts of 107 Can Be Waived, based on Safety Case
- Each is Evaluated Based on Specific Operational Risk




UAS Regulatory Structure
Risk Based Operations
Increasing privileges – risk – requirements
Part 107 – Small UAS (<55 lbs)
VLOS
< 400 feet
< 100 mph
Day
Compensation & hire
Part 21 PTF
Includes cases not waive-able under part 107
BVLOS
<55 lbs.
Incidental OOP
Cargo over sparse population
Class G airspace
Compensation & hire
VLOS
Weight < 1800 lbs.
OOP for < 55 lbs.
Class G airspace
Day/night
Compensation & hire
14 CFR 21.17(b) Special Class Type Certification
ALL ELSE:
(e.g., Package Delivery in Urban Use)
Larger UAS
Cargo over dense population
Sustained OOP
Integrated Airspace


Overall Risk Based UAS Operations Structure
Part 107 Ops
Part 107 Expansion
Part 91 Ops
Part 107 – Small UAS Operations
Risk Mitigation by Operational Limitation & Size/Energy
• VLOS < 55 lb.
• Daytime
• Below 400 ft.
Waivers and exemptions for limited use Over People, Night, BVLOS, etc.
Part 21 "Permit to Fly" Operations + Airworthiness
Risk Mitigation by Airworthiness, Operational Limitation, & Size/Energy
• VLOS > 55 lb.
• BVLOS < 55 lb.
• Low Altitude
Industry Standards Provide Requirements.
21.17(b) Certification Operations + Airworthiness + Design Certification
Risk Mitigation by Design Approval, Airworthiness, Operational Limitation, & Size/Energy
Custom Cert Basis per Operational Risk Assessment & Design
Increasing Level of FAA Oversight & Level of Risk
Federal Aviation Administration

FAA Rules with Risk-Classes

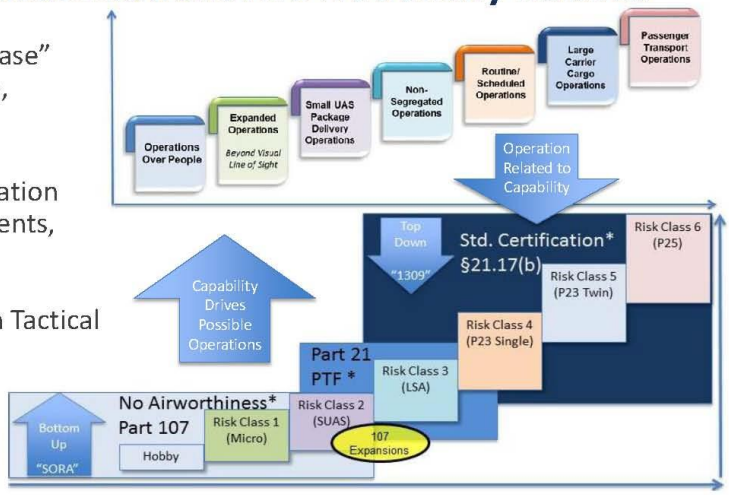


Risk-Based Operational Classification Strategy

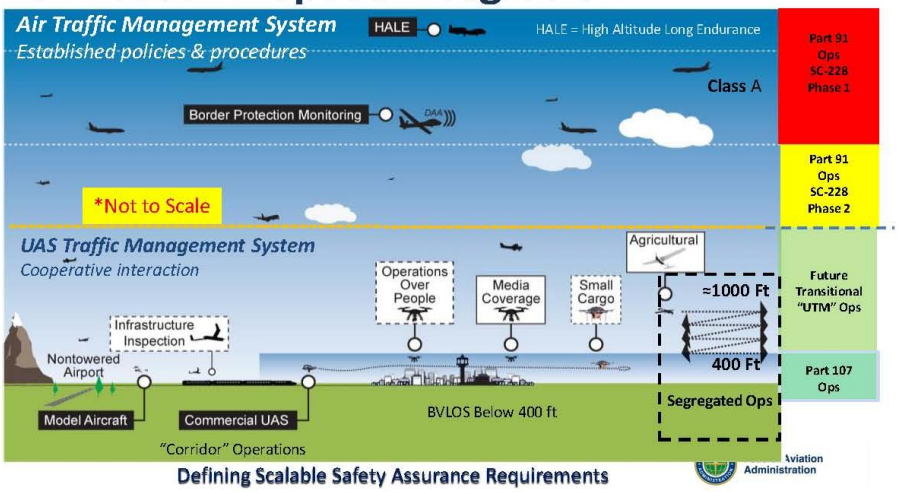
- For Applicability of Operational Requirements - Address Operational Risk Exposure While Avoiding a "Zero-Risk" Mentality

The Two Classifications Are Notionally Related

- "Typical Use-Case" Related to Size, Capability, & Performance
- Level of Integration sets Requirements, Level of FAA Oversight, and Involvement in Tactical Operation



Risk Based Airspace Integration



EASA – Similar 3 categories in EASA NPA to FAA

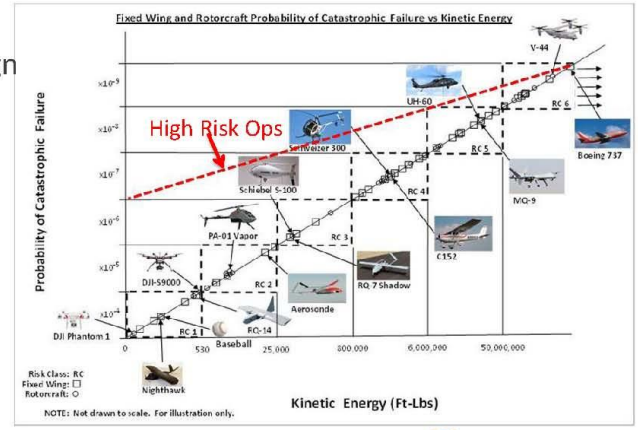
EASA NPA (05/2017) operation centric concept:

- 3 categories (open, specific and certified)
- Performance based, risk based and proportionate

Federal Aviation Administration

UAS System Safety Targets – Initially Energy Based

- For Applicability of Airworthiness & Design Requirements
  - RC1 and RC2, Small UAS (Open, Part 107)
  - RC2 and RC3, Mid-Sized (Specific, PTF)
  - RC4 to RC6, Large UAS (Certified, Std. Cert)
- Does Not Set "Operational Safety"" Target



Defining Scalable Safety Assurance Requirements

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Original Risk Classes - Based on Kinetic Energy

- Falling Energy for Rotorcraft
- Cruise Speed and Mass used for fixed wing calculation
- Risk Classes 1-2 are primarily used under part 107.
- Risk Classes 1-3 should not require TC in the future, once Permit to Fly is in place.
- Risk Classes 4-6 are "typical" certification processes.

Table 12-1. Energy-Based Classifications for UAS.

Risk Class	Kinetic Energy in Ft-Lb
1	≤ 529
2	≥530 to ≤24,999
3	≥25,000 to ≤799,999
4	≥800,000 to ≤5,999,999
5	≥6,000,000 to ≤49,999,999
6	≥50,000,000 and up

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Part 23 Example

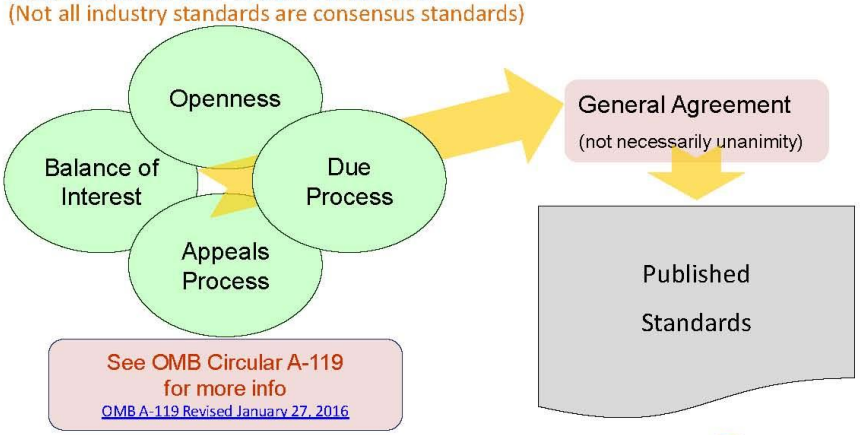
Existing Part 23 Requirement	Proposed Part 23 Requirement
(f) Each nickel cadmium battery installation capable of being used to start an engine or auxiliary power unit must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of its individual cells. (g) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have— (1) A system to control the charging rate of the battery automatically so as to prevent battery overheating; (2) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or (3) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.	The power generation, storage, and distribution for any system must be designed and installed to— (a) Supply the power required for operation of connected loads during all likely operating conditions; (b) Ensure no single failure or malfunction will prevent the system from supplying the essential loads required for continued safe flight and landing;

U.S. Requirements for Industry Standards

- Public Law 104-113: National Technology Transfer and Advancement Act of 1995
  - Requires Federal agencies to use voluntary consensus standards as a means to carry out policy objectives
    **unless illegal or impractical*
  - Requires Federal agencies to participate with voluntary consensus standards bodies
    **when in the public interest and compatible with mission, budget, etc.*
- OMB Circular A-119
  "Federal Participation in the Development and Use of Voluntary Consensus Standards and in Conformity Assessment Activities"

Consensus Standards

(Not all industry standards are consensus standards)



UAS Certification Process

- Following 8110.4C and All Other FAA Cert Procedures
  - Familiarization, Cert Basis, Conformity, Showing, Finding, etc.
- Operational Risk Assessment for Proposed Mission Drives Requirements and FAA Involvement
- Why is the pace slow for UAS Type Certification?
  - Unique Aspects must be addressed for integration
  - Manned aircraft operational integration built into part 23 and part 91 – UAS operations are not yet included
- Several Integration Areas Addressed by "Issue" Paper Process

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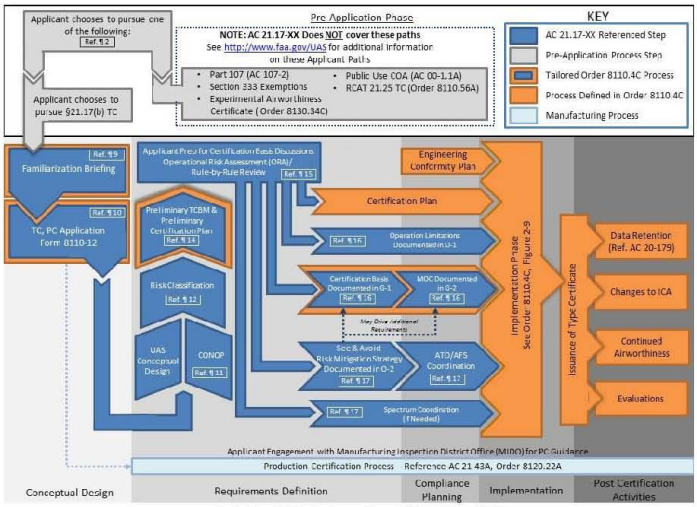

*Note: Type Certification Process Phases Defined in Order 8110.4C

Process Flow

- Blue is "new" UAS
- Orange is 8110.4

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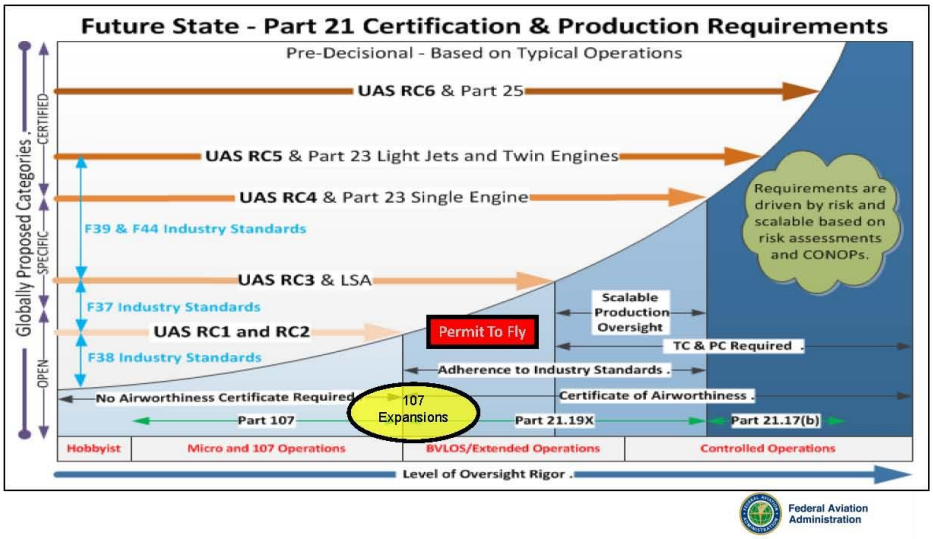

Future State - Part 21 Certification & Production Requirements
Pre-Decisional - Based on Typical Operations
Globally Proposed Categories
CERTIFIED
SPECIFIC
OPEN
UAS RC6 & Part 25
UAS RC5 & Part 23 Light Jets and Twin Engines
UAS RC4 & Part 23 Single Engine
F39 & F44 Industry Standards
UAS RC3 & LSA
F37 Industry Standards
UAS RC1 and RC2
F38 Industry Standards
Permit To Fly
Scalable Production Oversight
TC & PC Required
Adherence to Industry Standards
Certificate of Airworthiness
No Airworthiness Certificate Required
Part 107
107 Expansions
Part 21.19X
Part 21.17(b)
Requirements are driven by risk and scalable based on risk assessments and CONOPs.
Hobbyist
Micro and 107 Operations
BVLOS/Extended Operations
Controlled Operations
Level of Oversight Rigor
Federal Aviation Administration

MOLIT

UAS Experience & Lessons Learned

Republic Of Korea 2017

Contents

1 UAS Category

2 Unmanned Aircraft Systems

3 UAS Registration & Certification

4 UAS Special Airworthiness

5 UAS Special CoA (for flight test)

Unmanned Aircraft Systems Category

UAS CATEGORY

- **UAV**(Ultra light Vehicle) : Empty Weight Below 150kg
  ☞ MTOW 25kg ~ Empty weight up to 150kg : Required to obtain Safety certification
- **UAS**(Unmanned Aircraft System) : Empty Weight over 150kg
  ☞ Required to obtain Special Airworthiness Certification

UAS Registration

- **UAV**(Ultra light Vehicle) : MTOW 25kg ~ Empty weight up to 150kg + Below MTOW 25kg(Business Purpose only) : Required Registration
- **UAS**(Unmanned Aircraft System) : Empty Weight over 150kg : Required Registration
  ☞ Research/development purpose : don't required registration

Unmanned Aircraft Systems Category

Weight	Aircraft Registration	Airworthiness Certification	Pilot License	Flight Approval	Remarks
Below Empty Weight 12kg	O*1	X	O*1	X	UAV Category
Empty Weight 12kg ~ MTOW 25kg	O	X	O*1	X	
MTOW 25kg ~ Empty Weight Up to 150kg	O	O (Safety Certification)	O*1	O*2	
Empty Weight Over 150kg	O	O (Special CoA)	O	O	GA Category

***1 For Business Purpose Only (Business License Registration Required)**

***2 Not Required for Agricultural Spraying and Preventing Disease in Stockbreeding**

Unmanned Aircraft Systems

▪ *Certification Category*

Flight Permit
(Registration: N/R)

- UAV : **Flight Permit(Experimental)**
- MTOW: 67kg, Hybrid Propulsion

- UAS : **Special Airworthiness(Experimental)**
- MTOW: 1,000kg

Safety Certification
(Registration: Required)

- REMO H : MTOW 100kg, Agriculture
- REMO Farm : MTOW 25.5kg, Agriculture
- ACE 12 : MTOW 60kg, Traffic Control

UAS Registration and Certification

▪ Ultra light vehicle

Year	2013	2014	2015	2016	2017.10
Registration	241	395	968	2,227	3,320
Issuance of Safety Certification	189	248	312	525	490

- **Since 2002, ROK implementation UAV's Safety Certification**

▪ Certification Check lists

- Performance (flight envelope), Operational/Maintenance manual
- Structural design, Fuel/Battery system(warning system, CE certification)
- Radio Control device(including Ground Control Station)
- Emergency Procedure(Safety landing procedure such as Go-home)
- Power-plant(electric motor, reciprocating engine, hybrid, etc.)
- Vehicle Status(structure, Wing, Propeller/blade, Registration Marking, etc.)

UAS Classification by Purpose

- Ultra Light Vehicle Registration (Classified by Purpose)

Purpose	Media (Camera)	Agriculture	Advertisement	Leisure	Research	Education
Registered No.	1904	1361	32	10	10	3

UAS Registration and Certification

Safety Certification On-Site

- Vehicle Status(structure, Wing, Propeller/blade, Registration Marking, etc.)
- Radio Control device(including Ground Control Station)
- Power-plant(electric motor, reciprocating engine, hybrid, etc.)

Flight Performance Test

- Performance (flight envelope, hover, take-off, landing), airspeed)
- Battery warning light
- Communication and control
- Emergency Procedure(Safety landing procedure such as Go-home)

UAS Registration and Certification

Considered Special Feature

- Special Performance
  - Agriculture(Spray system, Seeding system)
  - Observation System(Camera, etc.)
  - Loading System
  - life vest equipment, Beyond Line of sight flight, etc.

UAS - Special Airworthiness

- Issuance of Special Airworthiness certificate (experimental) for UAS
  - **ROK had issued a Special Airworthiness certificate(Flight Permit) for TR-100(UAS Category)**

SMART UAV : TR-100

- Test Flight period : From 2011 to 2013

SPECIFICATION

- Dimension : Length 4.96m, Width 4m
- Engine : PW206C(550hp) x 1ea
- Maximum Take off weight : 1,000kg
- Ceiling : 5,000m
- Max. Flight time : 5hours
- Features :
  - Vertical Take off
  - Flight mode : Transition/Fixed wing/Rotor

UAS - Special Airworthiness

- Elements for Issuance of Special C of A

Ground Test

Ground Control Station

Radio communication

Monitoring system

- Source: Korea Aerospace Research Institute

UAS - Special Airworthiness

- Elements for Issuance of Special C of A

Safety rope

Rotorcraft mode

Transition mode

Flight Test

Airplane mode

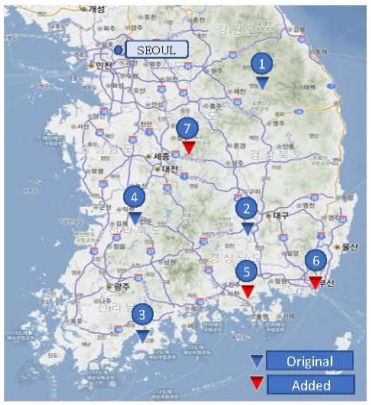
- Source: Korea Aerospace Research Institute

UAS Airworthiness Criteria(for test flight)

Area	Subject
Airframe Tech.	Aerodynamic performance
	Structure
	Propulsion
	Control
	Equipment
Safety Tech.	Ground Control Station
	Safety Procedure
	Manufacture Quality
Communication Tech.	Air Traffic Control
	Electric / Communication
	Pilot

▪ Source: Korea Aerospace Research Institute

Designated UAV Test Flight Zone



Zone N.	Diameter	Altitude	Shape
1	11km	450m	Circle
2	7.4km	450m	Circle
3	22km	450m	Circle
4	3.6km	300m	Circle
5	3km	450m	Circle
6	11km	450m	sector
7	6km	300m	Circle

* UAV Operator can test flight everyday with out permit.

▪ Source: Korea Institute of Aviation Safety Technology

Designated UAV Test Flight Zone

Night Flight	High Altitude Flight	Auto Flight	FPV
Stadium	Beyond VLOS Flight	Impact Simulation	Geo-fencing

- ROK trying to develop requirements for approval of special flight such as Night Flight, High Altitude Flight, FPV, GOE-Fencing, Beyond Visual Line of sight Flight, etc.
  - ❖ Tests conduct designated UAV Test Flight Zone.

- Source: Korea Institute of Aviation Safety Technology

附件 六、我國簡報

UAS Certification Working Group

The Transformation and Challenge of Aviation Oversight

Flight Standards Division
Civil Aeronautics Administration, Chinese Taipei

Outline

- Introduction
- Overview
- Regulatory Framework
- UAS Implementation Project
- Conclusion

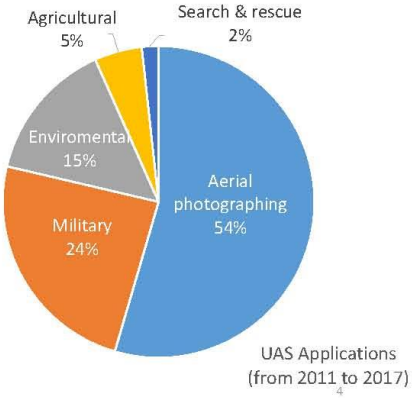
Introduction - Chinese Taipei

- Location
- Civil Aeronautics Administration
  - Aerodromes: 17
  - Routes:
    International 18 / Domestic 4
  - Commercial Air Transport
    Company 7 / 26,197 employees
    General Aviation
    Company 10 / 400 employees
  - **UAS operator/employee ?**

3

Overview - UAS Applications in Taipei FIR

- Published UAS AIC of Taipei FIR since 2011
- For government affairs, military and science research purposes
- Approx. 120 events per year



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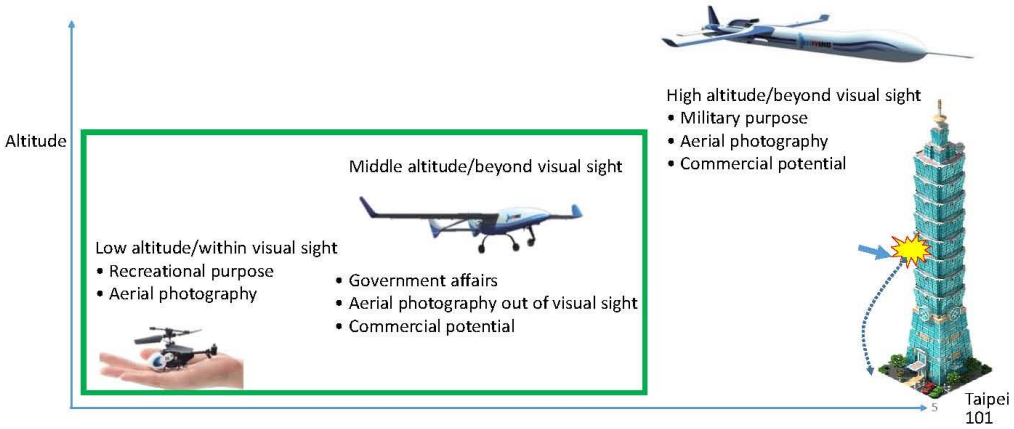
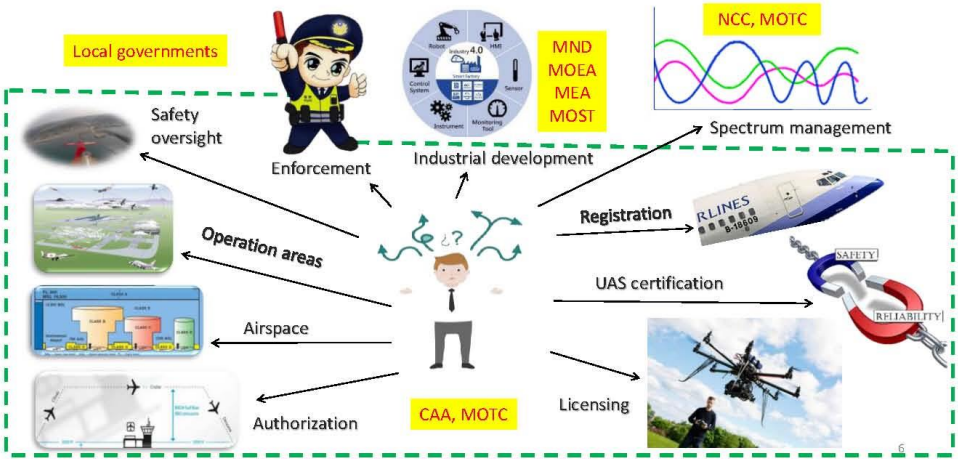
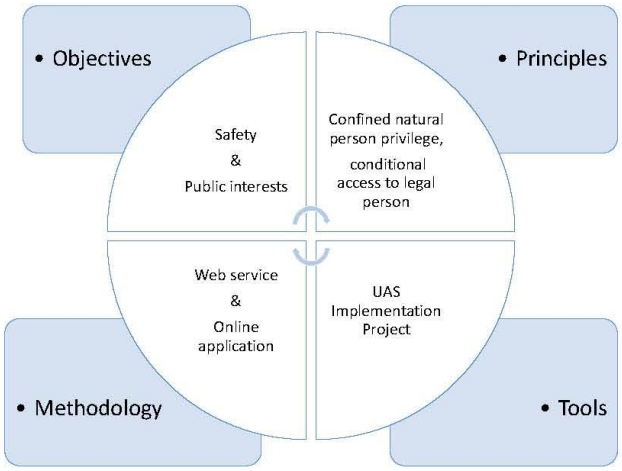
Overview - UAS categories



Regulatory Framework - Diversified Governmental Sectors



Regulatory Framework - Perspectives



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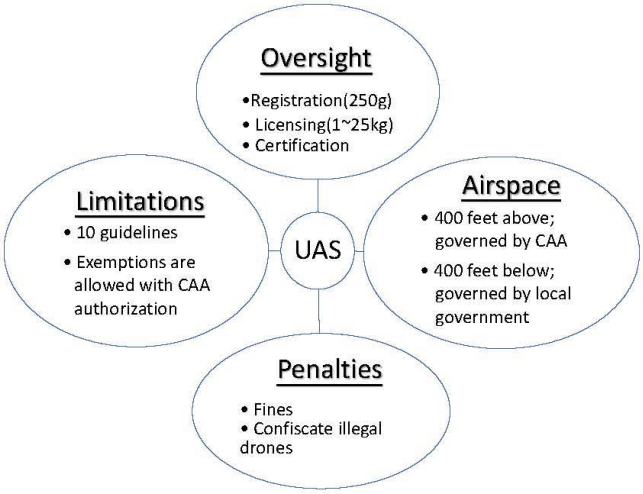
Regulatory Framework - Goals



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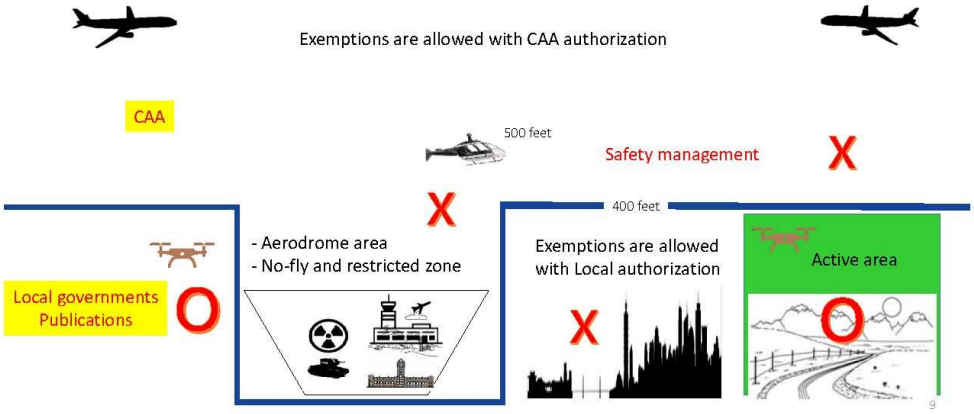
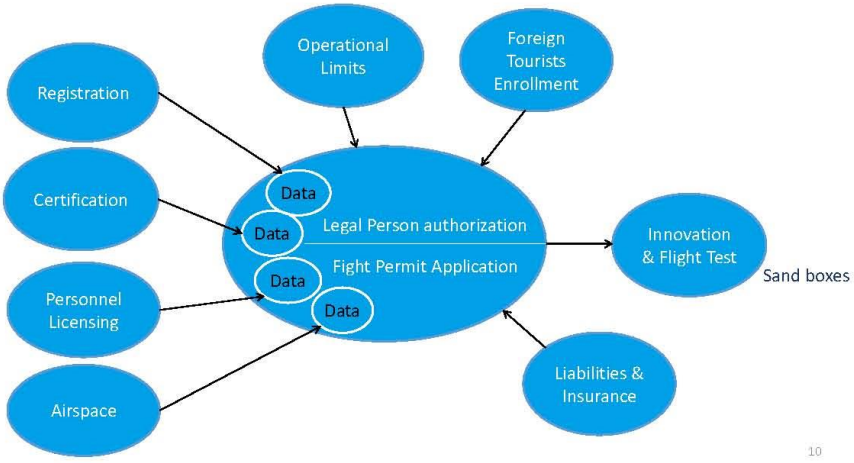
Regulatory Framework
- UAS Operation Areas & Airspace



UAS Implementation Project



Conclusion

- Changing of Civil Aviation Act process has been undertook by Parliament
- Implementation is scheduled by 2018 (at least one-year buffer time)
- Global harmonization of UAS classification/certification are necessary
- Non-segregated airspace utilization and UTM system are expected

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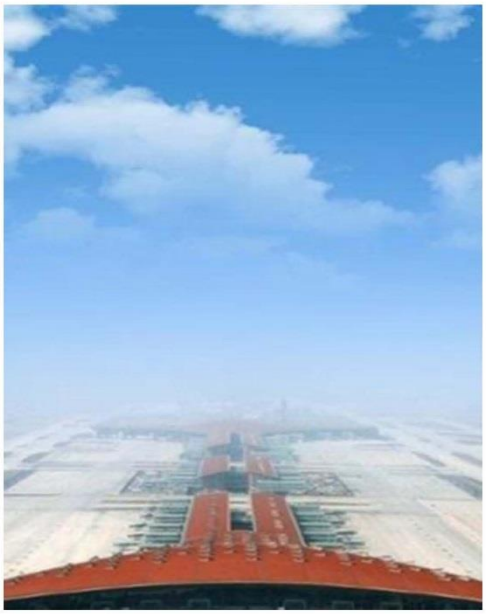
Thank you for your attention

UAS Certification Practice of CAAC

Present to: UCWG
By: CAAC CAST
1/26/2018



Outline

- Overview of UAS industry in China
- Organization Briefing
- Current rulemaking practices
- Future plans

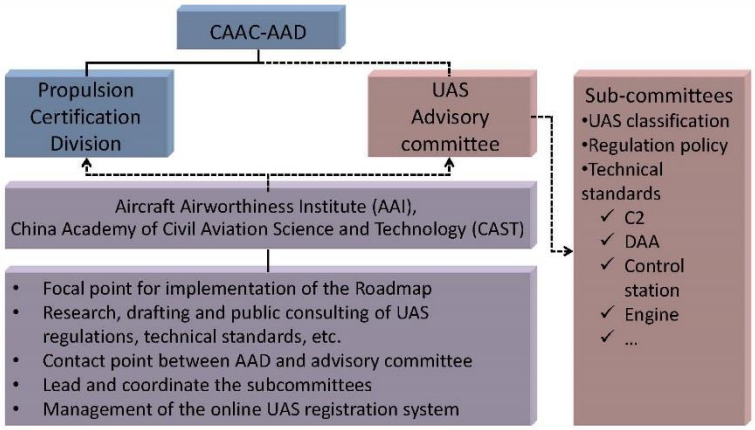
Overview of UAS industry in China

- Hobby/recreational use
  - More than 2/3 registered drones
  - DJI, Ehang, Zero, YUNEEC, …

Overview of UAS industry in China

Organization Briefing

Organization Briefing

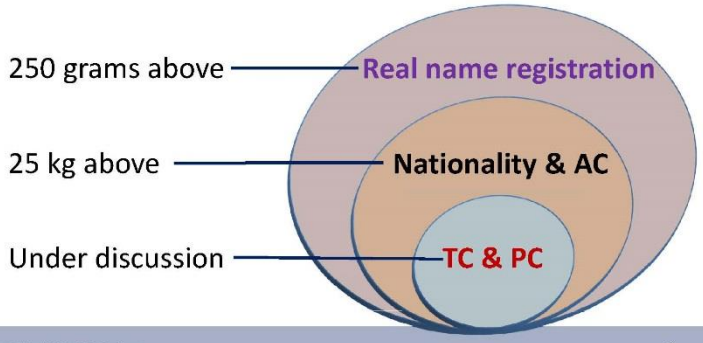


Current rulemaking practices

- **Roadmap of UAS airworthiness management**
- **Real-name registration of civil UAS**
  - AP-45-AA-2017-03
  - Online registration system
- **Collision test**
  - UAS & transport aircraft collision test
- **Pilot programs**

Roadmap of UAS airworthiness management

- Key principles
  - Deregulation & Scalable approach



Roadmap of UAS airworthiness management

- Working mechanism
  - Monthly report CAST-AAI
  - Monthly meeting CCAC-AAD & CAST-AAI
    - Assess progress & make next month plan
  - Irregular meeting held by sub-committees

Real-name registration of civil UAS

- Online registration system *free*
- More than 250 grams *takeoff weight*
- Responsibilities
  - Owners: *Individuals & Entities (enterprises, public service)*
    - » register the UAS & update information
    - » Paste the mark on the UAS
  - Producers:
    - » Register UAS models
    - » Provide self-adhesive sticker
  - CAAC-AAD
    - » Policy making
    - » Management of the registration system

Real-name registration of civil UAS

- Marking:
  - Registration number
    - » UAS + 00000001
  - QR code
    - » 2cm × 2cm
    - » UAS model, serial number, producer, issue date,
    - » Owner name, contact
  - Sent to owner by email
  - Print and paste by owner

Collision test

- Aim
  - Evaluate the collision effect
- Team
  - led by Shanghai certification center
  - Including universities, AVIC, DJI
- Test parts
  - ARJ 21-700 nose
  - DJI inspire

Pilot programs

- Special flight permit
  - Ehang 184 by Ehang Intelligent Equipment Co., Ltd
    - » Autonomous air taxi
    - » Under process by the CAAC central-south reginal administration
  - U650 by UVS Intelligence System
    - » Amphibious cargo
    - » Under process by the CAAC east reginal administration
- Integration of UAS registration and activation
  - DJI

Future plans

- UAS classification and related regulation policy
  - Certificate types
  - Specify the AC-only category
    - » Procedures
    - » Inspection items
  - Specify the TC/PC category
    - » Procedures
    - » Technical standards
      - ✓ Fixed wing, multi-rotor, VTL, ...
      - ✓ C2, DAA, ...
- Operational requirements and limitations
  - Geo fencing and no-fly zone
  - Collision protection
  - Location surveillance and report

Thank you