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無人飛行載具 在海巡勤務之應用



● 空中勤務總隊 AS365 直升機
The National Airborne Service Corps's
AS-365 helicopter

The application of unmanned aerial vehicle in Coast Guard patrol

近年來，隨著通訊技術之研發、電腦與電子科技之精進及各項偵蒐器材之精巧化，以往研發之瓶頸亦獲突破，其中「無人飛行載具」的發展也更趨成熟，這使得運用無人飛機不再是夢想，預見不久將來，國防、海巡甚至民間運輸都將善加運用無人飛機。

由於行政院去（93）年將公務航空器改採一元化政策，本署目前空中偵巡勤務均由內政部空中勤務總隊派遣直昇機支援執行，未來如考量實用性與節約預算，以無人飛機配合運用，甚為可行。本文先介紹各國發展無人飛機情形，進一步將討論無人飛機在我國海巡勤務之運用，俾利瞭解運用無人飛機的重點不在無人飛機，而在如何規劃我國整體海巡勤務。

無人飛機之研究

無人飛機又稱無人飛行載具（Unmanned Aerial Vehicle，UAV），可由人操控亦也自動航行，並配賦照相機、感測器及通訊器材等裝備，可用來執行偵察任務或蒐集地理水文等相關資訊，並進一步朝戰鬥任務角色發展。為達成各種任務需求，無人飛機之技術研發更為精密、複雜，以下分別就靜態的機體配置與動態的飛行操控兩方面探討：

In recent years, following the R&D in communications technology, refinement in computer and electronics technology, and the miniaturization of a host of intelligence gathering devices, not only many of the previous technological hurdles have been surpassed but the development of the "Unmanned aircraft" has increasingly matured, allowing the adoption of unmanned aircraft to be not only kinds of fancy, but making it feasible that the unmanned aircraft will soon be adopted in national defense, maritime patrol or even private transport in the foreseeable future.

With Executive Yuan moving to induct a uniformed policy for government aircrafts in 2004 and Administration's current aerial surveillance duties having been executed with helicopters deployed by National Airborne Service Corps., Ministry of Interior, it remains quite feasible taken into account the practicality and budget conservation by adopting the support of the unmanned aircraft. The article intends to provide an introduction to the state of unmanned aircraft adopted by world countries, and further explores the adoption of unmanned aircraft in Taiwan's Coast Guard duties, intended to discern that the key in unmanned aircraft rests not solely on its unmanned feature but rather how best to develop and plan Taiwan's overall Coast Guard duties.

Study of unmanned aerial vehicle

The unmanned aerial vehicle (UAV) can be operated manually or flown automatically, and is equipped with camera, sensor and communication devices that can be used to carry out surveillance mission or gather geographical and ocean monitoring information, bracing toward filling a combative mission role. To achieve a host of mission requirements, the technological R&D of the unmanned aircraft has become more precise and complex; following examines the aircraft by two



一、機體配置精進方面：

- (一) 多功能結構－要能結構性地將天線、各項設備與其子系統等整合於機翼與機身。
- (二) 自動控制－必須具有像由人駕駛飛機之安全與效能，包括光電管理系統、資訊整構控制、飛機狀況預知及自動閃避空撞等。
- (三) 機翼效能－要以活性的流體控制加強空氣動力效能，並以極輕的機身來配合機翼幾何學。
- (四) 重量減輕－採用新的製造概念與方法及金屬或合成材料，設計上減少組件與結構間之接合處等。
- (五) 推進器整合－使氣體結實，並有效率的吸入與排出，以推進飛機，因其體積小故較輕巧並有更多空間攜帶燃料。

二、飛行操控方面：

- (一) 遙控方式－可由地面單位以搖桿控制，也可於機上裝置電腦自動控制程式，以點至點控制自動起飛與降落，失去控制時亦可自動飛回。
- (二) 起降方式－較由人駕駛飛機多樣化，如掃描鷹(ScanEagle)，利用彈射器起飛，並以名為"天鉤"(SkyHook)之專利裝置，使飛機飛向一垂下之繩子，將機翼鉤住而收回，使得輕易於艦艇甲板上起飛、降落，此外尚有以網及降落傘回收。

aspects of fixed layout and fixed flight control,

1. Aircraft structural refinements:

- (1) Multifunction structure - it needs to structurally integrate the antenna, various equipments and subsystems onto the air-plane wings and body.
- (2) Automated control - it needs to be safe and performs like normal manned aircraft, including the electro-optical management system, information streamlined control, plane condition forecast, and auto anti-collision detection and so forth.
- (3) Wing performance - it needs to provide interactive control for stepping up aerodynamic performance, and with a lighter plane body to support of the geometric wingspan.
- (4) Weight reduction - it adopts the latest fabrication concept and methodology and metal or composite material and aims to reduce designed parts and structural seams.
- (5) Integrated propulsion - it compacts the air to allow a more efficient air intake and outtake, used for aircraft propulsion, and its compact size allows more room to carry the fuel.

2. Flight control:

- (1) Means of remote control - it can be controlled by the ground unit through a computer-game-style joystick, or automatically controlled for point-to-point takeoff and landing by installing automated control program on the aircraft, and can be automatically retrieved when losing control.
- (2) Means of takeoff and landing - it is more versatile when compared with manned aircraft such as the ScanEagle which is deployed by a catapult launcher, and use a patented device named as the Skyhook, that steers the plane toward a draping rope to retrieve the plane by hooking up the plane, allowing easy takeoff and landing on vessel deck. Besides



● 掃描鷹 - 降落用之天鉤
The sky hook used by ScanEagle for landing



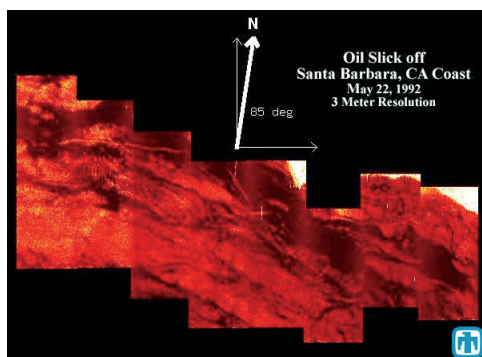
● 掃描鷹 - 起飛之彈射器
The accelerator used by Scan Hawk for takeoff

(三) 飛行能力－無人飛機之飛行能力已不是問題，如美國的太陽能無人飛機赫立鄂斯（Helios）原型機，創造高達96,863呎世界紀錄，可於高空停留數月，另如全球鷹亦可飛越太平洋。

(四) 偵蒐技術－無人飛機可攜帶合成孔徑雷達（synthetic aperture radar）或其他感測器與攝影器。高空巡航勘察廣闊區域，可提供幾近即時的高解析偵察影像。

下圖為以ku-band（頻率）合成孔徑雷達獲得的影像：

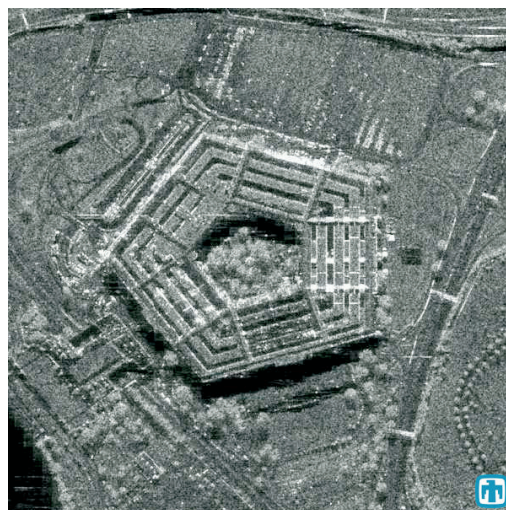
- 加州勝芭拉海面漏油情況
Oil leak off the shore of Santa Barbara, California, USA



some UAVscan also be retrieved using nets and parachute.

- (3) Flight endurance - there is no problem with the unmanned aircraft's flight endurance, such as the U.S. solar-powered unmanned aircraft - the Helios prototype, has created world record of flying 96,863 feet and can linger in space for several months, or how the Global Hawk is capable of crossing the Pacific.
- (4) Surveillance technology - the unmanned aircraft can carry synthetic aperture radar or other sensor and photography devices. High-altitude patrol may have a widespread reconnaissance, and is capable of offering near real-time, high-resolution surveillance imagery.

- 美國華盛頓五角大廈
The Pentagon in Washington D.C., USA



(五) 作業能力－為軍事需要，無人飛機各種作業能力不斷地研究開發，如便利攜帶，可在戰場上短距離偵查，亦可飛進建築物監視，並可加以攻擊等，最近也發展編隊飛行之概念，互相支援，並智慧性地回應突發事件，而整個操作只需一人即可勝任。

(六) 資訊傳遞－管制基地取得無人飛機即時現場視訊，可藉由衛星做跨越地平線的資料鏈結，也可直波電訊傳遞。

- (5) Maneuverability - In support of military needs, the unmanned aircraft's functions are constantly being explored and developed, such as portability, close range reconnaissance on battlefield, and can be flown into a building for surveillance and the ability to launch tactical attack. Recently, the concept of formation flight has been developed for mutual backup and intelligent respond to sudden incidents, while the entire fleet can be manned by only one man.
- (6) Information transmission - Real-time location video signals that the control base pulls from an unmanned air vehicle can be linked up through satellite crossing the horizon, or be transmitted through microwave transmission.

The purpose of the unmanned air vehicle

The unmanned aircraft comes with the advantages of lower building and operating cost, and its weight reduction less the pilot, when compared with a manned aircraft would allow a longer air endurance time than the current surveillance airplane, and the loaded surveillance equipment can be effective round-the-lock, and with no concern of flight

無人飛機之用途

無人飛機擁有造價及操作成本較低廉之

優勢，且重量因省去承載駕駛員而較有人駕駛輕，其滯空時間亦遠較現用空偵機型為優，所裝載之偵蒐設備，具全天候操作能力，更無須顧慮因飛安意外及執行危險地區任務以致人員傷亡之問題。

迄今無人飛機 98% 用於政府與軍事用途，民用與商業方面之使用仍待開發；除軍事用途外，尚包括：執法、消防、搜救、農漁牧觀測、資源研究、地形地貌偵照及監控、氣象觀測及資料蒐集、交通監視與管制、海岸巡防、反走私及偷渡、空中觀測與攝影、新聞報導、災情紀錄、土地測量輔助、商業攝影及臨時電訊傳遞中繼站等。

無人飛機之種類

茲依無人飛機之大小與功能，分為五個等級如下：

一、第一級－微型無人飛機

指長、寬、高以 15 公分為原則之無人飛機，可飛到樹上或建築物上「棲息並監視」，其大小可能與手掌一般大小（如下圖所示），甚至可飛進窗子停在一安全地方進行觀察，惟迄今尚未有軍用的微型無人飛機進入量產。

二、第二級－迷你無人飛機

大小約二公尺左右之小型飛機，可從事短距離飛越山丘之偵察，以發現鄰近的威脅。現在，較新型之迷你型機逐漸開發，如掃描鷹，其續航力與耐力比微型無人飛機大，故各有其適用。

三、第三級－戰術無人飛機

戰術無人飛機擁有更大之裝載容量與耐力，故可執行遠至 200 公里遠之任務，且高度可提昇至數千公尺，但本機型需投資較多時間與裝備，如影子 200 系統（如下圖所示），除有 4 架載具外，尚包括 2 座地面控制站、1 部可攜式地面控制站、1 部液壓發射器、1 套降落系

accident, or personnel casualties for executing duties in hazardous areas.

Up to the present day, 98% of the unmanned air vehicles are allocated in government and military use, and it leaves room for further development in private and commercial adoption. Besides military usage, other areas include law enforcement, fire mission, rescue mission, agricultural, fishery and live stock surveillance, resource study, topographical photography and surveillance, meteorological observation and data gathering, traffic surveillance and control, coastline guard, anti-trafficking and people smuggling, aerial reconnaissance and photography, news coverage, disaster documentation, land survey aid, commercial photography, transmission relay in the event of an interim disruption of telecommunications transmission and so forth.

Groups of unmanned aircraft

To group unmanned aircraft by size and function, it can be divided into five classes as follows:

1. Class I - micro unmanned aircraft

This refers to unmanned aircraft measuring 15cm in length, width and height, and is capable of perching and surveying at treetop or above buildings; the size could be that of a palmtop (see sketch below), and can also be flown into a window sill to conduct reconnaissance, except that there has not been military micro unmanned aircraft being mass produced.



● 微型無人飛機
The micro UAV

2. Class II - mini unmanned aircraft

A small plane measures roughly 2m in length, and is used for cross-mountain range reconnaissance for spotting close-range threats. Currently, newer models of the mini planes are being developed in succession, such as the ScanEagle, which provides additional applications for how it outperforms the micro unmanned aircraft in navigation and endurance.

3. Class III - tactical unmanned aircraft

The unmanned tactical aircraft features a great loading capacity and endurance, and is able to carry out missions as far as 200km away, ascending to an altitude of several thousand meters, if not for the fact that the aircraft model is more timing consuming for equipment loading, such as the Shadow 200 system (show below) is comprised of four sets of carriers but also two ground

統及攔截索設備，且需多達 22 名操作與維修人員。



● Shadow 200 無人飛機
The Shadow 200 UAV

四、第四級－高海拔、長續航力

無人飛機（HALE, high-altitude, long-endurance, HALE）為大型無人飛機，在一至二萬公尺高空長時間巡航勘察廣大區域，提供大範圍幾近即時高解析偵察影像能力，如全球鷹。

五、第五級－無人戰鬥飛（unmanned combat air vehicle, UCAV）

無人戰鬥飛機尚未進入生產階段，大小約等於目前有人駕駛戰鬥機，主要目的是深入敵後，進行危險轟炸任務，可事先設定目標位置，然後起飛、完成任務，再返回基地，全程不需人力介入；惟無人戰鬥飛機無法快速反應，故不會裝配空對空飛彈或槍枝，所以無法進行空戰。

各國發展無人飛機情形

一、美國

美國為目前最主要的無人飛機研發國家，從微型至戰鬥飛機均有，其作業能力也極盡構思所能，在軍事上約有 200 種，多係由美國國防先進研究計劃局主導，未來五年內可能增加至 500 種。美國空軍最近委託阿拉巴馬州麥克斯威爾航空大學進行一項名為「空軍 2025」之研究，主要是預判三十年後之空軍力量如何發展，結果在其認為未來最

control stations, one portable ground surface control station, one hydraulic launcher, one landing system and interception cable equipment, and requires as many as 22 operators and maintenance crews.

4. Class IV - high-altitude, long-endurance unmanned aircraft (HALE)

A large-scale unmanned aircraft that is capable of flying at a 10,000 to 20,000m high altitude to conduct extended surveillance and reconnaissance over an extended area, offering near real-time, high-resolution reconnaissance imagery over a large area, much like the Global Hawk.



● 全球鷹
The Global Hawk

5. Class V - unmanned combat air vehicle (UCAV)

This model of unmanned air vehicle has not yet entered a mass production phase, and its size is comparable to the manned aircraft at the present time, which is designed to infiltrate the enemy's hub and carry out bombing duties, and can be preprogrammed and launched to complete the mission before returning to the base, in a process that requires no human intervention, except that the UCAV cannot respond swiftly and is thus not equipped with any aerial-to-aerial missiles or guns.

The state of UAV development among world countries

1. The U.S.

The U.S. is of a key country focusing on developing unmanned aircraft that ranges from micro to tactical models, and their maneuverability has been highly sought out, where there are over 200 types of military applications, and are largely developed by the U.S. Defense Advanced Research Project Agency, and the number is likely to excel to 500 in the next five years. An Air Force 2025 study that primarily aims to forecast how best to develop the U.S. Air Force in the next three decades has found the most ten crucial systems to include unmanned tactical aircraft and unmanned surveillance airplane, while the U.S. aircraft industry also identifies that the unmanned aircraft would dictate the future of air travel. After the Predator's successfully infiltrated Iraqi air defense bases during the second Persian Gulf War, scoring triumphant performance, the unmanned aircraft has been pushed to an R&D focus status much sought after by world countries.

重要的十項系統中，包含了無人戰鬥飛機以及無人偵察機，美國航空界也咸認為航空的未來在無人飛機。而在掠奪者無人飛機於第二次波灣戰爭期間，成功達成攻擊伊拉克防空陣地的任務，並獲致優異戰果後，無人飛行載具已是各國致力研發的重點。

美國可能於 2010 年即開始部署無人戰機，且該國五角大廈官員亦預期到 2030 年，無人戰機 UCAV 將會主宰空中戰場。特別一提的是，美國正在構思一款體積小、造價低且採用編隊飛行概念之無人飛機，若有一架飛機飛丟，其他飛機則會自動補位，小飛機群亦能在飛行中根據資訊分享而更動任務計畫，智慧性地回應突發事件。此款設計被命名為「SWARM」—取自「可重新設定模組的智慧作戰編隊」(Smart Warfighting Array of Reconfigurable Modules)之縮寫，目前已係美國海軍之重要計畫。此項無人小型飛機，單機造價，預計僅在 2,000 美元之譜，整個 SWARM 機隊的操作只需一人即可勝任，此系統可能轉移予其他政府機關，甚至民間產業，以發展各種用途，如氣象研究、交通管制、監測國界有無非法移民活動、偵察森林火災、以及定位出受困的航海與登山民衆。

二、歐亞

歐洲各國在無人飛機發展多與美國有關，如美國諾斯羅普·格魯門公司製造的“全球鷹”採用歐洲 EADS 公司研製的 ELINT 型電子情報感測器無人平臺，可實施廣域監視任務，其技術與效果可行性於 2003 年在德國 Nordholz 飛行演示通過驗證。兩家公司且討論了未來在“

The U.S. may soon deploy unmanned air vehicles by 2010, and a Pentagon official also predicts that UCAV would soon dominate aerial battleground by 2030. Noteworthy, the U.S. is devising a compact, low cost unmanned air vehicle for formation flight, in which any one aircraft down, another will automatically take its place, and a small aircraft fleet could intelligently respond to any incident by changing the mission plan through information sharing. The model has been named as SWRM, deriving from the acronym of smart war-fighting array of re-configurable modules, which is to a vital project to the U.S. Navy. To build a single unmanned small air vehicle costs around US\$2,000, and the entire SWARM fleet could be manned by a single person; the system is likely to be transferred to other U.S. government agencies, or even the private sector for exploring various usage, such as in meteorological study, traffic control, national border surveillance for illegal migrants, forest fire surveillance, position for trapped ships and hikers.

2. Europe and Asia

The development of unmanned aircraft among the European countries is largely tied to the U.S., such as the Global Eagle fabricated by U.S. Northrop Grumman Corporation has adopted European EADS's Elint unmanned electronic intelligence platform, which is capable of conducting wide area missions, and its technology and performance feasibility has been further proven at Germany's 2003 Nordholz flight drill. The two companies are in talks for a joint venture for producing the European Hawk version of unmanned air vehicle, and Germany's Department of Defense has demanded a European Hawk proposal be submitted in mid 2004, with the first prototype is slated for delivery in mid 2007, pending a mass production contract upon prototype approval. In the meantime, German military is also considering purchasing a derivative of the U.S. Global Hawk model that could be used to retire its Atlantic sea patrol aircraft currently in use.

Israel has been at the forefront of deploying unmanned aircraft. In 1982, Israel has deployed the unmanned aircraft - the Scout to bomb a Syrian air defense missile base in the Becca Valley south to Lebanon, while the Israeli military has long developed yet another unmanned air vehicle - the Harpy, which has been fitted with U.S. Raytheon Company's automatic target recognition system to greatly excel its precision for instantaneous destruction once the target is found sending microwave signals. Israel is also working with the EU in developing a long-range unmanned aircraft - the Gray Hawk. In addition, a micro unmanned air vehicle measuring 15cm in length and weighing a mere 90gram is in development.

Differs from the path taken by the U.S., France focuses on tacti-



歐洲鷹"無人飛機計劃的合作步驟，德國國防部要求在2004年年中提交有關"歐洲鷹"的建議書，計畫中第一架原型機的交付時間在2007年年中，然後批准整批生產合同。同時，德國軍方也考慮採購美國的全球鷹衍生機種，以汰換現役的「大西洋」式海上巡邏機。

以色列在使用無人飛機方面極為積極，1982年以色列以史考特(Scout)無人飛機在黎巴嫩南方貝卡山谷一役大破敘利亞防空飛彈基地，而以色列軍方另發展哈丕Harpy無人載具由來已久，並獲美國雷神公司之自動辨識目標系統而大幅提高精密度，一旦目標發射出電波，即可偵獲並予以摧毀。以色列亦與歐洲聯合開發蒼鷹長程無人飛機，另亦研發一架長15公分重90公克之微型無人飛機。

法國發展的路線與美國不同，將情報與偵蒐擺在次要，而以攻擊方式為發展目標，並以有人飛機與無人飛機聯合作戰，法國達梭公司(Dassault Aviation)已於2000年試飛其Grand Duc原型機，該機重60公斤，寬2.4公尺，另亦發展高海拔長航程，中海拔長航程及戰術型等無人飛機。

英國使用鳳凰(Phoenix)無人飛機擔任聯合國在柯索夫和平部隊監偵任務，該機可飛行4小時，以傘回收，下降時機身會反轉以保護裝於機腹之偵蒐器材。

德國由萊恩梅達防衛電子(RHEINMETALL DEFENCE ELECTRONICS)研發無人飛機，包括柯若(KZO)為一般監偵用，迷克(MUCKE)為干擾敵方電子用，弗列德毛斯(FLEDERMAUS)為輔助電子用，而颱風

cal attack, leaving intelligence and reconnaissance as secondary, and deployed manned and unmanned aircraft in joint combat duties. The French Dassault Aviation has test flown this Grand Duc prototype plant in 2000, which weighs 60 kg, and measures 2.4m in wingspan. In addition, high altitude long-endurance, mid-altitude long-endurance and tactical UAV are currently being developed.

Britain has adopted the unmanned aircraft - the Phoenix, to carry out UN's peacekeeping mission in Kosovo; the aircraft is capable of a four-hour flight time, and can be retrieved using a parachute, and the aircraft invert in descent to protect the reconnaissance equipment mounted on its belly.

In Germany, Rheinmetall Defence Electronics is researching unmanned aircraft, which includes the KZO that is intended for general reconnaissance, the Mucke that is intended for energy electronic infiltration, the Feldermaus that is intended as electronic aid, and the Taifun that is intended as an UCAV, with a flight distance reaching 500 kilometers, and destroys a target upon confirmation.

3. Mainland China

Not far behind the others, the Chinese regime has since 1978 purchased the Mastiff remote aircraft to conduct tests, and further substitutes Mastiff with Scout in 1985. Currently, the Searcher is being operated, which is of a mid-sized unmanned aircraft, measuring 5m in length, 7.4m in wingspan, and is capable of maneuvering over a 100km distance. Sources reveal that the Chinese regime has deployed in Fujian province Israeli made unmanned aircrafts - the Harpy.

The Chinese regime has been research unmanned air vehicles independently, and has sparked many Western manufacturers to compete for the market. With its self-sufficient technology, coupled with outside help, research outfits such as Northwest Industrial University, Beijing Aerospace University, and Nanjing Aerospace University have become R&D hubs for researching unmanned aircraft.

The Chinese regime has also developed a solar-powered unmanned aircraft, named The Green Pioneer, which is designed for high-altitude, long-endurance flights. The Chinese regime has already deployed some of the unmanned aircraft developed to serve military duties, among them are the Chang Hong #1, Chang Kong #1, ASN-104, ASN-206, 207 and B-2 target plane. In addition, Pakistan has deployed the Chinese made ASN-105A and ASN-206 UAV for infringing the borders of India. In addition, the Chinese regime has also developed an aircraft model that resembles to the U.S. Global Hawk, which is on dis-



(TAIFUN) 為戰鬥型無人飛機，其航距可達500公里，發現目標經確認後即可摧毀。

三、中共

中共在無人飛機的發展並不落後，於1978年即購置 Mastiff 遙控飛機進行測試，又1985年以 Scout 取代 Mastiff，而目前使用之搜索者 Searcher，係為中型無人飛機，機長5米，翼長7.4米，有操作100公里之性能。據了解，中共亦於在福建部署以色列製造之 Harpy 無人飛機。

中共早已自立研發無人載具，並引起數個西方製造商積極競爭此市場，而其自製技術亦在外來協助下，以西北工業大學、北京航空航天大學及南京航空航天大學等為主要無人載具研發中心。

中共也發展出名為「綠色先鋒」之太陽能無人飛機，該載具能於高空長期飛行。中共也將已發展出之部分無人飛機量產進入服役，其主要者為長虹一型、長空一型、ASN-104、ASN-206、207及B-2型靶機。另巴基斯坦亦曾使用中共製的ASN-105A型及ASN-206型無人載具入侵印度國界。此外，中共也發展了一型與美國全球鷹類似之機型，在2002年第四屆珠海航空展中展出，稱為WZ-2000A。

四、我國

我國過去靶機多循軍售管道由國外進口，惟近來已由中山科學研究院投入無人載具之研製行列，而民間公司與大學亦有加入研發工作。中科院研發有天隼二型與中翔二號，歸類為戰術型無人飛機；另緯華航太公司與美國ATI及SAIC合作發展Vigilante 502無人垂直起降直昇機，已使用於伊拉克戰場。

此外，台灣大學大氣科學系與中央

play at the fourth Juhai Air Show in 2002, and is named as WZ-2000A.

4. Taiwan

In the past, Taiwan relies on foreign imports in securing its target plans through arms dealers, while the Chung Shan Institute of Science and Technology[°]CSIST[°] has embarked on the rank of researching for unmanned aircraft, while some private companies and universities have also joined in the R&D work. CSIST has developed the Tien Chuen II and Chung Shiao II models, which are classed as unmanned tactical air vehicles. In addition, Wuei Hwa Aerospace Corporation is working with U.S. ATI and SAIC for joint development of a Vigilante 502 unmanned vertical take off and landing helicopter, which has been deployed in the Iraqi war.

Moreover, National Taiwan University school of meteorology and the Central Weather Bureau have since 1998 begun to conduct meteorological studies along the Dongsha, Pintung, and Ilan areas utilizing the Australian AeRA's unmanned aircraft - the Aerosonde. Currently the Central Weather Bureau and NTU have jointly brought in a total of eight unmanned aircraft, with each carrying a building cost of \$900,000.

● 天隼二型
The Tien Chuen II



● 緯華 - Vigilante 502
WH Vigilante 502



● 中翔二號
Chung Shiao II



● 澳洲 AeRA 公司
之 Aerosonde 無人飛機
The Australian AeRA's Aerosonde UAV





氣象局於 1998 年起於東沙島、屏東、宜蘭等地配合澳洲 AeRA 公司運作無人飛機 Aerosonde 從事氣象研究，目前中央氣象局與台大共引進八架無人飛機，平均一架造價為九十萬元。

結論

現今時代科技進步，各國包括中共均已積極研發與運用無人飛機，本署對無人飛機的運用，時不宜遲，其原因並非僅在趕上時代，而係經由上述對無人飛機各種功能之介紹，可知必須使用無人飛機，才可運用科技，節省人力，節省預算，並可發揮更大的勤務效能。

未來將再提出本署海域運用無人飛機相關規劃建議，並詳述美國深水計畫對航空器之運用內容，以供同仁參考。

最後，期望數年後，可見到本署無人飛機在海域忠實地執行監控任務，為海巡延伸雙眼，隨時掌握 548,898 平方公里的廣大海域！（本文作者任職於海巡署空中偵巡隊）

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Conclusion

With progressing modern technology, as world countries including the Chinese regime are rushing to develop unmanned aircraft, it is prudent for the Administration to seize the timing in its efforts to adopt the unmanned aircraft, for it is more than catching up with the current trend, but the foresaid analogy on various functions of the unmanned aircraft also suggests that the adoption of unmanned aircraft not only serves to conserve manpower and budgets through technological adoption but also helps to further excel mission performance.

In the future, relevant development recommendation pertaining to the Coast Guard Administration's deploying unmanned aircraft will be presented again, with detailed description made to cover the content of the aircraft adoption by the U.S. Deepwater project, intended as references to all administration associates.

Lastly, looking ahead to a few years from now, it is conceivable that the Administration's unmanned aircraft will be deployed to truthfully carry out surveillance patrol missions, serving as the eye for the Coast Guard grasping Taiwan's immense sea territories covering some 548,888 square kilometers.

(The author is within Air Squad, Coast Guard Administration.)

Source of data:

1. Global Defense magazine, vol.241.
2. Photos derived from:
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