

振興臺灣

核心國防產業

**Bolstering Taiwan's Core
Defense Industries**

新境界文教基金會
國防政策諮詢小組
2014年10月

New Frontier Foundation
Defense Policy Advisory
Committee
October, 2014

國防政策

藍皮書

在彙整執政經驗與學者專家見解，以鼓勵對國防議題的理性深入討論，並作為民主進步黨政見與政策的參考。

國防政策藍皮書第七號報告
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序言

國軍的戰力不僅是部隊目前所擁有的武器裝備，更重要的，是未來研製更先進武器裝備的潛能。不僅軍人擔負著保家衛國的責任，武器裝備研製的設計師與技工也擔負著相同的任務。

國防產業具有國家安全與經濟發展上的重要性。只求外購軍備，臺海軍力失衡的現象縱能有所改善，但十年後還會再度發生。而面臨到產業外移，失業率攀高的經濟困境，國防產業能根流臺灣、創造就業機會，如果有適當的政策輔導與需求經營，就能夠刺激產業的自我升級，開啟全球更大的市場。而國家安全與經濟發展併重，正是民進黨邁向執政過程中的兩大政策主軸，民進黨對於國防產業的重視不言自明。

在此，我代表民進黨再度重申：2016 年民進黨重返執政之後，將會積極強化臺灣自我防衛的能力，努力達成將國防預算恢復到 GDP 3% 的水準。新增的國防預算，大部分將用於振興國內國防產業上，目標在提高武器裝備的自我研製能力。我將極盡所能讓國軍擁有財政條件許可下最優良的武器裝備，我將用盡辦法讓國防產業在台灣這塊土地上成長並且茁壯。

振興國防產業將是民進黨推動臺灣特色軍事事務革命的切入點，除了心態上的全面調整與制度上的翻修外，為刺激三項核心國防產業，我在此提出「二個決心，五項準備」來啟動國防產業的發展。

Foreword

It is not only the weapons and equipment our national armed forces currently possess that constitute their capability. Even more important is the potential to develop and produce ever more advanced armaments. Just as service members shoulder the responsibility of defending the homeland, the designers and technicians who produce their weaponry must also share in their mission.

The domestic defense industry holds important implications for both national security as well as economic development. While it is still possible to address the growing gap in Taiwan's defense capabilities exclusively via foreign procurement, the same gap phenomenon will reoccur in ten years. Meanwhile, facing an environment of economic constraint in which the manufacturing sector continues to move abroad and unemployment rates climb, a domestic defense industry rooted in Taiwan with the appropriate guiding policies and management of demand can create job opportunities, stimulate industrial upgrading, and open up access to an even bigger market globally. As the equal prioritization of national security with economic development forms one of the major planks of the DPP's road back to government, the importance with which the DPP views the development of the domestic defense industry goes without saying.

Therefore, I reaffirm on behalf of the DPP that if the DPP returns to government in 2016, it will proactively seek to strengthen Taiwan's self-reliance in national defense and work tirelessly to restore the defense budget to 3% of national GDP. A significant portion of the increased budget allocation will be devoted to the task of reviving the domestic defense industry, with the goal of elevating Taiwan's capacity to produce our own defensive equipment and weaponry. I will do my utmost to maximize the available resources allocated to national defense and provide the highest quality equipment to our armed forces, and I will spare no effort to cultivate a thriving defense industry on home soil.

Revitalizing the defense industry is the entry point for the "revolution of military affairs with Taiwanese characteristics" advocated by the DPP. In addition to underscoring the need for a total change of mentality and structural overhaul, and in order to stimulate three core sectors of the domestic defense industry, I hereby announce the "two resolutions and five preparations" to initiate the development of the defense industry.

第一個決心：自我研製潛艦、下一代戰機的決心不會動搖。

第二個決心：營造開放競爭的產業環境，推動國防產業升級的決心不會改變。

我們歡迎也需要透過國際合作來達成此一長期計畫，我們認為透過跨國產業合作能夠更為強化臺灣與友邦間雙邊的安全夥伴關係。

國防自主需要龐大的資源，需要舉國之力來達成，需要跨部會與軍民間的充分合作，在 2016 年前，民進黨有五項需要事先準備的工作，應當先行。

第一項準備：透過立法院民進黨黨團啟動相關的立、修法，以落實國防自主精神。

第二項準備：充分向各友邦說明跨國產業合作的必要性，智庫國防小組應持續進行此一合作模式的研究。

第三項準備：本黨各涉外人員應主動協助國內國防產業與全球連結，為後續的跨國產業合作先行對話討論。

第四項準備：推動國防部制度改革，以期有效經營需求、善用資源，智庫國防小組應持續相關的研究。

第五項準備：民進黨不可辜負民眾的期待，要多傾聽各種不同的聲音，以求政策規劃的完善。在振興臺灣國防戰力與國防產業議題上，黨部同仁與智庫先進要擺脫藍綠，多營造與產官學界的連結，走進工廠、試驗室、營區與校園。

Resolution No. 1: Our determination to indigenously design and produce submarines and new generation fighter jet will not waver;

Resolution No. 2: Our commitment to building an open and competitive market in order to engineer the upgrade of our defense industry will not change.

We welcome, and indeed need, international cooperation to materialize this long-term project. We believe that transnational industrial cooperation will serve to strengthen the bilateral security partnership with our friendly countries.

A self-reliant defense calls for tremendous resources that will require a nationwide effort to accomplish, as well as full interagency and civil-military cooperation. The DPP for its part faces five preparatory tasks that we must undertake prior to 2016:

First, the DPP Legislative Caucus must lead the way to legislate or amend the laws necessary to support the self-reliance in national defense;

Second, we must actively communicate the necessity of transnational industrial cooperation with our friendly countries and security partners. The Defense Committee will also continue to study the optimal models for the future cooperation.

Third, DPP personnel should be proactive in seeking out opportunities to expand the global connections of Taiwan's domestic defense industries and to lay the groundwork of dialogue and communication for future international industrial cooperation.

Fourth, the Defense Committee will continue to study how to promote institutional reform of the Ministry of National Defense to improve the efficient use of resources and implement effective management procedures.

Fifth, the DPP must not betray public expectations, and must listen to different viewpoints from across the whole spectrum of voices to formulate an optimal and comprehensive policy. On the matter of bolstering Taiwan's national defense capabilities and defense industry, my illustrious colleagues in the DPP and the think tank must rise above the blue-green divide, for we will need to forge as many linkages as possible between the government, private sector, and academic realms, and to facilitate interflow between the factories, laboratories, business parks, and campuses.

過去，國防自主總是只聞樓梯響；而今天，我們的決心與準備，將自信與勇敢地與臺灣共同跨出這歷史重要的一步。

蔡英文

新境界文教基金會 董事長

The concept of self-reliance in national defense has been largely limited to words unaccompanied by actions in the past. Our resolutions and preparations will help to propel Taiwan toward this historic step with confidence and courage.

Ing-Wen Tsai

President, New Frontier Foundation

摘要

民主進步黨智庫新境界文教基金會國防政策諮詢小組(以下簡稱國防小組)建議民進黨：未來推動國防改革，強化臺灣自我防衛能力，應以振興國防自主產業為起點與主軸，民進黨要作為能保障臺灣國家安全與提振經濟發展的政黨，一定須自許成為國防產業帶動國防建設的支點。

因此，於邁向 2016 年重返執政之政策準備過程中，在蘇貞昌、蔡英文前後兩任主席的指示下，國防小組針對我國國防產業發展願景進行研究，並廣徵意見、開拓連結，找出當前國防產業發展之瓶頸，以擘劃未來重返執政後國防產業發展之願景。

研究中指出：第一個瓶頸在於：國安高層急功近利的心態，未能體認國防自主才是國軍戰力的根本，擴大跨國產業合作才能建立全面性的安全夥伴關係。第二個瓶頸在於：國軍建軍觀念與流程不利於落實「國防法」第二十二條國防自主的精神，缺乏自我研製為先的制度設計。第三個瓶頸在產業界，國際連結與技術水準有待自我提昇。

針對這些瓶頸，國防小組建議：民進黨應於重返執政後，堅定國防自主的路線，並在執政準備過程中完成相關的政策準備。以利於執政後，迅速帶動國防改革，擴大國防部在國防產業發展中的角色，以完整的規劃，從需求面帶頭，以產業規範確保國家安全與軍品品質，支持協助產業透過國際合作進行升級，並鼓勵投資以提高自製率與提供國軍優質武器裝備。國防部在過程中必須同時善盡規劃者、使用者、支持者、規範者與投資者的多重角色，以在即將到來的第三代兵力整建過程中，振興國內國防產業，以免重蹈軍備死結。

民進黨一再宣示於執政後將儘速恢復國防預算至 GDP 3% 的水準，國防小組建議：基於提振國內國防產業的需要，新增之國防預算應以 70% 用於軍事投資項，以創造需求方式，帶動後續產業發展，並以 2020 年起保持自主研製比例不低於軍事投資總額 60% 為目標。

Summary

The Defense Committee finds that bolstering an indigenous defense industry must form one of the key planks of the DPP's efforts to promote national defense reform and strengthen Taiwan's self-defense capability. For the DPP to stand for safeguarding national security as well as furthering economic development, it must act as a pivot supporting for the industry to drive the building up of the national defense.

Thus, in the process of working toward a return to government in 2016 and under the direction of both former chair Su Tseng-chang and current chair Tsai Ing-wen, the Defense Committee undertakes a thorough examination of the current prospects for developing an indigenous defense industry, drawing on wide-ranging expertise and forging new linkages to identify the existing bottlenecks to industry development, and to formulate a defense industry vision for a new DPP administration.

Our research revealed that the first bottleneck resides in the shortsighted mentality and desire for quick, visible success at the highest decision making levels, which prevents a recognition that self-reliance is the foundation of true defense readiness and that building comprehensive security partnerships requires expanding international industrial cooperation. The second bottleneck is that the existing concepts and procedures for force planning are not conducive to implementing the spirit of Art. 22 of the National Defense Act regarding defense self-reliance, as the institutional design do not prioritize indigenous production. The third bottleneck is the current technological gap between the domestic industry and international standards which will need to be addressed.

With regard to these bottlenecks, the Defense Committee recommends that a DPP administration should resolutely insist on self-reliant defense, and should begin undertaking the necessary preparations as part of the process of returning to government. Upon taking office, it must move swiftly to implement defense reform, including giving the MND a leading role in the development of the indigenous defense industry. This reform should be based on a comprehensive strategy that is demand-driven, in compliance with industry quality standards to ensure readiness, and focused on supporting and assisting the upgrading of technological standards through international cooperation, as well as incentivizing investment toward elevating the proportion of high-quality and indigenously-produced equipment in service. The MND will need to take on multiple roles as planner, user, supporter, regulator, and investor, in order revitalize the indigenous defense industry, and to avoid replicating the same dead knot of arms procurement, in the process of ushering in the imminent third generation military force reconstruction.

The DPP reaffirms to increase the defense budget to GDP 3% level. Additionally, the Defense Committee recommends that to meet the needs for revitalizing the defense industry, 70% percent of the new budget increase must be devoted toward military investment items, to stimulate the industry development by creating stable demand. The goal is that by the year 2020, expenditures going toward domestic production should reach no less than 60% of total military investment.

許多工作，民進黨現在就可以作。國防小組建議：建議民進黨立法院黨團可立即啟動以落實國防自主、建立廉潔聰明的採購程序與打造公開具競爭性市場為主軸的相關立（修）法工程，為發展自主國防產業先行建立法律基礎。國防小組也建議：民進黨在 2016 年前可協助並促成國內外國防產業界的互動與對話，為日後的跨國產業合作的模式先行討論。

在此一研究中，國防小組針對三項國防核心產業——航太製造業、船舶製造業與資安產業——分別提出發展策略。

在航太產業方面，高級教練機以自我研製為優先，啟動短場或垂直起降戰機之研製，將有助於航太產業龍頭漢翔公司在穩定的需求下尋求技術突破。國防部須營造無人飛行載具的高競爭性市場，一方面保持多款軍用無人飛行載具的科技水準，另一方面促進更多廠商或研究團隊投入研發，活絡整體無人機市場。

在船舶產業方面，堅定潛艦國造的路線，以促成跨國國際合作來協助廠商在研發與產製水準上的升級。支持海軍水面艦更新計畫，並啟動無人水面艦與無人水下載具的研發。國防部應善盡需求經營之責，透過競爭性的市場，鼓勵更多廠商自我升級以技術競爭博得應有的利潤，除提昇海軍戰力，也提昇國內造艦產業技術水準，開啟進入國際市場的大門。

在資安產業方面，基於產業特色，應置重點為引進民間研發能量提高國軍資安戰力，再藉資安戰力的轉為民用，開啟另一波的研發循環。關鍵點在於：如何有效吸引民間資安能量轉為軍用。其發展策略循：以發掘人才為先，再鼓勵中小型資安產業投入國防市場，最後進行關鍵技術研發等三階段循序前進。■

Meanwhile, there are many tasks that the DPP can begin tackling even now. The Defense Committee recommends that the DPP Legislative Caucus immediately initiate the requisite legislation or amendments to existing laws to achieve national defense self-reliance, including establishing a clean and smart procurement process centered on the principle of an open and competitive market mechanism, thus laying the foundation for a legal framework for self-reliant national defense. The Defense Committee also advises that prior to 2016, the DPP should endeavor to forge connections and dialogue between domestic and international defense industries, to facilitate preparatory discussions toward a model for future international industrial cooperation.

The Defense Committee proposes the following specific strategies for developing the three core defense industries: aerospace, shipbuilding, and information security.

In the aerospace industry, we must commit to the path of indigenous design and manufacture trainer jets and V/STOL fighter jets, in hopes that, with a steady and predictable level of demand, industry leader AIDC will be capable of achieving technological breakthroughs over time. The MND must also create a highly competitive market for UAV, which on the one hand would lead to a high technological standard for a variety of UAV with a broad range of different functions and features, while on the other hand will incentivize more manufacturers or research organizations to get involved in R&D, invigorating the whole UAV sector.

In the shipbuilding industry, we must stay the course toward indigenous construction of submarines, leveraging international industrial cooperation to elevate domestic R&D and production standards. To support the Navy's surface vessels upgrade plan while stimulating R&D relating to UUV, the MND must fulfill its role as demand manager, using a competitive market mechanism to encourage manufacturers to raise their own standards, and thereby reap greater profit margins based on their competitive technologies. In addition to improving naval capabilities, this would also raise the standard of the entire domestic shipbuilding industry, opening up the possibility of access to the global market.

As for the information security sector, in consideration of the unique characteristics of the industry, the focus should be on introducing the capacity already currently available in the civilian sector spin-on military applications, then releasing military IO technologies spin-off to commercial market, and initiating a new round of R&D. The key determinant might be how to effectively attract, identify, and recruit IO talent, followed by encouraging SMEs to enter the defense security market, and, lastly, proceed to the R&D of critical IO technologies. ■

壹、臺灣國防轉型的起點：自主國防產業

民主進步黨智庫新境界文教基金會國防政策諮詢小組(以下簡稱國防小組)屢屢建議：基於國家整體層面因素(整體財政吃緊、產業升級需求、製造業發展、擴大國內就業機會)與國家安全層面因素(兩岸戰力逐漸失衡、先進武器裝備外購困難與不確定、新興網路威脅型態)等考量，未來臺灣國防改革與戰力提昇應以振興國內自主產業為起點。提出：在國防研發人才資源尚未流失殆盡、產製所需基礎設施尚稱可用、國際產業合作仍屬可為的現況下，民進黨應下定決心，於未來執政後全力投入於振興國防自主產業。

這些建議受到民進黨的重視。在國防小組歷來國防政策藍皮書的發展中均受到相當的關注，例如：在《國防政策藍皮書第一號報告：民進黨的國防議題》(2013年6月公布)，前主席蘇貞昌將「厚植自主國防產業基礎」列為民進黨執政準備過程中第三項重大國防議題(僅次於第一項「重塑軍人尊嚴與榮譽」與第二項「立即增加國防預算」)，提出：

全力落實國防建軍與經濟發展相互結合，只有在觀念與作法上把國防支出當作是可增值的投資去經營，才能將國防與經濟發展之資源競爭的關係轉化成相輔相成的關係。無經濟即無國防，必須以經濟建構國防，以國防支援經濟。扶植民間產業投入國防武器裝備的研發與產製，鼓勵外商與國內業界合作，並置重點於下一代戰機與無人戰鬥載具的研製、潛艦國造、不對稱武器的研製與資訊攻防能量。¹

同一期間，適逢中科院轉型為行政法人之修法在立法院遭遇困難，基於中科院為我國國防研製之重鎮，是國防安全的重要戰略資產，國防小組奉令進行相關研究，並於《國防政策藍皮書第二號報告：中科院轉型與厚實自主國防核心研製能量》提出相關修法的建議：

¹ 民主進步黨新境界文教基金會，《國防政策藍皮書第一號報告：民進黨的國防議題》，(2013年)，頁5。

I. A Self-reliant Defense Industry: The Starting Point of Taiwan's Defense Transformation

The Defense Policy Advisory Committee of the DPP's New Frontier Foundation (hereinafter "Defense Committee") has stated on multiple occasions in the past that reforming Taiwan's national security and raising defense capabilities must begin with the revitalization of the indigenous defense industry. This imperative takes into consideration both national security objectives—such as the growing imbalance in cross-strait military capabilities, the difficulties and uncertainties of procuring advanced equipment from foreign sources, and the nature of emerging new threats—as well as broader national conditions, including across-the-board tightening of resources, as well as the need to upgrade industries, sustain the manufacturing industry and create local job opportunities. The Defense Committee thus strongly recommends that—before the existing human capital for defense research and development is exhausted, as the necessary basic infrastructures and facilities are still serviceable, and while international industrial cooperation remains a possibility—the DPP must fully commit to the revitalization of the domestic defense industry if it returns to government.

This idea has been affirmed by the DPP and developed in the previous volumes of the defense policy blue paper. For example, in *Defense Blue Paper No. 1, DPP Defense Agenda*, released in June, 2013, former DPP Chair Su Tseng-chang cited the strengthening of the indigenous defense industrial base as the third most important priority in the DPP's preparation to return to government (with the first priority being "re-establish soldiers' dignity and honor," and the second, "immediately increase the defense budget"), stating that:

...[T]he combination of defense expenditure and economic development must be fully implemented. The resource competition between defense expenditure and economic development must be changed conceptually and practically into a mutually reciprocal relationship. Defense expenditure must be well-managed as value-added investment in economic development. No economy, no defense: the economy and defense must be mutually reinforcing. We have to foster private industry investment in weapons research and development (R&D), encourage foreign partners to work together with local industries, and put the focus of future R&D on next-generation fighters, unmanned aerial vehicles (UAV), indigenous submarines, asymmetric weapons, and cyber warfare.¹

At the same time, when the legislation required for converting the Chung-shang Institute of Science and Technology (CSIST) into an executive agency met with obstacles in the Legislative Yuan, the paramount importance of the CSIST in the national defense industry led the Defense Committee to undertake an in-depth study of the issue. *Defense Blue Paper No. 2: Transforming the CSIST: Strengthening Indigenous Defense Research and Development* recommended that:

¹ DPP's New Frontier Foundation, *Defense Blue Paper No. 1: DPP Defense Agenda*, (2013), p. 5.

中科院轉型應當藉由人力素質與效能的提升來強化先進武器的自主研製。不過，更形重要的是：中科院轉型為行政法人，將會改變它與國防部之間既有的從屬關係，但兩者不應自此形同陌路。轉型後的中科院仍應有相當層級位階，以能在建軍決策以及國家整體國防產業發展中與國防部建立起緊密的夥伴關係，一個「研用一體」的健全體系。為達成此一目標，中科院不可遺忘初衷，中科院行政法人化後，將軍用科技中可供民用者釋出（spin-off）固然是維持中科院運作之所需，但中科院不應流於與民間產業逐利，而當更聚焦於整合民間產業能量轉而投入（spin-on）國防科技與先進武器研製。為求此一均衡發展，主張：未來國防部投入中科院國防科技研發（不含以量產為主之軍種委託計畫）經費，不得低於國防預算總額百分之三的最低必要比例。同時，也主張：未來中科院的人事與營運固可更具彈性，但國防部仍須有效地將中科院導向能達成其核心任務的方向。¹

過程中，國防小組、民進黨立院黨團除與國防部針對中科院修法保持良性雙向溝通協調外，2013年4月間，蘇前主席在民進黨立院黨團總召集人柯建銘立委、民進黨政策會執行長（現為民進黨秘書長）吳釗燮與國防小組諮詢委員等陪同下，親自與國防部官員進行中科院修法之協調，最後促成「國家中山科學研究院設置條例」之修正通過。此一事例，除彰顯民進黨由上至下對國防與國防自主的重視外，更是本黨力主國防事務應「朝野合作」之「優質、民主的國防治理」的一次重要實踐。在通過條文之中，出於民進黨之倡議與堅持，而由國防部納入而通過修法者，主要有：

國防部對中科院之捐（補）助經費，不低於同年度國防預算總額百分之三。（「國家中山科學研究院設置條例」第五條第二項第一款「以國防部年度國防預算總額百分之三為原則」）；

¹ 民主進步黨新境界文教基金會，《國防政策藍皮書第二號報告：中科院轉型與厚實自主國防核心研製能量》，（2013年），頁1-2。

Competent defense science and technology (S&T) manpower is the backbone for the CSIST to achieve its core missions. The chief goal for this CSIST transformation is to augment the advanced weaponry R&D through upgrading personnel competency and efficiency. Nevertheless, more importantly, existent subordinated relationship between the CSIST and the Ministry of National Defense (MND) will be consequently altered as soon as the former is transformed into an executive agency. But, it would be unwise if this caused the CSIST and the MND to become strangers on the street. The transformed CSIST should maintain a qualified status and build a closer partnership, a healthy reciprocity between operational requirement and S&T potential, with the MND in the process of procurement decision-making and overall defense industrial development. To achieve this goal, the CSIST cannot distract from its established purpose. After transforming into an executive agency, the CSIST will need to spin-off its dual-use technology to commercial market to obtain funding for its operations, but it cannot immerse itself in competing with civilian industries only. What the transformed CSIST should concentrate upon is to integrate S&T potentials from civilian sectors and to spin-on CSIST advanced weaponry R&D. To strike such a balance, we urge that the transformed CSIST S&T budget (excluding the R&D budget for mass production) allocated by the MND should not be decreased below the level of 3% of annual defense budget. Meanwhile, we also urge that, in spite of the increase of the CSIST personnel and operational flexibility, the MND should effectively guide the CSIST to the direction for fulfilling its core national defense missions.¹

Throughout the legislative process, not only did the Defense Committee and the DPP caucus keep up positive two-way communications with the MND about the legislation relating to CSIST transformation, in April, 2013, former DPP Chair Su Tseng-chang also personally met with MND officials to coordinate on the issue, accompanied by caucus convener Ker Chien-ming, Dr. Joseph Wu, then-executive director of DPP's Committee on Policy Research and Coordination (currently DPP Secretary-General), and some Defense Committee advisors. The dialogue ultimately facilitated the passage of amendments to the Act for the Establishment of the National Chung-shan Institute of Science and Technology. This example not only demonstrates the great importance which the DPP accords to the matter of national defense from top to bottom, but also set a major precedent for kind of bipartisan cooperation for "competent democratic defense governance" that the party advocates. Major initiatives proposed by the DPP that were ultimately folded into the MND's draft bill and passed include:

-- MND S&T fund allocations to the CSIST shall not fall below 3% of the total annual defense budget. (Act for the Establishment of the National Chung-shan Institute of Science and Technology, Art. 5, Section 2, Clause 1 – "In principle, 3% of the annual budget for national defense.");

¹ DPP's New Frontier Foundation, *Defense Blue Paper No.2: Transforming the CSIST: Strengthening Indigenous Defense Research and Development*, (2013), pp. 1-3.

中科院之董事長「由國防部部長兼任」(「國家中山科學研究院設置條例」第十條第一項)；

中科院應提出十年國防科技發展構想與五年國防研製應用計畫(通過條文中使用「十年期國防科技發展構想與五年期國防科技研究、應用及產製計畫」)，國防部對中科院前項兩規劃有監督權責(「國家中山科學研究院設置條例」第十一條第一項第一款、第二十條第一項第一款)；

國防部應邀請中科院參與相關國防科技研究、應用與產製之各項重大建軍規劃會議，並依建軍構想與兵力整建計畫，頒定各項指導，以利中科院後續研擬提出十年期國防科技發展構想、五年期國防科技應用研製計畫以及年度營運計畫與預算(通過條文為：「國防部應要求本院參加與國防科技研究、應用與產製作業相關之重大建軍規劃會議，並得視建軍構想與兵力整建計畫之規劃情形，頒布國防科技發展之指導」)。

2014年3月，在《國防政策藍皮書第五號報告：二〇二五年中國對台軍事威脅評估》國防小組特別強調中國軍事科技研發所帶動的戰力世代躍進，呼籲：面對未來險峻的軍事威脅，國人「應當揚棄失敗主義的心態，時間永遠站在願意努力的一方，臺灣有一流的人才與創新的科技研發能力，這些是臺灣國防最根本的能力。」確立以振興國防自主產業帶動國防改革與戰力提昇的基本路線，並自我期許

民主進步黨要成為國防產業帶動國防建設的支點。各國國防建設的實例告訴我們，如果沒有自主的國防產業支持，戰力是假的，沒有發展性的，與經濟發展是零和的。而未來推動「具臺灣特色的國防建設」須務實地掌握未來中國對台軍事威脅的趨勢，以國內各地的實驗室、工廠為起點。¹

¹ 民主進步黨新境界文教基金會，《國防政策藍皮書第五號報告：二〇二五年中國對台軍事威脅評估》，(2014年)，頁3。

-- Defense Minister shall serve as the President of CSIST (Act for the Establishment of the National Chung-shan Institute of Science and Technology, Art. 10, Section 1);

-- The CSIST shall issue a "Ten-Year Defense S&T Development Concept" and a "Five-Year Defense S&T Application Program," while the MND is given authority to supervise the development of these two documents by CSIST (Act for the Establishment of the National Chung-shan Institute of Science and Technology, Art 11, Section 1, Clause 1; and Art. 12, Section 1, Clause 1);

-- The MND should invite the CSIST to participate in major force planning meetings related to defense S&T, S&T application and production. and direct guidelines regarding force planning so that the CSIST can proceed to develop follow-up "Ten-Year Defense S&T Development Concept (TYDS&TDC)," the "Five-Year Defense S&T Application and Production Plan (FYDS&TAPP)," and the annual operational plans and budgets (As stipulated, the MND should demand the CSIST to participate in major force planning meetings related to defense S&T, S&T application and production, and [the MND] should direct guidelines of defense S&T development based on its force buildup concept and force construction plan.)

In *Defense Policy Blue Paper No. 5: China's Military Threats against Taiwan in 2025* published in March 2014, the Defense Committee especially highlighted the fact that Chinese military technology R&D has driven a generation leap in People's Liberation Army capabilities, and cautioned that in order to meet the severe military threats of the future, "we must overcome a defeatism mentality because those who are willing to devote efforts will stand the test of time. Taiwan has the first-class talent and the capability for innovative R&D in science and technology. These are the most fundamental capabilities for Taiwan's national defense." Setting a course for the revitalization of the indigenous defense industry to serve as the main path to Taiwan's defense reform and strengthening defense capabilities,

[t]he DPP wants to be the catalyst in encouraging our indigenous defense industry to bolster our defense capabilities. Drawing on the examples of the defense establishments in other countries, we could say that military capabilities require the support of indigenous defense industries; otherwise, the combat capability is a facade, lacking development potential, and in a zero-sum battle with economic development. In the future, the pursuit of "national defense development with Taiwanese characteristics," should be pragmatic about the trends of China's military threats against Taiwan and will be initiated from the laboratories and factories across the country.¹

¹ DPP's New Frontier Foundation, *Defense Policy Blue Paper No. 5: China's Military Threats against Taiwan in 2025*, (2014), p. 3.

民進黨認真對待國防自主議題，務實面對國內產業現況。為達成「國防法」中對於國防自主之規範（第二十二條第一項：「行政院所屬各機關應依國防政策，結合民間力量，發展國防科技工業，獲得武器裝備，以自製為優先，向外採購時，應落實技術轉移，達成獨立自主之國防建設。」）民進黨自 2012 年後更加積極參與在美國舉辦的「美台國防工業會議」，除當年民進黨與會人數創下歷史最高的紀錄外，每次與會均以推動台美國防產業合作、強化技術移轉與工業合作計畫為主要訴求。民進黨認為：要強化台美間的安全合作關係，除了傳統的軍售議題外，在《國防政策藍皮書第四號報告：開啓臺美國防夥伴關係的新章節》中，更提出互惠的台美國防產業合作關係，將會是未來台美關係新章節中的重要區塊：

基於支撐兩國國防產業基礎，也基於提振臺灣國防產業水準與增加國內就業機會，雙邊互惠的國防產業合作將是我們新章節中的重要部分。我們追求聰明乾淨的武器獲得過程，也鼓勵有效多元的國防產業跨國合作模式。¹

在 2012 至 2014 年間，國防小組的 24 次例會中，涉及國防產業自主發展相關議題的討論多達 10 次，比重約佔 42%。在 12 位諮詢委員中，具國防產業相關背景或經歷者佔 4 位，達三分之一比例。國防小組也在 2013 年間進行了兩次國防相關產業與展示會場的現地觀察。並利用各次外訪機會，向各國政府與產學界表達民進黨在振興臺灣國防產業與推動跨國國防產業合作的態度與立場。

2014 年 6、8 月間，經現任主席蔡英文指示續依既定路線完成國防政策藍皮書研究工作，並擴大既有與產業界之連結；9 月間，智庫執行長林全除支持國防自主發展優先路線，並囑咐以制度改革、有效整合運用資源為先。依規劃，國防小組除已公布之第一至六號報告外，將在 2014 年 9 月至 2015 年 5 月間公布其餘六冊藍皮書，其中與振興我國國防產業有直接或間接關連之藍皮書將計有：

¹ 民主進步黨新境界文教基金會，《國防政策藍皮書第四號報告：開啓臺美國防夥伴關係的新章節》，（2013 年），頁 2。

The DPP takes very seriously the question of self-reliance in national defense while realistically confronting the current conditions of the domestic industry. In effort to achieve the norm for national defense self-reliance set out in Art. 22, Section 1 of the National Defense Act (“Government agencies under the Executive Yuan shall follow national defense policies to consolidate efforts of the private sector to develop defense technology industries. Acquisition of weapon equipment shall firstly consider those built domestically. When it is necessary to pursue outsourcing channels, the acquisition activities shall realize technology transfer policy so as to establish an autonomous national defense infrastructure”), since 2012 the DPP has participated even more actively in the U.S.-Taiwan Defense Industry Conference held annually in the United States. In addition to setting a new record for the number of DPP participants in the conference that year, we have also made promoting U.S.-Taiwan defense industry cooperation and increasing technology transfers through the Industrial Cooperation Program (ICP) as the primary objectives each time we attend the conference. The DPP believes that strengthening the U.S.-Taiwan security cooperation relationship should go beyond the question of traditional arms sales. In *Defense Policy Blue Paper No. 4: New Chapter for Taiwan-U.S. Defense Partnership*, we also stated that

industrial defense cooperation has to be seen as a vital part of the new chapter of the partnership...Such co-operation will support the defense industrial bases in both countries, foster the quality of our defense research and development, and deliver new job opportunities. In essence, we intend to seek smart and clean acquisition operations while furthering efficient and pluralistic patterns for international cooperation of defense industries.¹

In the 24 regular meetings of the Defense Committee held between 2012 and 2014, at least 10 (or 42%) of them have included discussions about the issue of improving the degree of self-reliance of Taiwan's defense industry. Four the 12 advisors of the Defense Committee, or one-third, have background experience in the defense industry. In 2013 the Committee has also undertaken two site visits to related local shipyards and defense exhibit, and took every opportunity of official overseas visits to articulate the DPP's approach to reviving Taiwan's defense industry and cross-border industrial cooperation to the government, contractors, scholars and think tankers from various countries.

Between June and August, 2014, current DPP Chair Tsai Ing-wen authorized the continuation and completion of the defense policy blue papers series, and expanded the existing channels of communication with the industry sector; in September, 2014, New Frontier Foundation CEO Lin Chuan endorsed the development of the indigenous defense industry as a priority, and set institutional reform and resources optimization as the two guiding principles. According to our roadmap plan, in addition to the blue papers #1-6 previously released by the Defense Committee, there will be six more volumes to be published between September 2014 and May 2015. The papers among these with direct or indirect relevance to the question of Taiwan's national defense industry will include

¹ DPP's New Frontier Foundation, *Defense Policy Blue Paper No. 4: New Chapter for Taiwan-U.S. Defense Partnership*, (2013), p. 2.

本次發佈的：

《第七號報告：振興臺灣國防核心產業》（提出國防產業發展願景）；

在 2015 年 5 月前將發佈的：

《第十號報告：新世代的國軍》（「國防前瞻規劃室」、資電作戰指揮部位階提昇兩項倡議的具體規劃，以及前揭兩單位編制、相關硬軟體與人力需求、跨部會與軍民間介面連結之設計）

《第十一號報告：清廉與聰明的軍事採購》（提出機敏軍品研發採購、國防產業認證與規範等相關立法建議）

《第十二號報告：台美國防產業合作新模式》（提出台美國防產業合作研發產製模式，協助臺灣國防產業進入全球供應鏈等建議）

在十二冊國防政策藍皮書任務達成後，其中與振興我國國防自主產業有直接或間接關連者將達到八冊，佔總數三分之二。這些國防政策藍皮書中的政策建議，將供民進黨未來研擬國防政策白皮書與總統候選人提出國防政見時的參考。

貳、國防產業發展的三個瓶頸

國防資源得之不易，當思有效運用，近年來臺灣財政吃緊，如圖一所示，國防支出與經濟發展、社會福利已生排擠效應，若軍事投資成爲純「消費性」之武器裝備外購，自難爲社會大眾所認同。爲解決此一零和現象，軍備之獲得更必須要以具增值潛能（增加就業機會、產業升級機會、進入全球市場機會）的「投資」來加以經營。如果國防部不能達成此一期待，不僅浪費人民稅金，民眾也難支持增加國防預算。而要達成此一期待，國防部須擴大其角色與任務，承擔更多振興國內國防產業的責任，將自主研製產能視爲戰力的一部份。

在提出國防產業願景之前，以往，我國國防產業發展過程中有三個瓶頸，分別在國安決策高層、國防部與產業界等三個層面。這三個瓶頸涉及觀念或制度上的問題，如果沒有改變，國防產業將無法突破。

-- The current volume, *Defense Policy Blue Paper No. 7: Bolstering Taiwan's Core Defense Industries*, which will describe the vision for developing the indigenous defense industry and outline the core sub-sectors to be developed; and

Volumes to be released by May 2015:

-- *Defense Policy Blue Paper No. 10: Taiwan's Armed Forces After Next*, which will propose the establishment of: the Advanced Defense Program Office and the elevation status of Information and Electronic Warfare Command, along with these two units' related organizational, software and human capital requirements, as well as a design for inter-agency and military-civilian interface;

-- *Defense Policy Blue Paper No. 11: Clean and Smart Procurement*, with recommendations for ensuring prudence in military procurement, industry certification, and related statutes and regulations; and

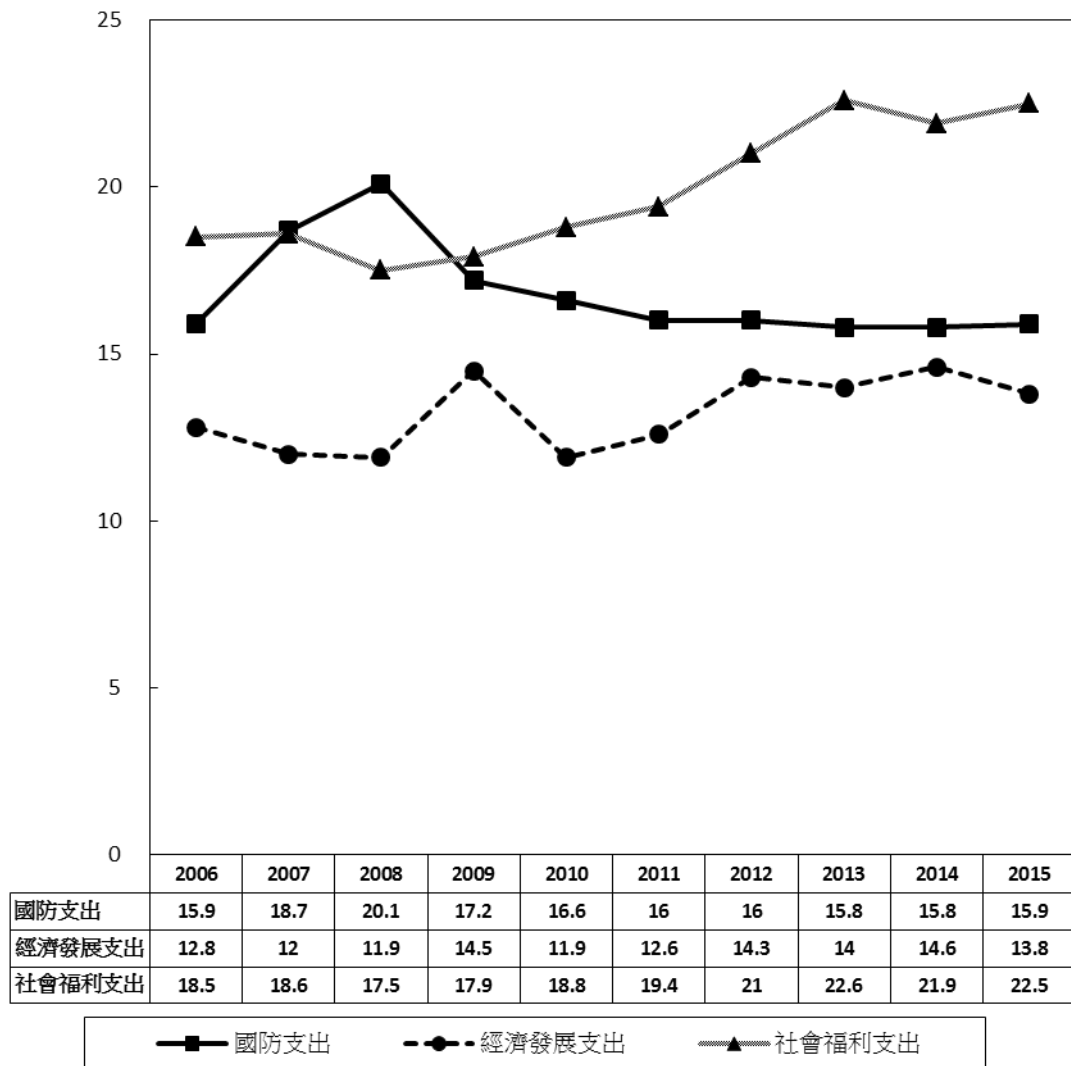
-- *Defense Policy Blue Paper No. 12: New Model for Taiwan-U.S. Defense Industrial Cooperation*, discussing models for Taiwan-U.S. defense industry R&D and production cooperation, and bringing Taiwan's defense industry into the global supply chain.

Once the release of the 12 defense policy blue papers is completed, eight of the 12, or two-thirds, will either directly or indirectly touch upon the issue of Taiwan's defense industry. The policy recommendations contained in these papers will form the DPP's defense policy white paper and an important reference for the defense policy platform of the party's presidential candidate.

II. Three Bottlenecks of Taiwan's Defense Industry Development

In times of constrained defense resources, efficiency matters. Due to fiscal tightening in recent years, economic development and social welfare spending have crowded out defense (see FIGURE 1). It would naturally be difficult to garner the general public's approval if our military investment becomes nothing but "consumption" of foreign arms procurements. The solution to this zero-sum situation is to turn defense acquisition into value-added investments, such as increasing jobs opportunities, industrial upgrades, and global market access. It would be a waste of taxpayers' money and difficult to garner the public's support for defense budget increases, if the MND cannot meet these expectations. To satisfy expectations, the MND needs to expand its roles and mission, shoulder more responsibilities to bolster indigenous defense industries, and see a self-reliant defense R&D capacity as part of military readiness.

Before depicting a vision for our indigenous defense industry development, we should point out three bottlenecks in the process of our defense industry development: from the national security top decision maker, the MND, and the industry sector. The development of Taiwan's defense industry cannot make a breakthrough without tackling these three conceptual and institutional bottlenecks.



圖一：國防、經發與社福支出佔中央政府歲出預算百分比

「國防自主最大的障礙，」如同立法委員蕭美琴所說：「就是領導者的意志！」在國安決策高層層面，對外軍購案常被誇大地解讀為是臺灣與友邦安全合作關係的唯一指標，以致常急功近利，在心態上以對外獲得為優先選項，以軍購總額炫耀臺灣與友邦的安全合作關係穩固。在這樣的態度下，自主研製或成為爭取友邦供售軍備的籌碼，或在談判過程中被輕易犧牲。

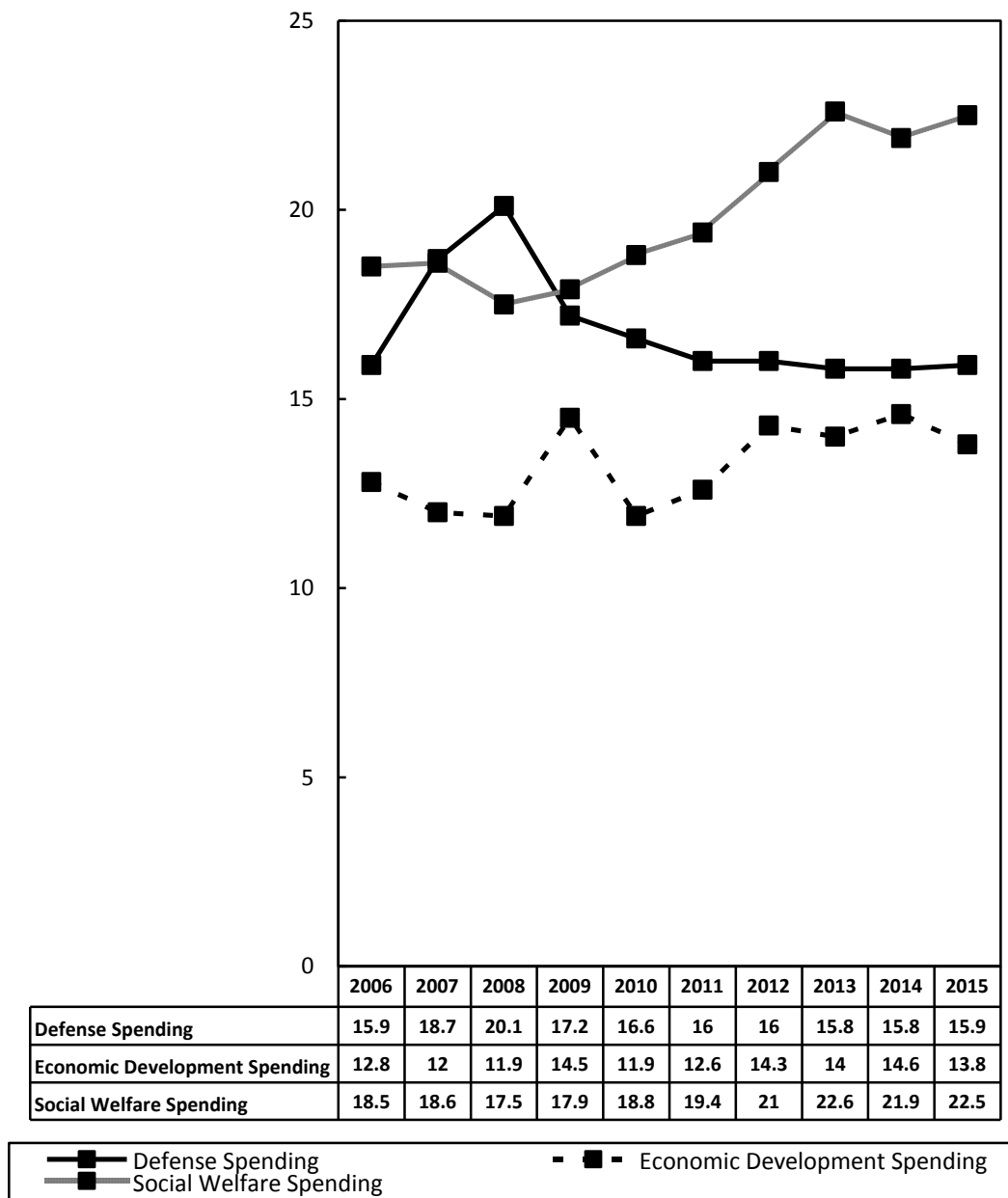


Figure 1: The Percentage of Defense, Economic Development and Social Welfare Spending in the Central Government's Annual Budget

“The biggest obstacle in self-reliant defense,” as Legislator Hsiao Bi-khim stated in 2013, “is the leader’s will.” The national security top decision maker often overstated arms procurement as the only indicator of security cooperation relations between Taiwan and its friendly countries. This urge for quick success and fast returns leads to conspicuous consumption of weaponry as a top priority to publicly display a seemingly strong security cooperation relationship with our friendly countries. Under this mentality, indigenous defense industry development is regarded as a bargaining chip in exchange for arms sales, or is easily sacrificed during the negotiation processes.

事實上，軍購不是與友邦安全合作關係的唯一指標。透過外購取得武器裝備也未必是對帶動雙邊關係進展的最佳方案。軍售案固可促進臺灣與友邦間軍方對軍方間的互動關係，但透過技術轉移、合作研

軍售案固可促進臺灣與友邦間軍對軍互動關係，但透過技術轉移、合作研製、資本投資、垂直分工等雙邊產業合作，在提昇臺灣國防自主研製能量的同時，更可以創造臺灣與友邦的安全合作全面深化的契機

製、資本投資或垂直分工等產業合作，在提昇臺灣國防自主研製能量的同時，更可以創造臺灣與友邦的安全合作全面深化的契機。更何況武器裝備供應廠商除有商業獲益考量外，供應國基於自身的國家利益考量，未必願意提供臺灣所須武器

裝備。因此，臺灣應當追求國防自主，與友邦建立全面性的國防產業合作夥伴關係，由國防產業的互動與合作，厚實兩國密切的安全與經濟合作關係。而非一味依賴友邦供售，反而讓友邦質疑臺灣自我防衛的決心。

而且，隨著中國崛起後，中國挾其經濟力處處杯葛我對外採購，造成外購越來越難，友邦基於自身利益考量，未必能及時供應臺灣所提的軍備需求，以戰機外購為例，如表一所示，臺灣比起南韓晚了將近十年取得 F-16 A/B，南韓的 F-16 C/D 早在 1986 年服役，但臺灣迄今尚未獲得美方同意供售同型機。臺灣比新加坡空軍早十餘年引進 F-5，但新加坡獲得 F-16 A/B 卻比臺灣早了近十年，現在的新加坡空軍擁有 F-16 C/D 與 F-15 SG 戰鬥機。換言之，在戰機水準上，本在 1950 年代落後於臺灣的日本、南韓與新加坡，現在反而超越臺灣。

In fact, arms procurement is not the only indicator of security cooperation success, nor is it the best way to improve bilateral relationships. Though arms sales cases can increase mil-to-mil exchanges, it is bilateral cooperation such as technology transfer, capital investment, joint R&D and vertical industrial division that creates opportunities for

Though arms sales cases can increase mil-to-mil exchanges, it is bilateral cooperation such as technology transfer, capital investment, joint R&D and vertical industrial division that creates opportunities for deepening the security cooperation relationship while promoting Taiwan's capacities of indigenous defense research and production

deepening the security cooperation relationship while promoting Taiwan's capacities of indigenous defense research and production. The arms suppliers may not only have commercial profit considerations in mind, but also have national interests concerns when they are unwilling to provide the arms that Taiwan needs timely. Taiwan should pursue a self-reliant defense and seek to establish a comprehensive defense industrial partnership with its friendly countries.

Over dependence on arms sales would only leave our friendly countries in doubt about Taiwan's self-defense resolve.

Furthermore, arms acquisitions from abroad will only become increasingly difficult as China rises, with China's leveraging its economic power to bar our arms procurements. Friendly countries might not necessarily be able to provide Taiwan what it needs in time, considering their own national interests. Take the fighter jets for example, as TABLE 1 shows, Taiwan was nearly 10 years behind South Korea in acquiring F-16 A/Bs. South Korea commissioned its F-16 C/Ds in 1986, while Taiwan has not been sold the same type of aircraft by the United States. Taiwan introduced F-5s more than a decade earlier than the Republic of Singapore Air Force (RSAF), but Singapore acquired F-16 A/Bs nearly a decade before Taiwan. The RSAF currently owns both F-16 C/Ds and F-15 SGs. In the other words, countries that lagged behind Taiwan in the 1950s, such as Japan, South Korea, and Singapore, are now at least 10 years more advanced than Taiwan.

表一：我軍引進美製戰機的時間差距比較

機型	各款美製主要戰機機型在美國與其他亞太國家服役時間點				
	美國	我國	日本	南韓	新加坡
F-86	1949	1954	1955	1955	尚未獨立
F-100	1954	1958	未引進	未引進	
F-104	1958	1960	1962	未引進	
F-4	1960	未引進	1968	1969	
F-5	1962*	1965	未引進	1965	1979
F-15	1974	未引進	1981**	2005**	2011**
F-16	1979*** 1984****	1998***	未引進	1989*** 1986****	1988*** 1998****

說明：

*為僅用於假想敵中隊，未列入一線主力作戰機種

**為使用該型機衍生款如 F-15 J（日本）、F-15 K（南韓）、F-15 SG（新加坡）

為 F-16 A/B *為 F-16 C/D

造成臺灣主力戰機獲得落後的現象，除了美方有其國家利益考量外，我政府一向缺乏國防自主的決心也難逃其咎。新加坡的空軍成軍比臺灣晚，但新加坡的軍用航空產業（與其他國防相關產業）卻從零逆轉勝過臺灣。當漢翔公司在 IDF 戰機研製後幾無軍方訂單，研發人才因無從發揮而一批批被南韓挖角之際，新加坡在 2004 年宣布參與美國先進 F-35 戰機國際研製計畫，成為第十個研發夥伴國家。在全球前百大國防產業公司中，新加坡廠商有三家入榜。在歐洲，西班牙的國防產業本不起眼，但在 1980 年代，政府大量投資國防科技研發並善用 F/A-18 戰機購案的工業合作機會，到了 1990 年代，西班牙已經從軍事採購的需求方轉變為歐洲跨國廠商共同研發 Typhoon 戰機的合作夥伴。這兩個案例告訴我們：如果政府不痛下決心，堅持國防自主路線，不僅將越為依賴只會更難獲得的外購，臺灣要與友邦建立在國防上真正的合作夥伴關係實緣木求魚。

我國國防產業發展的第二個瓶頸在於國防部，可分為觀念面與制度面兩個層面。

TABLE 1: Time Comparison for the Introduction of American Fighter Jets

Jet type	Year American Fighter Jets Were in Active Service in the US and Other Asian Countries				
	USA	Taiwan	Japan	South Korea	Singapore
F-86	1949	1954	1955	1955	Not yet independent
F-100	1954	1958	Not introduced	Not introduced	
F-104	1958	1960	1962	Not introduced	
F-4	1960	Not introduced	1968	1969	
F-5	1962*	1965	Not introduced	1965	1979
F-15	1974	Not introduced	1981**	2005**	2011**
F-16	1979*** 1984****	1998***	Not introduced	1989*** 1986****	1988*** 1998****

Note:

* aggressor/adversary squadron, not enlisted as the main force, front-line fighter.

** variants like F-15 J in Japan, F-15 K in South Korea, and F-15 SG in Singapore

*** F-16 A/B **** F-16 C/D

Besides U.S. national interest concerns, the government of Taiwan's lack of resolve regarding self-reliant defense is also to blame for the looming Taiwan fighter gap. Even though the RSAF was established later than Taiwan, Singapore's military aviation industry (and other defense related industries) has turned around from scratch. At the time, Taiwan's Indigenous Defense Fighter (IDF), designed and built by the state-owned Aerospace Industrial Development Corporation (AIDC), was suffering from a lack of interest by the military, and subsequently headhunters siphoned off talented Taiwanese R&D experts for South Korea. Meanwhile, Singapore joined the American F-35 program in 2004 as the 10th international cooperation participant. Three of Singapore's arms producers were ranked among the world's top-100 companies in the defense industry. In Europe, the defense industry in Spain was hardly significant. But since the 1980s when the Spanish government started to invest heavily in defense technology R&D and seized the opportunity of ICP through F/A-18 fighter jet contract, Spain, in the 1990s, has transformed itself from an arms buyer to partner in a multinational collaborative effort to develop the Eurofighter TYPHOON. These two cases tell us: if our government cannot make up its mind to assert a path to a self-reliant defense, it will be harder to acquire arms because of its growing dependence on foreign arms sales, and Taiwan will be less likely to establish a credible defense partnership with its friendly countries.

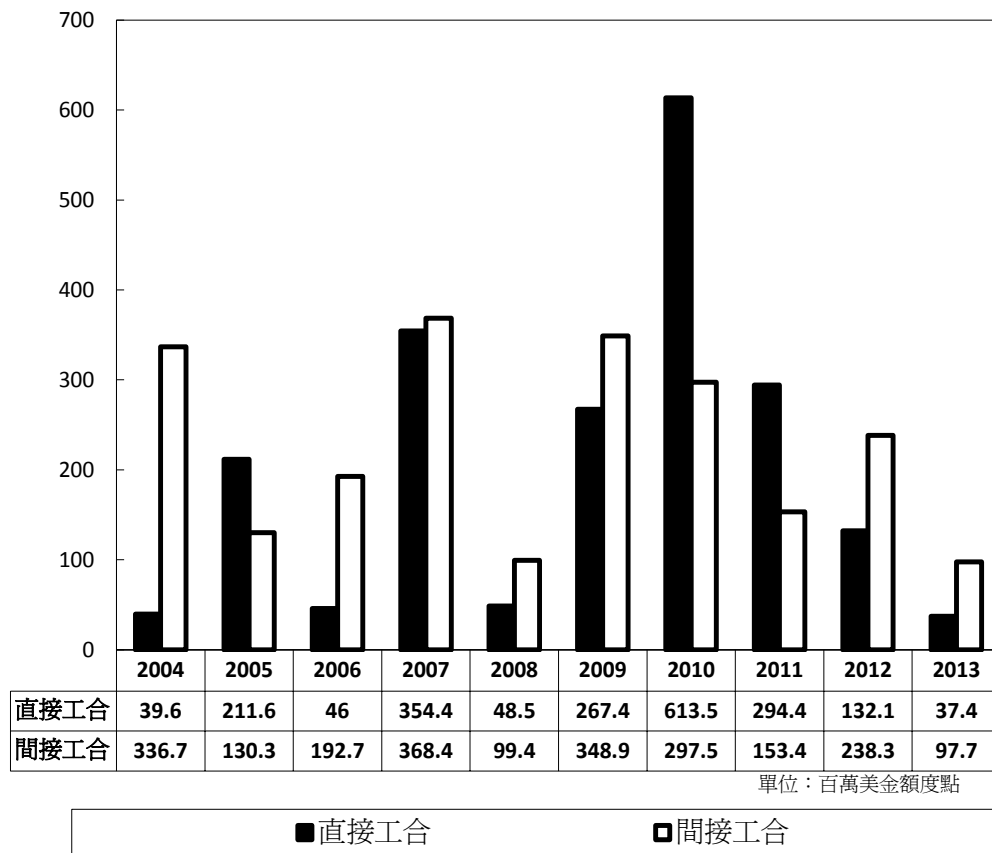
The bottleneck at MND level consists of both conceptual and institutional problems.

在觀念面上，「打、裝、編、訓」是國軍建軍傳統理則，但此一理則過於消極與短視。消極處在於只求裝備獲得，認為國內國防產業發展非國防部的事；短視處在於強調現役裝備，忽略創新科技對戰略、戰術的影響。舉例而言，在對外採購時，常早已擇定特定的現役機型、艦型，一旦遭遇採購困難，即產生「軍購死結」現象（下敘），錯失自我研發時間。即便能順利採購，過程中幾無選商談判籌碼，難以獲得足夠工業合作（以下簡稱工合）額度。我國在重大軍購案能夠談成的工合額度約在合約值 40% 左右，屬中低水準（在 1993-2006 年間，歐洲國家爭取到的工合額度平均為 97%，澳洲則高達 172%，非歐洲國家為 46.7%）¹。而更重要的，工合額度之分配過去均由未參與外購談判也對國防科研需求陌生的經濟部主導，可以理解的，工合額度常用於與軍售項別無關的間接工合。如圖二所示，用於能提昇國內國防產業科技水準的直接工合額度過少（在不計航太類時，國防佔工合總額度約二成），更遑論對國防產業升級有助的機敏技術移轉（技術移轉類，占工合總額度約五成）。2010 年後，成立「經濟部國防部工業合作政策指導會」，但情況並未有明顯的改善，以 2010 年為例，已簽署 110 份工業合作協議書，累計承諾額度達 90.54 億美元點，累計實核額度 60.03 億美元點。其中承諾額度與實核額度即相差 35.51 億美元點，實際執行成效僅 62.83%，而且從 2000 年以後，此一差距越來越大，顯見工業合作的執行成效亦逐年越來越低。最後，在欠缺採購規範與拉法葉案的陰影下，國防部對外採購向來自鎖於軍購的架構，不僅資源無法有效運用，無法有效達成國防自主，也無助於建立廉潔的採購程序。

¹ Bernald Udis, "Offsets and International Industrial Participation," in Richard A. Bitzinger ed., *The Modern Defense Industry: Political, Economic, and Technological Issues* (Santa Barbara: Praeger, 2009), 262.

Gauging the conceptual problem, our traditional guiding principles for military build-up -- “fighting, equipping, organizing, and training” -- appears overly conservative and shortsighted. It is conservative in the sense that the MND only focuses on “equipping” and regards the development of the indigenous defense industry as beyond its scope. It is shortsighted for its emphasis on equipment in service and negligent regarding the strategic and tactical impact of new technology. For example, only vessels or fighter jets in service made them to the procurement list, but this caused a “dead knot of arms procurement” (defined below) when the arms procurement negotiations stalled. As a result, the window of opportunity for indigenous R&D was missed. Even when the arms sales are successfully negotiated, there were nearly no bargaining chips to leverage between competing suppliers, to say nothing of gaining sufficient ICP promised quota. For Taiwan, in the major arms deals, there is usually a promised quota of 40% of the contract value allocated for ICP, which is below median level (During 1993-2006, European countries had a quota of 97% on average, Australia 172%, and non-European countries 46.7%)¹. Moreover, the allocation of ICP quota is authorized by the Ministry of Economic Affairs (MoEA), which is unfamiliar with defense R&D needs and is excluded from the beginning of arms trade negotiations. Needless to say, the ICP quota was mostly applied to those indirect ICP unrelated to the arms sales items. As FIGURE 2 illustrates, there have been insufficient direct ICP (only 20% of total ICP promised quota used in defense industries excluding aviation-related technology transfer) to improve the technological level of the indigenous defense industry, not to mention the transfer of sensitive technologies (only 50% of total ICP promised quota used in technology transfer) which can help the indigenous defense industry to make R&D breakthrough. Situations have not improved much after the establishment of MoEA/MND ICP Policy Committee in 2010. For example, in 2010 approximately 110 ICP agreements was signed, the sum of promised quota reached 9.054 billion US dollars. However, the sum of actual fulfillment quota was only 6.003 billion US dollars. In other words, only 62.83% of promised quota have been successfully implemented. Since 2000, such a gap between promised and fulfilled ICP quota is steadily growing. The ICP efficiency is obviously stagnated. Shadowed by the “Lafayette scandal” and suffering from a lack of arms procurement regulations, the MND's foreign procurements have been self-locked into the framework of foreign military sales (FMS). This has not only been an issue of resource utilization efficiency and procurement process accountability, but also a roadblock for achieving a self-reliant defense

¹ Bernald Udis, “Offsets and International Industrial Participation,” in Richard A. Bitzinger ed., *The Modern Defense Industry: Political, Economic, and Technological Issues* (Santa Barbara: Praeger, 2009), 262.



圖二：我國近十年來的直接工合與間接工合

即便由國內產業進行產製，國防部常過於強調迅速建立戰力，當產製完成後，即無進一步持續研製規劃，致使人才研製熱情與能量喪失，廠商投資於精進研發的誘因降低、風險增高。而且，若干廠商不思技術升級而只想動員政治關係進行遊說，未得標者黑函滿天飛，低價得標者最後無法履約，使得國防部視與國內產業界的互動為畏途。而國防部汗牛充棟的繁文縟節與動輒得咎的潛規則，加上極不穩定的訂單，國內廠商（特別是中小型廠商）也視與國防部往來為畏途。國防部與國內產業界間無法營造出友善合作的關係，形成了國防部傾向外購的制度性記憶。

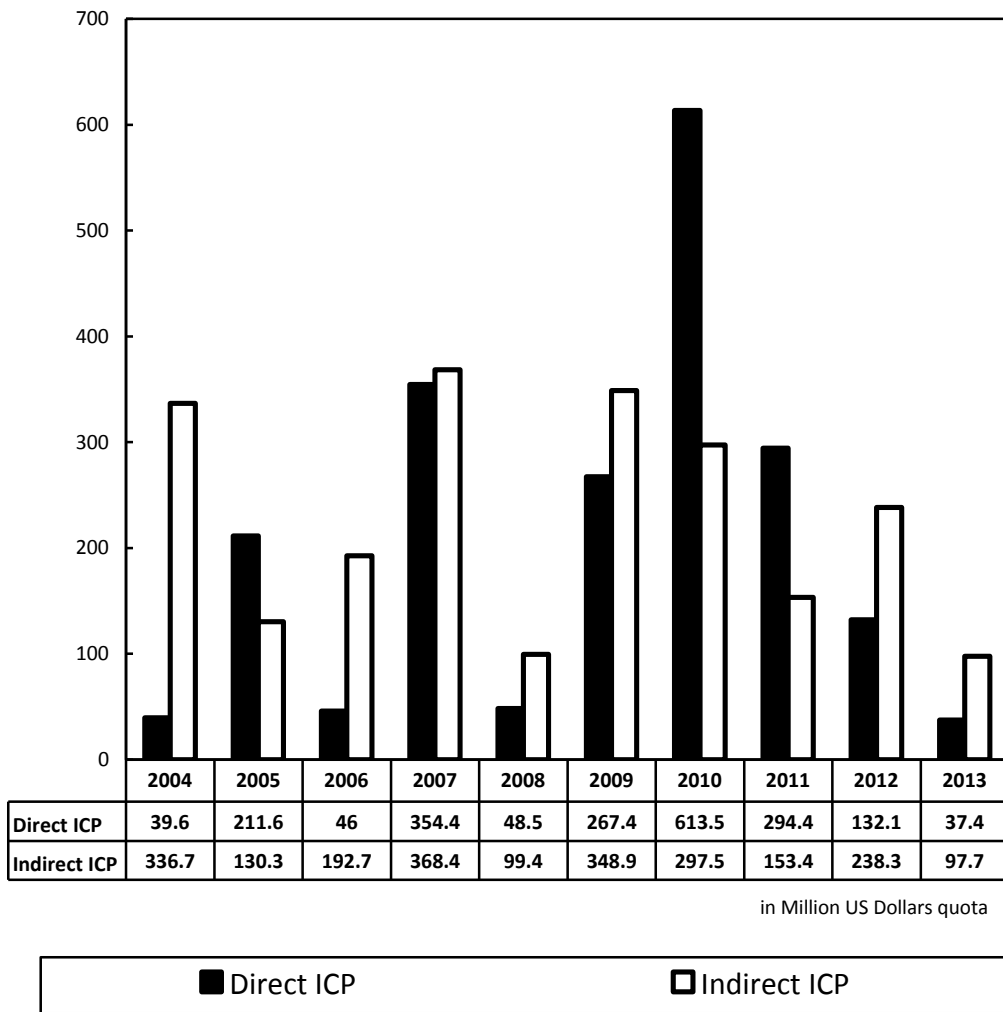


FIGURE 2: Taiwan's Direct and Indirect ICP Received in the Past Ten Years

Even with domestic production, the MND's over emphasize on immediate readiness often led to ignorance of continuous R&D planning once the production is completed. As a result, the talented S&T experts lost their passion and energy, and the companies lost incentive to invest in advancing defense R&D due to growing risks. Besides, instead of advancing R&D capacity, some local companies prefer to mobilize its political networks to lobby for contracts; as a consequence, those who lost the bids turned to blackmailing, while those who won at a low bid failed to fulfil the contract. In the end, the MND duly avoided interactions with domestic industries. Likewise, the domestic industries (especially small and medium enterprises [SME]) duly avoided working with the MND due to its endless red tape, unwritten rules everywhere, and extremely unpredictable orders. Taken together, this situation makes up MND's institutional memory, which subsequently is inclined to seek foreign procurement via FMS when it fails to establish a friendly collaborative relationship with the domestic industries.

如同在下節願景中所提，有形戰力的計算除了服役的武器裝備數、質量與後勤補保能力外，更當加計推陳出新的後續研製潛能。振興國防產業不等於圖利特定廠商，國防部不可再自限為單純的武器裝備使用者的角色，觀念上應該從「打、裝、編、訓」調整為「研、打、造、裝、編、訓」的新一代建軍理則。除了多吸納創新科技，多扶植國防科研外，更要落實國防自主，以國內產製為原則，自國外獲得為例外。

在既有消極短視的觀念下所建立的採購決策、規劃流程，自然成為制度面的瓶頸。如圖三所示，我國軍事採購規劃流程以參謀本部作戰及計畫參謀次長室（簡稱聯三次長室）為起點，根據各軍種所提需求，擬定「聯合戰力規劃」，考量該規劃所欲之戰力，國防部戰略規劃司（簡稱戰規司）將軍備需求項目列入「十年建軍構想」文件（每二年更新）。「十年建軍構想」中的軍備需求並未排定獲得優先順序，但進一步到戰規司的「五年兵力整建計畫」時，軍備獲得的優先順序則已成形。參謀本部（以聯三次長室為主）再根據「五年兵力整建計畫」督導軍種提出詳盡的作戰需求文件，列明可供選擇的武器裝備選項與來源，進而由整評司針對這些選項進行評估，完成系統分析文件，至此大抵已完成特定武器裝備的擇定，後續由軍備局負責所擇定選項的投資綱要計畫審查，待戰規司完成財力規劃優先順序後，由軍備局負責計畫之執行（履約督導與專案管理）。

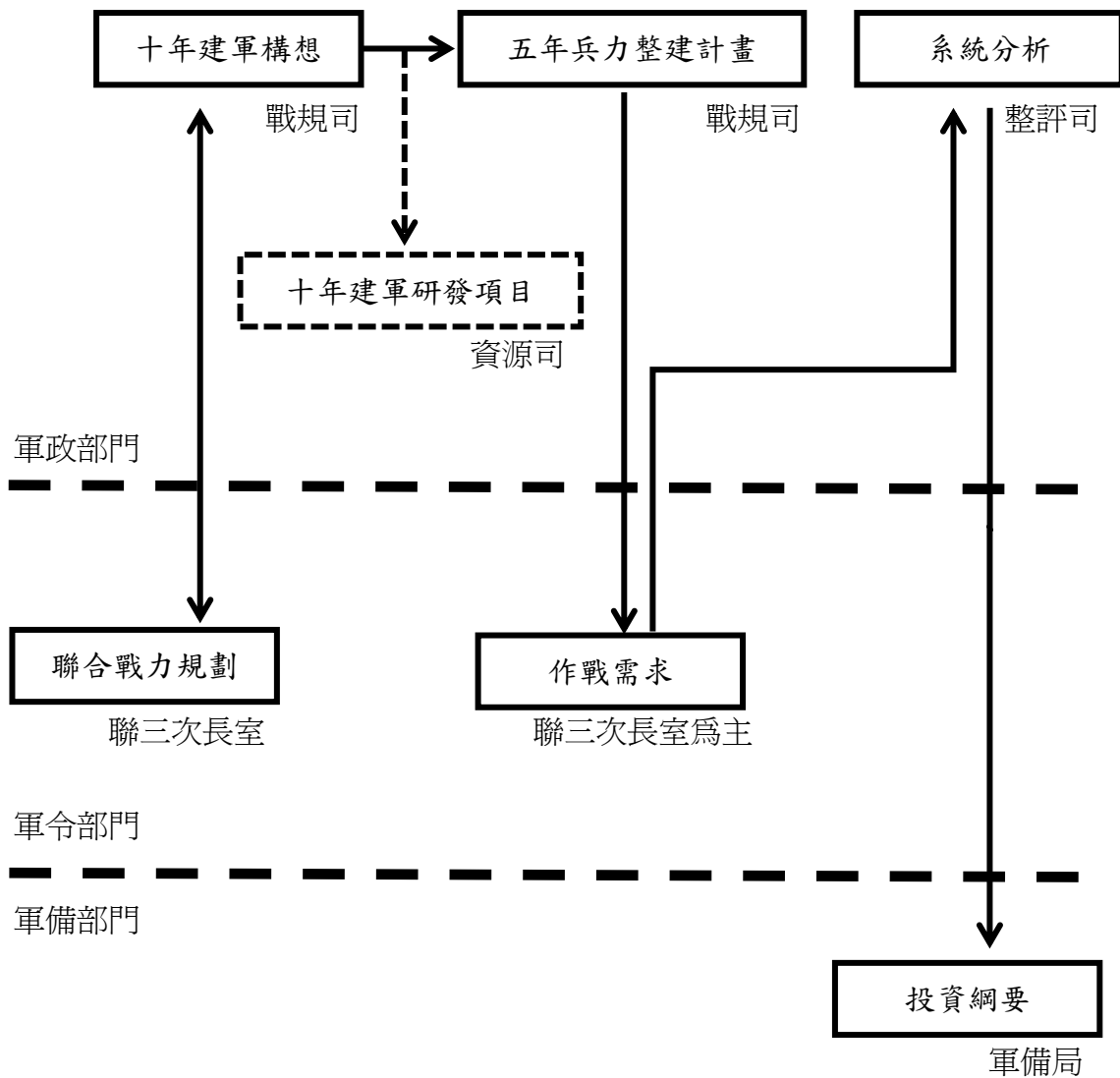
In the next chapter on our vision for industry development, we will underscore the imperative of continuously maintaining R&D potential, which should be added to the

The military should evolve to new guiding principles from “fighting, equipping, organizing, and training” to “researching, fighting, building, equipping, organizing, and training.” In additions to utilize innovative S&T and support defense R&D, the MND should also fully implement the self-reliant defense policy by encouraging domestic production as principal, foreign procurement as exception

equation of visible combat capabilities along with the quality and quantity of weaponry in service, and logistics and supply management. Bolstering our defense industry does not equal profiting specific contractors; the MND must get rid of those self-imposed restrictions as simply a user or consumer of weapons. Instead, the armed forces should evolve to new guiding principles from “fighting, equipping, organizing, and training” to “*researching, fighting, building, equipping, or-*

ganizing, and training.” In addition to utilizing innovative S&T and supporting defense R&D, the MND should also fully implement the self-reliant defense policy by encouraging domestic production as principal, foreign procurement as exception.

The procurement decision-making, planning, and procedures constructed on the basis of existing conservative and shortsighted principles naturally become structural bottlenecks. As illustrated in FIGURE 3, the starting node of Taiwan's military acquisition is the Office of the Deputy Chief of the General Staff for Operations and Planning (J-3), which puts together the Joint Warfighting Capability Planning (JWCP) based on the operational requirements put forth by Services. Interacted with the JWCP, desired weapons and equipment that are deemed necessary for military operations are folded into the Ten-Year Force Buildup Concept (TYFBC) document, produced every two years by the MND's Strategic Planning Department (SPD). While there is no designation of priority sequencing among the desired weapons and equipment listed for acquisition in the TYFC, this sequencing and prioritization are determined in the SPD's Five-Year Force Construction Plan (FYFCP). The General Staff Headquarter (GSH) -- primarily J3 -- directs the Services to put forth their detailed operational requirement documents in accordance with the FYAP, including a listing of possible sources and suppliers of the selected armaments systems, and these requests are further evaluated by the Integrated Assessment Department (IAD), which will complete a system analysis report. At this point in the process, the selection of systems for acquisition is largely set, and it then falls to the SPD to review the investment program for the chosen systems. Once the funding plan is completed, Armaments Bureau (AB) units are responsible for implementation of the procurement, including contracting, auditing, and program management.



圖三：我國現行軍事採購規劃架構

此一規劃流程雖稱縝密，但有制度面上的漏洞。首先，整個流程缺乏整體的策略規劃，起點的「聯合戰力規劃」並無明確的國家層級戰略文件加以指導。沒有國安會的「國家安全戰略報告」，¹也沒有國防戰略或國防科研、國防產業相關政策指導文件。兩年發佈一次的「國防報告書」與四年發佈一次的「四年期國防總檢討」是戰略規劃的產出，而非啟動戰略規劃的輸入，對指導國防規劃並無太大關連，參謀本部只能從總統或國防部長零碎的言論中去參悟國軍建軍的政策方向。

¹ 國防小組已於 2013 年倡議：國安會應於每任總統就職後六個月內，向立法院提交「國家安全戰略報告」。見：民主進步黨新境界文教基金會，《國防政策藍皮書第三號報告：建立權責相符的國家安全會議》，（2013 年），頁 2。

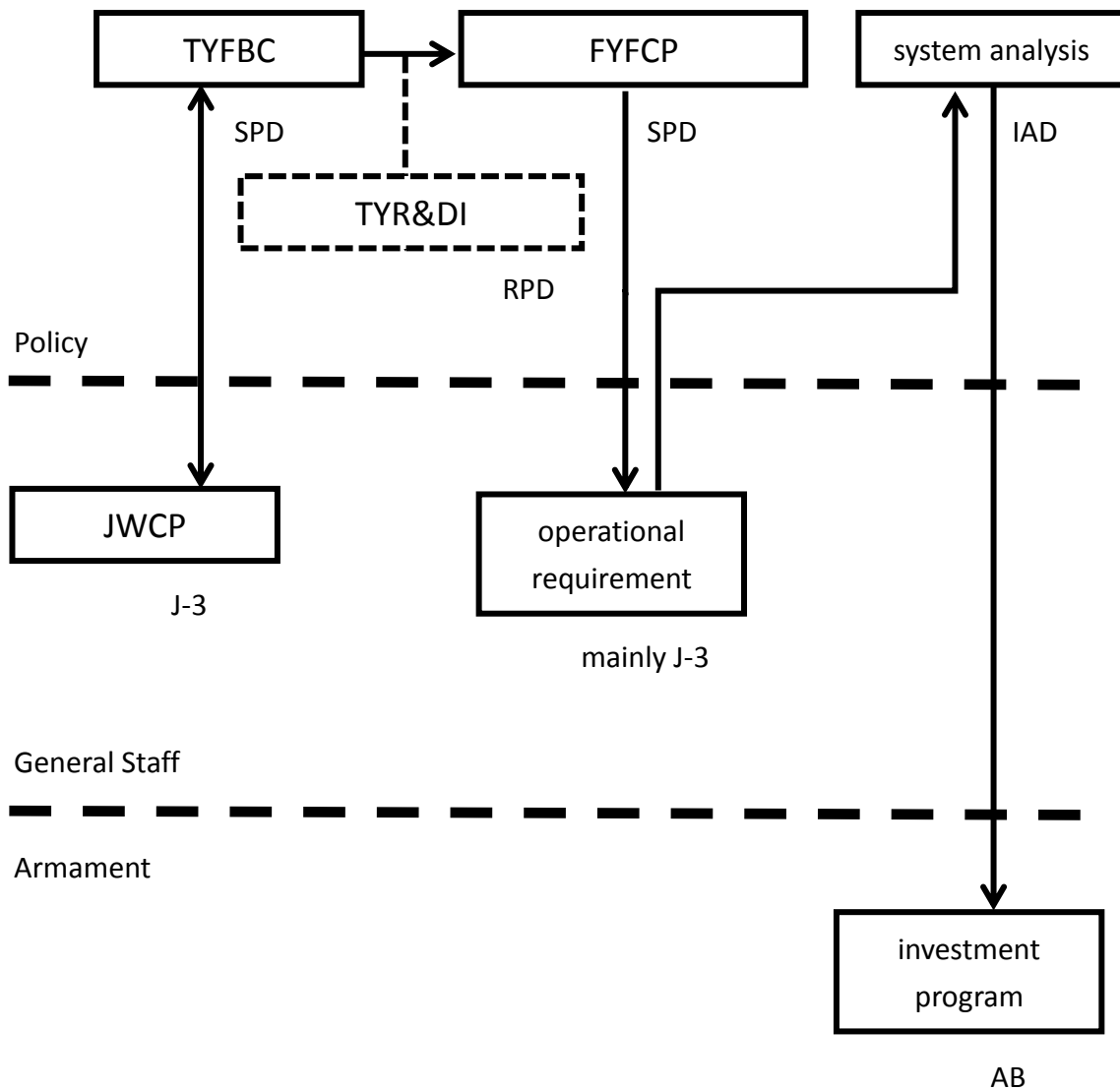


FIGURE 3: The Framework of Taiwan's Military Procurement Planning

This procedure outlined above may appear precise, but in fact contains many structural loopholes. First of all, the whole process lacks a comprehensive strategic guidance. The starting node of the JWCP is not clearly rooted in guidance from any national-level strategy document. There is no National Security Strategy Report from the Taiwan's National Security Council (NSC),¹ There is no guiding policy documents on national defense strategy, military S&T, or the defense industry. The National Defense Report published once every two years and the Quadrennial Defense Review (QDR) released every four years are outcomes rather than initiative inputs of strategic planning and serve no significant roles in guiding defense planning. The relevant agencies and departments are left to discern the direction of defense policy based on ad hoc statements and remarks by the President or Defense Minister.

¹ The Defense Committee proposed in 2013 that NSC should submit National Strategy Report to the Legislative Yuan with six months after the inauguration of new president. See New Frontier Foundation, *Defense Policy Blue Paper No. 3: An Accountable National Security Council* (2013), p. 2.

其次，既無由上而下的政策指導，聯三次長室的「聯合戰力規劃」又受到軍種戰力需求提案之左右。實務上，聯三次長室難以提出聯合作戰所必須但卻不受軍種青睞的戰力需求案。最後，軍購流程中最為關鍵的節點在從「十年建軍構想」到「五年兵力整建計畫」間的軍購需求優先順位的排定，其間雖經國防部部長主導的專案會議（政策小組會議）討論議決，但軍人背景部長容易受到軍種本位主義之左右，而有以個人偏好決定軍購需求優先順位之虞。

此一規劃流程亦有四項不利國防自主之處。首先，在從「十年建軍構想」到「五年兵力整建計畫」間的軍購需求優先順位的排定過程中，若有研發之必要則列入「十年建軍研發項目」（現由資源司主責），其邏輯乃在無外購取得可能後，則進行國內研發。但此一邏輯與「國防法」第二十二條第一項「獲得武器裝備，以自製為優先」相違背。

當外購遭遇困難時，常在冗長的軍購規劃流程與涉外談判之後，此時早已錯失國內自行研發時間，為求儘速弭平戰力間隙，而必須更加依賴外購，這產生了臺灣國防特有的「軍購死結」現象

而在實務上，當外購遭遇困難時，常在冗長的軍購規劃流程與涉外談判之後，此時早已錯失國內自行研發時間，為求儘速弭平戰力間隙，只能更依賴由外購取得，這產生臺灣國防特有的「軍購死結」現象——因為

外購獲得困難而造成必須更加依賴外購。其次，「聯合戰力規劃」由參謀本部聯三次長室主責協調各軍種戰力需求，但聯三與各軍種參三幕僚基本上以「有什麼、打什麼」或「打什麼、有什麼」的思維為主，考量點在威脅想定與現役裝備，鮮少能從「打什麼、造什麼」的科技創新著想。第三，聯三次長室主導作戰需求文件審查，但軍種所提作戰需求文件常將所須性能特定到形同「先射箭再劃靶」，對於武器裝備選項早已有所定見。而當武器裝備來源有自國內獲得的可能性時，但因國內廠商能量的查察非軍種與參謀本部業務，在進行國內商源評估時自然無法周全。最後，「十年建軍研發項目」原由與國內廠商連結度較高之軍備局主責，甫移由資源司主導，資源司要重建相關資料庫與經驗，恐非一時可蹴。

Second, without top-down guidance, J-3's JWCP comes under the political manipulation of Services' competing operational requirements proposals. In practice J-3 finds difficulties in raising joint operation requirement proposals that are displeasing to the Services. Finally, the most critical step in the process is the prioritization of various operational requirements going from the TYFBC to the FYFCP. Although special project meetings headed by Defense Minister deliberates over these proposals, military-background ministers are frequently influenced by his Service interests creating a risk that the determination of procurement priorities are colored by parochial biases.

The above framework carries four features that are not conducive to a self-reliant defense. First, in the process of going from the TYFBC to the FYFCP to prioritize procurement needs, any R&D initiatives are designated under the Ten-Year Research and Development Items (TYR&DI, currently overseen by the Resource Planning Department, RPD). The logic of TYR&DI is: domestic R&D programs are initiated once the desired capability is unlikely to be obtained via foreign acquisition. Yet this logic would contravene the principle of "acquisition of weapon equipment shall firstly consider those built domestically," as laid out in Art. 22, Section 1 of the National Defense Act. In practice, the long built-in lead time of the procurement planning and international negotiation process means that by the time attempts at foreign acquisition meet obstacles, the

When foreign acquisition meets obstacles, the window of opportunity for domestic R&D has long passed. The quest to rapidly close the capability gap has led to the "dead knot of arms procurement", wherein the difficulty of procuring from foreign sources leads to ever greater reliance on foreign procurement

window of opportunity for domestic R&D has long passed. The quest to close the capability gap in the shortest possible time span has led to the phenomenon of "dead knot of arms procurement" that is unique to Taiwan, wherein the difficulty of procuring from foreign sources leads to ever greater reliance on foreign procurement. Second, the JWCP is subject to a J-3 led process to co-

ordinate between the operational requirements of the different Services, but the operating principle of J-3 and colleagues S-3 staff in Services seems limited to "operating with existing equipment, instead of preparing for strategic needs" (*you sheme, da sheme; da sheme, you sheme*). Very rarely does the thinking extend to the possibility of technological innovation, of building something specifically tailored to the anticipated threat. Third, although J-3 is responsible for reviewing Services' operational requirement documents, the Services sometimes have described their requirement so specific -- like "first shooting the arrow, then hanging the target" -- that the selection of arms and equipment is made long before the following analysis of various options. Even if the possibility of domestic procurement does exist, because ascertaining the possibility does not fall within the responsibility of the Services nor the GSH, a comprehensive assessment of domestic suppliers is naturally lacking. Finally, the TYR&DI was previously tasked to the AB, which possesses greater connections and communication with domestic suppliers. Shifting this portfolio to the Resource Planning Department (RPD) would require a great deal of time for RPD to re-build the relevant databases and experience.

第三個瓶頸在產業界，在主合約商部分，除了國防部傳統的合作大廠（如漢翔、台船）外，基於國防部的採購需求不穩定與公司營運的成本考量，許多廠商吝於投資研發，也缺乏國際合作經驗，致使研製水準無法提昇，只能停留在低階組裝工程，戰鬥系統必須全賴中科院提供，自身幾無系統整合能力。部分外購武器裝備之零組件實由臺灣廠商製造，卻無法直接提供國軍使用，必須先輸往國外，經原廠認證後，再進口回臺灣，一來一往之間，國防部除須等待料件而影響戰備外，價格更是倍增。而這些零組件廠，卻也未因此多獲收益。而臺灣是資安強國，擁有許多資安人才，這些人員擁有一流的技術，但缺乏管理、整合與行銷能力，更缺乏資金，無法形成堅實的中大型公司，而在擴大發展前即常被外商（包括中資企業）所收併，人才亦因之被吸納。缺乏研發投資、國際連結與資金，是臺灣國防產業界常見的發展瓶頸。

參、國防產業整體發展願景

振興國內國防產業既是民進黨國防議題的重要項目，除了應對發

**民進黨國防產業發展願景與策略
為：需求帶頭，以產業規範確保
國安與品質，以國際合作提昇技
術，鼓勵投資科研以提高自製率
與啟動新需求循環**

展瓶頸有所認識外，更應當在在野期間經多方討論後確立國防產業發展願景，以利執政後迅速整合資源，付諸政策實踐。在此，國防小組先行提出整體發展願景與建議，並在

隨後三節中提出各核心產業別的個別發展願景。就國防產業整體發展而言，建議以下列四項發展重心為願景：

一、首先，以需求吸引國內產業投入國防產業市場

堅定國防自主路線，未來重大武器裝備之取得，以國內自製為優先。透過規劃流程的精進與重大武器裝備採購需求的公開透明，提供廠商更多洽商國際合作夥伴的準備時間。若必須外購，則應積極談判由外製逐步過渡轉為自製。

The third bottleneck lies on local industries. Among the prime contractors, apart from the ones that have traditionally worked with MND such as the AIDC and China Shipbuilding Corp. (CSBC), due to the uncertainties of MND's procurement needs and expensive overhead costs, many firms are reluctant to invest in R&D while also lacking experience with international cooperation. Consequently, they are unable to elevate their technological and technical standards, remaining stuck on lower-level assembly operations while relying entirely on CSIST to provide the combat system, with no independent capacity for systems integration. The components and parts of some foreign-procured defense equipment are actually produced by Taiwanese manufacturers, yet cannot be directly supplied to the military, but must first be shipped abroad and certified by the original platform maker before being re-imported to Taiwan. Throughout this process, the additional time required not only impacts the military readiness, the cost is also exponentially increased, yet the benefit of the additional MND expenditure does not flow to the domestic manufacturers. Moreover, Taiwan is a leader in information security, possessing a wealth of skilled talent in this area, but lacks the management and integration capacities or the capital for existing SMEs to expand into medium- to large-scale enterprises. Indeed companies are often acquired by or merged with foreign (including Chinese) firms before having a chance to expand, as a result of which the domestic talent and expertise are absorbed. The lack of investment in R&D, international connections, and ready access to capital are very common bottlenecks within local defense industries.

III. A Comprehensive Defense Industry Development Vision

Bolstering Taiwan's domestic defense industry is a key agenda item in the DPP's defense policy. The DPP, while in opposition, should identify the industry's developmental bottlenecks and establish a clear vision for defense industry development. This will help accelerate the process of resource integration and policy implementation as soon as the Party returns to power. This chapter will first offer recommendations for a comprehensive development vision, and then the

The DPP's vision for defense industry development should be demand-driven, to establish regulations for quality and national security control purposes, to improve technology by international cooperation and to encourage investment in S&T so domestic production rate can rise and a new cycle of demand can be activated

following chapters outline our specific approaches for three core industries. Here, we recommend the following four focuses.

First, create a demand-driven market for domestic industries.

To demonstrate our unwavering resolve for a self-reliant defense posture, future major arms acquisitions should set domestic industries as the preferred contractors. Reducing procedural red tape and increasing transparency of the major procurement needs will allow domestic producers more time to find international partners. If foreign procurement becomes necessary, the negotiators should actively bargain for a gradual transition from offshore to local production.

二、其次，建立國防產業與產品規範

確保國軍能取得財力堪荷下最佳的武器裝備，確保機敏軍品資訊不致外洩。國防部應依所涉軍品的國安機敏性與科技複雜度，擬訂國防廠商與軍品分級制度，協助國內廠商取得認證，並輔導國內廠商認證升級，也應主動監督國內廠商確保各級所需之保防水準。

三、同時，促成國際合作以協助產業升級

鼓勵協助國內主合約商與外商合作，或藉由外購案之工合額度，以直接工合的技術移轉、外商技術或資本投資，在國防科技發展規劃架構內，促成國內廠商獲得技術升級與進入國際市場機會。

四、最後，擴大創新的科研投資

經前述作為後，在國內國防產業發展（或特定武器裝備研製）已有穩固進展後，以針對產業（或特定武器裝備之次系統）弱項中有自主研製提高自製率之必要者，或在國防科技發展規劃架構中設定之下階段研製品項，以主動積極態度，投資中科院或國內產學界進行研發，並從研發成果中，擇優創造新需求循環。

為達成前述願景，建議民進黨在重返執政後，除應堅定國防自主路線外，並應要求國防部在國防產業發展的過程擴大其角色與任務，不能再以單純的使用者為滿足，而必須朝向支持者、規範者、投資者的角色發展，並以規劃者為樞紐帶動此一進步（見圖四）。

面對戰力差距日漸擴大、外購難度增加與國防資源取得菲易，國防自主將是維持可恃戰力的唯一道路。國防自主支援經濟發展，增加國內製造業工作機會，並吸引外資投資與刺激產業技術升級；經濟發展支持國防自主，國內廠商供應國防所需武器裝備，提高戰備妥善率，並刺激作戰構想的創新。在國防自主與經濟發展的結合過程中，國防部不能自限於使用者的角色，其角色與任務必須擴大，必須有振興國防自主產業即為建立未來可恃戰力的認知，在跨部會的合作中負起更大的責任。

Second, establish laws and regulations to govern defense industries and products.

To equip our armed forces with the best affordable arsenal, and to secure the confidentiality of military assets, the MND should stipulate a rating system for defense contractors and military assets based on their classification levels and technological complexities. The MND should also assist domestic contractors to obtain certification and upgrades, and actively oversee their security measures at different rating levels.

Third, step up industrial upgrades via international cooperation.

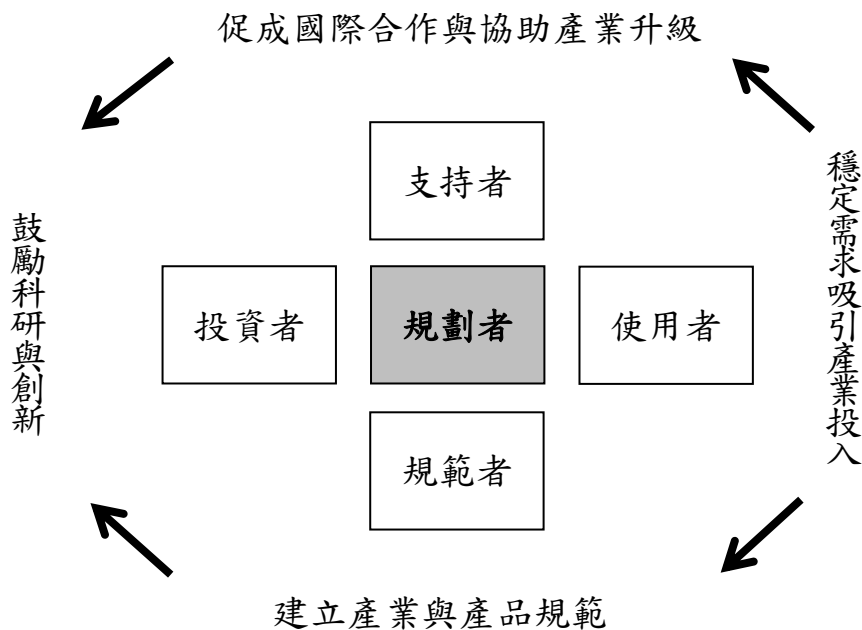
The MND can encourage its major domestic contractors to partner with foreign companies, or use ICP agreements to demand technology transfer or technological and capital investments from abroad. With an overarching plan of advancing defense technology, the MND can motivate domestic contractors to achieve technological advances and enter the global market.

Fourth, lastly, expand investment in innovative S&T.

After carrying out the programs described above, and once the development of the domestic defense industry (or the R&D of particular defense systems) has gained some momentum, go forward with identifying the weaker domestic R&D items (or specific armament subsystems) which deserve a higher ratio of self-manufactured content or assigned R&D items under the overarching S&T planning. Proactively invest in S&T of these identified items at the CSIST or other business or academic institutes. Select the best of the S&T achievement to create a new, demand-driven virtuous R&D cycle.

To realize the above mentioned goals, the Defense Committee recommends that after the DPP returns to power, the DPP administration should maintain its resolve to achieve a self-reliant defense, and direct the MND to expand its roles and mission in the process of defense industry development. The MND cannot complacently stay on the user end. It must move in the direction of becoming a supporter, regulator, and investor, and actively seek to advance development through its planner role (see FIGURE 4).

In light of the widening gap in our military capabilities and the growing difficulty of acquiring foreign defense articles and resources, maintaining a self-reliant defense will be the only way to keep up our combat capabilities. Self-reliant defense can support economic development, create jobs opportunities for the domestic manufacturing industry, attract foreign investment, and encourage industrial technological upgrades. Likewise, economic development can support self-reliant defense: domestic manufacturers can supply defense needs, help increase combat readiness and spur innovative operational concepts. During the process of incorporating economic development into self-reliant defense, the MND cannot limit itself to a user's role, and must expand its roles and mission. The MND must acknowledge the fact that bolstering self-reliant defense industries will strengthen military capabilities for the future, and it must shoulder greater responsibilities in inter-agency cooperation.



圖四：國防部在國防自主中新的角色與任務

建議民進黨重返執政後具體的政策著力點如下：

在規劃者面向上：

(一) 新任政府之國安會應於總統就職後六個月內，向立法院提交「國家安全戰略報告」；

(二) 國防部應依「國家安全戰略報告」，於總統就職後八個月內，向立法院提交「國防戰略報告」，並依新任政府之國防政策持續或調整部分，於「四年期國防總檢討」精進或修正未來中長期國防規劃，於總統就職後十個月內公布(現行「國防法」第三十一條第四項)。

(三) 國防部於總統就職後三個月內組成由跨部會並納入立法委員、產學界人士的國防產業協進小組任務編組。國防產業推動協進小組於總統就職後八個月內，向立法院提出「國防產業發展策略」。¹

(四) 於國防部本部新設「國防前瞻規劃室」，除承辦前項(三)業務外，依「國防戰略報告」、「國防產業發展策略」與「四年期國防總檢討」之指導，規劃「十年期自製武器裝備發展構想」、「五年期國自製武器裝備產製計畫」，送交立法院，並協助軍備局執行前兩項構想與計畫，督導中科院據此完成相關規劃。

¹ 國防產業推動協進小組的設計參考自英國 Defence Growth Partnership，見 HM Government, *Delivering Growth: Implementing the Strategic Vision for the UK Defence Sector* (2014).

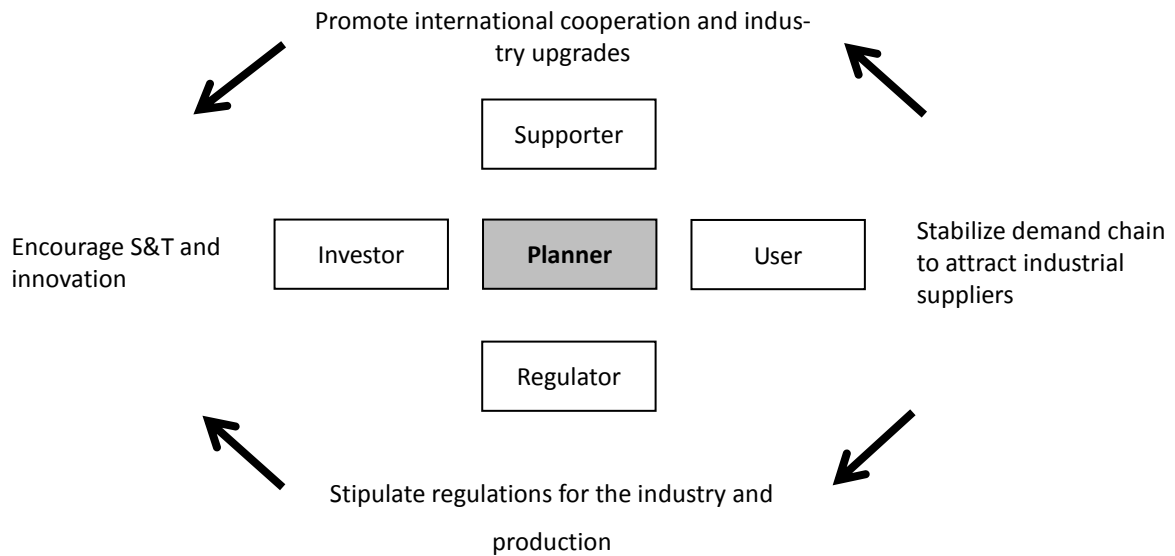


FIGURE 4: The New Role and Mission for the MND in Self-Reliant Defense.

From the planner's point of view:

(1) The NSC in the new administration should submit a National Security Strategy Report (NSSR) to the Legislative Yuan (LY) no later than six months after the presidential inauguration.

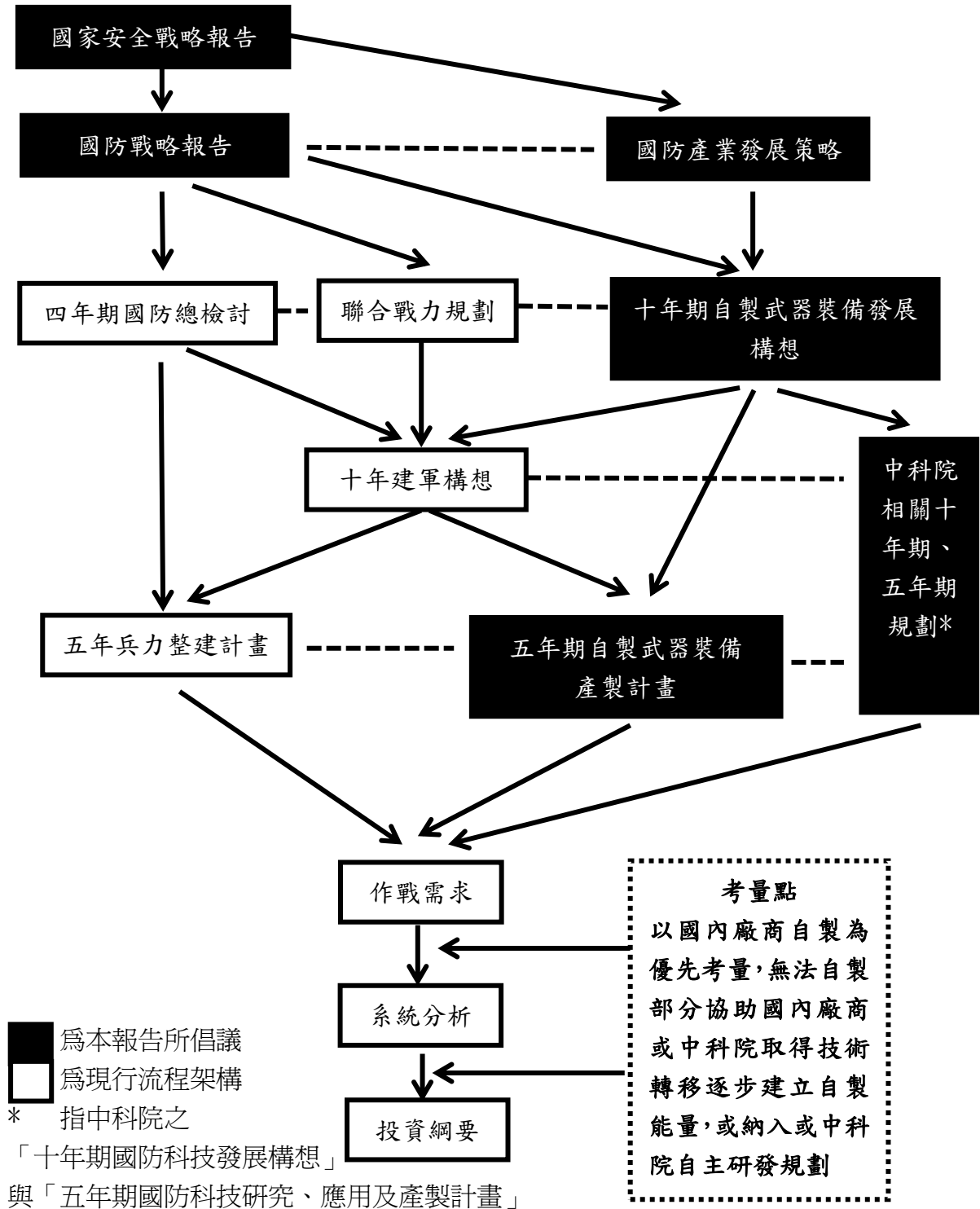
(2) The MND should follow the comprehensive guidelines laid out by the NSSR and submit a National Defense Strategy Report (NDSR) to the LY eight months into the presidency. The continuities and discontinuities of new administration's defense policy in the NDSR shall affect the medium- and short-term planning in the QDR (submit to the LY ten months after inauguration).

(3) Three months after the president takes office, the MND should assemble a Defense Industry Partnership Group (DIPA) task force,¹ which includes legislators and experts from the academic and business sectors. The DIPA should submit a Defense Industrial Development Strategy (DIDS) to the LY eight months after the presidential inauguration.

(4) Establish the Advanced Defense Program Office (ADPO) in the MND. Besides taking on the three above mentioned tasks, based on the guidelines of the NDSR, the DIDS, and the QDR, the ADPO should design and submit to the LY the following reports: "Ten-Year Indigenous Weapon and Equipment Development Concept (TYI-WEDC)," and "Five-Year Indigenous Production Plan (FYIPP)." The ADPO should also assist The Armaments Bureau in implementing these two reports, and supervise the CSIST's related planning process based on them.

¹ The idea of establishing a DIPA is inspired by British Defence Growth Partnership. For further information, see HM Government, *Delivering Growth: Implementing the Strategic Vision for the UK Defence Sector* (2014).

(五) 以「研、打、造、裝、編、訓」新理則調整現有建軍規劃架構，建軍規劃新架構如圖五所示。



圖五：本報告倡議的軍事採購規劃新架構

(5) Revise the current force planning framework with the new guiding principles “*researching, fighting, building, equipping, organizing, and training.*” The newly proposed framework is illustrated as FIGURE 5.

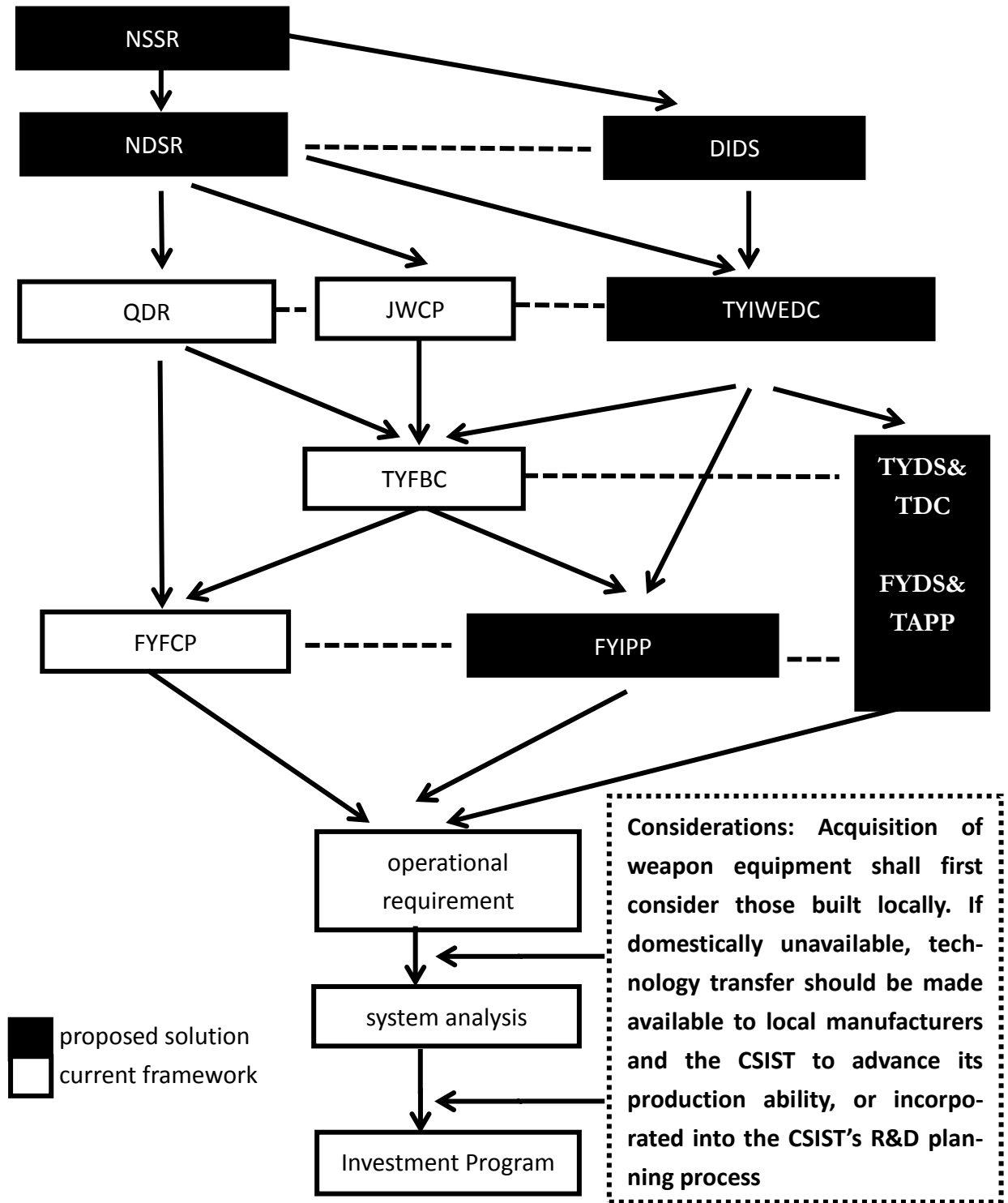


Figure 5: Proposed Framework of Defense Procurement Planning

在使用者面向上，除中國軍力擴張與外購日益困難等因素外，如表二所示，我國現有主戰載台縱使有升級、研壽計畫（如 IDF 與

2020 年後，第三代兵力整建期勢所難免，為讓國內外產業及時準備，避免重蹈軍購死結，民進黨業已宣示：加速潛艦國造、發展長程無人飛行載具與短場或垂直起降之先進戰鬥機、資訊攻防戰具為未來重點

F-16A/B)，但機（艦）體逐漸老舊，安全風險提高，且外商生產線關閉，補保日趨困難，形成消失性商源，亦為客觀事實。在 2020 年後，國軍現有主戰載台必然將逐步進入更新階段，第三代兵力整建期（1990 年代為第二代兵力整建期）勢所難免，臺灣應及早確立國防自主需求，以利國內外產業及時準備，方能避免重蹈軍購死結，造成國家安全危機。

免，臺灣應及早確立國防自主需求，以利國內外產業及時準備，方能避免重蹈軍購死結，造成國家安全危機。

表二：國軍現役主戰載台服役年齡

	空軍			海軍					陸軍		
	IDF	F-16 A/B	幻象 2000	基隆 級艦	康定 級艦	成功 級艦	濟陽 級艦	劍龍 級艦	M60-A3	AH-1W	AH-64E
2014	14	14	16	23/8	16	10	47/19	26	11	13	1
2015	15	15	17	24/9	17	11	48/20	27	12	14	2
2016	16	16	18	25/10	18	12	49/21	28	13	15	3
2017	17	17	19	26/11	19	13	50/22	29	14	16	4
2018	18	18	20	27/12	20	14	51/23	30	15	17	5
2019	19	19	21	28/13	21	15	52/24	31	16	18	6
2020	20	20	22	29/14	22	16	53/25	32	17	19	7
2021	21	21	23	30/15	23	17	54/26	33	18	20	8
2022	22	22	24	31/16	24	18	55/27	34	19	21	9
2023	23	23	25	32/17	25	19	56/28	35	20	22	10
2024	24	24	26	33/18	26	20	57/29	36	21	23	11
2025	25	25	27	34/19	27	21	58/30	37	22	24	12

說明：IDF 與 F-16AB 最後成軍年份均為 2000 年；MIRAGE-2000 為 1998 年；基隆級艦於美國海軍成軍年份為 1981 年，在我海軍成軍於 2006 年；康定級艦最後成軍年份為 1998 年；成功級艦最後成軍年份為 2004 年；濟陽級艦於美國海軍最後成軍年份為 1967 年，於我海軍為 1995 年；劍龍級潛艦最後成軍年份為 1988 年；AH-1W 眼鏡蛇攻擊直昇機最後一批於 2001 年成軍；AH-64E 阿帕契攻擊直昇機現正交貨中，計畫 2014 年完畢；M60-A3 戰車最後一批於 2003 年成軍。

The third generation of force reconstruction will be inevitable in the 2020s. Taiwan must get a head start toward defense self-reliance in order to prepare the defense industries home and abroad. In this way we can avoid repeating an arms procurement dead knot. The DPP has already announced that indigenous submarine program, long rang UCAV, V/STOL fighter jets, and IO capabilities are our priorities

From the user's point of view: apart from external factors like China's military expansion and the growing difficulty of foreign procurement, as depicted in TABLE-2, it is objectively true that our main combat platforms are aging (even when there are plans for upgrades and programs of extending service life, taking the IDF and F-16 A/B as examples), while operational risks are escalating, and supply and maintenance are increasingly difficult due to the closure of foreign production lines, also known as diminishing manufacturing sources and material

shortages (DMSMS). Starting in 2020, the major combat platforms of Taiwan's armed forces must gradually enter the modernization phase and the third generation of force reconstruction will become inevitable (the second generation of force rebuilding took place in the 1990s). Taiwan must get a head start toward defense self-reliance in order to prepare the defense industries home and abroad. In this way we can avoid repeating an arms procurement dead knot that leads to a national security crisis.

TABLE 2: Age of Taiwan's Main Combat Platforms

YE AR	Air Force			Navy					Army		
	IDF	F-16 A/B	MIRAGE 2000	KIDD DDG	LA FAYETTE FFG	PERRY FFG	KNOX FFG	Z. SS	M60- A3	AH-1 W	AH-64 E
2014	14	14	16	23/8	16	10	47/19	26	11	13	1
2015	15	15	17	24/9	17	11	48/20	27	12	14	2
2016	16	16	18	25/10	18	12	49/21	28	13	15	3
2017	17	17	19	26/11	19	13	50/22	29	14	16	4
2018	18	18	20	27/12	20	14	51/23	30	15	17	5
2019	19	19	21	28/13	21	15	52/24	31	16	18	6
2020	20	20	22	29/14	22	16	53/25	32	17	19	7
2021	21	21	23	30/15	23	17	54/26	33	18	20	8
2022	22	22	24	31/16	24	18	55/27	34	19	21	9
2023	23	23	25	32/17	25	19	56/28	35	20	22	10
2024	24	24	26	33/18	26	20	57/29	36	21	23	11
2025	25	25	27	34/19	27	21	58/30	37	22	24	12

Note: The last of IDF and F-16 A/B entered service in 2000; MIRAGE-2000 became operational in 1998; KIDD-class destroyers were commissioned by the U.S. Navy in 1981, and 2006 by ROC Navy, respectively; the last of LA FAYETTE-class frigates entered service in 1998; the last commissioned PERRY-class frigate was in 2004; the last commissioned KNOX-class frigates by the USN was in 1967, and 1995 by ROCN, respectively; the last of Dutch built ZWAARDVIS-class submarine entered service in ROCN in 1988; the last of AH-1W attack helicopters were commissioned by ROCA in 2001; the AH-64E attack helicopters are in the process of delivery and expected to complete delivery in 2014; the last of M60-A3 tanks entered service in 2003.

針對此，民進黨業已宣示若於 2016 年重返執政後，國防自主重點置於加速潛艦國造、發展長程無人飛行載具與短場或垂直起降之先進戰鬥機與資訊攻防戰具。

民進黨已宣示將於 2016 年重返執政後恢復國防預算至 GDP 3% 之水準，新增之預算建議以人員維持費、作業維持費、軍事投資費各為 10%、20%、70% 的配比增加，並以 2020 年起保持自主研製佔年度國防預算軍事投資項總額之比例不低於 60% 為目標

。民進黨亦已宣示將於 2016 年重返執政後應恢復國防預算至 GDP 3% 之水準，新增之預算建議以人員維持費、作業維持費、軍事投資費各為 10%、20%、70% 的配比增加，並以 2020 年起保持自主研製佔年度國防預算軍事投資項總額之比例不低於 60%（在 2005 年

時，美國自主比例為 91%、英國則為 68%）¹為目標。達成以擴大並穩定國防自主需求，吸引國內廠商投入。

在規範者面向上，為利後續外國技術轉移，保障國家安全，國防部應監督並確保國內廠商所持有機敏軍品資訊不致外洩。同時，須確保國軍能取得財力堪荷下之最佳武器裝備，確保品質，一方面既要杜絕低價劣質蒙混得標的現象，另一方面也要避免軍規過於浮濫而阻絕有效利用民間現貨，²應擬訂國防廠商與產品分級制度之必要，協助國內廠商取得認證，並輔導國內廠商認證升級，協助中小型企業進入市場。為發揮效益，刺激產業自我升級，在擴大需求之後應以建立公開具競爭性之市場為目標。

¹ Ministry of Defence (UK), *Defence Industrial Strategy* (2005), p. 31.

² 美國在最近二十年的國防採購政策以民規現貨軍用或調整民規現貨軍用為原則，而以軍規為例外，以營造公開競爭市場，吸引廠商投入國防科研。見：J. Douglas Beason, *DoD Science and Technology: Strategy for the Post-cold War Era* (Washington DC: National Defense University Press, 1997), p. 81.

In this vein, the DPP has declared that, upon returning to power in 2016, it will focus on accelerating domestic production of submarines and developing long-range

The DPP has announced that, after taking office in 2016, it will return the annual defense budget to the level of 3% of GDP, where allocation ratio for the increased amount will be 10%-20%-70% to personnel management, operational maintenance and military investments, respectively. Also, starting in 2020, the percentage of indigenous R&D and production in the military investment baseline should aim to stay above 60%

UCAVs, advanced V/STOL fighter jets, and IO capabilities. The DPP has also announced that, after taking office in 2016, it will return the annual defense budget to the level of 3% of GDP, where allocation ratio for the increased amount will be 10%-20%-70% to personnel management, operational maintenance and military investments, respectively. Also, starting in 2020, the percentage of indigenous R&D and production in the military investment baseline should aim to stay above 60% (In 2005, indigenous R&D

and production was 91% in the U.S., and 68% in U.K., respectively).¹

From the regulator's point of view, to secure the accessibility of future technological transfer and to safeguard our national security interests, the MND should supervise its domestic contractors to prevent classified military information or components from being leaked. At the same time, the MND must ensure that the national armed forces can obtain the best affordable weapons. To ensure quality, the MND needs to put an end to awarding low priced but bad quality bidders, and avoid the excessive red tape that hinders effective use of commercial off-the-shelf (COTS).² It is also necessary to set up a rating system for defense contractors and military products, to help the domestic manufacturers to obtain certification and provide counsel regarding their certification upgrades, and to provide assistance in market access to the domestic SMEs. To maximize results and spur industrial upgrades, the MND should aim to establish an open and competitive market after expanding its demand chain.

¹ Ministry of Defence (UK), *Defence Industrial Strategy* (2005), p. 31.

² In recent two decades, the U.S. military procurement policy encourages flexibility and exploitation of COTS technologies rather than developing unique military standard in order to create an open, competitive market that attracting industries to invest in R&D. See J. Douglas Beason, *DoD Science and Technology: Strategy for the Post-cold War Era* (Washington DC: National Defense University Press, 1997), p. 81.

針對此，建議：民進黨當須於 2016 年重返執政後，落實前揭的軍事採購規劃新架構之制度改革。然而，就發展自主國防產業而言，

建議民進黨立法院黨團可立即啟動以落實國防自主、建立廉潔聰明的採購程序與打造公開具競爭性市場為主軸的相關立（修）法工程，為發展自主國防產業建立基礎

我國相關法規基礎薄弱，既無可落實「國防法」第二十二條第一項（「獲得武器裝備，以自製為優先，向外採購時，應落實技術轉移」）之相關立法。且機敏軍品採購多可由現行「政府採購法」（第一〇四條）掩護下

排除適用，致生無法規範，不利國內廠商發展。建議民進黨立法院黨團可在 2016 年前啟動以落實國防自主、建立廉潔聰明的採購程序與打造公開具競爭性市場為主軸的相關立（修）法工程，為後發展自主國防產業先行建立法規基礎，而在重返執政落實執行。

在支持者面向上，根據英國國防部的研究，建造一架軍機的工程，可由民間廠商以現有民用或軍民通用物資或技術完成的約佔 62%（包括機體結構、通用系統與推進系統），但仍有 38% 屬於高階的航電系統（22%）與系統整合（16%）無法由前述管道取得；在水面艦的部分，亦有將近 40% 高階系統（如戰鬥系統）難以由民間廠商獲得，而相對於 60% 建造成本用於戰鬥系統，只有 20% 用於艦體組裝。¹ 因此，約當 40% 的尖端裝備將會決定海空主戰載台的性能與其和所攜武器的整合戰力，而這 40% 尖端裝備均屬於高價格、高獲得難度的品項。雖然，以國內廠商現有的科技水準與中科院的研發成果，可降低此一比例，但不可否認的，仍有部分關鍵性裝備，國內暫無研製能量。而這個領域正是國防部須發揮支持者角色的地方。

¹ *Defence Industrial Strategy* (2005), pp. 43, 71.

In this regard, we recommend that the DPP, upon returning to power in 2016, complete a system-wide reform of the above-mentioned framework of military procurement planning. However, gauging from the perspective of defense self-reliance,

The DPP legislative caucus could initiate the needed legislation for achieving self-reliant defense, constructing a clean and smart procurement process, and forging an open and competitive market. The legislation will provide a legal basis prior to developing a self-reliant defense industry

Taiwan has a weak legal base that failed to enact relevant legislation following Art. 22, Section 1 of the National Defense Act (“Acquisition of weapon equipment shall firstly consider those built domestically. When it is necessary to pursue outsourcing channels, the acquisition activities shall implement a technology transfer policy”). Besides, most of the procurements of sensitive

weapons and equipment can avoid regulations by applying the existing Government Procurement Act (Art. 104), which is disadvantageous for domestic industry development. We recommend that the DPP legislative caucus initiate the needed legislation for achieving self-reliant defense, constructing a clean and smart procurement process, and forging an open and competitive market. The legislation will provide a legal basis prior to developing a self-reliant defense industry, which the DPP administration can follow through as soon as it returns to power.

From the supporter's point of view, the MND can play a supporting role in harnessing civilian technologies for military use. According to a study by the UK Ministry of Defence, to build a military aircraft, the civilian companies can apply the existing COTS or civil-military dual-use technology to complete approximately 62% of the total construction (including the airframe, the general systems and the propulsion), but there is still 38% (including 22% of the advanced avionics system and 16% of the integrated system) lacking in onshore capability. In terms of surface warships, there is nearly 40% of the advanced system (such as combat system) unattainable from COTS, but 60% of the building costs will be used for combat system wherein only 20% for hull costs.¹ Therefore, approximately 40% of the sophisticated equipment (which determines the air-sea combat platform capability and its integral weapon capability) is in the category of highly priced items which are also difficult to acquire. Though the high technology level of our domestic manufacturers and CSIST can lower the percentage in this category, there will undoubtedly still be some key components that are unattainable by the current domestic R&D and production capability, which is exactly the area where the MND can step in to provide support.

¹ *Defence Industrial Strategy* (2005), pp. 43, 71.

針對此，建議民進黨於 2016 年重返執政後，落實前揭的軍事採購

由於目前多數國內廠商欠缺國際合作之經驗與管道，民進黨在 2016 年前可協助並促成國內外國防產業界的互動與對話，為日後的跨國產業合作的模式先行討論

規劃新架構之制度改革，依「國防產業發展策略」與「十年期自製武器裝備發展構想」排定自外購取得技術移轉之優先順位，在涉外談判時爭取有利工合條件，以直接工合的技術移轉、外商技術或資本投資等

途徑，鼓勵協助國內主合約商與外商合作，促成國內廠商獲得技術升級與進入國際市場機會。由於多數國內廠商（特別是中小型公司）目前嚴重欠缺國際合作之經驗與管道，在 2016 年前的執政準備過程中，建議民進黨可主動協助並促成國內外國防產業界的互動對話，為日後雙方合作的模式先行討論；並利用各種場合向友邦政府說明國防產業跨國合作的必要性與民進黨將採取的途徑。

在投資者面向上，今天對於國防科技研發的投資，將是明日戰力的基礎。許多國家不惜於今天對國防科技研發增加投資，因為他們知道明日進行產製時會有更高的收益，所以美國、英國、日本乃至中國等國無不極力贊助學界的基礎科學研究，營造具競爭性的國防產業環境。而這也是軍用科技中可供民用者釋出（spin-off）民間廠商與整合提昇民間產業以開發之產品與技術轉而投入（spin-on）先進武器研製的重要介面。

Therefore, after returning to power in 2016, the DPP can jump-start executing institutional reform based on the above-mentioned new framework of military procurement planning, such as prioritizing technological transfer from foreign procurement programs based on the DIDS and TYIWEDC. During arm sales negotiations, we should

Due to a serious lack of experience and channels in international cooperation among most of the domestic manufacturers (especially the SMEs), prior to 2016, the DPP can reach out to the foreign and local defense industry communities to assist their dialogues and interactions so as to prepare and discuss future cooperation models

bargain for beneficial ICP conditions to encourage and to assist domestic prime contractors (especially the SMEs) to partner with offshore manufacturers via the channels of direct ICP technology transfer, foreign technological or capital investments, etc., so that the domestic manufacturers can seize the opportunity to obtain technology upgrades and global market access. Due to a serious lack of experience

and channels in international cooperation among most of the domestic manufacturers (especially the SMEs), prior to 2016, the DPP can reach out to the foreign and local defense industry communities to assist their dialogues and interactions so as to prepare and discuss future cooperation models. The DPP can also use various occasions to explain its approach to foreign governments and foreign contractors, and address the importance of international cooperation among the defense industries.

From the investor's point of view, today's investment in defense S&T will form the foundation of tomorrow's combat capability. Today, many countries are striving to increase investment in defense S&T, knowing that it will yield higher profit margins in tomorrow's production. Therefore, countries like the US, the UK, Japan and even China are going all-out to sponsor academic research in basic science, as well as creating a competitive environment for their defense industries. This is also an important platform for technological spin-off from the military to civilian industries in order to integrate and elevate civilian capabilities of product and technological development, which can, in turn, provide COTS "spin-on" to advanced weapon R&D.

針對此，建議民進黨若於 2016 年重返執政後，在國內國防產業發展（或特定武器裝備研製）已有穩固進展後，應擴大國防部對於國防科技的投資，刺激與協助民間產業自我的研發投資。

協助國內廠商成為具系統整合能力的主契約商。而使誤認市場短淺、習於低階組裝、吝於技術升級、低價競標的國內廠商在市場競爭機制下退場；促成國外廠商成為國內主契約商的重要科研合作伙伴，讓短線操作、只求一次性銷售、無心協助臺灣產業升級的國外廠商在市場競爭機制下怯場

而使誤認市場短淺、習於低階組裝、吝於技術升級、低價競標的國內廠商在市場競爭機制下退場；促成國外廠商成為國內主契約商的重要科研合作夥伴，而讓短線操作、只求一次性銷售、無心協助臺灣產業升級的國外廠商在市場競爭機制下怯場。倡議於國防部部

本部新設「國防前瞻規劃室」，「國防前瞻規劃室」將整合國防科研院所涉產官學各項資源之規劃，扮演類似美國「國防先進研究計劃署」（Defense Advanced Research Projects Agency, DARPA）、瑞典「國防研發署」（Defence Research Agency, FOI）或新加坡「未來系統處」（Future Systems and Technology Directorate, FSTD）的角色，並結合美國「國家國防製造與加工中心」（National Center for Defense Manufacturing and Machining, NCDMM）的部分功能，在「國防產業發展策略」之指導下，與參謀本部的「聯合戰力規劃」相互合作，規劃出「十年期自製武器裝備發展構想」，凡屬國內民間廠商現有能量研製可成者，研擬降低民間廠商研發風險方案，並協助民間研發者取得國防部或中科院所轄之設施進行測試。而經評估後，非民間廠商研製能量可及者，則採媒和工合技術移轉，或引導學界進行前瞻研究，或督導中科院列入其「十年期國防科技發展構想」。「國防前瞻規劃室」整合所有資源與窗口，達成「十年期自製武器裝備發展構想」之規劃。「國防前瞻規劃室」視中科院或國內產學界研發成果，從研發成果中，擇優在「聯合戰力規劃」形成過程中，創造出新的需求循環。

Therefore, the Defense Committee recommends that under a DPP administration after 2016, once the domestic defense industry (or the production of specific systems and equipment) is on a path of steady development, the MND should expand its investment in defense S&T to stimulate and supplement investment by the private sector contractors themselves. The domestic firms that mistakenly gauge the market to be shallow,

The domestic firms that mistakenly gauge the market to be shallow, that are accustomed to low-level assembly work, eschew technological upgrades, and compete only on cost, will be compelled by competition to exit the market. Foreign firms that operate by short-term calculations or seek only one-time contracts and lack the commitment to contribute to the transformation of Taiwan's industry will also withdraw due to competitive pressures

low, that are accustomed to low-level assembly work, eschew technological upgrades, and compete only on cost, will be compelled by competition to exit the market. Through licensing arrangements, international companies must become important partners for R&D cooperation, while foreign firms that operate by short-term calculations or seek only one-time contracts and lack the commitment to contribute to the transformation of Taiwan's industry will also withdraw due to competitive

pressures. The initiative will come from the proposed establishment of the ADPO which will coordinate the planning and resources of all actors involved in defense S&T and R&D across the government, private, and academic sectors—a role similar to the U.S. Defense Advanced Research Projects Agency (DARPA), the Swedish Defense Research Agency (FOI), or Singapore's Future Systems and Technology Directorate (FSTD). The ADPO will also take on some of the functions of the National Center for Defense Manufacturing and Machining (NCDMM) in the U.S. Under the guidance set by the DIDS and in coordination with the JWCP, the ADPO will formulate the TYIWEDC to harness domestic civilian companies' R&D capability, to execute programs to reduce R&D risk for private sector suppliers, and assist civilian developers to gain access to MND or CSIST facilities for testing. After assessing which components are beyond civilian capability, ADPO should match them with ICP technology transfers, induce academic institutes to conduct S&T, or assign the CSIST to incorporate them into its TYDS&TDC. The ADPO can coordinate all the available resources and windows to achieve the plan depicted in TYIWEDC. The ADPO can also select the best R&D results from the CSIST or domestic industrial and academic sectors to recommend to the General Staff Headquarters or to the service branches in the JWCP process, so as to create a new demand-driven virtuous cycle of development.

整體而言，前述的主張以調和部隊戰力求「好」與民間廠商求「利」兩者間的矛盾為目標，而產業發展策略則視各核心國防產業別與武器裝備之性質而定。舉例而言，在潛艦國造上，國防小組建議「二階段潛艦國造」，倡議長期程的潛艦構型設計研發、關鍵裝備取得、測試運作與改良精進的發展循環，即採取細水長流的研發途徑，維持穩定而長期之需求，營造廠商投入之有利誘因；並以日本雙廠併進的方式，藉產業的技術競爭以維持研發動能，提高國製潛艦的性能。但在資安產業，基於資安產品週期短、國內研發能量高、民用市場需求量大，就必須有不同的途徑。配合倡議的資電作戰指揮部位階升級計畫，在「國防前瞻規劃室」的促成下，結合中科院、資策會下轄之技術服務中心（未來將轉型為行政法人國家資通安全科技中心）與民間廠商之能量，縮短資安攻防之戰力研發、服役與轉為民用的循環時間，一方面國防部可自軍民合作的研發中獲得尖端的軍用資安戰力，另一方面研發單位或民間廠商可自迅速退役之軍用資安戰力轉為民用商品中獲利，並在獲利後投入可讓國防部有更為先進之資安戰力的研發，以為下一階段獲利取得先機。

在此一國防產業整體發展願景與建議下，除仍保持我國在彈藥研製（中科院的空對空飛彈、空對地飛彈、防空飛彈、反艦飛彈、巡弋飛彈、水雷）等強項外，基於《國防政策藍皮書第五號報告：二〇二五年中國對台軍事威脅評估》所做的威脅評估，民進黨未來將以「強化保障數位國土的能力」、「加速潛艦國造」與「轉型制空戰力」三項為核心戰力，所涉者為「航太」、「船舶」與「資安」三項產業。國防小組分別延請各領域八位專家提供各該產業發展書面意見（其書面意見全文刊登，如附件 3 至 10），並邀請長期關注潛艦國造與資安產業發展的民進黨籍立委林岱樺與姚文智提供書面意見（如附件 1、2）。九月間，擴大各產業學者專家進行密集討論。與會者，除前述八位學家專家外，另有其他八位學者專家與會，合計十六位航太、船舶與資安產業專家共同參與本藍皮書的準備工作。而後由國防小組全體諮詢委員初審後，在發表前，再送請五位具實務經驗之前政務官、學者或專家進行審閱工作，而後完成本藍皮書。有關航太、船舶與資安三項核心國防產業之個別發展策略如下：

Taken together, the Defense Committee's multiple proposals outlined above aim to harmonize the mismatch between the quality-seeking military and the profit-seeking civilian contractors. In terms of industry development strategy, it depends on the specifics of each core defense industry and the weapon system in question. For example, in terms of indigenous production of submarines, the Defense Committee recommended the "two-stage indigenous production" development cycle, from long-term ship design, acquisition of key components, and test operations, to technological improvement, which purports to be the kind of R&D approach that goes a long way toward maintaining stable and long-term demand and to create incentives for civilian partnership. We should apply the Japanese model of parallel production lines to maintain the R&D momentum through industrial technological competition. The information security industry, however, requires a different approach due to the short product cycles of cybersecurity products, the strong capabilities of indigenous R&D, and the high demand in the private sector market. In coordination with the proposed organizational upgrade plan for the Information and Electronic Warfare Command, the ADPO can connect the CSIST and the technological service center of the Institute for Information Industry (which will become the National Information and Communication Security Technology Center) with civilian capability, so as to shorten the cycle from the R&D phase of IO capability, time in commission, to civilian applications. On the one hand the MND can acquire state-of-the-art military IO capability through military-civilian cooperation; on the other hand the research units or civilian companies can quickly profit from government spin-offs, use the profit gains to invest in R&D which helps the MND to advance its IO capabilities, and seize the early advantages of profiting from the next phase.

Following the vision and recommendations for the overall defense industry development, Taiwan should continue our lead in the R&D of munitions (namely, the CSIST's air-to-air, air-to-ground, surface-to-air, anti-ship, and cruise missiles as well as sea mines). Also, based on the threat assessment in the DPP's Defense Policy Blue Paper No. 5, the DPP will focus on developing three critical capabilities, including "strengthening the ability to protect the digital territory," "accelerating the indigenous production of submarines," and "transforming air capabilities;" namely, the aerospace, shipbuilding, and cybersecurity industries. The Defense Committee invited eight experts from different areas to contribute written opinions on these different industries (see addendum 3 to 10). We also invited two DPP legislators Lin Dai-hua and Yao Wen-chih to provide their written opinions. Both of them have been tracking indigenous submarines production and cybersecurity industry development for a long time (See addendum 1 to 2). In September 2014, the Defense Committee hosted intensive discussions among experts from various sectors. The participants, besides those eight who provided their written opinions in the addendum included another eight scholars and experts from different fields, constituting a total of 16 experts from the aerospace, shipbuilding, and cybersecurity industries. After all advisors of the Defense Committee reviewed the first draft, before completion the blue paper was submitted for further review to five former officials, scholars and experts who have practical experience in the field, such as Chen Jen-ran and Chen Chun-lin. The development strategies for the three core defense industries (aerospace, shipbuilding, and information security) are in the following:

肆、航太產業發展策略

由表三顯示，我國航太產業近十年來總產值隨航空市場的興盛而顯著成長，以總產值計，十年間成長幅度為 155%。雖然如此，以 2011 年為準，航太製造業當年總產值（707.9 億元）約當年製造業生產總額（約 17 兆）的 0.4%，比例仍低。2003 年經濟部列定航太產業發展目標將在 2013 年達到年產值 1200 億元，但實際達成率僅八成，政府的努力還是不夠。

表三：我國航太製造業近十年發展趨勢

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
我國航太製造業近十年產值									
325.7	372.7	414.3	502.7	611.0	586.8	626.9	707.9	783.9	832.2
漢翔公司近十年營業總收入									
104.2	114.8	126.2	150.4	170.6	190.8	181.7	204.1	228.0	236.1
漢翔公司近十年營業毛利									
-0.3	-11.5	-12.2	9.4	0.7	8.8	10.2	11.3	12.4	12.8
漢翔近十年國防業務營業收入									
51.0	43.0	39.0	48.0	54.9	74.3	88.7	108.6	115.3	76.2

單位：億元

我國的航太產業的產業集中度屬中度，雖然有機體結構（漢翔、千附、拓凱、駐龍、佳瑋等 27 家廠商）、發動機（漢翔、長亨等 17 家廠商）、內裝（懷霖、福基、拓凱等 23 家廠商）與航電（漢翔、克瑞電子、奇美電子、台灣貝克等 21 家廠商）、維修（華航、長榮航太、亞航、華普、漢翔等 27 家廠商）等近二十餘家廠商，漢翔公司（員工 3300 餘人，不含勞動臨時派遣工 1800 人，廠區於台中市逢甲、沙鹿與高雄市岡山）佔有航太產業 30% 上下產值，並具軍民航空器研製維修、引擎製造及工業技術服務提供之垂直整合能力，國際連結強，基礎設施完善，為航太產業的龍頭公司。漢翔公司在 2007 年轉虧為盈，爾後收益年年成長，2013 年營業毛利達 12.8 億元，此一營業榮景使得漢翔公司在 2014 年民營化釋股時，成為競相投資的標的。漢翔民營化是政府近十年來最大民營化釋股案，總釋股金額 93.41 億元，外資對漢翔的青睞業已逼近外資最高投資上限 10%。

VI. Aerospace Industry Development Strategy

As illustrated in TABLE 3, the value of production by Taiwan's aerospace industry has shown steady growth commensurate with the flourishing of market demand. In terms of the value of production output, the growth over the last ten-year period is around 155%. Nevertheless, taking 2011 as an example, the annual industry productive output (NT\$70.79 billion) still makes up a very low proportion of the total national manufacturing output value for that year (NT\$17 trillion) at approximately 0.4%. In 2003 the Ministry of Economic Affairs set NT\$120 billion as the target value for the industry's total productive output by 2013, but has only been able to realize 80% of the goal, indicating that greater efforts from the administration are needed.

TABLE 3 : 10-Year Trends in Taiwan's Aerospace Sector

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Domestic Aerospace Sector Total Value of Production Output									
325.7	372.7	414.3	502.7	611.0	586.8	626.9	707.9	783.9	832.2
AIDC Total Annual Revenue									
104.2	114.8	126.2	150.4	170.6	190.8	181.7	204.1	228.0	236.1
AIDC Annual Gross Profit									
-0.3	-11.5	-12.2	9.4	0.7	8.8	10.2	11.3	12.4	12.8
AIDC Revenue from Defense Related Contracts									
51.0	43.0	39.0	48.0	54.9	74.3	88.7	108.6	115.3	76.2

Unit: NT\$0.1 Billion

The degree of concentration in Taiwan's aerospace sector is about average—while there are more than 20 firms engaged in the production and provision of air frames (27 firms including AIDC, ChenFull International, Topkey Group, Drewloong Precision, Jia Woei Precision Machinery); engines (17 firms including AIDC and Chaheng Precision); interior builds (23 firms including Flylin Industrial, Fuchi Textile, Topkey Group); avionics (21 firms including AIDC, Crane Aerospace & Electronics, Chi Mei Optoelectronics, Becker Electronics Taiwan); and maintenance (27 firms including China Airlines, EVA Air, Air Asia, Asian Compressor Technology Services, AIDC)—AIDC nevertheless makes up around 30% of the industry's output value and employs more than 3,000 workers, not counting an additional 1,800 temporary contractors, operates production plants in Taichung City's Fengchia and Shagang districts, as well as Gangshan district in Kaohsiung. With its capacity for manufacturing and repair of military and civilian aviation equipment, engine production, as well as related technical services, AIDC possesses vertical integration capabilities on top of its strong international linkage and comprehensive facilities, making it the obvious leader in Taiwan's aerospace industry. Since attaining profitability in 2007, corporate earnings have seen steady annual growth, and operating margins reached NT\$1.28 billion in 2013. Its profitability made AIDC a highly attractive investment target upon its privatization in 2014. The privatization of AIDC is the biggest divestment by the government in the past 10 years, one that saw NT\$9.341 billion worth of stocks released. External investment in AIDC is already nearing the 10% ceiling.

航太產業的發展對國防的依賴度屬高度，國防業務營收約佔漢翔公司總營收三分之一至二分之一，是公司盈虧的關鍵。目前承接 IDF 與 F-16A/B 兩款戰機升級案，估計在 2017 年國防業務營收將達 107.6 億元。

以漢翔為首的軍用航空機的科技水準與整合度屬中高度，漢翔公司是國防自主化的指標，自中科院航發中心轉型為國營企業（1996 年）、民營企業（2014 年）以來，漢翔公司擔負合作生產 UH-1H 直昇機與 F-5E/F 戰機以及研製 AT-3 高級教練／輕攻擊機與 IDF 戰機等研製；不僅如此，漢翔公司也與亞航、長榮共同執行空軍二指部國有民營（Government Owned, Contractor Operated, GOCO）案，以及空軍官校教練機場站級的維修，前兩案不僅節約軍隊人力（800 與 820 員），增加民間就業機會（430 與 530 人）與民間航空產業產值（20 與 11 億元）。漢翔公司與多家外商公司合作研製軍用引擎，也與負責戰系與彈藥研發的中科院有長期合作的關係，具有研製下一代高級教練機的能量，在取得關鍵組件後，亦有發展下一代短場或垂直起降之先進戰機的潛能。如同 AT-3 與 IDF 的先例，這些戰機具有與國產戰系彈藥的整合較易、後續的補保取得較為穩定等優點。

近年來，無人飛行載具吸引國內廠商投資，也逐漸被廣泛使用。非軍事的公務用途可包括沿海巡邏、交通監控、災害搶救、科學觀測等。而高規格的軍用無人飛行系統或無人飛行攻擊系統，被視為是臺灣發展不對稱武器的重點裝備，可用於巡邏監控、遙測、通訊等用途，在克服易被干擾的脆弱性與在複雜電磁環境下操作的不確定性後，未來可能會逐漸取代有人戰機，成為攻擊載台，並可提供海、陸軍戰術偵蒐與通訊中介。目前國內有中科院與漢翔公司具有相關研製能量，部分裝備業已部署。

但在太空科技方面，遙測與通訊衛星是我國最具國防意涵的衛星科技，但目前民用衛星科技水準，亦遠低於自外國可取得的資訊與數據水準。除再行評估衛星科技發展對國家安全的必要性外，太空科技轉用於國防安全（如高空長滯空〔High Attitude Long Endurance, HALE〕系統）具有相當可觀的潛能，應列為未來研發的重點。

The development of the aerospace sector relies heavily on national defense expenditures. For AIDC, revenue from defense related contracts makes up between one-third to one-half of its annual total revenue, and is a key determinant of the firm's profitability. With orders for the IDF and F-16 A/B upgrades currently on hand, AIDC's revenue from defense contracts is expected to reach NT\$10.76 billion by 2017.

With AIDC leading the way, the current level of technological development and degree of integration of Taiwan's military aviation sector is considered medium to high. AIDC acts as the barometer for defense self-reliance. From the time of its nationalization in 1996 until the privatization in 2014, AIDC has produced UH-1H, F-5E/F, AT-3, and IDF. Not only that, but AIDC also entered a GOCO (Government Owned, Contractor Operated) contract jointly with Air Asia and EVA Air to operate the Air Force's 2nd Air Logistics Center, and to provide depot level maintenance and repair services to the aircraft trainers at Air Force Academy. These two contracts preserve military manpower (800 and 820, respectively) while creating civilian jobs (430 and 530, respectively) and injecting revenue into the civilian aviation industry (NT\$2 billion and NT\$1.1 billion, respectively). AIDC works with other subcontractors to produce military aircraft engines, as well as maintaining long-term cooperation projects with CSIST, which is tasked with R&D of munitions and combat systems. It is thus capable of producing new jet trainers, and if it is able to acquire the critical components, also has the potential to produce next generation V/STOL fighter jets. Judging from previous experience with the AT-3 and IDF, these fighter jets would offer significantly greater compatibility with domestically produced munitions and combat systems, which promises the advantage of easier maintenance and repair in the future.

The UAV sector has also attracted investment from domestic firms, as UAVs are entering into wider service. Non-military applications for UAVs include coastal patrol, traffic surveillance, disaster response, scientific observation, etc. Meanwhile, military UAV or UCAV are seen as critical to Taiwan's asymmetric warfare capabilities, as they can be used in a wide range of applications such as patrol, surveillance, reconnaissance, and communications. Once UAVs' main vulnerabilities of susceptibility to interference and unpredictability when operating in complex electromagnetic environment are overcome, they may be able to gradually replace manned fighter jets to serve as attack platforms, as well as provide a tactical and reconnaissance communications link between the Army and Navy. Domestically, both CSIST and AIDC already possess the necessary development and production capacities, and some of the developed armaments have been in service.

In the area of space technologies, remote-sensing and communications satellite capabilities are the subsectors of the domestic satellite industry with greatest relevance to and implications for national security applications, but the present technological level of domestically produced civilian-use satellites still lag far behind the data information that MND can acquire from abroad. In addition to a necessary reassessment of the importance of satellite technology development to overall national security, space technologies more generally (such as the High Altitude Long Endurance [HALE] systems) hold considerable potential for conversion to national security applications, and should be viewed as a focal point of future R&D.

因此，在航太產業方面，建議發展策略重點如下：

(一) 自行研製短場或垂直起降之先進戰鬥機：空優是我防衛作戰的根本，但我國空軍的最大弱點在跑道的脆弱度，縱能藉強化防空火網、跑道緊急搶修裝備或以民用道路起降加以彌補，但都是治標不

十年內取得美製 F-35B 戰機之可能性不高，且短場或垂直起降之戰機極可能為我國邁向全面無人戰機的最後一款有人戰機。我國宜保有相當的自我研製補保能量，故應以自行研製為優先考量。自行研製約需七年，每年平均約需投資 114 至 143 億元，約可在研發計畫啟動後九年進入量產階段

治本的權宜之計，也容易在密度高、數量大的解放軍奇襲下失去效能。因此，短場或垂直起降之戰機有其需要，同時，基於於十年內取得美製 F-35B 戰機之可能性不高，且短場或垂直起降之戰機極可能為我國邁向全面無人戰機的最後一款有人戰機(如同 Typhoon 型戰機之於若干歐洲國家一般)，我國宜保有相當的自

我研製補保能量，故應以自我研製為優先考量。自我研製期程(至原型機組裝完成)約需七年，研發成本約在 800 至 1000 億元，每年平均約需投資 114 至 143 億元，約可在研發計畫啟動後九年進入量產階段。建議民進黨在 2016 年重返執政後，以發展短場或垂直起降之先進戰鬥機為軍用航太產業的旗艦計畫，更須要求國防部善盡支持者的角色，協助民間廠商取得關鍵的技術與零組件(如可變控制向量噴口與高推力裝置)。

Consequently, our key recommendations for the development strategy for the aerospace industry are as follows:

1. Indigenously develop advanced V/STOL fighter jets. Air superiority is a basic element of Taiwan's defense, yet the fragility of our runways is the Air Force's greatest vulnerability. Intensive anti-air missile, emergency runway repair gears or using civilian

The probability of acquiring the U.S.-made F-35B within the next ten years is quite low. V/STOL fighters could represent Taiwan's last manned fighter jet as we move toward a completely unmanned air fleet. To ensure that we retain a certain capacity for indigenous R&D and maintenance, we must set domestic production the default first option. The time frame for development is approximately seven years, with an development cost of between NT\$80 to 100 billion, and mass production can begin approximately nine years after the development program is initiated

roadways for takeoff and landing are expedient work-arounds that address the symptoms but not the root cause of the issue, and could well be ineffective under conditions of unexpected high-density bombardment by the People's Liberation Army. Advanced V/STOL jets are therefore a defense necessity, and yet the probability of acquiring the U.S.-made F-35B within the next ten years is quite low. V/STOL fighters could represent Taiwan's last manned fighter jet as we move toward a completely unmanned air fleet (similar to the Eurofighter TYPHOON for several European countries). To ensure that we retain a certain capacity for development and

maintenance, we must set domestic production the default first option. The time frame for indigenous development from conceptualization to completion of the prototype is approximately seven years, with an upfront development cost of between NT\$80-100 billion (approximately NT\$11.4-14.3 billion per year), and mass production can begin approximately nine years after the development program is initiated. The development of a V/STOL advanced fighter jet should be the flagship project for the revitalization of the aerospace sector under a new DPP administration, one which would require the MND to play a major supporting role by assisting the contractors to acquire key technologies and component sets (such as thrust vectoring rudder control and high speed propulsion systems).

(二)高級教練機以自行研製為優先：空軍現有高級教練機(AT-3與F-5)壽齡已屆，已有更新機型的迫切需要。在戰力的考量上，自行研製的教練機具有與國製彈藥的高整合度與後勤補保的便利性，並可在戰時迅速轉用於戰術任務或補充一線戰機消耗等優勢。雖多耗時二至三年與額外450億元上下研發成本，但自行研製模式所產出的航太產業產值將較與外商合作模式略增300億元，多出的研發成本應可發揮增加航太產業研發能量與產值之效果。國防部應落實2003年經濟部「航空產業發展方案」與立法院2011年通過之決議案以自行研製為優先選項。

(三)營造無人飛行載具之高競爭性市場：無人飛行載具或無人攻擊機具有相對成本低、操作難度低、人員戰鬥傷亡風險低等作戰面上的優勢，未來將會逐漸取代有人戰機的角色。但無人機也有易被干擾的脆弱性，故應利用其產品特質，鼓勵多元研製，形成多款無人機戰具。國防部應採釋出軍用科技轉供民用(spun-off)與以民間產業產品與技術投入軍品研發(spun-on)雙管齊下的方式，營造高競爭性市場。以競爭刺激軍用無人機的技術升級，縮短軍規無人機轉為非軍事公務使用或民用之週期，除可保持國軍所使用之無人機裝備的科技優勢外，並可開拓廠商利基，以加速廠商的自我投資研發。同時，國防部應掌握無人機蓬勃發展之趨勢，協助民間研發利用國防部設施與場地進行測試，並就民規現貨擇優升級轉為軍用，在中科院與漢翔公司的傳統供應者之外，國防部應更多釋出需求以期帶動無人機科技水準的競爭。目前，國防部已完成若干用以戰術情報蒐集之無人飛行載具系統，並陸續部署；未來，在此一基礎上，除持續精進現有無人飛行載具系統外，並應朝向建立具反輻射打擊能力(近程，六年)、全天候精準打擊能力(中程，六至十年)、遠距聯合打擊與模組化酬載能力(遠程，十年以上)之無人飛行載具系統。

2. Prefer to full domestic production of advanced jet trainers. The Air Force's AT-3 and F-5 training jets are nearing the end of their respective service life and in critical need of upgrades. From a readiness and capabilities perspective, domestically developed jet trainers boast a high degree of compatibility and carry the advantage of being able to be rapidly used in combat missions or to supplement depleted first-line aircraft. Although it would require 2-3 years and an additional upfront R&D expenditure of approximately NT\$45 billion, taking into consideration the advantages described above as well as the prospects for expanding the capacity of domestic development and production in the process, it would be appropriate to choose the option that charts the steady path toward upgrading the indigenous R&D and productive capabilities. Under a model of indigenous production, the value of the aerospace industry production output will slightly exceed that of an international cooperation model by approximately NT\$30 billion. The additional overhead would be an investment toward raising the level of national aerospace production value. The MND should thus quickly act to implement the Aerospace Industry Development Plan put forth by the MoEA in 2003, as well as the resolution passed by the LY in 2011 to make domestic procurement the preferable option.

3. Create a competitive market for UAV. UAVs and UCAVs have the advantage of being relatively low cost, low operational complexity, and low casualty risk, and can thus be expected to increasingly replace the functions of manned fighter jets in the future. Since unmanned vehicles are vulnerable to interference, the development and production of diverse models with a wide variety of features and characteristics should be encouraged. MND should foster a competitive market through a two-pronged approach, by "spinning-off" military technologies for civilian uses on the one hand, and "spinning-on" civilian technologies for defense applications on the other. Market competition will stimulate the advancement of technologies for military-use UAVs, while shortening the time period for making military UAVs available for civilian functions will maintain the military's edge in the use of unmanned equipment in addition to incentivizing and accelerating investment in R&D by contractors. At the same time, MND should seize the trend of proliferating UAV development to assist civilian R&D by offering the use of MND facilities for testing purposes. MND can also select from the best available civilian UAVs for conversion to military uses. Beyond the traditional suppliers CSIST and AIDC, MND must seek out other potential suppliers, with an eye towards elevating standards through promoting competition in the UAV sector. MND is already gradually integrating and deploying multi-use and reconnaissance UAVs; from this basis going forward, apart from continuously improvement the existing UAV systems, it should also look to develop unmanned vehicles with anti-radiation attack capabilities (near term, 6 years), all-weather precision strike capabilities (medium term, 6-10 years), and long-range joint strike, and modular payload capabilities (long term, more than 10 years).

伍、船舶產業發展策略

由表四顯示，我國船舶製造業近十年來由於南韓與中國新興競爭者的壓縮，市場成長趨緩、波動亦大，以總產值計，2013 年較 2004 年成長幅度約為 70%；原本船舶製造業年產值較航太製造業高，但 2009 年後情勢逆轉，2013 年船舶製造業的產值已顯著落後航太製造業近 250 億元。以 2011 年為準，船舶製造業當年總產值（562 億元）約當年製造業生產總額的 0.3%，比例仍低。

表四：我國船舶製造業近十年發展趨勢

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
我國船舶製造業近十年產值									
342.8	394.6	428.2	541.0	658.7	551.8	540.3	562.0	608.3	582.7
台船公司近十年營業總收入									
192.9	198.0	291.3	356.5	311.9	261.7	289.7	308.1	248.1	NA
台船公司近十年營業毛利									
8.1	13.5	48.7	56.5	26.4	21.6	20.2	9.7	8.4	NA
台船近十年國防業務營業收入									
1.41	1.80	0.09	0.09	13.69	47.29	55.54	18.33	2.37	29.38

單位：億元

我國的船舶產業的產業集中度屬中高度，雖然國內有台船、中信、慶富等公司具有建造中大型船艦的經驗，但台船公司（員工 2770 餘人，約佔船舶製造業總從業人員四分之一，廠區於高雄市小港，2008 年完成民營化）約佔有船舶產業 30%-50% 產值。國內船舶製造業與航太產業在發展歷程上有三點差異：首先，船舶產業對國防的依賴度遠較航太產業為低，台船在 2006、2007 兩年承接國防業務幾乎為零，但營業毛利未受影響，甚至於還比起國防業務激增的 2009、2010 年為高。

其次，軍用艦隻的研發能量大部分仍然保留在海軍造船發展中心（簡稱海發中心）。因此，相對於空軍在戰機研製過程中的角色，海軍在軍用艦隻研製過程中所扮演的角色較大。海軍不僅是使用者，同時海發中心也常扮演系統整合的主承包商角色。

V. Shipbuilding Industry Development Strategy

As illustrated in TABLE 4, the total value of Taiwan's shipbuilding industry's production output in 2013 showed only a 70% increase from 2004, due to rising competition, from South Korea and China over the past decade, as well as the slowdown in the rate of market growth and rising market volatility. In the past, the shipbuilding industry's annual output value was typically higher than the aerospace manufacturing industry; however the situation reversed in 2009, and in 2013, the shipbuilding industry's output value was significantly lower than the aerospace manufacturing industry by NT\$25 billion. In 2011, the total output value (NT\$56.2 billion) of the shipbuilding industry was only 0.3% of the total output value of all manufacturing industries.

TABLE 4: 10-Year Trends in Taiwan's Shipbuilding Sector

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Domestic Shipbuilding Sector Total Value of Production Output									
342.8	394.6	428.2	541.0	658.7	551.8	540.3	562.0	608.3	582.7
CSBC Total Annual Revenue									
192.9	198.0	291.3	356.5	311.9	261.7	289.7	308.1	248.1	NA
CSBC Annual Gross Profit									
8.1	13.5	48.7	56.5	26.4	21.6	20.2	9.7	8.4	NA
CSBC Revenue from Defense Related Contracts									
1.41	1.80	0.09	0.09	13.69	47.29	55.54	18.33	2.37	29.38

Unit: NT\$0.1 billion

The degree of concentration in Taiwan's shipbuilding industries is medium-high. Although CSBC, Jong Shyn Shipbuilding, and Ching Fu Shipbuilding all have medium and large size vessel manufacturing experience, CSBC, with 2,770 employees (approximately 25% of the total number of employees in the shipbuilding industry), a yard in Siaogang District, Kaohsiung, with privatization completed in 2008, produces 30%-50% of the shipbuilding industry's total output value. There are three differences in the development of Taiwan's shipbuilding industry and aerospace industry: First, the shipbuilding industry's dependency on national defense is lower than that of the aerospace industry. CSBC contracted almost no defense projects in 2006 and 2007, and yet its gross profit was not only unaffected, but was also better than 2009 and 2010 when defense contracts significantly increased;

Second, the R&D of military vessels is mainly conducted by the Naval Shipbuilding Development Center. Therefore, in contrast to the Air Force's role in fighter jet developments, the Navy plays a bigger role in vessel developments. The Navy is not only the user, but the Naval Shipbuilding Development Center is also in charge of system coordination, sometimes playing the role of a prime contractor.

第三，由於中科院具有部分戰鬥系統、裝備的研製能量，而船舶暨海洋產業研發中心（簡稱船舶中心）與各船廠也具有艦體研發能量。因此，軍艦的研發相較於戰機研發需要更多垂直分工上的整合。最後，如表五所示，台船、中信、慶富、龍德等公司均有承造軍艦經驗，在大型艦隻的建造，台船因基礎設施而有明顯優勢；但在中小型艦的建造，則是高度競爭的市場。

表五 國內船廠基礎設施與承接建造軍艦經驗

船廠	基本設施	主要建造經驗
台船	百萬噸級乾塢	成功級巡防艦、 油彈補給艦、 快速人員運輸艦、 龍江級巡邏艦、 錦江級巡邏艦、 150 噸級飛彈快艇、 50 噸海鷗級飛彈快艇、 海巡署 2000 噸級巡護船
中信	四萬噸級半乾船塢	1200HP 港勤拖船、 海巡署 3000、2000、1000、500 及 100 噸等各型巡護船 25 艘
慶富	六千噸船台 三千噸船台	1800HP 港勤拖船、 海巡署 600 噸級巡護船 4 艘、100 噸級巡護艇
龍德	65 公尺室內船渠 五百噸級浮塢 三百噸級船台	500 噸沱江級飛彈巡邏艦、 海巡署 100 及 60、50、30、20 噸 等各型巡護艇

臺灣有百餘家造船廠，大部分為承造小型船艇廠商。2012 年，以承造小型船艇起家的龍德公司承接了海軍新一代匿蹤雙船體沱江級飛彈巡邏艦的原型艦建造，沱江級巡邏艦的先進設計，需要高精密的組合技術來保持它的匿蹤性能，所需的技術水準遠高過於該公司過去所承造的一般海巡署艦隻所需的水準。龍德公司的市場策略非常明顯：它不惜賠本也要學習到此一先進設計的施工技術，以建立承接中型軍用艦的經驗，因為這會讓該公司未來在國內外市場的競爭中建立技術與經驗上的優勢。沱江級艦現已下水測試，預計 2014 年 11 月交艦。這不僅是一個廠商升級的模式，也將是整體船舶產業升級的模式。

Last, the CSIST has the R&D and manufacturing capacity for some combat systems and equipment, and the Ship and Ocean Industries Research & Development Center and most ship manufacturers also have research capabilities. Therefore, the R&D of military vessels requires more vertical coordination than fighter jet R&D. As TABLE 5 indicates, CSBC, Jong Shyn, Ching Fu, and Lung Teh Shipbuilding all possess experience in manufacturing military vessels. CSBC has significant advantage in large size vessel manufacturing due to its facilities, but the manufacturing of medium size vessels is a highly competitive market.

TABLE 5: Taiwanese Shipbuilders' Facilities and Experience in Military Vessel

Shipbuilder	Facilities	Military Vessel Building Experience
CSBC	1 million-tons dry dock	CHENG KUNG-class frigates Combat support ships High-speed personnel transport ships LUNG CHIANG-class fast attack missile crafts CHING CHIANG-class fast attack missile crafts Missile boats (150 tons) DVORA-class fast patrol boats (50 tons) Coast Guard patrol vessel (2000 tons)
Jong Shyn	40,000-tons dry dock	1200HP tugboats 25 Coast Guard patrol vessels (3000, 2000, 1000, 500, and 100 tons)
Ching Fu	6000-tons ship cradle 3000-tons ship cradle	1800HP tugboats 4 Coast Guard patrol vessels (600 tons) 4 Coast Guard patrol boats (100 tons)
Lung Teh	65-meters indoor dock 500-tons float bridge 300-tons ship cradle	TUO RIVER-class corvette (500 tons) Various Coast Guard patrol boats (100, 60, 50, 30, and 20 tons)

Taiwan has more than a hundred shipbuilders, but the majority of these only contract for small-scale vessel building. Lung Teh Shipbuilding—a builder equipped for small size vessel contracts—won a contract for the Navy's new stealth twin-hull TUO RIVER-class corvette in 2012. The advanced design of the TUO RIVER-class corvette requires highly precise assembly technology to maintain its stealth characteristics. The required technology is far more advanced than any Coast Guard vessel that Lung Teh has ever built. Lung Teh's market strategy is clear: to acquire this advanced manufacturing technology and the experience of building medium size military vessels at all cost. This will provide Lung Teh with an advantage in technology and experience when it comes to future domestic as well as international marketing. The TUO RIVER-class corvette has completed its water test, and is scheduled to be handed over in November 2014. This will not only become the upgraded module for Lung Teh, but the upgraded module for the whole shipbuilding industry.

船舶製造業在艦體打造的技術上已經成熟，但誠如前述，艦體承造僅佔軍用艦隻成本的 20%，船舶產業未來升級的關鍵將是藉研發、系統整合與技術水準的提昇上來突破這 20% 門檻。如果妥善經營海軍艦隻的未來需求，就可發揮帶動船舶產業升級的引擎效果。唯有如此，船舶製造業才能在南韓與中國的競爭下持續保持榮景。目前，海軍傾向國艦國造的路線是正確的，但如何產生前述的引擎效果將更為重要。臺灣是海島國家，應當企思師法英國，英國海軍縱使艦隻數量已大不如昔，但仍保持極為亮眼的軍艦自製能量，包括艦體結構、推進系統、電子設備、指管系統、武器系統、系統整合、組裝、生活設施、內裝設施等必要的軍用艦隻裝備之供應廠商有 81% 為本地廠商。¹因此，未來海軍的需求無論水面或水下艦隻，均應以國內研製為優先，國防部支持者的角色至為重要，需主動積極協助國內廠商以主合約商角色擔負更大的系統整合責任，並在外購案中積極為船舶產業爭取技術轉移、合作研發的機會，讓國內廠商突破技術門檻。

因此，在船舶產業方面，建議發展策略重點如下：

（一）堅定潛艦國造路線：潛艦國造的最大障礙不在高雄，不在華盛頓特區，而在凱達格蘭大道上的總統府，政策不明造成本就具有研發風險的潛艦國造更形複雜。唯有清楚的政策指導，友邦才知道如何協助臺灣，產業界才能專心克服研發風險。國防小組建議：民進黨雖已宣示潛艦國造決心，視潛艦國造為各項國防自主旗艦計畫之首，在執政準備過程中，當極力向友邦與國內外產業界溝通說明此一理念，於 2016 年重返執政後，當堅定落實此一路線，立即啟動潛艦國造工程。

¹ Mark V. Avena et al., *The United Kingdom's Naval Shipbuilding Industrial Base: The Next Fifteen Years* (Santa Monica: RAND, 2005), p. 117.

Shipbuilders have mature technology in hull building, but as mentioned above, hull contracts are only 20% of the total costs of military vessels. The key for the shipbuilding industry to break through this threshold is through R&D, system integration, and the enhancement of its technological level. The upgrade of the shipbuilding industry can be initiated by properly managing the future naval demands. Only through this, can the shipbuilding industry maintain its prosperity given the competition from South Korea and China. Taiwan's new naval vessels are about to be manufactured domestically. This is the correct course for the Navy to take. However, jump-starting the upgrade process of the shipbuilding industry is even more important. As an island nation, Taiwan should learn from the British experience. Although the number of British naval vessels has decreased significantly, the British Navy has retained strong R&D momentum, and 81% of essential components for naval vessels such as hull structure, propulsion system, electronic equipment, command and control system, weapon system, system integration, assembly, living facilities, and interiors, are manufactured by domestic shipbuilding companies.¹ Therefore, naval future surface vessels or submarines should be designed and built domestically. The supportive role of the MND is also important. The MND should actively assist local companies take on the responsibility of prime contractor in system integration. Additionally MND should also help shipbuilders, via ICP, gain opportunities for technology transfers and for joint R&D, helping domestic shipbuilders to break through the technological threshold.

As such, the Defense Committee recommends focusing on the following issues in a development strategy for the domestic shipbuilding industry:

1. Stay the course toward the indigenous production of submarines: the biggest obstacle to building submarines domestically is not in Kaohsiung; it is not in Washington, DC; it is in Taiwan's presidential office. Vague policies have further complicated an already complex and risky project of indigenously building submarines. Only a clear policy directive can let our friendly countries know how to assist Taiwan, and help the industry to focus on managing the associated R&D risk. The Defense Committee suggests that since the DPP has declared its determination to domestically manufacture submarines, and placed it as top priority of all national defense flagship projects, it is important to explain this idea to our international friends and domestic shipbuilders while preparing to return to government. When the DPP takes power in 2016, it should strengthen this course and immediately initiate the submarine project.

¹ Mark V. Avena et al., *The United Kingdom's Naval Shipbuilding Industrial Base: The Next Fifteen Years* (Santa Monica: RAND, 2005), p. 117.

潛艦研製所需之設計、建造與關鍵性裝備，目前國內產業界與中科院已具有 70% 左右自我研製能量、20% 具有研製成功之潛能、10% 為短期內需向外採購。國防小組彙整各界意見，評估國內潛艦自行研製能量如表六所示：

表六 國內研製潛艦能量評估

	主要項目	評估
設計階段	船型擇定	■
	各系統（結構、推進、靜音、操控、排氣、燃油、導航、通信系統與生活、救難設施）等設計	■
	軟體設計	■
	人力	■
載台建造階段	船殼（艦體鋼材、壓力殼、魚雷發射管）	■
	柴油發電機	□
	主電池	■
	推進系統	■
	絕氣推進系統	■
	電力與控制系統	■
	液壓、通風、高壓閥、升降	■
	呼吸管排氣閥	□
	人力	■
	陸基測試站	■
戰鬥系統	指管系統	■
	聲納系統	■
	電偵系統	■
	魚雷與魚雷反制系統	■
	導航系統	■
	通信與資訊鏈路系統	■
	潛望鏡系統	■
	人力	■

■ 國內已具相當能量

■ 國內具有研發成功潛能或部份能量（需國外技術協助）

□ 短期內需自國外引進

Domestic shipbuilders and CSIST currently possess the R&D capacity for 70% of the necessary designs, constructions, and key equipment for submarine building. We also have the potential to successfully research and produce an additional 20%. In the near future, the remaining 10% will still need to be purchased from abroad. The Defense Committee has combined various suggestions and advice from different areas to evaluate Taiwan's capacity for producing submarines, shown in TABLE 6:

TABLE 6: Taiwan's Indigenous Submarine Capacity Evaluation

	Main Items	Evaluation
Design Stage	Vessel type selection	■
	System designs (structure, propulsion, mute, control, exhaustion, fuel, navigation, communication system, and living and rescue facilities)	■
	Software design	■
	Personnel	■
Construction Stage	Hull (hull material, pressure hull, torpedo tube)	■
	Diesel-electric generator	□
	Main battery	■
	Propulsion system	■
	Air-independent propulsion	■
	Power and control system	■
	Hydraulic pressure, ventilation, high pressure valve, elevation	■
	Breathing tube exhaustion valve	□
	Personnel	■
	Land-based testing station	■
Combat System	Command and control system	■
	Sonar system	■
	Electronic detection system	■
	Torpedoes and torpedo countermeasure system	■
	Navigational system	■
	Communication and information chain system	■
	Periscope	■
	Personnel	■

■ Taiwan possess sufficient capacity

■ Taiwan possess partial capacity or potential for successful development (requires foreign assistance for technology support)

□ Need to be purchased from abroad

我國研製潛艦的瓶頸不在於所謂的紅區裝備，事實上國內在這些機敏尖端裝備的研發已取得相當成果。真正的瓶頸在於人力，國內缺乏具有潛艦設計與建造經驗的人力，特別是在研發階段，這將會是潛艦國造必須要克服的最大困難。一艘新型潛艦的研製一般需時十至十五年，其中三分之二的時間會用在設計階段上，若缺乏一定數量具經驗與相關專業的設計人員，將會使得設計階段時程延宕，連帶提高研製成本。據估計，在充分的設計軟體與設施的支援下，設計階段高峰期需要 600 至 900 名專業設計人員，而其中 500 名須具備有潛艦設計的相關經驗。¹而目前國內的設計人力數量顯然未及此一標準，更遑論具設計潛艦之經驗，而這才是潛艦國造真正的困難。但換個角度，這也是潛艦國造的價值，藉由國造過程，引進外國設計人員、技術與軟體協助，達成從設計到建造技術與人力上的提昇，進而帶動產業的升級。

國防小組提出「二階段潛艦國造」構想，倡議長期程的潛艦構型設計研發、關鍵裝備取得、測試運作與改良精進的發展循環。在此一構想下：

第一階段：目標為藉現有劍龍級潛艦的延壽與逆向工程，以維持水下兵力，並增加產業經驗與自信。採延壽與逆向工程並行，後者規劃於計畫啟動後六至八年完成延壽 2 艘、逆向新造 2 艘。計畫完成後，延壽後的劍龍級取代海獅（茄比）級潛艦成為訓練艦。

¹ John Birkler et al., *Australia's Submarine Design Capabilities and Capacities: Challenges and Options for the Future Submarine* (Santa Monica: RAND, 2011), p. 184.

Taiwan's bottleneck in indigenous submarines is not the so-called "red-zone" equipment. In fact, our R&D in cutting-edge equipment has been pretty fruitful. The real bottleneck lies in manpower. Taiwan lacks people with experience in submarine design and building, especially at the R&D stage. This will be the biggest obstacle to overcome for indigenous submarines. It generally requires ten to fifteen years to develop a new type of submarine, with two thirds of that time spent on the designs. Without a certain number of experienced professionals, the designing stage will be prolonged, raising the R&D cost. In a RAND analysis, with sufficient software and facilities, an estimated 600 to 900 professional designers are required during the peak of the designing stage, while among them, 500 designers need sufficient experience in designing submarines.¹ Taiwan currently does not meet these requirements, which is the real obstacle for indigenous submarines. On the other hand, this is also the value of indigenous submarines. Importing foreign designers, technology, and software assistance during the process of submarine building will upgrade the industry by enhancing our technology and personnel in designs and construction.

The Defense Committee proposes a "two-stage indigenous production" concept for a long-term submarine R&D, key equipment acquisition, and testing and improvement cycle. Under this concept:

Stage One: Use life extension and reverse engineering of the current ZWAARDVIS-class submarine to maintain our submarine force, and to increase the industry's experience and confidence. Life extension and reverse engineering should be conducted simultaneously. The life extension of 2 vessels as well as the production of 2 additional vessels through reverse engineering should be completed six to eight years into the project. The extended ZWAARDVIS-class submarines will then replace the current GUPPY-class submarine as training vessels.

¹ John Birkler et al., *Australia's Submarine Design Capabilities and Capacities: Challenges and Options for the Future Submarine* (Santa Monica: RAND, 2011), p. 184.

第二階段：與第一階段同時或直後啟動，為真正的潛艦國造計畫。目標為：研製 6 艘以上新型潛艦，以建立總艦數 8 艘以上可恃的

**新型潛艦為水面排水量 1500 噸級
中型潛艦，以三年新建 1 艘頻率
進行，預計於八至十年後完成第
一艘新型潛艦，於二十三至二十
五年完成 6 艘新型潛艦的建造**

水下嚇阻兵力，並增加國內船舶產業研製潛艦之能量。新型潛艦為水面排水量 1500 噸級中型潛艦，以有效捍衛巴士海峽與臺灣東北部、東部水域。規畫於計畫啟動後（若以 2017 年為基

準），以三年新建 1 艘頻率進行，預計於八至十年後（2025 至 2027 年間）完成第一艘新型潛艦，而後以每 3 年完成 1 艘新艦頻率，於計畫啟動後二十三至二十五年（2040 至 2042 年間）完成 6 艘新型潛艦的建造。

預計兩階段需耗資 3500 至 4000 億元，以期程二十三年計，預計每年最多需投入 173 億元。

潛艦的作戰特性具戰略持久優勢與敵第一擊下可靠的不易毀性，應為未來海軍主力。故當以維持、精進、擴大水下戰力為潛艦國造之主要目的，為維持研製動能，除於新型艦服役八至十年後進行研改升級，更考量以日本雙廠併進的模式，於設計建造技術與人力日趨成熟後，擇定有利時點，創造雙廠市場結構，鼓勵技術競爭，擴大研製動能。

（二）更新水面戰力，營造科技競爭市場：隨著海軍中大型水面艦齡老化，海軍未來水面艦更新需求龐大。海軍已透露未來二十年的水面艦更新構想，包括 4 艘 10,000 噸級驅逐艦（取代艦齡將屆三十年的基隆級驅逐艦）、10 至 15 艘 3000 噸級雙船體巡防艦（取代艦齡將滿二十年的康定級與成功級兩款巡防艦）以及兩棲船塢運輸艦（取代現有船塢登陸艦與坦克登陸艦），並規劃以國艦國造並採細水長流的方式執行。

Stage Two: Start simultaneously with or immediately after Stage One on the project

The new submarines will be medium size submarines with 1500-ton surface displacement. Once the project is initiated, production on a new submarine will start every three years. The first submarine will be completed approximately eight to ten years after the program launch, completing the production of six submarines in 23 to 25 years

of true indigenous submarine production. The goal is to design and produce six or more submarines, to form a fleet of eight to establish a sufficient submarine force, and to increase Taiwan's submarine building capacity. The new submarines will be medium size submarines with 1500-ton surface displacement, in order to protect the Bashi Channel and Taiwan's northeast and east waters. Once the project is initiated (projected at 2017), production

on a new submarine will start every three years. The first submarine will be completed approximately eight to ten years after the program launch (between 2025 and 2027), completing the production of six submarines in 23 to 25 years (between 2040 and 2042).

The estimated cost for both stages is between NT\$350 to \$400 billion (US\$11.5 to \$13.1 billion). With the projected 23-years timeframe, an estimated NT\$17.3 billion (US\$567.6 million) will be required each year.

The combat characteristics of a submarine are its advantage in strategic endurance and its survivability in the face of the enemy's first strike. Thus, it should be considered as the main force for the Navy in the future. The objective of indigenous submarines should be to maintain, improve, and expand our submarine force. In order to maintain the R&D momentum, new submarines should be upgraded eight to ten years after being commissioned. Additionally, the Japanese double-manufacturer model should also be implemented when Taiwan's design and building technology and personnel have matured. Through a double manufacturer structure, we can encourage technological competition and expand our research and building capacity.

2. Modernize our surface fleet and create a technologically competitive market: With the aging of the Navy's medium and large size vessels, there is an urgent need to replace the Navy's surface vessels. The Navy has already laid out its 20-year concept for surface fleet renewal, including four 10000-ton destroyers (replacing the 30-year old KIDD-class destroyers), ten to fifteen 3000-ton twin hull frigates (replacing the 20-year old LA FAYETTE-class and PERRY-class frigates), and amphibious transport docks (replacing the current amphibious transport docks and tank landing docks). These vessels should be built domestically and executed on a long-term basis.

國防小組建議：對於海軍水面艦登新的規劃，可予支持。對於起造的優先順序排定，宜同時考量艦齡與任務實需，也須注意反潛任務（濟陽級）艦的更新需要。然而，此一龐大的水面艦更新計畫，除能提供船舶產業穩定的訂單外，民進黨更應於執政後要求國防部善盡支持者、規範者與投資者的角色，以經營需求來帶動船舶產業升級。鼓勵更多中小型船舶業者（如龍德公司）進入國防產業，刺激中大型船舶業者（如台船、中信與慶富公司）藉由國際連結取得技術利基投入競爭，並藉由垂直整合發展出從研發到承造的整體能量。換言之，應善加利用需求，營造開放的造艦產業市場，刺激競爭性的商源，讓廠商以科技水準而非價格取得訂單，讓國軍能獲得性能比規劃中更佳的艦隻。

（三）研究發展無人水面艦與無人水下載具：無人水面艦與無人水下載具是繼無人機後各國現正積極研發的國防科技項目，而美軍現已進入測試階段。之於傳統的水面艦與潛艦，無人水面艦與水下載具有成本低、操作易、人員風險低等優勢，而且對於在臺灣西部水域的水面作戰，面臨到高密度反艦飛彈的作戰環境，無人水面艦與無人水下載具可降低部署水面艦的風險，而此一水域的水文與水下地形，無人水下載具將可發揮與小型潛艦相當的戰力。與無人機相同，無人水面艦與無人水下載具也深具轉為民用之潛能；但比起蓬勃發展的無人機，我國在無人水面艦與無人水下載具的發展起步較晚，需國防部投資促進初期研發，俟產學界研製有成後，循無人機發展模式，以競爭刺激軍用無人艦與水下載具的技術升級，縮短軍規無人艦與水下載具轉為非軍事公務使用或民用之週期，保持國軍所使用之無人艦與水下載具裝備的科技優勢，開拓廠商利基，以加速廠商的自我投資研發。

The Defense Committee's advises full support the Navy's surface fleet renewal plan, and prioritizing of the building sequence by considering the life span of vessels and mission requirements. In the meantime, the upgrade needs for the KNOX-class frigates should also be given consideration. This large-scale renewal plan will provide the shipbuilding industry with stable demands, and the DPP should also enforce the MND's role as supporter, regulator, and investor. MND should induce the industry's upgrade through creating market demand, encourage small and medium shipbuilders (such as Lung Teh) to enter the defense market, motivate medium and large shipbuilders (such as CSBC, Jong Shyn, and Ching Fu) to acquire competitive technology through international connections, and develop R&D capacity through vertical coordination. In other words, MND should take advantage of the future naval demands to foster an open market, and to stimulate competitive opportunities, allowing shipbuilders to win contracts on the basis of technological capacity and not just price, and thus providing the military with better vessels than planned.

3. Develop unmanned surface vessel (USV) and unmanned underwater vehicle (UUV): After UAV, USV and UUV are the defense items that some countries are most aggressively developing. The U.S. has already started testing its unmanned vessels. USV and UUV are low cost, easy to control, and low casualty risk compared to traditional surface vessels and submarines. USV also minimize the risk when deploying surface vessels in Taiwan's western waters that faces a high density of anti-ship missiles. UUV will also have equal combat capabilities as a small size submarine in that area's underwater terrain. Similar to UAV, USV and UUV also have the potential for civil use. However, the development of USV and UUV started later than the development of UAV. Thus, it will require MND investment in at an earlier stage of R&D. Once R&D has matured, unmanned vessels can follow the UAV model of stimulating technology upgrades through competition, shortened spin-off period from military use to civil use, which would maintain the military's technology advantage while accelerating industries' own investments in R&D through market incentives.

陸、資安產業發展策略

台灣是資訊業強國，資訊業在當今臺灣經濟發展上扮演舉足輕重的角色，國家實驗研究院科技政策研究與資訊中心 2011 年的數據顯示，資訊業的產值為製造業整體產值的 33%，為製造業之冠（但在國內生產的比例僅 0.4%）。又依資訊工業策進會 2013 年的數據（如表七所示），臺灣有十項以上資訊產品的市佔率居全球第一，而資訊硬體產業產值約當我國資訊業四項類別（資訊硬體、網路通訊、行動裝置與軟體服務）總產值的 65%，其中硬體業的筆記型電腦與主機板全球市佔率分別高達 86.9%與 80.8%，更足以影響全球市場。同時，臺灣也是資訊高度普及的發達國家，同一資料來源顯示：臺灣電腦的普及率達到 80%，網路普及率 76.3%，行動電話普及率 127.1%，行動電話上網普及率為 53%。這些數據顯示：臺灣在經濟結構與社會互動上都高度依賴資訊，因此，在經濟面與社會面上，資訊安全對於資訊產業產品與民眾生活方式均有其影響。但表七也顯示：我國在資安產業（屬資訊軟體服務類項下）的發展雖然保持亮眼的成長，但市場規模相對仍小，以 2013 年的數值，資訊安全項相關產值僅占資訊軟體服務業產值 13.5%，約佔資訊產業整體總產值之 0.7%。

表七：我國資訊相關與資安產業近年發展趨勢

2006	2007	2008	2009	2010	2011	2012	2013
資訊硬體產業產值							
89,656	105,446	110,250	107,830	120,405	139,355	150,312	133,754
網路通訊產業產值							
6,643	8,643	9,581	9,115	10,698	12,630	13,785	16,411
行動裝置（僅計智慧型手機）產業產值							
		9,656	11,610	21,747	39,356	45,747	48,337
資訊軟體服務業（2011 年前數字僅資訊軟體業）市場規模（以匯率 1:30 折算為美金）							
		4,327	4,302	4,869	6,281	6,545	6,841
資安產業市場規模（以匯率 1:30 折算為美金）							
		468	531	610	703	807	927

單位：百萬美元

VI. Development Strategy for Information Security Industry

Taiwan is a major player in the global information technology (IT) industry, which also plays an important role in Taiwan's economic development. According to data from the National Applied Research Laboratories' Science & Technology Policy Research and Information Center, the total value of production output by Taiwan's IT industry in 2011 was 33% of the total output value generated by the manufacturing sector in that year. That was the highest of all manufacturing industries, but products that were produced domestically were only 0.4% of all products produced. According to the Institute for Information Industry's 2013 data (shown in TABLE 7), Taiwan holds the highest global market share in more than ten categories of IT products. The output value of the computer hardware industry is approximately 65% of the total output value of Taiwan's four IT industry sub-sectors (computer hardware, internet communication, mobile devices, and software services). Laptop and motherboards (under computer hardware sub-sector) have an influential global market share as high as 86.9% and 80.8%, respectively. At the same time, Taiwan is a nation where information is highly popularized. The same data indicates that the adoption rate of computers is 80%, internet access penetration is 76.3%, and cellphones is 127.1%. The popularization of cellphones with access to the Internet is 53%. These figures indicate that Taiwan is highly dependent on information economically and socially. Therefore, information security has a great impact on the IT industry overall as well as people's way of life. However, TABLE 7 also indicates that although Taiwan is an outstanding performer in information security industry (classified under software services sub-sector), its market share is still small. In 2013, the value of production output by the information security segment was only 13.5% of the total output value of software services, which was only 0.7% of the entire computer IT industry.

TABLE 7: Recent Trends in Taiwan's IT and Information Security Industries

2006	2007	2008	2009	2010	2011	2012	2013
Computer Hardware Industry Total Value of Production Output							
89,656	105,446	110,250	107,830	120,405	139,355	150,312	133,754
Internet Communication Industry Value of Production Output							
6,643	8,643	9,581	9,115	10,698	12,630	13,785	16,411
Mobile Devices (Smartphones Only) Industry Value of Production Output							
		9,656	11,610	21,747	39,356	45,747	48,337
Software & Services Industry (Only Software Industry Before 2011) Market Scale							
		4,327	4,302	4,869	6,281	6,545	6,841
Information Security Industry Market Scale							
		468	531	610	703	807	927

Unit: US\$ million

與航太、船舶等國防產業傳統的相比，2013 年臺灣資安市場規模約在 278 億元，僅航太與船舶產業之 33% 與 48%。但資安產業卻有相較於傳統國防產業更為穩定的成長率，具有更大的市場潛能。

我國資安產業的產業集中度屬中低度，例如在資安中心（security operation center, SOC）系統服務上，由於涉及資安監控機房等基礎設施，在國內就集中於包括中華電信、數聯資安、安碁等五大廠商。但在最具軍事用途的網路攻防，中小型企業甚至於鬆散的駭客團隊卻常有令人矚目的成績。

我國資安產業對國防的依賴度屬低度。不僅我國在政府資安防護體制設計做出切割，包括國防部在內的國家安全部門的內部資安，實務上並不在行政院國家資通安全會報的權責範圍內，國防部自成一次系統，採保守的實體隔離方式，與外界連結度低，寧願折損資訊網路的便利與作業互通性，也要極力避免資訊遭竊風險。也因此，在國防部內的資安需求，主要由中科院來承接，鮮少交由民間廠商擔任主合約商。而中科院在能量不及之處，則再藉由分包、轉包等型態，將部份國防部需求委外由民間廠商或研究團隊承接。換言之，國防部與國內資安產業界間的商業互動低，而資安產業的行銷焦點自然不會注意到國防部。

然而，與其他傳統國防產業不同，資安領域內民間的科研能量要勝過國防部所屬單位與中科院，軍規規格未必能高過民規，特別在網路攻防上，臺灣民間擁有世界一流的駭客能量。因此，與其他傳統國防產業強調軍轉民用的 Spin-off 途徑不同，國軍網路戰戰力的強弱繫乎於如何從民間產業界發掘技術與人才轉為軍用的 Spin-on 的成效，這是中科院在轉型後急於從民間挖角大量資安人才的原因。

Compared to traditional defense industries such as aerospace or shipbuilding, the 2013 market share of Taiwan's information security segment was NT\$27.8 billion (US\$912.1 million), only 33% and 48% of aerospace manufacturing and shipbuilding, respectively. But information security has more stable growth than that of traditional defense industries, and with greater projected market potential.

The degree of concentration in Taiwan's information security industry is medium or low. In the area of security operation center (SOC) system services, for instance, there are only five companies including Chunghwa Telecom, Information Security Service Digital United, and Aker due to information security concerns of basic facilities such as security monitoring room. However, when it comes to cyber warfare, or more precisely information operation (IO), SMEs and even individual hackers can have outstanding results.

Taiwan's information security industry has a low level of dependence on defense related contracts. Not only does the governmental institution deliberately runs on separate systems of information security, but also, the major national security agencies including the MND is not under the jurisdiction of the National Information & Communication Security Taskforce. The MND implements a more conservative isolation method, minimizing connections with the outside networks, sacrificing convenience and operational connectivity to protect information from being stolen. Thus the CSIST is responsible for managing most of the MND's information security need. CSIST usually serves as a prime contractor, and this role is rarely given to an outside contractor. When there are services that CSIST cannot provide, the task is contracted out to civil companies or research teams. In other words, the business interaction between the MND and Taiwan's information security industry is minimal, and consequently the information security industry does not devote any of its marketing efforts toward the defense sector.

However, unlike traditional defense industries, the private sector's research capacity in information security is stronger than MND and CSIST. The military's standards and specifications in this field are not always higher than the private sector. Particularly in the area of defending against cyber attack, Taiwan possesses world-class hacking talent. Therefore, contrary to traditional defense industries where technologies are spun-off from military to civil use, the military's IO capabilities often spins-on technology and personnel. This is the main reason why CSIST has been eager to recruit many information security experts after its transformation as executive agency.

資訊戰或網路戰不是新興的軍事作戰領域，而是目前臺灣每天都在發生的情況。就國家層面而言，防衛數位國土的责任不單是國防部的責任，主責為行政院資通安全會報，但國防部必須要有擔當負擔比起現況更多的責任。就國防層面而言，一味實體隔離是故步自封，戰具、社會與科技的進步終究會迫使國軍必須在複雜的資訊密集連結環境中面對資安防護問題。臺灣是資訊強國，有一流的資安能量，國防部應與其他部會密切配合，協助資安產業的發展。未來除須在「個人資料保護法」立法後，持續健全資安相關法制，針對國家安全機密保護與關鍵基礎設施的資安防護權責有所規範。在國防產業面，更應利用軍事資訊戰、網路戰之需求，結合中科院、資策會下轄之技術服務中心（未來將轉型為行政法人國家資通安全科技中心）與民間廠商之能量，引進民間現有人力、技術或產品，提高軍用資安系統、裝備與戰具之水準，有效縮短資安攻防之戰力研發、服役與轉為民用的循環時間，以 Spin-on 帶動 Spin-off，從 Spin-off 進一步 Spin-on，一方面國防部可自軍民合作的研發中獲得尖端的軍用資安戰力，另一方面研發單位或民間廠商可自迅速退役之軍用資安戰力轉為民用商品中獲利，並在獲利後持續投入更為先進之軍用資安戰力的研發，以為下一階段軍轉民用的獲利取得先機。因此，在資安產業的發展上，國防部將需更加強調投資者的角色。

也因此，在資安產業方面，建議發展策略重點如下：

（一）發掘人才：相對於航太與造艦產業所需的龐大基礎設施，資安產業對硬體設施的依賴度較低，人才素質才是國軍建立資安戰力關鍵。由於臺灣已成各國政府與產業搶奪相關人才的戰場，國防部也必須需國內產業與其他部會爭奪優質資安人力，因此，首要之計為搶先發掘與善用對國內網路攻防人才，利用甚至舉辦各類型的資安或網路攻防競賽，是許多國家常用的吸收資安人才方式，具成本低、收益大的特色，應為首要。

Cyber warfare or IO is not new forms of military operations, but rather something that occurs in Taiwan on a daily basis. At the national level, the responsibility of defending our cyber territory does not fall solely to the MND. The Executive Yuan's National Information & Communication Security Taskforce is the primary agency in charge of ensuring the safety of national cyber territories, but the MND needs to shoulder more responsibility. From the national security perspective, total isolation is impractical. The advancement of equipment, society and technology will eventually force the military to face information security problems in a complex information chain. Taiwan is a major player in the global IT industry with excellent information security capabilities. Thus the MND should collaborate with other agencies and departments to support the development of the information security industry. Following the passage of the "Personal Information Protection Act", related information security legislation should also be enacted to delegate the responsibility for the protection of national security secrets and information security at critical facilities. At the industry level, we should leverage the needs of military cyber warfare and Internet warfare, while joining the forces of the Technical Service Center within CSIST and the Institute for Information Industry's (which will be converted into the Executive Yuan's National Information & Communication Security Technology Center in the future) with the energy of private sector to recruit experts, technologies, and products to enhance the effectiveness of military information security systems, and shorten the development-commission-privatization cycle for IO capabilities, using spin-on to impel spin-off, and spin-off to advance spin-on. The MND can acquire cutting-edge information security capabilities through public-private partnerships, while on the other hand research teams and civilian contractors can gain profit from retired military equipment and technologies, and invest in the future R&D of more advanced information security capabilities to gain an advantage for the next cycle of civilian-military cooperation. Hence, the MND should enhance its role as an investor in the development of information security industry.

In consideration of the above, the Defense Committee recommends setting the following priorities for the development strategy of the information security industry:

1. Recruit quality personnel: The information security industry does not rely on facilities as much as aerospace or shipbuilding industries; rather, quality human capital is the key to building information security capabilities. Since Taiwan is already a battlefield for many countries to recruit IO personnel, the MND must also recruit the best information security talent eagerly. It will therefore be imperative to identify and utilize Taiwanese people with outstanding IO capabilities. Holding information security contests is a common, low-cost and high-return method for governments to recruit IO personnel.

(二) 公開需求、協助中小型公司加入競爭：與航太與船舶產業不同，國防部疏於經營資安產業領域，大部分的資安需求不僅缺乏公開，且常獨厚於中科院，這並不利於將民間科技能量帶入軍品研製。而且，國軍的資安需求也經常透過調整民間現貨規格後即能滿足，需求公開，有利於節約研發成本。此外，國防部投注資源扶植台灣資安產業，重點應在中小型企業上。配合精簡招標作業，營造對廠商友善的環境，將使得國防需求更能獲得中小型資安企業的青睞。

(三) 強化核心關鍵技術之研發：在延攬人才、打開產業連結後，若市場沒有辦法提供足夠的商機，台灣的資安能量仍然會外流。因此，考量軍用資安與網路作戰所需，建議以下需求應列為未來國軍建置資安與網路作戰能量的起點：

(A) 網路即時監控系統：運用雲端及巨量資料分析技術，即時分析骨幹網路封包資料，並進行即時監控。

(B) 網路戰情指管系統：即時掌控所有網路節點之運作情形，並統籌調度網路相關資源。

(C) 網路滲透攻擊系統：發展網路滲透系統進行資安情蒐，發展網路攻擊系統建立網路戰能量。

(D) 對阻斷服務式攻擊及先進式持續性威脅攻擊偵測防護系統：針對阻斷服務式攻擊及先進式持續性威脅，建置自動偵測防護系統。

(E) 惡意程式分析鑑識系統：建立惡意程式（特別針對零時差弱點）分析鑑識技術，並建置惡意程式資料庫。

(F) 精簡客戶端作業系統：針對使用者端環境開發專用之精簡型作業系統，以因應戰術需求。

(G) 安全行動裝置：利用民間現貨配合加解密技術的合作研發，以供軍方人員普遍使用。

(H) 網路攻防演練系統：發展網路攻防實兵、情境演練平台，以模擬不同網路攻防想定，提升網路作戰能量。■

2. Publicize defense IO needs and assist SMEs to compete for bids: Unlike the aerospace and shipbuilding industries, the MND has not had long experience with the information security industry. Thus the vast majority of the MND information security needs not only lack publicity, but are often dominated by CSIST, which is not conducive to bringing the COTS to bear on the production of military goods and services. Furthermore, the armed forces' information security requirement can often only be met by making adjustments to COTS. Open calls for bids would cut down on the up front R&D costs. The focus of the MND's efforts at supporting Taiwan's information security industry through investment should be on SMEs. Streamlining the bidding process and creating a friendly environment for private contractors will attract SMEs to compete to fulfill the needs of national defense.

3. Strengthen R&D of critical technologies: Even after recruiting high-quality talent and establishing industry connections, if the market is unable to provide sufficient demands, then Taiwan's information security capabilities will nevertheless continue to be lost to foreign competitors. As such, taking into consideration the military requirements for information security and IO, the Defense Committee recommends setting the following capabilities as the starting point for building up national defense information security and IO capacities:

(A) Real-time network monitoring system: Utilizing cloud-based big data analysis technologies to provide real-time analysis of backbone network data packets, as well as real-time monitoring.

(B) Cyber warfare command and control system: Gain instant awareness and control of the operational status of all network nodes, and manually administer related network resources.

(C) Network penetration attack systems: Create network penetration systems to carry out information security intelligence functions, and network attack systems to build up IO capabilities.

(D) detection and defense systems against distributed denial of service (DDoS) and advanced persistent threat (APT): Construct automated detection and protection systems against DDoS and APT attacks.

(E) Malware forensic analysis system: Develop malware forensic analysis techniques and build up a malware database.

(F) Thin Client operating system: Create streamlined operating system customized to the end-user environment, in accordance with tactical requirements.

(G) Secure mobile devices: Jointly develop currently available devices from the COTS with encryption and decryption technology to enable widespread adoption by the armed forces.

(H) IO training and drilling system: Develop IO field or simulation exercise to practice different IO scenarios and improve IO capabilities. ■

略語表 Abbreviations and Acronyms

ADPO	Advanced Defense Program Office	國防前瞻規劃室
AIDC	Aerospace Industrial Development Corporation	漢翔航太公司
AB	Armaments Bureau	軍備局
APT	advanced persistent threat	先進式持續性威脅
CEO	chief executive officer	執行長
COTS	commercial off-the-shelf	民間現貨
CSBC	China Shipbuilding Corp.	臺灣船舶公司
CSIST	Chung-shang Institute of Science and Technology	國家中山科學院
DARPA	Defense Advanced Research Projects Agency	美國國防先進研發署
DDG	guided missile destroyer	導彈驅逐艦
DDoS	distributed denial of service	阻斷服務式攻擊
DIDS	Defense Industrial Development Strategy	國防產業發展策略
DIPA	Defense Industry Partnership Group	國防產業推動協進小組
DMSMS	diminishing manufacturing sources and material shortages	消失性商源
DPP	Democratic Progressive Party	民主進步黨
FFG	guided missile frigate	導彈巡防艦
FMS	foreign military sales	軍售
FOI	Defense Research Agency	瑞典國防研發署
FSTD	Future Systems and Technology Directorate	新加坡未來系統處
FYDS&TAPP	Five-Year Defense S&T Application and Production Plan	五年期國防科技研究、應用及產製計畫
FYFCP	Five-Year Force Construction Plan	五年兵力整建計畫
FYIPP	Five-Year Indigenous Production Plan	五年期自製武器裝備產製計畫
GDP	gross domestic production	國內生產毛額
GOCO	Government Owned, Contractor Operated	國有民營
GSH	General Staff Headquarters	參謀本部
HALE	High Altitude Long Endurance	高空長滯空系統
IAD	Integrated Assessment Department, MND	整合評估司
ICP	industrial cooperation program (offset)	工業合作
IDF	Indigenous Defense Fighter	經國號戰機
IO	information operation	資訊作戰
IT	information technology	資訊科技
J-3	Office of Operations and Planning, GSH	作戰計畫次長室
JWCPC	Joint Warfighting Capability Plan	聯合戰力規劃

LY	Legislative Yuan	立法院
MND	Ministry of National Defense	國防部
MoEA	Ministry of Economic Affairs	經濟部
NCDMM	National Center for Defense Manufacturing and Machining	美國國家國防製造與加工中心
NDSR	National Defense Strategy Report	國防戰略報告
NSC	National Security Council	國家安全會議
NSSR	National Security Strategy Report	國家安全戰略報告
QDR	Quadrennial Defense Review	四年期國防總檢討
R&D	research and development	研發
RPD	Resource Planning Department, MND	資源規劃司
RSAF	Republic of Singapore Air Force	新加坡空軍
SS	attack submarine, conventional-powered	傳統動力潛艦
S&T	science and technology	科技
SME	small and medium enterprises	中小型企業
SOC	security operation center	資安中心
SPD	Strategic Planning Department, MND	戰略規劃司
TYFBC	Ten-Year Force Buildup Concept	十年建軍構想
TYDS&TDC	Ten-Year Defense S&T Development Concept	十年期國防科技發展構想
TYR&DI	Ten-Year Research and Development Items	十年建軍研發項目
TYIWEDC	Ten-Year Indigenous Weapon and Equipment Development Concept	十年期自製武器裝備發展構想
UAV	unmanned aerial vehicles	無人飛行載具
UCAV	Unmanned combat aerial vehicle	無人飛行攻擊載具
USV	unmanned surface vessel	無人水面艦
UUV	unmanned underwater vehicle	無人水下載具
V/STOL	vertical and/or short take-off and landing	短場或垂直起降

附件
ADDENDUM

附件 1

潛艦國造的思考

林岱樺

台灣是個海島國家，海上貿易是臺灣生脈所繫，而海上防衛更是國防的最後一道防線。但近來一則新聞卻讓人懷疑台灣對其海疆防衛的意識與決心：那便是越南自俄羅斯獲得了 Kilo 級潛艦。為了反制中國在南海的擴張，越南購置潛艦的理由不難理解。但是，我們不禁要自問的：如果連越南也擁有了潛艦，那自詡海島國家的台灣為何沒有辦法獲得？越南固然未必像台灣一般會遭遇外購武器的困難，但這筆不小的預算畢竟對越南也是困難的決定。其實，台灣為何沒法獲得，正因為我們太過依賴外購。國防法第 22 條寫得很清楚，當國內無法自製時，外購才是考慮的選項。然而，長期以來，臺灣的軍備政策剛好是相反地走，外購才是主選項，自製不過是備案。臺灣造不出潛艦嗎？身為在高雄地區長期觀察造艦業發展的立委必須說：這是心態問題。臺灣有 70% 左右潛艦自製的能量，有 10% 屬於短期內無法自製而需外購的關鍵零組件，有 20% 則屬國內具研製潛能的灰色地帶。當我們從那 30% 去看潛艦國造議題時，會卑微地搖頭說不行；但當我們從那 70% 去看潛艦國造議題時，會自信地抬頭說行。

台灣船舶產業始於明鄭時期，日治時期引進蒸汽機技術，1937 年日本基於軍事考量，在基隆和平島興建一座 25,000 噸船塢，奠定了台灣船舶產業現代化的基礎。目前，國內已有台船、中信、高鼎、慶富、豐國、龍德等約 125 家規模不一的造船與修船廠，相關周邊產業也有高度整合，已建構出稍具規模的產業鏈。自 2007 年起迄今，年產值都在 550 億元以上。雖然在產值數字上比不過新興的資訊產業，但船舶產業是製造業的龍頭產業，其周邊產業包括有鋼鐵、機械設備、電機、電子、化學與非金屬產業，並與航運、漁業、營造、休閒與國防產業等有既廣且深的密切關聯，暫不論對其他產業產生的連帶效益，單就造船產業投入人力而論，舉凡船體設計、輪（電）機設計、重量控制、結構安全、自動監制、防蝕及環保節能要求等，均需運用並不斷開發創新造船工藝與結合新式裝備引用，需要專業技術人力，另在期程、合約管理、成本物料控管、工安維護等工作，也需相關專案管理領域人才執行，更遑論是直接於現場執行組裝、焊接、起重、搬運等大量勞力密集的工作；這是一個全方位需求高、中、低階人力的產業，如能持續穩定的發展，其所能創造的就業機會與帶動的經濟效益，將非一般產業所及。創造國內就業機會，對國家整體經濟

發展有顯著的貢獻。更重要的，基於保障國防機敏資料的需要與造艦所需龐大的基礎設施，船舶製造業幾無外移的可能，是真正根留臺灣的產業，發展船舶製造業有助於改善台灣產業空洞化現象。

國內船廠雖有民用艦隻研製能量，但對於高階軍用艦隻（特別是潛艦），船廠的角色往往只限於生產成本與技術水準都較低的艦體建造工程，這並不利於產業的升級。而國內廠商研製潛艦或其他高性能的水面戰鬥艦不僅能振興國內船舶產業，更能推動船廠在研發與系統整合能量，特別是國內廠商目前並無水下艦隻的製造經驗，潛艦的自製更將會是國內造艦技術突破的切入點。

產業界瞭解潛艦自製的財務與技術風險。潛艦自製初期的研製成本可能會比外購高，但若考量國內就業機會、產業升級、全壽期補保與未來持續研製能量的建立，這些可能多出的成本是項可以回收的投資。技術的風險集中在 30% 國內廠商現階段能量未及的部分，這一部份需要一段時間來進行研發，或自外國引進成品或技術，後者可能會遇上外國政府出口管制的問題。如果遇上，政府的責任應該在協助船廠獲得這些成品與技術，而不是以此為由，要船廠放棄自製的想法。

政府無法落實國防法第 22 條的精神，立法院未能善盡責任也有責任。除了監督政府真正落實國防自主外，做為立委，現在正是立法以規範行政部門落實國防法第 22 條的時候。

（林岱樺是民進黨籍立法委員）

附件 2

資安強國需要強大的資安產業

姚文智

台灣資安人才濟濟，除了資通訊技術向來是台灣的優勢產業、是全球最大的資通訊硬體生產國，加上網路普及率逾 95%，資訊安全領域的軟體技術相對成熟。另一個原因則是台灣長期飽受有組織、有計畫且具針對性的網路間諜活動，稱為先進式持續性威脅（Advanced Persistent Threat, APT），累積許多攻防經驗所造就出來的。

中國自 1995 年開始進行資訊戰，2010 年設立官方的網路作戰指揮部。從 1999 年開始，中國駭客對境外進行網路攻擊的頻率大幅增加，攻擊手法包括癱瘓網站或竊取機密等。從美國、歐洲到亞洲國家，無一倖免。根據 IT 安全服務商 NCCGROUP 的報告，中國是全世界第二大的駭客活動發源地（佔 13.7%）。

在所有被駭客攻擊的國家當中，台灣更是首當其衝，不管是跳板數量、後門程式數量，台灣總能排進前四強，甚至 VirusTotal 的病毒上傳統計，台灣名列第二，僅次於美國；全世界上傳 VirusTotal 的病毒量接近 25% 來自台灣。因為語言、文化相近，加上兩岸關係的特殊政治情勢，中國駭客寫出新的惡意程式，無論是出自民間或官方之手，首選測試地點都是台灣，只要在台灣看到一個新的網路攻擊手法，六個月後，就會在美國看到同樣的攻擊，台灣因此成為全球對抗網路攻擊的最前線，甚至被當作中國駭客的練兵場與攻擊境外目標時的跳板，要說「台灣電腦病毒淹腳目」一點也不為過。這樣高強度的對抗，促使資安防護技術的發展，為台灣成為資安強國奠下基礎。

隨著資訊科技日新月異，資訊系統使用範圍不斷擴大，對資訊系統依賴程度提高，伴隨著資訊便利而來的則是高度的資安風險，各種型態的網路攻擊不斷推陳出新，駭客使用攻擊程式等級加高，以及惡意程式攻擊的頻率大增，使得如何確保資訊安全成為愈來愈重要的課題；要想維持系統的可用性、完整性及機密性，面對的挑戰也愈來愈艱難。

資安領域涉及專業知識與經驗的累積，為了因應變化多端的威脅態勢，不同於一般實體 IT 產品，資安產品必須與時俱進，因此，產

品生命周期短、技術發展速度快，才能符合實務上的需要與各項資安管理制度的相關標準。

台灣資安人才的實力，有目共睹，而最主要的人才庫則來自於駭客社群。台灣駭客曾多次在世界級的駭客競賽中取得佳績，最近得獎的兩個例子是：2014年5月在南京舉行的中國「百度盃」全國網絡安全技術對抗賽，最終由台灣駭客年會的 HITCON217 戰隊，以極大的比分差距奪得第一。由上海交大等知名大學所組成的戰隊，第2到7名積分「全部相加」還比不上台灣，實力之強，由此可見一斑。

此外，2014年8月在拉斯維加斯舉行的全球駭客競賽 DEFCON 22 CTF，該競賽號稱是駭客界最高等級的公開賽。台灣駭客團隊今年首度進入決賽就傳出捷報，平均年齡僅22歲的 HITCON，打敗日、韓等18支隊伍，勇奪亞軍，被網友譽為「資安圈的新台灣之光」。

既然台灣有如此優質的資安人才，為何在全球資安市場規模持續成長的情況下，從2010年的453億美元，到2014年的713億美元，台灣的資安產業卻僅佔全球資安市場規模比率的1%？

與各國相比，台灣政府對資安的重視相對落後，美國歐巴馬總統於2009年上任後，宣布加強網路安全的新計畫，將資安提升至國家安全的層次；南韓藉由 Broadband IT Korea Vision 2007 政策，將資安列為國家基本政策；日本政府的資安政策發展方向則著重在提升國家安全與系統安全、增強資安教育、促進國際合作等面向；甚至連中國都在2008年第16屆中國共產黨四中全會中，將資訊安全列為國家安全的重要組成部分。

反觀台灣，行政院雖然早在2001年就成立「行政院國家資通安全會報」，陸續針對政府機關和重要基礎建設資訊系統，建立整體防護體系。但資安權責機關分散，各自為政，國安部門（特別是國防部）未對資安產業的發展有所關注，致使台灣資安發展一直缺乏自給自足的正向發展。

台灣資安業者的技術能力與產品性能，相較國際資安大廠毫不遜色，具有一定的競爭力。但因台灣資安業者皆為中小企業，在國內資安防護法制未臻完備的情況下，無法有效拓展內需市場，廠商無法內銷練兵又面臨外商進逼，生存不易，資源、商品、國際化等專業都不足，難以與國際資安大廠相抗衡。除少數上市上櫃的網通大廠能藉其

既有的行銷通路與品牌知名度打進國際市場，多數中小型的資安業者都無法與其競爭。

中小型資安業者生存的另一難題在於資金不足，資安產品研發需投入大筆資金，卻未必能在短時間內獲得成果，更增添研發資金籌募的困難，新興的軟體公司亟需創投的資金投入，卻僅有少數能獲得青睞。技術領先業者一旦研發成功，常被國際業者併購。最著名的案例則是 2013 年美國郵件安全公司 Proofpoint 以 2,500 萬美元(約新臺幣 7.5 億元)收購阿碼科技。2014 年，年營收超過 300 億台幣的美國上市公司威瑞特系統併購了台灣首家鑽研 APT 研究的艾斯酷博科技，這是一家在決策系統、情報分析及資通訊領域居於全球領導者的公司，再次印證了台灣資安界的實力與資安經營環境的不易。

論天然資源、面積、人口、軍事武器等硬實力，台灣只是個蕞爾小國，面臨諸多困境，但台灣一直是個充滿創新、創意的國家，非常適合發展諸如資安這樣的軟實力，發揮以小搏大的功效。

面對來勢洶洶的網軍勢力，Cyber War 天天在現實生活中上演，而台灣準備好了嗎？想要打贏這場數位戰爭，就需要把資訊安全提升到國家安全層級的高度，將資安問題視為國安問題、國防問題，當務之急則是整合國內的資安能量，藉由國防部投入研發資源、製造需求，培養出一批用鍵盤保家衛國的資安人才，以帶動資安產業升級，厚植台灣的資安能量。

(姚文智是民進黨籍立法委員)

附件 3

從國防科技自主談軍機國造之必要性

盧天麟

國防科技自主之重要性

2013 年 2 月 25 日朴槿惠當選南韓總統，同年 3 月 26 日在其訪問德國的一次談話中，朴槿惠表示：「如果沒有強大的國防力量，所謂的和平只是海市蜃樓。」誠哉斯言。

事實上，戰爭的陰影仍存在於世界上的各個角落，台灣與中國兩岸間的衝突相較於南北韓及南海主權的爭執有更大的風險。目前與我國鄰近且具有潛在危機的國家，莫不競相研發或採購先進的武器，以提高自身的國防實力。即使日本與南韓均可買到美國所研製的 F-35 戰機，但兩國仍致力於下一代戰機的研發，例如日本的 ATD-X 和南韓的 KF-X。長久以來，我國皆處在危機動盪的風暴之中，因此建立自主的國防科技能量，一直是我國重要的國家科技政策。同時，積極發展堅強的經濟實力，突破外交困境，以為國防建軍的後盾。

所謂的國防自主，即是我國國軍可依照國家願景，設定建軍目標，獲得維護國家安全所需的武器裝備等必要事務，以確保國家願景在不受制於他國狀況下順利達成。雖然我國國防規模及需求均名列世界前茅，2015 年國防預算編列 3,193 億元，未達 GDP 之 3%，其中的軍事投資約佔整體國防預算之 30.6%，但是軍事關鍵技術水準及自給自足率卻明顯偏低。我國國軍目前重要的軍事設備，如軍機、船艦、戰車、雷達、飛彈等，每年均需大量向國外採購，受制於外國而無法順利獲得的情形非常嚴重。

世界各國的國家科技政策因國情、整體目標的不同，而有不同的科技發展重點，但維護發展自主的國防科技能量，幾乎是一種共識。以美國而言，政府「總體研發預算」分配依功能分為八大類，但以國防預算為最高。英國的十大類「前瞻專案」(Foresight Programs)，包括了國防、航空及系統 (Defense, Aerospace & Systems)。中國的第十個五年計畫 (十五計畫)，將航天技術列為五大重點技術領域之一。鄰近國家日本、韓國雖有美國駐軍協防，但亦積極地朝建立自主的國防科技能量而努力，自主研發下一代戰機，如前所述。

除此之外，朝鮮半島、臺灣海峽、南中國海被國際安全事務專家視為亞太地區三個最具衝突性之熱點。中國透過軍售、仿製、合製武器裝備，從美、以、蘇、英、法等國家獲取各類機密技術，並積極自力研製各類武器系統，全力進行軍力的提昇。我國國防戰略雖採取守勢戰略，但亦積極自力研發防衛武器裝備，同時向歐美等國採購先進武器裝備。

綜合上述，更加深國防科技自主對我國的重要性。因此，在朝野政黨均有共識之下通過「國防法」，並於 2000 年 1 月 29 日由總統公布，其中第二十二條：

「行政院所屬各機關應依國防政策，結合民間力量，發展國防科技工業，獲得武器裝備，以自製為優先，向外採購時，應落實技術轉移，達成獨立自主之國防建設。國防部得與國內、外之公、私法人團體合作或相互委託，實施國防科技工業相關之研發、產製、維修及銷售。

國防部為發展國防科技工業及配合促進相關產業發展，得將所屬研發、生產、維修機構及其使用之財產設施，委託民間經營。

前二項有關合作或委託研發、產製、維修、銷售及經營管理辦法另定之。」

檢視「國防法」第二十二條通過後政府執行此項法律的效果，可以從兩個層面來加以探討。

首先，所謂「獲得武器裝備，以自製為優先」，根據 1999 年我國國防預算外購與軍售採購之軍品或服務總金額比例，約佔國防採購預算之 68%，這是「國防法」未通過前的情況。然而根據 2013 年「國防部武器自製與外購預算」報告，可發現國防部的武器裝備採購，目前只有四分之一為國內製造；若以 2014 年「軍事投資」預算總金額來說，其中也只要一、兩百億屬於國內採購，而六成以上都向美國購買。而 2015 年預算中編有多項新增的武器採購計畫，包括天弓三型防空飛彈、AAV-7、紅雀戰鬥型無人飛行載具及紅隼反裝甲火箭等。光這四樣武器裝備總金額，即高達 802 億餘元。其中，國防部斥資 748 億，採購中科院研製的天弓三型防空飛彈，預算於 2015-2024 年編列，是近年來手筆最大的國造武器系統採購案，明年也只先編列 28 億餘元。尤有甚者，國防部在最新出爐的「五年兵力整建及施政計畫報告」指出，未來武器裝備籌獲要按照「國內自製優先、國外採

購為輔」、「共同研發、合作生產優先、現貨採購次之」等策略進行，達到國防自主的目標。但是在空軍裝備上，F-16A/B 戰機性能提升案總經費達 1,100 億元，雖是向美採購，但主要是在台灣由漢翔公司來執行與組裝，估計將為漢翔公司帶來至少 55 億元商機，國內所獲得產值幾乎不到 5%。凡此種種，在在顯示國防法第二十二條通過後不但沒有增加國內自製，反而有減少的情況，顯見我國國防科技自主政策之推動，成效實在不佳。

其次，所謂「向外採購時，應落實技術轉移」，應可從我國工業合作推動的情形得知。根據經濟部工業合作推動小組的資料，以 2010 年為例，已簽署 110 份工業合作協議書，累計承諾額度達 90.54 億美元點，累計預核額度 77.43 億美元點，累計實核額度 60.03 億美元點。其中累計承諾額度與累計實核額度即相差 35.51 億美元點，實際執行成效僅 62.83%，而且從 2008 年以後，累計預核額度更呈現平緩的成長趨勢，以致於三者之間的差距越來越大，顯見工業合作的執行成效亦逐年越來越低。

其實，國防產業包括軍機、船艦、戰車、雷達、飛彈等，本文旨在探討其中有關航太產業的軍機部份。任何文件或研究談到台灣航太產業的發展時，幾乎一定會談及漢翔公司，漢翔公司被視為是台灣航太產業的指標公司，漢翔公司由於具備了國營事業的性質，在國營事業體移轉民營的政策原則下，漢翔公司的轉型更影響著台灣航太產業的未來。就在 2014 年 8 月 21 日漢翔公司民營化的同時，探討建立國防科技自主能量，推動航太產業深植民間的這項課題，在時間點上是很適當的一件事。因此，本文也嘗試把另一個焦點放在探討台灣航太產業成長的歷程及未來的輪廓上。

世界各國政府扶植航太產業之作法

熟知航太產業發展的人士都瞭解航太產業所具有之特性，航太產業是一種高度資本密集、技術密集、少量多樣、高附加價值及產業關聯性大的產業。同時其能源的消耗低，而且公共危害亦較低。因此，航太科技及其產業體系的重要被視為「戰略性工業」，世界各國多設立專責開發機構以國家的力量長期而實質支持其發展。以歐美先進國家為例，不論在直接融資、技術創新補助、銷售補貼、營運補貼、元首介入上，均給予相當的政策工具上的協助。

在此引用曾任經濟部工業局局長歐嘉瑞的論文「世界各國政府對

航太工業補貼政策之研究」來加以闡述，其中內容：

以美國推動航太產業政策的方式來說明，其運用間接輔導，亦即利用軍機發展計畫協助民用機之發展。「所謂間接輔導，是指利用軍機或太空發展計畫，委託民間飛機製造者從事研發，累積製造飛機的相關技術及能量，以減少該民間飛機製造商從事新民航機的開發與製造時的研發支出。美國是利用此種間接輔導最多的國家，由於美國一直投資相當多的資源從事軍機發展及太空計畫，因此，美國的民航機製造商是間接輔導的最大受益者。」例如波音公司之 B707 即是 KC-135 的化身，B747 則是 C-5A 的化身，其它如麥道公司之 DC-10 也是 KC-10 的民機版本。美國政府除了運用間接輔導外，同時也運用軍事研發專案及採購合約、美國太空總署（NASA）研發專案及合約與銷售支援及干預等政策工具，積極協助波音、洛馬等航太大廠。

西歐國家推動航太產業政策的方式亦不遑多讓，「歐體諸國對空中巴士的補貼可以說是直接補貼最成功的例子。在空中巴士（Airbus）發展的過程中，英、法、德等國政府所提供的直接補貼約達 260 億美元之譜，使得空中巴士於 1960 年代起，從無中生有，直到最近超越麥道，而成為僅次於波音的世界第二大民航機製造者，並不斷的推出各種與波音系列飛機競爭的機型，頗有直逼波音之勢。」「所謂直接輔導，就是政府以補助金、低利貸款或參與投資，甚至直接以國營的方式來發展國內的航空工業。」「空中巴士集團中的各國政府主要以直接的方式來支援其航太產業。一般的產業工具為：開發基金、資本投入、低利貸款、擔保借款、開發及生產成本補貼、保障匯率、及經營損失補貼等。」美國商務部曾提出數據資料，其中顯示空中巴士集團會員國所支出的金融援助，光是在開發基金上就獲得可觀的政府支援。除此之外，西歐國家也在政府間接補助、軍方合約及政府設備的使用、銷售支援及干預等其它政策工具加以運用，亦相當程度地發揮其效益。

再以我們鄰近的國家日本與南韓為例，「日本政府為促進其國內航太工業的發展，特別訂有『航空機工業振興法』（Aircraft Industry Development Law）。其主要目的在於鼓勵日本與外國廠商合作，共同從事航空工業技術之研究發展。此法規定國際貿易及工業部（The Ministry of International Trade and Industry）對參與共同合作研究發展之日本廠商提供貸款。接受貸款之廠商於開發計畫成功並將開發成果運用於商業用途產生盈餘後，始償還該項貸款。」在實際的輔導案例上，日本政府對參與波音 B767 零組件開發的日本廠商提供高達 50%

的開發補貼。在波音 B777 的開發上，日本政府也將會提供日幣 8 億零 3 佰萬元的利息補貼。「南韓政府則設有『航空宇宙事業開發促進法』(Korean Aviation and Space Industry Development and Promotion Act)，並於 1989 年 1 月 1 日生效。依據該法，南韓政府須設置航太工業研發機構，並提供國有財產，低價或無償借用或讓與及低利貸款之輔導，以協助廠商開發航太產品。」

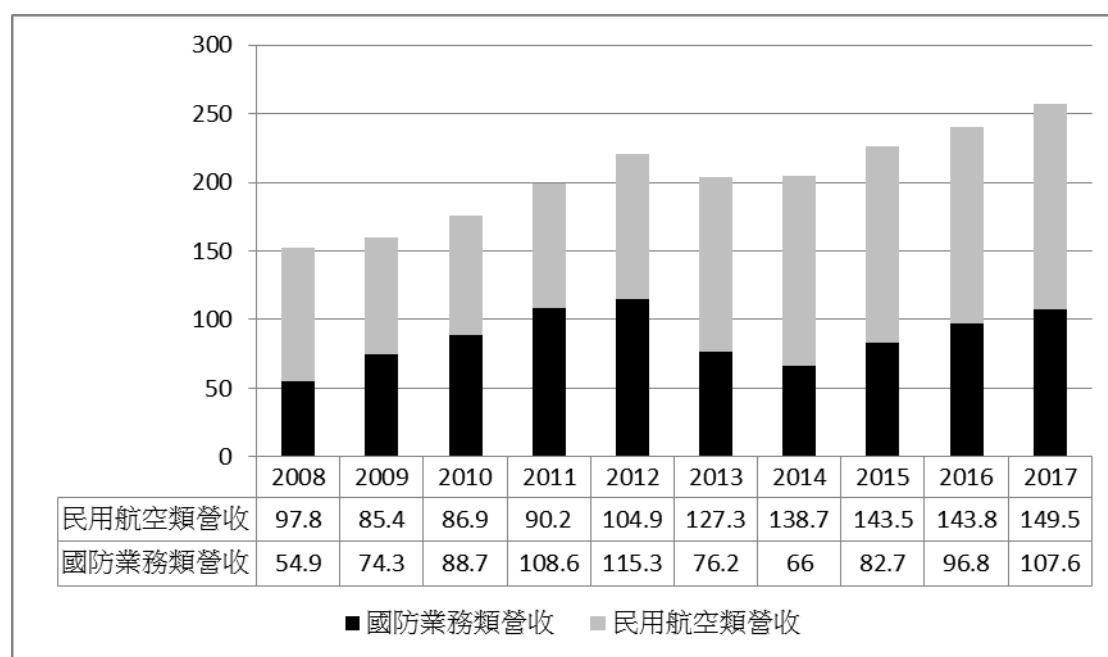
下表表示世界各國政府對航太產業發展的支持方式。然而根據 1994 年經濟部航太小組所做的調查，世界各國政府對航太產業的輔助措施中，以利用軍機發展計畫協助民用機之發展最為普遍，每個國家都充分運用此一金額龐大，又有國防機密考量，而且為國際法所容許的合法管道。其次，政府資金的投入則在腹地及市場規模較小的國家普遍存在，其理由不外乎是因為市場規模太小加以國內缺乏大型的企業，因此，需要政府資金投入。而直接的補貼雖為大多數的國家所採用，但是在自由貿易的風潮及世界貿易組織日益成熟的趨勢下，其運用將逐漸受到限制。由此可見，我國的航太產業政策在「以軍養民」的方面還有很大的努力空間。

各國政府政策工具的比較表

	利用軍機發展計畫協助民用機之發展	直接補貼	政府投資
美國	◎		
加拿大	◎	◎	
法國	◎	◎	◎
德國	◎	◎	
義大利	◎	◎	◎
西班牙	◎	◎	◎
英國	◎	◎	
巴西	◎	◎	◎
日本	◎	◎	
瑞典	◎	◎	◎
印尼	◎		◎

以色列	◎		◎
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前文曾提及漢翔公司，漢翔公司目前為我國航太產業之龍頭，不論在軍用飛機、民用飛機、以及科技服務……等方面，均有很好的業績。但是不可諱言，以其歷年營收為例（如下圖），可發現其軍用飛機業務佔該公司整體營收之 50% 左右，試想漢翔公司如果沒有國人之自製軍機（IDF、AT-3）相關研發經費之挹注，漢翔公司之經營是否還能如今日民營化後大放異彩，殊堪憂慮。其實，漢翔公司就是台灣航太產業的成長歷程中，政府「以軍養民」最典型的案例之一。



單位：億元

漢翔公司過去經營績效與未來預測績效

我國航太產業發展的現況

政府為推動航太產業，1990年7月4日由行政院頒佈「航太工業發展方案」，並依據本方案於1991年7月1日正式成立「航太工業發展推動小組」。經過多年的發展，近年又配合政府製造業服務化政策，將國內航空工業之推動擴大納入航空服務產業。因此，「航太工業發展推動小組」自2012年3月1日起變更名稱為「航空產業發展推動小組」。綜觀20多年來，其推動航太產業的工作成果分述如下。

我國航空產業發展範疇可概分為五大類：

機體結構（漢翔、千附、拓凱、駐龍、佳瑋等27家廠商）；

發動機（漢翔、長亨等 17 家廠商）；
內裝（懷霖、福基、拓凱等 23 家廠商）；
航電（漢翔、克瑞電子、奇美電子、台灣貝克等 21 家廠商）；
維修（華航、長榮航太、亞航、華普、漢翔等 27 家廠商）。

其中航太產業的產值從 1991 年的 65.57 億至 2012 年已達 783.87 億，我國廠商獲得航空驗證家數從 1991 年最初的 2 家至 2012 年已達 192 家，項數更從最初的 201 項成長至 735 項。值得注意的是投資當年金額並無逐年成長，不過卻仍見到民間廠商多年來在航太產業方面的投入與努力，而漢翔公司是國內唯一具有飛機設計研發、製造、測試、後勤支援等能力的廠商，其次在複合材料、航空電子技術等方面的能量提升，已與當年 IDF 完成之初不可同日而語。主要產品類別為飛機及航空器維修類、引擎類及工業技術服務類等三大項，並已陸續打入波音、貝爾直升機、賽考斯基飛機、奇異航空、普惠公司、漢威聯合、法國空中巴士、加拿大龐巴迪航太、英國勞斯萊斯、日本三菱航空等全球飛機及發動機生產供應鏈。

軍機國造之必要性

《全球防衛雜誌》最近報導一則消息：「美國空軍可能引進南韓 TA-50 教練機，負責的美國空軍小組 8 月 17 日上午試飛南韓國產教練機 TA-50，藉此了解飛操性和對於部訓機來說非常重要的機體安全性。美空軍派出的訪視小組先後訪問了南韓防衛事業廳、第 16 戰機飛行團和空軍軍需司令部，接受 T-50 戰機的性能簡報，並對該戰機的飛離單價和維修成本進行。韓方則對 T-50 戰機的性能及裝備提出說明。南韓方面表示，若美國空軍引進 TA-50 教練機，將給南韓帶來 100 億美元的經濟效益。目前美國計畫引進 350 架高級教練機，以替換目前正在使用的老舊 T-38C 超音速教練機。」眾所皆知，T-50 是南韓與美國洛馬公司合作的戰機，TA-50 則是其中的教練機版本，當時還借重了幾位漢翔公司的離職人員參與研發，在國內媒體上還鬧得沸沸揚揚，如今獲得美國青睞，真是可謂 20 年有成，然而對我國而言是否會有一種情何以堪之感嘆。

2012 年 2 月 22 日航空產業發展推動小組公布國防大學李貴華、賀增原的一篇產業分析報告：「簡述軍機國造之現況」，其內容概以漢翔公司曾研製多種軍機（如 PL-1、PL-1B、UH-1H、T-CH-1、F-5E/F、AT-3、XA-3、IDF），顯示我國自主研發與自製戰機之能力，加上目前我國空軍有汰換教練機之需求，綜合飛機與裝備之維持、國防自主、

軍機外銷、國家整體經濟等四項觀點，認為國防投資應以站在國家整體發展的角度來看，不但可帶動國家整體工業進步與經濟發展，增加國內消費，最終可得到國防支出所帶來的乘數效果（multiplier effect），所以軍機國造不但可以促進產業升級，還可以提升國內的 GDP 值。

事實上，早在 2004 年經濟部即提出一項「旗艦計畫」，目的就是集全國產官學研之力量發展先進軍用高級教練機。該計畫主要著眼於我國空軍當時所使用的 T-34 初級教練機及 AT-3 高級噴射教練機，平均使用已達 15-20 年，因此空軍在未來將有高級教練機的市場需求出現；其次，國際教練機市場將持續擴大，主要原因是大多數國家現有教練機如 T-38C、T-45、Hawk 等，有 65% 皆已使用超過 25 年，已進入汰換的生命週期，潛在市場需求量大；再者，國際航太廠商皆已投入教練機市場，並以國際合作方式進行以分散投資風險，是我國航太廠商切入此市場的最佳時機。唯當時以等待軍方決定訓練政策後再決定，以致於旗艦計畫胎死腹中，對照今日南韓已能推出 TA-50 教練機競逐美國下一代教練機之 T-X 計畫，政府部門間之溝通協調整合失靈及缺乏遠見，莫此為甚。

多年來我國空軍一直有汰換教練機之議，其作戰需求亦已研議訂定完成，漢翔公司並已分別向國防部提出新機籌建案，以及將 AT3 教練機二次延壽計畫等案，2011 年立法院為此曾做出決議：

「國防部應規劃，空軍陸續汰換現有部訓機及高級教練機，並且 2012 年起逐年編列所需研製經費及支持國營國造研製空軍新世代〔高級〕教練機，以建構自主國防暨促進國家經濟發展。」

同年，馬英九總統在視察漢翔公司時更高呼「軍機國造」、「國機國造」之聲，但是不管國家元首如此振臂，國會如何為國防科技自主發聲，主其事的國防部索性將高級教練機直接從五年建軍計畫中刪除，對比於國防部在最新出爐的「五年兵力整建及施政計畫報告」指出，未來武器裝備籌獲要按照「國內自製優先、國外採購為輔」、「共同研發、合作生產優先、現貨採購次之」等策略進行，達到國防自主的目標的宣示，真是教人感嘆。引述立法委員蕭美琴在 2013 年 10 月 21 日一次「國防部武器自製與外購預算」報告會議中的評論，面對變化莫測的外在威脅，國防自主之路通向何方？蕭美琴說：「最大的障礙，是領導者的意志！」

我們對政府之政策建議

對我國而言，建立自主的國防科技能量，有明確的國防需求，面對國防科技類別涵蓋廣泛，政府雖規劃各類科技重點發展，但缺乏對國防科技自主長期發展的整合與願景。為維護發展自主的國防科技能量，未來國防預算應提高內購及研發比例。對我國而言，國防科技實力絕對是武器獲得的基礎，若無法形成一個國防產業體系，所謂的國防科技自主，將難以生根、壯大，在投入大量的國家資源後，仍無法發揮國防自主的目標與效益。因此，我們在此提出幾項政策建議如下：

- 一、推動研製先進軍用高級教練機計畫〔軍機國造〕
- 二、研發先進長程無人攻擊載具〔UAS〕
- 三、整合國內產官學研界，研發高空長滯空無人飛機〔HALE〕
- 四、工業合作納入採購合約，爭取航空零組件製造組裝
- 五、推動軍工廠國有民營，擴大軍機維修商機〔軍機商維〕

（盧天麟為前立法委員、前勞委會主委，也是國防小組諮詢委員）

附件 4

推動國防自主與國內產業發展緊密結合的「國防政策」

王耀德

台灣四面環海，與中國大陸僅數哩相隔，爭取空中優勢為確保國防安全的第一防線。雖然兩岸目前正在進行經貿、服貿等交流合作談判，但若沒有堅強國防與經濟實力做後盾，那就無法做對等公平的洽談。檢視我國國防陸、海、空相關武器裝備，歷年來對美國依賴比重極高，即便號稱自製率超過 50% 的 IDF 戰機，除機體結構外，其他動力系統（發動機熱段）、航電系統（雷達、偵測導引等）及關鍵零組件均依靠美方核准後進口組裝，更遑論目前主力戰機 F-16 了，所以未來如何提高國防自主能力，應為國防政策重要的研究議題。

一、國防部如何協助降低產業進行武器裝備研發的風險

就航空武器而言，重點在如何提高國內航空相關業者，成為國防部供應鏈一環之意願航空產業具有高投資（資金密集）、高風險（市場不確定性）、高門檻（技術密集且品管要求嚴謹）、回收慢之特性。以往國防部資金（預算）、人力資源、技術都掌握在自己手中，民間投資意願不高。

但由於國防預算逐年減縮、人力精簡政策、航空器研製技術落伍、組織變革（漢翔公司民營化、軍工廠國有民營政策）等環境因素變遷，航空器後續研製與維修服務依賴民間與國外比重日增。因此應積極落實下列措施，以提高國內業者參與之意願：

（A）**開放軍品國內研製及採購市場**，並落實軍品研發試製**獎勵措施**。目前國防部絕大部分幕僚人員，為了避免涉及採購弊端，造成個人升遷無謂困擾，盡量以國外原廠採購為主，導致國家公帑耗費巨大，國內業者卻不得其門而入。因此在國防部軍品採購的政策面，應先調整為**國內採購為優先**，且立法保護承辦人員，如此方能激勵民間業者參與軍品開發之意願。

（B）同意開放**國防資源與民間分享**（確實執行國防法第二十二條即可），以降低業者投入初期成本及風險。由於國防部歷年國外武器採購，已擁有多項昂貴的航空器產能及相關測試裝備（電鍍廠、特殊焊接、表面處理、航電測台、發動機試車台等），對民間業者而言

由於量少樣多之特性，投資上述裝備不符成本效益。國防部依法得以開放相關設施裝備與民間共同使用，將可大幅提高民間業者投入軍品研製之意願。

(C) 正當運用採購法限制性招標相關規定，以確保投入軍品研製認證廠商之權益。政府採購法行之有年，但國防部採購軍品幕僚人員由於擔心採限制性招標造成無謂困擾，雖然明知國內特定廠商經過輔導，也投入大量成本，通過軍品試製認證合格，可是當國防部正式招標作業時，幕僚人員仍寧可採用一般最低標原則，導致認證合格廠商權益受損，因而國內業者對軍品採購望之卻步。

(D) 軍品開放國內業者研製認證的政策必須一貫性，以增強業界對國防部信心。由於國防部各單位主官均須定期輪調充實經歷方能有助升遷，以致國防軍品採購政策經常面臨新人新政朝令夕改，令業者無所適從之窘境。建議國防政策之制定必須審慎製訂，執行面也必須持之以恆方能取信於民。

二、國防部如何協助創造非壟斷具競爭性的軍用航空器產業環境

(A) 審慎評選軍用航空器研製項目，切勿重蹈凡事都要自製的迷思，必須就市場面、技術面、效益面及國際競爭力等審慎評估。當然仍須兼顧國防安全的考量為前提。

(B) 結合業界既有資源，建立產業合作聯盟，開放中科院等研發單位協助國內業者開發新產品，降低進入門檻。由於航空器發展初期（例如 UAV）必定產生研發階段的高成本，若能以中科院所累積的研發能量，結合業界生產管理及市場開發的實戰經驗，將可使國內業者成功地成為國防供應商，並進而進軍國際市場。

(C) 與經濟部合作，結合其投資獎勵資源（科專計畫、新產品開發條例等），共同遴選意願廠商投入。由於國防部除了能提供既有產能、研發成果及後續市場需求為誘因外，其他資金面工具甚少。因此必須經由跨部會合作，結合經濟部相關獎勵措施，才能吸引國內業者投入軍品研發生產。

(D) 訂定軍職人員轉任民間辦法，一則落實國防人力精簡政策，一則協助業者解決人力資源問題。

三、國防部如何鼓勵產業與外國廠商間的合作

航空產業為深度國際化的產業，即便歐美知名航空廠商空中巴士、波音等，亦充分運用全球分工合作模式，以提升其競爭力、降低研發成本及分散風險。

國防部為鼓勵業者投入軍品研製，亦應同時協助國內業者與國外知名廠商合作，一則可引進關鍵技術，一則可協助業者切入國際市場，同時也可吸引國外廠商來台投資。

建議具體措施如下：

(A) **充分運用國防武器採購談判籌碼**，國防部必須培養卓越談判人才，配合國防採購需求，與國外（美國為主）國防供應商洽談武器採購談判時，必須站在國內國防產業立場，而非僅僅局限在國防部軍種角度，提出相關條件及要求（包括**提高工業合作承諾額之額度、關鍵零組件製造與技術轉移、全壽期後勤整體資源轉移至國內等等**），爭取納入採購意願書（LOI）內，對有意承接國防武器國內廠商創造最有利發展條件與誘因。

(B) **有效運用「工業合作承諾額」**，創造國內外業者合作驅動力。目前工業合作承諾額的使用與管控，主要掌握在經濟部工業局手中（由於國防部官員漠不關心），訂定了極為嚴苛的門檻（須繳回饋金等）與罰則，導致國內外業者執行工業合作的意願降低。未來有關工業合作承諾額之運用沖銷，應由國防部主導，經濟部及業界相關同業公會協助審查，以引進國外原廠技術轉移為優先，參與國內投資合作次之，其他如開放對台採購、人員培訓等，都可創造國內業者參與國際合作有利環境與誘因。

(C) **開放國防資源吸引國外業者與國內意願廠商共同合作投資**，由於國防部長期投資建軍，已累積豐沛資源，可惜目前其能量多未能有效運用，就航空領域而言，例如空軍在屏東的第一指揮部（噴射戰機維修工廠）、在岡山的第三指揮部（噴射發動機維修工廠）及空軍航空技術學院等等，空軍仍秉持其本位主義故步自封，不願開放與民間合作開發其潛能；甚至有些資源遭到多年閒置，例如原屬空軍第五聯隊駐紮的桃園基地，五聯隊移防至花蓮後，不願交出土地給地方政府，竟巧立名目移交給海軍神鷹中隊使用，使得桃園航空城的規畫延宕多年，導致目前的規劃案支離破碎未能做全盤的有效規劃。強烈建議在目前政府相關資源不夠寬裕情況下，應鼓勵國防部釋出資源，開放給民間業者及國外意願廠商共同合作，創造多贏。

(D) 鼓勵並協助國內業者成為國外軍品供應鏈一環。美國軍方為了分散供應鏈管理的風險，每年都會定期到全球友邦國家遴選合格供應商加入其軍品採購合格名單中，台灣的業者也曾在經濟部鼓勵下，參與其評選，例如製作浴廁衛生器材廠商參與其防彈衣的評鑑、手機電池業者參與其軍規電池供應評鑑（已通過）、遊艇業也邀請美方評審專家訪視高雄及花蓮業者，評估加入供應鏈之可行性。但由於缺少國防部的加持與背書，業者通過評鑑的可能行降低甚多。國防部應主動建立國防軍品合格供應商名單，並參與美方定期來台評鑑之說明會及實地訪視行程，如此可提高美方對台業者之信任度，能納入其供應鏈並擴大對台採購，提升品質促使台灣業者進軍國際市場。

寓軍與民，相當與古時候的屯兵政策。國家平時不需要養那麼多的兵（精兵政策），但須扶植民間業者成長，符合國防後勤需求，一旦有作戰需求（下達動員令），即可做到全民皆兵。總之，作好國防軍品的供應鏈管理，為國防自主與國內產業發展緊密結合的不二法門，但在執行面的策略，必須做到：欲取之，先與之。先捨才會有得，如此才能創造國防與產業的雙贏。

（王耀德為前台翔公司董事長）

附件 5

國防策略有關海上防禦武力整建之研析

朱旭明

我國為海島國家位處國際航道要衝，物資主要仰賴進口，經濟活動命脈與世界接軌程度息息相關，基於海洋立國理念，在有效維護海權與護漁前提下，必須有足夠能力於所轄之領海執行巡弋、查處、管制、救難與治安維護任務，方能建構完整之制海權。另中共現今已完成海上航空兵力建置，軍事威脅已擴及到第二島鏈，對我國國土防禦已形成嚴峻考驗，是故將國防事務與已有相當自主規模之國內造船產業結合，自有其必要性與迫切性，透過「軍需領導產業、產業支持國防」之經營模式，達成海軍艦隊國造目標，必能提昇與強化海防戰力於不墜，相對亦可增進我國造船產業於世界之競爭力，進而創造政府政策、國防建設、民生經濟三贏局面。

背景檢討：

(一) 我國海軍現役各型艦艇，大多經由美國採軍售管道獲得，並循獨立之專案模式執行，專案與專案間並未有延續性與相互支援性，且與國內造船產業間迄未建立供需及維保之相互支援關係，長期以往，導致我國在建軍預算層面上，獲得及維持成本不符經濟效益原則。

(二) 綜觀近 20 年艦艇整建任務，受限於預算籌措、供售廠家態度及關鍵裝備獲得不易等因素，難以執行各型艦艇更新，更遑論全面且完整之規劃。目前國防部雖有商維策略之檢討，期將艦船維修作業轉移國內民間船廠，惟僅採逐次、逐案簽訂短期維修合約，且屢生造艦（維修）採購爭議，導致國內船廠無意願參與，對於建構整艦維修能量之長期投資益形困難。

(三) 我國政治環境特殊，但在維持區域安定前提下，國防支出自有其重要性，除保障國家安全，國防研究與科技開發對產業界是具有提升競爭力之潛在效果，間接也能對國家整體經濟成長提供實質效益。

產業現況概述：

(一) 檢視國內造船產業，經歷長期於商用船舶建造所累積之經驗，對於新式輪機裝備運用、建造技術開發及船舶設計等面向，已建置一定規模與技術，具備承接商用船舶客製化要求之能量，在爭取國際船舶建造訂單上，已有不錯之表現，近年來在國內並有大型工作船舶、海洋測量船、油彈補給艦、快速水面艦建造之實績；此外，也在船舶節能減碳、環保規範等設計與建造上，也已符合國際間認證要求之標準。

(二) 中山科學研究院甫於 2014 年 5 月 18 日正式掛牌轉型為獨立之行政法人，轉型後在自負盈虧之經營條件下，必將與國內外相關產業尋求合作，故與國內造船與海洋產業結合，自當為該院重要經營策略之一；依據該院艦艇戰鬥系統發展之經驗，已有武進一、二、三號戰鬥系統開發之實績，加諸近年甫研發之開放式戰鬥系統，該院對於海用系統之工程技術已建置相當能量，將可提供予國內造船產業運用及協助推展海用系統商機。

(三) 另有關國內裝備製造廠商在船舶主要基礎裝備之設計與製造能量檢討，經訪查國內業界已有多家廠商具備相當之製造或設計技術，舉凡動力馬達、自動控制系統、俾葉、軸系、液壓系統、空壓機、高壓管、高壓閥、電瓶、燃料電池、監控設備、動力電纜等，且已達防爆、防震、低噪音等規格要求與產製實績，然受制於國內市場未出現穩定需求之支撐，復在產業資金規模較小，自創品牌風險等因素考量，目前多採保守經營策略，接受國外相關大廠委託或代工，若能透過國防艦艇建造與維持需求商機提出之整合，必能有效支持國防需求，進而逐步於國內建構完整之供應鏈系統。

海上防禦武力整建之建議：

(一) 落實全壽期管理：

審度國防部以往「五年兵整」暨「十年建軍」計畫，均未見有全壽期之規劃，應依據全壽期思維對海軍艦隊整建重新進行全盤檢討，將國防艦船更新與汰換，採逐艘分批小量建造，並透過螺旋式發展理念，逐次提出驗證檢討與使用者經驗，結合國內產製技術及科技能量提升，回饋接續之造艦任務予以精進，以達艦隊戰力與船舶性能持續提升之要求，同時可依研發建造速率穩定汰換老舊兵力，達成海軍艦隊整建目標，有效屏除戰力罅隙；同時可讓國內造船產業，安於長期持續經營國防研發設計及建造業務，且無慮業務中斷而發生投資設施

閒置與培植技術人才流失。

(二) 發展多功能並可彈性運用之載台構型：

為達訓練、測評與後勤維保作業單純與一致性，載台應朝多功能設計，結合任務特性，搭配不同功能模組與機具，並採開放式戰鬥指管系統，視任務需求擴充操控台，除可有效節省研發、建造、操作、訓練及維持成本，並使船舶構型簡化相近，在艦船相互支援與執行任務上，創造更大之戰術運用彈性，另基於戰系發展之複雜度較高，應採行先輔戰後主戰之造艦原則、先行籌建兩棲、救難、測量、訓練等後勤輔戰艦船，以降低投資與執行風險。

(三) 建置造、修結合之供需環境：

檢討足敷維持賡續造艦之基本預算逐年編配，將後勤維保工作透過長期後勤支援協議委原由承造船廠執行，運用合約管理模式維持獲得品質及合理預算，持續進行造艦、修艦，減輕國防人力與物力負擔，並藉此與國內造船產業建立永續合作關係，激發國內船廠投資意願及提升能量，透過國防艦船承造實績，提升競爭力於國際造船界，拓展造船業務；此外，船廠平時承接國防艦船修造訂單，戰時船廠人力、物力可立即就地轉換為軍需工廠，符合「平戰結合」、「寓軍於民」之國防建設要求。

(四) 設置專職公務艦船造艦管制單位：

依船舶共通性需求與任務特性，統籌並持續規劃公務部門造艦業務，主導設計、採購與建造業務，透過專案管理架構與系統工程理念，運用構型化、模組化設計，建置多功能、多用途之海上防禦武力、海巡艦船、訓練船及特殊艦船（如測量、情報）等各型艦艇，整合裝備系統與後勤維修作業，除簡化機關採購作業負擔，增加公務船舶流用機會，亦可增加並創造民間參與國防建設之機會及平台。

(五) 檢討適切採購方式：

現行政府採購法基於公平、公開原則，多數購案均採最低標方式辦理，雖有消弭爭議發生之效果，但長期以往恐有防弊有餘而興利不足的情形發生，應在不涉及討論修法之情形下，採購方式應予適度律定，現行對市場開發成熟度高之商品採最低標方式獲得，並無疑慮，惟對有關國防艦船之類的公務船舶，應考量其具備客製化要求之條件，應採行最有利標方式辦理購案，以符市場供需實際。

(六) 放寬投資建案作業限制：

既有之軍投建案模式，均採一次作需、一次系分與一次投綱之一系列建案審核，一次執行，雖能將所規劃之軍備在短期（一般約3至5年內）一次獲得，但也衍生整批屆壽汰換與預算集中之情形，進而或有因消失性商源問題，必須再次籌措大筆經費執行性能提升；應在全壽期管理思維下，適度放寬允許在一次作需下，執行多次系分與投綱，結合科技與工藝提昇情形，採分階段逐次執行、分批少量造艦方式，永續執行海軍艦隊整建任務。

結論

以日本為例，從「明治維新」開始，每年均維持固定造艦方式於國防艦艇建設，並結合日本國內各項關鍵工業持續發展未曾間斷。反觀我國自政府來台迄今，僅有海鷗級、光六級飛彈快艇、錦江級巡防艦及獲得美國提供藍圖與技術協助之成功級艦，近二年復有油彈補給艦及迅海艦之建造，持平而論，均未見有全般之造艦規劃；另有鑑於我國自行發展 IDF 案例，因未能繼續開發後續機種，使人才未能持續保留與培育，導致人力、物力投資的浪費，著實令人痛心。

考量維護國家海權之重要性，海上防禦武力之建設必不可輕忽，然檢視我國國防艦船多數艦齡均已超過40年，從正面觀之，國防部確實不負國人所託，盡心盡力維持艦船戰力於不墜，但從經濟與效益而言，卻相對造成資源浪費，值此時機，將海上國防建設與國內造船產業結合，應是為必要且迫切推展之重點工作。

（朱旭明為海軍備役上校）

附件 6

國防策略有關國防艦船採購問題之研析 顏聞明

國內船廠參與國防艦船的造艦任務，迄今有 40 餘年，計有油彈補給艦 1 艘（武夷艦）、小型飛彈快艇（FAB）50 艘、港巡艇（PBL）12 艘，尤其是自 1990 年開始的光華一號 8 艘成功級巡防艦的造艦案、光華三號 12 艘錦江級飛彈巡邏艦、光華六號 30 艘新一代飛彈快艇，以及 1200hp 及 1800hp 等二型港勤拖船造艦專案，目前尚有在台船公司建造的快速油彈補給艦（AOE），以及龍德造船廠建造穿浪型雙船體設計的迅海艦等。上述各造艦專案雖然在建造過程中，或多或少碰到一些困難與爭議，但是在國內造船產、學以及相關單位的共同努力下，均能逐一克服，順利交艦；是以，依據前述之造艦案例觀之，國內造船產業已有高度的自信與充分之能量，足以承接國防各型艦船之艦造任務，只待政策明定完整造艦執行作為，並協助提供產業更公平、合理之採購平台。

影響國內造船產業參與之問題探討

（一）當前國防艦船之採購模式大多均循政府採購法，採公開招標之最低標方式辦理，殊不知船舶之建造，具有設計、技術、施工複雜性及船東特殊使用環境與操作性能之要求，加上國際間對節能、環保、強化安全新制定的法規要求，若要新造艦擁有高品質、交期準且最適於船東特殊需求及作業環境與符合節能環保法規的高效能國防艦船，以最低標方式辦理採購，恐衍生惡性競標，導致造艦品質良莠不齊衍生之障礙，不利整體造艦環境之良性發展。基於一分價錢一分貨之現實條件，船廠迫於成本效益的經營壓力，勢必選取僅能符合性能要求門檻之廉價且次級甚或屬較老舊將屆產品週期之裝備，雖可於交船時滿足驗收條件，但對船東而言，將增加日後維修負荷與成本，相對造成船舶使用性能不穩定之風險，就獲得與維持之整體成本效益而言，絕非有利選擇。

（二）採最低標方式辦理之國防艦船採購模式，雖已有前述諸多案例執行完畢，但就國內造船產業發展之角度持平而論，並未對產業之能量擴充與永續經營產生實質助益，概因國內各船廠受限於資金與規模較小之先天條件，在國際市場受到造船大廠與國家保護政策的排

擠，爭取造船訂單的空間相對受到壓縮，雖然具備國防艦船之承造經驗能協助船廠提升競爭力，但在尋求生存之前提下，船廠往往被迫採取不惜成本、僅求維持之無奈決定，壓低造艦報價參與競標，其結果是船廠並未因承攬造艦而獲利，加劇產業間惡性競爭，破壞彼此良性競合的默契，此外，也容易衍生成本與品質無法兼顧之不當情形，造成履約爭議，就長遠而論，勢將不利於國內造船產業的整體發展。

(三) 國內造船業界對於承造國防艦船，雖然保有高度參與之意願，但對當前造艦案時而缺、時而有之情形，仍存在有一定程度之顧慮，缺時數年不見，一旦出現則事隔多年甚或一案多艘，此種訂單不穩定之需求市場，迫使各船廠無法安心投資供應鏈整合工作，更遑論於穩定培養與長期維持國防造艦人才，對物力及人力資源永續建立形成風險與不安定性。

產業期待之政策發展建議

(一) 律定合宜之採購方式：現行政府採購法對於採購態樣、購案製作、選商條件及決標方式等，均有完整律定且提出多種採購作為供選擇，並由主管機關依特殊個案例經驗，統籌發布釋疑與執行標準持續精進，就立法之精神而言，已臻落實採購之公正與防弊性；然對採購國防艦船之招商方式，應考量其需求具特殊性，且不具備市場量產之流通商品性質，不論在操作環境、性能要求或安全係數均非一般商用船舶所能比較，是屬高度客製化產品，基此，不應採最低標方式辦理採購，而應依其特性規範相關商情條件，運用選擇性招標或最有利標方式辦理採購，透過公開說明機制，進行雙向溝通，提供公開管道由船廠反映商情實況，交國防需求單位正確制定購案計畫，再由欲參標船廠進行合理之備標準備，以利國防單位擇定最適切且最符合成本效益之選擇；此次，海軍獵雷艦採購案係採最有利標方式辦理，並於購案準備期間辦理多次公開說明，現各參標船廠在完整瞭解海軍實際需求後，已遵循最有利標評分標準，並依其能量各自積極進行備標準備，亦無惡性競爭之不當情事發生，應屬成功案例可供繼續援引。

(二) 運用專業分工執行造艦：國內各船廠均有其特定的建造能量，應可參考歐美軍艦籌獲計畫，舉凡驅逐艦、巡防艦、油彈補給艦、潛艦、獵雷艦等大型及精密船艦之研發及建造皆以專門機構或研發團隊之設計單位與船廠參與完成，未來國內各型船艦建造需求，可依艦艇功能性分類，透過適當的採購模式，提供國內設計、造船各廠皆有機會參與精密造艦技術，避免惡性競標發生導致造艦品質良莠不齊，影響建軍備戰；再者，此方式將可確保造艦預算留用於國內，以國內

建造現況，約有 65% 的船價將直接貢獻於國內產業，有利於開發國內拼經濟之動能及就業率之提升，相對可創造政府、國防與造船產業三贏之有利布局。

(三) 提出穩定的造艦需求：我國雖已有國防艦船國造之實績與案例，但缺乏計畫性的持續推動，觀諸先前造艦專案之執行前後往往相差三至四年，甚或十餘年，此種未連貫之造艦作為，使得國內船廠在產能投資、人力培養與生產配置上，產生極大的不確定性與困擾，應律定一長遠可靠之執行政策，確定造、修建之法律依據及程序，在不涉及國防機密範疇內適度公開，俾使國內造船產業據以擘劃發展目標，放心大膽進行長遠規劃與投資，國防部門亦可據以調整人力及結構，達成雙贏之目標。

結論

造船產業為關聯性高的基礎傳統工業，所需裝備、器材廣泛，技術層次亦較先進，因此，造船工業可帶動國內相關工業技術的提昇與發展，包括鋼鐵、機械、電器、電子及化學等工業。世界擁有造艦能力之國家，其國防所需的艦船，均由其國內造船產業在政府經費支持下，運用國內資源進行造艦，除可提升國內造艦技術、擴大造艦能量，並相對帶動國內週邊工業，促進工業繁榮，厚植國力。

我國是一個海島型國家，在面臨中國大陸強大的武力威脅下，更須維持基本的造船工業，以保有相當的國防自主能力。若國內造船產業能獲得政策穩定的推展與落實，估且不論對國內其他產業之效益，將直接助於造船產業發展能量滿足國防艦船之需求，成為國防建設的堅實後盾。

(顏闡明為台船工程師)

附件 7

推動「潛艦國造」的建言

蔡宗亮

包道格在卡內基國際和平基金會「亞太再平衡」會議中指出「台灣的造船廠沒有足夠的經驗，要製造安全的潛艦會有困難。」我們的看法如下：

(一) 不開始做，永遠不會得到經驗。包道格的說法還是圍繞在美國單方面利益之思維。「潛艦國造」是台灣的國家利益，也附和美國全球防衛戰略利益，可創造雙贏。

(二) 「船舶暨海洋產業研發中心」(船舶中心)與台灣船廠有足夠的經驗踏足「潛艦國造」。

(三) 沒有「潛艦國造」的經驗，將無法執行未來「軍艦商維」更龐大的產業商機。

以下是我們的建議：

(一) 潛艦國造應先整合國內現有的相關技術能量，組織一個「產、學、研」的工作推動與執行小組，與海軍共同研擬全盤性的技術需求路徑圖 (Roadmap)，一方面整合國內的能量及釐訂國外技協具體需求，並參考國際相關價格行情，以政治／技術雙面考量，爭取國外技協單位合作。

(二) 船舶中心是國內公務船艦的「設計中心」(Design House)，有能力也適合擔任組織與推動「潛艦國造」核心幕僚的角色，整合國內外的技術能量。

(三) 台灣國際造船股份有限公司(台船)具有國防船艦建造的實績與經驗，可以負責「潛艦」建造技術與工程規劃和試製工作，並規劃建構製程裝備、品保／性能測試的機制，以及規範文件和技術人力規劃等。

(四) 「工作推動執行」小組成員分工準備並分析相關技術資料，同時與國防／外交部門溝通協調技術內容與國際交涉策略，與美方相關單位對談，表現我方具有相當的技術能量與經驗，以技術層面要求技協對話，尋求軍／商售的最佳可行方案。

(五) 請協助要求國防部將「潛艦國造」的「合約設計」案盡快付諸行動，也請「立法院」盡快通過預算，得使「潛艦國造」計畫能夠盡快付諸執行。現在已具有「天時」、「地利」、「人和」的良機，不可錯失。

船舶中心願盡全力配合國人對「潛艦國造」的期望與決心。

(蔡宗亮為財團法人聯合船舶設計發展中心董事長)

附件 8

臺灣資安產業現況調查與未來發展建議

陳振楠

美國、歐盟、日本及韓國等相續提出資訊高速公路與國家資訊基礎建設之概念，並大力推動數位化生活，全球已邁入網際網路和數位貯存庫 (repository) 迅速普及的數位經濟時代，隨之資訊安全與個人資料保護，面臨日趨嚴重與多樣化的潛在威脅，其焦點從強調通信保密，進而著重在資料的機密性 (Confidentiality)、完整性 (Integrity) 與可用性 (Availability)，並加入資安特性：鑑別性 (Authenticity)、不可否認性 (Non-repudiation)、可歸責性 (Accountability) 及可靠度 (Reliability)；資訊安全比較偏重技術與方法。而個人資料保護著重在防止個人隱私資料被不當的蒐集、竊取、竄改、毀損、滅失、洩漏或利用、作業流程的控管與資料管理人及處理人的道德操守，會直接影響資料保護工作的成效。

政策依據

行政院於 2009 年召開「塑造資安文化、推升資安產值」產業科技策略會議，邀集產官學研共同規劃我國資安產業發展願景、目標、以及推動策略。其中，依據議題三「建構資安產業發展環境」之結論與後續關鍵推動措施之規劃，由工業局成立資安產業專責推動計畫，帶動資安廠商投入資安產品開發、輔導業界導入自主資安產品與服務，並鼓勵產業整合建立解決方案進軍國際市場。

資安產業現況與建議：

依軟協資安促進會會員加上工業局資通訊安全產業推動計畫之會員彙整分類如后：

- (1) 內容安全：廠商共有 28 家；
 - (2) 網路安全：廠商共有 27 家；
 - (3) 應用安全：廠商共有 37 家；
 - (4) 資安服務：廠商共有 9 家；
- 總共 101 家。

由於國內資安廠商均屬中小企業，資金、資安人才及研發產品經濟規模小，難與國外資安及網通大廠相抗衡，因此，過去政府推動的資安建設往往肥了國際大廠，使國內資安產業難以茁壯，尤其我國個資法立法通過，並未有完善配套的政策法源與專責單位（與公權力），落實執行監督與稽核的角色，評鑑業者資安與個資防禦的適法性，讓消費者有感「安全信賴的資訊化社會，安心優質數位創新生活」。例如：電子商務平臺業者，結合資訊流、商流、物流及金流盛行之際，網路威脅及個資外洩嚴重影響消費者信心（傳統產業：生產廠商、倉儲業、供應商及配送商對資安的防禦投資金額不足）

資訊安全是國家安全的一環，政府應該有資安策略性作法-落實扶植資安產業，才不致於受制國外廠商，特別是雲端安全及行動安全，強烈建議公務機關若能儘早成立資安與個資專責單位，預算及人力獨立，進行資安資產與應用系統的盤點，重新提出「擴大內需政策促進資安產業發展」方案，帶動資安廠商在內容安全、網路安全、應用安全（行動安全及雲端安全）等領域之產品開發與應用導入，或利用台灣硬體行動裝置製造優勢，整合新興資安技術，以發揮軟硬綜效效益。

積應用成功案例實務驗證，提升國內業者之品牌形象，使政府投資之金額發揮約 3 至 4 倍的業績乘數效果，帶動政府 GDP 成長及增加國內就業人口數且具國際能見度與資安產品拓銷能力。

（陳振楠為臺灣隱私權顧問協會理事長）

附件 9

台灣的資安強國之路

Benson

沒有資安，哪有國安

在資訊化時代的今天，資訊掌握的深度與力度是國家軟實力與整體競爭力的重要指標，此變革也決定了資訊系統必成為現代戰爭與區域衝突的重點攻擊對象。這種以電腦和網路為主要攻防目標，槍砲彈藥變成由滑鼠、鍵盤、特殊軟硬體所精心設計的惡意程式與木馬後門的作戰，簡稱資訊戰。因能有效以寡擊眾、決勝於千里，正重新定義資訊化時代的網路強國、資安強國。

千軍易得，一將難求

近年世界各國都在厚植自身的資訊戰實力，而作為資訊戰根基的資安人才就更顯得重要與難求。舉辦世界級的資安研討會和資安競賽是各國吸引資安人才的第一步。全世界最頂尖的資訊安全會議當屬美國源自 1997 年的黑帽大會（Blackhat）和源自 1993 年的戰備大會（Defcon）。前者吸引高階資安將才，後者吸引黑手駭客雄兵，這兩場大會每年都遴選上百篇未曾發表的驚人之作，並吸引上萬名資安人齊聚拉斯維加斯交流切磋。在 Blackhat 除了可一窺最新的資安技術，各國的產官學高階主管也會來此選才挖腳，尋求技術合作或企業併購。Defcon 更設計有奪旗競賽（CTF; Capture the Flag），此資安攻防平台正好提供美國政府了解全球各國資安戰力，並招募資訊戰新血。我國應持續支持已成立 10 年的台灣駭客年會（HITCON），媲美 Defcon 作為培養頂尖人才的搖籃，同時有系統地成軍到 Defcon 世界舞台較勁，展現我國軟實力與資安籌碼。另外，我國應積極支持具有資安創新，資安自主，掌握關鍵技術的新創企業，協助其登上 Blackhat 等世界舞台，增加國際知名度，將資安能量輸出全球。

知彼知己，百戰不殆

當國家利益至上時，一國在資安技術的領先就會變相地危及其他國家的整體競爭力。近年已發生多起國際性的先進資安入侵事件，包括針對跨國集團（如 Google）、國防工業（如美國洛克希德馬丁、日

本三菱重工)、能源事業(如美國各大能源公司、伊朗核電廠)、金融單位(如韓國 DarkSeoul 事件癱瘓多家韓國銀行達數萬台電腦與 ATM 提款機)等。台灣長期也面臨嚴峻的資安威脅,自 2003 年我國各政府機關就發現有越來越多有組織、有計畫的資安攻擊在入侵台灣,這類攻擊簡稱先進持續威脅(APT: Advanced Persistent Threat),亦可俗稱網軍攻擊。歸納遭攻擊的單位遍及各級政府機關(尤其是 A 級與 B 級機關的機敏資料如公務資料、戶籍資料、健保資料、出入境資料、犯罪資料等)、學校機構(重要統計數據與研究成果)、新聞媒體業(政經內幕)、金融單位(交易紀錄)、跨國集團(營業秘密)、高科技廠商(智財和程式碼)。在部分資安調查中可發現這類攻擊有能力潛伏在受害單位之中長達數月至數年之久,甚至有的入侵時間可追溯到 2008 年,而迄今惡意程式仍在活躍竊取資料。這表示受害單位全然不知已遭網軍入侵。有鑑於此,當務之急應展開全國性的資安健診,一方面了解面臨的威脅現況,哪些單位和哪些資料應列為重點保護對象,另一方面歸納分析攻擊方的戰技、武器和戰術(TTP: Tactics, Technologies, and Procedures)。

掌握關鍵，重點突破

綜觀當前全球面臨的資安挑戰,可重點歸納三大現象:(1)順手牽羊、(2)瞎子摸象,與(3)隔牆有耳。其一,資訊化的資料太容易被複製與竊取。其二,資訊化的軟硬體都是黑盒子,難確保有無隱藏功能甚至是後門。其三,即時通訊與雲端服務的普及讓資料在傳遞過程中很難確保不會遭截取竊聽。因應這些威脅的關鍵技術包括(1)資料加密技術與內容管理技術,(2)惡意程式分析技術與行為監控技術,(3)即時通訊技術與傳輸加密技術。一旦在過程中發現威脅,即加以分析威脅,將威脅建檔,長期追蹤威脅,並建立情資查詢平台與他國聯防與交流。

養兵千日，用在一時

鄰近台灣的南韓正傾全國之力發展資訊戰能量。在青少年階段韓國就透過資安科展導正駭客非黑客的觀念,宣導資安能學以致用,獲家長認同資安是有利升學和生涯發展的。據統計,韓國有 400 餘學校有資安社團,全國每年均有諸多國際規模的高額獎金資安競賽,如 Codegate、SECUINSIDE 和 PoC (Power of Community),韓國政府更推展 BoB (Best of the Best) 菁英計畫,延攬世界頂尖的駭客來指導韓國的資安菁英。這些優異的年輕學子,未來不僅可在各行各業大放異

彩，在國防上韓國國防部與韓國的高麗大學有軍官養成計畫，全額補助資訊防衛系（Cyber Defense）的學生畢業後可進入國家的資電作戰部隊，為韓國的資訊作戰效命盡力。我國可借鏡將資安推廣向下扎根自青少年，規劃一系列的資安菁英培育計畫，涵蓋高中三年、大學四年，以及後續的研究所深造與生涯規劃，就學期間輔以高額獎學金長期地支持有潛力的資安人才，不同性向的人才可育成至從軍作戰、技術研發，甚至新創企業。

軍民一體，資安強國

台灣缺乏天然資源、腹地人口、軍事武器等硬實力，但台灣一直是充滿創新、創意、創業的國家，我國應積極掌握發展資安軟實力的契機，提高資安層級的高度，將資安問題視為國安問題、國防問題，化危機為轉機，整合國內的資安能量，發揮政府、學校、產業與社群的綜效。

（Benson，Xecure Lab 共同創辦人、台大電機博士、Chroot 成員，也是國防小組諮詢委員）

附件 10

我國中小企業資訊安全的發展與未來

郭秋田

資訊安全產業是攸關國家安全的重要產業，應該受到國家的積極重視與扶植。由於資訊科技的應用深入各行各業，也包括政府機關、軍、情單位，因此資安問題的重要性不下於國防的各項軍事安全問題。一旦資安出現問題，不論是各項資訊服務功能遭癱瘓或是重要資料被竊取、竄改，都將造成我國極大的威脅與損失。重視資安的國家往往會積極投注於資安的基礎建設、開發自有系統、協助本國資安廠商建立充足的研發能量。其目標在於掌握必要的關鍵技術，重要的資訊設施自主、軟硬體能夠使用國內自有產品，以避免受制於外國或甚至形成嚴重的資安漏洞。因此，從國防層面的資安布局來說，培育充足的資安人才、扶植國內資安產業茁壯，是達到上述目標的當務之要。

目前國內並未積極重視資安產業，主要缺乏高層次的國家戰略層面資安考量。每年投注在資安產業發展的經費如果和國防預算相較，堪稱九牛一毛，並且也缺乏具體的政策方向。國內的資安技術能量發展，大致上是在民間自主的研發下自由進展，缺乏有效的政府支持下，進展緩慢並且不夠完整符合國防資安需求。再從市場面來看，國內的資安產業由於受限於本身的市場經濟規模小，原本就不易發展，在目前整體經濟大環境並不好的情形下更是雪上加霜。國內資安市場主要為政府機構、金融業、上市上櫃公司，一般中小企業則相對地較不重視資安問題。然而，政府機構的資安市場目前在政府採購法的限制下，中小型廠商很難參予競爭。而大型廠商多數為所謂的系統整合廠商，本身並不具備資安專業，以致於得標後往往再下包給中下游廠商，經歷二、三、四甚至更多層轉包的情形也司空見慣。

國內資安能量藏於民間，每逢有兩岸駭客攻防事件，可看到台灣的戰績亦不遑多讓。可惜這股力量平時並未集中，不是屬於個人工作室就是藏於小型公司，缺乏穩定的研發環境，這些人才的力量無法聚焦發揮。縱有極具理想的廠商延攬集中了這些人才，然而，國內資安市場的制度與規模不易讓專業的中小型資安廠商能有足夠的營收來維持，人才也因此而不斷流失或轉入其他行業。此外，基層的資安人才十分缺乏，目前的大學或技職院校並未針對資安產業設計具體有效的學程來培育業界需求的人才。在資安課程面，密碼學相關領域的比

重過高，校園實驗室中也缺乏相關實作環境。企業反映即使是在校成績極為優秀的人才，要符合業界用人需求往往仍須半年以上的培訓。

要具體培植國內資安能量，在國內內需不足，市場規模小的情形下，第一、可以積極製造內需，讓一般資安中小企業擁有較大的市場。這些內需也可強化政府部門的資安基礎建設。此外，需支持具有研發能量的公司能夠持續進行研發工作。對於需要昂貴經費研發的特定資安品項，則可以透過政府出資成立專業公司或機構長期挹注研發能量來強化；第二、人才培育面，在大學中應規劃專業的完整資安學程，並可透過建教合作的方式來達到學用合一的目標。讓畢業生在投入資安職場後能夠馬上銜接產生具體的生產力；第三、了解資安發展趨勢並搭配國防需求，規劃重點發展項目。例如：相關資安基礎建設項目如軟硬體資安檢測，資安產品軟硬體、行動 APP，都可能暗藏木馬、後門，特別是部分地區、國家的相關產品，政府部門或重要機構在採購建置這些產品時即將資安漏洞帶進來。透過軟硬體資安檢測驗證，可強化確保這方面的安全。此外，如網路通訊安全、行動裝置安全、資料洩漏預防……等相關技術亦是十分重要的基礎項目；第四、跨足海外市場，受限於國內資安市場不足，國內資安產業宜擴大市場至海外。政府可協助讓本國原廠能夠與海外代理商進行媒合合作。

（郭秋田為國立空中大學電子計算機中心主任）

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蔡行健

蔡明憲

蘇紫雲

以及不具名的一位退役海軍少將

And an anonymous retired rear admiral

幕僚：黃柏彰 Staff: Paul HUANG

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國防政策藍皮書 Defense Policy Blue Paper

- | | |
|------------|---|
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| 第二號報告 | 中科院轉型與厚實自主國防核心研製能量 |
| DEF-PUB 02 | Transforming the CSIST: Strengthening Indigenous Defense Research and Development |
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