

SUBMISSION TO COMMISSION ON DEFENCE

Air Policing

Policy Options for Ireland



Coimisiún um Óglaigh na hÉireann
Commission on the Defence Forces



**Commission on the Defence Forces
Public Consultation Response Template**

- 1. Capabilities** – In this regard, you may wish to consider future integrated capability development and the planning and delivery requirements to support a joint force approach in terms of new equipment, professional military education and training, maintenance and development of infrastructure, developments in military doctrine, and transformative concepts, including specialist capabilities, that prepare and support the Defence Forces for future operations.

This submission proposes developing a capability for air policing in Ireland. The details of the submission are elucidated in the appended briefing précis.



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- 2. Structures** – In this regard, you may wish to consider the most effective high-level Command and Control (C2) structures within the Defence Forces to ensure an agile and balanced approach that can function across all domains at home and overseas.

Additionally, you may wish to address appropriate future force structures for the Army (including its brigade structure), the Air Corps, and the Naval Service, individually as component services and collectively as part of an integrated joint force approach.

Furthermore, you may wish to address the changing nature of reservists, which presents an opportunity for the Reserve Defence Force to further integrate and support the Permanent Defence Force through the provision of enhanced collective and specialist capability across all domains.

Details provided in attached précis.



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3. Staffing – In this regard you may wish to consider the HR policies that support the requirement for an agile and adaptive modern military force. You may wish to consider issues such as recruitment and retention, organisational culture and values, gender and diversity, career progression, and industrial relations machinery.

Details provided in attached précis.



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4. Any other comments you may wish to make in relation to the Defence Forces having regard to the Commission's Terms of Reference

Details provided in attached précis.



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Appendix 1

Air Policing Policy Options for Ireland



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Commission on the Defence Forces



KAI FA-50

Air Policing - Policy Options for Ireland

Briefing Précis
Jan '21

Introduction

Air Policing - Ireland

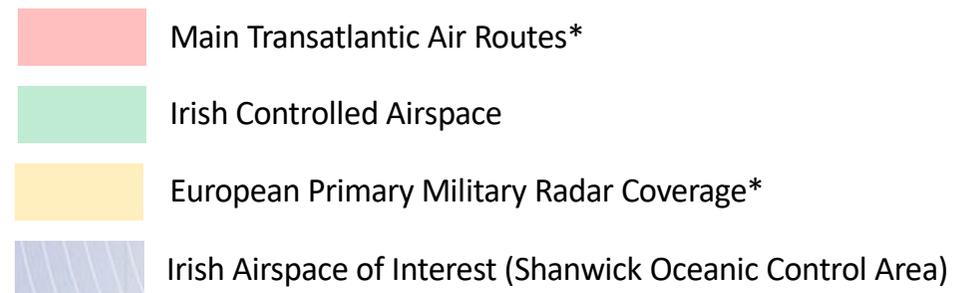
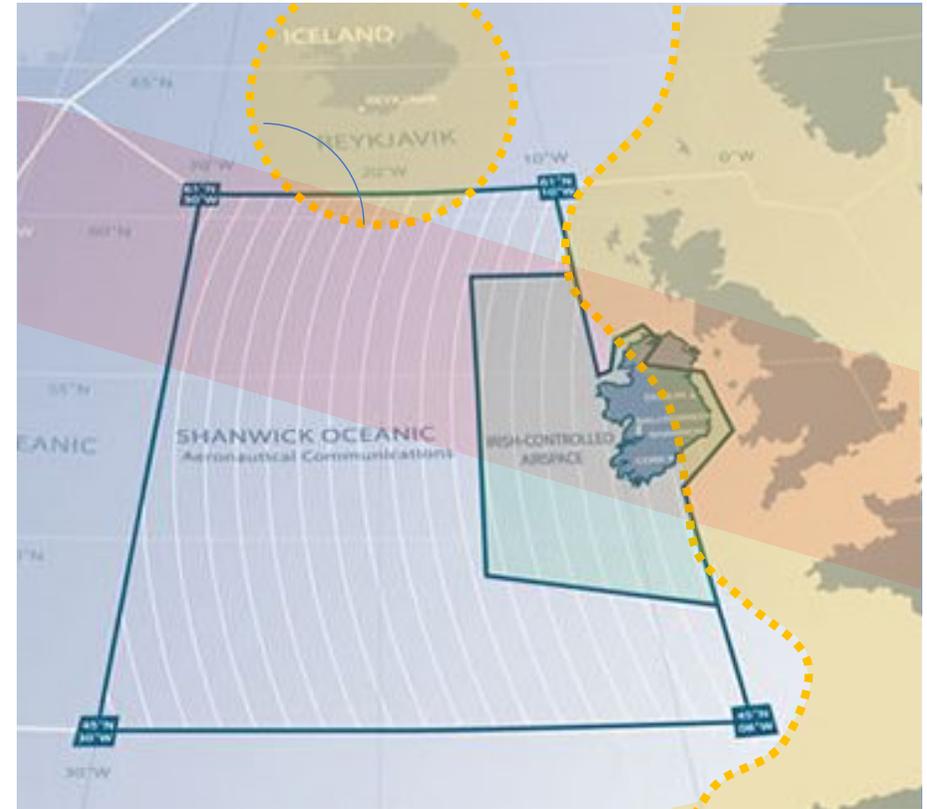
Irish Airspace

- Ireland's directly controlled airspace extends deep into the Atlantic - an area which is approximately six times larger than Ireland's sovereign land mass.
- Ireland's airspace of interest reaches even further, extending to mid Atlantic longitudes (~30° W).
- Approximately 1.2 million flights pass through Irish airspace on an annual basis representing approximately 80% of trans-Atlantic flights.
- Surrounding jurisdictions on Europe's Western flank (Norway, United Kingdom, France, Spain, Portugal and Iceland¹) possess comprehensive air policing capabilities with primary military radar and Quick Reaction Alert (QRA)² aircraft.
- Ireland is the only country on Europe's West Atlantic frontier that does not possess primary military radar and QRA capabilities, leading to a gap in Western European airspace monitoring and air policing.

Air Policing

- Air policing is a peace-time capability involving the monitoring of airspace, the identification of threats and the interception/escorting of targets as required.
- Ireland does not possess a meaningful air policing capability.

Irish Controlled Airspace & European Primary Radar Coverage



*illustrative only.

¹ Iceland possess organic primary military radar and NATO QRA based at Keflevik.

² QRA refers to immediate jet fighter response capability 24/7.

Capability Spectrum

Air Policing - Ireland

Air Policing Capabilities

- Air Policing typically consists of four key elements:
 - Aircraft:** Intercept aircraft, normally with supersonic capability.
 - Readiness:** Rapid response, typically achieved with Quick Reaction Alert (QRA) aircraft (24/7 capability).
 - Situational Awareness.** Primary surveillance radar to monitor and identify targets and control friendly aircraft for intercept.
 - Command/Control:** C4ISR¹ systems to support operations.
- Applying these elements, a capability spectrum with 5 capability categories exist, ranging from 'none' to 'full', as illustrated in the adjacent table.

¹ Command, Control, Communication, Computers, Intelligence, Surveillance and Reconnaissance.

Ireland's Current Capabilities

- Ireland's current air policing capability is 'token'.
- Ireland's PC9M aircraft are capable of low altitude low speed air intercept only.
- Ireland has no effective primary radar and does not possess the capability to monitor sovereign airspace.
- Other European countries of Ireland's size (Finland, Norway, Denmark et al) typically possess comprehensive 'full' air defence with large fleets of 4th/5th Generation fighter aircraft.

Airspace Policing Capability Spectrum

Capability	Description	Equipment
None	<u>No</u> capability to monitor or control sovereign airspace.	<ul style="list-style-type: none"> None
Token  Current Capability	Limited capability to control airspace locally and intercept low velocity and low altitude targets.	<ul style="list-style-type: none"> ~8 x Turboprop Tactical primary radar only. No QRA capability.
Embryonic  Option #1**	Limited peace-time airspace policing capability with limited ability to monitor, intercept and escort hostile aircraft at high altitude and transonic speeds as operationally required.	<ul style="list-style-type: none"> 8 x Jet training Aircraft. National primary radar coverage. Limited C4ISR capability.
Realistic  Option #2**	Full peace-time air policing capability and embryonic military air defence capability with credible capacity to monitor, intercept and escort hostile aircraft 24/7.	<ul style="list-style-type: none"> 8 x Light Combat Aircraft. National primary radar coverage. integrated C4ISR. Pre-QRA capability***
Full	Full military air defence capability to standard comparable to similar size European countries (Norway, Denmark, Finland)	<ul style="list-style-type: none"> 40 x 4th/5th Gen Fighters National primary radar coverage. Fully Integrated C4ISR. 24/7 capability with full QRA.

**Air policing upgrade options.

***Pre-QRA refers to a non-immediate response, typically 60-minute response time on a continuous basis, with the capability to surge to immediate response when operationally required.

Aircraft Categories

Air Policing - Ireland

The following table illustrates different aircraft suitable for air policing roles.

Category	Description	Air Policing Capability*	Equipment
Turboprop Training Aircraft	<ul style="list-style-type: none"> Capable of low altitude/low velocity. Only capable of intercept for slow moving targets. <u>Ireland's Current Capability</u> 	 10%	 Typical 'trainer' PC9M
Jet Training Aircraft	<ul style="list-style-type: none"> Capable of high altitude/medium velocity air policing. Only capable of intercept for medium speed targets due to limited, subsonic, cruise speed. Limited sensors and weapon systems. 	 50%	 Typical jet 'trainer' M346 Master
Light Combat Aircraft	<ul style="list-style-type: none"> Advanced supersonic Jet training aircraft converted to combat role. Capable of high altitude and high-speed intercept, up to Mach 1.5. Performance very close to Gen 4 fighters but lower cost. Ideally suited to air policing role. 	 90%	 Typical 'Light Combat Aircraft' FA-50
Gen 4 Fighter	<ul style="list-style-type: none"> Typically, 1990s design fighters with enhanced sensors. Capable of high altitude and high-speed intercept (Mach 2). Suitable for airspace policing and intermediate military air defence. 	 95%	 Typical 'Gen 4 Fighter' Gripen
Gen 4+ Fighter	<ul style="list-style-type: none"> Latest (pre-stealth) high performance fighters. Superior performance characteristics and latest sensor (beyond horizon) systems. Optimised for sophisticated air defence. 	 100%	 Typical 'Gen 4+ Fighter' Typhoon
Gen 5 Fighter	<ul style="list-style-type: none"> Similar to Gen 4+ with integrated stealth and full next gen beyond horizon systems 	 100%	 Typical 'Gen 5 Fighter' F-35

*indicative air policing capability.

Light Combat Aircraft

Air Policing - Ireland

Light Combat Aircraft Capabilities

- Light Combat Aircraft are combat variants of advanced/supersonic jet training aircraft.
- The latest light combat aircraft variants are comparable to the capabilities of Gen 4 fighters - with supersonic interception and advanced sensor/weapon suites.
- High performance light combat aircraft have ~90% of Gen 4 fighter capability at a fraction of the cost.
- The operating capability of light combat aircraft are perfectly suited to air policing capabilities.
- High performance light combat aircraft also have embryonic military air defence capabilities – capable of air-to-air, air-to-ground and air-to-sea operations.
- Light combat aircraft can also operate as training aircraft, which is ideally suited to smaller countries that do not wish to maintain both training and combat aircraft fleets.

Light Combat Aircraft for Ireland

- Several smaller counties have selected or are considering light combat aircraft as a credible but economic alternative to full fighters.
- Light Combat Aircraft would provide an effective capability for Ireland's airspace policing requirements with a realistic capability (~8 aircraft) estimated at ~€20m per annum (CAPEX* & OPEX**) over 25 year life.
- While the cost would be approximately twice the price of a new PC9m type fleet, the operating capability is immeasurably greater.
- A larger force (~20 units) of light combat aircraft could build to a pre-full air defence capability as required, allowing Ireland to scale capability as appropriate.

Current Capability



Realistic Capability

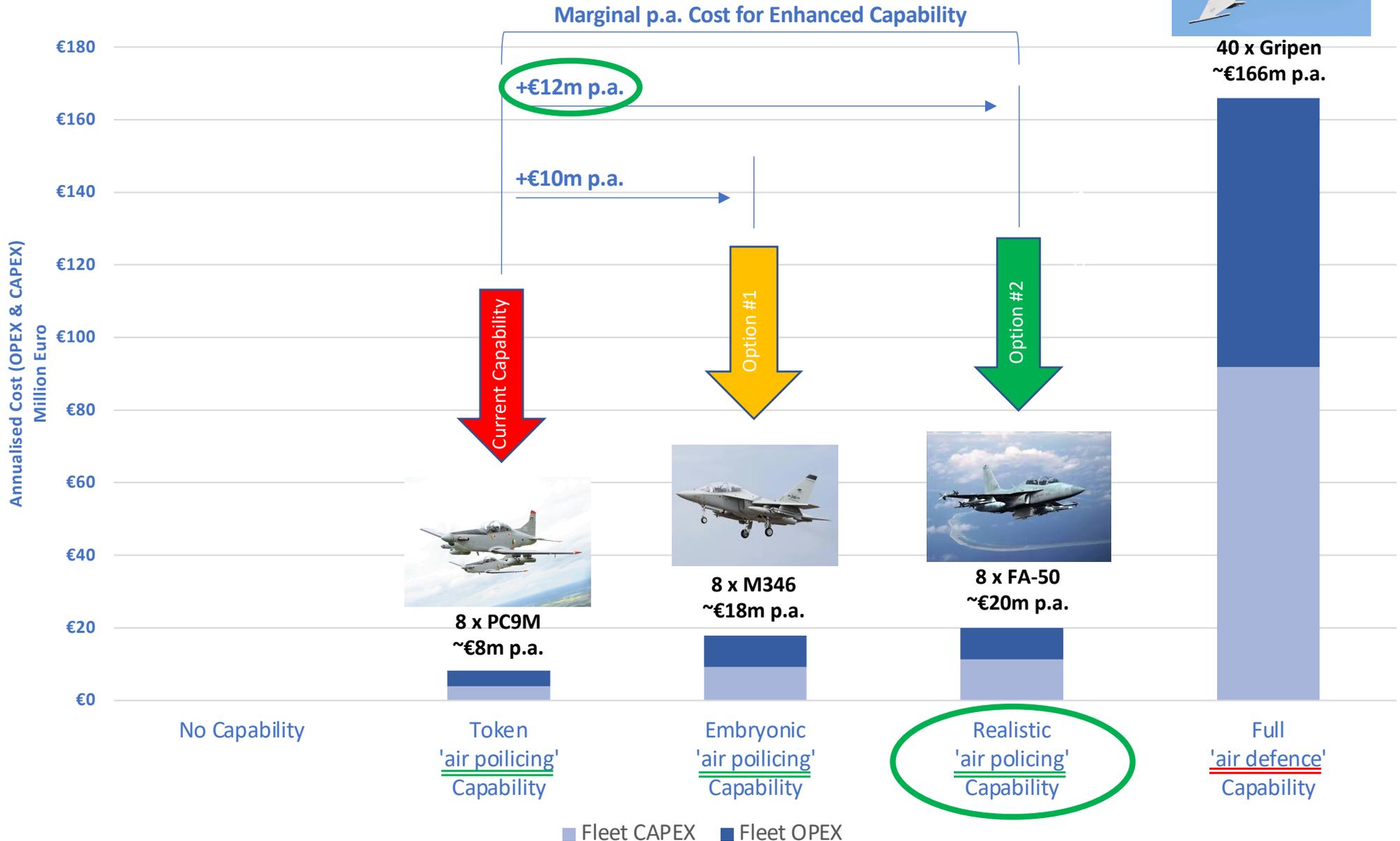


*CAPEX: Capital expenditure, consisting of non-recurring expenditure upon introduction.

**OPEX: Operating expenditure, recurring expenditure required to operate the aircraft through useful life.

Annualised Cost (CAPEX + OPEX)

Air Policing - Ireland



*total cost estimates based on open source, publicly available and published data.

FA-50 Fleet Cost

Air Policing - Ireland

Light Combat Aircraft Cost Estimate

- Light combat aircraft are suitable for Ireland's 'realistic' air policing requirements.
- For the purpose of analysis, the KAI FA-50 has been selected as the market leading light combat aircraft, in order to estimate ownership and operational costs, as illustrated in the adjacent table.
- Capital Expenditure (CAPEX) estimate is based on recently contracted purchase price for FA-50 adjusted for 2021 economic conditions (e.c.).
- In order to estimate the annualised life cycle estimate, a 25 year depreciation profile has been used with a cost of capital based on Ireland's sovereign credit spread in order to simulate leasing costs.
- Operational Expenditure (OPEX) is based on airframe and engine reserves per Flight Hour (FH), direct labour costs, and FA-50 fuel consumption, as illustrated.
- OPEX assumes marginal costs only. All other costs are assumed to be sunk under the Defence Forces' existing Table of Organisation and Equipment.
- The estimated number of flight hours, 150 per annum, is a relatively low level of activity, and reflects a high state of readiness, rather than a high state of activity. By way of comparison, fighter aircraft typically operate ~150 – 200 FH per annum. A higher FH activity level will not significantly increase annual operating costs.

CAPEX		
Aircraft Purchase Price (per a/c) 2021 e.c.	€ 35,283,267	per a/c
Munitions CAPEX (4 x Sidewinder)	€ 1,311,475	per a/c
# aircraft (Air Corps fleet)	8	
Total CAPEX (fleet of 8 aircraft)	€ 292,757,936	
Useful Life (S/L depreciation)	25	years
OPEX		
A. Engine Restoration Reserve	€ 750	per FH
B. Airframe Reserve	€ 1,000	per FH
Pilots/aircraft	2	
Technicians/aircraft	5	
Pilot Salary/Pension (per pilot)	€ 150,000	p.a.
Technician Salary/Pension (per tech)	€ 75,000	p.a.
C. Fuel Burn / FH	€ 1,040	per FH
D. Salary / FH	€ 4,500	per a/c
E. Flight Hours p.a.	150	per a/c
Annual Opex (A+B+C+D)*E	€ 1,093,500	per a/c
Annualised CAPEX (Finance Lease Cost*)	€1,411,331	per a/c
OPEX + CAPEX		
Total Cost of Ownership and Operation		
OPEX+CAPEX (per a/c)	€ 2,504,831	p.a.
OPEX+CAPEX (fleet)	€ 20,038,645	p.a.
MISC. INPUTS		
EUR/USD FOREX	\$1.22	
Weighted Average Cost Capital (WACC)	0%	

*Simulated finance lease assumes straight line depreciation profile over 25 years and Irish Sovereign credit spread as the weighted average cost of capital.

Light Combat Aircraft – KAI FA-50

Air Policing - Ireland

- Avionics**
- Embedded GPS/INS
 - UHF/VHF Radio
 - Integrated IFF
 - Store Management System
 - Radar Altimeter
 - Integrated Mission Computer
 - Data Transfer & Recording System
 - RWR/CMDS
 - Tactical Data-Link System

- Cockpit**
- Wide Field of View HUD
 - Integrated Up-Front Controls
 - Smart Color Multifunction Displays
 - Hands-On Throttle And Stick (HOTAS)
 - Zero-Zero Ejection Seat
 - Night Vision Imaging System (NVIS)
 - Digital Engine Instrument

- Flight control System**
- Fly-by-wire digital flight controls
 - Active stick technology
 - On-board oxygen generation system (OBOGS)
 - Electrical emergency power unit
 - Triple redundant electrical system
 - Digital break-by-wire

- Radar**
- Multimode Radar

- Armament**
- AIM-9 missile
 - MK-82
 - AGM-65
 - Internal 20mm gun
 - SUU-20
 - JDAM/SFW

- Propulsion system**
- High thrust with afterburner F404-GE-102
 - Dual-channel digital electronic control



Funding

Air Policing - Ireland

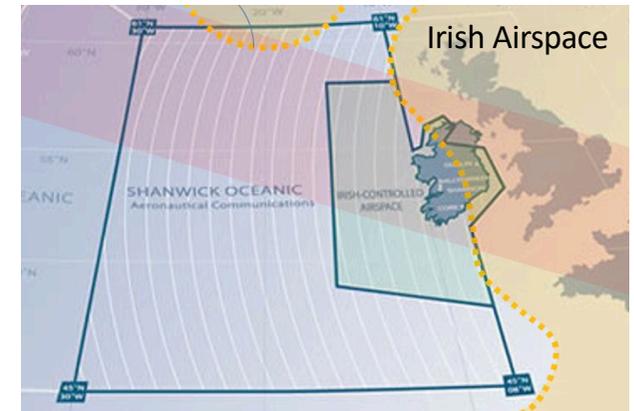
- Defence expenditure has traditionally been expensed exclusively from the Defence Vote.
- While air policing is a capability that would be provided by the Defence Forces, its primary objective is the security of civil airspace in peace-time. In its essence, air policing is a civil function, comparable to Aid to the Civil Power (ATCP).
- As a civil function, consideration might be given to appropriate budgetary allocation and cost recovery.
- Previously, ATCP costs have been recovered from the beneficiaries of services rendered by the Defence Forces. Notably, the cost of cash in transit security provided by the Defence Forces has been charged to the benefiting banks to which the service was provided.
- Primary responsibility for the management of Irish civil airspace is vested in the Department of Transport, Tourism and Sport, and the Irish Aviation Authority (IAA).
- The IAA, a commercial semi-state entity, is responsible for the management of civil air traffic passing through Irish airspace and levies air traffic management charges on transiting air traffic.
- From total annual revenue ~€200m, the IAA generates ~€120m for “en route” navigation services. IAA net income is ~€30m, with a ~€20m annual dividend paid to the exchequer.
- If the IAA levied air traffic for air policing services, it would defray some or all costs and would ensure that the beneficiaries of the service (transatlantic air operators) would bear the cost instead of the exchequer.
- Such a funding model, relying upon commercial revenue, could remove any debt accrued to fund an air policing capability from the State’s balance sheet. A capital structure of this nature would be highly efficient and could set an example for wider exchequer applications.
- In summary, a shared funding model could allow an air policing capability to be developed at little or no direct cost to the exchequer by reallocating a proportion of air navigation charges already generated by the IAA.



Summary & Conclusion

Air Policing - Ireland

- Ireland's directly controlled airspace extends deep into the Atlantic - an area which is approximately six times larger than the Irish sovereign land mass – 80% of transatlantic air traffic passes through Irish airspace.
- Ireland is the only country on Europe's western flank with no primary radar or Quick Reaction Alert air policing capability.
- Ireland's air policing capability is taken consisting of Pilatus PC9M turboprop aircraft only.
- The cost of developing a 'full' air defence capability, comparable to other European countries of Ireland's size (Finland, Norway, Denmark et al) would involve annualised life cycle cost above ~€166m p.a. (estimate for 40 x SAAB Gripen fleet).
- The cost of developing a 'realistic' air policing capability would cost considerable less, ~€20m p.a. (estimate for 8x KAI FA-50 fleet).
- 'Realistic' capabilities would provide credible peace-time control of Irish airspace and a scalable capability which could be expanded, as required, to full air defence.
- Air policing capabilities lever light combat aircraft, which are high performance variants of supersonic jet trainers, rather than being full fighters. Such aircraft offer ~90%+ capabilities of Gen 4 fighters, while operating in an air policing role, at a significantly lower price.
- The most capable high performance light combat aircraft currently available is the KAI FA-50, manufactured by Korea Aerospace Industries (KAI) in collaboration with Lockheed Martin, both leading global aerospace companies.
- The FA-50 is based on the T-50 supersonic training aircraft and the aircraft's dual capability for training and air policing, allows it to cover both roles which would be highly efficient for a small air force like the Air Corps.
- The FA-50 annualised life cycle cost is approximately twice the cost of turboprop aircraft, such as the current Air Corps PC9M, but the cost/benefit from the FA-50's enhance operating capability would provide considerable value for money by enhancing capabilities significantly at a modest marginal cost (+€12m p.a.) above the PC9M.
- In addition to aircraft requirements, an air policing programme would require ~2x military primary radar at a cost of ~€12m p.a. over a three year period.



References

Air Policing - Ireland

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