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Australian Defence Capability Analysis Project LAND 4503 - ARH Replacement Program

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About the Author

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Capability Analysis – LAND 4503 ARH Replacement Program

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Introduction

In July 2019, the Helicopter Systems Division (HSD) of Defence's Capability Acquisition and Sustainment Group (CASG) released a Request for Information[i] in relation to Project LAND4503 Armed Reconnaissance Helicopter (ARH) Replacement. There is already a strong belief within Defence Industry that the findings of the ARH ANAO Performance Audit Report[ii] may have sealed the fate of the Tiger.

The project is currently in the information gathering phase to assess the available ARH replacement options on the market.

The incumbent Airbus Australia Pacific is proposing for Defence to keep and incrementally upgrade the current fleet of ARH Tigers. They are advocating to leverage selected features of the European Tiger Mk.3 upgrade program currently under development by France, Germany and Spain under OCCAR[iii]. So far, two other strong contenders have publicly declared their intention to respond to the RFI.

This paper provides a project and capability analysis of the three known options being presented to Defence for Project LAND4503. Publicly available data is presented against a summary of the requirements stated within the RFI. There is also a discussion on other relevant factors that should be considered for this program before contract award.

Capability Requirements

As per the Statement of Requirement attached to the RFI[iv], the respondents must address how their platform can satisfy the requirements of the three primary missions for LAND4503 (reconnaissance, attack and security operations) with a fleet of up to 29 aircraft, ensuring to address the following capability criteria:

1. General Specifications – details about the platform's make, history, operators and performance data
2. Platform Systems – details of the major systems, subsystems, architecture and specific mission systems capabilities (CNS-ATM, C4ISR, EWSP, etc)
3. Weapon Systems – current and future armament details
4. Survivability – design details about the platform's self-protection against battlefield threats and crash survivability
5. Interoperability – ISR and communications systems interoperability with current and future UAS platforms
6. Transportability – details about the platform's ability and readiness to be transported by air, land and sea
7. Amphibious Operations – history of amphibious operations and specific platform marinized design details

The following factors are also to be addressed in the RFI responses:

1. Production and delivery projections
2. Through Life Support concepts, including maintenance, engineering, logistics, IP provisions, training, facilities requirements, information support systems and Australian Industry involvement
3. In Service Support concepts
4. ROM costings for acquisition, operation and through life support

Options Under Consideration:

For the purposes of this paper, it is assumed that the following platform options shall be considered for LAND4503.

ARH Tiger Upgrade (Incumbent)

Description: The ARH Tiger is a European four-bladed, twin engine, two seater attack helicopter, manufactured by Eurocopter (now Airbus Helicopters) and "Australianised" under the AIR87 program by Australian Aerospace. The Australian Tiger has made one recent, albeit minor LHD deployment outside Australia, but has yet to see combat much less deploy outside Australia for any length of time.

Bell AH-1Z Viper

Description: The AH-1Z Viper is a land and amphibious combat proven American four-bladed, twin engine, two seater attack helicopter. Manufactured by Bell, it is a new design helicopter that is nearing completion of initial production for the US Marine Corps and beginning production for international customers.

Boeing AH-64E Apache Guardian

Description: The AH-64E Apache Guardian is a land combat proven American four-bladed, twin engine, two seater attack helicopter. Manufactured by Boeing it is based on the AH=64A which was initially produced for the US Army beginning in 1983.

Capability Assessment

The following is a direct comparison of the three platforms. Of note, this comparison uses only publicly available data – in some cases, data is incomplete or may be outdated and may not fully represent the capability that shall be presented in response to the RFI. Care has been taken to source the most recent available data, however this comparison is for academic purposes only and in no way is meant to be an official representation of any potential respondent.

General Specifications

Table 1 shows a direct comparison against the General Specifications of the aircraft:

General Specifications	Eurocopter ARH Tiger[v]	Bell AH-1Z Viper[vi]	Boeing AH-64E Apache[vii]
Operators (current and future)	French Army German Army Spanish Army	US Marine Corps Bahrain Air Force Czech Republic Air Force	US Army UK UAE Chinese Army (Taiwan) South Korea Saudi Arabia + 3 other
No. Produced	180[1]	141 (total will exceed 215)	56 (new) + qty upgraded D models
Weights	Empty – 3,060kg Max T/O – 6,000kg	Empty – 5,433kg Max T/O – 8,390kg	Empty – 5,165kg Max T/O – 10,433kg
Speed	Cruise – 146 knots Max – 160 – 170 knots	Cruise – 160 knots Max – 200 knots	Cruise – 143 knots Max – 158 knots
Range	Standard – 430 nmi Ferry – 700 nmi	Standard – 390 nmi Ferry – 780 nmi	Standard – 257 nmi Ferry – 1,024 nmi

Table 1 – General Specification Comparison

[1] This figure refers to a baseline version of the Eurocopter Tiger (EC655) – several specific modifications to the baseline configuration have been made to the ADF fleet of 22 aircraft that has resulted in a divergent "orphaned" configuration.

Table 1 suggests that against the general specifications for history and performance for the three aircraft, there are few discriminating factors between them. Where one aircraft type can carry more, it can't fly as far or as fast. There are significant quantities and respective flight hours of each type and all could be considered in their own right as mature aircraft that have met their FOC (noted that the ARH Tiger had 9 x FOC caveats[viii]). For these general specifications, it will be up to the ADF to determine which performance factors meet the intended ARH replacement CONOPS best and how much weight they give to a platform's fleet size and usage history.

Mission Systems

Table 2 shows the comparison between the aircrafts Mission Systems, including CNS-ATM and EWSP:

Mission Systems	Eurocopter ARH Tiger	Bell AH-1Z Viper	Boeing AH-64E Apache
Comms	Obsolescence issues with radios – new models on order	AN-ARC-210 UHF/VHF COMSEC radio (SATCOM optional)	VHF/UHF SATCOM COMSEC radio
Data link	iTDL	Link 16 (due 2022)	Viasat Link 16 STT
Navigation	Thales Topstar EGI – Obsolescence and integration issues for Mode S and IFF	Integrated nav suite including MSO-145 certified EGI (M-Code GPS upgrade due 2022)	Integrated nav suite including EGI (M-Code Ready)
Sensors / Targeting	Roof/helmet mounted sights Laser/EO guided weapons targeting FLIR	Target Sight System with: • 3rd Gen IR Sensor • Low-light level TV Camera • Laser range-finder / designator Top Owl integrated helmet display sight system	IHADSS MTADS FLIR
ATCRBS	ADS-B Out Mode S (ELS) Mode 5 L1 (TBC) – 2-D GPS	ADS-B Out (due 2022) Mode S (EHS) Mode 5 L2	ADS-B Out Mode S (EHS) Mode 5 L2
EW Suite	RWR UV missile sensors Chaff/flare IR suppression	RWR UV missile sensors Chaff/flare IR Suppression Future DAIRCM	RWR UV missile sensors Chaff/flare IR Suppression

Table 2 – Mission Systems Comparison

Based on the information available, the following comments can be made about the above mission systems comparison:

- Although ARH Tiger has seen difficulties with regards to radio communication system obsolescence, the three contenders are expected to put forward a solution that provides sufficient modern aircraft secure voice and data communications capabilities. Consideration should be made as to which systems offered have sustainable through life support and perhaps commonality throughout the ADF inventory.
- The standard NATO TDL for interoperability is Link 16. The Apache has a proven Link 16 TDL with the Viasat STT. The Viper has a planned Link 16 upgrade due for service release in 2022. ARH Tiger has already had an upgrade to its TDL capability with an Elbit Systems Australia developed "interim TDL". It has been rumoured that the Tiger Mk.3 upgrade may offer a Link 16 option, but it is yet to be confirmed.
- All three aircraft have the minimum navigation suite to achieve an IFR certification and Military Type Certificate. Both US aircraft have fully integrated MSO-c145 compliant M-Code ready EGI's (currently SAASM), which not only gives them a certification advantage with regards to navigation and ATCRBS (Mode S, ADS-B and Mode 5), but it also future proofs their upgrade capability to the next generation protected GPS technology. The ARH's EGI has provided difficulties for the ARH's Mode 5 upgrade program and is planned to be upgraded as part of the Tiger Mk.3 upgrade. The integration of an upgraded EGI for the ARH Tiger should be considered as a significant risk for the following reasons:
    - History of integration issues with the ARH avionics suite
    - Access to US protected (M-Code) technology for integration on European designed aircraft can be difficult (there were major political and logistics issues originally getting SAASM chipsets installed in European EGI's)
- As previously mentioned, the ARH has limitations to its ATCRBS Mark XIIA compliance due to the limitations of its current EGI. The full ATCRBS capability of the Tiger is pending a future EGI upgrade. Both US options have achieved (or are pending) full ATCRBS capability certification.
- All three aircraft have a capable EWSP suite. Consideration should be given to the ADF's ability to support these three suites with their in service electronic warfare support agency (JEWOSU). The ARH Tiger already has a certified RF and IR EW programming capability and has matured the effectiveness of the programs with in-country trials at EX SURFRIDER over the last decade. It is currently unknown as to how the US options EW support shall be undertaken, but the main two options are:
    - In-country design and programming capability at JEWOSU – additional cost and will take several years to develop and mature into combat readiness status. This option does however allow the ADF to optimise their libraries for individual missions and flight profiles and a quick library development turn-around upon request; or
    - Use of standard EW libraries and pre-designed programs to be delivered under an EW support agreement from the US DoD – the ADF may lose ability to optimise operational effectiveness of EW programs (unless the support arrangement allows for user feedback and customisation – e.g. JSF) and have increased turn-around times from request to delivery. This option however, has a significantly lower sustainment and setup cost.

Weapon Systems

Table 3 shows the comparison between the platform's Weapon Systems, Survivability and UAS Interoperability:

	Eurocopter ARH Tiger	Bell AH-1Z Viper	Boeing AH-64E Apache
Weapon Systems	30mm turret canon (450 rounds) 4 x external weapons pylons: 70mm rockets (x52 max) AGM-114 Hellfire (x16 max)	20mm M197 turret canon (650 rounds) 6 x external weapons pylons: 70mm rockets (x76 max) AGM-114 Hellfire (x16 max) AIM-9 Sidewinder A-to-A (x2 max)	30mm M230 (1,200 rounds) 4 x external weapons pylons: 70mm rockets (x76 max) AGM-114 Hellfire (x16 max)
Survivability			
Battle Damage	Ballistic protection optional config	Redundant systems (engines, hydraulics, electrical system, selected avionics), ballistically-hardened/damage-tolerant systems (drive system components, rotor blades & controls, fuel cells) and crew seats with wrap-around ballistic armour.	Multiple ballistics hardening design features (shielding, ballistics protection kit, self-sealing fuel system, etc)
Crash	Crashworthy modular design Self-sealing tanks	Certified to US Navy Crashworthiness Specifications	Certified to MIL-STD-1290
UAS Interoperability	Not with current design	Yes (due 2022)	Yes (RQ-7 Shadow / MQ-1C Grey Eagle)

Table 3 – Weapon Systems, Survivability and UAS Interoperability Comparison

With regards to the aircraft available weapon systems, there is little to no difference in the amount of available firepower to each platform, and would thus have a similar battlefield effect. It should be mentioned though that both US platforms can carry significantly more ordinance in its fully loaded configuration than the ARH. Also, the AH-1Z can carry two AIM-9 air-to-air missiles simultaneously with air-to-ground ordnance thus providing an organic air-defence capability. It will be up to the ADF to weigh this factor with respect to the aircraft's CONOPS.

Some discussion points on the aircrafts design with respect to survivability are:

- All three platforms have taken ballistic and kinetic weapon damage into consideration for their design. The ARH has an optional ballistics protection configuration, which does in fact reduce the effective lift and range capability of the platform. The Viper has taken the design route of system redundancy and ballistically hardening critical flight components of the aircraft, including wrap around armour protection for crew seating. The Apache has significant ballistic protection in its design features, which is a main reason for its high MTOW and the requirement for uprated T700-GE-701C engines, which provide more power and burn more fuel than the standard and more common 401C engines.
- Crashworthiness is a major requirement for modern aircraft and is a DASR Part 21 design requirement for initial airworthiness certification. The ARH Tiger has a crashworthy modular design, self-sealing tanks, stroking seats, etc and famously had a controlled flight into terrain incident at night in 1998 in Townsville, where both pilots walked away unharmed while the platform burned to the ground (definition of crashworthy!). The Apache has been certified to MIL-STD-1290 for crashworthiness, which meets the requirements of DASR. The Viper was designed and tested to meet the US Navy's specifications for crashworthiness and includes impact absorbing landing gear, crashworthy fuel-cells and stroking crew seats.

The requirement for UAS interoperability and control is a relatively new concept. Very little is publicly known about the possible CONOPS the ADF will employ with this capability, however it has been issued as a requirement of LAND4503 and the respondents must answer.

The Apache has a known UAS interoperability capability with the RQ-7 Shadow and the MQ-1C Grey Eagle. Neither of which were mentioned by the RFI as possible UAV options, however it is expected that it would be a similar (if not identical) data link interface for the options under consideration for the ADF, which gives it a clear advantage in this RFI.

The Viper currently has UAS interoperability as a planned upgrade due in 2022, which is in line with the delivery timeframe of the project and also allows for ADF design specific requirements to be incorporated prior to service release (low risk of fleet integration, lower design change cost if taken up early in the design phase).

There has been no public mention of the ARH Tiger planning this upgrade. It is assumed it will be addressed in the RFI response, however the issue should be considered to be in a similar risk category as other yet to be confirmed integration and upgrade options.

Transport and Amphibious Operations

Table 4 shows the comparison between the three platform's transportability and amphibious operations capability:

	Eurocopter ARH Tiger	Bell AH-1Z Viper	Boeing AH-64E Apache
Transportability			
Air	C-17 certified (x2)	C-17 certified (x2)	C-17 certified (x2)
Land	No rotor brake Manual blade fold only Tie down points	Rotor brake Semi-auto blade fold (included in basic config) Tie down points	Rotor brake Blade fold kit optional Tie down points
Sea	Not fully marinized for transport or operations Additional maintenance actions required for corrosion prevention	Fully marinized for transport and operations, includes EMC with naval ship systems (e.g. radars, comms arrays, etc)	Not fully marinized for transport or operations Additional maintenance actions required for corrosion prevention
Amphibious Operations			
History	Conducted FOCFT on HMAS Canberra (sea state 5)	First fully marinized attack helicopter Regular conduct of amphibious ops with US Marines	No public information found
Design	Composite fuselage No specific amphibious design considerations	Corrosion resistant Semi-auto blade fold Small compacted footprint Maintenance conducted in aircraft shadow Over water operation specific design features (e.g. quick release canopy, explosively detonated windscreen)	No specific amphibious design considerations Significant post amphibious mission maintenance overhead

Table 4 – Transportability and Amphibious Capability Comparison

Based on the information available, the following comments can be made about the transportability comparison:

- All three aircraft types are rated for C-17 airlift and can be configured to allow two aircraft to fit the C-17 cargo hold. Consideration should be taken as to the airlift preparation requirements of the three aircraft. Features like blade fold procedure, additional ramp requirements, parts removal requirements, specialised lift and tow vehicle requirements, etc are a significant factor for operational effectiveness. As deployment support becomes more complex, aircraft flight and cargo prep times can effect operational availability and readiness. Transport preparation and post transport maintenance times can vary from less than an hour to a full day or more, which can be the difference between a rapid deployment capability and a cumbersome logistics burden.
- All three aircraft are certified for surface transport. The only discriminating factor, again would be the transport preparation requirements. If the recovery of an unserviceable aircraft is taking place in a forward operational environment, quick preparation with a minimum of maintenance procedures can be critical to minimize exposure to danger.
- For sea transport, there is a clear standout in the Viper. Although the ARH and Apache can be transported by sea, there are no specific marinisation design features that protect the airframes from extended exposure to corrosive environments like sea transport. The Viper was specifically designed to be the first fully marinized attack helicopter for the US Marine Corps and has various features that lend it to be suitable for sea transport (and extended maritime use)[ix]. Both the ARH and Apache have extensive post-sea transport preventative maintenance procedures that must be conducted ASAP following exposure to a seagoing conditions.

Following on from the last point on sea transportability, it is clear from the RFI “Amphibious Operations” requirement that the ADF intends to include operating from naval platforms to the ARH replacement CONOPS. This was to be expected with the introduction of the Canberra Class LHD’s entering service recently for the RAN.

There are many factors of an aircraft that lend itself to amphibious operations, such as would be conducted from an LHD. The following points should be considered:

- Corrosion protection – is the aircraft susceptible to corrosion at sea? How does that effect the aircraft life of type? What penalty maintenance is required for continued operations (compressor washes, sacrificial anode installations, additional lubrication schedule, etc)?
- Maintenance operations – How easy / difficult is it to maintain the aircraft in a limited space environment? Does the aircraft require any bulky tooling that would take up valuable deck and storage space on the ship? What are the intervals between deep level services and can they be conducted at sea?
- Stowage and Launch – How long does it take to prepare the aircraft for below deck stowage from landing (factors mainly include rotor braking and blade fold)? Vice-versa, how long does it take for the aircraft to be ready for launch once retrieved from stowage?
- Flight over water – Is the aircraft rated for flight and navigation over open water? What safety design features are included for over water operations (floatation, canopy release, underwater escape rating, etc)

- Electromagnetic compatibility – Ship-borne operations expose aircraft to high levels of electromagnetic energy (Naval platform radars, communications, etc) and ship systems can also be susceptible to aircraft EM energy emissions (weather radar, weapons radar, etc). What design features of the aircraft take these EMC factors into account? Are the aircraft rated for HIRF / HERO?

Again, based on the information available, for this requirement the Viper is the standout aircraft. It will be up to the ADF to determine the weight they give to this requirement, most likely to be based on an estimated percentage of intended amphibious operations.

Interoperability

Interoperability is a critical enabler for Defence. It defines the extent of force integration and cooperation within the ADF and with non ADF forces. Australia participates in, and even leads, multinational operations in support of national security objectives.

The ability of the ADF to operate alongside other defence forces is an important political consideration and, therefore, an increasingly important factor in major acquisition programs, as reflected in the different ways it is referred to in this paper.

In addition to the operational benefits, from a logistics perspective, common systems across platforms also provides sustainment efficiencies.

While the RFI requirements includes a specific mention on UAS interoperability, a broader view of each platform's interoperability is worth examination. For example, consideration should be given to the operators list and interoperability with coalition partner nations.

For deployed support purposes and logistics supply chain leverage, historically our US DoD counterparts have provided invaluable deployed support for ADF operated versions of their aircraft types (e.g. Afghanistan – CH-47D). If history is any indication, the likelihood of deploying within the vicinity of US coalition forces afloat or ashore in current and future conflicts is far higher than that of German, Spanish or French forces, and their good will is yet to be tested in regards to aviation deployed support assistance.

ROM Cost Assessment

	Eurocopter ARH Tiger	Bell AH-1Z Viper	Boeing AH-64E Apache
ROM Costings			
Per platform	$58.57M AUD[x]	$45.26M AUD[xi]	$51.83M AUD[xii]
Per flight hour	$34,482 AUD (FY 18/19)[xiii] $20,000 AUD (Govt target)[xiv]	$7,208 AUD (2018 FMS User Rate)[xv]	$10,567 AUD (2018 FMS User Rate) [xvi]
Life Cycle (assuming 29 a/c @ 250 hours per year each)	$145M AUD/year	$52.26M AUD/year	$76.61M AUD/year
Life of Type Cost (Total Procurement + Usage) – Assumes 20 year program (does not include through life upgrades)	$3.31B AUD	$2.36B AUD	$3.035B AUD

Table 5 – ROM Program Costing Comparison

Based on the most current available platform costing information, let's crunch the numbers for each potential program solution (Note: AUD figures are based on exchange rates current at time of authoring):

ARH Tiger:

Current costing per platform - €36.1M = $58.57M AUD

Assumption that another 7 aircraft will be required to meet the stated 29 in the RFI

Total additional platform procurement cost = $410M AUD

Cost per flying hour – historically improving from $40k AUD/hour to $27k AUD/hour. Government target is $20k AUD/hour (assume best case scenario of $20k for life of type) (calculated for ashore operations only)

Cost per year of fleet at 250 hours per aircraft = $145M AUD

Assuming a 20 year life of type; **Program total cost = $3.31B AUD**

Note: This ROM costing model does not take into consideration the additional cost of platform modifications to the ARH Tiger required to meet the requirements of the RFI (e.g. EGI, Comms, Link 16, UAS control, etc), their associated in-service costs, nor any through life upgrades that may be required.

Bell AH-1Z Viper:

Current costing per platform - $31M USD = $45.26M AUD

Total platform procurement cost = $1.312B AUD

Cost per flying hour = $4,896 USD = $7,208 AUD (calculated from combined afloat and ashore operations)

Cost per year of fleet at 250 hours per aircraft = $52.26M AUD

Assuming a 20 year life of type; **Program total cost** = **$2.36B AUD**

Note: This ROM costing model does not take into consideration the additional cost of support equipment, training or facilities required to achieve FOC (e.g. Mission planning system architecture, EWSP programming capability, hangars, fly-away kits, etc), nor any through life upgrades that may be required

Apache AH-64E Guardian:

Current costing per platform - $35.5M USD = $51.83M AUD

Total platform procurement cost = $1.503B AUD

Cost per flying hour = $7,177 USD = $10,567 AUD (calculated for ashore operations only)

Cost per year of fleet at 250 hours per aircraft = $76.61M AUD

Assuming a 20 year life of type; **Program total cost** = **$3.035B AUD**

Note: This ROM costing model does not take into consideration the additional cost of support equipment, training or facilities required to achieve FOC (e.g. Mission planning system architecture, EWSP programming capability, hangars, fly-away kits, etc), nor any through life upgrades that may be required

Although there are multiple unknowns at this stage on the final costing considerations for each platform, based on the most current available pricing data, again, there appears to be a clear standout for the Viper with respect to value for money.

Other Considerations

Without knowing the specifics of each contending platform's response to the RFI, the above comparisons were compiled to best address as many of the released requirements as possible using available public data. The finer details describing the individual respondent's ability to meet the stated system requirements, delivery projections and concepts of through life support will only be known once the responses are received by the ADF.

Aside from the information directly requested by the RFI, there are several other factors and considerations that the ADF may take into account when it comes to selecting a preferred respondent for LAND4503. The following discussion points describe just some additional factors that could be considered in the ADF's deliberations.

History

What are the known factual and relevant histories of all three platforms and their suppliers? What can be said about these entities that may have bearing on their future performances? Many promises can be made on how a program will unfold and how capability and performance targets shall be met, but what has history said about the validity of these claims? Some notable examples are:

ARH Tiger:

- FOC delivered 20 months behind schedule with nine attached caveats
- A long list of issues with serviceability and logistics supportability
- Successful local weapons integration and EW support capability development projects
- Significant local Industry involvement and investment
- Development and commissioning of local aircraft software support capability
- Issues with a locally developed and orphaned mission planning system (GMMS)
- Limited but positive crash survival history

Bell AH-1Z Viper:

- Relatively new airframe with minimal proven combat record
- Based on the very successful AH-1W Super Cobra
- US Marine Corps increased order numbers due to successful testing and delivery
- Some modernised avionics systems yet to be integrated
- A mixed history of accidents, shoot-downs and crew losses/survivals

AH-64E Apache:

- Most successful and proven make of any attack helicopter in history
- Currently most advanced avionics suite certified
- History of delivery on or ahead of schedule to FMS customers
- A mixed history of accidents, shoot-downs and crew losses/survivals

All three aircraft have positive and negative points to their histories, and the future is no guarantee of like performance, however history is the best teacher and should be considered relevant to this decision, as long as the following assessment methodology is adhered to:

- Is the historically relevant point positive or negative?
  - If positive: Is there any reason as to why this would no longer be valid in this case?
  - If negative: What has been / is being done to address this issue? Are the rectification actions sufficient / successful?

Commonality

It is always advantageous to consider a procured system's commonality with other systems within the ADF inventory. These advantages include, but are not limited to:

- Pre-accepted materiel advantages (pre-loaded part numbers, NSN's, and usage certification within MILIS, etc)
- Established and proven logistics support networks
- Reduced item management overhead through pooled resourcing
- Accepted training, usage and maintenance systems in place

The following describes a limited view of common sub-system items for each platform under consideration:

ARH Tiger:

- Armaments: 70mm rockets, AGM-114 Hellfire
- System Support: ASSC/MSSC software support centre
- Maintenance: Airbus DLM facility (Brisbane)

AH-1Z Viper:

- Armaments: 70mm rockets, AGM-114 Hellfire, AIM-9 Sidewinder
- Airframe Systems: Engine (T700-GE-401C – same variant as MH-60R)
- Avionics: Top Owl helmets, AN/ARC-210 radios
- Mission Planning System: JMPS

AH-64E Apache:

- Armaments: 70mm rockets, AGM-114 Hellfire

The ADF should do a full systems review of each aircraft and identify all common items and sub-systems that are already supported within the ADF inventory to gauge any significant advantages or savings that can be exploited.

Program Complexities

Anyone with military weapon system acquisition experience can tell you that there are many factors that contribute to the success and/or failure of these projects. The project type and the associated complexities is right at the top of the list.

Let's have a look at the two main types of acquisition under consideration here:

ARH Tiger – Direct procurement from OEM + Complex upgrade program:

- Two separate projects – Buying additional platforms to reach the 29 required PLUS agreed, multifaceted systems upgrade project to meet capability requirements.
- Original AIR87 procurement contract was extremely complex (>1000 pages), with many detailed and caveated DID's and CDRL's that required legal interpretation and constant negotiation to determine an agreed performance and capability baseline.
- Had a very large "Acceptance" overhead, where Commonwealth representatives were required to do multiple levels of acceptance activities throughout the project lifecycle (accepting requirements, accepting test procedures, witnessing test activities, accepting test reports – plus additional workload for any failed steps along this process).
- Included a high Airworthiness Certification overhead as well. Although recognition of prior acceptance (RPA) was heavily leveraged, many systems did not meet the required DGTA standards for a local Military Type Certificate – significant instrumentation and flight testing was required.
- The upgrade program would most likely follow this complex performance and delivery pattern, requiring significant effort on behalf of Defence.
- All this aside, the ARH Tiger currently has a significant in-country support capability, including DLM facilities in Brisbane, type training capability in Oakey and a fully manned operational

unit in Darwin, which represents significant investment on Defence's behalf and is quite a head start to consider abandoning.

AH-1Z Viper and AH-64E Apache – FMS Procurement:

- Low complexity contract – basic FMS terms and conditions with a line-item delivery annex.
- Tried and proven procurement method (CH-47F, MH-60R, etc).
- Low risk of airworthiness issues – US Military Airworthiness Authorities are recognised under DASR (Type Certificates: Apache – US Army MAA; Viper – US Navy MAA).

The main complexity faced by adopting a new airframe type whilst transitioning from an in-service platform comes from the requirements associated with the stand-up of an all new through life support capability, including:

- All new support systems (e.g. AMO, AEO, facilities, tooling, training, etc).
- A new NPOC with many positions to fill (project office, operational units, headquarters, etc – difficult to find qualified staff).
- Operational units having significant operational preparation overhead (training both maintainers and operators, establishing new maintenance and logistics support procedures, achieving and sustaining required ROE, etc).

The ADF must weigh their options in this case. Are we prepared to undergo the growing pains of establishing yet another weapon system into the ADF inventory, or is it "better the devil we know"?

Life-Cycle Upgrades

All modern platforms will be required to undergo upgrades throughout their operational lifespan. As new threats emerge, technologies mature and obsolescence sets in, military platforms need to modify, replace or add additional capabilities to maintain combat superiority on the battlefield.

Some questions that should be considered in regards to these technology advances are as follows:

- Who develops the majority of these military technology advancements?
- Who controls the release of these technologies to allied partner nations?
- Who sets the standards for implementation and interoperability of these technologies?
- How will my platform integrate these new technologies?

For the majority of all military platform advancements in communications, navigation, surveillance, weapon systems and electronic warfare, the US DoD has been the source (most likely due to their Defense budget being higher than all other allied nations combined).

The US Defense Advanced Research Projects Agency (DARPA) has been responsible for developing a significant percentage of all common allied nations military technology advancements since 1958 (including GPS, computer science technologies, telecommunications standards, material advancements, precision munitions, stealth technology, unmanned vehicles and advanced sensor and targeting[xvii]). At any one time, DARPA has over 50 active and publicly acknowledged projects developing new technologies for military application. Outside of DARPA, there are several other US DoD agencies that are developing and trialling advanced military technologies.

Some examples of future technologies that will be in consideration for the platform selected under LAND4503 are:

- ATIRCM / DAIRCM
- Assured PNT – Augmented navigation systems
- M-Code GPS
- IFF Mode 5 L2B and beyond
- ADS-B (In) / ADS-C
- Advanced target recognition optics
- TDL network upgrades
- Modular weapon system advances

The US supplied platform sponsors work directly with DARPA and US DoD projects to ensure that they know what technology shall be available within the platforms active lifespan. They also select specific technologies that meet the platform's capability requirements and schedule in their upgrade programs up to 10 years in advance. Leading up to the release of the capability to customer nations, the platform sponsor tends to cover all developmental, certification and testing costs and simply releases the upgrade as an optional Service Bulletin or Modification Order once accepted into service.

Historically, designs that originated elsewhere in the world have had to firstly wait until the technology has become releasable to allied nations, be assessed by the OEM for integration compatibility and then optioned to customer nations as a developmental project that must be funded by the customer in order to make it available for their platforms. Then follows the requirements for design, testing, certification and design acceptance prior to releasability to the customer.

In this case, it can be assumed that for the majority of Life Cycle Upgrades that the LAND4503 platform shall be facing, a US FMS supplied option will deliver these upgrades far sooner and at a significantly lower price than the European option.

Leverages

It is always a consideration as to how to leverage current in-place systems to your advantage when it comes to selection of any procurement option.

Existing agreements, relationships, support networks, facilities, infrastructure, etc should be considered in this case as well. The following points may provide attractive leverage for the LAND4503 project:

ARH Tiger:

As discussed previously, it cannot be overlooked that the ARH Tiger currently has an entire in-country support and operational capability, with established facilities, training and manning. No other option can offer this kind of pre-existing capability as leverage for this project

AH-1Z Viper:

The Australian Army has a continuous exchange pilot program with MAG-39 in Camp Pendleton, CA and has numerous AH-1W Cobra and AH-1Z Viper trained pilots. Additionally, the USMC sends an exchange pilot to the 1st Aviation Regiment in Robertson Barracks.

As a US Marine Corps platform, the Viper has already been operated out of Darwin by the US Marine Rotational Force. Leverage could be gained utilising the US Marines rotational presence in Darwin for:

- Training
- Logistics
- Interoperability
- Operations and tactics development

AH-64E Apache:

Previously, there was a continuous pilot and engineer rotation with the US Army 101st Airborne which operated various models of Apache. Five or so years ago, the AUS Army – US Army exchange was cancelled. The AUS Army now sends its pilots on exchange with the USMC at MAG-39 in Camp Pendleton, CA for training in the AH-1Z Viper.

Sponsorship and Configuration Management

Platform sponsorship was touched on briefly within the Life-Cycle Upgrade section above, but is worthy to be its own discussion point.

There is a significant increase in cost, risk and management overhead throughout the life of a platform if your nation is the single or joint Lead/Sponsor of that platform or a divergent configuration thereof.

A lead or sponsor nation not only bare significantly more costs in the support, management and upgrade of a platform's configuration (typically including developmental costs), but there is also a significantly increased capability risk. Firstly, the risk of sponsoring a new technology project that may or may not succeed (there are several historical examples where integration projects have failed). Furthermore, you will generally have to sacrifice one or two operational platforms for several months due to instrumentation, testing and certification activities. With a small fleet of 29 helicopters, it is rare that an operational authority will have aircraft to spare.

Additionally, what effect does a platform having multiple sponsors have on the way the ADF would manage its configuration? Should the ADF just choose one main sponsor and lock their configuration to theirs? Take for example the AH-64E Apache – if it is selected for LAND4503, it may initially appear to be sensible to configuration lock it to the main sponsor version utilised by the US Army. But, what if the ADF's Apache's start spending a lot of time on-board LHD's and there is a marinisation modification option that the Augusta-Westland versions operated by the UK have ready for integration? Do we continue to suffer from corrosion issues that will drastically reduce the life of the platforms, or do we diverge from the US Army configuration and risk future interoperability and upgrade integration issues?

Conclusion

The RFI released to Industry has shown the intent of the ADF to seriously consider replacing the entire ARH Tiger fleet with a proven, in-service attack helicopter that is capable of providing reconnaissance, security operations and air-attack on the modern battlefield. Whilst two very capable and proven contenders have declared their intent to respond to the RFI, the incumbent Tiger shall be fighting hard to retain its place in the ADF inventory.

There are multiple defendable and justifiable reasons to select any one of the three aircraft under consideration for LAND4503. Each option presents its own unique advantages over the others, be its general characteristics, advanced avionics suite, sustainability, operational agility, suitability for specific roles or even operational costs and value for money.

This paper outlines just some of the factors that may be taken into consideration during the Defence evaluation and selection process. In the end, the final selection decision that the Government makes will depend firstly on how well each contender presents their solution against the various declared and undeclared requirements and secondly on how each requirement is weighted by Defence.

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