

## What goes around—choosing the RAN's future combat helicopter

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### I. The choice

This is the third (and final for the foreseeable future) ASPI paper on the future of the Royal Australian Navy's combat helicopter capability. The previous two papers reviewed the capability<sup>1</sup> and the policy issues<sup>2</sup> relevant to the government decision expected in the first quarter next year.

Both of those papers concluded that the optimum strategy at the time was to wait until both of the contenders—the Sikorsky/Lockheed Martin MH-60R (*Romeo*) version of the *Seahawk* and the NATO Helicopter Industries NH-90 *NFH*—were in at least limited service and 'at such time as operator experience with both types, operating in their full range of tasks, is available.' Consistent with that advice, the government announced in February this year that it would run a competition between the two types, and decide between them in 2011.<sup>3</sup>

In the intervening time, it is fair to say that events have tended to favour one of the contenders ahead of the other. The *Romeo* has gone from strength to strength in its role with the US Navy (USN) and has proven to be remarkably reliable and capable after a smooth service introduction. The fleet has amassed more than 50,000 flying hours and most of the reliability indicators for the type's mission systems are higher than the specified values. Seventy-six aircraft have been delivered to date, and the eventual number is likely to be 250–300 for the USN, plus exports.

The *NFH* has also made progress. The first aircraft were delivered to the Dutch and French navies for operational trials and evaluation in April 2010. The French aircraft will transition to service in late 2011. Norwegian and Italian aircraft are also due for delivery soon. The total order book for the *NFH* is now over 100. By the time Australian aircraft are delivered (if Australia goes with the *NFH*), they will join forty other *NFHs* which will have achieved over 13,500 flying hours (the overall fleet of more than 200 NH90s will have 80,000 hours up.)

The *NFHs* delivered early are qualified only for the maritime support role, including boarding operations, medical evacuation (medivac) and the movement of personnel and supplies between ships and from ship to shore. These aircraft are fitted with sensors, hardware and software required for combat roles, including dipping sonar, forward-looking infrared and sonobuoy

capability. They have not yet undergone the qualification process for these systems, but presumably some test and evaluation data is available to the ADF and DMO for evaluation purposes.

The timetable for *NFH* delivery and qualification appears to have slipped since the previous ASPI reports. And the perception of maturity of the *NFH* has not been helped by a number of operational problems with the related MRH-90 utility helicopter during 2010, including engine problems that grounded Australia's nascent fleet for a period of about ten weeks from April to July.

### **Risk**

As explained in the preceding two papers, the government's decision will be based on balancing through-life cost, risk and capability. The *Romeo* currently has a clear lead in the risk category. The USN's *Romeo* fleet may have surpassed the entire flying time of the RAN's ageing S-70B-2 *Seahawks* by the time a decision is made in 2011. (The second section of this paper examines the significance of this observation.) The *NFH* is less mature overall and operational aircraft are still under evaluation.

While the ideal situation would be a purchase of 'off-the-shelf' aircraft without modification, that won't be the case. Either aircraft would require modification of its deck handling equipment for Australian service. The *Hobart* class DDGs ('air warfare destroyers') currently under construction are designed with the ASIST deck-handling system which is compatible with the *Romeo* only in manual mode, and not with the *NFH*. There should always be a degree of scepticism when it is claimed that modifying a military platform will be straightforward, but earlier S-70B export model *Seahawks* have been successfully adapted to use the ASIST system. The *NFH* would require modification to operate from either the DDGs or the *Anzac* frigates.

### **Cost**

As per the previous reports, the acquisition cost of the *Romeo* is substantially less than that of the *NFH*. USN budget figures show a weapon systems cost for the *Romeo* of US\$30–35 million per aircraft.<sup>4</sup> This figure has been stable for the last couple of years, reflecting a mature production line. However, the USN is an established operator of the helicopter and already has many of the associated support systems in place. As a new user, Australia would have to acquire systems and facilities well beyond the airframes themselves.

In fact, the cost to Australia through a Foreign Military Sales (FMS) deal, approval for which was sought in July, is estimated to be US\$2.1 billion. The total package requested includes twenty-four aircraft, sixty engines (forty-eight installed and twelve spares), communication equipment, support equipment, spare and repair parts, tools and test equipment, technical data and publications, personnel training and training equipment, and US Government and contractor engineering, technical, and logistics support services.<sup>5</sup> (Curiously, a November 30 FMS request from Denmark for twelve *Romeos* is costed at US\$2 billion—essentially double the Australian price.<sup>6</sup> It is not clear why the prices differ.)

The acquisition cost of the *NFH* is expected to be higher—perhaps US\$45–50 million for each aircraft, or about 50% higher than for the *Romeo*. And, as with the American aircraft, additional costs would be expected to add substantially to the total project cost. But in the case of the *NFH*, there should be through-life support cost savings due to commonality of substantial elements of the airframe, engines and avionics between the *NFH* and the related MRH-90 in service with both Army and Navy. However, there is only sparse data available

for the *NFH* and that is based on evaluation aircraft, rather than squadron-level operations. No doubt projections are available, but they would need to be treated with some caution.

### **Capability**

In secondary naval combat support roles, the *NFH* has its nose in front due to its more capacious cabin, which provides more space for medivac, personnel transport or internal cargo. However, the *Romeo* has performed medivac missions in USN service and, according to the manufacturer, can sling a load of over 2,000 kg underneath while still configured for the anti-submarine warfare (ASW) role. In a previous paper, ASPI observed that the USN's concept of operations is different from the RAN's, and that the big decks of aircraft carriers and amphibious ships allowed a mix of utility and combat helicopters to be embarked. Since the publication of the earlier paper, the USN has deployed *Romeos* on individual frigates without apparent inconvenience. The 'sister' *Sierra* model *Seahawks* operate only from the decks of aircraft carriers.

As for weapons, the observations from the previous papers in this series still stand. The main points are:

- The *NFH* will have a dedicated anti-shipping missile. The *Romeo* can carry much smaller *Hellfire* missiles—capable of disabling or sinking smaller craft but less effective against major combatants. Both aircraft will have the sensors and data links to provide third-party targeting data for missiles fired from other platforms (such as surface vessels or maritime patrol aircraft).
- The *Romeo* carries the Mk 54 ASW torpedo and Australia has made an FMS request to the US Government for the weapon for use on the *Romeo* should the aircraft be selected.<sup>7</sup> The same weapon will be a standard fit on the P-8 *Poseidon* maritime patrol aircraft to be acquired by the RAAF. The *NFH* has the MU-90 torpedo, which is the ASW weapon carried by Australian frigates. Both weapons will therefore be common to others in the ADF inventory, but for onboard stores the MU-90 probably offers a smaller logistics footprint. And, since the MU-90 was selected ahead of the Mk 54 when the ADF was in search of a new ASW torpedo, it is likely that there is a capability edge to the European torpedo as well.

### **Other factors**

The government appears set to make a decision in the near future, from the data and facts publicly available at present, the *Romeo* is the lower risk selection. As matters currently stand, it offers a proven performance—and thus lower project risk—and a lower acquisition cost. It also comes with built-in commonality and interoperability with the USN—the navy of a major ally that shares the ADF's Pacific Ocean and Indian Ocean operating areas. As a NATO helicopter, the *NFH* will also be highly interoperable with American platforms (it will have the Link 16 datalink, for example) but will not have common parts.

With the US set to acquire up to 300 *Romeos* and a similar number of the 'sister' platform, the MH-60S (*Sierra*), the economies of scale are likely to provide a robust and effective maintenance supply chain and upgrade path. European navies operating the *NFH* will have different configurations in terms of systems, weapons and deck handling systems. While the differences would not be huge, the configuration of RAN machines would probably not be identical to any of them. (The subject of configuration management is discussed in Part II of this paper.)

However, some factors could tip the decision the other way:

- Australian industry factors
- a compelling business case based on through-life costs of a partly common MRH-90/NFH fleet
- the growth potential of the NFH (It is commonplace for aircraft to have additional systems (and weight) added over their lifetimes. The NFH has a greater volume and performance margin than the *Romeo*).

The NFH would be assembled at the Australian Aerospace facility in Brisbane. It's believed that Sikorsky/Lockheed Martin have developed a proposal for a local *Seahawk* and *Black Hawk* refurbishment facility that would offer refurbished surplus helicopters from the ADF and other regional fleets for sale to third parties elsewhere. (Of course, if it is cost-effective to do so, that facility could be established regardless of which helicopter is selected.)

So, in many ways, the Australian industry factor consideration will come down to an evaluation of the relative merits of an in-country industry capability to support the extended MRH-90/NFH fleet versus a contracted *Romeo* support capability that takes advantage of the existing overseas support chain, which will necessarily have a local footprint if the helicopters are operating here. It's hard to tell how important this factor will be. But, as ASPI found last year, the trend in Australian defence procurement has been very much towards the global supply model and away from the 'do it yourself' approach.<sup>8</sup>

### ***The business case?***

If the decision is made to go with the *Romeo*, that will be at odds with the business case that saw both the Army's *Black Hawk* fleet (retired before it reached life-of-type) and the RAN's *Sea King* fleet replaced with the MRH-90 in anticipation of further ADF fleet rationalisation when it came time to replace the S-70B-2 *Seahawks*. For reasons outlined earlier, the *Romeo* appears to be the obvious choice in terms of risk management and immediate capability outcomes. But if it also turns out to be the best choice in terms of through-life costs, some searching questions should be asked about the pre-2006 work that led to the previous ADF helicopter fleet decisions.

As described in the 2006 Defence Capability Plan (DCP), AIR 9000 (the project under which the naval helicopters are being procured) was intended to rationalise the ADF helicopter fleet to 'as few as four types'. To achieve the four-type fleet, all of the naval helicopters would need to be the same basic type. And that would make sense—if commonality was to provide a big pay-off, it would seem to be obvious that thirty naval helicopters (six utility MRH-90s and twenty-four combat NFHs) would provide more economy of scale with forty Army MRH-90s than just the six utility aircraft. Either that remains the case, or earlier estimates on which decisions were made were wide of the mark.

## **II. Lessons learned and questions to ask**

Deciding which naval helicopter to buy next is only part of the story. It's also worth asking how the ADF can get to a situation where any major ADF force element that needs replacement needs it 'as a matter of urgency'. This section will show that the situation is largely due to choices made in the acquisition of the current *Seahawk* fleet.

The RAN has described its fleet of sixteen S-70B-2 *Seahawk* aircraft as being at the heart of its current helicopter force. But it has also conceded that the aircraft 'are now 20 years old and specialist replacement parts are becoming increasingly difficult to find to keep them flying.'<sup>9</sup>

This raises two questions:

- (1) Why are parts hard to find for a helicopter (apparently) still flying with the US Navy?
- (2) Have the aircraft reached the end of their useful lives from a platform point of view?

The answer to the first question appears to lie in the fact that the RAN's *Seahawk* fleet is an orphan. They are built on the SH-60F *Foxtrot* airframe (an aircraft that has been in service with the USN) but have a totally bespoke mission system designed and integrated by Rockwell Collins, making the RAN's aircraft unique in their configuration of radar, datalink, mission computer and much of their avionics. Subsequent modification programs have exacerbated this situation.

Earlier plans to upgrade the *Seahawks*, as reflected in successive DCPs, have revealed a downscaling of ambition over the years. Initially, a major midlife upgrade (MLU), which would have replaced the onboard processing capability to enable it to handle the data rates required for modern weapons and sensors, was planned. That was scaled back to a more modest *Seahawk* Capability Assurance Program (SCAP), which was in turn split into two components, with only the most urgent work to address immediate obsolescence issues in mission systems, and referred to as SCAP1, to go ahead.<sup>10</sup>

It's probably fortunate that the MLU did not go ahead. In many ways it was similar to the ill-fated *Super Seasprite* project, which was intended to replace the avionics and mission systems in an existing airframe. Similarly, the USN abandoned plans to refurbish existing *Bravo* and *Foxtrot* aircraft to produce the *Romeo* version (then given the catchy title 'LAMPS MK III Block II Upgrade'), deciding that it was cheaper and less risky to acquire new-build aircraft.

The systems issues are the clear culprit. In terms of the airframe useful life remaining, it's worth looking at some numbers. Table 1 shows Defence annual reporting data for the S-70B-2 fleet. Since 1990, the sixteen aircraft have flown a total of 63,785 hours, averaging just under 4,000 hours each. Given that the aircraft were delivered in 1988–89, it's safe to assume that the total average hours per airframe is not much more than that. Some of the USN's *Seahawks* have flown well over 10,000 flying hours, accrued from 1979 onwards. In 2003 the USN *Seahawk* fleet was cleared to fly to 12,000 hours per aircraft.<sup>11</sup> And the original *Romeo* program envisaged rebuilt *Bravo* airframes being life-extended to 20,000 hours.<sup>12</sup> So the RAN's airframes should have quite a bit of life left in them—which is presumably why there are plans to refurbish them for resale.

The difficulties of the MLU and SCAP programs were in no small part brought about because the onboard systems were unique to Australia and there was no simple replacement option. As well, attempts to integrate European weapons onto this US-sourced helicopter in the form of the *Penguin* anti-shipping missile, purchased for the *Seasprite*, and the MU-90 anti-submarine torpedo<sup>13</sup> only complicated matters. In the end neither weapon has been fitted onto any Australian aircraft, despite much effort and expense. For example, the MU-90 torpedo integration onto the *Seahawks* was removed from the lightweight torpedo project but was originally budgeted at \$30 million.<sup>14</sup>



**Table 1:** RAN Seahawk fleet flying hours 1990–2009

Year	Fleet flying hrs (planned)	Fleet flying hrs (achieved)	Fleet cumulative flying hrs	Cumulative hrs/aircraft	5 year average annual hrs/aircraft
1990–91	3,770	2,755	2,755	172	
1991–92	3,550	3,090	5,845	365	
1992–93	3,281	3,002	8,847	553	195
1993–94	3,535	3,161	12,008	751	
1994–95	4,450	3,582	15,590	974	
1995–96	4,450	2,899	18,489	1,156	
1996–97	4,050	2,978	21,467	1,342	
1997–98	3,596	2,963	24,430	1,527	198
1998–99	3,500	3,338	27,768	1,736	
1999–2000	4,000	3,636	31,404	1,963	
2000–01	4,450	3,261	34,665	2,167	
2001–02	4,600	3,931	38,596	2,412	
2002–03	4,600	3,887	42,483	2,655	234
2003–04	4,600	3,788	46,271	2,892	
2004–05	4,600	3,874	50,145	3,134	
2005–06	4,200	2,670	52,815	3,301	
2006–07	3,300	2,439	55,254	3,453	
2007–08	2,800	2,543	57,797	3,612	171
2008–09	3,100	2,809	60,606	3,788	
2009–10	3,400	3,179	63,785	3,987	

Source: Defence annual reports and portfolio budget statements

### *Rates of effort*

Table 1 shows another feature worth noting here. At the time of the RAN's acceptance of the S-70B-2 fleet into service, it was anticipated that the mature rate of effort (ROE) would be 4,450 hours per year, or 278 annual hours per aircraft. But figures show that the highest ever ROE was 3,931 hours in 2001–02. The average over the fleet's service life is 3,190 hours per year—some 28% below the projected figure. On the basis of public information, it's not possible to explain why the apparent shortfall occurred. But it seems fair to identify it as underperformance—as Table 1 shows, the RAN's own annual planning figures exceeded the achieved number of flying hours every year from 1990–2009. And aircraft availability was identified as an issue in a series of internal reviews as early as the mid-1990s.

The rate of effort has not increased in the past five years, despite the failure of the *Seasprite* project to deliver an operational helicopter. In fact, the RAN's S-70B-2 fleet averaged sixty-three annual hours *less* per aircraft over the period 2005–09 compared to annual hours for the previous five years. Again, comparison with USN figures is not flattering. As noted earlier, the USN's *Romeo* fleet already has over 50,000 hours of flying time behind it—despite beginning operations in 2008 with just eleven aircraft. A total of seventy-six aircraft have been delivered to date and some reasonable assumptions on ramp-up rate lead to the conclusion that they are operating at a rate well in excess of the RAN's S-70B-2 best annual outcome.

### ***Managing the future naval combat helicopter fleet***

It's hard to avoid the conclusion that the sixteen S-70B-2s in the RAN's inventory will have delivered remarkably poor value in terms of flying hours and capability when they are 'urgently' retired. The choice of an Australian-unique mission suite in the first instance meant that they were always going to be difficult to support and upgrade—a fleet of sixteen unique aircraft operated by a middle-sized navy is always going to struggle. Because of those difficulties, the S-70B-2 aircraft, with less than half of their rated airframe life, which could reasonably have been expected to last thirty years (as their USN counterparts have) will be retired after twenty.

Sunk costs are not relevant to future planning and the money expended to produce the current state of Australia's naval aviation cannot be recovered. But it would be remiss of the government to approve the purchase of a replacement fleet without ensuring that concrete steps are taken to ensure that it provides better value for money than its predecessor.

Some necessary steps (the first of which is applicable well beyond naval helicopters) are:

- establishing clear lines of accountability and responsibility for raising and sustaining the capability—and ensuring that the small number of individuals thus charged have the authority and delegation to take the requisite actions.

And, if the *Romeo* should prove to be the successful contender, every effort should be made to take advantage of economies of scale with the larger US fleet.

- making the USN baseline for the helicopter a 'strict default'—deviation from the parent navy configuration will happen only if there is no Australian requirement *and* no likely impact on future upgrade paths (for example, the RAN may opt out of acquiring a USN weapon fit, but cannot opt out of a processor upgrade associated with it)
- ensuring that aircraft availability levels meet an agreed standard, with rigorous reporting and annual benchmarking against the USN experience.

Similar considerations apply to the *NFH*, although there will be no single fleet in operation elsewhere. But every effort should be made to standardise Australian aircraft to common European practice.

To implement this approach, future governments will also have to realise that sometimes it will be necessary to spend money to modify or upgrade ADF equipment, even if it is currently performing at an acceptable standard. This will be necessary to keep it in lockstep with larger fleets elsewhere. The example of naval aviation examined here shows clearly what can happen if that is not possible. In economic terms, long-term economies of scale taking advantage of larger common fleets will generally trump short-term savings that result in orphan capabilities. And in terms of capability, upgrades tend to be sequential rather than parallel—especially where mission systems are concerned. Today's processor upgrade will enable tomorrow's weapons and sensors.

### **III. Conclusion**

The timing of this decision and the relative state of maturity of the two contenders make the *Romeo* the more likely winner of the competition if project risk is the decisive factor. There is no doubt that it is an able machine, but the likely outcome would be less clear if the *NFH* had more time to build a similar service record and reduce project risk commensurately.

So the circumstances of the decision warrant reflection. A major ADF force element has got to the point of requiring urgent replacement after underdelivering for a good part of its service life—the RAN has now gone fifteen years without the ability to conduct dipping sonar operations, has had to soldier on with an obsolete airborne ASW torpedo and has no helicopter-carried missiles in naval service. And the timing of the decision means that one of the contenders—about which was built a business case that impacted upon previous decisions—appears insufficiently mature to be able to compete effectively, given the stated urgency of the decision.

Even excluding the \$1.4 billion spent on the *Seasprite* failure, in recent years the total annual cost of naval aviation has been around half a billion dollars.<sup>15</sup> Despite that, the government finds itself about to retire aircraft two-thirds of the way through their expected life in order to rectify a serious capability shortfall. Clearly, steps need to be taken to prevent a recurrence of this situation, whatever decision is taken.

## Endnotes

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- 10 The history of these projects is summarised neatly by Tom Muir in 'Sense and sensibility - sustaining the Seahawks', *Australian Defence Magazine*, September 2009.
- 11 US Naval Air Systems Command Release E200306171, June 2003. Available at <http://www.navair.navy.mil/newsreleases/index.cfm?fuseaction=home.view&id=2348>



- 12 See the discussion of the SH-60R program at <http://www.fas.org/programs/ssp/man/uswpns/air/rotary/sh60seahawk.html>
- 13 For a summary of this project, see Gregor Ferguson, *Australia's new lightweight torpedo*, ASPI Defence Budget Brief 2009–2010, pp 202–207.
- 14 *Lightweight Torpedo Replacement Project*, Australian National Audit Office Report No. 37, 2009–10.
- 15 The last year for which separate costs of naval aviation were broken out was the 2007–08 FY. (In 2008–09, the naval aviation cost was rolled into an aggregated—and thus less useful—overall figure for Navy.) Including personnel and supplier costs, but excluding depreciation and amortisation, the 07–08 figure was \$402.5 million and the 06–07 figure was \$505.0 million.

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