PROJECT MANAGEMENT... *(Cont'd from page 32)*

staggered assembly approach, but it also increases the number of operations and resources to be tracked at any one time. The plan called for whole ship cross-section to arrive prefabricated from Kockums in Sweden to be completed in Adelaide section by section then joined. In practice, the alignment demands of such an approach are very considerable, given that any precision systems which pass through the hull sections (cabling, ducts, etc.).

Valuable time was gained by assembling "system", welding two sections together before completing the systems inside them. The consequences for labour, parts and resource allocation following this schedule realignment are profound; illustrating the flexibility required project management as well as the Micro Planner X-Pert software's agility in coping with it. The scale and complexity could also be depicted by the several hundred tonnes of batteries to be installed per ship, warranting a separate Battery Installation project plan within X-pert. The Collins class submarine is entirely run on batteries; the only carbon powered engines in the craft are the backup generators which can be run from time to time to recharge the batteries. The electric power plant explains the submarine's silent operation, and the ultra-short length reduces mechanical rumble to a minimum. Anyone who saw the movie or read the book Hunt for Red October will realise that the author came very close to reality.

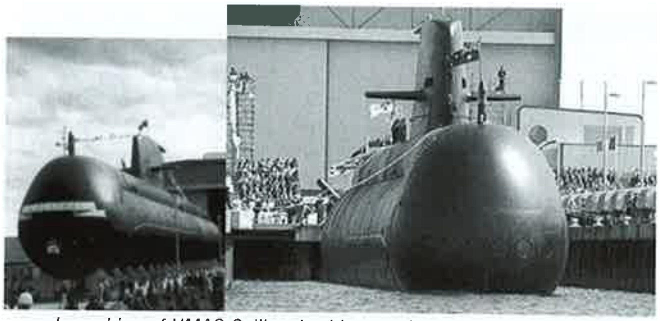
The launch

The first sub launched on 28th August 1993. According to Dr Don Williams, Managing Director, ASC, the project had "exceeded contract requirements and exceeded quality requirements" and the first sub was delivered "on time and on budget".

Entry into service

Raf of Micro Planning International Asia Pacific has his own variation on the theme: "on time and budget and on Micro Planner". Corny, but understandable. The scheduling and project planning section is a linchpin.

I and Micro Planning International, helped produce one of those extremely rare beasts in project planning history: a project of this size that went to plan and did not double in cost. One down, five to go.



Launching of HMAS Collins, lead boat and namesake of the class, on 28 August 1993

Dr William's estimate is that while the project is on target now, there is a chance that it will inch some months ahead of schedule by the time they reach submarines NO.5 and 6. The most unpredictable elements were dealt with early in this unusual partnership between a long time Swedish shipbuilder, Kockums, and an Australian start-up company Australian Submarine Corporation.

Surrounding the submarine project were the usual political pressures, and a share of scepticism from some quarters, that Australians could undertake such a manufacturing venture from scratch. We might add that ASC raised the stakes even higher by opting for an all Macintosh administration, at this time (1991) the largest Australian Mac Installation and certainly the most critical role for a computer that was still fighting for acceptance in corporate circles. The Mac's role in steering the project schedule via its Micro Planner software would be its most critical test. Raf conducted his onsite and very hands on consultancy while something of a permanent resident at Adelaide's Park Royal Hotel.

Rather than quote tons (some 3050-330) or sizes (77 metres) or numbers of parts (some 500,000 per sub) We think a better way to hint at the complexity of planning the Collins submarine is indicated by the number of working drawings used: some 23,000 drawings, and most of them in multiple revisions. Tracking those, deriving sensible material requirements and labour schedules from them, integrating frequent plan revisions and all the time optimising time costs is a monster of an undertaking.■

Project management at the $6 billion level

Manufacturing and Delivering Australia's own Submarine, using Micro Planner X-Pert[1]

By Raphael M. Düa, FAICD, MACS (Snr), CP, Grad DISC
Chairman and Owner Micro Planning International Asia Pacific Pty Ltd

Prologue

It is perhaps fortuitous that prior to my writing this article on the Collins Class submarine, that RADM R.C. Moffat had his article published in the previous edition of *United Services* talking about the future submarine program. In this article I will be recounting and talking about how the first of the Collins Class submarine was built starting in February 1991 and successfully delivered on time and on budget in August 1993.

The author on July 28 1993 – one month before launch

Introduction

The ***Collins* class** is a class of six Australian-built diesel-electric submarines operated by the Royal Australian Navy (RAN). The *Collins* class takes its name from Australian Vice Admiral John Augustine Collins; all six submarines are named after significant RAN personnel who distinguished themselves in action during World War II. The boats were the first submarines to be constructed in Australia, prompting widespread improvements in Australian industry.

Planning for a new class to replace the RAN's *Oberon*-class submarines began in the late 1970s and early 1980s. Proposals were received from seven companies; two were selected for a funded study to determine the winning design, which was announced in mid-1987. The submarines, an enlarged version of Swedish shipbuilder Kockums' *Västergötland* class and originally referred to as the **Type 471**, were constructed between 1990 and 2003 in South Australia by the Australian Submarine Corporation (ASC).

Construction

The Australian Submarine Corporation construction facility was established on previously undeveloped land on the bank of the Port River, at Port Adelaide, South Australia on the site began on 29 June 1987, and opened in November 1989. South Australia was selected as the site for construction, based on the proposed location of the facility and promises by the State Government to help minimize any problems caused by workers unions. The state's bid was aided by careful promotion to both Kockums and IKL/HDW during early in the project, and problems with the other states' proposals: Tasmania and Western Australia lacked the necessary industrial base, New South Wales could not decide on the location of the construction facility, Victoria's proposed site was poorly sited, and building in Liberal-led Queensland would have been politically unwise for the project when Labor was in power both federally and in all other states.

The Project

Each submarine was constructed in six sections, each consisting of several sub-sections. One of the main criteria of the project was that Australian industries contribute to at least 60% of the work; by the conclusion of the project 70% of the construction and 45% of the software preparation had been completed by Australian-owned companies. Work was sub-contracted out to 426 companies across twelve countries, plus numerous sub-sub-contractors. In many cases, components for the first submarine were constructed by companies outside Australia, while those for the following five boats were replicated by an Australian-owned partner or subsidiary the project prompted major increases in quality control standards across Australian industries: in 1980, only 35 Australian companies possessed the appropriate quality control certifications for Defense projects, but by 1998 this had increased to over 1,500.

In August 1993, the first Collins class submarine wet its fins. Launched from the Australian Submarine Corporation's (ASC) Port Adelaide facility, its production had been managed by some eight hundred Macintoshes onsite.

Computers are welcome on board; each submarine will carry portable UNIX machines. Under development is CIM/SIS, a complete electronic information system for the Collins submarine, and it has the potential to replace a mountain of paper based maintenance and emergency documents. According to Michael Ward, the MIS manager for ASC, a submarine will typically carry seven to eight tonnes, of documentation on board. With SIS in place, the substantial relief from eliminating this weight will be accompanied by faster access and better informed intervention during active service.

Ward has overseen the development of three in-house software systems: distribution system for the more than 23,000 submarine drawings; a configuration management information system; and a cost schedule control. Armed with these together with the design and construction experience gained on the Collins project, the ASC hopes to branch out to other defence shipping contracts and exports. It has built a unique and substantial technology base for Australia, and with ninety three major sub-contractors and a host of business supporting them, the boost for industry and employment is very apparent. Ward says: "This organisation must find further contracts and continue its operation after the submarines have been delivered, it would be crying shame if not." According to Dr Don Williams, the managing director of ASC, they have identified defence needs worth bidding for throughout Asia and the Persian Gulf patrols boats, mine hunters and submarines. Meeting the scheduled launch date is a source of some pride for ASC.

According to an article in the Australian, Michael Ward holds one of the most challenging MIS missions currently on the "go". I asked him about the common perception that because Macs are fun, people get less work done. "Do they play games here?" that is a management issue and not one of technology. If we don't know what our people are doing, they'll play. The challenge is to make sure they have plans and tasks to be busy with. Touché.

The National Audit Office conducted an efficiency report on the submarine project in 1991-1992, expressing some doubt that the ships would be delivered on schedule. Messrs Williams and Ward both reflected on the inexact nature of such external audits, adding that the report had confused "launch" with "handover" date events that are many months apart.

"It's in our national psyche to prove people wrong," Williams observed, and coining a phrase he added that first Collins class vessel was indeed delivered "on time, on budget, and on Micro Planner". "On Micro Planner", this is where Macintosh played a pivotal role.

Raphael (Raf) M Düa of Micro Planning International Asia Pacific Pty Ltd has been the scheduling consultant via his software, effectively acting as a team leader during the building of the first vessel. Some 80 ASC Macintoshes are Micro Planner X-Pert-equipped. Raf's credentials go back a long way. He worked on the original Polaris project in the US and nuclear powered submarines in the UK, followed by many years of refitting Oberon class submarines at Cockatoo Dockyard.

It is no mean task steering the massively complex project through the maze of subcontractors, parts deliveries from across the world, and the multitude of trades engaged, and with all of this activity constrained by high-level security procedures. In the first six years, there have been 289 subcontractors and 257 suppliers, 70% of them in Australia, and ASC employs more than 1,000 workers at the site. In terms of designs, virtually every component is custom-built, and the component count is high.

A completed submarine has about 35km of cable running around inside. When the first submarine was launched in August 1993, several others had reached various stages of completion. The project uses a

(Continued on page 34)

[1]The major part of this article was first published in Macworld in September 1993 and was written by Osmond Iversen in conjunction with myself, which I have updated for publishing in *"United Service"*.