ADVANCED TECHNOLOGIES GROUP

SUBMISSION TO THE

JOINT COMMITTEE OF PUBLIC ACCOUNTS AND AUDIT

REVIEW OF COASTWATCH

BARRY DOUGLAS AUSTRALIA PTY LIMITED
representing
ADVANCED TECHNOLOGIES GROUP. UK

NOVEMBER 2000

INTRODUCTION
Review of Coastwatch - New Technologies

The purpose of this submission is to inform the committee of the emergence of a new technology; a cost efficient and highly effective surveillance platform, the Hybrid Air Vehicle, (HAV).

Barry Douglas Australia Pty Limited is the Australian representative of Advanced Technologies Group UK, manufacturers of the “SkyCat” range of hybrid aircraft.

These vehicles are being developed by Advanced Technologies Group in the UK and USA as a result of a strong interest expressed by the United States Transport Command. They comprise a range of vehicles from the “SkyCat15” designed for surveillance and Airborne Early Warning roles, to larger craft with payloads up to 1000 tons that are designed for Remote Area Logistics requirements that rapid reaction forces require in early force insertion.

These aircraft are a fusion of conventional and lighter than air technologies and result in vehicles which have astonishingly long “hang” times (endurance), measured in days rather than hours, together with standards of interior payload volume which conventional aircraft cannot approach. They are thus able to carry any combination of surveillance systems including very large physical sensors such as “B” band radar that make them uniquely capable of detecting very small, and “stealthy” targets at extreme ranges. They are also able to descend to sea level, hover or land and deploy an armed boarding boat.

Based on long-standing proven technical foundations, these craft now incorporate the latest technologies such as composite construction, modern fabrics and Fly-by-Light flight control systems, and can provide very effective stand-alone surveillance platforms. Their benign operating environment and attractive acquisition and operating costs make them powerful candidates for inclusion in a balanced platform response to Australia’s challenging Coastwatch requirement.

The Skycat is self-sufficient and can operate for protracted periods in remote regions without any ground support. The Advanced Technologies’ amphibious SkyCat 15-series, for example, can operate autonomously from any flat area, including open sea, scrubland, swamp and desert. It is possibly the optimal platform for any barrier surveillance task as typified by the baseline Coastwatch and AEW&C requirements: it will also contribute usefully towards any SAR tasking. Compared to fixed and rotary wing aircraft typically used for these tasks SkyCat operating costs are significantly lower.

Two SkyCat 15's, equipped as C3 platforms and with appropriate surveillance systems are able to maintain a virtual permanence on station. A small fleet of such platforms has the potential to provide a highly effective surveillance barrier around the entire Australian coastline. In this context it is worth noting an element unique to the SkyCat 15, namely hover pads that allow it to land almost anywhere on land or sea. It is thus able to combine the wide area surveillance capabilities of an aircraft with the classic interdictive "board and search" function of a conventional surface vessel thus offering the potential for additional savings by liberating Naval/Customs vessels currently allocated to that task.

Floodlighting at night, use of Skyshout loud hailers and recorded messages in the assumed language of the target crew are effective interdiction tools.

The following summary of SkyCat 15 capabilities together with the enclosed brochures provide more detailed information on this technology. The company is already pursuing the Australian AEW requirement in association with BAE Systems and, as agent for its activities here we should be delighted to arrange a detailed briefing concerning these remarkable aircraft at a time and venue convenient to the committee.

Thank you for the opportunity to make this submission to the Joint Committee.

ILLUSTRATION

A SURVEILLANCE RENAISSANCE

Every so often, a new technology appears that transforms a particular work environment. In the 15th century, the cannon was one such, instantly annulling the value of some 400 years of development of spectacular castle defences. The steam engine was another transforming for ever the meaning of "horsepower". Most recently, digital technologies, allowing the storage of all man's knowledge prior to the development of the computer on a single chip and its transmission round the planet in the wink of an eye, is surely a third.

Less dramatic but no less cogent in the field of airborne surveillance, the airship, now metamorphosed from its romantic heritage by the application of 21st Century technologies into the Hybrid Air Vehicle (HAV), has the ability to transform the conduct of the surveillance function and this, in the main, simply as a function of two particular attributes:-

1. **Endurance** measured in “days” on-station as compared with conventional surveillance aircraft measured in “hours” on-station, means that the possibility of achieving the optimum surveillance goal of maintaining an on-zone permanence becomes a reality, and,

Illustration

2. Operating costs less than 20% that of conventional aircraft of equivalent payload capability, making that potential for permanence economically feasible.

This permanence has “added value” arising from the range and quality of sensors such a Lighter-than-Air (LTA) platform can deploy. In this regard, an avionic payload measured in tonnes and a payload-volume measured in thousands of cubic meters means that not only can larger, hence ‘more powerful’ sensors be deployed but, in addition, a different range of mission systems from those deployed in conventional aircraft may be considered. Significant examples of these "differences" include in particular, the following :-

- **Radar –** with the HAV gas envelope doubling as a radome, in principle capable of containing an antenna of some 15,000 cu.m in size, the installation of new

technology UHF radars, in aerodynamic terms at least, becomes a simple matter.

- **Electro-optics/sensors -** installation of stabilized platforms with the most powerful sensors with magnifications in excess of x200, becomes a relatively simple matter. Further to that, the "either/or" compromises in equipment selection for conventional aircraft becomes a simplified "....and....". Virtually any type of sensor can be installed in the Sky Cat's spacious and benign workspace environment.

- **Boarding boat –** the proven ability to deploy a manned (armed) surface craft from a SkyCat 15, (French Navy / US Coastguard trials), means that uniquely, this single airborne platform can achieve both the surface surveillance and the low level interdiction functions.

- **Aircraft/UAV's –** in the 1930's the US Navy had three operational aircraft carrying Rigid Airships each with 6-8 Curtis biplanes. Operating from a trapeze beneath the hull using a hook fixed to the aircraft's upper wing, with the airship at a fast cruise, these aircraft were routinely operated with no losses incurred at any time during launch and recovery. To extrapolate from this to the deployment of UAV's from the gondola of a modern airship is indeed but a small step. The aim of any such UAV deployment would be to facilitate the identification of surface targets detected at the very long ranges expected from UHF radars.

This very large payload volume means that systems which, due to aerodynamic constraints, have to be "shoe-horned" into conventional aircraft hulls, can be spread around the large areas available in an HAV. This will greatly facilitate the rapid exchange of digital technology mission equipment modules, thus endowing this single platform with a true multi-role capability.

Illustration

For example, it can be demonstrated that, in little more than a 24 hour turn-round between missions, a SkyCat configured, say, for the surface surveillance tasking of Coastwatch, could be reconfigured for Navy force protection tasking, deploying AEW, ASW or MCM sensors, and reconfigured again, at some later date, for Police missions such as internal security or crowd control at major events/incidents.

Some typical strategic surveillance roles well suited to HAV tasking.

- **Coastwatch –** equipped with "S" and "X" band radars, a suite of separate

long focal length (x200), short focal length (x30) and infra-red sensors, with boarding boat and/or UAV, this single platform will combine the ship-aircraft surveillance-interdiction function with unparalleled endurance capability. If required, a helicopter winch, for example, deploying the "Billy Pugh" multi-personnel lifting device (much used on offshore platforms in the oil & gas industry) would allow it to achieve all the usual helicopter roles as well. SkyCat 15's can also be appropriately protected and armed if needed.

Illustration

Internal Security - the same Coastwatch platform with the boat removed and with additional mission equipment such as searchlights and a loud-hailer system, will fully achieve police surveillance functions, either discretely from 10,000 feet or as an obvious presence low-level and, if necessary, for many days at a time.

SAR - Being amphibious, SkyCat 15 is able to carry out all functions of search, rescue and medivac .

Oil Spill and Pollution - Appropriately equipped the SkyCat range of HAV's offer effective rapid response, containment and clean up capability.

AEW – in an Airforce or Naval context, <u>any</u> of the present generation radars or their planned replacements in the future, can be deployed in an HAV. At altitudes of up to 15,000 feet a three day endurance may be anticipated.

Fleet Escort – a mix of every active and passive MPA/Helicopter anti-submarine sensors, existing or planned, can be deployed from an airship. Equipped, in addition, with a substantial Air-surface surveillance radar and electro-optic suite, and operated at some 5,000 feet in a fleet surveillance role, an un-refueled endurance of approximately 5 days may be expected with a mission endurance of some two weeks.

Such a multiplicity of roles also predicates the ability to operate from a wide variety of bases. The Skycat-series, with the following flight systems, are uniquely well adapted in this regard:-

- With four engines Skycats can fly up to 100 mph and offer unusually rapid acceleration and deceleration

- Vectored thrust on all engines, allows vertical take-off / landing

- Pneumatic Bow Thrusters offer exceptional maneuverability and rapid control response.

- The rate of climb of these large platforms (a sustainable 2,500 feet per minute) is only exceeded by the most powerful fighter jets.

- A Flight Control System (FCS), using the next generation “Fly-by-Light” (FBL) signaling technology, integrates all the above into a cohesive, automated system. The airship is the only commercial platform to have achieved FAA Transport Category certification of an FBL-FCS. Indeed the only other working platform making use of this technology is the NASA Space Shuttle.

- The FCS includes unique hover pads (based on the hovercraft principle) which, with reverse thrust, suck-down and hold the Skycat onto the ground, thus removing the need for the mooring masts and large ground crews that were a feature of airship operations in the past.

Illustration

Thus equipped, a Skycat can operate from any unprepared flat surface, be it an airport, open fields, the outback, swamps or the sea-surface – a variety that is more than a match for the proposed range of tasking.

As important as its strategic utility as a surveillance platform (high payload, long endurance and low operating costs), this flexibility (massive payload-volume and few aerodynamic constraints) accords this platform, in addition, an excellent "Force Multiplier" capability. In an environment, common to all developed nations, of increasing requirements and decreasing numbers of platforms to cover them, these are two very

useful attributes.

How effective as a surveillance platform is an HAV and how would it fit in the existing operational environment? One of the problems with barrier surveillance is that its strategic value is as a deterrent and as such, its value is difficult to measure. "Cost-efficiency", as much as anything else, is the public's measure of "success" particularly in time of peace or low-level tension. The low operating cost and high operational capability of an HAV platform goes a long way towards balancing that political equation of enforcement against cost.

A perceived weakness of this platform is its lack of speed which is equated with lack of responsiveness. This is a false perception for the following reasons:-

(a) Barrier surveillance, by its very nature, is a preordained strategy not a tactical response. While for the latter "speed" is the essential ingredient, for the former deliberated and deliberate response is the key, longevity rather than speed . AEW, for example, typifies this, whereby high speed fixed wing platforms, once on task, are obliged to fly tight patterns to remain airborne at its geographically fixed station.

(b) It is for this reason, that historically, such preordained long-term surveillance tasking has been the province of ships rather than aircraft. Inherent in its very name, the "Air-ship" is best considered, and used, as a very fast Ship rather than a slow "Air-craft".

Every military and para-military Government Agency has a similar mix of strategic surveillance and tactical response requirements. It is also true that the assets they have at their disposal tend to be more focused to the latter type of tasking. This is because without the tactical response capability agencies would have no "teeth". The problem is, that having acquired these tactical response assets, there often remain insufficient funds to procure and operate the necessary strategic assets. As a result, in virtually every country and every agency, the tactical response vehicles are used in strategic surveillance roles. Typical examples are warships used in EEZ policing roles, MPA's in drug trafficking control operations or helicopters for Policing crowds. Expensive to operate, and, in the latter examples, of insufficient endurance, they are ill adapted to such tasks and hence not cost-effective.

It can be demonstrated that HAV's can cost-effectively fulfill strategic surveillance requirements typically required by government agencies. They have the payload to deploy the required mission equipment. For the same payload capability an HAV platform is significantly cheaper to procure than its heavier-than-air counterpart. Once in operation cost differentials are exponential.

Illustration

LTA's are sometimes perceived to usefully supplement rather than replace the existing response vehicles already in service. Hence, at current procurement levels, budget is possibly not available for the procurement of any additional equipment, however desirable. The solution could be that with the strategic task fulfilled by cost-effective HAV platforms, fewer response vehicles are required because their utilization will be more focused. If that is accepted, then budget can be liberated for HAV procurement. To illustrate this potential;

- The Dash-8's are currently fulfilling both functions, but even though maintaining a prodigious flying-rate they are very stretched with limited spare capability available to deal with the unexpected. The budget to deploy HAV's could most readily be obtained from three sources. Firstly by releasing military assets applied to the task (P3 Orions/Navy vessels), secondly through the reduced load on the Dash-8's liberating additional operating budget and finally drastically reducing the requirement for the smaller fixed wing aircraft and helicopters.

- Whilst not within the scope of the Coastwatch Review, committee members might be interested to note that the same holds true for the proposed AEW&C program. It is very likely that by reducing the intended procurement by three units would generate sufficient funds to procure some half-dozen AEW-equipped HAV units. Not only does this increase the total number of platforms procured but it also provides a mix able to cost-effectively achieve both the planned strategic function and the unplanned response tasking. With the HAV platforms dedicated to the former, the response vehicles will always be ready and available for the latter response tasking. Not only does this offer a significant increase in capability, but achieves this at a very substantial decrease in the associated life-time cost.

After a hiatus of some 40 years the airship is back in its new form as an hybrid aircraft. Applying modern technologies to a proven concept, it is now infinitely more capable than in the past. Studies by the Pentagon and UK MOD put it among the least vulnerable of airborne platforms. An avionic payload of some 10 tonnes and massive volume, means this platform is blessed with wide-ranging capabilities. Low operating costs make them affordable. In short, this platform offers users effective capability at a politically acceptable cost.