Telstra Applied Technologies

Submission to the Joint Committee of Public Accounts Audit

Review of Coastwatch

2 June 2000

Telstra Applied Technologies submission to:
The Joint Committee of Public Accounts and Audit

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Review of Coastwatch

Executive Summary

Telstra Applied Technologies estimates that the cost of coastal surveillance conducted by Coastwatch, Defence and other Federal and State agencies exceeds $210 million per annum. $159 million per annum [excluding other agencies costs] is consumed searching for threats to Australia's economic security.

Each year the number of threats to Australia's economic security increases, as does the pressure on Coastwatch and Defence to widen their field of surveillance. However, the ANAO found that Coastwatch did not have the resources required to respond to current potential threats.

Data from the Australian Bureau of Statistics indicates the potential cost to Australian agriculture and fisheries from the introduction of exotic diseases, plants, animals and people is approximately $30 billion. It is therefore evident that action must be taken now to maximise the effective use of current surveillance assets. Failure to do so will see spiralling increases in the cost to search for threats instead of controlled cost increases in the cost of deterring and prosecuting threats.

Sensors such as aircraft, patrol vessels, sub-sea acoustic arrays, unmanned aircraft and satellites can only provide a snap shot of an area under surveillance. Simply increasing the number of these sensors will not change the current operational paradigm. I.e. 80% searching, 20% deterring and prosecuting. Continuous, round the clock, 365 days per year surveillance coupled with data acquired by these sensors is required in high risk areas to detect, deter and allow prosecution of threats.

Surface Wave Radar can provide such surveillance at a much lower cost than any other sensor and can be relocated as and when new high risk areas are identified. Information from Surface Wave Radar can be formatted to suit Coastwatch clients and other agencies involved in coastal surveillance and reticulated on a user-pays-basis.

Telstra Applied Technologies has worked closely with the Defence Science Technology Organisation, the Cooperative research centre for Sensor Signal and Information Processing and Daronmont Technologies to create a world class Surface Wave Radar and fully expects that the trials to be conducted in Northern Australia over the next three months will prove its unique capabilities.

Both the Prime Minister's Task Force and the ANAO have recommended the active investigation of new technology. Accordingly, Telstra Applied Technologies invites members of the Joint Committee of Public Accounts and Audit to attend these trials before finalising their recommendations.

Review of Coastwatch

1. Introduction:

Telstra Applied Technologies (TAT) has worked closely with the Defence Science and Technology Organisation (DSTO) over the passed six years to develop surveillance solutions for Australia and has gained valuable insight into the problems that confront Coastwatch and Defence in the surveillance of Australia's coastline.

TAT recognised that the Prime Minister's Coastal Surveillance task force provided an opportunity for greater understanding of the real increase in illegal activities in Australia's area of interest and a review of the existing coastal surveillance capability. Accordingly TAT provided a submission to the Prime Minister's Task Force 12 May 1999 (a copy of this submission is provided at Attachment C for your review).

Among other things the TAT submission stated:

- After reviewing the Governments "Australian Oceans Policy" and the Coastwatch "Overview" report of September 1998 and taking account of our discussions with various agencies involved in coastal surveillance, it is evident that a whole of Government approach for all Federal, State and Local Authorities is needed now; and

- Coastwatch's current modus operandi and charter will not allow Coastwatch to provide the level of detection and prosecution of illegal incursions that is required if Australia is to stem the tide of illegal immigration, drug trafficking, unauthorised fishing and other transgressions within the Australian Exclusive Economic Zone (AEEZ).

The recommendations of the Prime Minister's Task Force confirmed the accuracy of the above statements and initiated a programme capable of delivering significant improvements to Australia's coastal surveillance capabilities.

The Auditor-General Audit report No.38 1999-2000 issued 6 April 2000 further confirmed TAT's statements and highlighted issues that require action. TAT observes that where these issues fall within the control of Coastwatch significant progress has been made within a very short space of time. However, a number of issues require Government review and direction if the recommendations of the Prime Minister's Task Force are to achieve full potential. To this end, TAT is pleased to provide its submission to the Joint Committee of Public Accounts and Audit (JCPAA).

2. Purpose of submission.

This submission seeks to respond to the following areas of the JCPAA's inquiry:

- The role and expectations (public) of Coastwatch;
- The effectiveness of Coastwatch's allocation of resources to its tasks;
- New technologies which might improve the performance of Coastwatch;
- Cost allocation; and

In addition, provide compelling reason for the early deployment of Surface Wave Radar as an adjunct to current Coastwatch surveillance assets.

3. Submission.

The role and expectations (public) of Coastwatch

The costs associated with the delivery of Coastwatch services in 1998-99 were $168 million.[1] Further, the Prime Minister announced that immigration and Coastwatch-related activities would receive an additional $124 million [spread over 4 years] based on the recommendations of the Task Force, bringing the total cost to $199 million per annum. This figure does not include costs associated with other agencies, both Federal and State, engaged in various forms of coastal surveillance. It is therefore reasonable to assume that the current Coastwatch services and other agencies coastal surveillance costs would be in excess of $210 million per annum.

With these costs in mind, it might be reasonable for the Australian public to assume that Coastwatch protects our coastline from illegal intrusion by sea or air. Indeed the ANAO views Coastwatch as providing the following services to clients:[2]

- Patrolling;
- Detection;
- Identification;
- Surveillance;
- Interception; and
- Deterrence.

However, while identification, interception and deterrence of Suspect Illegal Entrant Vessels (SIEVs) and illegal Foreign Fishing Vessels (FFVs) would appear to be tasks with the highest priority, they occupy less than 20% of Coastwatch's total aerial and long term sailing programs.[3] This means that $159 million per annum [excluding other agencies costs] is expended in administration, coordination, intelligence gathering, planning, patrolling and surveillance. This is not surprising given that Coastwatch is responsible for the provision of surveillance services for approximately 37,000 kilometres of coastline and a nine million square kilometre offshore maritime area. Nevertheless, a considerable amount of time and money is expended in looking rather than detecting, deterring and prosecuting intrusions.

SIEVs/FFVs are not the only threat to Australian sovereignty, unregistered or unidentified aircraft entering or leaving Australia (black flights) pose similar problems. The ANAO found that it was not possible to report on the extent of the black flight problem because there have been no studies completed by Coastwatch.[4] In other words, "you don't know what you don't know". A similar conclusion is possible with respect to the number of SIEVs/FFVs. I.e. With current resources Coastwatch can only conduct limited surveillance over a small percentage of the AEEZ in a given period and could not be expected to state, with any certainty, the number of SIEVs/FFVs in that period.

[1] ANAO Audit report No.38 (Summary 2.)
[2] ANAO Audit report No.38 (Coastwatch role and objectives 1.5)
[3] ANAO Audit report No.38 (Client responsibilities in relation to the tasking process 2.24)
[4] ANAO Audit report No.38 (Suspect illegal (black) flights into Australian airspace 2.73)

The ANAO cited the following additional issues associated with black flights:[5]

- Aircraft altitude. Aircraft travelling at low altitude may not deliver a radar return (radar paint) making them difficult to detect;
- Aircraft speed. Aircraft travel at high speed therefore making it difficult for an Australian authority to intercept and/or conduct surveillance on an aircraft;
- The number of airfields. There are numerous sites that can be used as airfields spread throughout northern Australia, making it difficult to pinpoint where a possible black flight has landed;
- Coastwatch contractor aircraft have not been equipped with the facilities to detect black flights. Existing radar systems are specifically designed for surface craft detection;
- Previous reports on Australia's civil surveillance and response service have not addressed which government agency should manage the issues related to black flights.

Surface Wave Radar (SWR) offers a unique, cost effective enhancement to current Coastwatch and Defence surveillance assets by concurrent detection and tracking of surface vessels and aircraft.

The Defence Science Technology Organisation (DSTO) stated the following in its "Project ILUKA briefing paper":

"One operational need of considerable importance for Australia is continuous surveillance of coastal waters out to the boundary of the Exclusive Economic Zone (EEZ), 200 nautical miles offshore. Areas of special concern include the Gulf of Carpentaria, Torres Strait, the Great Barrier Reef, Bass Strait, the North-west Shelf, the Timor Sea and the Arafura Sea. Targets of interest in this context range from moderate-sized boats, as used by drug smugglers, fishing poachers and illegal immigrants, to large ships which venture from their expected courses in hazardous waters. Air targets may also be of interest, especially small aircraft used for drug smuggling. DSTO has concluded, on the basis of its expertise in HF radar, that SWR may offer a technological solution to this class of surveillance problems."

TAT estimates that a single SWR can provide 24 hour air/sea surveillance over an area of 70,000 square kilometres at a cost of $3,000/day.[6] By comparison:

- A Coastwatch plane would take 5 hours (assuming the surveillance area was 30 minutes from base) to conduct surveillance over an area of 70,000 square kilometres. However, 6 aircraft would be required to provide 24 hour surveillance at an estimated cost of $64,530/day.[7]

[5] ANAO Audit report No.38 (Suspect illegal (black) flights into Australian airspace 2.73-2.74)
[6] This cost is based on a Commercial-in-Confidence model. TAT would be happy to discuss the model at an "in camera session".
[7] Cost derived from ANOA figure 12

- A National Marine Unit patrol vessel would take 60 hours to conduct surveillance of 70,000 square kilometres at a cost of $16,500 (Australian Customs Vessels) and $32,500 (Bay class vessels).[8]

- A RAN Fremantle class patrol boat might take less than 60 hours to conduct surveillance of 70,000 square kilometres, but at a cost of $61,738 per steaming day would still cost over $100,000.[9]

TAT does not suggest that a SWR could replace the valuable roles achieved by aircraft or patrol vessels in providing positive identification, deterrence and interception of SIEVs/FFVs, nor could a SWR fulfil the requirement to monitor marine wildlife. However aircraft and marine patrol vessels can only provide intelligence within their immediate vicinity [in effect creating a single snap shot of their vicinity]. SWR will provide 24 hour intelligence over a fixed wide area freeing up valuable Coastwatch and Defence assets to either be deployed across a greater area or to intercept, deter and prosecute targets identified by SWR.

In addition to surveillance of SIEVs/FFVs, SWR would provide Coastwatch and Defence with a significant improvement in their ability to detect black flights at no additional cost. SWR can detect low flying aircraft at distances far in excess of conventional microwave radar and utilising sophisticated tracking algorithms; provide a prediction of possible landing areas within Australia.

The effectiveness of Coastwatch's allocation of resources to its tasks

Based on data obtained from the Australian Bureau of Statistics, the potential cost to Australian agriculture and fisheries from the introduction of exotic diseases, plants, animals and people was estimated to be approximately $30 billion in 1996-97. In addition, the cost of detaining and subsequently repatriating illegal immigrants has to be met by the Australian Government.[10]

If we assume a 1% probability of an exotic disease being introduced into Australia, which affects 10% of Australia's agriculture and fisheries, the resultant potential cost arising from a single incident is $30 million. In 1998-99, Coastwatch did not detect one third of SIEVs before they reached the Australian coastline.[11] Since that time Coastwatch has made significant improvement in detecting SIEVs. However, without the addition of new technology the probability of a single incident must grow.

The introduction of exotic diseases is not the only economic peril facing Australia. Illegal fishing, drug smuggling and illegal immigration are all taking their toll. It is therefore imperative that the limited resources of Coastwatch and Defence are allocated and directed with maximum effect.

[8] Cost derived from ANOA figure 14
[9] Cost derived from ANOA figure 15
[10] ANAO Audit report No.38 (Economic importance of the Coastwatch function 1.15)
[11] ANAO Audit report No.38 (Operational environment 3.3)

Coastwatch states; *"Coastwatch's effectiveness is directly related to the effectiveness of the information sources and intelligence assessments which flow from these sources. If these are ineffective then Coastwatch will simply 'bore holes in the sky' with only small probabilities of detection. Put simply, Coastwatch needs and relies on information to plan operations which are conducted in the right place at the right time."*[12]

Strategic air and sea patrols [which take up 80% of Coastwatch's resources] are planned using risk assessments provided by Coastwatch clients and other sources. These risk assessments are based, in the main, on historical data relating to activities in a sector, gathered intelligence and current observations. However, greater use of sophisticated vessels [enabled by the high profits associated with people smuggling, drug trafficking and illegal fishing] is rapidly changing historical movements within defined sectors. The Prime Minister's task force allocated an additional $85 million [over 4 years] to extend the footprint and intensity of Coastwatch's aerial surveillance because of such changing movements [4000 hours of operation per annum for 2 aircraft and 500 hours of operation per annum for I helicopter].

Note: TAT estimates that 2 SWR's would provide effective surveillance of the Torres Strait for fifteen years for less than $30 million. Similar surveillance by aircraft would require over 21,000 hours of operation per annum.

Coastwatch's operations centre and intelligence cell has been significantly improved following the Prime Ministers task force recommendations and with greater integration of client intelligence will be able to more rapidly predict changing risk patterns.

SWR can be deployed to high risk sectors and provide a 24 hour cover for both air and sea traffic within that sector with real-time radar track information fed directly back to the National Surveillance Centre. Information regarding the traffic would be correlated with other information sources to provide a substantial picture from which tactical missions would be initiated. It is anticipated that the resultant increase in tactical missions within a surveillance sector and the concurrent increase in interception and prosecution would act as a deterrent forcing SIEVs/FFVs and black flights to move outside the sector. Coastwatch would then relocate a SWR into the next high risk sector.

The ability to relocate SWR to new sites around the coastline ensures the long term economic viability of this form of surveillance asset and provides Coastwatch with the flexibility that it requires. Without this flexibility ever increasing numbers of aircraft and patrol vessels will be required creating an impossible burden on the Australian taxpayer.

The ANAO noted that there were two areas for which Coastwatch appeared to be accountable, but where it did not have the resources to respond to potential agency requests. These two areas are the patrolling of Australia's Southern Oceans and the AAT; and the detection and surveillance of suspect illegal (black) flights. Australia's international commitment to patrol actively and conduct surveillance operations in the AEEZ, not only requires active patrolling of high risk sectors of the AEEZ such as the northern Australia, but also the Southern Oceans and the AAT. To date, Coastwatch is only able to provide limited coverage of Australia's Southern Ocean and the AAT.[13] With SWR's providing 24 hour surveillance of high risk sectors, Coastwatch would be able to deploy more of its current assets to these areas.

[12] Coastwatch – An overview – September 1998
[13] ANAO Audit report No.38 (Scope of Coastwatch operations 2.60-2.61)

Findings contained within the Prime Minister's task force and ANAO reports make it clear that there is no lack of evidence to support the growing threat to Australia's economy resulting from increased illegal activities. Action must be taken now if Australia is to avoid an exponential cost increase in surveillance.

The technology required to significantly increase the effective deployment of Coastwatch and Defence assets, while stemming the tide of increasing costs exists now. That technology is Surface Wave Radar.

New technologies which might improve the performance of Coastwatch.

[Refer Attachments A, B and C for greater detail]

In early 1996 DSTO entered into a licensing agreement with TAT to develop and commercialise surface wave radar. The licence provided a very strong commercial development focus for Australia's Surface Wave Radar research efforts and an impetus for further development of DSTO's Surface Wave Radar technology. The licence also provided the necessary early industry involvement in the research and development to ensure a successful partnership for commercialisation.

In 1998, TAT contracted Daronmont Technologies (DarT) to build a commercial prototype SWR. Originally scheduled for completion in October 2000, this prototype is now due for completion August 2000 with test and trials commencing in June 2000. TAT has let a further contract to the Cooperative research centre for Sensor Signal and Information Processing (CSSIP) to improve the performance of SWR. TAT expects that the close collaboration between TAT, DSTO, DarT and CSSIP will produce a world class SWR capable of achieving performance unmatched by any other SWR.

While aircraft, marine vessels, satellite pictures, long range unmanned aircraft and sub-sea acoustic arrays are sensors that can all provide snap shots of activity within a surveillance sector, SWR is the only sensor that can provide almost continuous 24 hour, 365 days a year coverage at an affordable price. The combination of data received via intelligence and other sensors with SWR will provide the most complete picture available today.

SWR is an enabling technology that combines the best aspects of surveillance technologies available today and available in the future and as such will be 'future proof'. No other technology can provide the quantum leap necessary for Coastwatch and Defence to meet its surveillance requirements within an affordable budget.

Cost allocation

Information derived from SWR combined with other sources of surveillance information could be readily provided to Coastwatch clients in a format specific to their needs. As such Coastwatch clients would be able to act on the information in a timely manner. The cost of SWR could be allocated in a number of ways. E.g. risk to clients core activities and access to data. When fully operational, other Federal and State agencies involved in coastal surveillance would find a compelling reason to access the data.

Attachment A

Coastal Surveillance Operations Scenario with a Surface Wave Radar (SWR)

Marine Targets [Note concurrent detection of marine and air targets]

- Coastwatch, in consultation with its clients, designate a high-risk sector and deploy SWR to conduct 24 hour surveillance of the sector.
- The SWR detects targets [air and sea] and reticulates real-time information [Range, Speed, Azimuth] regarding the targets to the National Surveillance Centre (NSC).
- Information [intelligence], gathered from other sources is correlated with SWR information and the NSC relays back to the SWR operator targets of interest. I.e. where the NSC is unable to identify the target.
- The SWR operator maintains surveillance of the targets and provides real-time track information [course and speed] to the NSC.
- The NSC determines that the target or targets require identification and despatch a patrol vessel [aircraft or marine patrol vessel depending on location of target].
- The SWR continues to provide track information and the patrol vessel intercepts the target [taking the shortest path to the target].
- The patrol vessel identifies the target as a threat and maintains surveillance to acquire evidence that may be used in legal proceedings if the patrol vessel is an aircraft, fuel restrictions may force the aircraft back to base. In this case, the SWR maintains track information until the threat is mitigated.

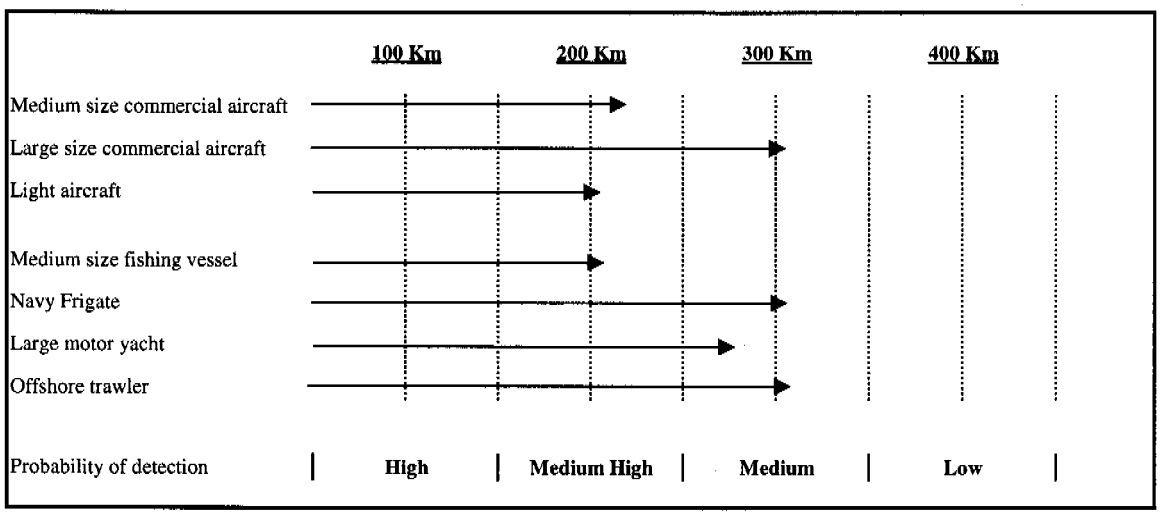
Air Targets ("Black flights")

- Coastwatch, in consultation with its clients, designate a high-risk sector and deploy SWR to conduct 24 hour surveillance of the sector.
- The SWR detects targets [air and sea] and reticulates real-time information [Range, Speed, Azimuth] regarding the targets to the National Surveillance Centre (NSC).
- Information [intelligence], gathered from other sources is correlated with SWR information and the NSC relays back to the SWR operator targets of interest. I.e. where the NSC is unable to identify the target.
- The SWR operator maintains surveillance of the targets and provides real-time track information [course and speed] to the NSC.
- The SWR operator provides probability of aircraft type together with potential aircraft landing areas.
- The NSC determines that the target or targets require identification and provides information to the Federal Police for follow-up.

Attachment B

Predicted Surface Wave Radar (SWR) Performance

The following table depicts the performance that might be expected from a SWR.



Note that for security reason the above table does not depict the expected performance of the SWR presently being tested in Northern Australia. The above performance figures represent predictions made by a foreign manufacturer. TAT expects to exceed these performance predictions.

Attachment C

Telstra Applied Technologies

Submission to the Prime Minister's Coastal Surveillance Task Force

12 May 1999

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Executive summary

At present the majority of civil surveillance flying time used by Coastwatch is spent looking for targets of interest within designated areas – this points to a clear need to optimise the use of limited and expensive labour-intensive assets. In essence, it is not economically viable or realistic to cover the area of our EEZ (9 million sq kms) in this way.

Telstra Applied Technologies (TAT), through its ability to provide specialised data management services and advanced High Frequency Surface Wave Radar technology, believes there is an opportunity to significantly improve the effectiveness of Australia's coastal surveillance operations.

TAT, through Daronmont Technologies Pty Ltd, is now commercially exploiting the Australian-developed Surface Wave Extended Coastal Area Radar (SECAR) as a means of achieving reliable and comprehensive surveillance and detection of incursions of our EEZ.

Below are indicators of how SECAR, located in critical areas, can combine with integrated data management techniques to allow reprioritising of assets, and produce more efficient and effective coastal surveillance.

EFFICIENCY, COST & READINESS:

- Correlation of data from various agencies such as port authorities, air traffic control and maritime vessel management systems combined with data received from Surface Wave Radars can secure a better information base to drive the surveillance program.

- Over an area of 70,000 sq km, Surface Wave Radar can provide continuous surveillance at an estimated cost of $9,000 per day. To provide (non-continuous) surveillance of the same area by existing means – if it were possible – would cost in excess of $48,000 per day.

- Surface Wave Radar as the "enabling technology", is available now and, within twelve months, can be progressively integrated into, without causing major disruption, normal Coastwatch activities.

- Other surveillance activities, such as monitoring local fishing fleets, monitoring of sea states and collection of pollution data (oil spills) can be provided on a user-pays basis.

COVERAGE, FLEXIBILITY & DETERRENCE:

- Surface Wave Radar can provide a detailed picture, within the area of surveillance, of what is out there and allow effective and regular reviews of the adequacy of responses.

- The use of Surface Wave Radar will significantly increase Coastwatch's ability to also detect and track aircraft engaged in illegal activities.

- Surface Wave Radar can be relocated to a new site, at minimal cost, when the pattern of incursions changes.

- It is anticipated that a reduction in the number of breaches of Australian law and sovereignty will occur, as perpetrators become aware of the certainty of prosecution.

OPERATION & RISK:

- Our proposal allows for a single operator to establish an information data base, integrated with existing agency data bases; to provide dedicated communication services between the agencies, and Build Own Operate and Maintain (BOOM) the Surface Wave Radars.

  The provision of these services via a long term BOOM contract would be low risk.

- Government would require no capital investment and the operator would carry all risks associated with the technology.

1. Introduction:

The establishment of the Prime Minister's Coastal Surveillance task force is a catalyst to recognise that:

(i) there is a real increase in illegal activities in Australia's area of interests, and

(ii) Australia's existing coastal surveillance capability requires review.

Hugh Hudson's report "Northern Approaches" in 1988 to the Government of the day went some way in establishing Coastwatch as a vehicle to begin the rationalisation of government "stovepipe" or duplicated activities.

Two public documents which provide a snapshot of where Australia is today are the Government's recently released "Australia's Oceans Policy" and the Coastwatch "Overview" Report of September 1998. After reviewing these documents and taking into account our discussions with various agencies involved in coastal surveillance, it is evident that a Whole of Government approach for all Federal, State and Local Authorities is needed now.

Coastwatch's current modus operandi and charter will not allow it to provide the level of detection and prosecution of illegal incursions that is required if we are to stem the tide illegal immigration, drug trafficking, unauthorised fishing vessels and other transgressions within our EEZ. Nor will the current methods reduce the growing risk that illegal incursions will bring foreign diseases, capable of wiping out vital primary industries.

The following solution will provide the catalyst for a complete paradigm shift in the way that Coastwatch currently operates - freeing current assets, to sweep far wider areas of our coastline and facilitate a more rapid response to unfriendly incursions.

2. Purpose:

To appraise the Task Force of the opportunity to provide significant enhancement of current coastal surveillance operations, specifically through:

- dedicated and tailored data management processes which give users of coastal surveillance services the ability to identify targets of interest and review and analyse clearly presented information;

- a flexible user-pays framework for charging, as appropriate, for the surveillance and data management services used by the various federal, state, semi-government and private entities which have a role in the control of border and coastal matters of any kind; and

- the introduction of surface wave radar systems to perform, continuously, the primary role of detection of unauthorised vessels and aircraft, thereby freeing up valuable air and sea patrol assets, the majority of whose time is presently spent in the expensive and unproductive task of searching, rather than interception and enforcement.

3. Background:

Under a licence agreed with DSTO in 1996, TAT has been pursuing opportunities to commercially exploit surface wave radar technology, and with Daronmont over the last 18 months, has worked closely with DSTO to further its development through R&D effort, including sponsoring of experimental deployments, to continue to enhance range, detection and identification functions.

While DSTO has been pursuing defence applications directly through Department of Defence channels, TAT recognised two years ago that there were likely to be gains by using Surface Wave Radar in other surveillance and monitoring arenas, and has, in particular, been active over that period in investigating its incorporation into the coastal surveillance role. In this context, discussions over some months with Coastwatch personnel and Coastwatch clients have resulted in wide interest in surface wave radar as a prospective surveillance tool.

Further, TAT has a strong background in the development and implementation of data management and communications systems for various public and private customers; and it is from this broader perspective that TAT concluded there is a clear need for improving the methods employed by relevant agencies for data collection, correlation, analysis, protection, screening, presentation, distribution and exchange.

While a detailed profile of the technical aspects of the High Frequency (HF) Surface Wave Extended Coastal Area Radar (SECAR) being developed by Daronmont for TAT is provided in the Addendum to this submission, it is appropriate to summarise its basic characteristics as follows:

- SECAR propagates radar waves following the curvature of the earth and is most efficient over sea surfaces;
- SECAR covers an area of 70,000sq km (at a range of 300km);
- SECAR is capable of detecting low-flying aircraft and small surface vessels; and
- As SECAR is of the HF family of radar, it is highly unlikely that those being tracked will realise they have been detected.
- In 12 months' time, SECAR will give reliable surveillance to a range of 100km, and intermittently, as far as 300km.
- With further development, reliable coverage should extend to 300km.
- Government support for operations would greatly facilitate the introduction of this capability.

4. Issues: Identified Needs & Proposed Solutions

TAT and Daronmont have canvassed, via direct enquiries and historical research, over some months, a number of organisations involved in coastal surveillance, including Coastwatch and most of its clients.

Existing Coastwatch activities.

> *"In surveillance terms, it is simply not possible to 'lock up' an area this large and continuously maintain an acceptable probability of detection against an unknown threat. The key, therefore, is risk assessed operations which are based on good and timely information. Coastwatch's effectiveness is directly related to the effectiveness of the information sources and intelligence assessments which flow from these sources. If these are ineffective then Coastwatch will simply 'bore holes in the sky' with only small probabilities of detection. Put simply, Coastwatch needs and relies on information to plan operations which are conducted in the right place at the right time."* [1]

Coastwatch provides a civil surveillance and response service that covers 37,000 kilometres of coastline, and an offshore maritime zone of 9 million square kilometres. Until now, technology available to Coastwatch and its clients has dictated a "look and see" modus operandi, with strategic surveillance based on historical patterns, such as known movements in national and international fishing fleets and intelligence gathered through clients. The civil surveillance contractor, therefore, spends the majority of the 15,000 flying hours available per annum looking for targets of interest.

Coastwatch currently relies heavily on intelligence from other sources to identify incursions by aircraft, and presently, the use of civil surveillance aircraft to spot other aircraft provides extremely limited capability and capacity to thwart illegal drug trafficking.

Enhanced Coastal Surveillance.

> *"One operational need of considerable importance for Australia is continuous surveillance of coastal waters out to the boundary of the Exclusive Economic Zone (EEZ), 200 nautical miles offshore. Areas of special concern include the Gulf of Carpentaria, Torres Strait, the Great Barrier Reef, Bass Strait, the North-west Shelf, the Timor Sea and the Arafura Sea. Targets of interest in this context range from moderate-sized boats, as used by drug smugglers, fishing poachers and illegal immigrants, to large ships which venture from their expected courses in hazardous waters. Air targets may also be of*

[1] From "Coastwatch – An Overview – September 1998"

> *interest, especially small aircraft used for drug smuggling. DSTO has concluded, on the basis of its expertise in HF radar, that SWR may offer a technological solution to this class of surveillance problems."*[2]

Surface Wave Radar[3] can secure a better information base to drive the surveillance program.

> *"The basic rationale for integrating all available relevant surveillance information and intelligence is to enable those involved in planning and coordinating the surveillance program, to do so with the best available information upon which to base their plans."* [4]

Data collected from agencies such as port authorities, air traffic control and maritime vessel management systems can be correlated with targets detected by Surface Wave Radar, thereby eliminating known vessels or aircraft and highlighting targets which require further investigation.

By appropriate configuration of a specialised data management system, agencies need only provide basic data which will enable filtering to allow elimination of "friendly" sightings. Information regarding the ownership or activity of these "friendlies" will not be required, which means that sensitive information, such as who is catching what and where, will not be available, thus protecting the commercial viability of fishing fleets.

Information derived from Surface Wave Radar alone cannot replace human observation, but it can provide a meaningful basis on which to deploy other assets. At present approximately 70% of the civil surveillance flying time is spent within 70 nautical miles of the coastline. The utilisation of Surface Wave Radar would allow Coastwatch to redeploy aircraft further from the coastline and/or enable faster and more focussed tactical response to detections by the radar.

Aircraft cannot maintain continuous surveillance of an area, indeed we estimate an aircraft would take four hours to cover the same area that Surface Wave Radar would cover in thirty minutes.[5] In broad terms, surveillance of a 70,000 sq km area would cost $230 using Surface Wave Radar,[6] whereas the cost to cover the same area by aircraft would be $4,000.[7] A Surface Wave Radar would cover this area 48 times per day ($9,000/day); aircraft could cover this area 12 times per day ($48,000/day). A 50% increase in the current Coastwatch budget would dramatically increase the current area under surveillance and improve tactical response times.

[2] From DSTO's "Project ILUKA Briefing Paper"
[3] See Annex A for an explanation of Surface Wave Radar
[4] From Para. 4.18 Northern Approaches, written by Hugh Hudson
[5] Assumes a range of 300 km (162nm) from shore.
[6] Assumes cost of single radar $4m
[7] Assumes cost of $1k/per flying hour.

In reality it would be impracticable for aircraft to try to achieve the same surveillance capability as Surface Wave Radar. The number of planes required coupled with availability of qualified crews would be prohibitive. Other technologies such as satellite and unmanned aircraft represent expensive alternatives which will not be available to civil agencies for some years. Surface Wave Radar can be available within twelve months and progressively integrated, without causing major disruption, into normal Coastwatch activities.

Other benefits.

> *"Incursions may be multi-faceted in their consequences, e.g. a foreign fishing vessel landing may create problems for fisheries, plant and animal quarantine, for human health and may also be associated with illegal immigration and narcotics;"*[8]

While it is extremely difficult to allocate the cost of surveillance to particular agencies, based on benefit received, certain surveillance activities such as monitoring local fishing fleets may be viewed as critical to particular State responsibilities. Further, future enhancement to Surface Wave Radar may provide a versatile ocean surface monitoring system capable of providing a full directional analysis of surface wave fields, monitoring near-surface currents, deriving surface wind fields and measuring swell. This capability will prove extremely useful in detecting cyclones, ship routing, general maritime safety and search and rescue, with the prospect of additional capabilities such as detecting and tracking oil spills. Information of this nature could be provided on a user-pays basis.

> *"The potential users of information concerning coastal and offshore surveillance are many, and the administrative structure must be one which:*
>
> - *Reviews effectively and regularly the adequacy of responses so that government is automatically aware of deficiencies;"* [9]

The saying *"you don't know what you don't know"* is very relevant to Australia's coastal surveillance needs – particularly with our offshore maritime zone of 9 million square kilometres. However, Surface Wave Radar can provide a detailed picture, within the area of surveillance, of what is out there and allow effective and regular reviews of the adequacy of responses.

> *"Intelligence can never be sufficient to eliminate the random component in incursions, and one must expect considerable variation in the pattern of behaviour along northern shores."* [10]

[8] From Para. 4.17 Northern Approaches, written by Hugh Hudson
[9] From Para. 3.14 Northern Approaches, written by Hugh Hudson
[10] From Para. 3.9 Northern Approaches, written by Hugh Hudson

The SECAR system currently under construction is designed to be portable, which means it will be possible to relocate a radar to a new site, at minimal cost, when the pattern of incursions changes. Alternative sites might be prepared in advance to allow ready installation and start-up of modular components.

> *"The benefits obtained from aerial coastal surveillance are not directly measurable. The purpose, however, is clear; to detect or prevent breaches of Australian law and sovereignty both by Australians and by foreign nationals."* [11]

Continuous surveillance of defined areas via Surface Wave Radar would significantly increase the ability of Coastwatch to detect breaches of Australian law and sovereignty, and, consequently free Coastwatch civil surveillance assets to focus directly on the prevention of such breaches. A reduction in the number of breaches will occur, as perpetrators become aware of the certainty of detection and prosecution. Further, the use of Surface Wave Radar will significantly increase Coastwatch's ability to detect and track aircraft engaged in illegal activities. Trials to date have shown that light aircraft, flying at low altitudes, can be tracked well beyond the microwave radar range and large commercial jets can be detected and tracked at a distance in excess of 250 km (135nm).

The correlation of data from various agencies with targets detected by Surface Wave Radar, and the subsequent provision of information back to Coastwatch and its clients can best be achieved through a single operator whose prime objective is the supply of meaningful and defined services. A single operator could establish an information data base, fully integrated with agency data bases; provide dedicated communication services between the agencies, and Build Own Operate and Maintain (BOOM) the radar systems. The provision of these services via a long term BOOM contract would be low risk.

Government would neither be required to make any capital investment nor bear any risk, as the operator would carry all risks associated with the technology in the context of its BOOM contract. Reduction in the cost of providing services, or the possibility of further revenues from new services would provide ample motivation for the operator to continue to enhance the technology, thereby ensuring that Coastwatch could maintain best practices.

[11] From Para. 3.5 Northern Approaches, written by Hugh Hudson

5. Conclusion:

Briefly stated, we believe there is a timely opportunity to dramatically improve the efficiency and effectiveness of Australia's coastal surveillance functions by the introduction of leading-edge technology in data management and surface wave radar, at relatively less cost than any other alternative which may be available now, or in the foreseeable future.

While these innovations will neatly complement and enhance existing methodologies, they, in fact, reflect a paradigm shift in approach to the issue, and will allow the responsible agencies to work with confidence in their proper roles of interception and enforcement, leaving detection to be carried out using a more reliable and comprehensive technique.

We look forward to an opportunity to make a detailed personal presentation to the Task Force, at its convenience, and will contact the secretariat within the week to pursue this opportunity.

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6. Sources & Contacts:

Documents:

1. "Northern Approaches" – A Report on the Administration and Management of Civil Coastal Surveillance in Northern Australia.
   Hugh Hudson, April 1988

2. "Coastwatch: An Overview" – produced by the Australian Customs Service, September 1998

3. Command and Control of Civil Coastal and Offshore Surveillance.
   Peter Naylor (former National Manager, Coastwatch)

4. Australia's Oceans Policy (released December 1998)

As well as a number of public information documents from DSTO.

Contacts:

Mr R Stone	Director, Coastwatch Operations, Canberra
Mr A Stretch	Coastwatch Planning & Liaison Division, Canberra
Mr M Hallam	Environment Australia, Biodiversity Group, Area Management & Planning Section, Parks Australia (South), Canberra
Ms K Dundas	Assistant Director, Unauthorised Boat Processing, Department of Immigration & Multicultural Affairs, Canberra
Mr E Curtis	Federal Agent, National Operations, Australian Federal Police, Canberra
Mr G Nix	Senior Project Officer, Intergovernmental Relations, Department of Premier and Cabinet, Queensland Government, Brisbane
Mr D Currey	General Manager, Fisheries Resource Protection Division, Fisheries Group, Queensland Department of Primary Industries, Brisbane
Mr P McGinnity	Director, Day-to-Day Management Co-ordination Unit, Great Barrier Reef Marine Park Authority, Townsville

ADDENDUM
Surface Wave Radar

1. Background.

Since the 1970s, Defence Science Technology Organisation (DSTO) has been internationally recognised for its pioneering work on HF radar exploiting the skywave mode of propagation, especially in the context of Project JINDALEE (HF radars are those which operate in the HF frequency band, 3 - 30 MHz). DSTO has also developed an HF line-of-sight mode radar for short range applications. The third main category of HF radar is that which employs the surface wave mode of propagation; DSTO has conducted research into Surface Wave Radar using a rudimentary system deployed on the Army Proof and Experimental Establishment near Port Wakefield, SA, since 1993.

2. Commercial Licence.

In early 1996 DSTO entered into a licensing agreement with Telstra Applied Technologies to develop and commercialise surface wave radar. The licence provides a very strong commercial development focus for Australia's Surface Wave Radar research efforts and an impetus for further development of DSTO's Surface Wave Radar technology. The licence also provides the necessary early industry involvement in the research and development to ensure a successful partnership for commercialisation.

3. Project ILUKA .

The ILUKA radar project evolved from discussions held over the past year or two by all the parties listed earlier. The decision to deploy an experimental Surface Wave Radar was made in late 1997, with construction and installation commencing early in 1998. Tightly coordinated planning and management, together with an effective team approach, enabled the complex task of designing and building the radar to be completed in a matter of months. DSTO selected candidate sites in the Darwin area and TAT made the necessary access arrangements and provided the infrastructure Experimental campaigns have been held in Darwin over the second and last quarters of 1998. Satisfying results were obtained in every trial undertaken.

Coastwatch personnel attended the first field trials in May/June 1998. The National Manager and senior executives were present in November 1998 for further briefs. Since then, more detailed discussions concerning Coastwatch requirements have been held, and Coastwatch has identified a number of "hot spots" (areas of significant interest to Coastwatch clients) which will allow us to focus on likely deployment sites for the radar.

DSTO has made it clear that its ILUKA system makes no claim to being a prototype for an operational Surface Wave Radar. Rather, it is best described as a laboratory experiment taken out of the laboratory and placed in the field, in

order to gather data and to provide a base on which TAT can make decisions on the future development of the technology.

TAT, through its subcontract with Daronmont Technologies, expects the design and construction of the commercial SECAR system to be completed in October 2000. At that point, SECAR, will at a minimum exhibit the current ILUKA radar capabilities.

4. Principle of operation.

Surface Wave Radar exploits the fact that some radiowaves can propagate around the curved earth as a guided wave, or surface wave, when the surface conductivity is high, as it is for seawater. The resultant field at any point in the illuminated zone is thus made up of a direct (line-of-sight) signal, a skywave signal reflected from the ionosphere, and a surface wave. The relative strengths of these components at the given point will depend on the radar frequency and various environmental factors, but especially on the distance from the transmitter. For ranges between 10 and perhaps 300 - 400 kilometres, it is often the case that the surface wave dominates at points on and just above the surface, thereby providing a mechanism for detection of targets well beyond the visual horizon radar design.

While it is too early to draw any firm conclusions about the ultimate capability of the ILUKA system, let alone a future operational radar designed on the basis of the scientific output from ILUKA, some initial results are worthy of mention:

- merchant ships have been detected to over 250 km range,
- some smaller vessels have been detected to over 100 km,
- a light aircraft flying at low altitude was tracked to well beyond the microwave radar horizon; and
- a large commercial jet was detected and tracked to a range in excess of 250 km.