PLATFORMS FOR MCS

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INTRODUCTION

This paper focuses on available Monitoring, Control and Surveillance (MCS) platforms and sensors commonly used for fisheries compliance control and data management. Certain aspects such as operational use and strategic utilisation of this equipment are not covered since these issues will be addressed in detail in the paper on MCS Operations.

It is important to emphasise that use of MCS hardware should never be assessed in isolation. It belongs to a holistic integrated scenario where legal framework, management plans, scientific needs and economic constrains should be equally considered before implementation.

PATROL VESSELS

A fisheries patrol vessel is a very broad expression for vessels in a variety of sizes with many different configurations. The main principle is to be able to monitor and enforce fisheries legislation on the fishing grounds. The type of fleet to be controlled may vary from artesanal boats to large foreign trawlers. The fleets to be monitored, sea and weather conditions, possible hostile situations, etc. will determine the capacity and configuration required for a patrol vessel.

The following list is not exhaustive but it indicates reasons why countries may consider using a patrol vessel as part of their MCS system, in addition to the fact that patrol vessels usually are the only MCS platforms that can be used to perform offshore arrests:

- To prevent fishing in closed areas,
- To prevent fishing out of season,
- To prevent the use of illegal gear among licensed vessels,
- To prevent unlicensed vessels fishing in any area,
- To prevent illegal catches i.e. undersized fish, illegal bycatch etc.,
- To prevent dumping,
- To assure correct reporting of catches,
- To assure correct reporting of fishing activity,
- To deploy observers or scientific personnel onto fishing vessels,
- To provide support to other platforms such as patrol planes and VMS,
- To provide a service function to the fishing fleet e.g. diving facility, medical assistance, technical assistance etc.

The limitations of patrol vessels are:

- Limited area surveillance capacity,
- Low-speed operation,
- Easily detected and reported by the fishers,
- Costly to operate,
- Requires highly skilled personnel.

PATROL AIRCRAFTS

There is a wide range of aircrafts available with different performance abilities within the range of light aircrafts, which are suitable for maritime and fisheries surveillance. It is generally accepted that these planes should be of the twin turboprop variety. The main qualities required are: rugged construction, pilot friendliness, ease of maintenance and the ability to operate from remote airfields, as well as from their main operating base.

A suitable aircraft should be able to manoeuvre quickly and reach a search or patrol area in a reasonably short time. Also, in order to cover a wide area during a patrol, the aircraft must have a good search speed, but this cannot be too high, as most patrols have a visual element related to identification of vessels. To achieve this, it is advantageous that the aircraft should have a transit speed between 120-150 knots and a sustainable patrol speed of 100-130 knots. On fisheries flights there will be many occasions when the aircraft will be required to loiter or to investigate small areas whilst carrying out identification or photography of vessels. It is therefore highly desirable that a surveillance aircraft is able to safely carry out manoeuvres such as a steep turn around a target at 70-90 knots. It is necessary for the aircraft to remain on task for comparatively long periods, which requires long endurance at slow speed.

The limitations of patrol aircrafts are:

- Generally only suitable for controlling border and area violations,
- Weather limitations,
- Costly operations,
- Requires highly trained staff,
- Cannot enforce any regulations (unarmed airplanes).

USE OF CHARTERED AIRCRAFTS

It is worthwhile looking into the cost-benefit side of a chartered aircraft used for air surveillance once or twice a week. There are many cases where this is far more cost efficient than actually owning and operating a similar aircraft. World wide the trend towards using private companies for maritime surveillance is growing as private companies tend to be more cost effective and respond to technological advancements much faster. Many countries, including Australia, Canada, Norway and Great Britain, now use private companies for much of their maritime and fisheries surveillance activities. This growth in private sector surveillance has expanded the types of aircraft and equipment used for maritime surveillance and this is now trickling down to government operations. An example of this can be seen

when comparing the cost of a fully equipped Orion P3 aircraft at around 50 million US dollars and a B-200 aircraft at around 4 million US dollars. An example from Canada is given in Annex A.

COMMONLY USED SENSORS

Again the type of operation will determine which sensors will be required. Photographic equipment like cameras and videos are primary tools to secure evidence from smaller crafts. Larger patrol vessels will normally be equipped with radar(s), night vision equipment, satellite positioning systems (GPS), radio scanners and direction finders. (Weapons are normally fitted as required related to the situation the vessel is operating under.)

CAMERAS

The use of cameras to allow evidence from a patrol vessel or aircraft on its own to support fisheries prosecutions is becoming more widespread and cameras in the correct configuration are now widely recognised by courts as being reliable instruments.

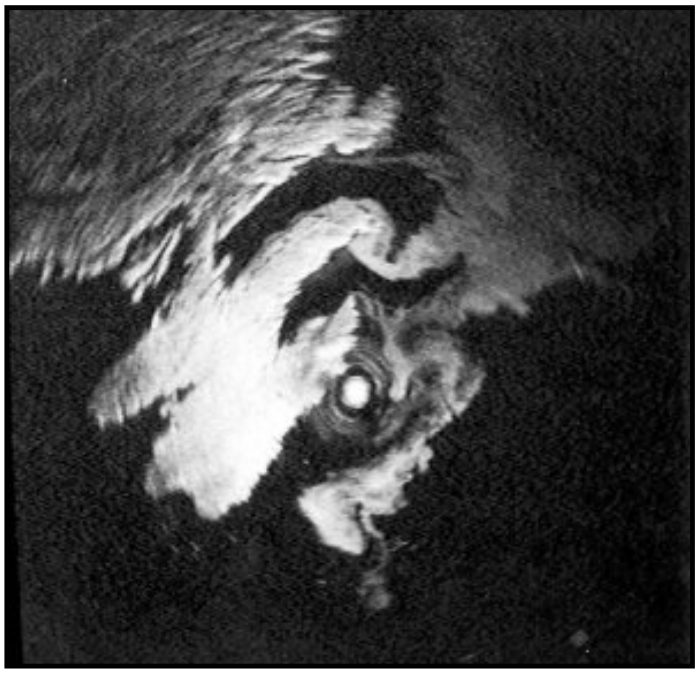
A number of systems are capable of printing the required position, date and time on to the film and are generally accepted to be reliable

Photography itself requires cautious considerations. It should always be borne in mind that the on-board camera records the position of the craft and not the target, hence the importance of what is termed ‘on top’ photography and this is particularly important if the offending vessel is observed close to a boundary. Once an offender is identified, the vessel or aircraft should take photographs of:

- The offence being committed; for example, gear in the water, gear not stowed and ready and in a position that would allow fishing,
- A clear view of the vessel showing name and/or call sign if visible,
- An ‘on top’ photograph to enable the Date Time Group (DTG) printed on the exposure to coincide as nearly as possible with the geographical position of the aircraft,
- Any additional photographs that the aircrew think necessary to clarify the sighting.

RADAR

All maritime and fisheries surveillance aircrafts and larger patrol vessels should be equipped with a powerful search radar system that is capable of detecting vessels out to 150 – 200 nautical miles from the aircraft or 25-50 nautical miles from a patrol vessel. The radar needs a variety of functions including multiple tracking of targets, alarm functions for border violations etc. A system that can be integrated together with other sensors in a “command” unit would be preferable. The first picture below shows a typical radar picture where the white in this case are land formations. The next picture shows a typical radar station onboard a fisheries surveillance aircraft.



FORWARD LOOKING INFRARED (FLIR)

The aid in nighttime target identification are infrared imaging systems mounted in a gyro-stabilised turret. The system allows for clear and precise target acquisition and tracking of targets even in total darkness. The picture below shows an infrared image of a trawler by night.

DIRECTION FINDING SYSTEMS

These systems enable the aircrew to perform in-depth analysis, location and identification of any transmissions from the fishing fleet. The system can be valuable for the location of fleets and vessels.

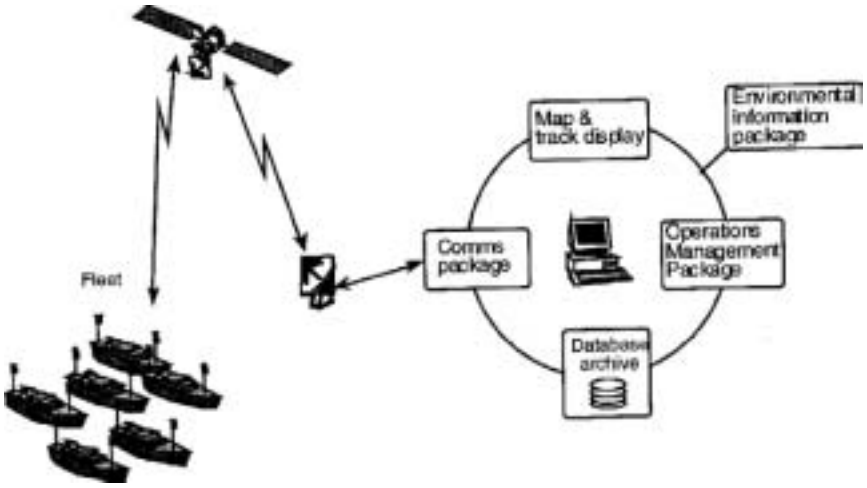
OTHER SENSORS AND FEATURES

Other sensors and features are:

- Low-light cameras/television that increase nighttime capability.
- An observation window for visual search or photography.
- A drop hatch for airdrops of marker buoys and survival/rescue equipment.

The list could be made much longer but at least the most common and relevant equipment for tactical utilisations of fisheries surveillance platforms have been listed. Additional tasks may require different configuration or additional sensors. A plane equipped with the mentioned sensors could be used for a number of missions in addition to only fisheries surveillance, for example search and rescue, pollution monitoring, maritime surveillance and inter-ministerial assistance. The picture shows a vessel photographed in total darkness with flashlight.

VESSEL MONITORING SYSTEMS (VMS)



VMS is one of many tools for fisheries management to assist in more timely and cost effective monitoring and control of authorised and participating fishers. VMS provides another effective tool for MCS, particularly for developing countries that lack the financial and physical resources to support an effective, conventional MCS capability. A Vessel Monitoring System (VMS) provides real-time Position, Course and Speed (PCS) data through a satellite link directly into a base station. This allows operators to follow all licensed activity as it happens. This data are displayed on electronic maps with an accuracy up to 100 m (Global Positioning System based positioning). Fishing in illegal areas, transshipments of fish and transfer of fuel are all violations that can be indicated through this system.

Catch and effort data can be forwarded through the same system for assisting in management of quotas and research when required. Additional information from other sensors such as gear detectors, engine detectors, etc. can also be attached to the system. It is also worthwhile mentioning the maritime safety benefit for Safety-at-Sea. VMS creates a solid safety feature for all vessels and crew as their position is known at all times with an emergency function built in to the system for this purpose. VMS also has an added benefit for the industry in providing the capability for fleet management.

SHORTFALLS OF VMS

- The VMS will not locate vessels that are not participating in the system, it is not a radar, which covers all contacts on the sea and consequently you cannot afford to be negligent of the other traditional MCS activities to monitor those vessels without VMS. VMS does not replace traditional MCS activities; it supplements them and enhances their efficiency.
- VMS information acceptance in court needs to be tested. Experiences indicate that an additional sensor such as a patrol vessel, plane, satellite image or observer is needed to secure sufficient evidence in case of violations.

- VMS security will place considerable demands on staff and infrastructure.
- VMS maintenance will require highly qualified IT support or the system will fail.
- VSM coverage on only some vessels in an area reduces its potential benefits for patrol planning.

IMPLEMENTATION LIMITATIONS OF VMS

Issues to be considered before implementation of a VMS include:

- Legislative support;
- Information Technology (IT) capability and support for VMS;
- Operations Centre capability, staffing and procedures;
- Local company support;
- Security of the system and data; and
- Cost

SATELLITE IMAGING

Satellite imaging is another tool that can be successfully integrated with VMS. The latter is still a reasonably new technology to be used in fisheries management, but the advantages of integration with VMS can be significant for surveillance purposes. Satellite images like RADARSAT-1 (picture at the end of the paragraph) are offered commercially.

In the satellite picture a ship acts as a bright point target against the ocean background clutter. Ship detection is dependent on ship size and type, as well as wind speed. As wind speeds increase, the clutter from the ocean background also increases, making it difficult to distinguish the return from a bright point target. The presence of a wake can be used to determine ship heading and speed.

Integration with VMS will give a reasonable and cost effective tool to detect unlicensed vessels that are not logged on to the VMS. The picture below shows how vessels can be detected on a satellite image.

COASTAL RADAR SYSTEMS

Some countries have coastal radar surveillance mainly for military purposes. These radar chains can be utilised for monitoring of the near costal fishing fleet if available. Normally these radars have a coverage of about 30 nautical miles. These systems could be valuable to monitor closed or restricted areas, but fast response units such as smaller patrol crafts or planes would be required to investigate possible violations and to secure acceptable evidence.

NAVY/COASTGUARD

Governmental duplication of MCS tasks is common and often creates some discussion on where responsibilities should be allocated to maximise effects or to reduce costs. This can easily result in compromises were the fisheries surveillance loose in competition with military objectives. It is quite obvious that a diverse task requires a broad knowledge of the operations with priority being directed to the main purpose. With this in mind it is important to remember that a Navy is normally neither designed, educated or particularly trained for fisheries MCS operations. The organisation can be a valuable asset in the sense of boarder violations of unlicensed vessels, etc., but it is seldom efficient with catch or gear controls.

A Coast Guard is far more aimed for the fisheries protection task and less advanced than a Navy in terms of training and equipment. A Coast Guard is normally designed to meet the requirements of the United Nations Law of the Seas Convention with basic police tasks to perform with emphasis on boarder violations, fisheries, Search and Rescue Operations, custom and immigration tasks. Anyhow, even a Coast Guard is a compromise compared to a specific fisheries protection agency.

ANNEX A

Fisheries and Oceans Canada

News Release

Five-Year Air Surveillance Contract Awarded to Provincial Airlines Ltd.

OTTAWA -- Provincial Airlines Limited (PAL), based in St. John's, Newfoundland, has been awarded a competitive contract to provide fisheries air surveillance services for the Department of Fisheries and Oceans (DFO), to September 30, 2004.

The announcement was made by the Honourable Fred Mifflin, Minister of Veterans Affairs and Secretary of State (Atlantic Canada Opportunities Agency) on behalf of the Honourable David Anderson, Minister of Fisheries and Oceans and the Honourable Alfonso Gagliano, Minister of Public Works and Government Services.

"This contract will help us protect our fisheries and marine resources by strengthening our existing capability to conduct air surveillance up to 400 miles offshore," Minister Mifflin said. "It will also help us meet our international obligations."

The contract will provide DFO with three modified Beechcraft King Air B200 aircraft containing a suite of sophisticated and fully integrated surveillance equipment, which is effective, both during the day and at night. This includes: a 360-degree search radar system, a specialized data management system, a unique nighttime photography system, an infrared telescopic camera and modern navigation and communications systems. The contract is expected to maintain up to 24 jobs for each of the three aircraft, including highly trained and capable crewmembers.

This high-powered technology is aimed at protecting Canada's precious marine resources. It provides support to DFO patrol vessels, a deterrence to illegal activity and, where violations are found, also helps Fishery Officers and aircraft crewmembers work quickly and accurately to document them for the successful conviction of offenders.

These aircraft operate mainly off the East Coast but can be moved to any part of Canada where their services are required. During the summer months, one aircraft is sometimes deployed to British Columbia to monitor the salmon and groundfish fisheries. In total, these aircraft normally operate about 3,500 to 4,500 hours annually.