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Aerial surveillance technology and capability

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Abstract

The importance of aerial surveillance has long been recognised as a critical part of spill response. Understanding the problem, knowing its location and scale is crucial in being effective in responding. Over the years different skills and technologies have been applied to the problem and in that time a number of issues have been identified as playing a vital part in efficient surveillance and reporting :-

- *It is important not to assume the best case and be optimistic, the worst generally always happens*
- *It is important that experienced observers are used when carrying out surveillance*
- *It is important to be methodical in the approach to surveillance*
- *It is important to have continuity of observers to get consistency of reports*
- *It is CRITICAL to get the information in the command centre as soon as possible in a manner that people can understand*

From the above it is clear that it is a combination of skill, planning and technology to achieve the a significant factor for the industry when spills have occurred. The impact of failure and error can lead to disproportionate regulatory, public and political interest in spills that otherwise might be characterised as being minor in nature. The quest for better surveillance, quantification and reporting continues. This paper will look at some the developments and improvements in technology planning and capability recently introduced by OSRL and look at how they can benefit overall spill response delivery.

Background

Recent spills have demonstrated the critical nature of surveillance, tracking and quantification when responding to oil spills. A failure to quickly and accurately quantify the oil amount of spilled, understand its movement and fate will make relationships with regulators and other stakeholders more difficult. The only absolute way of measuring the oil loss is by direct measurement, but this is not always possible so some system of estimation is required o assist the responder.

The traditional way monitoring oil spills through observation has been by the use of aerial surveillance technology. The sensors employed include Visual, Infra red, ultraviolet and radar. These sensors can give indications of the amount of oil present on the sea surface but there are few that can provide thickness data. The thickness is traditionally estimated using colour comparison scales, such as the Bonn Agreement Colour Observation Code which relates the oil thickness to the observed colour. The area coverage is then established, giving a volumetric calculation Minimum (used as the legal minimum of oil spilt) and Maximum (the quantity used to respond to). The method is approximate and can give results that may vary by an order of magnitude dependant on the skill of the observer and is designed to give a range of possible spills size. It is possible that false images may be detected that look like oil and provide incorrect results.

The tool is useful but most often the regulator is looking for an accurate report of the amount of oil spilled. To validate these results it is important get as many observations and systems working as possible to cross check the results.

As well as the volume the location and movement of the oil is required to assess its possible impact. This is achieved using geo-referenced observations from the aircraft. Search patterns must be established, the directions to locate the centre of the search pattern might often be identified using a surface drift model. It should always be remembered, the model does not tell you where the oil is, it tells you where to start to look for the oil.

Key point 1 : Colour observation codes provide only rough estimates of the amount of oil spilled. They can indicate the difference between a 1 cu.m. , 10 cu.m., 100 cu.m.or a 1000 cu.m. spill but not much else.
Key point 2 : Observer must be skilled in aerial observation to know how to conduct a survey and recognise oil on the surface
Key point 3 : It is not wise to keep changing observer during an operation as errors in calibration will occur
Key point 4 : The more suitable the aerial platform the better the results
Key point 5 : Models provide guidance on where to begin searching for oil not the location of te oil

Conducting effective Aerial Missions

Good practice is to clearly define the mission you are asking the aircraft to undertake this will ensure that the end uses of the gathered intelligence get the results they require. Splitting the missions in to 4 clear areas assists in this process of clarity.

1. **Verification**

The purpose of the verification flight is to determine whether or not there has been a spill. In the event that no oil is found it is as important to capture evidence of this when surveying the area as it is for any positive verification of pollution, this may have come from a know process upset or a Satellite detection.

2. **Quantification**

The purpose of the quantification tasking is to determine the volume of the oil on the water as discussed previously.

3. **Monitor and Evaluate**

The purpose of the monitor and evaluate is determine the location of the spill and note the condition of the spill (i.e. whether it may be naturally dispersing, emulsifying etc.), note the direction of travel and act as a tool to confirm the Spill models and satellite detections

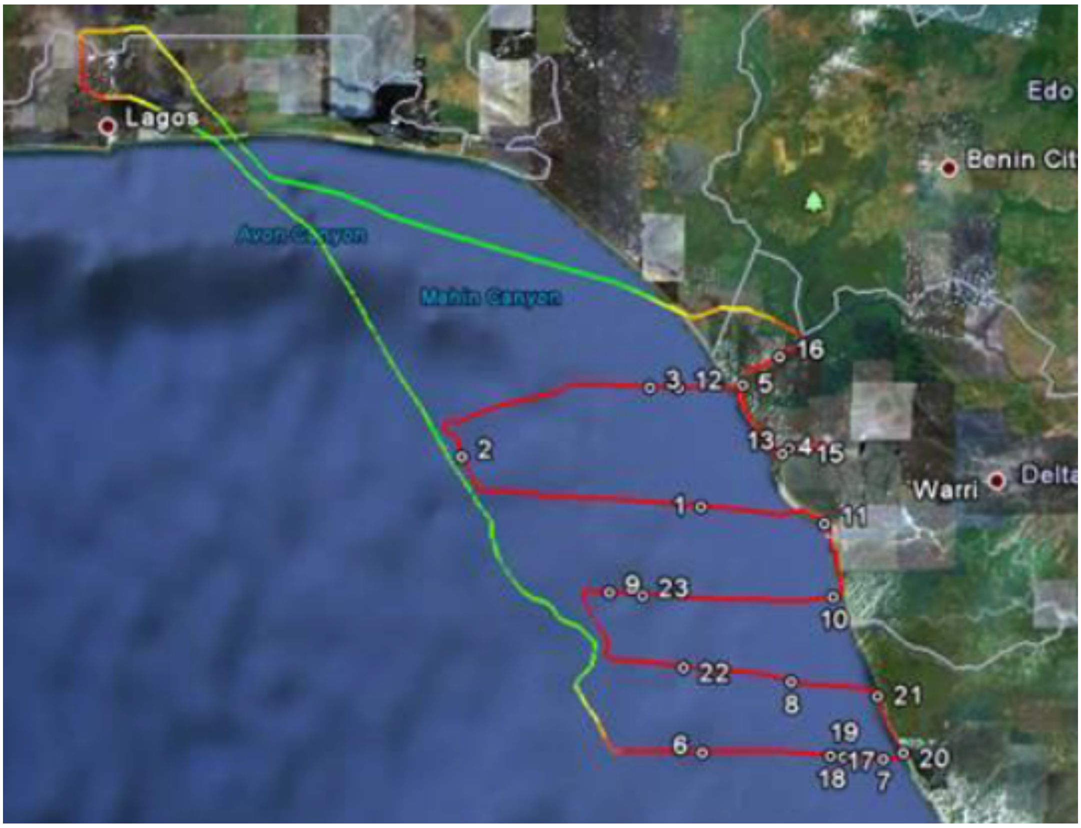
4. Provide Operational Support

To provide targeting and observation guidance for response operations, eg : Aerial dispersant aircraft typically fly 100-150 ft above the water to apply dispersant at the correct droplet size and swath width. Visibility from the spray aircraft is therefore limited. A spotter aircraft flying above the spray aircraft can inform the spray crew they are on target, increasing the efficiency of the dispersant application operations.

Likewise, vessels that are involved in response operations have a 'low height of eye' and therefore require aerial surveillance support to ensure that they are targeting the thickest 'leading edge' part of the spill.

Flight planning and execution

Establishing effective search patterns to ensure that the whole threatened sea area is covered is an important part of effective surveillance for Verification, Quantification and Monitor and Evaluate missions. The over-flight should be planned and clearly briefed to the aircrew to define the objective, flight paths, targets, areas of interest for the flight; this is best achieved by a signed work assignment that is agreed by all parties.



Flight tracks need to identified, GPS tracking systems can be used to produce charts that show the track of the aircraft in the debrief / report. Timing of the conduct flight is critical, low angle sunlight, precipitation and cloud will all affect the quality of observations.

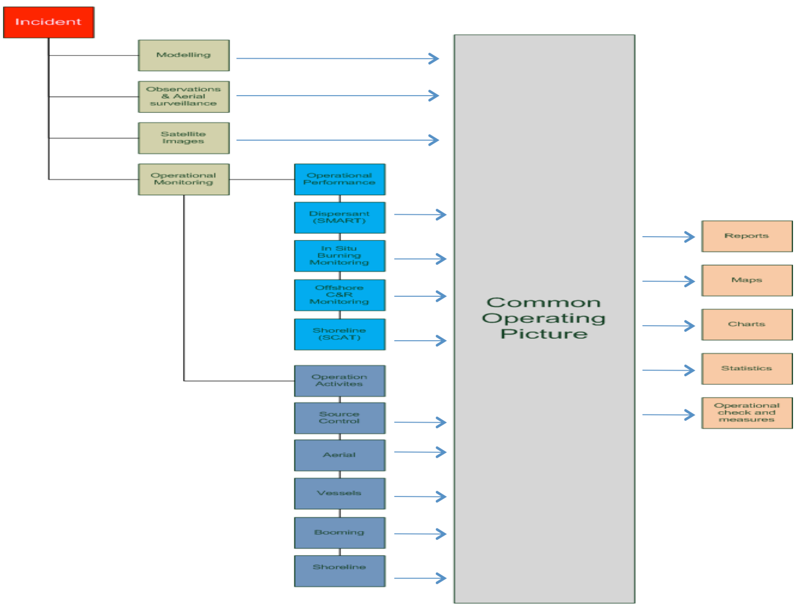
Key point 6 : Carefully plan flights to set aims and objectives before departure
Key point 7 : Time flights to avoid low angle sunlight where possible

Getting over-flight information back into the command post

In the past there has often been delays in getting the information off of the aircraft and being able to present it in a usable form in the command centre. The speed of response is based on the time that information becomes usable, not when it is obtained. This is a critical part of the response management as until the data is received, decision making will be either less effective or delayed. Having the ability to transmit data from the aircraft into the command post via the internet and also stream video and images greatly assists operators in their response planning and satisfies the regulators and government with their information requirements.
Key point 8 : Information transfer is key to making sound incident decisions.

Integrating inputs to achieve a Common Operating Picture

The next step is to integrate the entire information into a viewing platform to produce a Common Operating Picture (COP) see below, all intelligence inputs need to be combined and reviewed as a whole to ensure a complete picture. Therefore when required Modelling (OSIS, Oil Map, OSCAR), Observations (aerial surveillance) Satellite images as well as operation performance and activities need to be combined to give the management team the best and most complete information to base immediate and future decisions on.



Key point 9 : Information need to be collated, reviewed and seen as one to give the management group and regulators the most complete information.