

# THE USE OF HOVERCRAFT FOR OIL SPILL RESPONSE

Mark Shepherd

Agip Kazakhstan North Caspian Operating Company/Oil Spill Response Limited.  
Lower Williams Street,  
Southampton, SO14 5QE, United Kingdom

## ABSTRACT

*Oil exploration and production operations have expanded in the shallow and environmentally sensitive waters in the northeast area of the Caspian Sea, calling for new and innovative methods for oil spill response countermeasures. Water depths as low as 0.6 metres and ice conditions for up to 5 months of the year, present severe planning and response challenges.*

*Agip KCO is in the process of testing air-cushioned vehicles (ACVs)—also commonly referred to as hovercraft, for both Emergency Escape and Rescue (EER) and oil spill response operations.*

*Two such ACVs were sited in the Caspian Sea during 2003 for trials. Tests included boom deployments, skimming operations and general operational criteria. Further trials are planned in 2004, to assess suitability for use within reed bed areas and their benefits over other, more conventional craft in this special operating environment.*

*This paper describes the trials carried out 2003 and their results, together with a review of the issues that are to be addressed*

## BACKGROUND

Over recent years oil exploration in the Northeast Caspian Sea has been increasing. The northeast Caspian Sea is a unique environment; with temperature ranges from +40 degrees Celsius down to minus 40 degrees Celsius. For up to five months of the year the northeast Caspian Sea is frozen.

The Caspian Sea has no tidal currents, however there are water shifts caused by wind direction. This can cause the water level along the northeast coastline to fluctuate by up to 2 metres. This area has become known as the "Transition Zone". Around this area there are a lot of ex-soviet wells that were drilled as land wells in the 1970's. Due to the increase in the Caspian water level during the 1980's, these wells can now be submerged below the water level if the wind direction comes from north or the northeast, or above the water line if the wind direction is south or south west. This can change the coastline by up to 30 kilometres out.

The Northeast Caspian coastal area around the Ural River delta (the second largest river flowing into the Caspian Sea) round to the Volga river delta, has been classified as a state nature reserve; regulated by its own piece of legislation. This area consists of extensive reed beds and marsh areas, major wildlife habitats as well as fish spawning, nursery and migration areas.

With all this in mind the oil operators needed to look at the best possible means of transport which would cause minimum environmental impact to the operating environment.

Over the years tracked and balloon tired vehicles have been used for carrying out surveys in the transition zone. These vehicles leave tracks that take several years to recover. There are also safety issues as these vehicles regular get bogged in and required recovery.

In the early part of 2002 it was decided to look at the use of hovercraft. The driving factor on this was the requirement to have a vessel / vehicle that could operate in the shallow waters, transition zone and during the winter months. Air cushion vehicles (ACV) have undergone numerous evaluations in regards to their environmental impacts. These studies in general concluded that ACV created less environmental impact than any other form of transport in these sorts of areas. ACV also has an excellent safety record and over 30 years experience in operating in harsh environments. The scope of work was drafted as to the roles the craft would be required to perform. These were defined as Escape, Evacuation and Rescue (EER) and Oil Spill Response (OSR).

A Hovercraft Consultant contacted Oil Spill Response Limited (OSRL) and asked them to define the type of equipment that might be required to be carried and deployed from a vessel / craft. A meeting was held so as to understand the craft that were being proposed and their layout and limitations. The craft that were identified were both AP 1-88, Idun Viking an AP 1-88/100 and Manta AP 1 88/300

Manta was the craft that was identified as the primary OSR vessel. Manta is a modular craft with a removable passenger compartment. With the passenger compartment removed the craft can carry in the hold a standard ISO 20' container. Footprints and weights of offshore boom reels were sent to the hovercraft consultant so as to ensure that there was adequate space and lashing points for the boom reel within the cargo compartment. A suitable Hiab crane was also located and bracing bars fitted to the craft for locating the crane when in cargo mode.

Both craft underwent extensive refits before being shipped to Kazakhstan. Unfortunately during this period it was not possible to test the craft in OSR configuration, this would have to wait until the craft arrived in Kazakhstan.

## OIL SPILL RESPONSE TRIALS

The aims and objectives of the trials was to ascertain the suitability of ACV (Air Cushion Vehicle) for use in oil spill response operations, the main goal being to look at the potential uses for equipment deployments in the ultra shallow waters of the Northeast Caspian, what type of equipment best suited the craft and the limitations of using ACV for oil spill response operations.

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The first trial to evaluate the use and roles that an ACV could play in the event of an oil spill, was carried out in February 2003, at Bautino marine supply base, Kazakhstan. The ACV "Manta" was used in cargo mode for conducting these trials along with 200 metres of solid flotation boom (*Troil boom 1100*) complete with hydraulic boom reel and hydraulic power pack and an oleophilic disc skimmer (Komara 12K). The first thing that was noted was that the boom would need to be deployed over the cargo wall, which stands from deck level at approximately 1 metre. It would then pass over the engine covers. The problem with this was that there were several sharp ledges that the boom would need to pass over and it was felt that this could damage the boom. The solution was to construct a chute that would allow the boom to pass over these areas. With the chute in place a test section of boom was run out through the chute, on recovery of the boom it was found that chute was hindering the deployment and recovery of the boom by snagging it at the boom joining sections.

As there were no other vessels available at the time, it was decided to secure the boom to an anchor point on the beach. The ACV then slowly started to move away from the beach while the boom was being paid out. Due to the wind effect on the side of the ACV it was difficult to control the tension on the boom and this was causing the anchor point to move and pull towards the waterline. Once the boom was clear of the reel a boom was attached to the towing end and the boom released from the vessels. The ACV then manoeuvred into position and the boom secured to the ACV, at slow speed the ACV proceeded into a "U" formation so as the crew would get a feel for manoeuvring the craft with the boom attached. The whole operation from start to finish took just over 1 hour. Once the boom was recovered back onto the boom reel, the skimmer was made ready for deployment. The intent was to get a feel for any effects that might be caused by the down force of the ACV and whether longer lifting straps would be required to lower the skimmer over the side of the craft. With the skimmer deployed over the side of the craft and into the water there were no concerns regarding the down drafts or of the operation of the skimmer or any safety issues associated with using the skimmer in an oil recovery operation.

The plan for the following day was to once again deploy the boom from the ACV again and one of the Shallow Draft Tugs (SDT) would pick up the line. Once both vessels have the lines secured onboard both vessels would try both "J" and "U" boom towing formations.

The following morning a briefing was held with both vessels to plan for the day. However due to wind speeds in excess of 30 knots in the bay it was decided to cancel the deployment. These wind speeds continued for several further days and therefore the trials were suspended until both the ACV were out in the field.

During the ramp up to the commencement of the craft being deployed in the field the ACV operator constructed a floating garage that the craft would sit on during stand-by operations of the rig. It was decided to put a 20' shipping container containing oil spill equipment onboard the barge. A three door container with 200 metres of Troil boom GP-1100, a skimmer and temporary storage bladder, the configuration on the barge would allow for the boom to be deployed from the barge rather than transferring it into the cargo bay of the ACV Manta.

During July 2003, with both the "Manta" and "Idun Viking" on location and the hovercraft barge with the oil spill response container onboard, arrangements were made to run a series of training exercise, with both crews. The first day was spent with both crews going through the equipment, its uses and limitations, as well as the fate and effects of oil on the sea surface. Once this was complete the roof was removed from the "Manta" and the crane installed.

Day 2, all the equipment was made ready for deployment and a briefing held, the plan was for the Fast Rescue Craft (FRC) to

collect the towing end of the boom and run the boom out of the reel, it would then pass the towing line to the "Idun Viking" and return to the barge and collect the other towing end, and proceed in conjunction with "Idun Viking" into a "U" formation.

This operation was successful. There was however a few minor problems with the container set-up on the barge, that need to be addressed. The main problems encountered was the location of the oil spill equipment storage container on the barge. The container used was a 20 foot side opening freight container. This was positioned on the side of the barge with the side doors slightly overhanging the hull of the barge, which made it very difficult to recover the boom on to the reel, it was also found that the boom kept catching on the door securing latches. To overcome these problems a roller was made up and connected to the floor of the container to aid in deployment and recovery of the boom. It was also felt that the FRC (Fast Rescue Craft) was a little bit under powered for the operation. The FRC used was a 5 metre ridged inflatable with an 80 horse power outboard engine. It was therefore decided to pass the line from the FRC, to the "Manta".

With both towing ends secured to Idun Viking and Manta, the two vessels were requested to form a "J" while keeping the forward speed at under 0.7 knots. Once this had been achieved the formation then moved into a "U" formation. Once again this manoeuvre was successful. As the deployments continued the crews of both vessels grew confident and proceeded with changing formations and lead vessels.

During the deployment the power to both thrust engines was isolated, for safety reasons. Personnel would be required to work on the side of the craft to secure the boom alongside and also to minimise the chance of lines or the boom being pulled into the propellers. The lift or bow thrusters were used for manoeuvring the craft throughout the whole deployment. The boom was recovered back onto the barge by utilising one of the craft to keep the boom inline with the reel as it was pulled back onboard.

On completion of the deployment a debrief was held to discuss what went well and what could be done to improve the operations. The key findings from the trial was that exceptional manoeuvrability was achieved when the boom was towed in formation between the two craft, there were no concerns from the pilots with regards to any of the aspects of the deployment and they found that changing direction was achieved with great ease. The biggest concern to all those involved was the layout of the oil spill container on the barge, and the pilots of the craft were satisfied with the way the deployments had gone, and how the vessels manoeuvred with the equipment deployed. All those involved believe more practice is needed.

## CONCLUSION

During both trials the ACV proved themselves to be a very useful platform to operate from during oil spill response operations in both the shallow waters and during the ice season. No specific trials have as yet been conducted during the ice season with the focus on oil spills, but they were used on numerous occasions for freight movements during the ice season. Hovercrafts have been used for all sorts of operations at other locations, on ice and in broken ice and their capability has been well documented for this type of environment.

### What next for ACV and oil spill response in the Northeast Caspian:

There are on going studies into the use of ACV for both EER (Emergency Escape & Rescue) and OSR (Oil Spill Response), these studies are looking at both existing craft and new generation craft. New generation craft investigations would consider what are the requirements of OSR, changes to designs / construction

to allow benefits such as lower cargo walls, bow ramp doors as well as larger cargo bays. The effect of ACV on oil on the water surface, specifically looking at spread and dispersion of oil caused by the down draft from the craft .

Once these studies are complete and suitable craft have been designed, an on going training and trial program will be established to look at conducting more boom towing trials with different types and variations of boom and response equipment, utilising hovercraft in oil recovery operations at the apex of a boom and trials involving oil spill response in both solid ice and broken ice. During their time training time both ACV's and their crews have proved themselves to be a very useful addition to the oil spill response capability.

### BIOGRAPHY

Mark Shepherd, a senior consultant with Oil Spill Response Limited, has worked in the Kazakhstan region since early 2000 on a range of issues. Mark is now seconded to Agip KCO as their Oil

Spill Response Coordinator, based in Atyrau, Kazakhstan. There Mark heads up the Oil Spill Response Group, dealing with prevention and preparedness issue across the whole Agip KCO project.

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