

# Griffon design for geophysical work in Arctic Ocean

UK-based Griffon Hovercraft has built its most popular design – 2000TD – for marine geophysical work in the most inaccessible regions of the Arctic Ocean. Here we look at how this design benefits marine research scientists working in the region.

**T**he 2000TD Mark II hovercraft was chosen by marine geophysicists, Dr John K Hall, from the Geological Survey of Israel and Professor Yngve Kristoffersen of the University of Bergen in Norway. It was given the name R/H *Sabvabaa* after the Inupiaq word for 'flows swiftly over it'.

R/H *Sabvabaa* is 12m loa with an obstacle clearance of 73cm and 2200kg payload above its 5000kg empty weight. Its cabin is configured with accommodation facilities comprising four bunks, an aft cabin, computer workspace and kitchenette. During sea trials the craft attained a maximum speed of 43kts (with full payload). The economic speed is around 25kts.

Designed specifically with the arctic environment in mind, it has double windows and 5cm of insulation. A forward-looking infra-red sensor (FLIR) allows night vision. A full Furuno navigation suite with radar and map display is installed, together with marine and aircraft very high frequency (VHF) radios as both base stations and mobile units, and three Iridium satellite telephones with internet and data transmission capabilities. A gigabit LAN provides navigational information to up to eight laptops, operating off the science battery bank, which is also charged by a rooftop solar panel. There is a full complement of mandated safety equipment (EPIRB beacon, life-raft and so on), as well as a portable winch attachable to points fore and aft for pulling the craft off obstacles onto thick ice.

Four extra fuel tanks on the side-decks provide 1600litres of fuel for R/H *Sabvabaa*'s water-cooled Deutz 440hp diesel engine. Around 40% of the power is used for the lift fan, with ground loading of about 0.5bar. Thus 60% of the power is available to the ducted variable-pitch propulsion propeller. The engine has a very large alternator, as well

as a hydraulic pump supplying energy to two battery banks and hydraulic implements such as an air compressor, winch and ice-drill. Baseboard heat is supplied while underway and two economical diesel-fed Danish Refleks heaters provide warmth and cooking surfaces when drifting. An exterior diesel-powered 6kVA generator also has its own hydraulic pump for static use. Under power, the usage is 1.5litres/km and the craft can cover more 800km before refuelling.

## Scientific capabilities

R/H *Sabvabaa* is completely outfitted for science. For depth measurements there is a Knudsen 12/200kHz echo-sounder with 5000m capability, which can also be used to follow the deep scattering layer. A Knudsen four-element chirp supplies shallow sub-bottom information, while deep seismic profiling is done with a 20inch<sup>3</sup> air-gun and a six-channel streamer. This equipment can either be towed in leads of open water, or used while parked on floes moving at rates up to 20km/day. The hovercraft is the ideal platform for deploying these systems, which consist of a sparker, hydrophone, solar panels, wind generator, computer, GPS and Iridium telephone. After every 50m of drift the system fires the sparker and then transmits the received signals to Bergen as a short burst data (SBD) packet.

The hovercraft is primarily intended to operate in areas of very thick ice, laced with long open leads, where icebreakers have yet to penetrate and where some of the most intriguing results were found from the ice-station work.

R/H *Sabvabaa* is also equipped for direct sampling of areas of interest on the seafloor detected using the seismic gear. A large tent can be affixed to the craft over the rear door, offering weather-free access directly to the ice from the after (air-lock) cabin.

When installed over a suitable opening cut or drilled through ice, the tent provides a workspace for a specially built lightweight winch. This winch can handle up to 3000m of Kevlar aramid fibre line, which is run around a hydraulically powered capstan.

## Operations

R/H *Sabvabaa* was ordered in October 2006. Construction was completed in September 2007 at a cost, including the majority of the scientific gear, of less than US\$1.5 million. Sea trials and acceptance tests were carried out successfully in the Solent between Southampton and the Isle of Wight in October 2007. On 2 June 2008 the hovercraft arrived by ship in Longyearbyen on Svalbard where it is based at UNIS, the University Centre in Svalbard.

In total R/H *Sabvabaa* completed over 3300nm during the first season with a total of 318hrs on the engine. The craft performs at least as well as expected in pack ice. Pack ice fields may look messy, but usable passages can always be found with little delay. A rule of thumb for all ice surface travellers is that the actual distance made between two points will be 1.5-2 times the great circle route.

R/H *Sabvabaa* moves with the same ease over thick ice as over thin, and the craft has proved to be useful for a variety of scientific tasks. It appears more efficient than any other platform for ice thickness measurements and oceanographic work (i.e. ice melting/freezing processes in general). It is, however, a small vessel and requires relatively good weather conditions for unsheltered open ocean passages. Future use of the craft jointly with an icebreaker expedition is expected to significantly increase the scientific efficiency of the total operation.

R/H *Sabvabaa* belongs to Blodgett-Hall Polar Presence LLC, based in Delaware, USA. **SBI**