As reported in *Advantage* magazine, Spring 2005, Gurit was awarded a contract from Isle of Wight based company Hoverworks for the structural design and build of a number of propeller ducts for their new BHT 130 hovercraft.

The Canadian coast guard currently operate a fleet of Hoverworks’ AP188 hovercraft and have placed an order for the new BHT130’s. Their existing craft routinely operate in temperatures of -20°C and over the years their ducts have incurred impact damage caused by ingestion of sand and stones through normal operational use. One aspect of the design brief was to minimise the damage caused by foreign objects entering the ducts.

A product developed by Gurit for an automotive application addressed this problem by the inclusion of an advanced surface coating for the duct. SF95VH is a Silicon Carbide filled epoxy surface film, normally used with Gurit’s SPRINT® composites for under-body and wheel well applications, where stone chips and similar abrasion is likely to occur. This product has been thoroughly tested for its use on a well-known European supercar. The leading edge surfaces of the ducts utilise this film as a “protective barrier”.

To address the question of surface contaminants, ranging from de-icing substances to fuel oils, Gurit performed a series of tests over a period of fifteen weeks whereby the chosen materials were immersed in these fluids and regularly checked for degradation. In order to keep the weight of the duct to a minimum and produce a design that maintained extreme stiffness and allowed for a clearance area over the tip of the propeller blades at all times, ST94/RC600T Single SPRINT® was the perfect material choice for construction and internal bore.

The leading edge of the hovercraft duct is of double curvature making it a difficult shape to drape the material in a consistent manner. Clearly the fibre directions alter in relation to any chosen datum as the fabric is laid into the mould. To account for this, Gurit used MSC Patran and MSC Lamine Modeller finite element analysis (FEA) software that enables the fibre directions to be predicted aiding stiffness and strength analyses of the structure to be undertaken.
Concurrently, manufacturing requirements were considered in defining the desired ply shape. As the RC600T SPRINT® is used in both 0°/90° and ±45° fibre directions, the ply shapes or petals were dictated by a combination of required fibre orientation and the maximum roll width.

As a by-product of this lay-up definition, the software produces the flattened petal. The arc of the component covered by each ply was defined by ensuring the flat template covered the maximum width available. As a result, 18 identical petals of a 20° arc created a single layer of the leading edge component. Using Gurit’s fabric cutting machine, the templates were then nested for optimum material usage and a kit of plies was produced.

The Hoverworks laminator is then able to follow a pre-defined set of instructions to lay up the component far quicker than traditional methods. Each layer is staggered from the previous layer with a minimal amount of overlaps producing a consistent and predictable part thickness. This was very important given the relatively tight dimensional tolerances specified for assembly of the duct.

The duct assembly was completed at an incredibly fast pace and the first duct is now awaiting installation on its supporting structure. Work is continuing to complete the remaining ducts by the end of Summer 2005. Thanks to Gurit’s innovation and motivation, a viable solution enabling reduced lead times whilst producing a quality product was achieved.

This contract win for Gurit demonstrates the company’s increasing focus on the improvement of existing products and development of new products within a real life, full scale and controlled manufacturing environment. Each project is carefully assessed to provide the greatest return in terms of knowledge growth, technology advancement and eventual customer benefit.

Prototyping Teams working on marine, industrial and automotive applications are now even more closely integrated with Gurit’s engineering and processing specialists. This integration has already resulted in many innovative solutions that are now reflected in the company’s range of products and services.