



## GPS-based Handheld Marine Navigation Device

### Introduction

The advent of handheld devices and GPS has brought in a great degree of flexibility in marine navigation. This case study showcases Mistral's capability in designing a low-cost, low-power, handheld GPS device for marine requirements. This product was taken to large volume production by the customer.



“ The design needed to be a low-cost device with low-power consumption that used existing application software. It also needed to conform to marine regulatory standards defined in IEC 945. ”

### The Customer

The customer is an OEM specializing in building navigation equipment.

### The Requirement

The customer has more than 20 years of experience in building desktop navigation equipment. They wanted to get into the handheld business, and approached Mistral to design and develop the handheld navigation device. The design had to be a low-cost device with low power consumption, and would have to use their existing application software. The design also required to conform to marine regulatory standards defined in IEC 945.

### Solution Provided

Mistral offered a highly integrated ARM processor-based handheld solution operating on 4 AA batteries, and running Linux:

- 3.5" advanced trans-reflective LCD from SHARP; rendering it usable even in bright sunlight
- GPS feature provided by a 12-channel GPS with passive antenna
- USB interface to provide PC / Compact Flash connectivity for storing cartography data.

### The Challenges

- The design team at Mistral was to interact with 6 teams in 4 geographical locations across the world; at various stages - from concept to production. This was achieved by setting up a tight interaction system with risk mitigation mechanisms, between the core developers and the customer
- Designing a low-cost device with low-power consumption. An in-depth study of the design requirements, alternate design and trade-off analysis was performed to find the right balance between the two
- Successfully combining mechanical constraints, signal integrity and EMI/EMC requirements in a small footprint design was a challenge. For example, the high sensitivity GPS and high-speed digital design working in a small footprint needed detailed pre and post-layout simulation and analysis. This was achieved by having regular interaction with the industrial design, CAD and design teams in the early stages of development

- Meeting the stringent emission requirements defined by IEC 945, as marine vessels carry many other communication devices
- Designing a device that is dust and water resistant, and capable of working in ambient temperatures. As the unit design could have no air vent, so as to meet the “dust/water resistant” requirement, sufficient thermal simulation had to be performed on the board to cater to 0-55° C ambient temperature range operation. This involved employing board design strategies utilising low thermal dissipation components and intelligent component placement.

### Key Achievements

- Designing a product from concept and taking it to large volume production

- Building a mixed signal device with GPS and high-speed digital design, working in close proximity
- The product received a special mention award at the International Boat Show event in Geneva, in 2003.

### Customer Benefits

- Leveraged Mistral's proven expertise in development of handheld devices to architect and develop the product faster-to-market
- The powerful and highly integrated architecture designed by Mistral allows the customer a quick turnaround cycle for future designs. This has already been proven by the 3 new design adaptations done by Mistral on the same platform.



**Mistral Solutions Pvt. Ltd.,**  
 # 60, Adarsh Regent,  
 100 Feet Ring Road,  
 Domlur Extension, Bangalore - 560 071  
 Tel: +91-80-4562-1100  
 Fax: +91-80-2535-6444  
 E-mail: info@mistralsolutions.com

**Mistral Solutions Inc.,**  
 43092 Christy Street  
 Fremont, CA 94538  
 USA  
 Tel: +1-408-705-2240  
 E-mail: usa@mistralsolutions.com

**Branch Offices:**  
**INDIA**  
 • Hyderabad  
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 • Dallas, Texas