

# Connected Navigation Devices

Industry Research whitepaper

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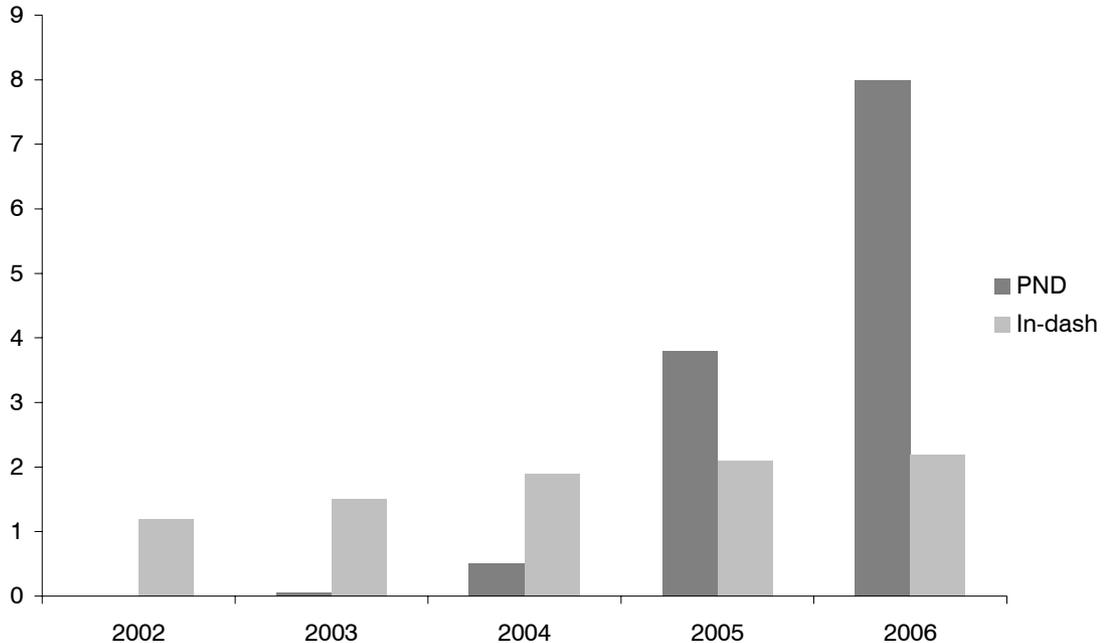
# Connected Navigation Devices

Sales of car navigation solutions reached record levels in 2006, both in Europe and North America. Personal Navigation Device (PND) sales reached about 10.7 million units in 2006, up from 4.5 million devices the previous year. In-dash navigation systems, comprising factory installed and aftermarket solutions, increased from about 3.3 million systems to roughly 3.7 million. Moreover, the growth potential for navigation systems is still large. At the end of 2006, only about 11 percent of all cars in Europe were equipped with an in-dash or PND navigation system. The corresponding figure for the North American market is even lower at slightly less than 5 percent.

To increase adoption of navigation systems, especially in the medium and low-end segment, vehicle manufacturers are introducing low cost integrated navigation solutions. These mass-market systems include on-board systems with pictorial information display rather than full map display, as well as off-board systems that use mobile networks to connect to a server that stores the map data and performs route calculations. Off-board navigation is attractive for service providers because it is a service, requiring monthly or annual subscription payments, in contrast to on-board systems that are sold as products for a one-time fee. In North America, General Motors provides off-board navigation as a standard feature on many models or as an option most other models, part of the company's OnStar telematics service. In the UK, Trafficmaster markets a turn-by-turn off-board navigation with new vehicles from several manufacturers, or as an integrated aftermarket solution for any car.

Meanwhile, PND vendors continue to add functionality to their products in order to maintain margins, stimulate replacement and gain new customers. TomTom and Dash Navigation are the first vendors to announce integrated two-way communication, but more are likely to follow. In the future, the PND may well become a vehicle computer, used to access information on the Internet, store music and other content, as well as provide navigation functionality.

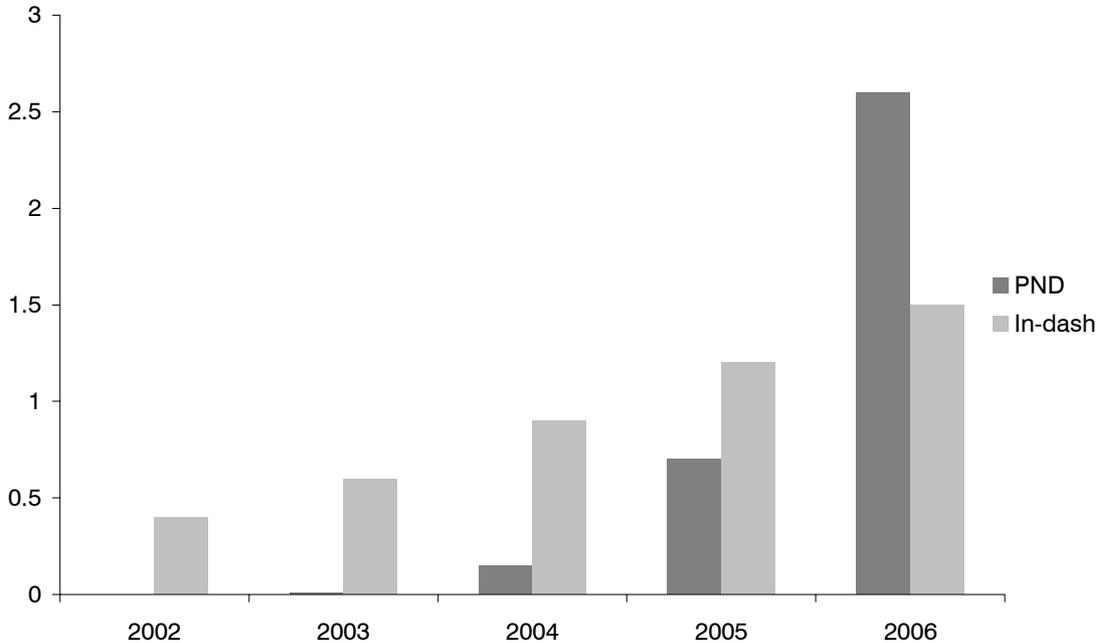
**Figure 1: Car navigation system shipments, Europe, 2002-2006 (million units)**



Source: Berg Insight

In Europe, sales of factory installed OEM and aftermarket in-dash navigation systems have gradually increased from about 1.2 million units in 2002, to roughly 2.3 million units in 2006. At the same time, the penetration of in-dash systems has increased from 8 percent, to nearly 15 percent of all vehicles sold. In-dash navigation systems are available as options for most car models on the European market, approximately 80 percent in terms of vehicles sold. The attach rate, i.e. the number of cars shipped with navigation systems as a percentage of cars with navigation systems as an option, has reached around 95 percent in the luxury segment, nearly 30 percent in the premium segment, almost 10 percent in the medium segment, and about 2 percent in the small vehicle segment. However, there are already clear signs that the growth is hampered by increasing sales of PNDs that have rapidly gained mass-market acceptance. The first PNDs were introduced in 2003 and already in 2005 managed to outsell in-dash navigation systems. In 2006, shipments increased about 110 percent, to about 8 million units, up from 3.8 million units in 2005.

Figure 2: Car navigation system shipments, North America, 2002-2006 (million units)



Source: Berg Insight

In terms of sales, the North American in-dash navigation systems market is about three years behind the European market. The penetration of in-dash OEM and aftermarket systems has increased from 2 percent in 2002, to roughly 8 percent in 2006 as shipments have increased from 0.4 million units to about 1.5 million units. Whereas the availability rate of in-dash systems for cars in Europe has stabilised at about 80 percent, the percentage of cars sold in North America with optional in-dash navigation systems only surpassed 50 percent in 2006, although the rate is expected to grow to nearly 70 percent in 2007. There are yet no clear signs of PNDs limiting the growth of in-dash systems, since PNDs sales have thus far been relatively low in North America, compared to Europe. However, PNDs sales increased threefold in 2006, to about 2.6 million units as major manufacturers increased marketing and outlet presence, especially in the second half of the year.

So far, customer uptake of in-dash navigation systems has remained relatively limited because of high prices. Most factory-installed systems with colour map displays cost approximately € 2,000, whereas more limited systems with monochrome displays and pictorial information cost about € 1,200. However, mass-market systems have been introduced recently, for example by Fiat and General Motors. Fiat uses maps stored on-board, whereas GM has introduced an off-board system with maps stored on a central server. In the UK, Trafficmaster has marketed an aftermarket off-board system since 2002.

At the Geneva motor show in March 2007, Fiat and Microsoft unveiled the next generation of their communication and entertainment system Blue&Me. The new system, called Blue&Me Nav is priced at about € 500 and features a voice controlled navigation system with pictogram turn-by-turn navigation instructions, on top of Bluetooth connectivity, SMS interpreter and an MP3 player. The system uses on-board maps that are loaded into the system using a USB flash drive. Blue&Me was launched with the new Fiat Bravo, but will become available on other model from the Fiat Group later on. Additional telematics services will be deployed across Europe, starting in Italy in 2007. Examples include SOS emergency assistance, information services and Pay as You Drive insurance. In cooperation with Telecom Italia, new services such as remote diagnostics and off-board maps are being developed.

### **Trafficmaster's Smartnav off-board navigation service**

UK based Trafficmaster, a company specialising in digital traffic information, vehicle tracking systems and satellite navigation systems, launched the Smartnav integrated off-board navigation service in 2002 for UK customers. Today, Trafficmaster primarily provides the Smartnav service through automotive manufacturers that fit the system either as standard, or as an option on several car models sold in the UK. However, the system is still available as an aftermarket solution that can be fitted to any car. The only visible parts of the solution are a speaker, a backlit button and a microphone. The GPS receiver and GSM/GPRS module are hidden. To use the system, the driver simply presses the Smartnav button to connect to the Smartnav control centre where a Personal Assistant enters the destination details into the backend computer system, which calculates the best route based on current traffic conditions. Throughout the journey, the driver is guided by voice turn-by-turn instructions.

Should traffic conditions change, the system warns the driver, who can then download a better route by pressing and holding the Smartnav button. For drivers proffering visual guidance, there is also an optional LCD touchscreen display, which also enables the driver to input destinations as postcodes, or select from a list of the last or favourite destinations. Furthermore, customers have access to personal assistance in case of emergencies, breakdowns, or simply to book a hotel. Retailers throughout the UK can install the Smartnav system, currently costing about £ 400. The navigation service cost £ 9.99 per month, or £ 109 per year. Other subscription options include a European navigation extension for routes in mainland Europe, speed camera alerts, and stolen vehicle tracking. Price examples are given in the table below.

**Figure 3: Price examples for Smartnav services (April 2007)**

Service	Monthly	Annual
UK navigation	£ 9.99	£ 109
European navigation option	£ 9.99	£ 109
Speed camera option	£ 9.99	£ 109
Stolen vehicle tracking option	£ 9.99	£ 109
Any 2 services bundled	£ 16.99	£ 189
Any 3 services bundled	£ 21.99	£ 249
All 4 services bundled	£ 26.99	£ 309

Source: Trafficmaster

Since 1990, Trafficmaster has monitored traffic on motorways and trunk roads in the UK. The company has expanded its monitoring network, consisting of 7,500 infrared and camera sensors, to cover over 12,000 kilometres of roads. Gathered data is sent to the Trafficmaster control centre every three minutes, where the information, together with historic, predictive and forecast traffic data, as well as incident data from authorities, is compiled and delivered to subscribers and partners. The traffic data is for instance used for route calculations for the Smartnav service, the trafficmaster.net internet service for PCs and mobile phones, the 1740 Traffic Alert telephone service, and Trafficmaster's commercial RDS-TMC service.

## OnStar Turn-by-Turn Navigation

General Motors introduced the off-board navigation service OnStar Turn-by-Turn Navigation on select models in March 2006, as an option to the OnStar telematics service that already has attracted over 4.5 million subscribers. Later, in August 2006, GM announced that it will offer the navigation service free of charge for the first year on over two million vehicles sold in 2007 in the US and Canada. What is more, the service is available as a US\$ 100 option on a majority of GM 2007 models, about 44 in total. The OnStar telematics services include a range of in-vehicle safety, security and information services relying on the factory installed telematics system comprising a GPS receiver and a cellular modem. OnStar is currently available on about 54 models but will become standard equipment on all GM vehicles sold in the US and Canada by the end of 2007. Two services plans are available: Safe & Sound and Direction & Connections. Safe & Sound is a basic safety and security package, while Directions & Connections also includes information services and turn-by-turn navigation. The first year of the subscription for Safe & Sound is included in the price of all GM vehicles and the Directions & Connections plan is included on some vehicle models or available as an option. After twelve months, subscribers can renew the service at a price of US \$ 16.95 per month for Safe & Sound and US \$ 26.90 per month for Direction & Connections.

The driver or passenger can interact with the system through voice commands and three buttons, a white button for making hands-free calls, a blue button to connect to an OnStar advisor, or a red emergency button for manual reporting of emergencies. Depending on vehicle model, the buttons are located on the rear view mirror, the overhead panel, or on the dashboard. OnStar maintains service agreements with several mobile network operators to provide communication services across North America. The system uses mobile networks to access the OnStar Call Center, where advisors are ready to assist 24 hours a day, 365 days a year. Besides the core safety service providing automatic crash notification to the call centre, additional services like stolen vehicle tracking; remote door unlock; remote vehicle diagnostics; personalised weather, traffic and stock information; as well as hands-free voice calls are available. The Directions & Connections plan also features the Turn-by-Turn Navigation service that guides drivers with turn-by-turn voice instructions, offers automatic re-routing and access to ten million POIs. To use the service, the driver only needs to push the blue OnStar button to connect to an OnStar advisor and give the destination.

## Connected PNDs

PNDs have become increasingly popular because of their low costs and greater flexibility compared to current in-dash systems. By connecting the PND to a computer, the user can download and install software and map updates, update POI and speed camera databases, and transfer pre-planned routes to the PND. The user can transfer the device to any car or even it on foot. Moreover, as competition intensifies, manufacturers are adding more and more functionality to ensure continued revenue growth. Today, top of the range PNDs have wide 4-inch touchscreens to offer good visibility and easy interaction. Besides spoken turn-by-turn directions, these devices increasingly have text-to-speech functionality that announces upcoming exit and street names, thus allowing the driver to keep the eyes on the road at all times. Traffic information is often supplied through a built-in RDS-TMC receiver. Examples of other functionality are media players, picture viewers, and unit converters, as well as optional travel guides and translators. With preinstalled maps covering Europe or North America, these devices typically cost around € 400–500. Mass market PNDs provide great value for money, featuring the same high-sensitivity GPS receivers as more expensive models, but slightly smaller screens, typically around 3.5-inch. With regional maps, prices start at around € 200, rising to about € 300 for maps covering Europe or North America.

The latest significant functionality addition for PNDs is integrated two-way communication, presented by the new device vendor Dash Navigation and TomTom, the world's leading PND vendor. Dash Navigation has added a communication link to enhance traffic information and offer local search using the Internet. TomTom, however, has introduced the integrated connectivity to reduce the cost of its fleet management solution.

### TomTom

TomTom unveiled the TomTom GO 715 PND with integrated GPRS module in March 2007 as a new addition to its TomTom WORK fleet management services, launched one year earlier. By integrating a GPRS module and SIM card into the PND to allow out-of-the-box functionality, the installation costs for the fleet management solution is reduced considerably compared to existing solutions relying on integrated tracking modules. Besides the PND, the full solution, called TomTom WORK COMPACT, also includes the web based TomTom

WEBFLEET vehicle management and communication software. The two-way data communication link is also used to deliver traffic information to the driver. TomTom WORK COMPACT costs from € 1.8 excluding VAT based on a 36-month subscription period.

### **Dash Navigation**

California based Dash Navigation has added two-way connectivity to its PND to provide better traffic information for the customer base, as well as enable local search functionality. The Dash Express PND, announced in September 2006, is scheduled to become available in California in the spring of 2007, and across the US in the autumn. Using Wi-Fi or GPRS two-way communication links, the Dash Express will offer several new functions previously not found in PNDs. Dash Network Traffic allows the driver to select from up to three different routes to the desired destination, based on travel time forecasts for each route accounting for current traffic conditions. All Dash users will also participate in collecting traffic flow data by automatically and anonymously reporting local conditions to other devices. The information is combined with historic traffic flow data stored in the device as well as real-time traffic flow data provided by Inrix to give the best possible travel time forecasts. Dash Send to Car allows users to send an address from the computer directly to the PND in the car. The company also intends to offer automatic over-the-air map and software updates. Dash Destination Search enables location-based internet search, based on the current position or that of the destination. Dash Navigation has initiated collaboration with Yahoo! Inc. to allow Dash Express users to access Yahoo! Local on the web to find information about businesses, products, and services, using a variety of search terms. Users will have to pay a monthly subscription fee to get access to the on-line functionality, without which the device functions as a normal PND.

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