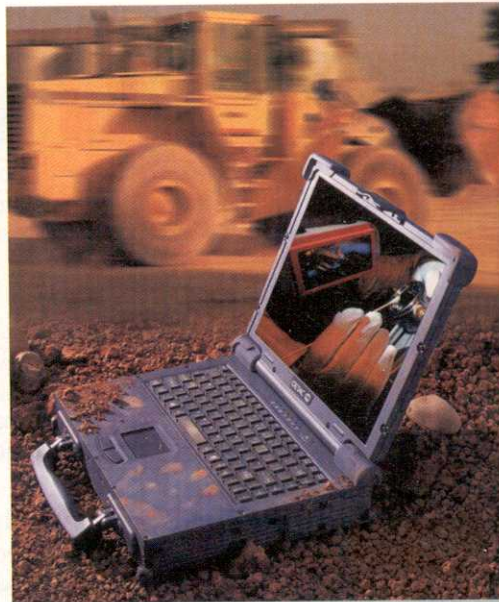


# Tough Choices

## Ruggedized Notebooks

Jim Engelhardt

**It's a rough world out there. To protect your hardware and data investments, durable notebook computers are essential for withstanding the harsh environments encountered during mobile mapping and GIS data collection.**



**A**ccording to a February 2003 report from VDC ([www.vdc-corp.com](http://www.vdc-corp.com)), a technology market research and consulting firm, the ruggedized mobile computer market is expected to climb 7 percent this year and become a \$1 billion a year industry by 2007. The company based its analysis on surveys and market research from 2002, in which ruggedized computer sales topped \$700 million.

The growth of this market should hardly come as a surprise, considering the increasing demand for mobile computing being driven by a focus on homeland security and defense programs. Besides those market drivers, the geospatial community is aggressively embracing mobile GIS and mapping, realizing that field force automation can drastically reduce staff time and costs related to data collection and maintenance.

Rugged notebooks are particularly appealing in a tight economy because they last substantially longer than a standard laptop and tend to provide a better return on investment, despite the higher initial cost. As with all hardware, ruggedized notebooks are available in different configurations to meet various needs.

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Making the selection of ruggedized notebooks more difficult is the array of standards to which units comply. The most widely accepted standards are MIL-STD-810E and MIL-STD-810F. These military standards comprise a subset of standards (detailed in a 539-page PDF at [www.dtc.army.mil/pdf/810.pdf](http://www.dtc.army.mil/pdf/810.pdf)) for evaluating a product's resistance to rain, humidity, salt fog, sand/dust, vibration, shock, and temperature. Both military standards are essentially the same specification — MIL-STD-810F is simply a major revision of MIL-STD-810E — and they do not impose specific design requirements. Rather, products certified to the standards follow the environmental testing processes outlined in MIL-STD-810 documents. Thus, units certified to MIL-STD-810E are not necessarily of lower quality, they were just tested following older procedures and/or have not been reevaluated according to MIL-STD-810F.

In addition, be aware that products compliant to the same standard may vary dramatically in performance. The standard for shock, for instance, entails that a unit withstand 26 drops from 3 feet onto plywood over concrete. Some notebooks barely meet the requirement, whereas other substantially exceed it. Both products, however, will be certified to the standard.

This overview of ruggedized notebooks on the market, culled from

information provided by manufacturers, supplies general information about the standards to which units adhere. The article is intended as a starting point for research about ruggedized options available for mobile GIS applications. To better compare products, it is recommended that buyers obtain a copy of a product's complete test report from the manufacturers.

Other major factors to consider include processor speed, RAM, weight, size, battery life, and connectivity options. In terms of displays, one should evaluate your needs for resolution, size, sunlight readability, and a touchscreen.

Units and product specifications are the most current and comprehensive information *Geospatial Solutions* could obtain as of press time. We can not be held responsible of the accuracy of information provided by vendors regarding product performance and features.

We have limited the discussion to ruggedized notebooks running full operating systems from original equipment manufacturers. Notably, dozens of companies rename, rebrand, and resell the notebooks from the manufacturers showcased in the following pages. In addition, other firms specialize in ruggedizing standard laptops from companies that do not manufacture rugged products.

## GETAC Inc. ([www.getac.com](http://www.getac.com))

**A320S and A760S** Ruggedized to MIL-STD-810F for temperature, shock, drop, vibration, altitude, humidity, dust, and water resistance.

**Size/Weight/Battery Life:** 12.2 × 10.1 × 2.8 inches/12 pounds/2.5 hours

**Display:** 12.1-inch, 1,024 × 768-resolution XGA TFT LCD (13.3 inch, sunlight readable, or touchscreen optional)

**CPU:** 600-, 750-, or 850-MHz Intel Pentium III

**RAM/Hard Drive:** 512 MB (maximum)/removable (memory not specified)

**Connectivity:** Serial, parallel, USB, CRT, PS/2, audio, IrDA infrared, port replicator

**Notes:** The products have two swappable bays. Available bay 1 modules include a secondary battery or hard drive, floppy disk drive, CD-ROM/CD-RW drive, DVD-ROM/DVD-RW combo drive, or 1 Type III or 2 Type II PC card slots. Bay 2 for the A320S is preconfigured with a 56K modem and 10/100 Ethernet module. For the A760S, bay 2 integrate a 56K modem and 10/100 Ethernet module, 1 Type III or 2 Type II PC card slots, wireless LAN, DPGS receiver, two COM ports, or one SCSI-II component.

**W120 Mini-Note** Ruggedized to MIL-

STD-810F for temperature, shock, drop, vibration, altitude, humidity, and water resistance.

**Size/Weight/Battery Life:** 10.8 × 9.4 ×



1.7 inches/6.2 pounds/3.5 hours

**Display:** 10.4-inch, 1,024 × 768-resolution XGA TFT LCD (sunlight readable or touchscreen optional)

**CPU:** 700-MHz Intel Mobile Pentium III or 500-MHz Intel Celeron

**RAM/Hard Drive:** 256 MB (maximum)/not specified

**Connectivity:** 56K modem, 10/100 Ethernet, Type II PC card slot, 2 serial, USB, PS/2, audio, and docking port

**Notes:** The optional docking station is required for integrating a CD-ROM, DVD-ROM, CD-RW, or floppy disk drive. An optional CDPD, GSM, or wireless LAN PC card provides wireless capability.

## Itronix Corporation ([www.itronix.com](http://www.itronix.com))

**GoBook** Ruggedized to MIL-STD-810E for temperature, drop, vibration, dust, and water resistance.

**Size/Weight/Battery Life:** 12.0 × 9.8 × 2.2 inches/7.5 pounds/not specified

**Display:** 12.1-inch SVGA antiglare touchscreen TFT LCD

**CPU:** 850-MHz Intel Celeron or Pentium III

**RAM/Hard Drive:** 512 MB (maximum)/20 or 30 GB

**Connectivity:** 56K modem, 10/100 Ethernet (optional), integrated wireless (CDPD, GSM, wireless LAN) and upgradable wireless modem, PC card slot, serial, parallel, USB, PS/2, CRT, and audio

**Notes:** Swappable media bay can be configured with CD-ROM, DVD-ROM, or floppy disk drive.



Look to future issues of *Geospatial Solutions* for information about ruggedized handhelds, tablets (with or without a detached keyboard), and vehicle-mounted systems.

**GoBook II** Ruggedized to MIL-STD-810F

for temperature, drop, vibration, dust, and water resistance.

**Size/Weight/Battery Life:** 12.0 × 9.8 × 2.4 inches/7.9 pounds/not specified

**Display:** 12.1-inch XGA antiglare touchscreen TFT LCD (sunlight-readable SVGA optional)

**CPU:** 1.8-GHz Intel Celeron or 1.7-GHz Pentium IV

**RAM/Hard Drive:** 1,024 MB (maximum)/20 or 30 GB

**Connectivity:** 56K modem, 10/100 Ethernet (optional), integrated wireless (CDPD, GPRS, CDMA, wireless LAN) and upgradable wireless modem, Bluetooth, PC card slot, serial, parallel (optional), USB, PS/2, CRT, audio, and docking port

**Notes:** Swappable media bay can be configured with second battery or CD-ROM, DVD-ROM, CD-RW, or floppy disk drive.



**GoBook MAX** Ruggedized to MIL-STD-810E for temperature, drop, vibration, dust, and water resistance.

**Size/Weight/Battery Life:** 11.0 × 8.8 × 2.2 inches/6.2 pounds/not specified

**Display:** 10.4-inch SVGA antiglare touchscreen TFT LCD (sunlight readable optional)

**CPU:** 700-MHz Intel Pentium III

**RAM/Hard Drive:** 512 MB (maximum)/20 or 30 GB

**Connectivity:** 56K modem, 10/100 Ethernet (optional), integrated wireless (CDPD, GPRS, wireless LAN) and upgradable wireless modem, PC card slot, serial, 2 USB, CRT, and audio.

**Notes:** Itronix classifies this unit as its most rugged.



**GoBook PRO** Semi-ruggedized to MIL-STD-810E for drop and vibration.

**Size/Weight/Battery Life:** 12.3 × 10.1 × 1.4 inches/5.4 pounds/not specified

**Display:** 14.1-inch, 1,024 × 768-resolution XGA TFT LCD

**CPU:** 1.6-GHz Intel Pentium IV

**RAM/Hard Drive:** 128 MB (expandable to 384 MB)/20 or 30 GB

**Connectivity:** 56K modem, 10/100 Ethernet, integrated wireless (GPRS, Bluetooth, or 802.11b), PC card slot, 3 USB, firewire, S-Video, CRT, IrDA infrared, audio, and port replicator

**Notes:** Swappable media bay can be configured with CD-ROM, DVD-ROM, or DVD/CD-RW combo drive.



## Kontron Mobile Computing Inc. ([www.kontronmobile.com](http://www.kontronmobile.com))

**ReVolution** Ruggedized to MIL-STD-810F for temperature, shock, drop, vibration, altitude, dust, and water resistance.

**Size/Weight/Battery Life:** 12.8 × 10.3 × 2.1 inches/8 pounds/3.5 hours

**Display:** 12.1-inch, 1,024 × 768-resolution SVGA touchscreen TFT LCD (sunlight readable optional)

**CPU:** 1.06-GHz Intel Mobile Pentium III

**RAM/Hard Drive:** 128 MB (expandable to 640 MB)/40 GB (upgradable to 60 GB)

**Connectivity:** 56K modem, 10/100 Ethernet (optional), integrated wireless LAN and Bluetooth, 1 Type III or 2 Type II PC card slots, serial, 2 USB, audio, and docking port

**Notes:** This unit can function as a notebook running Windows XP, 2000, or 98, or as a Tablet PC running Windows Tablet PC Edition. It can also be configured with a secondary removable hard drive or CD-ROM (standard), CD-RW, DVD-ROM, DVD/CD-RW combo, or floppy disk drive.



## MicroSlate Inc. ([www.microslate.com](http://www.microslate.com))

**MSL 3000PIII, 3000PIII-M** Ruggedized to MIL-STD-810E for temperature, drop, vibration, altitude, humidity, salt fog, and water resistance.

**Size/Weight/Battery Life:** 11.8 × 8.9 × 2.9 inches/

6.6 pounds/not specified

**Display:** 10.4-inch, 800 × 600-resolution SVGA TFT LCD (sunlight readable and touchscreen optional)

**CPU:** 500-MHz Intel Mobile Pentium III

**RAM/Hard Drive:** 128 MB (expandable to 512 MB)/20 GB (30 or 40 GB optional)

**Connectivity:** 56K modem, 10/100 Ethernet (optional), serial (optional), 1 Type III or 2 Type II PC card slots, IrDA infrared,

audio, and docking port

**Notes:** These units can be customized with integrated CDPD, ARDIS, or Mobitex wireless modem, GPS/DGPS receiver, 802.11 wireless, and CD-ROM, CD-RW, or floppy disk drive. The MSL 3000PIII-M features additional electronics for vehicle docking



## AMREL Systems LLC ([www.amrel.com](http://www.amrel.com))

**ROCKY Unlimited** Ruggedized to MIL-STD-810E for temperature, shock, vibration, altitude, humidity, water resistance, and salt fog.

**Size/Weight/Battery Life:** 12.3 × 9.7 × 2.5 inches/11 pounds/not specified

**Display:** 12.1-inch, 800 × 600-resolution SVGA TFT LCD (13.3-inch XGA,

sunlight readable, or touchscreen optional)

**CPU:** 800-MHz Intel Pentium III

**RAM/Hard Drive:** 256 MB (expandable to 512 MB)/removable 20 GB (30 or 40 GB optional)

**Connectivity:** 56K modem, 10/100 Ethernet, 2 serial, parallel, USB, CRT, PS/2, audio, IrDA infrared

**Notes:** Unit can be customized with integrated CDPD, GPRS, or Mobitex wireless modem, GPS receiver, Bluetooth, 802.11 wireless and COM 3/4 card. It also features a media bay for interchangeable components — secondary battery, floppy disk drive, CD-ROM drive, DVD drive, or super disk drive.



## Miltope Corporation ([www.miltope.com](http://www.miltope.com))

**TSC-750** Ruggedized to MIL-STD-810E/F for temperature, drop, shock, vibration, altitude, humidity, dust, and water resistance.

**Size/Weight/Battery Life:** 12.0 × 11.0 × 4.0 inches/11.5 pounds/8 hours

**Display:** 13.3-inch, 1,024 × 768-pixel sunlight-readable TFT LCD (15 or 12.1 inch optional)

**CPU:** Customer-specified Intel Pentium III

**RAM/Hard Drive:** 256 MB (expandable to 512 MB)/removable 20 GB

**Connectivity:** 56K modem, 10/100 Ethernet, 2 serial, parallel, 2 USB, IrDA infrared, 2 Type II PC card slots, CRT, and audio

**Notes:** The media bay can be configured with swappable DVD/CD-ROM or floppy disk drive (both come standard). An optional CD-RW is also available.



**VCU-1600** Ruggedized to MIL-STD-810E/F for temperature, drop, shock, vibration, altitude, humidity, and water resistance.

**Size/Weight/Battery Life:** 13.9 × 11.9 × 5.0 inches/13.6 pounds/3 hours

**Display:** 12.1-inch, 800 × 600-pixel sunlight-readable TFT LCD (10.4 inch [multiple resolution] and touchscreen optional)

**CPU:** 266-MHz Intel Pentium

**RAM/Hard Drive:** 256 MB (expandable to 512 MB)/removable (memory not specified)

**Connectivity:** 10/100 Ethernet, 4 serial, parallel, USB, 2 Type II PC card slots

**Notes:** For military applications, the unit can be configured with tactical communications capabilities.



## Panasonic (www.panasonic.com/toughbook)

### **Toughbook 18** Ruggedized to MIL-STD-810F for drop, shock, vibration, humidity, and dust.

**Size/Weight/Battery Life:** 10.7 × 8.5 × 1.9 inches/4.4 pounds/4–6 hours

**Display:** 10.4-inch, 1,024 × 768-resolution touchscreen XGA TFT LCD

**CPU:** 900-MHz Intel Mobile Pentium

**RAM/Hard Drive:** 256 MB (expandable to 768 MB)/40 GB

**Connectivity:** 56K modem, 10/100 Ethernet, serial, CRT, 2 USB, 802.11b, 2 Type II PC card slots, and audio

**Notes:** This unit can function as a notebook running Windows XP, 2000, or 98, or as a Tablet PC running Windows Tablet PC Edition. Additional integrated options include Bluetooth wireless, a CDMA or GPRS wireless modem, or GPS receiver.



### **Toughbook 28** Ruggedized to MIL-STD-810F for drop, shock, vibration, humidity, and dust.

**Size/Weight/Battery Life:** 11.8 × 9.5 × 2.3 inches/9 pounds/4 hours

**Display:** 13.3-inch, 1,024 × 768-resolution touchscreen XGA TFT LCD (12.1-inch, sunlight-readable SVGA optional)

**CPU:** 800-MHz or 1-GHz Intel Mobile Pentium III

**RAM/Hard Drive:** 256 MB (expandable to 768 MB)/30 GB

**Connectivity:** 56K modem, 10/100 Ethernet (optional), serial, parallel, CRT, USB, IrDA infrared, 1 Type III or 2 Type II PC card slots, and audio

**Notes:** Unit can be customized with integrated CDPD, CDMA, GPRS, or Mobitex wireless modem, GPS receiver, or 802.11b wireless. The media bay can be configured with a secondary battery or hard disk or floppy disk (standard), CD-ROM, CD-RW, DVD-ROM, or DVD/CD-RW combo drive.



### **Toughbook 34** Ruggedized to MIL-STD-810F for drop, shock, vibration, humidity, and dust.

**Size/Weight/Battery Life:** 9.0 × 7.4 × 1.7 inches/3.8 pounds/4 hours

**Display:** 8.4-inch, 800 × 600-resolution, sunlight-readable touchscreen SVGA TFT LCD

**CPU:** 700-MHz Intel Mobile Pentium III

**RAM/Hard drive:** 256 MB (expandable to 512 MB)/30 GB

**Connectivity:** 56K modem, 10/100 Ethernet, serial, USB, Type II PC card slot, and audio

**Notes:** The product can be customized with an integrated CDPD, CDMA, GPRS, or Mobitex wireless modem, GPS receiver, or 802.11 wireless.



### **Toughbook 48** Semi-ruggedized with shock-mounted hard drive and flexible connectors.

**Size/Weight/Battery Life:** 12.1 × 10.2 × 1.8 inches/7.48 pounds/3.5 hours

**Display:** 14.1-inch, 1,024 × 768-resolution XGA TFT LCD

**CPU:** 1.8-GHz Intel Mobile Pentium IV

**RAM/Hard Drive:** 256 MB (expandable to 768 MB)/20 or 40 GB

**Connectivity:** 56K modem, 10/100 Ethernet, serial, parallel, 2 USB, CRT, 1 Type III or 2 Type II PC card slots, and audio

**Notes:** This unit comes standard with a floppy disk drive. An additional internal CD-RW, DVD-ROM, or DVD/CD-RW combo drive is optional. 802.11b wireless is also available.



### **Toughbook 50** Semi-ruggedized with shock-mounted hard drive and flexible connectors.

**Size/Weight/Battery Life:** 12.8 × 10.9 × 1.9 inches/7.7 pounds/3.5 hours

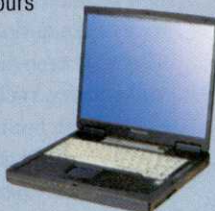
**Display:** 15-inch, 1,600 × 1,200-resolution UXGA TFT LCD

**CPU:** 1.9-GHz Intel Mobile Pentium IV

**RAM/Hard Drive:** 256 MB (expandable to 768 MB)/40 GB

**Connectivity:** 56K modem, 10/100 Ethernet, serial, parallel, 2 USB, CRT, firewire, 1 Type III or 2 Type II PC card slots, and audio

**Notes:** This model comes standard with a floppy disk and DVD/CD-RW combo drive. 802.11b wireless capability is optional.



### **Toughbook 72** Semi-ruggedized with shock-mounted hard drive, flexible connectors, and spill-resistant keyboard and touchpad.

**Size/Weight/Battery Life:** 11.7 × 10.5 × 1.9 inches/7.11 pounds/2.5 hours

**Display:** 13.3-inch, 1,024 × 768-resolution touchscreen XGA TFT LCD

**CPU:** 1.8-GHz Intel Mobile Pentium IV

**RAM/Hard Drive:** 256 MB (expandable to 768 MB)/30 GB

**Connectivity:** 56K modem, 10/100 Ethernet, serial, parallel, 2 USB, CRT, IrDA infrared, 1 Type III or 2 Type I or Type II PC card slots, and audio

**Notes:** This notebook can be customized with integrated CDPD, CDMA, GPRS, or Mobitex wireless modem and 802.11b wireless. The media bay can be configured with a secondary battery or hard disk or floppy disk (standard), DVD-ROM (standard), CD-RW, or DVD/CD-RW combo drive.



### **Toughbook R1** Semi-ruggedized with shock-mounted hard drive and screen and flexible connectors.

**Size/Weight/Battery Life:**

9.5 × 7.2 × 1.0 inches/2.2 pounds/5 hours

**Display:** 10.4-inch, 1,024 × 768-resolution XGA TFT LCD

**CPU:** 866-MHz Intel Mobile Pentium III

**RAM/Hard Drive:** 256 MB (maximum)/20 GB

**Connectivity:** 56K modem, 10/100 Ethernet, 2 USB, CRT, Type I or Type II PC card slot, and audio



### **Toughbook T1** Semi-ruggedized with shock-mounted hard drive and screen and flexible connectors.

**Size/Weight/Battery Life:** 10.6 × 8.3 × 1.0 inches/2.4 pounds/4 hours

**Display:** 12.1-inch, 1,024 × 768-resolution XGA TFT LCD

**CPU:** 866-MHz Intel Mobile Pentium III

**RAM/Hard Drive:** 256 MB (expandable to 512 MB)/40 GB

**Connectivity:** 56K modem, 10/100 Ethernet, 2 USB, CRT, Type I or Type II PC card slot, audio, and 802.11b wireless (optional).

