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Business Rugged Mobile Workstations Take the Heat

HP EliteBook Mobile Workstations are tough and powerful

By Robert Green, *Cadalyst* Contributing Expert



In the push to make notebook computers ever lighter and cheaper, most consumer units have become flimsy plastic cases that can't take a pounding. This lack of ruggedness may be okay for a notebook PC that never leaves your desk, but it's quite another for work computers that see rough duty on airplanes, trucks, and job sites. And, because many of these working computers must run high-end CAD software, they not only need to be tough — they must be powerful as well.

To address these concerns, HP's EliteBook Mobile Workstation family with 2nd generation Intel® Core™ i7 processors has a number of features that make them much more rugged than ordinary consumer notebook PCs. In this edition of Workstation Innovation News we'll explore those features in detail.



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Figure 1. Other than the nicely finished metal case, HP EliteBook Mobile Workstations (such as this HP EliteBook 8760w) look like normal notebook PCs from a distance. But inside the metal casing are a number of internal features that make them much more resistant to damage. Screen image courtesy of Autodesk.

Defining Business Rugged

Defining what business rugged means in the context of a mobile workstation is somewhat nebulous. I would say that business rugged means being able to transport and work with my computer without being nervous about bumps, an occasional drop or ambient temperature conditions. Others in more aggressive field environments may be more worried about moisture or sand infiltration. How you'll define business rugged really depends on the work environment you operate in.

Given this uncertainty, we need a way to quantify business ruggedness that can be used as a benchmark. There's no better independent way to obtain an independent concept of what rugged means than the US Army's military 810G testing standards (MIL-STD-810G for short).¹ A quick view of the standard (see figure below) reveals how demanding these business ruggedness tests actually are.

Test	MIL-STD-810G Method	Test Procedure
Vibration	Method 514 Procedure I, Cat 20 & 24	Operational and non-operational vibration designed to simulate 1000 miles of ground transportation in a vehicle
Drop Test	Method 516.5 Procedure IV	26 drops onto every side, angle and edge onto 2" of plywood over steel over concrete
Shock	Method 516.5 Procedure V	3 shocks/axis/direction for a total of 18 shocks
Dust Resistance	Method 510.5 Procedure I	Six hours of exposure to blowing dust
Altitude	Method 500.5 Procedure I & II	Simulates operation at 15,000 feet (4,572 meters)



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High Temperature	Method 501.5 Procedure I & II	Operating at 140°F (60°C), non-operating at 160°F (71°C)
Low Temperature	Method 502.5 Procedure I & II	Operating at -20°F (-29°C), non-operating at -60°F (-51°C)
Temperature Shock	Method 503.5	Subject the notebook to sudden temperature changes between -60°F to 205°F (-51°C to 96°C) at a rate of change greater than 18°F (10°C) per minute

Figure 2. The MIL-STD-810G standards read like a torture test for a normal notebook PC.

Expert Interview

To get a more detailed picture of the business ruggedness features in HP's EliteBook Mobile Workstations, I spoke with HP's Commercial Managed IT Life Cycle Marketing Manager Jacob Hernandez. Our conversation was very frank and refreshingly free of needless technical mumbo jumbo.

Robert Green: When I think about the term business ruggedness, I think of temperature and mechanical stress like you test for under the MIL-STD 810G specifications. Is that a good way to define the term?

Jacob Hernandez: It is. Within the MIL-STD 810G specification (see figure 2 above), the military actually outlines some of the conditions that are being simulated by the tests.¹ For example, the vibration test is designed to simulate 1,000 miles of ground transportation in a vehicle.

RG: It seems like the MIL-STD 810G specifications are the industry standard for ruggedness. Do HP Mobile Workstations have to meet all these criteria?

JH: Every computer manufacturer has some form of durability testing, however these test procedures can vary significantly. The MIL-STD 810G specification gives manufacturers a standard set of procedures that provide consistent test methodologies. While our PCs are not intended for military use, these tests allow us to demonstrate the business ruggedness of our EliteBook models that pass at least 8 tests including the brutal drop test. To our knowledge, we are the only mobile workstation supplier passing the drop test.

Drops, Dings and Drives

RG: I'm probably like most travelers in that dropping my computer on the floor is the most likely cause of damage. Is the MIL-STD 810G specification for drops and shock in line with those types of hazards?

JH: Yes. The test that we execute is designed to simulate a drop from desk height. We perform 26 drops from every angle at a height of 30 inches while the notebook is closed.* The vibration test is designed to simulate ground transportation. The temperature tests demonstrate durability of extreme temperatures.

RG: Can you tell me about 3D DriveGuard for hard drive protection? And does the DriveGuard system also work when the Mobile Workstation is powered down?

JH: When the unit is off, the hard drive heads are parked, which helps to protect



user data in the event of an impact. When the unit is on, HP 3D DriveGuard uses the built in accelerometer to detect motion and can park the hard disk within fractions of a second. It's a three-axis digital accelerometer, so it senses motion in any direction. This helps to protect the drive not only when the system is dropped, but also when it's bumped into a door jamb.



Figure 3. The 3D Drive Guard application takes proactive action to park the hard drive in cases where aggressive motion is detected, and comes standard on all HP Mobile Workstations.

RG: As long as we're on the subject of hard drives, are solid state disks (SSDs) inherently more rugged than a traditional magnetic hard drive protected with 3D Drive Guard?

JH: Hard disk drives contain moving parts, while SSDs contain no moving parts. As such, SSDs have advantages in the areas of performance, reliability, and power consumption.

RG: Is a machine with a single solid state disk (SSD) going to get radically better battery life than a machine with a single hard drive?

JH: The difference would be noticeable. On our 14" diagonal EliteBook model, we've seen battery life percentage improvements in the teens, although the difference would be smaller on a model with a larger display.²

Heat, Chills and Spills

RG: Another likely cause of damage for many users would be spilling a drink on their computer, but I don't see liquid exposure covered in the MIL-STD. Is there a ruggedness component for moisture resistance that HP Mobile Workstations adhere to?

JH: Yes, we include a spill resistant keyboard with a drain to help protect from minor accidental spills. You wouldn't want to use it in a rainstorm or dump a cup on it, but it does offer some protection from a minor spill.

RG: As far as operating in extreme heat or cold, I presume the MIL-STD specifications simulate a hot or cold truck on a job site, right?

JH: Yes. There are three MIL-STD 810G tests related to temperature which we run: Extreme heat and extreme cold tests are done while the units are on and off while the third goes from cold to hot and back again for three cycles. That last one is particularly tough.

RG: Do you see thermal damage as being a major problem with consumer notebooks? I know I've seen some units run really hot and experience very poor battery life as a result.

JH: Thermal design is very important to us. Due to our three-year warranty, we subject HP Mobile Workstation models to 100,000 hours of testing in order to help ensure they withstand the test of time.

Chassis and Screen Ruggedness

RG: Mobile workstations are actually built on a stamped frame rather than a plastic chassis right? Can you elaborate on that a bit?

JH: Our HP Mobile Workstations sport a precision stamped chassis constructed of aluminum and magnesium. The case also features HP DuraFinish which is both wear and smudge resistant.

RG: Is the screen you use in HP Mobile Workstations protected in any way? Are the screens in these machines more durable than those in conventional notebook PCs?

JH: Our HP DisplaySafe frames have magnesium underneath the aluminum display enclosure protecting the back while a 360-degree rubber bumper protects the front of the display.

RG: So you achieve external business ruggedness with the chassis and internal data protection via smart motion detection?

JH: Exactly.

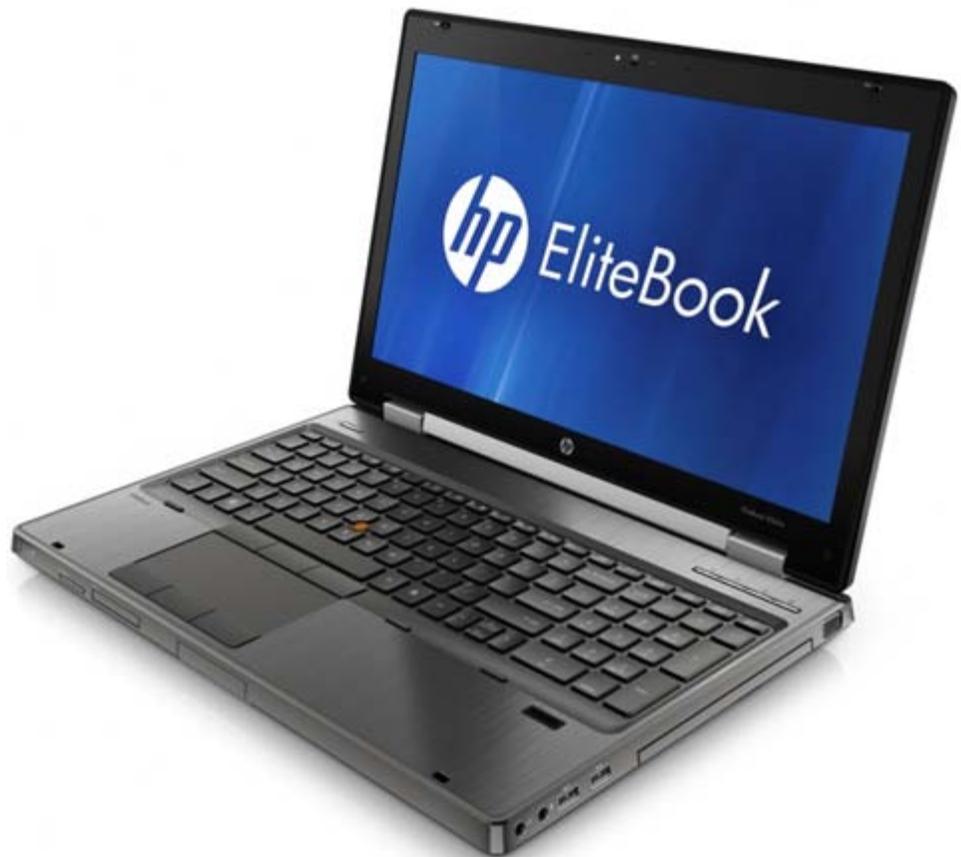


Figure 4. The metal HP DuraFinish chassis and black rubber bumper around the screen bezel is visible in this view of an HP EliteBook 8560w Mobile Workstation.

Data Security

RG: Another aspect of business ruggedness is how resistant the computer is to unauthorized access of data. What sorts of security and/or biometric utilities on HP Mobile Workstations contribute to how they protect the user's data?

JH: We have a collection of technologies called HP Professional Innovations. HP ProtectTools³ is one of the longest standing Professional Innovations we've developed and provides our users with the most comprehensive set of security tools provided by any PC manufacturer. We included biometrics based login using face and/or fingerprint recognition, disk encryption and secure drive, and file erase, among other features.

Tales of Abuse

RG: I presume HP has a "torture center" where all this simulated abuse takes place, right? What's it like?

JH: There are several chambers for altitude and temperature tests. There are aluminum platforms on which the notebooks can be bolted for vibration and shock testing. There's a pneumatically actuated device used for performing consistent drops.

RG: It sounds brutal.

JH, with laughter: Yes, it's a terrible, terrible place and I really don't like talking about it!

Financial Considerations

RG: With so many dirt-cheap consumer notebook pcs out there, how can I convince my boss to equip my users with more business rugged HP Mobile Workstations? Is there a way you can place a value on having a machine that can survive the rigors of the road?

JH: For your typical HP Mobile Workstation user, the cost of the hardware isn't the highest priority. It's really about having the assurance that the system has been certified to reliably run the application that represents a significant investment in time — to master the application — and money — to purchase the application. These users also need to reduce downtime as much as possible. Waiting for a software compatibility issue to be resolved or a hard drive to be replaced after an accidental drop can make a big difference for some of these users, especially if data is lost.

RG: So it really comes down to what would it cost to lose your data or have to replace a machine when a rugged HP EliteBook Mobile Workstation may be able to keep right on running?

JH: Yes.

Wrapping Up

You know the environment your mobile workers operate in, so you've probably already drawn some conclusions about how valuable business rugged machines, such as HP's EliteBook Mobile Workstations with an Intel® Core™ i7 processor , could be for your organization. Whether they are dropping the unit, working in hot/cold trucks at a job site, or have tough office environments, the HP EliteBook Mobile Workstations are up to the challenge. I hope you found this discussion of computer business ruggedness as educational and eye opening as I did.

Author's note: I'd like to personally thank Jacob Hernandez from HP for taking so

much time out of his day for our interview.

About the Author

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Robert provides CAD implementation, consulting, and programming services for a variety of companies throughout the United States and Canada. He holds a degree in mechanical engineering from the Georgia Institute of Technology and is the author of *Expert CAD Management: The Complete Guide*. Reach him via his web site at www.cad-manager.com.

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Systems may require upgraded and/or separately purchased hardware to take full advantage of Windows 7 functionality. Not all features are available in all editions of Windows 7. See www.microsoft.com/windows/windows-7 for details.

1. Testing was not intended to demonstrate fitness for DOD contracts requirements or for military use. Test results are not a guarantee of future performance under these test conditions.
2. Battery life will vary depending on the product model, configuration, loaded applications, features, use, wireless functionality and power management settings. The maximum capacity of the battery will naturally decrease with time and usage. See MobileMark07 battery benchmark www.bapco.com/products/mobilemark2007 for additional details.
3. Microsoft Windows required.

*The HP 8760w Workstation is dropped 26 times from 24 inches.

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