With the continued reductions in global military budgets, governments are continuing to look for ways to equip soldiers in the field with critical Satcom technology while minimizing their capital expenditures. There are quite a few choices for portable satellite terminals and navigating the relevant requirements can be a daunting task. Norsat International has recently achieved a number of military design wins, both domestic and abroad, for Military grade portable satellite terminals, and this article will share some considerations that our customers have explored with Norsat and our competitors.

Military vs. Commercial

One question we always ask our customers at the beginning of discovery is whether the application and end customer is military or commercial. Typically commercial customers are looking for a lower cost commercial terminal that doesn’t require the same specifications, certifications, or durability that a military application would. Military customers, on the other hand, are more concerned with durability, and field proven product and expect to pay a premium for these features. To determine if a product is designed for military one should look at the materials used (carbon fiber versus aluminum versus steel), the weight of the terminals, the portability (number of transit cases), whether it’s field proven by other military customers, and whether options like de-icing kits, vehicle power kits, and lightning protection are offered. Many times military customers will require a specific customization of a product to meet their needs. Commercial terminal manufacturers are typically interested in lowering their costs and as such may change the product every year, thus have trouble supporting military support contracts that can often last a decade or longer. Other considerations for military terminals are the MIL-810G standards that must be met in order to have confidence in the design and durability of the product. Without third-party verification of these MIL-STD-810G tests, one can only guess if the terminal can meet the harsh environments that military terminals must face.

Aperture Size

Aperture size in portable terminals determines not only the data rates possible, but aperture sizes of one meter and above, with one meter carbon fiber antennas yielding performances equal to steel and SMC antennas of yesterday. C-band requires an antenna aperture size of greater than 1.8 meters on most satellites around the world. Of course the larger the antenna aperture size, the greater the performance and data rates possible, but the cost is greater, the terminal is larger and weighs more, meaning less portability.

Packaging

In addition to the deployed size and weight of a portable terminal, one must consider how the terminal “measures
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up” when packaged. Key questions to ask a terminal supplier include whether the weight and number of cases includes all components, including the modem, block upconverter (BUC), and whether the packaging is IATA compliant if commercial airline transport is expected. If soft backpacks are required, something to consider includes whether they fit in hard transit cases for air transport. Recently the portable terminal industry has seen new entrants offering “one case solutions” which aren’t practical for the real world as they contain no BUC (or a low power BUC), no modems, and don’t include cables. It’s important to ensure the system packaging contains everything necessary to actually operate the terminal!

Auto-Acquire versus Manual Acquire

It is critical that satellite terminals are aligned precisely to the target satellite to ensure maximum signal strength and to avoid interfering with adjacent satellites. A poorly aligned satellite terminal may result in a satellite service provider denying service to a user. Satellite terminals can be aligned manually, with the help of some basic tools, or via an auto-acquire capability for those terminals that are equipped. The major advantage of the auto-acquire capability is the ease of acquisition primarily for motors and an integrated computer, and a higher price for the terminal. Some experienced portable terminal technicians can acquire a satellite lock faster with a manual acquire terminal and a spectrum analyzer than a terminal with auto-acquire capability, thus negating the advantage of the auto acquire feature. For less experienced users, Norsat’s free Satellite Locator app can help find satellites quickly for those lacking the auto-acquire feature.

User Interface

An area of differentiation for portable terminal manufacturers is the user interface (UI). All UI’s have basic functionality including transmit on/off and typical power output readings, but some have more advanced features. Norsat’s LinkControl includes an integrated satellite almanac, as well as a built in spectrum analyzer, useful for manual pointing. Some additional features unique to LinkControl include a user profile system that allows experienced RF engineers to setup the satellite parameters in the lab so that inexperienced field users simply have to click a button, a USB recovery tool that brings the system back to defaults in case of corruption in the field, built-in troubleshooting and component detection to ensure easy fault diagnostics, remote access via TCP/IP for remote control, auto-levelling for operation on uneven surfaces and closed loop power control that maintains power output over fluctuating environmental conditions. Although UI features are not always listed in customer specifications, the tools available in LinkControl can really make the operation of a terminal much simpler in the field.

An additional consideration for the user interface is whether the terminal comes with a Norsat, Con’t on pg 46
rugged display or whether the UI needs to run on a separate computer. In the case of Norsat’s flagship terminal, the GLOBETrekker™, the integrated display is waterproof, ruggedized to eliminate damage if dropped, and has a true sunlight readable display with over 1600 NITs of brightness as compared to the 300 NITS of a normal display.

Ease of Use
Lost amongst the myriad of technical specifications for portable terminals is the actual “Ease of Use and Operation” of the terminal. Users should be able to be set up one and 1.2 meter terminals in under 10 minutes and be on the air in 15 minutes total, if equipped with auto-acquire and a one touch “stow/go” button. In addition to a sophisticated user interface, some companies, including Norsat, package their terminals with a convenient “Pictorial Flip Book” which graphically shows how to put all the pieces of the terminal together so that a first-time user can follow each step and can have the terminal built and operating without prior training.

Modem and BUC options
Different portable terminals offer different options for modems and BUCs, with most manufacturers having a pre-defined list of manufacturers and models available. Modems come in many flavors including SCPC, TDMA, as well as MPEG2/4 Encoder/Modulators. Some products, including Norsat’s GLOBETrekker, have the ability to integrate one or even two modems right into the base unit. Alternatively if modem integration isn’t required, a separate indoor rack can be used to house the modem, power supplies and other baseband options, with connections to the terminal via an Interfacility Link (IFL). For the block upconverter, the output power typically determines if and how it can be integrated. Small BUCs of less than 8W may fit on the boom arm with larger BUCs typically mounted behind the reflector. Very large BUCs, of 100 watts or greater may have to have a special mount or sit on the ground due to size and weight limitations. Norsat’s ATOM series 100W BUC, the smallest in the industry, can be integrated into portable terminals due to its class leading size and weight.

Certifications
Certifications and compliances are a critical consideration for portable terminals as satellite operators demand that end users are operating correctly, within acceptable power levels and without excessive side lobes that will cause interference to adjacent satellites. With 30 years’ experience, 34 satellites in operation, and coverage in 150 countries, Eutelsat and their rigid and thorough certification testing process is considered the gold standard. Portable terminals with this certification are accepted by other satellite manufacturers as proof of a quality terminal that won’t bleed radiation. The new Wideband Global Satellite (WGS) system, primarily owned and operated by the US government, has the most intensive and difficult certification process to pass and can take over one year and cost over $120,000 to gain full approval for X and Ka-band operation. Auto-acquire terminals have additional tests required for both the Eutelsat and WGS certification process to ensure the terminals alignment doesn’t “drift” over time.

Unique Features
Each portable terminal manufacturer generally has some unique features that differentiate the product from its competitors. In Norsat’s case we elevate the electronics in our terminals above the ground to protect them from ground moisture, we include a Norsat Universal LNB to ensure global operation without the need to change hardware, we build the systems with modular components to allow for easy field replacements to reduce maintenance charges and complexity, and we design and test to full military specifications (MIL-STD-810) to ensure a long lasting and high performing product. One unique strength of Norsat is our ability to rapidly deliver a highly customized product that meets each of our customer’s unique needs. Offering all of the advantages of Norsat’s products at a cost competitive price has been a key success criterion for Norsat’s GLOBETrekker, Rover, and SigmaLink product lines. Of course dealing with a company that has been in business for over 37 years and has supported militaries around the world also makes Norsat a strong long-term partner.