

APPENDIX E

Spatial Interoperability

In the specific case of air-delivered weapon support to ground forces, the precision bombing benefits of the common-grid capability afforded by GPS cannot be assumed in advance. To ensure GPS common-grid is applied in air-delivered weapons support, a change in joint doctrine is necessary to require in-theater use of the grid reference alphanumeric position reporting system, Military Grid Reference System (MGRS), for all 2-D positioning, navigation and targeting purposes and as the 2-D component of 3-D operations. Universal use of the MGRS for all in-theater spatial operations will eliminate confusion regarding which coordinate system is being used in navigating and reporting positions and targets. It will also eliminate the practice of requiring that ground personnel electronically or manually convert positions and targets from MGRS to latitude and longitude for the purpose of obtaining support from aviation components.

In any emergency situation, whether in a war zone or the domestic environment, spatial interoperability is as important as communications interoperability. Said another way, confusion in identifying an incident location can be as deadly as not being able to transmit that location to a potential responder. GPS can solve that problem, but only if it is employed smartly and with forethought. GPS enables common grid operations, but only if the participants agree in advance on which of the many available coordinate grids they will use to identify locations of importance to the operations. Coordinate grids are the languages of location, and using different grids in the same operation is analogous to trying to communicate in different languages.

Military Spatial Interoperability

In the military mission environment, spatial confusion in joint operations can result from different participants in an operation expressing locations using spherical geographic coordinates (latitude and longitude - lat/lon) and planar grid coordinates (Military Grid Reference System). There are good reasons for using each, primarily related to distances traveled, but from a spatial interoperability standpoint this is like discussing ground operations in English and airborne operations in Chinese. When the two have to work together, translation is critical, but under stress, mistakes are all too common. The burden of conversion routinely falls on the ground troops, who are likely already over tasked in a stressful environment, many times under enemy fire. This is the reason for the recommended revision to joint operational doctrine expressed in the Weapons Delivery section above.

Civil/Homeland Security Spatial Operations

In the civil environment, people today have great difficulty in finding map products (even those provided by digital sources) which contain grids that can be used with GPS equipment. Those map products that do include grids may use any of several grid systems to identify locations, a

lack of standardization that can create time-consuming confusion in time of emergency. Many of the commercial proprietary grids do not permit precise locations to be determined, and virtually none work with GPS equipment. However, in a December 2001 action to address Homeland Security issues, the U.S. Federal Geographic Data Committee approved a new standard grid for such applications that can eliminate this spatial confusion. Called the U.S. National Grid (USNG), this standard will permit easy depiction of positions to 10 meters or less anywhere in the United States using an alphanumeric designator about the size of a telephone number. The USNG is based on the global standard grid called Universal Transverse Mercator, so it is non-proprietary and globally extendable. It is also designed to be identical to the MGRS grid coordinate system used by the Army and Marine Corps, so it can directly enable spatial uniformity in joint civil-military response operations.

Lack of a uniform method for describing incident locations has long been a major impediment to rapid and effective emergency response in diverse metropolitan and rural areas. Until the adoption of the USNG, there has been no standard that would enable uniform large-scale map products to be created that could be used directly with GPS equipment and be applicable across jurisdictional boundaries nationwide. The USNG corrects that glaring discrepancy, but, having now been officially adopted, it still must be used to be effective. A program of education and training, beginning at the middle school level, would be instrumental in facilitating its use by the public. More focused leadership by the Federal Government to promote such basic education as well as training in the uniform application of GPS at federal, State and local levels by emergency responders would pay nationwide dividends for Homeland Security.

The immediate domestic impact of USNG will be to ensure that GPS is directly useable with properly gridded map products to quickly enable multi-agency and multi-jurisdictional emergency responders, and the public in general, to precisely identify geolocations in the real world. Linking current technologies of overhead imagery and Nationwide Differential GPS at one-meter accuracy, the USNG can facilitate direct creation of gridded, very precise, large-scale image maps that would be immediately useable with GPS receivers. These maps will be extremely useful to emergency responders as they will depict the emergency environment as it exists rather than as it previously appeared from potentially out-of-date legacy sources. GPS commercial receiver manufacturers are now beginning to include the USNG in their newest products. As awareness of its usefulness grows, prompted by education, the USNG will be a principal integrating mechanism to create spatial interoperability nationwide. It will be equally effective among multi-jurisdictional civil emergency response organizations and, when necessary, between those organizations and the military to support any and all domestic emergency response and disaster relief operations.