
FIGURES

2.1. The Army Dominates DoD Receiver Purchases	13
2.2. GPS Security Devices Provided to Allies	14
2.3. GPS Policy Issues Are Interdependent	42
3.1. Jamming Range Versus Jamming Power	52
3.2. CEP Degradation After GPS Loss-of-Lock	53
3.3. Scud Accuracy Versus GPS Velocity Measurement Error	63
3.4. No Dong 1 Accuracy Versus GPS Velocity Measurement Error	64
3.5. Advanced Missile Accuracy Versus GPS Velocity Measurement Error	68
3.6. Navigation Drift Error	70
3.7. GCM Attacks Against Soft Point Targets	73
3.8. GCM Attacks Against Hard Point Targets	73
3.9. GCM Attacks Against Small Area Targets	74
3.10. GCM Attacks Against Large Area Targets	74
3.11. Selected DGPS Distribution Methods	77
3.12. Representative Space-Based DGPS Coverage	78
3.13. Medium-Frequency Propagation Modes for DGPS Signals	80
3.14. Designers' and Military Planners' Views of Medium- Frequency DGPS Signals Differ Significantly	81
3.15. Medium-Frequency DGPS Signal Propagation Assessment Methodology	82

3.16. Nations Can Take Advantage of Enhanced Ranges by Exploiting the Sky Wave	82
3.17. DGPS Reference Station Propagation in Northeast Asia	84
3.18. Key Attributes of DGPS Systems	85
3.19. Assessing the Threat of Hostile Forces Using GPS	89
4.1. GPS Navigation and Positioning Requirements	95
4.2. Global GPS Market Projections	105
4.3. Global GPS Market Share Projections by Operating Regime	106
4.4. Global GPS Land Use Sales Projections	107
4.5. Global GPS Land Use Market Share Projections	108
4.6. Projected GPS Sales in Japan	110
4.7. Recent Growth in International GPS Patent Families	116
4.8. Alternative GPS Demand Levels	122
4.9. GPS Security Devices Provided to Allies	125
4.10. GPS-PPS Receivers Bought by U.S. Civil Government Agencies	125
4.11. Wide-Area Differential GPS	128
4.12. GPS Augmentations to Support Civil Aviation	130
4.13. Frequency Locations for GPS Augmentations	132
4.14. Some Encryption Modes for DGPS Signal	138
5.1. Public and Private Payment Categories	170
5.2. Flow of Funds for Public and Private Providers of GPS	170
5.3. Excise Taxes as a Payment Choice	171
5.4. Flow of Funds for a Civil Function in DoD	173
6.1. A Combination of Information Technologies	198
A.1. Three Segments of GPS	217
A.2. GPS Constellation	218
A.3. How GPS Works	220
A.4. GPS Control Segment	223
A.5. Block Diagram of a Single-Channel GPS Receiver	224

A.6. Differential GPS	226
A.7. Wide-Area Differential GPS	229
A.8. Projected Gyro Applications and Performance	233
A.9. Projected Accelerometer Applications and Performance	234
B.1. GPS Satellite Costs over Time	268
B.2. GPS User Equipment Costs over Time	269