# Horizon 2020 on Global Navigation Satellite Systems

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## I. INTRODUCTION

The Global Positioning System, or GPS, has become the prime instrument for navigation and has made Geo-location as common as knowing time. The current GPS receivers use signals defined in the early seventies. Since then the digital revolution has introduced new and more reliable signals and techniques leading to new possibilities and a proliferation of GNSS (Global Navigation Satellite Systems) systems.

## II. CURRENT STATUS OF GNSS SYSTEMS

Usage of the GPS system has become a commodity without which we would no longer be able to find our way. GPS dominates the Geo-location products in your smart-phone and is the prime source for almost all navigation purposes of NATO forces. The less known Russian GLONASS system is based on a similar concept and is slowly being more adapted and Europe is actively testing the Galileo system.

## III. VULNERABILITIES OF GNSS SYSTEMS

The current GPS system is unable to guarantee the precision, integrity, availability or continuity of the navigation service. Moreover it is vulnerable to radio-frequency interference or jamming. Denial of the civil navigation service to its adversaries by NATO forces is currently impossible without interfering with the military signals. A new design of the signals is needed to overcome these problems and will be detailed.

## IV. THE FUTURE OF GNSS SYSTEMS

Not only the GPS will evolve based on these new signals, but we will see a proliferation of GNSS systems. These systems offer to some degree interoperability but will also provide specific navigation or timing services that will make them stand out from the lot.