Chapter 1 – INTRODUCTION

Today, most airdrops are conducted by flying to a computed air release point (CARP) that is based on winds, system ballistics and airspeed. A ballistic table (based on the average ballistic characteristics of the given parachute system) dictates the CARP, where the load is released. This average is often based on a data set that includes variations up to 100 meters (328 feet) standard deviation. The CARP is also often calculated using an average of the winds (at altitude and surface winds) and assumes a uniform profile of the wind from the drop altitude to the ground. Wind profiles are rarely uniform from ground level up to higher altitudes, with variations coming from terrain effects and natural variable meteorological characteristics of wind currents like wind shear. Since most present threats to military aircraft are from ground fire, modern thinking is to have aircraft airdrop at high altitudes and with horizontal offset, putting the aircraft out of harm's way. This has obvious consequences of exacerbating the effects of varying winds. To meet the need of airdropping from higher altitudes and preventing deliverables from falling into the wrong hands, precision airdrop has been given a high priority by the NATO Conference of National Armaments Directors (CNAD). Modern technology has made the realization of many new innovative methods of airdrop possible. In order to mitigate the effects of all the variables that hinder precision ballistic airdrop, systems are being developed to not only increase the accuracy of CARP calculations by more accurately profiling the wind, but also to guide the airdrop system to a predetermined ground impact point regardless of the variations in wind.

1.0 BACKGROUND

Variation is the enemy of precision. The less a process varies, the more precise the process is; airdrop is no exception. There are many variables in the airdrop process. Among these are parameters that cannot be controlled, like weather, human factors such as rigging variations and crew/timing procedures, the porosity of individual parachutes, parachute manufacturing differences, differences in opening dynamics of individual and/or groups of parachutes, and the effects of wear. All of these and many more factors have an effect on the achievable accuracy of any airdrop system, ballistic or controlled. Some parameters can be partially controlled, like airspeed, heading, and altitude. But due to the very nature of flight, even these will vary to some extent during most airdrops. That said, precision airdrop has come a long way in the past few years and is likely to mature rapidly as NATO Nations invest more funding in precision airdrop technologies and testing. Many advances to precision airdrop systems are under development and many others are planned in the near future in this rapidly expanding capability area. This AGARDograph will describe the state of precision airdrop.

1.1 AGARDOGRAPH OBJECTIVE

The objective of this AGARDograph is to discuss the current state-of-the-art in precision airdrop technology/systems and to identify considerations for evaluating the performance of related systems.