The Charged Aerosol Release Experiment (CARE)

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The goal of the Charged Aerosol Release Experiment (CARE) experiment is to determine the effect of charged particle layers on the scatter of MF, HF, VHF, UHF, L-Band and S-Band radars. Radar echoes have been produced with radio signals interacting with electrons near charged polar mesospheric clouds (PMC). A PMC composed of ice particles can become electrically charged by electron attachment at night or by electron detachment during the day. Radar signals transmitted from high latitude stations in Norway, Greenland, and Alaska have recorded significant scatter in terms of polar summer mesospheric echoes (PSME). The CARE program will (1) yield observational data bases to determine the magnitude of the radar scatter from artificial charged dust and (2) determine the effectiveness of various configurations of charged particles to provide enhanced radar scatter. The series of CARE rocket experiments will be designed to test the results of theory with artificial radar scatter using a chemical release payload. The CARE experiment will require the launch of ~ 400 kg payloads to an altitude of 200 to 300 km. The first CARE rocket will consist of a diagnostic radio beacon and a chemical release section that is separated from the rocket motor. The chemical release canisters will use an aluminum oxide generator to produce an expanding shell of sub-micron dust. The amount of chemical released will be about 60 kg. Included in the chemical payload will be powdered aluminum fuel, ammonium perchlorate oxidizer, and HTPB binder. An instrumented radio beacon will be attached to the rocket motor section. Ground radars will scan the dust release for enhanced turbulence. Simulations of the effects from the expanding show the type of plasma turbulence expected from the CARE releases.