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DESIGN AND DEVELOPMENT OF A NEXT-GENERATION GREENHOUSE GAS MONITORING MICROSATELLITE CLUSTER

Abstract

As the urgency around addressing climate change heightens to a crescendo, space-based instruments have emerged as a versatile tool to monitor anthropogenic greenhouse gas (GHG) emissions. GHGSat Inc. has developed novel satellite technologies to detect and measure greenhouse gas emissions from orbit with facility-scale accuracy. GHGSat Inc. uses an imaging spectrometer instrument first flown on the GHGSat-D demonstrator mission. This instrument achieved a combined spatial and spectral resolution greater than any space-based spectrometer to-date. The successful operation of GHGSat-D paved the way for the development of the enhanced GHGSat-C1 and C2 satellites based on the same platform. The three satellites continue to perform global methane observations today.

To continue growing the constellation for expanded worldwide monitoring, Space Flight Laboratory (SFL) is developing GHGSat-C3, C4 and C5. This three-spacecraft cluster will supplement GHGSat Inc's existing fleet of methane monitoring microsatellites. These spacecraft, each weighing 16-kg, are built on SFL's proven NEMO spacecraft platform measuring 20 x 30 x 44 cm and capable of housing the high-resolution imaging spectrometer. The new cluster will feature increased telemetry and command (TC) and payload downlink data rates, which will allow more data to be transmitted from the satellite. In addition, the payload computer was upgraded. All updates were made within the same platform volume constraints. Furthermore, development of a systematic approach to expand from single-spacecraft builds to multiple, concurrent spacecraft builds is discussed. Additional considerations for launching multiple spacecraft includes the development of a launch adapter to accommodate three spacecraft dispensers on a single launch vehicle port. Building on its extensive heritage, the GHGSat-C3, C4, and C5 cluster is poised to augment GHGSat Constellation by improving coverage, data capacity and measurement accuracy.