

Field Instrumentation for Atmospheric Plume and Contrail Measurements

Abstract:

This report describes two ground-based field instruments that measured the expansion rate of solid rocket motor exhaust in the stratosphere. These instruments, however, are useful for atmospheric plume or contrail measurements in general because of their ability to enhance the contrast of such images against the bright sky. The first instrument records video images at SVHS resolution of polarized near-infrared light. The second instrument uses an electronic camera to record 1.6 million pixel still images with 10-bit gray-scale resolution of polarized light in a similar near-infrared spectral region. The cameras are mounted on tripods that automatically record the azimuth and elevation of the center of the field-of-view on the electronic image. The technique used to enhance the contrast of the image of the plume against the bright day sky is presented. The instruments were used successfully to observe plume expansion of Space Shuttle and Titan IV vehicles.