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Precision metrology using photogrammetric techniques has served as a fundamental and contributing technology for tight tolerance geometric inspection of complex aerostructures. To maintain pace with the continuous evolvement of industrial metrology, a novel photogrammetric industrial Unmanned Aerial System (iUAS) has been developed to automate the photogrammetric survey process. Typically performed manually with a handheld camera, the iUAS offers a unique platform for automating photogrammetric surveys. An empirical study was performed between manual photogrammetry surveying as compared to an iUAS photogrammetry survey. Fully autonomous execution using the iUAS enables fast cycle time surveys, optimal camera placement, and greater survey performance. Relying on a Macro Area Precision Positioning System (MAPPS), the iUAS is able to execute autonomous flight in a Global Positioning System (GPS) denied environment inside a manufacturing facility. A gimbal designed specific to the photogrammetry process enables controlled rapid placement of camera orientation and roll relative to the surveyed scene. The iUAS presents a new method of achieving autonomous inspection with a highly flexible and reconfigurable platform design affording ubiquitous use across various production applications. Performing photogrammetry with the iUAS enables surveys in difficult to reach locations, reduces survey cycle time, and increases safety.