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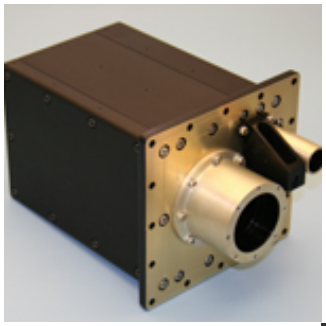
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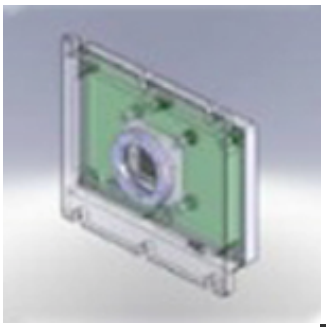
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GoldenEye 3D Flash LIDAR™ Space Camera

The GoldenEye 3D Flash LIDAR Space Camera™ is a lightweight, small form-factor (14x20.6x16.5cm) integrated 3D camera, capable of capturing a full array of 128x128 independently triggered pixels per each frame up to 10 frames per second, allowing 16,300 3D individual range and intensity points to be generated as 3D point cloud images or video streams per laser pulse (frame) in real-time. The 3D data output is used to provide autonomous (e.g. rendezvous, proximity, landing, etc.) operations or assist man-in-the-loop imaging. ASC's 3D focal plane array has been tested and used multiple times for space operations and has a rich heritage of success. The on-board processing in all ASC 3D cameras allows for streaming 3D point cloud and intensity output as well as camera telemetry.

Designed for deep space, geosynchronous or landing operations, the GoldenEye can be configured to meet mission specific application requirements. An example deep space operation using the Space Operations LIDAR (SOLID) GoldenEye configuration, the OSIRIS-REx Asteroid Sample Return mission camera was designed using 'S' level components in a space-qualified hardened assemblies. The OSIRIS-REx GoldenEye accommodates both long and short range imaging by using a switchable optical diffuser. Capable of withstanding 100kRad radiation, the SOLID camera weighs only 6.5kg, and can be configured for 1064nm or 1570nm laser wavelengths, depending upon eye-safety requirements. The SOLID GoldenEye laser and focal plane subsystems are independently sealed, reducing any chance of contamination by outgassing and meets NASA thermal, vacuum, vibration and shock requirements.

For geosynchronous and moon operations that do not require the heavy shielding and additional robustness required for deep space operations, ASC offers the GEO3D GoldenEye configuration. Using 'M' level components and shielding up to 25kRad, the GEO3D also supports the same range and capture capabilities as the SOLID configuration and allows for use of either laser wavelength. The mass is reduced to 4.0kg and meets NASA thermal, vacuum, vibration and shock requirements.

To determine whether the SOLID or the GEO3D GoldenEye configurations are appropriate for a given mission, ASC will help to model the requirements based upon the mission performance parameters. There are multiple options such as lens field of view, laser power, laser diffuser shaping and run-rate that

can impact pricing, schedule and performance. ASC will work through these options to determine the best model and configuration of the GoldenEye for your mission.

Sample Configurations

The SOLID GoldenEye configuration Part Number GE-2800-SC comprised of:

- 3D Sensor Engine with 128 x 128 InGaAs APD (detector array)
- 'S' level space qualified parts
- Range up to 3km inclusive (greater depending on laser/diffuser/lens choice)
- Height: 14.5cm; Length: 21.6cm; Width: 14cm
- Weight: 6.5 kg
- Anodized metal hermetically sealed laser enclosure and sealed focal plane array
- Laser assembly (2 to 8 mJ/pulse depending on configuration);
    - o 1570 nm, Class I eye-safe or 1064nm laser
    - o Low parallax laser positioning
- Nominal 5 Hz capture rate (5 Frames Per Second); up to 10Hz possible
- Based Unit Power Supply & Operation
    - o 24 V DC (+/- 4V); <50W
    - o Supports an operational temperature range of at least -0° to 35° C
    - o Extended temperature range available
    - o Power and data signals
    - o Low out-gassing parts
- Ranging accuracy specification
    - o Range bias of less than +/- (10 cm)
    - o Range noise of less than +/- 15 cm, 3-sigma
    - o More precise accuracy available

Licensed Software (included with initial development system)

- o Camera command & control
- o Camera status
- o 3D and 2D data viewing software
- o Data analysis (3D)
- o All embedded software installed by ASC prior to camera shipment

The GEO3D GoldenEye configuration Number GE-2800-3D comprised of:

- 3D Sensor Engine with 128 x 128 InGaAs APD (detector array)
- 'M' level space qualified parts
- Range up to 3km inclusive (greater depending on laser/diffuser/lens choice)
- Height: 14.5cm; Length: 21.6cm; Width: 14cm

- Weight: 4 kg
- Anodized metal hermetically sealed laser enclosure and sealed focal plane array
- Laser assembly (2 to 8 mJ/pulse depending on configuration);
    - o 1570 nm, Class I eye-safe or 1064nm laser
    - o Low parallax laser positioning
- Nominal 5 Hz capture rate (5 Frames Per Second); up to 10Hz possible
- Cooling operations via aluminum blocks, requires active cooling/heating
- Based Unit Power Supply & Operation
    - o Supports an operational temperature range of at least -0° to 35° C
    - o Extended temperature range available
    - o Power and data signals
    - o Low out-gassing parts
- Ranging accuracy specification
    - o Range bias of less than +/- (10 cm)
    - o Range noise of less than +/- 15 cm, 3-sigma
    - o More precise accuracy available

Licensed Software (included with initial development system)

- o Camera command & control
- o Camera status
- o 3D and 2D data viewing software
- o Data analysis (3D)
- o All embedded software installed by ASC prior to camera shipment

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