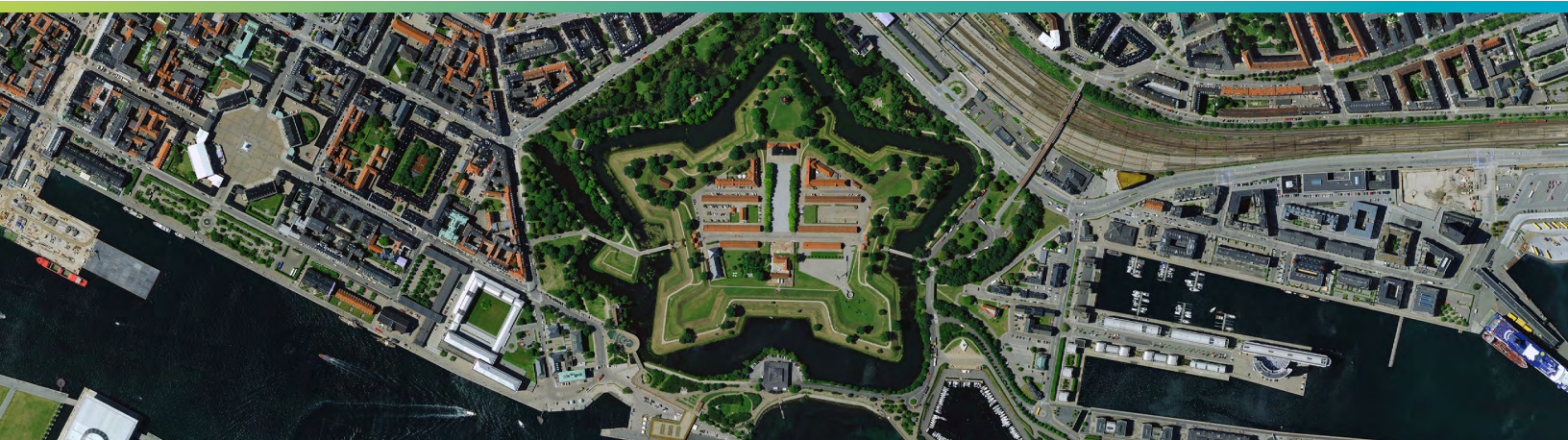


# ImageStation Automatic Triangulation

Image orientations: Aerial and satellite triangulation



One of the first steps in the photogrammetric production workflow is triangulation of aerial and satellite imagery. For your large volume aerial and satellite triangulation workflows, Hexagon offers a flexible, powerful product, ImageStation Automatic Triangulation (ISAT). ISAT provides fully automatic, high-performance and high-capacity aerial triangulation including automatic point matching, bundle adjustment and more. ISAT also contains tools that let you perform automatic point matching and bundle adjustment of satellite imagery from over 40 satellite sensors - virtually any sensor that provides Rational Polynomial Coefficient (RPC) or Generic Orbital Pushbroom (GOP) files, such as WorldView, Pleiades, Cartosat, and many more. ISAT includes efficient multiphoto point measurement with automatic point transfer for both aerial and satellite imagery.

The capabilities of ISAT are part of the ImageStation Orientations application that provides the complete project setup, management, measurement, and triangulation functionality of ImageStation Photogrammetric Manager (ISPM), ISAT, and ImageStation Satellite Triangulation (ISST) in a single installation and integrated run-time software environment. The level, or tier, of functionality available to the user is controlled by the individual software product licenses that are present.

## ImageStation Orientations application

### ISPM tier

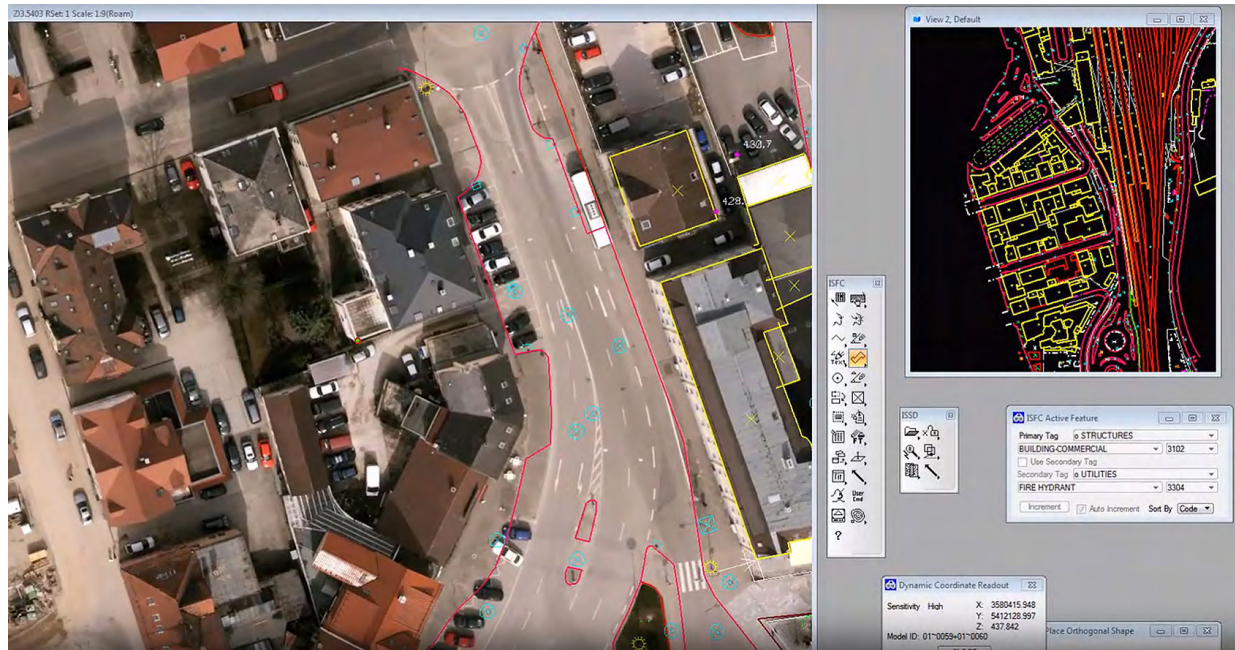
- Project setup and data management tools
- Import of aerial frame, UAV, ADS line scanner, and satellite imagery
- Import/export of photogrammetric data
- Automatic interior orientation
- Relative and absolute orientation of models
- Single-photo resection
- Archive/restore projects, reports

### ISAT tier

- Fully automatic, high performance and high capacity aerial triangulation
- GNSS/INS data processing
- Seamless POSEO support, camera and self-calibration, graphical error analysis
- Automatic point matching
- Efficient multiphoto point measurement with automatic point transfer
- Bundle adjustment of satellite RPCs and GOP metadata

### ISST tier

- Simultaneous bundle adjustment of imagery from a select set of satellite sensors based on ephemeris data and sophisticated orbital models



ImageStation Automatic Triangulation provides fully automatic, high-performance, high-capacity aerial triangulation.

## Automatic point matching

- Fully automatic tie point matching and triangulation of aerial frame imagery
- High performance using efficient algorithms and restricting tie points to a reasonable limit
- High quality aerial image matching using hierarchical image data structures and robust least squares image matching algorithms
- Well-connected image block by high-quality multi-ray points
- Automatic data checking at each step allows the user to be notified if something is missing
- Automatic detection of “Weak Areas,” checks if sufficient number of image points were available for each “Von Gruber” area, overlapping between models along the strip, and overlapping models across strips
- Auto Stretch (on-the-fly) option to change the image contrast for tie point generation
- Ability to specify a set of elevation files to be used to better approximate the starting point for matching
- Ability to reduce the number of shadow points that are used in the automatic point matching
- Stringent Matching option revisits difficult-to-match areas and applies more thorough matching processes to measure more rays, reducing weak areas and increasing multi-ray connections.
- Thinning and Weak Area Analysis to measure connectivity of points with regard to all photos, allowing the process to be used in an iterative manner to achieve a balance of points needed versus weak areas generated
- Thinning command for ISAT has an option to remove 2-ray points that fall in areas where 3 or more photos overlap. This eliminates questionable points from the interior of the block.
- QA/QC option allows a fast method to generate sufficient tie/pass points for a quick aerial triangulation

## Aerial triangulation

- High-performance and high-capacity comprehensive aerial bundle adjustment with virtually unlimited project size
- Bundle adjustment in Relative (without control points) and Absolute modes
- GNSS/INS data processing – tightly integrated with the Applanix POSEO system
- Camera and self-calibration capability
- Variance-covariance (precision) estimation
- Robust estimator option for blunder detection
- Display of vector residuals (image/object) to facilitate the error analysis process
- EO Analysis tool allows verifying the quality of provided EO parameters (GNSS/INS data)
- Ability to generate post-correction grids
- Ability to define and process blocks to more efficiently isolate and solve problems, and then merge multiple blocks into a new block and perform a final bundle adjustment of the new block at the master project level
- Submit jobs for immediate execution, or schedule jobs for later submission
- Ability to adjust several blocks simultaneously on a multi-processor computer or several computers

## Multiphoto measurement

- Manual control and check point measurement with automatic point transfer in an efficient multiphoto environment with multiple display windows and customisable window arrangement
- Multiphoto measurement environment works in mono or stereo mode and provides:
  - Dynamic pan and zoom; nearest neighbor, bilinear, and bicubic resampling options
  - On-the-fly image enhancements including Dynamic Range Adjustment (DRA), Auto DRA, continual Auto DRA, contrast and brightness, gamma, and sharpening with preview
- Automatic control point extraction with the use of Map Photos and the Elevation Files
- Automatic control point extraction from orthos by correlating them with photos (Second Generation Orthos)

## Satellite triangulation

- Automatic pass point matching of satellite stereo pairs
- Automatic blockwise tie point matching of satellite images
- Satellite bundle adjustment computes an affine post-correction to each rational function
- Provides a unique selection/parameterisation of the adjustable coefficients and choice of the constraints
- Supports adjustment of multi-segment satellite scenes with non-parallax points matched along a single scene between segments
- Robust automatic error detection
- Results dialog has options to withhold, reinstate and delete point measurements, and then recompute solution







## Integrated solutions

The ImageStation product family is the result of over 40 years of photogrammetric technology development, starting with analytical stereoplotters and progressing through the current full suite of digital photogrammetry software applications. ImageStation has applications for your entire production workflow including project creation, triangulation, stereo feature and digital terrain model collection and editing, automatic digital terrain model and digital surface model extraction, and orthophoto production and editing using aerial frame, ADS line scanner, UAV, and satellite imagery. ImageStation is designed with a high degree of automation for high-volume photogrammetry and production mapping customers who need to process large quantities of raw spatial information rapidly and accurately into an actionable format.

## Requirements

- ImageStation Photogrammetric Manager (ISPM)
- Optional: ImageStation Satellite Triangulation (ISST)

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## About Hexagon

Hexagon is a global leader in digital reality solutions, combining sensor, software and autonomous technologies. We are putting data to work to boost efficiency, productivity, quality and safety across industrial, manufacturing, infrastructure, public sector, and mobility applications. Our technologies are shaping production and people-related ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Safety, Infrastructure & Geospatial division improves the resilience and sustainability of the world's critical services and infrastructure. Our solutions turn complex data about people, places and assets into meaningful information and capabilities for better, faster decision-making in public safety, utilities, defense, transportation and government. Learn more at [hexagon.com](https://www.hexagon.com) and follow us [@HexagonAB](https://twitter.com/HexagonAB).

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