

Leica Aerial Survey Control Tool (ASCOT)

Overview

Leica ASCOT is a GPS-based flight management system for aerial survey flights, usually flown for photogrammetric purposes. ASCOT includes flight planning capabilities, with functionality allowing the digitization of information from a hard copy map. It also features navigation and camera control during flight, GPS raw data recording, and post-mission evaluation capabilities.

Product Description

Leica
Geosystems



Key Features

Flight Management System

- Interactive, graphical flight planning
- Better survey flight navigation
- Automatic camera release
- Flexible data annotation
- Storage of mission data
- Flight reporting
- Data export

Benefits

• **User Interface**

- Windows-style graphical user interface with mouse support
- Easy-to-learn with a short training period
- Homogeneous software; the user does not have to deal with different packages for planning, flight execution, etc.

• **Flight Planning**

- Interactive graphical and numerical flight planning using a digitizing tablet and mouse
- Comfortable editing and modification of flight plans
- Easy to edit, check and compare various possibilities to cover an area
- Planning in geographic and local grid systems
- Projects can contain different planning types such as Blocks, Lines and Points
- Sophisticated algorithm to calculate Lines to cover a block area
- Import complete external flight plan for execution with ASCOT
- Import coordinates for planning within ASCOT
- User definable free Line/Point labeling
- Enhanced data annotation with free text, different for each Line/Point
- Output calculated and summarized numerical data for flight planning and proposals
- Flexible data export for further use of all planning data (e.g. for aircraft flight management systems)
- Export graphical presentation in DXF data format

• **Flight Execution**

- Integrated hardware/software solution with powerful system check module
- In-flight numerical flight planning to adapt instantly to changing flight conditions
- Control of different GPS receivers and camera systems including gyro-stabilized mount
- Guidance throughout the project, including during approaches, turns and while on the photo line
- Release of the camera, individual annotation on each photograph
- Data storage of GPS data and event data in background processes
- Annotation on photographs when the camera is manually operated
- In-flight editing of guidance and camera control parameters

• **Flight Analysis**

- Graphical presentation of the flight; easy selection of displayed information
- Analysis of multiple flights
- Calculated and summarized numerical data for easy flight reporting and invoicing
- Export of graphical presentation in DXF data format
- Flexible data export for further use of all flight data
- Perfect data flow to the GPS post-processing step
- Automatic generation of flight plans containing only missed photos



Multi-Sensor Extension

Leica ASCOT Multi-Sensor is an extension to the standard ASCOT module. Leica Geosystems designed and developed ASCOT Multi-Sensor for users with dual camera systems as well as for users who want to operate another type of sensor in parallel with a frame camera. The main benefit of ASCOT Multi-Sensor is increased productivity of the flight crew, which results in shorter project flying time and saves money.

• **Features of ASCOT Multi-Sensor:**

- Interactive, graphical flight planning
- Better survey flight navigation
- Automatic camera release
- Flexible data annotation
- Storage of mission data
- Flight reporting
- Data export
- Streamlines data flow to GPS post-processing and photogrammetry

• **Easy to use**

- No special flight planning necessary for ASCOT Multi-Sensor
- Flight execution has enhancements but operates mostly like standard ASCOT
- All other software modules similar to standard ASCOT

• **Full Control of up to two Sensors During Flight Execution**

- One or two frame aerial cameras
- One frame aerial camera and one ON/OFF sensor
- One ON/OFF sensor only

• **Perfect Data Annotation and Image Identification**

- Unique identification of each photo from either camera
- Parameters updated and annotated individually for each camera

• **Supported Camera/Sensor Release**

- Single camera
- Synchronous operation of both cameras
- After simultaneous first exposure, the two sensors can follow their own different release cycles

- Flip-flop: In cases where images must be acquired too frequently for the camera cycle time, for example large scale exposures with large overlaps in urban areas, the two sensors can be used alternately to meet the requirement
- ON/OFF sensor

Flight Planning with ASCOT

• **Basics**

- Flight planning can be done by using a digitizer, a mouse or by numeric input.
- Flight planning has a Windows-style graphical user interface and runs within Windows 3.1/95/98/NT4.0/2000 as a DOS application.
- Flight planning also runs on the airborne computer ACU30, in which case input is done by using the numerical masks.
- Data can be entered in local grid coordinates, or in geographical coordinates.
- ASCOT performs all the necessary coordinate transformations in both directions, between local coordinate systems and WGS84.

• **Planning Types:** ASCOT supports three different planning types: Blocks, Lines, and Points:

- **Block (Irregular Blocks):** A Block is a polygon area defined by border points. To cover the area of the Block stereoscopically, ASCOT calculates the Lines in the Block and the photos on each Line according to given parameters.
- **Line (Individual Lines):** A Line is defined by start and end points. These points define either the extent along the Line to be stereoscopically covered or the first and last photographs on the Line. According to given parameters ASCOT calculates the photos on the Line.
- **Point (Individual Points):** A Point is a single photograph on a location defined by its center and the direction of approach. A Point can also be regarded as a special case of a Line containing only one photograph.



- **Project:** A Project may contain all planning types as well as more than one Block. Other related data such as parameters for coordinate transformation or data annotation are also part of a Project file.
- **Project Limitations**
 - A Project can contain a maximum of up to 999 Lines/Points. Each line of a Block, each Line and each Point are counted as one.
 - Each Line can contain a maximum of 30,000 photos (Line of a Block or an individually planned Line).
- **Safety Factors when ASCOT Computes Lines and Points:** The introduction of an edge and side safety factor results in an extension of the stereoscopically covered area. ASCOT shifts the start and end points of a Line, or in the case of Block coverage, expands the boundary polygon accordingly. The values for the safety factors are entered as percentages of the image footprint on the ground. This allows the user to investigate different variations during the flight planning for optimization.

Flight Execution with ASCOT

- Completely integrated system consisting of RC30, PAV30 and GPS means few units and few cables.
- Powerful system check module for all components allows control of all components during flight.
- Hardware designed for airborne application. (No “laptop” components that do not fulfill safety criteria.)

Flight Analysis with ASCOT

Analysis of Multiple Flights: In the event that a Project can only be completed by multiple flight missions, these missions can be analyzed jointly by ASCOT. This facilitates efficient project management, so the progress of a large Project can be monitored easily. ASCOT automatically generates flight plans of the remaining Lines/Photos depending on the progress in the Project.

Exporting Data from ASCOT

ASCOT performs flexible data export where planning data as well as flight data can be exported. Data export is controlled by export filters. Standard filters are already configured in ASCOT. Additionally, the user can freely define his own filters.

- Data can be browsed on the screen.
- Data can be stored in files for import into word processing programs, spreadsheet programs or databases.

General, Summarized and Statistical Data: General data can be used for report writing, project documentation etc. Summarized data can be used for report writing and to calculate project costs for proposal and invoicing. Statistical data can be used for flight preparation, to check the progress in a project, etc. The flexible data export in ASCOT offers a choice of 13 data groups, giving the user the ability to export exactly what is needed.

Detailed Data: Predefined filters allow easy data export. User-defined filters are also possible. The flexible data export in ASCOT offers a choice of more than 100 different items for export. Therefore, ASCOT supports the export of exactly the data needed in a user defined order. Detailed data can be used for data transfer, reports, flight preparations, processing, etc.

Airborne GPS Receiver for ASCOT

The GPS receiver is a board integrated into the airborne ACU30 computer of the ASCOT system. It features real-time navigation for flight control and phase measurements for subsequent post-processing and is based on proven technology. The main feature is its versatility: the same board is used for the most basic or the most hi-tech model and can be upgraded without hardware exchange.

FEATURE	BENEFIT
Integrated receiver	No cable, no loose parts; lower cost
Freely designable	Fits any customer’s requirements
Upgrades available	Evolves with customer’s needs
High recording rate	Better accuracy for projection centers
RTCM ready	No additional equipment required



Data Specifications

- Eurocard OEM board (single or dual)
- Single or dual-frequency GPS or GPS/GLONASS* receiver
- Fully controlled by ACU30 (through AOT30 terminal)
- 40 channels (L1 and L2, GPS and GLONASS*)
- In-band interference suppression*
- Multi-path reduction
- Two event markers
- Logging rate 1Hz or 2Hz*
- RTCM input/NMEA output

**optional features*

Ground Receiver for Airborne GPS Reference Stations

Leica's ground reference station is a compact, field capable unit. Based on new technology designed and improved during long experience, it ensures autonomous and reliable data collection under any conditions. The main feature is its simplicity: there are few cables and a robust design allow easy measurements after a quick setup.

FEATURE	BENEFIT
Compact receiver	Easy to transport
Field and office capable	Fits any conditions
Simple design	Easy to set up, by anyone
Upgrades available needs	Evolves with customer's needs
Survey equipment jobs	May be used for survey jobs
Established technology	Reliable system and components

Data Specifications

- Leica SR510 (single) and SR520 (dual)
- Single or dual-frequency survey/geodetic receiver (upgrades available)
- 12 L1 channels (and 12 L2 channels)
- Logging rate up to 10 Hz
- Dimensions: 205 x 165 x 72 mm; weight 1.15 kg
- Accuracy (kinematic): 10 to 20 mm + 2 ppm RMS
- Memory: 16 MB (standard, i.e. 16 hours of measurements at 2 Hz); optional 85 MB
- Control device: 100 x 50 mm LCD, 9 lines + status + function keys display, QWERTY keyboard

Enhancements and Differences in ASCOT Version 4

Version	ASCOT 4.x	ASCOT 3.x	ASCOT 2.x
General			
User interface	Planning graphically and numerically with digitizer and mouse and keyboard in a Windows-style graphical environment		Planning numerically with keyboard
	Single program entry for planning, editing and graphical presentation with increased features		Different program entries for planning, editing and graphical presentation
Default settings	Flexible configuration of the whole ASCOT software	Partly possible	A few parameters
File operations Directory structure	Flexible copying of planning information, flight data and raw data files	Limited access to the data files in a single directory	
New Event file format for perfect data flow	New format for enhanced dataflow: ASCOT → Flykin Suite+ → ORIMA; format for PATB/GPS	Format for PATB/GPS	

Flight Planning

Project	Project can contain all possible ASCOT planning types, i.e. Blocks, Lines and Points		A Project can contain only one of the three ASCOT planning types
Block planning	A Block is defined by an irregular polygon border line		A Block is a rectangle
	For planning a Block, the area which should be covered stereoscopically is entered; ASCOT will calculate the Lines for the Block, to minimize the numbers of Lines or according to a given line direction; to fit the Lines and photos to a given raster, a coordinate to lock on can be entered		For Blocks start and end point of the first Line and the offset between the first and the last Line are entered
	Lines of a Block can have different scales, reference heights and forward overlaps; Lines can be inserted into a Block.		All Lines of a Block have the same scale, reference height and forward overlap
Line planning	For planning a Line, the coordinates for the beginning and the end of the stereoscopic area are entered		For planning a Line the coordinates of the first and last photo center on the Line are entered
	Start and end points of the Line can be locked for computation	Not possible	
	Photos can be inserted into Lines		Not possible
Safety factors for computation	Side and edge safety factors can be entered for calculation of the photo centers		Safety factors have to be predetermined by the user
Undo function	Last action in graphical planning	Not possible	No graphical planning
Offset vectors for planning in geographic coordinate system	Library with unlimited entries	One vector at time	
Transformation parameters	Change of transformation set for same type of transformation	Not possible	
Digitizer sheet orientation	Accuracy of orientation displayed in ground distance	No accuracy information available	No digitizer
Line/Point labeling	Free three character Line/Point labeling by user		No Line/Point labeling by user
Data import	ASCII import of border points for Block planning, start and end points for Line planning or photo centers for Point planning	Not possible	

GIS & Mapping Division

ASCOT Technical Specifications

ACU30 / ACU30E

Processor: Intel Pentium 233 MHz
Main memory: 16 MB
Mass storage: Silicon Disk 80 MB

Peripheral devices: 3.5" floppy 1.44 MB
PCMCIA Type III

Graphics interfaces: VGA
VGA-PAL/NTSC converter

Communication interfaces: 6 RS232, optional 10
RS232 Event Input
external GPS
RTCM corrections
1 pulse per second

Dimensions: 420 x 195 x 355 mm
Weight: 17.5 kg

AOT30C

Display: TFT 640 x 480 pixel
26.5 cm (10.5 inch)

Dimensions: 330 x 250 x 80 mm
Weight: 5.8 kg, including holder
and cable

APV30

Display: Flat panel LCD, PAL/NTSC,
234 x 320 pixel,
12.7 cm (5 inch)

Dimensions: 140 x 113 x 35 mm
Weight: 0.5 kg

AFP30

Option:

Dimensions: 454 x 355 x 45 mm
Weight: 2.6 kg

Electrical

Voltage input: 22.5-29.5 V DC
Voltage output: 12 V DC on ext. GPS plug
28 V DC on ext. GPS plug
Average 80W, peak 180W
16A

Power consumption:
Circuit breaker: Internal 32V maximum
Overvoltage protection:

Environmental

Operating temperature: -10 to +50° C
Storage temperature: -50 to +75° C
Altitude: 50,000 ft (15,240 m)
Pressure: ICAO 50,000 ft (15,240 m)
Humidity: According to DIN 40040F
EMC: According to EN 55022
and
According to ISO 7137

Vibrations: According to ISO 7137
Shock operational: According to ISO 7137
Crash safety: According to ISO 7137
Emergency landing: According to FAA Part 25



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