

# DISTANCE LEARNING OF FCMS, THE LEICA FLIGHT & SENSOR CONTROL MANAGEMENT SYSTEM

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## ABSTRACT:

Modern airborne sensors are controlled and operated through software which performs on a single Man Machine Interface, all tasks such as sensor control, release and monitoring, as well as flight guidance. Owing to the high automation written into the software, user interaction is minimized during operation. The software of such a modern system hides the complexity from the user. Operation is intuitive. Novice users are able to operate such a sensor without attending a training course. Nevertheless, knowledge of background information and technical details enables users to benefit most from a sensor system. Therefore, training and education of users is still an important task. The paper is about the concept and tools Leica Geosystems implemented for education and training users of airborne sensors.

## 1. MODERN AIRBORNE SENSOR

### 1.1 ADS40 airborne digital sensor system

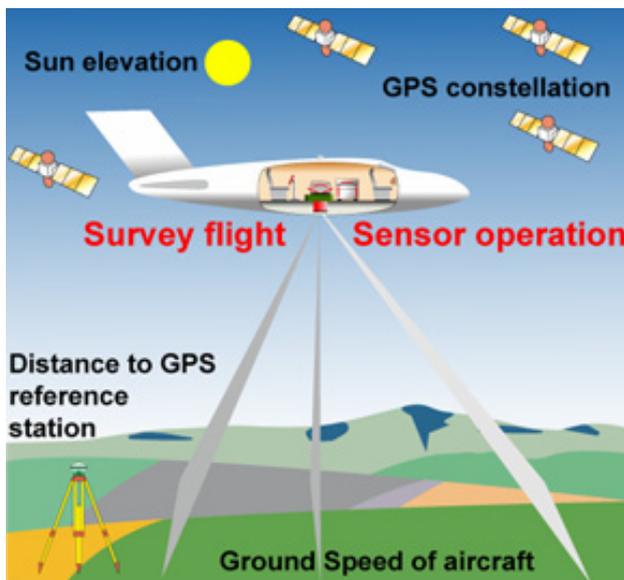


Figure 1. ADS40 sensor system from the user's point

Figure 1 illustrates the ADS40 sensor system from the user's point of view. The typical user's task during a survey mission is sensor operation and survey flight execution. As usual for all airborne sensors, limiting parameters must be taken into account. The main factor is ground speed of the aircraft (GS) which must not exceed given limits. Without this parameter, frame pictures cannot be taken with the desired overlap or in case of the push-broom type sensor ADS40 the ground pixels are stretched in the flight direction. To benefit from the advantages of GPS/IMU systems, GPS constellation as well as the distance from the survey area to the GPS reference

station(s) must be considered. For all imaging airborne sensors, sun elevation and atmosphere must be taken into account to record the images in the best possible quality.

### 1.2 FCMS – Flight and Sensor Control Software

The FCMS software is the heart of the ADS40 operation. All aspects of the ADS40 operation are conducted using this software. The main tasks are sensor control, flight guidance and user interface. The operator communicates with the software through the OI40 operator interface. No mouse or keyboard is necessary. The FCMS features a newly designed graphical user interface with the following features: clear icons on large buttons, simple touch screen interface, pre-defined system configurations, quick navigation within the menu-tree and on-line help.

### 1.3 Automated sensor control

The Operating System of the ADS40 system is hidden to the user. It is Windows® XP Embedded. The user does not have to start FCMS from the desktop. After the power-up sequence is completed the FCMS is ready to use on the OI40.

During flight execution a system monitor runs in a background process to supervise all relevant components of the ADS40 system. The system monitor also checks environmental limits as well as quality limits given for e.g. the required minimum number of GPS Satellites, the maximum accepted value for PDOP etc. In case the system monitor detects a condition in the ADS40 system where the collected data may be useless for post-processing, a message window pops up on the OI40. In the message window suggested actions are listed which are required by the user to solve the problem.

### 1.4 User interactions

User interactions are reduced to a minimum. The ADS40 sensor operates highly automated. To adapt the sensor to specific applications the user can configure all needed parameters. All

configurations are stored in a data base and can be recalled for the quick adaptation of the ADS40 to different applications.

## 2. DISTANCE LEARNING

### 2.1 Why distance learning?

Initial training courses are usually part of a sensor system sale. These courses cover all in-depth aspects of the sensor and its operation. Very often trained people change to other responsibilities within the company or leave. A careful hand-over to a successor usually does not take place. Therefore, distance learning and self-training become essential for the successors.

### 2.2 Tutorials

The ADS40 GUI tutorial allows the user to become familiar with all daily tasks of an ADS40 operator. See figure 2. The topics covered by the tutorial are grouped in lessons with a total of more than 300 slides. The most important ones are lesson 'Configuration' and lesson 'Flight execution'. In 'Configuration' an in-depth self-instruction is possible covering all aspects and parameters of ADS40 sensor configuration. In 'Flight execution' the user can train in-flight operation of the ADS40. The user can simply start with the first slide of the tutorial but he also can start with a specific topic. He can repeat slides or sections which cover parts of special interest. The last lesson of the tutorial covers the 'On-line help' system. After exercising the tutorial a user should have received the knowledge to operate the ADS40 properly.

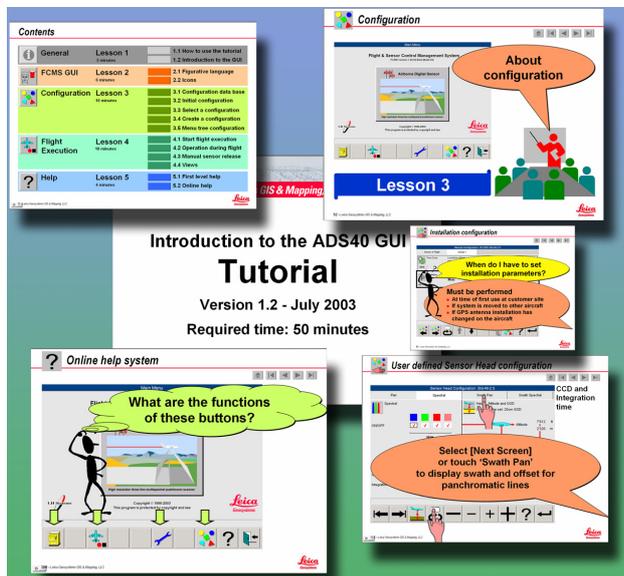


Figure 2. ADS40 GUI tutorial for distance learning

The tutorial has become part of each FCMS release. If new features are implemented in FCMS the tutorial will be extended.

### 2.3 Sections about basics in the ADS40 documentation

As mentioned in section 1.1 limiting parameters must be taken into account to get perfect ADS40 image data strips. In contrast

to traditional product related documentation, the ADS40 Technical Reference Manual contains background information and technical details which cover general topics such as: 'Transition from film based to digital systems', 'Differences from ADS40 to film frame sensor RC30' or 'Getting perfect digital image strips'. See figure 3. These sections are added to the ADS40 documentation to provide to all users the same knowledge base for self-education. Experienced aerial film photographers need to know the differences to avoid that they proceed to work just as they used to do in the past. By adopting this erroneous procedure, aspects of new technology are not taken into account. On the other hand newcomers need to get up to speed in a short period of time. Camera operators often migrate from other application fields to a sensor operator job. In general, camera or sensor operator is learned through practical experience. Therefore it is hard to find books with background information and written in the required level of understanding. Knowledge transfer through tutorials must be complemented by on-the-job training.

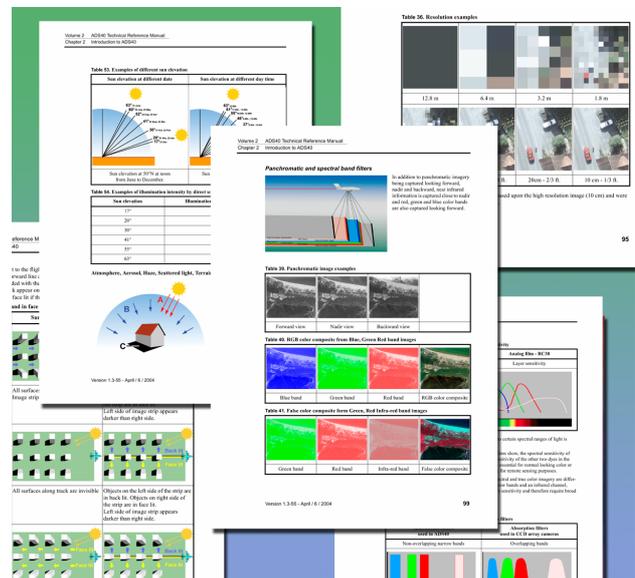


Figure 3. Sections of ADS40 documentation with general information

## 3. ADDITIONAL TRAINING

### 3.1 Training courses

Various training courses are offered by Leica Geosystems GIS & Mapping for different levels of users but as mentioned in 2.1, very often these are only requested on the occasion of a sensor sale.

### 3.2 User Group Meetings

Leica Geosystems GIS & Mapping frequently holds User Group Meetings and Workshops for users of all sensors ADS40, ALS40/50 and RC30. The purpose of the User Group Meeting is to assist in the advanced training of sensor users. The meetings are designed to be interactive workshops focused entirely on the operation, installation, maintenance and other day-to-day user issues.

## 4. OUTLOOK

### 4.1 Learning via internet

Distance learning is also possible via internet. Leica Geosystems GIS & Mapping plans to set up an ADS40 training website. Registered ADS40 users will be able to learn on-line, in addition to tutorials. This Leica Geosystems GIS & Mapping website will contain FAQs and will also cover other important topics as well as the On-line help procedure. This site is currently in an internal test phase. See figure 4. Soon registered ADS40 users will just need to connect to the ADS40 user's page to learn via internet.

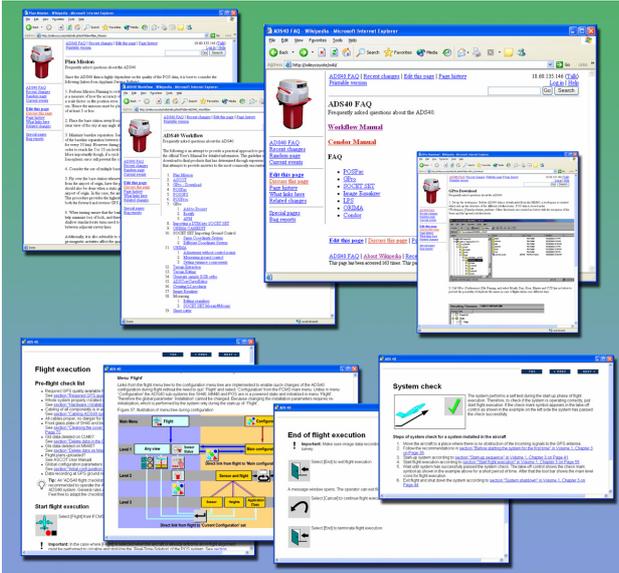


Figure 4. Websites for distance learning

## 5. CONCLUSIONS

Leica Geosystems GIS & Mapping pays attention to the education of airborne sensor users. Tutorials and in-depth documentation which covers background information is available within the training concept. This concept is a mixture of user self-education by using Leica Geosystems' tools, user participation on the various training courses and User Group Meetings offered by Leica Geosystems.