



7

Our Aeroplanes

- ▶ CESSNA 340 A RAM IV.
Twin-engine, 2 x 235 PS.
Service ceiling: 30.000 feet
Cruising speed: 200 knots
Flight time: 6 hours
- ▶ CESSNA 180 F
Single-engine, 230 PS.
Service ceiling: 21.000 feet
Cruising speed: 130 knots
Flight time: 7 hours

Our Equipment

- ▶ Intergraph Z/I DMC II (manufactured 2010)
- ▶ APPLANIX POS/AV 510 (Inertial Navigation System)
- ▶ Intergraph Z/I In-Flight (Flight management software)
- ▶ ZEISS RMK A 15/23 with FMC (forward motion compensation)
- ▶ ZEISS RMK A 30/23 with FMC
- ▶ TRIMBLE 4000 SSI, 2 frequency DGPS (for the recording of projection centres)
- ▶ TRACK'AIRs TRACKER for GPS navigation (Flight management software)

Surveying

- Our surveyors mainly deal with
- ▶ Determination of control points
 - ▶ Measurement of settlements (for example at disposal sites)
 - ▶ Site plan creation
 - ▶ Measurement of terrain models
 - ▶ Façade recording

We rely on most modern equipment from LEICA and TRIMBLE. With the LEICA TCRA 1103+ reflector less distance measurement as well as automatic target finding and target tracking is possible. For GPS Survey we use TRIMBLE R8 GNSS, which can process GPS and GLONASS signals.

For further information, please contact:

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YOUR EXPERTS FOR GROUND AND AERIAL SURVEY

■ geoplana, our services:

Aerial Survey Flights

- ▶ Digital
- ▶ Film based

- ▶ Digital printing
- ▶ Controlled mosaic

Engineering Surveying

- ▶ Site plans
- ▶ Construction surveying
- ▶ Field comparison
- ▶ Fixed point measurement
- ▶ GPS surveying with Trimble R8 GNSS
- ▶ Profile measurement
- ▶ Measurement of settlements

Photogrammetry

- ▶ 3D City Models
- ▶ Architectural photogrammetry
- ▶ Motorway surveying
- ▶ Tree and green space cadastre
- ▶ German base map (DGK5)
- ▶ Federal waterway maps (DBWK2)
- ▶ Digital terrain models
- ▶ Digital orthophotos
- ▶ Profile maps
- ▶ Surveying of quarries, disposal sites and coal dumps
- ▶ Cadastre of roads and cemeteries
- ▶ Topographic site maps
- ▶ Mapping of sealing
- ▶ Volume determination

Digital Image Processing

- ▶ Visualization
- ▶ Orthophotos
- ▶ Scanning and plotting services
- ▶ Single image rectification

- ▶ Photogrammetry
- ▶ Aerial Survey Flights
- ▶ Engineering Surveying
- ▶ Remote Sensing
- ▶ Laser Scanning
- ▶ 3D City Models
- ▶ GIS and CAD
- ▶ Orthophotos
- ▶ Disposal Site Surveying
- ▶ Digital Image Analysis



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Image 1 3D visualization
 Image 2 Height difference plan of disposal site
 Image 3 Colour coded plan of disposal site

Image 4 Orthophoto with cut lines
 Image 5 3D City Model
 Image 6 Site plan
 Image 7 CESSNA 340

geoplana

The company

geoplana Ingenieurgesellschaft mbH was founded in 1965 and has since then consistently specialised in the fields of photogrammetry and remote sensing. The company is based in Marbach, the birthplace of Friedrich Schiller, a famous German poet. We have [our own runway](#), which is located close to the office and [nearly all our flight projects depart from here](#). Our flight park consists of a CESSNA 340 and a CESSNA 180. Germany and the neighbouring countries belong geographically to the main area of work.

The geoplana team consists of highly qualified employees from different areas of specialisation. With a very high degree of coordination, surveyors work closely together with geologists, geographers, photogrammetric operators, business economists, cartographers, industrial engineers and computer scientists. The knowledge of each team member, combined with precise and highly sophisticated technical equipment, is a must for developing successful solutions.

Today geoplana is [the only photogrammetric company](#) with headquarters in Southern Germany [that has the complete production line in one office](#), starting from terrestrial surveying, aerial survey flights, over mapping capabilities right up to the final delivery of data to the customer. We guarantee that all work steps are "Made in Germany". Quick response time and a short delivery time is the positive consequence of this situation.

Products

Photogrammetry

Photogrammetry is the [usage of terrestrial or aerial photographs](#) for means of surveying and graphical purposes. Aerial mapping represents one branch of further processing.

Aerial Photo Interpretation

Here we have a two-track approach. Firstly, [digital](#), per screen with the software Summit Evolution® from DAT/EM Systems International. This software is compatible to MicroStation® (Bentley), AutoCAD® (Autodesk) and ESRI products. For the graphical elaboration of image contents the complete functionality of these software packages can be used. Secondly, photo interpretation is done [analytical](#). For this purpose we use the original photographs from aerial survey flights. In this case we also use MicroStation® (Bentley) in combination with the LEICA software packages Orima® and PC-Pro600®. Both approaches have in common that the mapping contents are captured in a CAD file. Depending on the demands of the customer it is possible to set different emphases.

Disposal Site Surveying

In the field of disposal sites (domestic waste, excavated soil landfill and other deposits for bulk material) the orientation is bound to the requirements. Particular attention is devoted to the [accurate and realistic acquisition of the terrain surface](#). From the captured data a digital terrain

model can subsequently be produced. A [computer-based volume calculation](#) can be executed from this data. As a result of this calculation for example it is possible to determine the yearly or total fill volume of the deposit. The advantage of photogrammetry is next to the [high accuracy](#) of the volume determination, the [exact time of acquisition](#), since the aerial images are taken in only a few minutes time. The result of the aerial survey represents an exact time.

3D City Models and Architectural Photogrammetry

If the aim of an aerial survey is a realistic representation of the building situation, then it is only a small step to a [3D City Model](#). The emphasis by this kind of interpretation lies on the building roofs.

[Depending on the level of detail](#) it is possible to map all kinds of [roof shapes](#) and [roof structures](#). Even the [mapping of fire walls](#) and other details is possible. If the mapped roof elements are combined with vertical wall shapes, then the [building is complete](#) and can be [realistically visualized](#) with appropriate software. geoplana participated significantly to the 3D City Model of Hamburg.

A special case in photogrammetry is the architectural photogrammetry. Here the emphasis lies in the exact mapping of building facades or views of interiors. Through skilful positioning of the camera while taking the survey photographs it is possible to map facade elements that are not directly visible.

Aerotriangulation

If it is required to map large land areas through aerial interpretation, then the performance of an aerial [triangulation](#) is necessary. For each image it is necessary to know the exact position and direction of the photographic situation. The images have to be correctly oriented before the mapping can commence. To gain orientation data of the survey images it is necessary to have [control points with geodetic reference](#).

To minimize the effort for signalling and determination of exact coordinates from control points in large land areas, it is possible to determine orientation data for connected images, through aerotriangulation with a reduced amount of control points. For this purpose images are oriented to the neighbouring image, and later on all the images of the photo block are oriented to the existing control points. In the computing process of aerotriangulation the orientation data for all images are calculated, adjusted and stay available for further applications, for example for the generation of orthophotos. For aerotriangulation we rely on the software Match-AT® from Inpho (Trimble).

Orthophotos

Large areas in a unique scale

An orthophoto is an aerial image that shows [areas in a unique scale](#). Therefore orthophotos can be used for direct position measurement (areas, distances, coordinates) performed in range of the ground surface. Basics for the calculation of orthophotos are next to the provision of the orientation data (aerotriangulation) the [digital terrain model \(DTM\)](#).

This is created either analytical or digital and consists of a uniform [three dimensional grid](#) with xyz-coordinates which is evenly distributed over the terrain. In addition to the grid, break lines (distinctive change in terrain slope) are captured to refine the terrain model. During the capturing of the terrain model it is essential to keep the purpose of orthophoto generation in mind. For this reason it is necessary to capture spot heights and breaklines on top of certain buildings like tunnels and bridges. Otherwise image distortion can occur. Orthophoto generation refers to the reversal of the central perspective of a camera image in an orthogonal projection of a map (horizontal projection of the terrain).

To make a [large amount of single orthophotos usable as one single map](#), the generated orthophotos have to be assembled to a mosaic. For this purpose individual areas are cut out of each single orthophoto so that they can be

bonded just like a puzzle. Finally, orthophoto tiles can be cut out of the orthophoto mosaic (corresponding with map sheets). For the orthophoto production we rely on the software OrthoMaster® and OrthoVista® from Inpho (Trimble).

Applications

- ▶ Determination of distances, coordinates and areas
- ▶ Analysis of land usage
- ▶ Overlapping of surface model and orthophoto for 3D visualization (True-Ortho)
- ▶ Pipework plan (above ground)
- ▶ Creation of vector data corresponding to the accuracy of the orthophotos

Image and Aerial Survey Flights

Our aeroplanes operate from the company owned airport in Marbach or from Schwäbisch Hall. The runway in Marbach is only a few hundred meters away from the office. This puts us into the position of making short-term decisions corresponding to the weather situation, and therefore we are able to use short periods of fine weather.