

# JENA PHOTOGRAMMETRIC INSTRUMENTS MANUFACTURE FROM 1984 to 1988

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## 1. Introduction

The history of Jena photogrammetric instrument manufacture started with the development of the first test models of a stereocomparator in 1901 and its series production from 1903. Up to the year 1945, there were more than hundred developments for recording, restitution and auxiliary instruments which were, for the most part, based on optical and precision-mechanical principles /7/. After several years of interruption in the production and development of photogrammetric equipment after the end of World War II, there was a new start in 1949 when the former traditional developments had first to be continued. It was not before the sixties that the photogrammetric instrument system could be completely redesigned, with the electric and electronic components gaining a growing importance. Some instruments from this stage of development, like the Interpretoscope, the universal analogue Topocart Stereoplotter, the Transmark Laser Point Transfer Instrument as well as the UMK 1318 Universal Measuring Camera, achieved particular success and are, still today, included in the production programme of <sup>the</sup>Jena Works.

Nearly all developments of the eighties comprise modern micro-computer control systems, in addition to the proven opto-mechanical components. The ever-growing and rapid advances in the field of microelectronics permitted an increasing extension and perfection in designing technological procedures and instrument lines for data acquisition and analysis. In the four years following the ISPRS-Congress in Rio de Janeiro, the main emphasis in developing the Jena photogrammetric instrument production was laid on equipment systems for aerial photography and multi-spectral photo analysis as well as components for analytical evaluation. Table 1 shows the essential new and further developments of photogrammetric instruments.

## 2. LMK Aerial Survey Camera System

With the introduction of forward image compensation (FMC) for compensating the forward motion of the airplane in photogrammetric survey cameras, the Jena Works made possible a substantial quality improvement of the airphotos. Rich experience gained with the LMK system on all continents over the past few years could then be used in the new LMK 1000 System.

- LMK 1000 Aerial Survey Camera System (1986)

- cones of 9, 15, 21 and 30 cm focal length
- maximum speed of forward motion compensation of 64 mm/sec.
- exposure of camera data onto the film edge (when using special interfaces, also external data, e.g. from a navigation system, can be exposed)
- control of two systems with the aid of one control unit
- connection facility for the exposure of fiducial marks
- automatic exposure control with half f-stop intervals.

- NCU 2000 Navigation Control Unit (1987)

- combination of navigation telescope and control unit for regulating drift and overlap in airphotos taken with the LMK or LMK 1000, resp.
- + 80° to - 10° angular aperture
- turret for different navigation line patterns according to the cone used
- luminous travelling marks in the telescope image.

## 3. Multi-spectral photo analysis

A particularly efficient method of photo analysis is the mixing of picture information obtained from different sources and spectral ranges. The further improvement of the Rectimat C and Kartoflex has, thus, taken into special account the possibilities of multispectral projection and vision.

- Rectimat CM Precision Colour Rectifier (1987)
  - multispectral projection of the three channels of an MKF-6/MSK-4 photograph according to the additive method
  - automatic vanishing point control
  - programme for the automatic rectification by measuring image coordinates through shifting the projected image and by internal computation and transfer of setting values
  - improved illumination of the projection table
  
- Kartofflex M Computer-assisted Interpretation and Map Revision Instrument (1988)
  - optimized multispectral vision by means of novel illumination systems for all three input channels of the optical viewing system
  - parallax measuring facility and programme for determining the height differences from parallax differences
  - improved connection possibilities for workplace computers by extending the serial interface.

#### 4. Components for analytical evaluation

Due to economical aspects, it is not possible yet to do without analogue memories (photos) and visual interpretation methods in photo evaluation.

The computer-assisted, analytical stereo evaluation of photographs has, thus, gained a growing importance over the past few years, a local interconnection of systems taking place. For these tasks, the Jena Works designed several hardware and software components.

- MTU 5300/P Magnetic Tape Unit (1984)
  - data buffers
  - recording on 1/2" magnetic tape on the basis of the CM 5300 Drive Unit
  - parallel interface
  - connectable to Coordinometer H, Orthophot E, DZT 90 x 120 and DZT 90 x 120/RGS Digital Plotting Tables.
  
- ZIF 2 Digital Interface Unit (1985)
  - connectable to Dicometer, Stecometer C, Topocart D, Stereometrograph G and Stereoplot for the acquisition and transfer of maximally 4 coordinates via a serial interface (programmable)
  - double foot switch
  - display of four coordinates and control panel with 32 buttons as an addition.
  
- Dicometer Precision Stereocomparator (1985)
  - 23 x 23 cm maximum format
  - viewing magnification 8 x, 14.5x and 24x (Galilean telescope)
  - drive of measuring spindles via selsyns
  - incremental shaft-angle digitizers (IGR) directly coupled with the spindles (resolution 1 $\mu$ m)
  - six selectable luminous measuring marks
  - mean error of the measured photo coordinates  $\leq \pm 2\mu$ m
  - special version with shaft-angle digitizers for the controls x,y,z and py for an extension to the Analytical Plotter.
  
- DICOP Programming System (1986)
  - computation of the model or national coordinates, resp. obtained from stereocomparator measurements with

programme modules for correcting instrument errors and for interior relative and absolute orientation.

- STRAUS Programming System (1986)
  - on-line aerotriangulation programme for analogue plotters with strip adjustment for the computer-assisted stereomapping system DZT 90 x 120/RGS.
  - additional programmes for determining the coordinates of projection centres and for the graphical presentation of results, including residual mismatches
  
- DZT 912 Digital Plotting Table (1988)
  - advanced version of the known family of digital plotting tables with extended applicabilities for drawing tools (Indian ink, engraving, fibre-tip tracer, ball-point-pen)

Table 1

## Photogrammetric instruments from JENA 1984 - 1988

Year	Instrument/Programme	Application
1984	MTU 5300/P	Magnetic tape unit with parallel interface as peripheral unit for Coordimeter H, Orthophot E, DZT 90 x 120 and DZT 90 x 120/RGS
1985	Dicometer	Precision stereocomparator for the picture format 23 x 23 cm
	ZIF 2	Digital interface for connecting units with 2 or 4 encoders to computers via a serial interface
1986	DICOP	Programme package for the on-line evaluation of Dicometer measurements
	STRAUS	Programme package for on-line aerotriangulation with the DZT 90 x 120/RGS
	LMK 1000	Advanced model of the LMK Aerial Survey Camera System
1987	NCU 2000	Navigation control unit for the LMK and LMK 1000 Systems
	FEAG 400	Photoscan/photowrite system with special facilities for the direct writing of scanner data
1988	DZT 912	Advanced model of the family of digital plotting tables DZT 90 x 120
	Kartoflex M	Computer-assisted interpretation and map revision instrument with improved image mixing possibilities

## Literature

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