

INTERNATIONAL SOCIETY FOR PHOTOGRAMMETRY AND REMOTE SENSING
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NATIONAL REPORT
OF
REPUBLIC OF CHINA (TAIPEI)

1. Topographic Operations

+ Projects executed

- Production of photo base maps of Taiwan

A photo base mapping project was initiated in 1975 and completed in June 1982. Photo base maps were produced at the scale of 1:5000 for regions up to 1000 meters above sea level and 1:10000 for mountainous regions at 1000 meters above sea level and higher where only little agriculture exists except forestry.

The orthophoto technique was used to produce base maps for hilly regions while conventional rectification served to produce those for flat regions. Four Zeiss D-2 Planimat plotters were used for profiling and one GZ-1 Orthoprojector for orthophoto production in the off-line mode. Photo flights were made over the middle of map quadrangles. Overlap of the photos is 90%. This makes it possible to select photos fully covering the map quadrangles. Consequently this allows one photo making one map.

Ground targets were placed prior to aerial photography at some 2000 existing triangulation stations of 1st, 2nd and 3rd order accuracy for the purpose of identifying the stations on photographs.

Photogrammetric control points required for photo mapping were determined by the analytical block adjustment method.

Maps numbering 3773 in total, including 3209 on 1:5000 scale and 564 on 1:10000 scale covering all Taiwan, were produced. 500 copies each map were printed for the users.

- Revision of photo base maps of Taiwan

Due to changes in ground features brought about by fast-paced economic growth in recent years, the completed base maps often diminish in value with the passage of time. Therefore, the maps must be revised from time to time. Upon completion of production project in June 1982, a revision plan was started in the following month. The base maps of urban, well-developed, and consolidated farmland areas are scheduled for revision every six years, and those covering underdeveloped or mountainous lands will be revised every ten to fifteen years. In principle 400 base maps will be subject to revision each year.

- Production of 1:1000 topographic maps for city planning purposes

Starting 1979, the photogrammetric method was used to produce 1:1000 topographic maps for the cities of Taiwan to replace the old 1:3000 city plans prepared mostly by means of the ground plane-table survey method. The 1:1000 maps are made from the 1:5000 photographs taken with the Zeiss Camera 21/23. The contour interval is 1 meter. The 1:1000 maps of the cities of Taipei, Pingtung, and Panchiao have been completed while those of Kaohsiung are being prepared. Mapping for the other cities is in the planning stage.

+ Photographic Coverage

- Sensors available

Zeiss RMKA 8.5/23

Zeiss RMKA 15/23

Zeiss RMKA 21/23

Zeiss EMKA 30/23

Wild RC 8 15/23

Wild RC10 15/23

Mark 1 multispectral camera

DS 1260 multispectral scanner

- Platforms available

Piper PA-31 survey airplane

Beechcraft King Air 200 survey airplane

- Photo Coverage

Complete aerial mapping photographs of Taiwan are available from year to year. The scales of the mapping photographs vary from 1:3,000 to 1:40,000.

Photographs used for 1:5000 base map production are on the scale of 1:17,000, while those for 1:10,000 base map production are 1:34,000. The mapping photographs are all black and white. In addition, some black and white infrared and color infrared photographs covering selected areas of Taiwan were flown for agricultural and other resource inventorying purposes. Since 1983, the DS 1260 scanner has been used to scan the multispectral images of Taiwan. Side-looking airborne radar images as well as Landsat images of Taiwan are also available.

2. Non-topographic Operations

+ Survey of raw material piles

In 1968 the Chinese Society of Photogrammetry and Remote Sensing signed a contract with the China Steel Corporation to survey its raw material piles by the photogrammetric method once every three months. The 1:3000 air photographs

used for the survey were flown with the Zeiss mapping camera RMK A 15/23. Cross-shaped control targets were laid on the ground prior to air photography. The Zeiss D-2 Planimat Plotter was used to plot 1:500 scale maps with contours at 0.25 to 0.5 meter intervals. The volume of raw material stocks was computed based on the contour maps.

+ Survey of typhoon-caused damage

The Taiwan Agricultural and Forestry Aerial Survey Institute started in 1981 to produce maps of cultivated land in Taiwan based on the existing photo base maps. This task was aided with some field checks. Whenever a natural disaster occurs, the affected area is photographed immediately and the extent and degree of damage is transferred from the new photos onto the land maps. Indemnity will be paid and remedial measures undertaken accordingly.

+ Compiling a gazetteer

Some 100,000 names of towns, villages, rivers, mountains and hills, bodies of water, streets, roads, public buildings, facilities, agencies, schools, etc. exist on the newly published photo base maps of Taiwan. To facilitate locating the names by users, the CAPD commissioned the National Taiwan University and the Chinese Culture University to compile a gazetteer of such names, including information like their categories, geographical locations, administrative districts and map numbers. Work has so far been completed on the maps of eleven cities and the information thus edited has been published in book form. All this information will be forwarded to the Ministry of the Interior to be computerized for centralized safekeeping and easy retrieval. Any revision in regard to the names will accordingly be transferred to the computerized data bank.

+ Demarcating township, county and city boundaries from photo base maps

Previously there have existed no precise large-scale maps upon which administrative boundaries can be shown. Onto the base maps have been transferred such boundaries based upon cadastral maps and related materials. The Ministry of the Interior has referred the base maps to the county and city governments for them to make field checks for the purpose of correcting erroneous demarcations on the base maps. The correction will be made accordingly.

3. Remote Sensing Operations

+ Remote sensing equipment

- A DS-1260 multispectral scanner with preprocessor
- A Mark 1 multispectral camera with an additive-color viewer

- A Beechcraft King Air 200 survey plane
- Map digitizers and computers

+ Rice yield prediction

The Taiwan Food Bureau initiated in 1979 a project aimed at surveying the rice yield of Taiwan. The rice-producing areas are photoflown twice a year. The rice lands shown on the new aerial photos are transferred to the existing photo base maps. The acreage planted to rice is calculated from the maps in order to predict the rice yield, which has proved very close to the actual yield.

+ Sugar Cane yield prediction

The sugar cane area, second only to rice lands, totals about 100,000 hectares. Beginning 1978, the Taiwan Agricultural and Forestry Aerial Survey Institute conducted a three-year project aimed at monitoring the sugar cane yield of Chihu in central Taiwan. Black and white photos on the scale of 1/12000 and color infrared photos on the scale of 1/8000 were taken of Chihu's sugar cane fields for the determination of areas planted to this crop. The final step in estimating the yield consisted in making sample ground checks on what varieties were involved and how plants were spaced.

+ Asparagus yield predication

Canners of asparagus, a leading farm export commissioned the AFASI to conduct a survey of the total area planted to this crop in central Taiwan. This survey was aimed at forming an accurate estimate of yearly yields in order to promote planned production and marketing. Photo base maps on the scale of 1/5000 and 1/10,000 were used and workshops held to train township workers in making adjustments in planted areas.

+ Remote sensing operations planned

- Make periodic surveys of land-uses in order that all land resources may be utilized optionally.
- Revise large scale photo base maps from time to time so that they may serve effectively as an important guide for economic development purposes.
- Make predictions about all crop outputs on which to base national food requirements.
- Investigate mineral resources.
- Monitor urban developments and construction projects and make pre- and post-construction environmental evaluations.
- Improve the meteorological satellite ground station to

enhance weather forecasting capability.

- Survey landslides.
- Monitor ocean conditions and offshore phenomena.
- Investigate water and air pollution.

4. Research and development

+ Geological and mining survey

The Mining Research and Service Institute is studying the geological structure and mineral resources of Taiwan using side-looking airborne radar images and Landsat images. Based on this study, two tectonic patterns have been discovered, i.e. the circular pattern surrounding the Peikang Basement High in the mid-west of Taiwan and the NW-SE shear pattern crossing the middle part of Taiwan.

A strain ellipse model has been worked out from image lineaments of Taiwan as a whole. This model is not only consistent with field observations but also able to explain the two newly-discovered tectonic patterns. This study reveals that the two patterns are basically formed by the interaction of the resistant forces of the Peikang Basement high against the northwesterly compressional forces of the clockwise rotational component of the Philippine Sea Plate relative to the Eurasian Plate.

+ Estuarine Processes of the Tatu River

Multitemporal Landsat MSS imagery, aerial photographs, and digital multispectral scanner data taken from 1972 to 1982 were used to study the estuarine processes. All the remotely sensed data revealed an unusual abundance, variety, and distinctness of discolouration and turbidity patterns and proved suitable for both qualitative and quantitative studies.

The estuary of the Tatu River, which has been seriously polluted by urban sewage and industrial waste water, was selected as the study area. This estuary lies in the central part of the western coast of Taiwan about 7.5 km south of Taichung harbor. On the southern side of this estuary, a huge industrial park is under construction on the tidal flats.

The qualitative approach was used to map the polluted water plumes discharged in different oceanographic seasons and tidal conditions. The quantitative analysis by which sea truth was collected at a limited number of locations served to calibrate remotely sensed digital data and to extend the results to the whole scene.

An estimate was made of the relative importance and time-

scale of the variety of physical parameters influencing the study area. Moreover, in summer the water motion was measured quantitatively from successive photographs in which the turbidity patterns remain recognizable from one photograph to the next. And a mathematical model was developed to simulate the process of this river.

5. Education

Both the departments of Survey Engineering of the Chung-Cheng Institute of Technology and the Cheng-kung University are the two main education organizations in Taiwan teaching photogrammetry. Besides, there are some other Universities such as Taiwan University, Chung-Hsing University, The University of Chinese Culture provide Photograph Interpretation and Remote Sensing Courses.

- + Number of staff: Photogrammetry 20, Remote Sensing 5
- + Equipment: Zeiss and Wild cameras; A-8, B-8, C-8, D-3, D-2 Stereoplotters, PK-1 Comparater, computers, etc.
- + Number of graduates: 35 persons a year (Photogrammetry).
- + Possibilities for foreigner: Foreign students are accepted through student exchange program which is sponsord by the Ministry of Education, ROC.

6. Publication

+ Periodicals

- Photogrammetry and Remote Sensing, published by Chinese Taipei Society of Photogrammetry and Remote Sensing, Taipei, Republic of China. Issue No. 1, June 1979 through No. 7, September 1983.
- Remote Sensing, published by the Remote Sensing Technology Development Group, Ministry of Economic Affairs, Taipei, Republic of China. Issue No. 1, February 1983; No. 2, October 1983.
- Survey Engineering Quarterly, published by Chiness Society of Survey Engineering, Taipei, Republic of China. Since 1958.
- The Cadastral Survey, published by Chinese Society of Cadastral Survey, Taipei, Republic of China. Issue No. 1, May 1982; No. 2, April 1983; and No. 3, March 1984.

+ Textbooks

- Photogrammetry, 366 pages, by Yu-Chun Chang and Jen-Hsing Hsieh, January 1982.

- Interpretation of Aerial Photographs, 262 pages, by Jen-hsing Hsieh, January 1983.
 - Map Reading, 47 pages, by Jen-hsing Hsieh, August 1982.
 - Forestry Resources Photogrammetry, 394 pages, by Daneil T. N. Liao, January 1980.
 - Forestry Photogrammetry, 471 pages, by Ying-lin Wu, April 1981.
 - Manual for Survey and Mapping of the Photo Base Maps of Taiwan, 76 pages, by Jen-hsing Hsieh, April 1977.
 - Remote Sensing, 430 pages, by Hsing Wang, November 1977.
 - Remote Sensing, 135 pages, by Yun-An Fang, December 1977.
- + Multilingual Dictionary for Photogrammetry and Remote Sensing

A Chinese-English-German Dictionary for Survey and Mapping containing 17323 entries was published by Chinese Society of Survey Engineering, June 1963. Among the 17323 entries of this dictionary, there are 1482 photogrammetric terms. To participate in the preparation of the Multilingual Dictionary for Photogrammetry and Remote Sensing as suggested by Commission VI, ISPRS, September 1982, the Chinese Taipei Society of Photogrammetry and Remote Sensing is planning to prepare a Chinese-English Photogrammetry and Remote Sensing Dictionary for publication.

7. Professional subjects

Chinese Taipei Society of Photogrammetry and Remote Sensing: The society, a private organization located in Taipei, Taiwan, The Republic of China, was established in 1963 and reorganized in August 1978. It is devoted to the development of photogrammetry and remote sensing technologies and their applications to land surveys and resources inventory.

At present, the society has 240 members, mostly college graduates trained in photogrammetry or remote sensing. They are also personnel employed by various governmental and private survey, mapping, agricultural and mining agencies such as the Agricultural and Forestry Aerial Survey Institute, the Topographic Map Service, educational institutions, etc.