

Testing of Instant Aero Survey

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ABSTRACT

When physical value is calculated from satellite data, it is very important to make a comparison between satellite data and ground truth data. Therefore, ground truth data is quite important. Many spectral data are collected using spectral meters on the ground level. But some parts of ground are very difficult to take spectral information of their surfaces. For example, Forest, wetland and agricultural land are difficult to take spectral information.

Instant Aero Surveying system with spectral meter has been developed to make spectral information of forest, wetland and agricultural land. A remote control helicopter was applied to this system.

1. System

We integrated with a remote control helicopter, spectral meter, micro-computer, GPS receiver, CCD camera and. The integrated system is shown in Figure 1. Remote helicopter was made by Organ needle co. Its payload is 11kg in ground height. When it is used over 1500m, its payload is 6kg due to low air pressure. The weight of our observing system is less than 6kg. Therefore, our system is available even over 1800m, high land area.

Our spectral meter has 2 channels. One channel is for sample observing. Another one is for white reference. Reflectance ratio is always calculated from these 2 values. It is not necessary to take a white reference measurement by sample channel during observing. This characteristic is very important to develop this system. If it is needed to make a white reference measurement by sample channel, it is impossible to make less than 6 kg and short observing time a observing module.

This system can collect reflectance data, image and GPS positioning data on the same time (each 1 second). All data except image data is collected in micro computer. This computer has 40 MB flash memory. Remote control helicopter can fly for 20 minutes. It is flying over 100 - 150m height from operator. Its ability is more high flight. But 150m is limitation of operator's eye.

This system can give us 30 - 50m accuracy of position. It is good enough for NOAA AVHRR data analysis. For more high resolution data (LANDSAT, SPOT ADEOS etc.), high accuracy positioning data is needed. In the near future, we will apply DGPS mode to positioning. In that case, accuracy of positioning is less than 3 m.

2. Test in field

This system was tested in Nagano pref. and Mongolia. Mongolia is almost high land area over 1400m. We had 5 flights in Mongolia. 1st flight is over slight dense grassland area. Figure 2 shows landscape of 1st test flight. 2-3 flights are over slight dense grassland with low trees. Figure 3 shows landscape of 2-3 test flight area. 4-5 flights are over middle dense grassland. Figure 4 shows landscape of 4-5 flights area.

When spectral data is detected from 1 - 2 m height, 1st test area is too low dense vegetation. 2-3 test area has low trees. Therefore, 1 - 2 m height measurement can not cover wide view of spectral meter. It is impossible to collect average information from such land cover.

Our system can collect average spectral data from such land cover areas. Because view area can be controlled by remote control helicopter flight height. If skillful operator control a helicopter, helicopter flight is very stable. Figure 5 shows result of spectral data of 2nd flight.

3. Conclusion

This system can take spectral information of canopy of forest, surface of water, wetland, agricultural land. The cost of ordinal aero experiment is too expensive. Therefore such measurement can not be standard information of ground truth. Much standard ground truth information is needed to process satellite data for physical values. This system is invaluable.

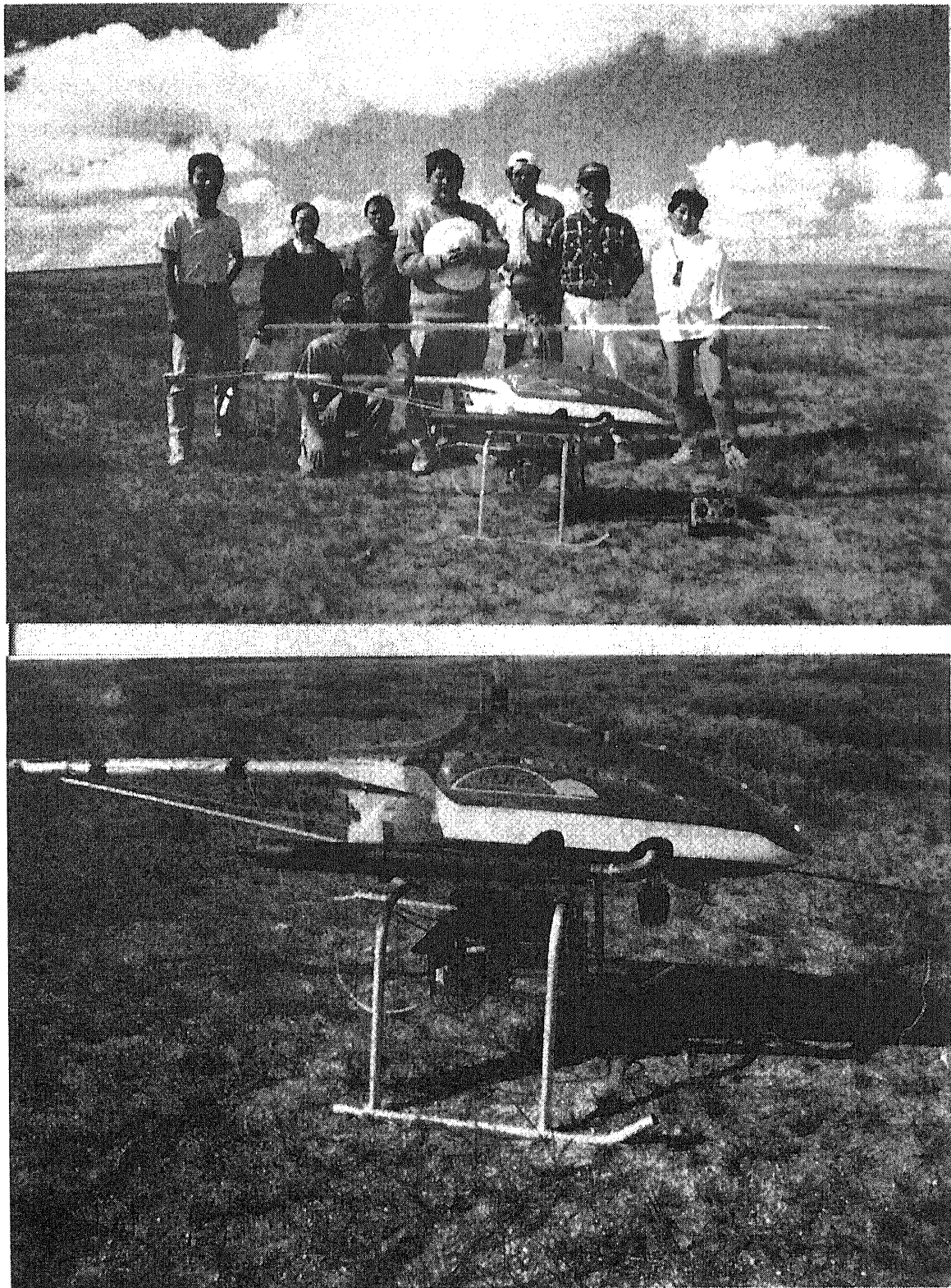


Figure 1 Integrated system



Figure 2 Landscape 1

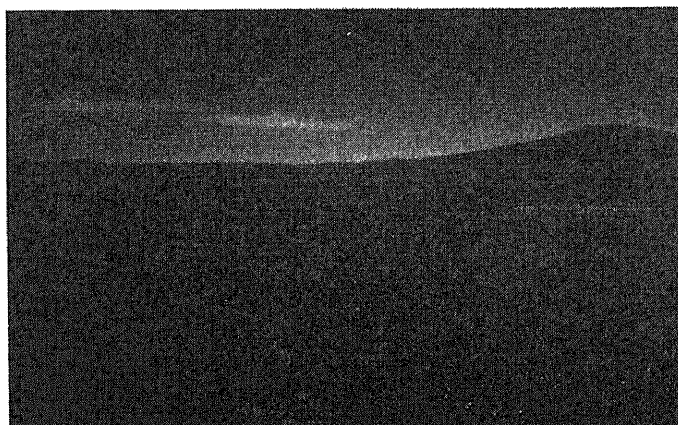


Figure 4 Landscape 4-5

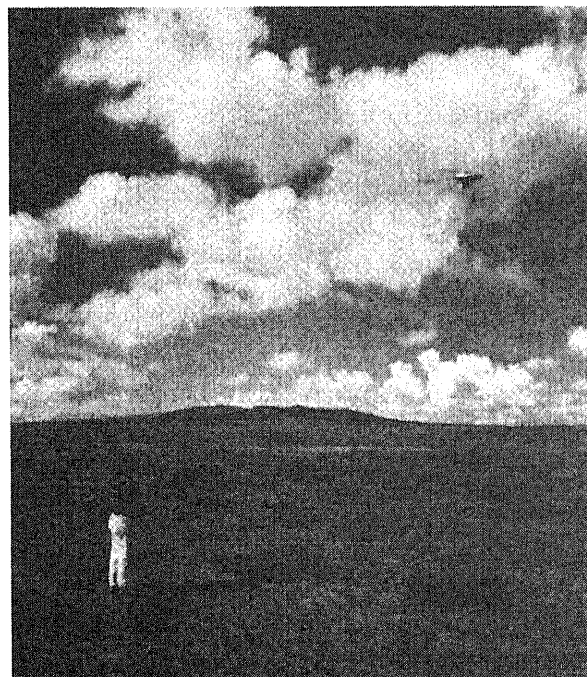


Figure 3 Landscape 2-3

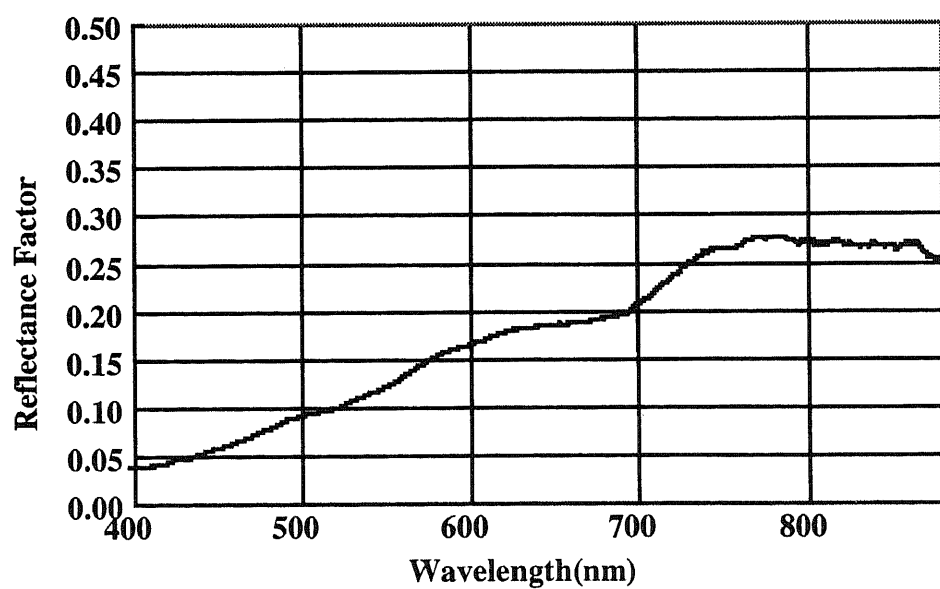


Figure 5 Reflectance