

AIRBORNE DIGITAL IMAGERS: AN OVERVIEW & ANALYSISG PETRIE¹, AS WALKER¹

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The paper sets out the current situation regarding the development of airborne digital imagers for photogrammetric and remote sensing applications.

In the first part of the paper, the current state-of-the art in the **sensor technologies** that are used in airborne digital imagers, including both CCD and CMOS detectors, is reviewed. Two main formats are available - (i) *linear arrays* that are used as the basic imaging technology in pushbroom scanners; and (ii) *area arrays* that form the basic building blocks for frame cameras. The methods used to produce colour images from the different sensor technologies are discussed in some detail, as are the methods being used to overcome the current limitations in the sizes of the different detector technologies.

The second part of the paper covers **airborne digital frame cameras**. These can be classified into three different groups on the basis of their format size. (i) *Small-format digital cameras* are in widespread use for the acquisition of airborne images using a wide variety of approaches - including mosaic filters, beam splitters and multiple cameras - to produce colour and false-colour images. The recent use of multiple small-format cameras to produce systematic oblique coverage of large areas of terrain is another interesting development. (ii) *Medium-format cameras* are now coming into greater use. The majority of these are modified film cameras that have been equipped with digital backs featuring ever-larger area arrays as these become available from the sensor manufacturers. The development of *large-format cameras* has taken place along two distinct lines. Those designed primarily for military use mostly make use of the largest and most expensive CCD area arrays that have been built so far. Whereas the commercially available cameras - such as the examples from Vexcel, Intergraph (Z/I) and DiMAC Systems - use multiple medium-format cameras in different configurations to produce large-format frame images through the post-processing of the image data after its acquisition in the air.

The third part of the paper covers **airborne pushbroom line scanners**. These include (i) the *monochrome pushbroom scanners* that have largely been developed for use on military reconnaissance aircraft. (ii) A second group comprise the specialized *hyperspectral pushbroom scanners* that have been developed primarily for environmental applications. Representative examples of these will be discussed. (iii) A third group are the *three-line pushbroom scanners* that have been developed specifically for photogrammetric applications based on overlapping stereo-imagery. These include the well-established Leica ADS40 imager and the several pushbroom scanners that are currently under development by Wehrli (3-DAS-1), Jena Optronik (JAS) and Starlabo (Starimager). The software implications of processing pushbroom scanner imagery are considerable and will also be discussed.

Finally a comparison of the relative merits of airborne digital frame cameras and pushbroom imagers will be conducted on the basis of digital data; format size; colour imaging; image storage and archiving; and comparative costs.