

NASA TECH BRIEF

Lyndon B. Johnson Space Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

Improved Discrimination in Photographic Density Contouring

The problem:

Important scientific information can be extracted from aerial photography by isolating or identifying those areas of a photograph which have equal densities. These densities may represent areas of the same reflectivity, such as a single crop, or areas of equal energy, such as equal temperatures of a hot glowing object. Standard techniques of density discrimination are either too complicated or too expensive for use by the average investigator. The technique previously used at the Johnson Space Center did not provide the fine discrimination that was required in some cases.

The solution:

Density discrimination can be accomplished through the use of a special photographic contouring material (Agfacontour Professional film or an equivalent) which has two sensitive layers (one negative, one positive) on a single support. One layer has the normal characteristic of a negative film — an increase in exposure causes (after processing) an increase in density of opacity. The other layer reacts just the reverse — an increase in exposure results in a decrease in density. The relative sensitivity of the two layers is such that at a particular intermediate exposure level, both layers have low density.

When a print is made onto the contour film from a black-and-white photograph, all those areas of the original photograph having a particular narrow range of densities will be reproduced as clear on the print. Those areas of the original which were darker or lighter than that specific density range will be reproduced as black. The specific band of densities thus isolated can be changed by varying the intensity of the printing light or

the time of exposure. However, the range of this band of isolated densities (0.30) is not adequate for some requirements. Therefore, a technique for reducing the range of isolated densities has been developed.

How it's done:

Using the same contour film reduplicated in a high contrast mode, the range of isolated densities can be decreased to less than 0.08. Specifically, the contour film which has been exposed through a deep yellow filter (such as CC150Y) is printed onto a high contrast photographic film. The first generation print is then reprinted onto the same high contrast material to make a duplicate. This results in an overall reproduction gamma of approximately 22.0. The limit to which this reduction can be carried is a function of the statistical variation of the densities of the original contour material or the original photographic subject. Caution should be exercised in processing the photographic materials, and in maintaining accuracy in the exposure determination for the original contour film.

Notes:

1. This process will be of interest to investigators who require a finer discrimination of the densities of an original photograph for purposes such as identification of crops and analysis of energy levels of a radiating object.
2. Requests for further information may be directed to:
Technology Utilization Officer
Johnson Space Center
Code AT3
Houston, Texas 77058
Reference: TSP73-10441

(continued overleaf)

Patent status:

Inquiries concerning rights for the commercial use of
this invention should be addressed to:

Patent Counsel
Johnson Space Center
Code AM
Houston, Texas 77058

Source: R. A. Goodding of
Technicolor Graphic Services, Inc.
under contract to
Johnson Space Center
(MSC-12588)