aerospace

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LANDING

Computing the last few feet

Radar guidance is invaluable in bringing aircraft through cloud cover to within sight of the runway. But up to now it has not been accurate enough to give the pilot a picture of a socked-in runway (SN: 8/30, p. 165).

To provide this help, Dr. Robert B. Merrick of the National Aeronautics and Space Administration's Ames Research Center at Moffett Field, Calif., has developed a program that eliminates much of the variability in the radar measurements. The result is an electronic display in the cockpit that presents an outline of the runway with the orientation and perspective the pilot would see if the weather were good. The landing point is also displayed.

The program takes information from two radar sensors or transponders on either side of the runway and the plane's radar altimeter and computes the proper display.

Dr. Merrick says the first version of the program needed more than four seconds of time on the computer normally carried on board airliners to compute one position for the display. With refinement and simplification, however, it was possible to make a computation and display a new position at least 10 times a second, adequate for a pilot to land by.

GUIDANCE

Going around in circles

A mathematical technique for guiding an aircraft in a circle around a fixed ground point has been developed by two researchers at TRW, Inc., Redondo Beach, Calif. The formula could be used by a computerized guidance system. Applications of such a system would include reconnaissance of a ground point by side-looking cameras, parking orbits for aircraft waiting to land and relaying data from a fixed point and forwarding it to other ground stations, say F. H. Kishi and I. Pfeffer.

DESIGN

Spacecraft temperature control

The kind of coating on the outside of a satellite affects the temperature inside the craft.

A problem lies in picking the right kinds of surface for the right spots so that the interior stays within the proper temperature limits throughout the orbit.

Up to now engineers have been picking what looks like a good pattern and then computing the resulting temperatures, a long and costly process. If the results aren't satisfactory, they make another stab at it; if that doesn't work, it is cheaper to go to active heaters or coolers.

A new computer technique now makes it possible to go beyond the trial-and-error method. The program automatically picks the spot in the spacecraft that is farthest from the desired temperature and changes the surface pattern to improve it.

Using the program on an Explorer EPE-D satellite, the researchers came up with a pattern in two man-days and 30 minutes of computer time, that was better than the one the original designers achieved in four man-weeks and two hours on the computer. The program was designed by F. A. Costello of the University of Delaware at Newark, T. P. Harper of General Electric at Philadelphia, R. E. Kidwell of NASA's Goddard Space Flight Center, Greenbelt, Md., and G. L. Schrenk of the University of Pennsylvania.

RELIABILITY

Adaptable, multi-cell computer

Most computers operate as a unit; a failure in one part generally means that the whole computer breaks down.

To get around this reliability problem, a computer system called the Block-Oriented Computer has been developed by Litton Industries at Woodland Hills, Calif.

The BOC consists of hundreds of small, identical connected cells. Some of the cells are programmed to perform more essential tasks than others, but if one of these critical cells fails, another cell is automatically taken off its less important task and acts as a replacement.

With a few spare cells, the computer can be designed to repair itself, merely replacing a defective cell with one of the spares.

The multi-cell computer must be able to handle data as fast as a standard system. It does this, says J. O. Campeau of Litton, by dividing a large problem into many smaller problems, thus giving each cell only a small percentage of the total work load. The result is that each cell of the system, one version of which is being developed for missile guidance, can be simpler and therefore faster.

TELEMETRY

Sleeker program for Apollo

During Apollo flights, information comes to the ground from hundreds of sensors at a rate of 100,000 bits per second. The data are picked up by remote monitoring stations and transmitted to the Mission Control Center in Houston.

But the transmission link to the MCC can only handle 4,800 bits per second, so not all the data are forwarded. Either the measurements are transmitted less frequently or some measurements are held up while others are transmitted.

Analysis of early Apollo data, report Bruce E. Meigs of Univac at Glenn Dale, Md., and Larry L. Stine of the Mitre Corp. in Bedford, Mass., indicates that another method, data compression, could be used to make the information more manageable.

Under this system, each measurement is compared to the one that came before it, and if the difference is less than a set amount, the second measurement is not transmitted. If the difference is significant, the second datum is forwarded. In this way slight changes in the various indicators are ignored; large ones go through.

An operational test of the system is being prepared, and if it is successful the system will be incorporated into the Apollo Applications Program.

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