Forest Fire Mapping

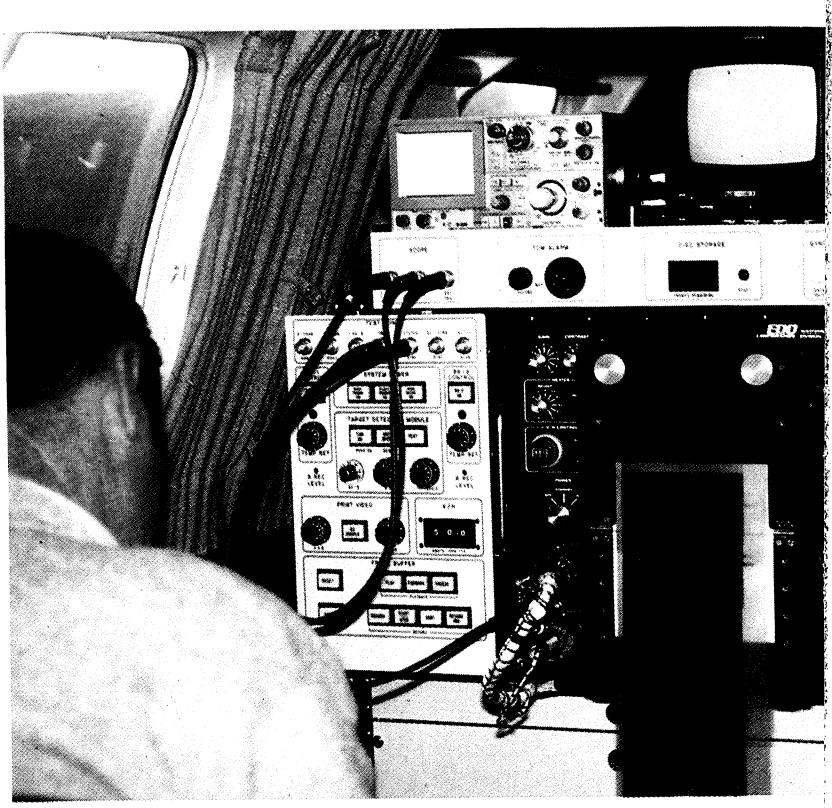
At right is a view of the Fire Logistics Airborne Mapping Equipment (FLAME) system mounted in a twin-engine airplane operated by the U.S. Forest Service (USFS) of the U.S. Department of Agriculture (USDA). An airborne instrument for detecting and pinpointing forest fires that might escape ground detection, FLAME was developed by Jet Propulsion Laboratory in collaboration with the USFS and jointly sponsored by NASA and the USDA.

The FLAME equipment rack includes the operator interface, a video monitor, the system's control panel and film output. FLAME's fire detection sensor is an infrared line scanner system that identifies fire boundaries. The sensor's information is correlated with the aircraft's position and altitude at the time the infrared imagery is acquired to fix the fire's location on a map.

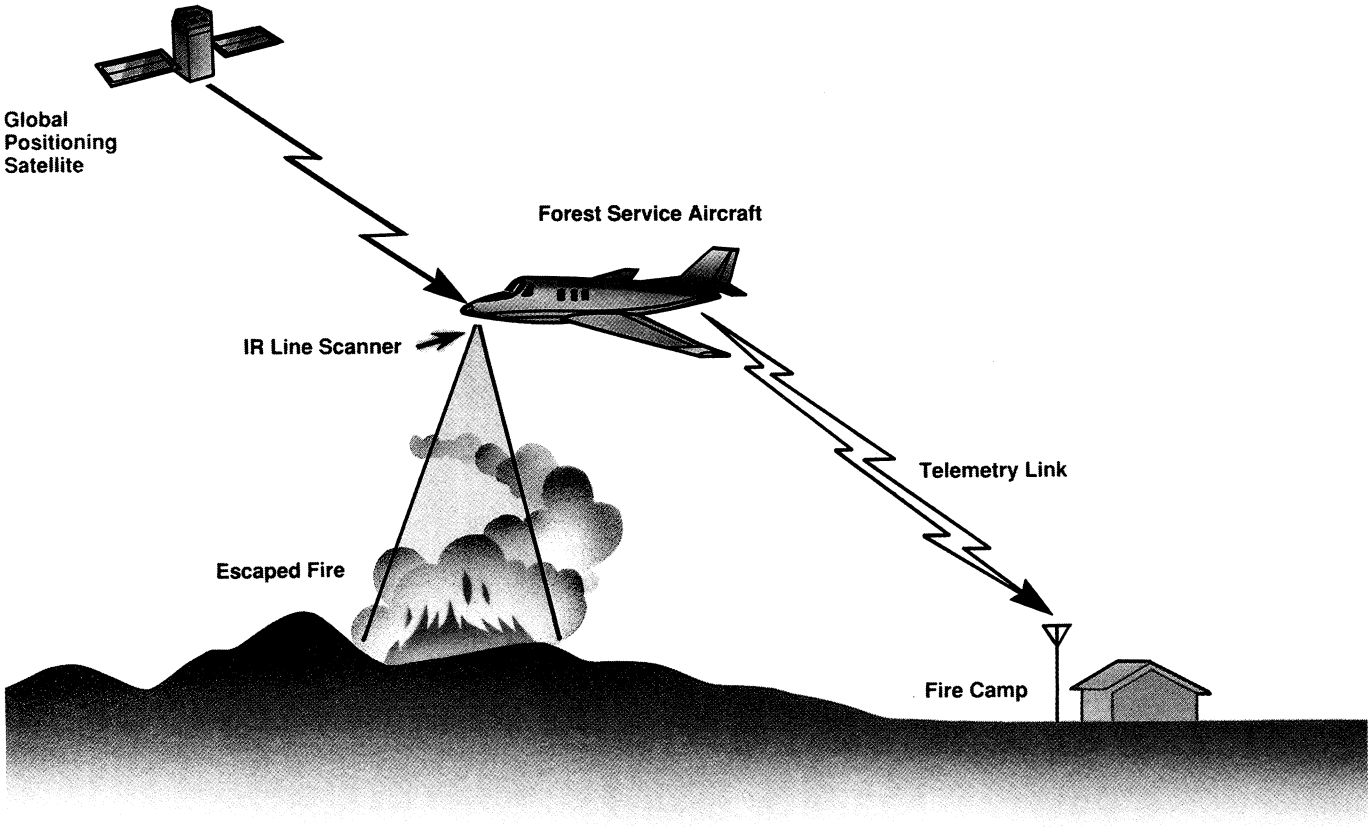
The FLAME system can be sent to a fire locale anywhere in the U.S. at the request of a regional forester. Operational since 1984, it has provided considerable improvement in getting wildland fire information to USFS firefighters; it has, says USFS, exceeded the original design and operational requirements.

However, the FLAME development was based on technology of an earlier vintage. For example, it requires manual image interpretation to process the infrared output, and it employs standard navigational means for aircraft position determination rather than the more precise satellite reference method now available. USFS felt a need for a more advanced system to deliver timely fire information to fire management personnel in the decade of the 1990s.

JPL conducted a study, jointly sponsored by NASA and USDA, on what advanced technologies might be employed to produce an end-to-end thermal infrared fire detection and mapping system. That led to initiation of the Firefly system, currently in development at JPL and targeted for operational service beginning in 1992. Firefly will employ satellite-reference position fixing and provide performance superior to FLAME in terms of increased timeliness of data delivery, accuracy, data consistency, reliability and maintainability.



The Firefly system is shown schematically at right above. The system consists of the aircraft unit, with a special purpose dual band infrared sensor for locating forest fire perimeters and high-intensity "hot spots," and a ground terminal located at the fire camp and linked to the aircraft unit by telemetry. The aircraft flies over an area designated by the Fire Incident Commander on a flight path designed to enable the infrared sensor to cover the entire perimeter area. The airborne system images the ground scene, computes fire perimeter and hot spot locations, and correlates fire data to geographic coordinates.



The "georeferencing" procedure—determining fire locations relative to a geographic base for plotting onto a map—is aided by use of the Department of Defense's satellite based navigation system, the Navstar Global Positioning System (GPS) now being deployed in orbit. GPS will allow fixing the aircraft's position—in three dimensions—within 25 to 100 meters, thus permitting Firefly georeferencing accuracy of plus or minus 500 feet. At the completion of the data gathering portion of the flight, the aircraft flies to a point within line-of-sight of the ground terminal, allowing transfer of mission results between the aircraft and ground terminal computers via the telemetry data link.