



Breast Biopsy System

Health and Medicine

Shown **below** are two Charge Coupled Devices (CCDs), high technology silicon chips that convert light directly into electronic or digital images, which can be manipulated and enhanced by computers.

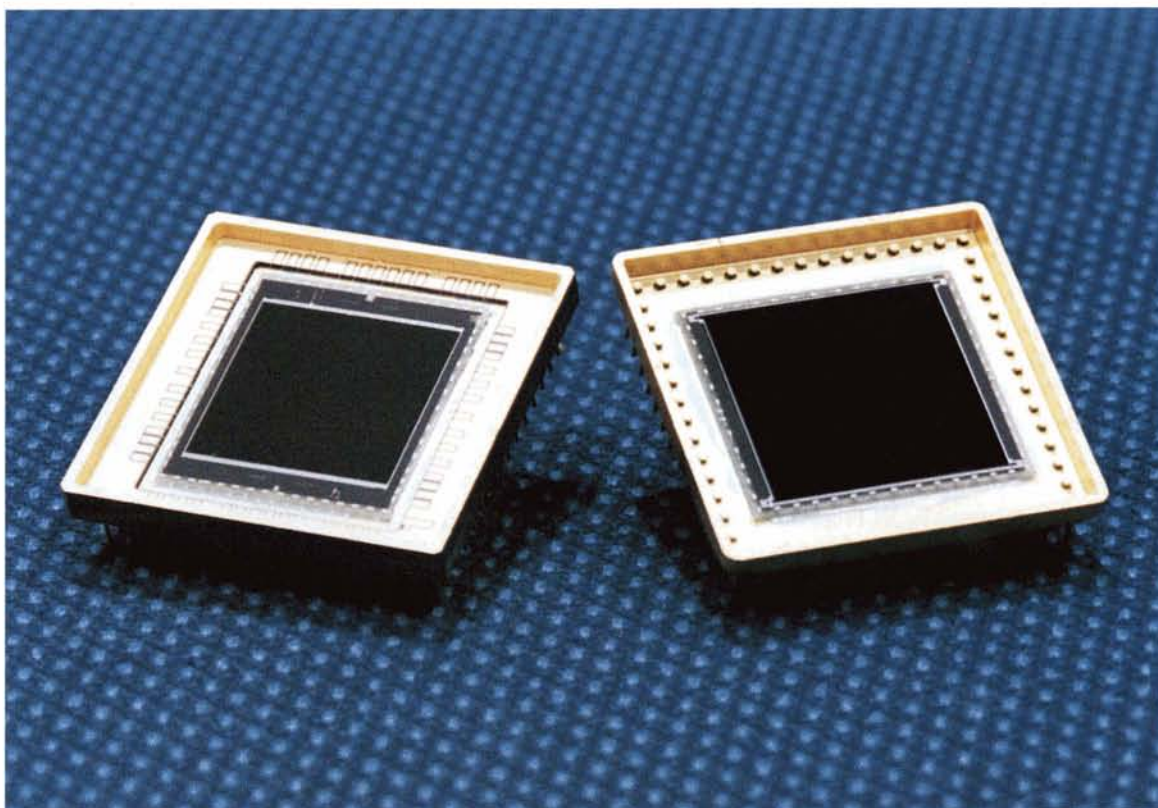
The CCD on the left is an advanced, extrasensitive device developed for NASA's Hubble Space Telescope by Scientific Imaging Technologies, Inc. (SITE), Beaverton, Oregon. The virtually identical CCD on the right is a commercial derivative of the Hubble device that has contributed importantly to a new, non-surgical and much less traumatic breast biopsy technique.

The new technique, which is replacing surgical biopsy as the method of choice in many cases, is saving women time, pain, scarring, radiation exposure and money. Known as stereotactic large-core needle biopsy, it is performed — under local anesthesia — with a needle instead of a scalpel and it leaves a small puncture wound rather than a large scar. Radiologists predict that the needle biopsy technique will reduce national health care costs by \$1 billion a year but the potential is even broader, because the imaging system can be used for routine (non-biopsy) breast examinations.

The system that makes possible the new technique is the LORAD Stereo Guide™ Breast Biopsy System, which incorporates SITE's CCD as part of a digital camera system that "sees" a breast structure with x-ray vision. The Breast Biopsy System is produced by LORAD Corporation, Danbury, Connecticut. By mid-1994, LORAD had produced some 350 units, which were in service mostly for biopsy procedures. By mid-1995, it is expected that full digital breast units will be available for routine mammographic examinations.

The technology breakthrough that spawned the LORAD system originated at Goddard Space Flight Center, where scientists are developing the Space Telescope Imaging Spectrograph, due to be installed on the Hubble observatory in 1997. The Goddard development team realized that existing CCD technology could not meet the demanding scientific requirements for the instrument.

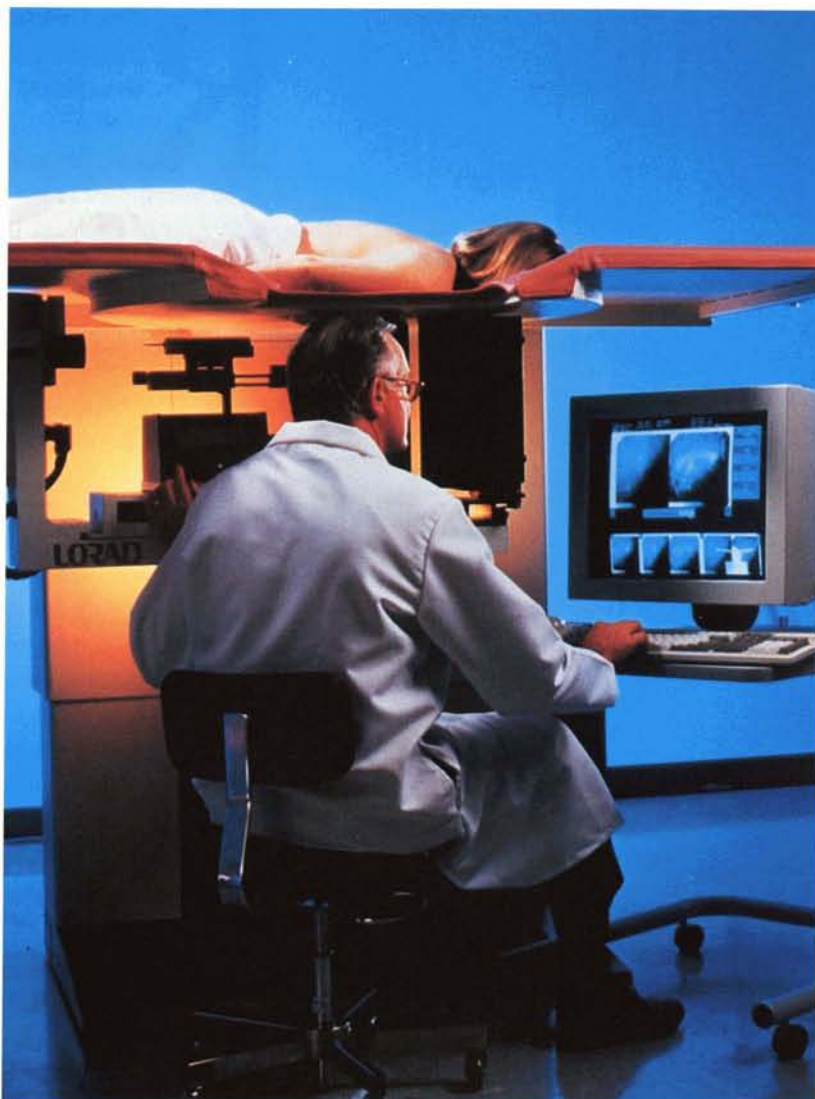
Goddard therefore contracted with SITE to develop an advanced, thinned, supersensitive CCD that could be manufactured at lower cost. SITE was able to meet the NASA requirements, and the company applied many of the NASA-driven enhancements to manufacture CCDs for the



digital spot mammography market. This was a natural technology transfer due to the common requirements for astronomy and mammography: high resolution to see fine details; wide dynamic range to capture in a single image structures spanning many levels of brightness; and low light sensitivity to shorten exposures and reduce x-ray dosage. The resulting device images breast tissue more clearly and more efficiently than conventional x-ray film screen technology, and the Hubble-derived CCD is now leading the field of digital breast imaging, according to medical specialists.

In the LORAD breast imaging system, a special phosphor enables the CCD to convert x-rays to visible light, which provides the digital camera with x-ray vision. The patient lies face down with one breast protruding through an opening in a specially-designed table; the imaging device is mounted under the table. The radiologist locates the suspected abnormality with the stereotactic imaging device by taking images of the suspect mass from two different angles. On the basis of those two images, the computer determines the coordinates of the abnormality and the radiologist extracts a tiny sample from that spot with the needle. The patient can walk out of the office minutes after the procedure and resume normal activities. At **right**, a physician is studying the images acquired by the LORAD Stereo Guide Breast Biopsy System.

Although stereotactic location is also accomplished by use of x-ray film, radiologists say that the new digital imaging device cuts procedure time by one-half to one-third and exposes patients to only half the radiation of the conventional x-ray film method. Additionally, digital images can be computer-enhanced to sharpen details. Studies show that the new procedure, which can be done in a physician's office at a cost of about \$850, is just as effective as traditional surgery, which costs about \$3,500.



TM Stereo Guide is a trademark of LORAD Corporation