Current work is directed at reducing the perturbation due to the stalk and studying the coating environment through the use of Langmuir probes. We feel that this method, based on experimental results to date, shows considerable promise for improving the microstructure, density, and surface smoothness of target pusher layers.

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3.B An Interactive Information Management Data Base for Fusion Target Fabrication

Multiple process steps are required to fabricate the targets used in irradiation experiments on the OMEGA laser system. Each step involves a measurement, layer deposition, gas fill, or assembly operation. A generic implosion target (see Fig. 19) is composed of four materials and requires more than a dozen processes in fabrication. These processes include:

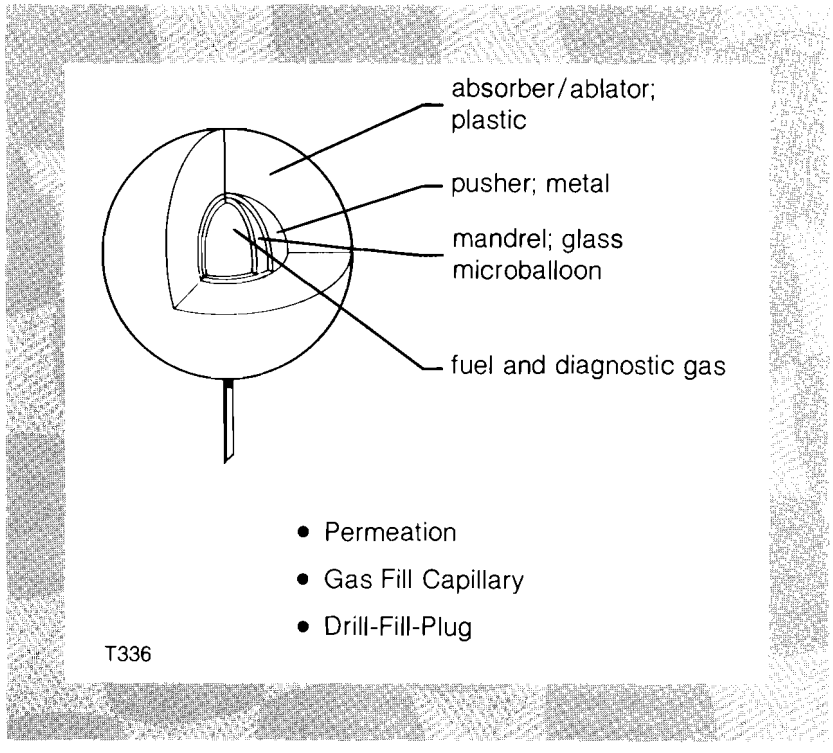

Fig. 19
Generic implosion target. The target consists of a GMB filled with a fuel gas and coated with layers of copper and plastic. The assembly is mounted on a glass stalk for positioning within the OMEGA target chamber.

1) glass microballoon (GMB) selection and characterization
2) fuel gas permeation and post-fill characterization
3) stalk mounting
4) copper layer deposition and characterization
5) plastic layer deposition and characterization

Each target has unique dimensions and specifications that are documented by measurements taken at each step of the fabrication process. More complicated types of targets are being made by the Target Fabrication Group which require different and/or additional process steps. Figure 20 shows some of the various paths a target may take during processing.

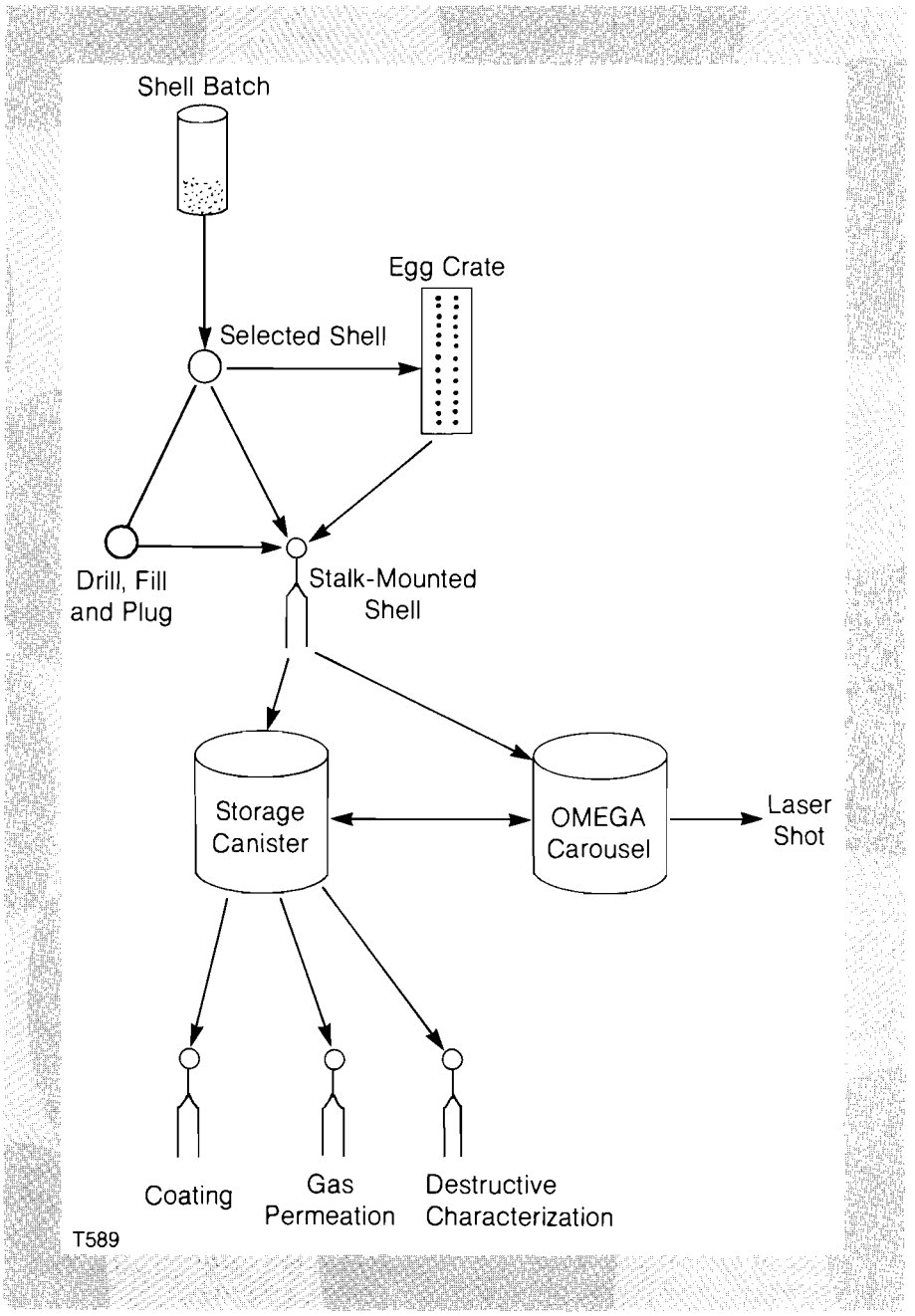

Fig. 20
Target fabrication process flowchart. A GMB may undergo various process steps and be stored in several different canisters before it is called for use on OMEGA.

Records detailing each process step are necessary for an accurate description of the finished target. This record keeping becomes a sizable task given the thousand or more targets delivered by the Target Fabrication Group in a year, with large numbers of targets at various stages in the fabrication process at any given time. The need for detailed, accurate, and readily available data on the entire process has been met by the development of a computer-based information management data base.[1] The system provides:

1) automatic record storage
2) flexible data entry and computation
3) fast searching for targets with specific characteristics
4) automatic report writing
5) computerized transfer of information to other systems

The information management system resides on the Laser Computing Facility's CYBER 175 computer. The records are stored in indexed sequential files, which optimize the tasks of working on individual records and searching across the entire data base. Each target is assigned a unique identification number by the Target Fabrication Group when a specific target request is made; this number serves as the key for the target records.

There are four data files in the data base. The master file contains information on target location, as well as a summary of the more important physical parameters. There are three satellite files, which contain more specific information on the target layers, gases, and fuel-activity measurements. The satellite files also contain data on when a target record was entered into the data base, or modified, and by whom.

The data base was created so that the CDC data base language, Query Update,[2] could be used to read the data files. This is a unique use of a commercial data base language for handling scientific data. Query Update has many features that make it convenient for obtaining access to data from individual target records. However, its data entry procedures are inflexible and cumbersome to use in these circumstances. The need for more powerful, more flexible access to the data lead to the creation of front-end programs written in FORTRAN that can obtain access to the data files without recourse to Query Update (see Fig. 21).

Three types of front-end programs have been developed.

1) The Data Entry program is a menu-driven system that allows the users to create and update records in the data base as a process step is completed. The program collects raw data from the users and performs computations to determine the thickness of the various target layers, and the gas pressure of any targets containing tritium. It can also delete the records of targets that have been destroyed or lost.

2) The Report programs allow the users, both Target Fabrication Group members and OMEGA experimentalists, to obtain reports on desired targets. There is a short report that can display the major target parameters, and a master report that gives the entire target record. There is also a plotting package that allows the users to see the distribution of targets with regard to their physical parameters.

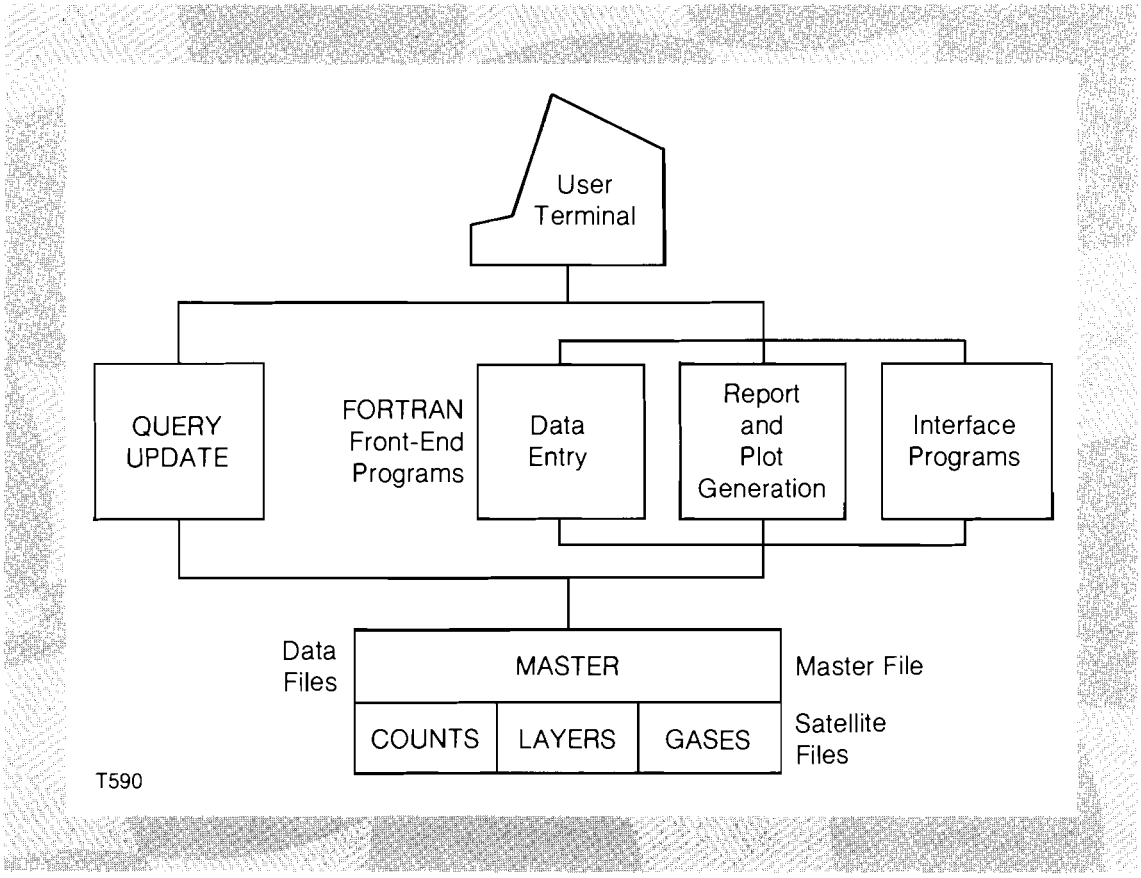

Fig. 21
Data base program schematic. The basis of the system is the data files; they can be accessed through Query Update or through the front-end programs.

3) There are other data bases in use at the LLE that rely on the data stored in the Target Fabrication Data Base; programs have been developed to automate the transfer of these data. When delivery of a set of targets in an OMEGA carousel is made, a program prepares individual target reports and a carousel summary report, updates the data base to note that the targets are now in a carousel, and creates a holding file that can be tapped by the OMEGA Laser System Data Base,[3] and the OMEGA Experimental Data Base (see Fig. 22). The holding file contains the physical parameters of all the targets in the carousel, and some additional parameters such as target mass; information used only by the Target Fabrication Group, such as storage locations, is not transferred. The holding file is updated whenever new targets are loaded into an OMEGA target carousel.

When a target has been used by the OMEGA system, the data on the target are inserted into the Laser System Data Base and the Experimental Data Base. After the data have been preserved, the original records are deleted from the Target Fabrication Data Base automatically. The records can also be deleted by the Target Fabrication Group for targets that have been destroyed in testing, or lost.

The Target Fabrication Data Base thus performs several much-needed services for the LLE. The efficiency of the Target Fabrication Group personnel is augmented by the automation of tasks such as report writing. The data recorded are more reliable, since copying mistakes can be eliminated. The data are guarded from tampering, as a

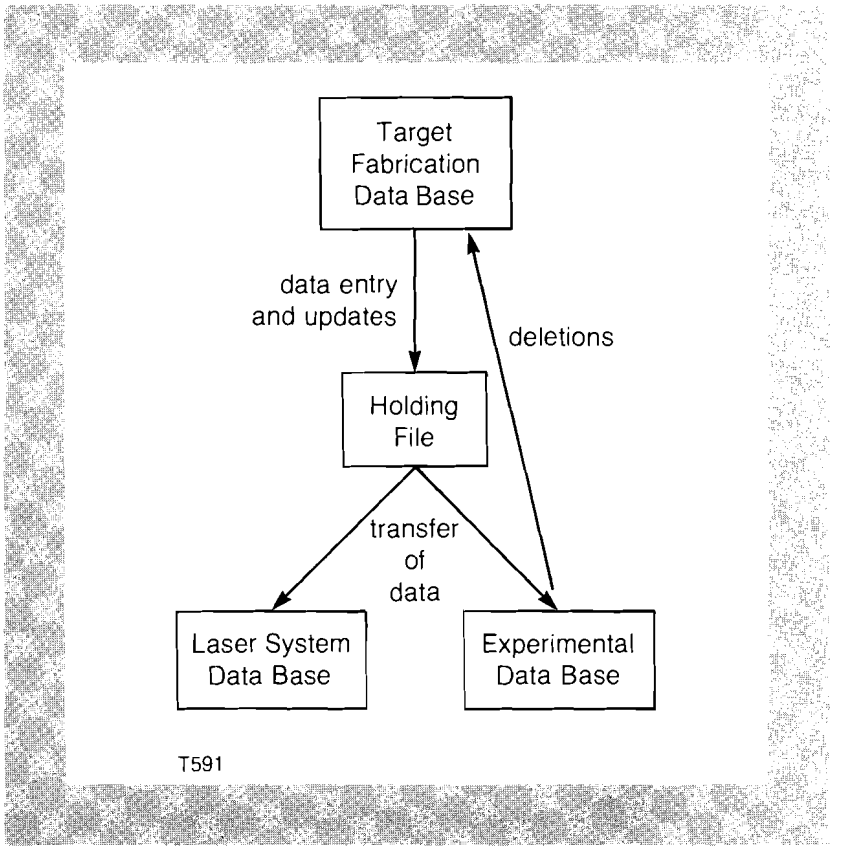

Fig. 22
Interface to other data bases. The target information in the holding file can be accessed by the Laser System Data Base, and by the Experimental Data Base. Once the information is transferred to the Experimental Data Base, the records are deleted from the Target Fabrication Data Base.

User Identification Code is required before the Data Entry program can be used. Information on target types, target components, and target parameters is made more accessible to the LLE as a whole through the searching and reporting mechanisms, and the interfaces to other LLE data bases. In summary, detailed, accurate, and readily available records of target fabrication are being efficiently handled by the computer-based information management data base.

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