Director's Corner

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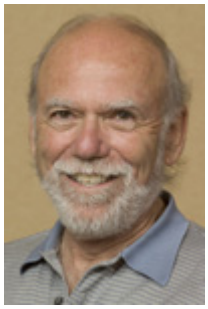

Barry Barish

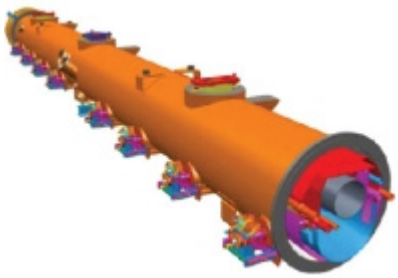
The role of industries during the ILC engineering design phase


Ken Olsen, President of the LCFOA

To strengthen our efforts for the ILC engineering design phase, we intend to increase our focus on industrialisation. We recognise that in order to make realistic funding proposals to our governments, we will need to work more closely with industry. On 28 February, a meeting of the Linear Collider Forum of America (LCFOA) was held in Washington DC. It was very well attended and proved to be a lively forum for discussions of industrial participation and included comments and interactions with several U.S. Congressmen. (See NewsLine, 8 March) During the formal programme, I spoke on the status of the ILC global design effort, especially the milestone of producing a reference design and costing. There was much interest both in the process of achieving our design and regarding the specific technical features. Earlier, I participated in a similar meeting in Tokyo with the Japan Linear Collider Forum and I also have met with representatives of the European Industrial Forum. Today, I reflect on where we can best make use of industry as we move forward, as well as indicate some of the issues involved.

The first important question to pose is why industrialisation is so important for the ILC? This is a question that has many answers, but perhaps the simplest response is just to recognise that the scale and complexity of the ILC is so far beyond our in-house capabilities that we must look to industry for most of the actual construction of the ILC, wherever it is built. This is obvious, by just considering the scale of our two largest systems. The conventional facilities for the ILC, as detailed in our reference design, consist of 72.5 km tunnels about 100-150 meters underground; 13 major shafts that are larger than 9 metre diameter; 443,000 cubic metres of underground excavation consisting of caverns, alcoves and halls, and finally, 92 surface "buildings" totaling 52,700 square metres to directly support the underground activities. This is an enormous civil project that clearly must be designed with and carried out by industry.

Moving to our largest and most complex technical system, the main linac, we need 14,560 nine-cell niobium cavities that are inserted into 1680 cryomodules driven by 560 RF units. These mind boggling numbers illustrate why industry is needed not only to build these complex objects, but to do it cost effectively in quantity. Our needs for industrial involvement go well beyond these two huge systems and include many of the machine's components, such as magnets, water and power distribution, electronics and control systems.


Fourth Generation Prototype 12.65m ILC Cryomodule. This design must be engineered for cost effective industrial fabrication.

Industry will be central to the actual construction of the ILC. But, what does that or what should that imply for how we approach the engineering design effort that precedes the actual construction project? The primary goal of the engineering design effort is to produce a proposal for construction of the ILC. A critical element will be not only to know what we want to build in detail, but also how we propose to build it and what it will cost. This means we must begin to work closely with industry *now*. For these reasons, we plan to invest significantly in developing the industrial capabilities that will be required for the actual ILC construction.

We will be involving industry in many ways over the next few years, first to develop the industrial capability, and second to work more with industry on our design effort. For example, industry can help us to optimise the civil facilities design, and we will be commissioning industrial studies to help us understand what discounts can be gained for quantity production of ILC components. Industry can provide assistance in project management, costing, and specialised engineering and through building various prototypes for our R&D programme.

There are many subtle issues and pitfalls we must face in involving industry in our work. I will address some of these issues in future columns. What is most unique about the ILC is that we are a total international project without a strong

central host laboratory or country. We must therefore take into account regional interests for the various ILC components, as well as large differences in how industry actually works in different parts of the world. We must be careful when involving industry early that we have taken into account issues such as intellectual property rights and competitiveness for future contracts. We also need to develop a realistic and cost effective plan for dividing up the project and for how we will contract industry for the actual project.

If we want to succeed in both using industry to help us produce a realistic design and in preparing them for the actual fabrication, it is crucial that we spend both the effort and the resources on industrialising the ILC now. One of the selling points for our governments in making their considerable investment in ILC R&D are the potential broader applications of our technologies. A nice example of a potential broader application is covered in a companion article in today's NewsLine on a calorimeter technology development that could have a potential important application to medicine. I am confident that as we develop our technologies and involve industry, many benefits to society will emerge.

-- *Barry Barish*