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Technological Cooperation with the Japanese

Current debate about future directions for U.S. industrial policy includes concern over the relatively free flow of U.S. technology to other nations. Japan is usually singled out as a prime example of how technology exports can be turned against us and used to damage our position in the marketplace. Protectionist measures that constrict the free flow of technology interchange might temporarily impede technology transfer abroad, but such a policy is shortsighted. Reciprocal reaction would certainly deny us rapid access to foreign-initiated advances.

Japan is a good illustration. There is a general lack of appreciation of the growing strength and vigor of Japanese R & D. The future trend is indicated by a survey conducted by the *Japan Economic Journal* of 638 companies listed on the Tokyo, Osaka, and Nagoya stock exchanges; for fiscal year 1980, technology sales (royalties and other technical service fees) for these companies exceeded the costs of imported technology by around $100 million, whereas there was a deficit in 1975. The top ten net earners from overseas technology transfers, which include transfers to the United States, accounted for income of $160 million. On balance, however, for the Japanese economy as a whole, the technology balance of payments is still in heavy deficit, with payments 1.8 times higher than earnings.

Financial statistics fail to convey the intensity with which the very competitive Japanese companies are strengthening their R & D resources. Government laboratories and the universities are also diligently expanding their generic research activities. A review of 2 years of recent publications of the Society of Automotive Engineers shows that 10 percent were by Japanese authors, and about 30 percent of them deal with fundamental research topics. Fields in which Japanese technology equals or leads that available in other advanced nations are well publicized and include steelmaking, vehicle and engine design, manufacturing processes and techniques, high-speed rail transport, fiber and ceramic technologies, and nuclear power plant operations. The list will grow.

Our experiences with Japanese clients range across many industrial sectors, and we find the relationships rewarding. New ideas are readily accepted, there is a noticeable absence of the not-invented-here syndrome, contacts between staffs are close (despite the geographic separation) and mutually supportive, and a special effort is made to explain how our research results will help realize company objectives. Publication of findings is encouraged whenever marketplace strategies permit.

As an example, a program comes to mind involving development of an advanced diesel engine based on a spark-assisted combustion cycle; in principle, such an engine has several significant advantages. After our presentation of the concept, we initiated R & D to develop the combustion cycle and refine performance estimates. As our results emerged, the client began development of a multicylinder engine, and soon after our research was completed a prototype engine was delivered for evaluation. Throughout the program, both staffs freely exchanged ideas and information, and a paper on our results was published in a peer review journal.

In nuclear power plant operations, the Japanese are leaders in achieving high plant availability factors; here they are helped by a steady stream of technical information exchange with other countries, to which they are also active contributors. More important, for the future, are the large resources Japan is committing to the development of advanced light water and breeder reactors. As partners in several international consortia (with U.S. participation) one result will be the emergence of Japanese industry as a substantial factor in future reactor designs.

In sum, my message is that Japan is emerging as a powerful R & D entity. By adopting protectionist attitudes on technology transfer toward Japan and other nations, our ultimate loss will certainly equal theirs, and the overall progress of science and technology will be retarded.—MARTIN GOLAND, *President, Southwest Research Institute, San Antonio, Texas 78284*