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COVER Artist's rendering of a Soviet Radar Ocean Reconnaissance Satellite, or RORSAT, which is used by the Soviet military to follow U.S. naval fleet movements. The electrons, positrons, and gamma rays produced by the RORSAT's nuclear power reactor have interfered with the efforts of astronomers to measure gamma-ray sources such as the sun and supernovae. The reactor core, shown being ejected, is designed to be boosted into a storage orbit at the end of the RORSAT's useful life. See Perspective, page 407, and Reports, pages 441 to 451. [Artwork by Paul Roberts/Bill Burrows and Associates, based on information provided by Charles P. Vick]

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Low Probability–High Consequence Accidents

The Valdez oil disaster fits into a class of low probability–high consequence dangers that are among the most difficult to predict and handle. As in the case of earthquakes, dam collapses, or nuclear accidents, disaster plans and appropriate machinery must be kept in readiness as part of the response to the unlikely but potentially catastrophic event. To say that an event is complex is not sufficient to absolve those who fail in meeting their responsibility. In fact, assigning responsibility and authority in advance may be one of the major ways in which future disasters can be averted.

Although the entire story is not yet known, it seems apparent that the oil company in this case was cavalier in regard to its responsibility. Failure of other agencies—the Coast Guard, Alyeska, and local authorities—does not obscure the primary role of the provider of service in the Valdez case. This accident suggests that a complacency can be generated by allowing a multiplicity of agencies to be involved, inviting a multiplicity of accusations in the wake of a disaster. The oil company should have the responsibility not only to develop a coherent emergency plan, to direct practice drills, and to have adequate clean-up equipment available, but also to provide continuous monitoring of operations to avert a disaster in the first place. Although detailed plans cannot be devised for all situations, certainly they can be developed for a busy port like Valdez, and more general plans for any area through which oil tankers travel. The plan, developed in consultation with environmental, legal, and various government authorities, would then be subject to evaluation and approval by the appropriate legal agencies. The line of authority in case of an accident must be spelled out and the individuals delegated sufficient power to be able to act rapidly to implement the plan.

In addition to assigning responsibility, much can be done to improve procedures. Some experts in this type of risk management suggest that too much attention has been placed on mechanics and too little on human factors. Research and procedures directed at counteracting the inevitable lapses of attention that occur in jobs with long periods of high boredom are indicated. Automated tracking of ships may be unnecessary on the high seas, but in coastal waters the expense may be justified. Because too much reliance on automation can be harmful, more extensive studies are required on the adverse consequences of automatic pilots as well as the management of employee frailties such as drinking and drug abuse. A financial structure should be developed that puts heavy premiums on prevention. Punitive damages for delinquent plans, coupled with actuarially devised rates of assessment that reward companies with superior prevention procedures, would help. One device to accomplish this would be an international consortium that maintained bases for emergency action at strategic locations around the world and provided advice on detailed plans. Oil companies would pay dues based on the volume of their tanker business, the quality of their plans, and their "good driver" record. Ports could then demand membership in this organization as a condition for entry.

The advance approval of contingency plans seems to be essential to ensure swift action. For example, the use of dispersants, although controversial, may be indicated when factors such as weather, local terrain, local fauna and flora, and size of spill are considered. A well-developed plan would eliminate the delays caused by ill-informed or obstructive officials and the temptation to blame them when the true problem was the lack of available equipment. By having everyone on record ahead of time, one can improve the quality of first guesses and undermine the authority of the second guessers.

The management of low probability–high consequence calamities is a new area which needs extensive research and new ideas. However, the immediate hazards we face today do not allow delay until ideal plans are realized. Existing knowledge is sufficient to implement plans that provide powerful incentives for prevention and better operational direction after an accident. Those plans and incentives can then be upgraded as new research and new experience become available.—DANIEL E. KOSHLAND, JR.