Until recently, environmental emphasis has been focused on cleaning up past mistakes through the Installation Restoration Program, complying with existing laws through the Environmental Compliance Assessment and Management Program, and minimizing waste in existing industrial processes like Air Force Logistics Command's PACER REDUCE. These programs deal with the past and present. We need to concern ourselves with the future! The focus of this paper is on what is being done today to prevent pollution in the development, production, operation and maintenance of weapon systems that will be fielded years from now. This paper will describe the Program Manager (the decision maker) and the environment he works in. It will discuss the processes in place that are his tools. Further it will review the organizations and committees that support the program manager. These three areas summarize the effort that Air Force Systems Command is putting on acquisition pollution prevention. Specific success stories from the National Aerospace Plane, B-2 and F-22 will be discussed to show what is being done. It is important to understand that an informed, accountable decision maker is responsible for minimizing the environmental impacts of future systems.

The business of Air Force Systems Command is to do the research, development, test and acquisition required to field new weapon systems.

The people that make up Aeronautical Systems Division at Wright-Patterson Air Force Base, Ohio, and Eglin Air Force Base, Florida, are currently developing the B-2, F-22, C-17, National Aerospace Plane and Advanced Medium Range Air-to-Air Missile as well as several hundred other systems. System Program Offices are the key organizations at ASD that focus on developing, testing and producing these weapon systems.

PROGRAM MANAGER

The program managers for the B-2, F-22, C-17, National Aerospace Plane and Advanced Medium Range Air-to-Air Missile are general officers or senior executive service members with staffs of about 350 people. Their entire focus is on the system COST, SCHEDULE, TECHNICAL PERFORMANCE and SUPPORTABILITY criteria mandated by Congress and directed in the Program Management Directive. The ultimate goal is to deploy their system on cost, on schedule and with the required performance characteristics. While doing this, the system must also be supportable, maintainable, and environmentally compatible. This is accomplished through multifunctional teams who work in concert to design and produce the best overall system. The concept is called Integrated Product Development. It can best be described with a negative. We all have heard of the great technical design that is difficult to produce, takes a PhD to
operate, and can't be maintained. And in today's world, it probably harms the environment. The goal of the integrated product development team is to consider manufacturing, operational, and supportability, as well as environmental issues up front during the design phase to insure my negative example does not happen.

The integrated product development teams are the people who must evaluate each of the subsystems from a life cycle cost approach. An example of a simple trade-off decision may be comparing two different materials that each meets the design criteria for performance. Material A costs less to purchase, costs more to dispose of, is easy to maintain but weighs more, and is a potentially hazardous material depending on levels of exposure. Material B, on the other hand, costs more to purchase, costs less to dispose of, is difficult to maintain but weighs less, and is not currently listed as a hazardous material. The integrated product development team must make these trade-off decisions to assure the most cost-effective solutions over the life of the system.

The integrated product development team receives guidance from Department of Defense Instruction 5000-2, "Defense Acquisition Management Policies and Procedures." This document establishes the acquisition milestones and phases a new system must follow (see Chart 1). For example, the F-22 fly off between two competing aerospace companies in 1991 occurred during Phase II, Demonstration and Validation. The key decision points in a program happen at the various milestones (circles) and are described as milestone decisions. Currently there are processes in place that help him make environmentally sound decisions while meeting the cost, schedule, and technical performance.

The B-2 program has had success in hazardous materials substitution. They have eliminated lead, formaldehyde and benzene from all production materials. Ozone depleting chemicals have been reduced by 70%. In the volatile organic compound area, they have banned all high volatile organic compound solvents, i.e., methyl ethyl ketone, acetone, from general use. Coating emissions have been reduced by 25% by implementing high volume, low pressure spray guns. These successes are a few examples of the many integrated product development team's consideration of environmental impacts while developing 115 new materials and 360 new processes for B-2 applications.

**PROCESSES**

The two processes key to making environmentally sound decisions are the Environmental Impact Analysis Program and the Hazardous Material Program. The Department of Defense Instruction 5000-2 directs that a programmatic environmental analysis be accomplished prior to each milestone. It can be a Categorical Exclusion, an Environmental Assessment or an Environmental Impact Statement depending on the issues. This analysis, along with cost, schedule, performance and supportability data, plays a critical part in the decision to proceed with the program. The Environmental Impact Analysis Program process is an integral part of the system program office decision making process and is accomplished at least four times before a decision is made to produce and deploy the system. When basing decisions are made on where to field a specific system, the programmatic environmental analysis is site-adapted by the operational major command.

The second key process supporting the program manager is the Hazardous Material Program. Department of Defense Instruction 5000-2 also directs the Hazardous Material Program with these key concepts:

1. Emphasize reducing the use of hazardous materials in processes and products rather than simply managing the hazardous waste created.
(2) Analyze proposed systems for their potential environmental impacts.

(3) Formally document each management decision to accept the risk associated with an identified hazard.

(4) Control risk by eliminating the use of hazardous materials.

To implement such a program, each major system program office has a Hazardous Material Working Group. The goal of this multifunctional group is to eliminate, substitute, minimize or control hazardous materials or processes associated with the manufacture, operation, and logistical support in each weapon system. They are the environmental advocates in each system program office and work closely with the integrated product teams to insure environmental impacts are considered during the many trade-off decisions.

Completed environmental assessments have been approved for C-17, F-22 and B-2 flight tests at Edwards Air Force Base, California. The environmental assessment for the Advanced Medium Range Air-to-Air Missile flight test at White Sands Test Range has also recently been approved. National Aerospace Plane is in the data gathering stage of an Environmental Impact Statement for flight test. The above "big" programs receive most of the publicity but there were over 160 program related environmental planning documents processed at ASD in 1991.

There are currently Hazardous Material Working Groups in all of Aeronautical System Division's major programs. They have developed a hit list of hazardous materials that need to be eliminated, reduced or controlled. The list is a composite of the "Environmental Protection Agency 17," and an Air Force Logistics Command Top 10 bad actor list. The Air Force Logistics Command Top 10 list makes up over 90% of the hazardous waste streams leaving the Air Logistic Centers. The Aeronautical Systems Division list contains carcinogens and ozone layer depleting chemicals to eliminate; chlorinated hydrocarbons, volatile organic compounds and heavy metals to reduce; and advance technology materials where toxicity needs to be considered.

**SUPPORT ORGANIZATIONS**

Each program manager is responsible for his individual system acquisition, i.e., cost, schedule, performance, supportability, and environmental compatibility. Aeronautical Systems Division is responsible to insure the program manager has the right tools to work with. Aeronautical Systems Division also has a role to crossfeed lessons learned between system program offices and ensure environmental training opportunities are available. This is done through the Environmental Protection Committee chaired by Aeronautical System Division's Vice Commander. The Environmental Protection Committee has Hazardous Material and Environmental Assessment Subcommittees that meet regularly and work the information sharing issues.

The Hazardous Materials Subcommittee has a published list of Aeronautical Systems Division's priority hazardous materials that system program offices are working to eliminate or reduce. As mentioned earlier, Air Force Logistics Command's PACER REDUCE Program is a waste minimization program that has been successful at reducing hazardous waste at their five Air Logistic Centers mostly through recycling and process substitution. The system program offices are actively pursuing environmentally compatible designs that will eliminate or reduce the need for the remaining hazardous materials.

The Environmental Analysis Subcommittee tracks the ongoing analysis. Each quarter the subcommittee processes about 50 Air Force Form 813's, Request for Environmental Impact Analysis. Many are approved for categorical exclusion and the Environmental
Protection Committee actively follows the progress of the environmental assessments and environmental impact statements.

The Environmental Protection Committee in its awareness/training role hosted the Air Force Civil Engineering Commander's Environmental Leadership Course in January 1990. Forty of Aeronautical Systems Division's program managers, as well as the Aeronautical Systems Division Commander and Vice Commander, attended. The course had a major impact on the Aeronautical Systems Division environmental awareness and the program managers who have traditionally managed only to cost, schedule and performance. Environmental awareness is a major goal of the Environmental Protection Committee and there is a metric that tracks program managers who have been to the Environmental Leadership course. As turnover occurs, new program managers will be scheduled to attend.

WRAP UP

We know that future weapon systems will be superior to the B-1, F-15, and C-141 that the Air Force operates today. These systems will perform their missions better, require less logistical support, and be more compatible to the environment. The culture, processes, and organizations are in place at Aeronautical Systems Division and other Systems Command Product Divisions to insure the program manager makes environmentally informed decisions today. Today's decisions will affect how the Air Force will fly and fight in the future.
ACQUISITION MILESTONES & PHASES

CHART 1