

**Example 1** iPod Hands-Free Device Needs and Objectives. *Abstracted from the iPod Hands-Free Device Design Report by Al-Busaidi, Bellavia, and Roseborough [AlbOI].*

*Need:* According to AppleInsider, approximately 10.3 million people owned iPods at the end of 2004 and many of the owners used them while operating their automobiles. The National Highway Traffic Safety Administration estimates that driver distraction is a contributing cause of 20 to 30 percent of all motor vehicle crashes-or 1.2 million accidents per year. One research study has estimated that driver inattention may cause as many as 10,000 deaths each year and approximately \$40 billion in damages. iPods can present a distraction to drivers that is similar to that of cell phones in that the driver's attention is divided between controlling the steering wheel, watching the road, and navigating controls on the iPod. A system is needed to allow users to navigate among the music selections of their iPod without distracting their attention from the road.

*Objective:* The objective of this project is to design and prototype a device that will make the iPod safer to use while driving an automobile, by allowing hands-free control of the iPod. The device will interact with the user, using spoken English statements. ~lbe user will be able to issue simple voice commands to the device to control the operation of the iPod. In turn, the device will communicate information verbally, such as song titles that are displayed On the iPod screen, to the user.

**Example 2** Experimental Design Problem Needs and Objectives. *Abstracted from the Intel Pro 1000XF Server Testing Design Report by Esek, Hunt, and Lewis. [Ese03].*

*Need:* Our industry sponsor is investigating the performance of commercial-grade gigabit Ethernet fiber optic equipment for computer data communications in a military environment. The proposed system will utilize an Intel Pro1000 XF server card. This is a harsh operating environment and its effects on the performance and lifetime of the equipment are unknown. The client wishes to understand how the military environment affects the optical power margin of the Intel Pro 1000 XF card and associated connectors and cabling.

*Objective:* The goal of this project is to design the experimental equipment and test pro-I cedures to determine the effects of temperature variations and vibration on the optical power margin and the operating lifespan of the system.

**Example 3** Portable Aerial Surveillance Needs and Objectives. *Abstracted from the PASS Design Report by Andre, Ko/b, and Thaler [AndOI].*

*Need:* Emergencies happen all across the world, all of the time. There are nearly 2,000,000 reported fires in the United States every year, and over 90 tactical activations of Pennsylvania's Special Emergency Response Team, which handles barricaded suspects and hostage situations. There have been over 100 documented riots in the United States in the past century, with the Los Angeles Riot alone causing \$1 billion in damage. Having an aerial view of these situations would be a great benefit to the emergency workers on the ground. For example, police may have to monitor a large crowd or a hostage situation where aerial surveillance would allow them to observe the situation from a safe distance and use the footage as evidence in court. Firefighters could use aerial surveillance to examine fire-damaged buildings and search for victims through the windows of high-rise buildings. In large cities, emergency organizations often employ helicopters for aerial surveillance. However, in smaller rural towns, helicopters either take too long to reach the scene from a nearby city or they are too expensive to afford. The least expensive two-seat helicopters cost over \$400,000, while new helicopters cost well over a million dollars with average operating costs of \$400-\$1000 per hour. There is a need for a low-cost aerial device that can provide emergency workers with overhead surveillance of emergency situations.

*Objective:* The objective of this project is to design a device that will provide emergency workers with a live aerial view of a situation at a cost that small municipalities can afford. The device will deploy rapidly and record and log video. The camera will also include pan and zoom functionality to make identification of victims and suspects easier.