the passage into the new millenium was not a jubilant period for everyone, most notably the teams of scientists and engineers who planned, built, and launched the Mars Polar Lander expedition that was scheduled to touch down on the Red Planet December 3. The mission failed. No signals came back at the scheduled time of landing and the Lander has been silent ever since. Months earlier, another Mars expedition, the Mars Climate Orbiter, was also lost. An investigation has begun, headed by A. Thomas Young who, according to the National Aeronautics and Space Administration, “will review the agency’s approach to robotic exploration of Mars.” Young, who retired as executive vice president from Lockheed Martin—prime contractor for the Lander—in 1995, is a former director of NASA’s Goddard Space Science Center. Also being conducted is a complementary inquiry into the technical reasons for the failure. Overseeing this effort is John Casani, former director of the Jet Propulsion Laboratory in Pasadena, California. JPL manages most of NASA’s planetary investigation program.

Mars expeditions—begun in 1964 with the early Mariner photoreconnaissance missions which orbited Mars—are all about photonics and optics in the most sophisticated sense. The remote sensors on the Lander—collectively called the Mars Volatiles and Climate Surveyor—were magnificent devices, employing all manner of optical and electronic systems to photograph and to physically and chemically analyze the various constituents of the Mars atmosphere, its surface, and subsurface.

The Lander had an international aspect as well. Aboard was a device developed by Russia’s Space Science Research Institute that was to have detected and determined the altitude of atmospheric dust hazes and ice clouds surrounding the Lander. Also aboard was a microphone that was to have recorded various sounds on the surface of the planet. Two ground-penetrating microprobes to study the subsurface of Mars were to have been shot out from Lander as it descended. These apparently did not deploy because no signals were returned from them.

The loss, in short, was a tragic one, and it is highly unlikely that the scheduled followup mission to the Lander will be sent without total rethinking. The Lander II craft is designed and built along the same lines as Lander I, but according to all reports, it won’t end up being launched. Too chancy. Another, probably a more expensive and reliable one, will have to be designed. One assessment is that NASA, forced to cut its costs for more than a decade, went too far in doing its Mars robotic missions on the cheap, and that the embarrassing results are there for all to see.

Others say the “cheaper, faster, better” approach NASA has been taking for its space science programs is exactly what is needed to keep a sustained program going. For one thing losses, when they occur, are less expensive. In any case, NASA already has been assessing how to improve on the methodology of faster/better/cheaper.

For such a wealthy country, money should not be the important element in assessing the failure of Lander. But it is. If the U.S. is buying the proposition that planetary exploration is important to the strength and vitality of its culture, and if visits to our mysterious and fascinating solar system neighbors are the best way to achieve it, then why should the country be chintzy about allocating the funds needed to do it all right?

That, at least, will be one major area of inquiry that the Young investigation will pursue. NASA administrator Daniel Goldin says he wants the inquiry to proceed with complete independence, letting the chips fall where they may. One brutal truth won’t be news to anyone with the slightest familiarity with NASA’s space science program. It is underfunded. Engineering staffs are overextended. The program is prey to the politics of balanced budgets and the refusal by Congress and the Administration to lift caps on spending during a time of budget surpluses.

What makes the Young and Casani inquiries so important for NASA’s entire planetary exploration program is the dismal record of Mars expeditions over the past few years. In the last decade, out of five attempts, only one Mars expedition has succeeded—the spectacular 1997 Pathfinder mission that landed triumphantly with its rover sojourner. It was designed and built by JPL, but at a cost double that of subsequent expeditions.

Least happy of the lot has to be Lockheed Martin Corp., prime contractor of the Lander, which admitted to programming failures in the Orbiter expedition and was prime contractor in many launch mishaps involving military satellites. Its engineers have stated that they were handicapped by scanty resources, forcing them to work 80-100 hour
Legal Lens

That's Obvious!
BY JOSEPH E. GORTYCH

Missed opportunities and legal snafus can result from applying common sense, logic and engineering experience to the legal world of inventions and patents. Among would-be inventors, for example, there is a commonly held misunderstanding regarding the concept of "obviousness" as it relates to the patentability of an invention. This month we highlight the importance of viewing the concept of obviousness through a "legal lens"—as this column's name suggests—rather than through a "layman's lens."

What is "obviousness"?
According to the Webster's New Riverside Dictionary (Office Edition), "obvious" is defined as "easily seen or discovered." Thus, "obviousness" can be considered "the state of being easily seen or discovered." This definition, consistent with our everyday understanding of the term, is very broad and entirely subjective.

The legal definition of "obviousness" is embodied in the patent laws in 35 United States Code § 103, which states that an invention is not patentable "if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains [emphasis added]." This definition is significantly narrower in scope than the Webster's definition because it includes language delimiting who is qualified to determine obviousness. Under this legal definition of patentability, obviousness must be determined relative to a person of ordinary skill in the art. This is the first trap to avoid: if you are an expert in your field, you will be more prone to find an invention "obvious" than would a person of ordinary skill. If, on the other hand, you are an ingénue in the art in question, you will be less prone to find an invention "obvious." For this reason it is important to view obviousness through the eyes of a person of average skill working in the field. This is not an easy thing to do unless you happen to be one of those average people (and are willing to admit it!).

Obviousness analysis
What is not apparent from the statutory definition cited above is how obviousness is actually determined by a patent examiner working in the United States Patent and Trademark Office (USPTO), or by a court of law. Most statutes simply cannot be drafted in sufficient detail to provide all the information one needs to know about how the law actually operates. Accordingly, judicial decisions in court cases involving the statutory language typically provide insights about how to perform a legal analysis under the statute.

The case law pertaining to obviousness under 35 U.S.C. § 103 has established that an invention will be considered unpatentable for "obviousness" if there are two or more prior art references which, when combined by one of ordinary skill in the art, teach all the elements of the invention. Further, the references must somehow suggest that the references should be or could be combined. Moreover, there must be some likelihood of success in combining the references to create the invention. Alternatively, obviousness can be found if there is a single prior art reference that can be combined with what is generally known to one of ordinary skill in the art. However, there still needs to be motivation and likelihood of success for combining what is generally known in the art with the cited...