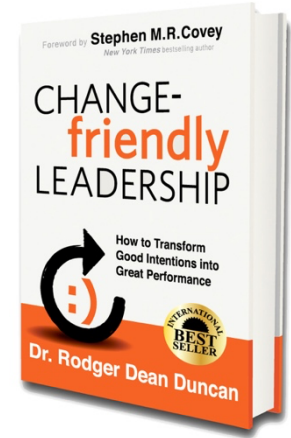


## Section



## BONUS•POINTS



### The High Cost of Compromise

By Dr. Rodger Dean Duncan

At a recent business conference, I visited with Harold W. Gehman. He prefers to be called Hal. Hal is a retired U.S. Navy admiral who served as a member of the Joint Chiefs of Staff, the Pentagon's top military decision makers. Hal was called on by President George W. Bush to head the special board investigating the *Columbia* Space Shuttle accident.

There is much to learn from the board's findings.

The investigation board set out to answer three questions. First, "What happened to the *Columbia*?" As anyone watching television on that Saturday morning can tell you, the *Columbia* disintegrated when it reentered the earth's atmosphere at 205,000 feet while traveling 14,000 miles per hour southwest of Dallas at about 8:00 a.m. Central time.

Although the *Columbia* scattered more than 84,000 pieces of debris across Texas and into western Louisiana, there were no witnesses to the accident. (Yes, millions of us saw the debris falling, but nobody saw the actual accident.)

The second question the board set out to answer:

"Was whatever caused the accident an anomaly, or was it something that had occurred before

without such consequences?"

If the answer to the second question was that the accident's cause had been seen before, then the third question had to be "Was the cause dealt with adequately?"

After thousands of man-hours of investigation, the board concluded that there were two causes to the *Columbia* accident. One was technical, the other was organizational.

The technical cause of the loss of the space shuttle *Columbia* occurred 16 days before the accident. It happened on launch. The shuttle was struck by a small piece of light-weight material similar to that of a Styrofoam cup.

The organizational cause of the accident was both complicated and simple. More on that later.

It's interesting to note that, prior to this launch of *Columbia*, there had been 113 shuttle flights. Most people are amazed by

that number. It shows how routine space flight has become. As it turns out, "routine" is part of the danger.

Now, a bit of Shuttle 101.

When a shuttle lifts off the launch pad, it is bundled with three other huge pieces of



apparatus. Two mammoth white rockets on the side of the shuttle are solid rocket boosters. They produce a total of five million pounds of thrust. After two minutes and 15 seconds, these two rockets are jettisoned and fall harmlessly into the ocean.

A big orange tank in the center of the bundle holds liquid fuel for the shuttle's three on-board engines. The tank is made of aluminum, and the fuel it holds is cold—roughly minus 450 degrees. Because something that cold produces dangerous ice in the humid Florida air at the launch site, the tank is covered with insulating foam. This foam was the technical cause of the *Columbia* accident.

Hal Gehman says the people in the space program had succumbed to “the Gamblers’ Dilemma.” On every single previous launch of a shuttle, the orbiter was damaged by foam striking it. And on every single previous launch the damage did not cause an accident. “The Gamblers’ Dilemma” was the danger in forgetting that what happened in the past is in no way a guarantee of what may happen in the future (as the fine print in any financial prospectus reminds us).

Early in the shuttle program, falling foam was regarded as a “Level 1” hazard. The orbiter is covered with an extremely delicate thermal protection system that absolutely must remain intact. Upon reentering the earth’s atmosphere, the orbiter is subjected to heat of up to 10,000 degrees Fahrenheit. Any compromise in the orbiter’s outer skin can spell disaster.

But on 113 previous flights, damage from falling foam was within tolerable limits. So, over time, the engineers accepted the falling foam as a harmless, recurring reality. They even had a term for the phenomenon. They called it “a normalized deviance.” Falling foam was “outside of specifications,” but because it hadn’t been a problem it was simply accepted.

A chilling part of this story is that “normalized

deviance” also played a role in a previous disaster. Remember the *Challenger* tragedy in 1986? It was caused by leaking O-rings on the solid rocket booster. The O-rings had leaked on nearly every previous flight of the *Challenger*, but the “outside of spec” phenomenon had become accepted as tolerable.

This kind of compromise is the organizational cause of the *Columbia* accident. As Hal Gehman says, “Some engineers were yelling and screaming, ‘We can’t live with this,’ while others were saying, ‘No, no, it’s okay. Don’t worry about it.’”

In a world driven by schedules and budgets and political pressures, compromises are an inevitable part of the mix. Some of the compromises can be deadly.

Hal Gehman puts it into perspective: “The really scary thing about this history of anomalies is how cleverly they [the space program engineers and administrators] documented every time a piece of foam came off, which was on every flight. And it’s scary how the recurring events were incrementally characterized as less and less serious. Somehow, man seems to think that by putting a different label on a bad thing he can diminish the danger of the bad thing.”

What can we learn from all this?

There are so many easy, even logical, compromises available to us. Most of us know a correct principle when we see it. And many people have a finely-tuned ability to cut corners for the sake of convenience or some other arbitrary excuse. For evidence, just consider the lapses at Enron, Tyco, the *New York Times*, WorldCom and other organizations where corners were cut.

A helpful approach to the temptation of compromise is seen in the story of the father of teenagers. The story may be only an urban legend, but it’s instructive nonetheless.

The family had a high standard on what kind

“ There are so many easy, even logical, compromises available to us. Most of us know a correct principle when we see it. ”

of movies were appropriate for viewing. The three teens in the family wanted to see a particular popular movie that—although was “mostly” okay—seemed to violate some of the family standards. The teens interviewed friends to get details on the movie. They compiled a list of pros and cons. They would use the list to persuade their dad that they should be allowed to see the movie despite its occasional lapses.

The father reviewed the list of “evidence” and promised to give them his answer in 24 hours.

The next evening he called his three teens into the kitchen. On the table he had placed a plate of brownies. He said he had carefully considered their request and had decided that if they would eat one brownie each he would let them see the movie. But just like the movie, he said, the brownies had pros and cons.

The pros were that they were made with the finest chocolate and other good ingredients. They were moist and fresh, made with an award-winning recipe.

The brownies had only one con. He had included a special ingredient—“just a little bit” of horse manure. But he had mixed the dough well.

The manure probably couldn’t even be tasted because the brownies were baked at 350 degrees and any bacteria from the manure had probably been destroyed. “Probably.” Therefore, if any of his children could stand to eat a brownie that included “just a little bit” of manure and not be affected by it, then he knew they probably would also be able to see the movie with “just a little bit” of smut and not be affected. “Probably.”

The teenagers decided the movie wasn’t that attractive after all.

The story is likely apocryphal, but it makes a good point. The next time we’re tempted to compromise a principle, wouldn’t it be great if a wise friend brought us back to reality by offering to whip up a batch of those special brownies?

Of course, that’s not the way it works. We make most decisions and choices on our own, without the coaching of others. And even if others are coaching us, they can be susceptible to the same compromises we are.

“Normalized deviance” is not unique to the space program. It can and does happen to anyone who toys with compromise.

Admiral Gehman certainly has it right. Putting an “acceptable” label on a dangerous thing is a perfect recipe for disaster.

