June 9, 1986

TO: Senator Dole

FROM: Steve Coen

SUBJECT: Summary of Report of Space Shuttle Challenger

A quick summary of the Presidential Commission's report shows:

1. The loss of the Space Shuttle Challenger was caused by a failure in the joint between the two lower segments of the right Solid Rocket Motor. The specific failure was the destruction of the seals that are intended to prevent hot gases from leaking through the joint during the propellant burn of the rocket motor. The seven astronauts died because hot gases escaped from the seam of the shuttle's right booster rocket, triggering a chain reaction that ended in a gigantic fireball.

2. Those who made the decision to launch the Challenger were unaware of the recent history of problems concerning the O-rings and the joint and were unaware of the initial written recommendation of the contractor advising against the launch at temperatures below 53 degrees farenheit and the continuing opposition of the engineers at Thiokol after the management reversed its position. Nor did they have a clear understanding of Rockwell's concern that it was not safe to launch because of ice on the pad.

3. The Commission is troubled by what appears to be a propensity of management at Marshall Space Flight Center to contain potentially serious problems and to attempt to resolve them internally rather than communicate them forward.

4. Thiokol Management (the company that designed, developed and manufactured the solid rocket booster) reversed its position and recommended the launch at the urging of Marshall and contrary to the views of its engineers in order to accommodate a major customer.

5. Neither Thikol nor NASA responded adequately to internal warnings a about the faulty seal design. Furthermore, Thikol and NASA did not make a timely attempt to develop and verify a new seal after the initial design was shown to be deficient.

6. Not included, was any recommendation about "minimum crews". Some commission members thought that the crews of future flights should be restricted to professional astronauts prepared for the risks inherent in space flight. Some say that such a recommendation was deleted because it would appear to criticize the President's support of the decision to send Christa McAuliffe.

7. One chapter is devoted to pressures within NASA to keep the shuttle flying. The Commission concluded that the decision to launch was made solely by the appropriate NASA officials. The fact that the President had planned on giving the State of the Union Message played no role. There was no plan for a live communication hookup with the crew during the State of the Union Message.

8. The Space Shuttle was not designed to survive a failure of the Solid Rocket Boosters. No corrective actions could be taken if the boosters did not operate properly after ignition i.e. there is no ability to separate an orbiter safely from the thrusting boosters and no ability for the crew to escape the vehicle.

The Commission had the following recommendations

1. The faulty Solid Rocket Motor joint and seal must be changed. The joints should be fully understood, tested and verified.

2. The Shuttle Management Structure should be reviewed. More astronauts should be used in management positions. NASA should develop a Safety Advisory Panel.

3. NASA and the primary Shuttle contractors should review all hazard analyses systems. An audit panel should verify the adequacy of the effort.

4. NASA should establish an Office of Safety, Reliability and Quality Assurance to be headed by an Associate Administrator, reporting directly to the NASA Administrator.

5. NASA should take energetic steps to eliminate the tendency to management isolation at Marshall Space Flight Center. A policy should be developed which governs the imposition and removal of Shuttle launch constraints.

6. NASA must take actions to improve landing safety. The tire, brake and nosewheel steering systems must be improved. These systems do not have sufficient safety margin, particularly at abort landing sites.

7. NASA should make all efforts to provide a crew escape system for use during controlled gliding flight and make every effort to increase the range of flight conditions under which an emergency landing can be successfully conducted.

8. The nation's reliance on the shuttle as its principal space launch capability created a relentless pressure on NASA to increase flight rate. NASA must establish a flight rate that is consistent with its resources.

9. More stringent tests are needed for items designated Criticality 1. NASA should develop and execute a comprehensive maintenance plan and perform periodic inspections when scheduled and not permit them to be waived. NASA should stop the practice of removing parts from one Orbiter to supply another.