

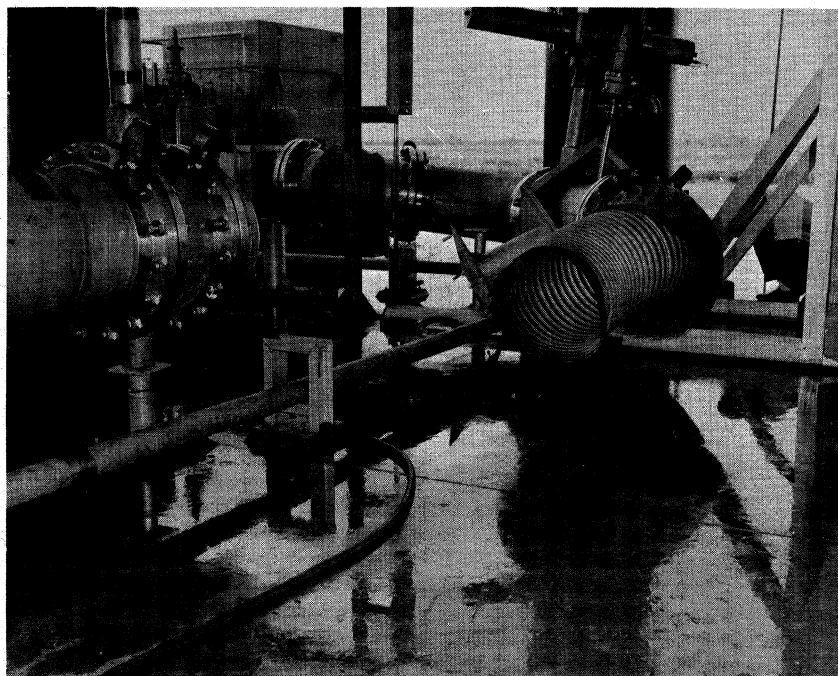


FIGURE D-21.—Liquid oxygen line failure.

are using 18-inch lines. Nobody has transported liquid oxygen at that rate through 18-inch lines before.

This particular break occurred on August 20. In 1 calendar month, September 20, this particular liquid oxygen tank had been refilled, the correction of the deficiencies had been redesigned, and it was back in operation.

Mr. WAGGONNER. Was the solution to open the second valve manually?

Mr. SHINKLE. No. A recirculation and precooling system was installed in front of the second valve so that there would always be liquid against the face of the valve rather than gas.

Mr. WAGGONNER. Couldn't you have done the same thing by simply opening that second valve manually and allowing enough time to elapse to be sure that liquid was against that valve to prevent the gas from doing what you described?

Mr. SHINKLE. Experiments were conducted on opening the second valve very slowly to allow the built-up gas to escape without creating the severe shock of impinging with the liquid oxygen. These experiments failed, since upon slight opening of the valve the quick release of gas occurred and the shock forces were again experienced. Therefore, we solved the problem by installing the recirculating system, which eliminated the gas build-up at the valve interface.

It became apparent last year that, to meet all our program commitments and milestones, we had to develop management systems which