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## **WRITTEN WITNESS TESTIMONY**

**"The DuPont Aerospace DP-2 Aircraft"**

Subcommittee on Investigations and Oversight

House Committee on Science and Technology

All of my exposure to the *duPont Aerospace DP-2* aircraft project took place during my 35 years of full-time career employment with the Department of the Navy in the position of Supervisory Aerospace Engineer, specializing in the fields of aircraft design, experimental development, and flight testing. I first entered that employment having two degrees in engineering, as stated in my accompanying resume. The graduate level coursework I completed at Princeton University in 1965-66 for my Masters Degree in Aerospace Engineering included a concentration in the theory and design of vertical takeoff and landing (VTOL) aircraft, and more specifically, in the flight stability and controllability of those aircraft when operated by human pilots. My master's thesis relied directly upon in-flight testing of an experimental aircraft capable of having varying degrees of stability and controllability, sponsored under a Princeton University research contract from the Navy.

My initial exposure to the DP-2 occurred in approximately 1985 when I was promoted into the position of Head, Aircraft Conceptual Design Branch, Naval Air Development Center (NADC), at Warminster, PA. My group of roughly (30) aerospace engineers conducted, among other duties, analytical evaluations of both solicited and unsolicited technical proposals for development of new aircraft concepts with possible application to the missions of the Navy and Marine Corps. These proposals came to our attention from sources that ranged from major aircraft manufacturing companies to small children interested aviation. It was Navy policy that we respond in writing to each proposal within thirty days. My introduction to the duPont DP-2 was in reading a just-completed detailed analytical evaluation of the DP-2 concept that some of my engineers had participated in along with others from the Naval Air Propulsion Center in

Trenton, NJ. That formal analytical evaluation of the duPont DP-2 proposal was ordered by, and funded by, the Under Secretary of Defense for Research and Engineering, in response to high level congressional interest in the duPont proposal. No other unsolicited proposals that came our way prior to that had ever been given such high level attention. The NADC evaluation was reported in writing by (4) senior engineers, one of which was my predecessor Branch Head, and another of which was a continuing member of my group. I myself did not get to play a direct part in that proposal evaluation, except as a reviewer. The 36-page report was issued as NADC-86069-60, "An Assessment of the duPont Aerospace Company Model DP-2 V/STOL Aircraft Design," in May, 1986. There were (20) specific technical conclusions at the end of that report, stating that the DP-2 design concept was deficient in its ability to generate enough jet engine thrust to hover in flight, that it lacked the means to control it in hover (if hover was ever achieved), and that the entire DP-2 conceptual design was far less attractive than other competing proposed designs then being considered for Navy and Marine Corps mission applications. In short, this 1986 formal technical evaluation of the DP-2 rejected the concept outright, and found no redeeming merit that would justify investment of government funding at that time.

It is important to put this 1986 evaluation in proper perspective. Those performing the study were dedicated civil service engineers with a wealth of lessons learned over previous decades of experimental V/STOL aircraft programs performed by NASA as well as by DOD and foreign governments. They had no prior awareness of either duPont Aerospace as a company, or the DP-2 as a concept that might have prejudiced them. They would have found no material gain in rejecting the concept. Contrarily, they would have stood to gain future project oversight funding for the Navy to proceed with a contract award for the DP-2 development.

I had no further involvement with the DP-2 concept between May 1986 and February 1999. During that interim, there were occasional reports in the aviation news media that the DP-2 proposal was bouncing from agency to agency in the U.S. government. Informal dialog with our counterparts in the aircraft design research groups at NASA and the Air Force, as well as the Army, revealed that similar negative assessments were being reported to their superiors, and ultimately to the congressional proponents of the DP-2.

In July of 1996, I and my entire engineering group were relocated to new facilities at the Naval Air Station, Patuxent River, MD, as a result of the recommendations of the 1991 Base Realignment Advisory Commission (BRAC). In that new location, I was promoted to a Division Head (GS-15) and my Advanced Conceptual Design group was elevated to a Division which included counterparts from the Crystal City, VA, headquarters of the Naval Air Systems Command (NAVAIR) .

In February of 1999, I received formal notification from the Navy Admiral and Commander, NAVAIR, that he had just been visited by Navy Captain John Kinzer, to review an ongoing contract between the Office of Naval Research (ONR) and duPont Aerospace. The DP-2 was being built, and had been under construction for some time. The Admiral directed that I form and lead a panel of senior NAVAIR engineers from various fields of technical specialization, to conduct a 2-day on-site review of duPont Aerospace facilities near San Diego, CA, and assess the ongoing design and construction of the DP-2. In meeting with CAPT. Kinzer myself, I learned that he was newly assigned to ONR in Ballston, VA, to be assistant program manager for the DP-2 contract. The ONR Program Manager himself at that time was Dr. Tom Taylor, an SES civilian, now deceased. In a later meeting at ONR with Dr. Taylor, I was informed as to how the DP-2 contract had come into being without the awareness of NAVAIR, who was chartered to manage all aircraft design and development conducted by or for the Navy and Marine Corps. I would soon come to learn that congressional proponents of the DP-2 had earmarked funding for the initial contract and directed the funds to the Defense Advanced Research Projects Agency (DARPA) in Rosslyn, VA, to award and manage the DP-2 contract. I was told that DARPA had refused to accept the funds and rejected the DP-2 concept on technical grounds. ONR, in the person of Dr. Taylor, stepped into the fray and informed the congress that if the DP-2-earmarked funds were redirected to ONR, he would gladly manage the project with duPont, as desired by the proponents on the hill.

When former F-14 project test pilot Captain Kinzer arrived at ONR and was confronted by the DP-2 project in being, he reported the situation to the Admiral at NAVAIR. The entire engineering staff at NAVAIR was briefed on the DP-2 project and a hand-selected team of (11) senior civilian specialists in aircraft research, design, test and evaluation (RDT&E) were placed under my leadership for the on-site review at duPont Aerospace facilities near San Diego which took place on March 8-9, 1999. Those senior specialists were from the following fields in the NAVAIR organization--- Aircraft Design, Test & Evaluation, Propulsion Installation and Test, Airframe Structures, Materials, Flight Controls, Flight Dynamics, Aircrew Escape Systems and Flight Test Clearance. The team conducted their on-site review at the duPont engineering facilities at La Jolla, and the duPont manufacturing hangars at Gillespie Field in El Cajon. The DP-2 was, at that point in time, less than 50% assembled. Each member of the evaluation team was allowed to closely inspect the partially built DP-2, and interview the various engineers and technicians on the project who were employed by duPont Aerospace. A rudimentary computerized flight simulator supposedly programmed with the handling characteristics of the DP-2 was demonstrated to the team by the duPont company test pilot who had been a Marine pilot flying the AV-8 Harrier VTOL jet fighter. This company pilot was not a graduate of either the Navy or Air Force Test Pilot Schools.

All team members submitted written detailed assessments of their particular aspects of the DP-2 project to me within a week of returning to our offices at NAVAIR, Patuxent River. I submitted a composite written team report, with all their individual reports attached, to the NAVAIR Admiral. The opinions of the entire group were unanimous in expressing grave concerns over the design, fabrication, and proposed testing of the DP-2. The mechanization of the elaborately articulated thrust-vectoring system was firmly predicted to destroy itself when subjected to the heat and thrust of the twin-jet engine exhaust. The company-estimated aerodynamics and handling characteristic of the DP-2 were inadequately substantiated by any routine means such as wind tunnel testing and computation of inertial properties of the completed airplane. This meant that the company pilot was being "trained" to fly a totally undefined computerized airframe on the so-called DP-2 flight simulator. The use of composite material shells for the airframe structure was being undertaken without any adequate fixtures to insure proper alignment.

I, myself, was extremely disturbed by the planned testing of the DP-2 situated on the public commercial airport, Gillespie Field in El Cajon, CA. We were shown a completed elevated steel platform on which the DP-2 was to be strapped down for testing of the thrust vectoring system. That platform was permanently located on the public airport property, less than 30 feet from the chain-link fence on the boundary between the airport property and a public thoroughfare including sidewalks, offices, and automobile parking in the city of El Cajon. The risk to off-airport property and pedestrian traffic was immense and of little apparent concern to duPont Aerospace management. Also disturbing was the stated intent to fit the DP-2 cockpit with a pilot emergency ejection seat taken (by suspect means) from a Navy F-14. That "free gift" F-14 ejection seat was simply plopped into the DP-2 cockpit area with over a foot or more of the seat head box structure protruding well above the top of the enclosed cabin structure. This was unexplained by the duPont management when challenged.

In overview, our March 1999 NAVAIR assessment of the ongoing DP-2 was as follows:

- The DP-2 design that was first rejected by a totally different Navy engineering team back in 1986 had not significantly changed in thirteen years, in the eyes of us newcomers.
- The propulsion thrust-vectoring system, consisting of two turbofan engines placed closely together at the nose of the airplane, plus an array of articulated vanes, was bound to break up structurally when employed to lift the DP-2 into a vertical takeoff or landing.
- There was a significant lack of control devices, such as attitude control "puffer" jets on the tail and wingtips, that were absolutely necessary to maintain piloted

control of the DP-2 in low forward speed, hover, and in vertical take-off and landing. The company maintains that such control would be provided by the variable vanes in the (highly suspect) thrust vectoring machinery.

- The lack of adequate hover control flies in the face of the company advertised scheme of having squads of equipment-laden Special Forces troops running the length of the fuselage and rappelling down ropes strung from the open tailgate.
- The testing of the DP-2, if continued, should be performed unmanned, through remote radio control, in a desert test range environment, well away from bystanders and valuable structures.

In summary, I wish to stress that the DP-2 proposal was summarily rejected by impartial engineers and scientists from government aeronautical laboratories of DOD and NASA repeatedly over the past twenty years, yet it was forcibly funded and undertaken at the insistence of congressional advocates, with no regard to the judgments of their own government laboratory experts. The DP-2 is not the first such ill-advised aircraft project, and it is not the only one ongoing now. At least one other that I had painful personal experience with resulted in a predicted catastrophe and fatality, all for no technical gain.