ABSTRACT

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Title: The Capture Theory and Federal Investigations of Aviation Accidents

Major: Political Science Degree: Doctor of Philosophy

Approved by: Date:

Dissertation Director

December 1, 2005

NORTHERN ILLINOIS UNIVERSITY

ABSTRACT

The idea that a federal regulatory agency can become captive of the industry it has regulatory responsibility over is a familiar concept in political science theory. On a practical level however, capture can bring about devastating results if not recognized and controlled, especially when it involves public transportation safety.

Aviation disasters in the 1990s raised public anxiety and caused the federal government to reexamine its ability to insure the public's safety in the air. Of great concern was that the National Transportation Safety Board (NTSB), the nation's independent guardian of transportation safety, was losing its ability to conduct complex aviation accident investigations, causing it to rely more on aircraft manufacturers and operators through the "party system," a mutual arrangement between the NTSB and industry, for the technical and operational expertise needed to conduct its investigations. A 1998 independent study argued that the party system created the appearance that the agency could be unduly influenced by manufacturers' representatives during the course of a crash investigation.

This study goes beyond the findings of the independent study and asks whether the capture theory helps explain the results of aircraft accident investigations and the safety recommendations made by the NTSB.

This study uses themes derived from coding 38 interviews of persons from government and industry involved in aircraft accident investigation. The derived themes led to three principal findings, which are that the NTSB is the subject of inadvertent capture by the design of the party system, which establishes the operating relationship between the NTSB and manufacturers' and operators' representatives. Second, that the NTSB's investigations through the preparation of factual reports pose a power position that proves to be very difficult to circumvent by the interested parties before the facts of an investigation are released to the public. And finally, the NTSB investigative findings influence party behavior, where facts found during the investigation are identified to the parties and the parties act to resolve the safety deficiencies immediately, well before the conclusion of the investigation.

NORTHERN ILLINOIS UNIVERSITY

THE CAPTURE THEORY AND FEDERAL INVESTIGATIONS OF AVIATION ACCIDENTS

A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE

DOCTOR OF PHILOSOPHY

DEPARTMENT OF

POLITICAL SCIENCE

BY

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DEKALB, ILLINOIS

DECEMBER 2005

UMI Number: 3205091

Certification: In accordance with departmental and Graduate School policies, this dissertation is accepted in partial fulfillment of degree requirements.

Dissertation Director

Dec. 1, 2005

Date

ACKNOWLEDGMENTS

This author wishes to express sincere appreciation to Professors Culhane, McSpadden, and Koenig for pointing me in the right direction regarding previous work done in the subject areas of capture, public interest, principal-agent, and other theories of regulation, and to Professor Rubin, who helped me refine the tools used in this study's methodology. In addition, special thanks are due to the men and women of the National Transportation Safety Board, the Federal Aviation Administration, and of the numerous manufacturers within the aerospace industry who recognized the importance of this study and courageously provided their insights and experiences.

This study was supported in part by funding provided under Chapter 32 of Title 38 U. S. Code, Post-Vietnam Era Veterans Education Assistance Program, and by a seed grant from the National Transportation Safety Board. This study was also supported in a different manner by my wife, who not only tolerated the long hours put into this effort, but served as a research assistant and brought insight and opinions that deepened and enriched this work. Finally, I wish to thank my children, who learned the value and importance of education through the effort I devoted to this study, and who patiently tolerated those times when I was absent, physically and emotionally.

DEDICATION

To former NTSB Chairman Jim Hall

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

A commercial airliner crashes. Numerous lives are lost. Property is destroyed. An anxious public asks, "Why?" To provide the answer to this question, in steps a team of investigators led by the National Transportation Safety Board (NTSB). On this team are inspectors from the Federal Aviation Administration (FAA). Also on this team are experts from industry--the manufacturers who built the airplane, the engines, and other components; the operating company that trained and managed the pilots and maintained the airplane; and the unions whose interests rest with how involved labors, i.e., pilots, mechanics, machinists, etc., may have contributed to the accident. As the investigation proceeds with no immediate answer to the question of "why," the public expresses its concerns over the participation of the manufacturers, companies, and unions, who have a stake in the outcome of the investigation. Questions arise as to whether the NTSB can actually conduct an unbiased independent investigation and whether the outcome of that investigation will truly lead to safety improvements and prevention of future aircraft accidents. Or is the NTSB investigation subject to capture by industry through its participation in the investigation?

This study seeks to answer those questions by looking specifically at the capture theory of regulation and, through this examination, to show that elements of this theory can manifest themselves in the federal government's task of independent aircraft accident investigation as conducted by the NTSB and also as conducted, in part, by the FAA.

Capture is the culmination of a process over time in which a group or industry, regulated by a government agency, exerts enough influence on that agency that the regulated group is able to control or "capture" the agency designed to regulate them, thereby insuring that regulation conferred on them by the oversight agency will be consistent with the regulated group's own interests. According to the theory, a process of influence occurs starting at the very beginning of the relationship between a regulatory agency and the regulated industry. Regulatory agencies are established to oversee some function of industry or business, usually as the result of a legislative act designed to correct deficiencies or establish safe standards in that industry. At the beginning, the regulatory agency has the support of the government and the public in its efforts to regulate its target industry. However, over time, government and public support wanes, especially when it seems that the industry is complying with regulations and standards are being met. As support wanes, industry exerts its influence. The regulatory agency, to remain effective in its mission, begins to seek industry's support for regulatory compliance. In achieving this, regulatory vigor diminishes and industry influence increases. Industry eventually gains a position such that the agency's execution of policies favors industry's interests. It is here where capture is achieved.

Previous studies have examined capture primarily with respect to federal and state regulatory agencies. A regulatory agency is one that is granted authority by an executive branch to oversee the safe and proper function of an industry, group, or service as specified by guidelines established within state or federal law. A simple example of a federal regulatory agency and its oversight function over an industry would be the FAA's oversight of the commercial airline industry. This function covers many aspects, from ensuring that airline pilots have the proper training, medical certifications, and experience in the airplanes they pilot to determining that aircraft are being maintained properly and inspected regularly. Throughout this study, the FAA example is revisited, as this agency and its mission have a direct tie to aircraft accident investigation.

This study, however, seeks to discover if the capture theory can explain some of the outcomes of government aircraft crash investigations and subsequent safety recommendations that demand of industry or groups some change in behavior as a measure of compliance with the safety investigations' outcomes. To do this, this study requires a look outside the regulatory relationship, which has previously defined the scope of capture, and examine capture as it might apply to an independent agency and its relationship with industry.

Aircraft accident investigation in the U.S. is conducted by the NTSB. The agency is mandated to investigate all aircraft accidents, be they small airplanes or commercial jets; determine the most probable cause of those accidents; and then make recommendations based on the investigation's findings so as to improve safety and prevent future accidents. The NTSB is not a regulatory agency. It has no regulatory power to force compliance to any standard. The recommendations it issues can be totally ignored by the industry or government agency it targets. Its ability to make positive safety improvements in aviation and other transportation modes comes from the combination of popular support from the president and Congress and its reputation among the media and the public to find the answers to transportation problems.

The NTSB is one of the smallest agencies in the federal government. It employs approximately 400 people. Less than a fourth of its employees are dedicated to aircraft accident investigation, and those investigators are distributed so as to be able to respond to the nearly 3,000 aircraft accidents that occur annually in the U.S.. So when the NTSB responds to an aircraft accident, it draws on representatives from the aviation industry to provide needed expertise and advice on their products and operations. The NTSB does this through the "party system," in which the agency requests the aircraft manufacturer and the company whose aircraft is involved to provide representatives possessing expertise of the product and operation and to participate as part of the investigative team.

The capture concept would readily show itself in the investigative process if party members with a vested interest in the final outcome of the investigation exercise their influence in such ways that the final outcome either favors their interests or, at a minimum, steers possible blame away from their product or company. A party member's or his or her company's attempt to influence one investigation does not necessarily constitute capture. The threat of capture arises from interested parties continuing to exert successful influence in subsequent investigations to the point where the agency becomes reliant on the parties in conducting its investigations and developing safety recommendations.

Research Questions

The purpose of this study is to examine the capture theory as it has been previously researched with respect to state and federal regulatory agencies and the industries that they oversee. Through the use of interviews, this study seeks to determine if some or all characteristics of capture do occur within an independent agency with no regulatory authority but whose functions influence industry behavior. The study focuses specifically on the investigative functions of the NTSB in aircraft accident investigation with respect to the relationship the NTSB staff has with other agencies and with representatives from private industry under the party process. In short, the purpose of the study is to seek information to test the following overarching research question: Do elements of influence defined by the capture theory of regulation manifest themselves in aircraft accident investigations conducted by the NTSB and FAA when functioning as an investigative agent of the NTSB? In seeking evidence to support this question, several other questions need to be answered. Therefore, the research seeks answers to the following:

1. If capture occurs, does it occur in degrees or in total?

2. At what times during an investigation is capture most likely to occur?

3. What events during an investigation perpetuate capture?

4. If capture is not occurring, are there other theories of regulation that can explain influence effects during aircraft accident investigations?

5. Do countervailing interests of interested parties play a role in accident investigation, and if so, to what degree?

6. Do the actions of agents exercising influence on their principals explain the dynamics occurring in the investigative process?

7. Is the FAA, when exercising its investigative responsibilities, more susceptible to influence or capture than the NTSB?

8. Can NTSB investigators or FAA inspectors identify when capture or other influences are occurring as they investigate?

9. Do elements described in agency professionalism and administrative behavior theories provide an explanation for why capture would not occur in accident investigation?

Aircraft Accident Investigation in the 1990s: Background for the Study

The aviation industry in the U.S. is one of the strongest and safest industries in the world. General aviation, defined as all aviation other than commercial and military, averaged over 27 million flying hours and carried some 166 million passengers in 2002 (General Aviation Manufacturers Association [GAMA], 2003). Commercial aviation averaged approximately half the number of flying hours of general aviation but carried four times the number of passengers--685 million in 2002 (Flight Safety Foundation, 2003). With respect to accident rates, the chance of being involved in a general aviation mishap in the U.S. is approximately 1 in 15,000 flying hours. The chance of being injured in a mishap involving a commercial airliner is much lower--approximately 1 in 513,000 flying hours (FAA, 2004). There are many reasons for this. American aviation traditionally has been at the forefront of cutting-edge flight technology, especially with safety systems. Commercial aviation has shown great flexibility in its ability to reinvent itself to stay competitive in changing economic situations. Business aviation has come on strong in the past two decades, providing the development of safe, high-performance aircraft with the ability to reach around the globe, thus giving American companies the ability to compete strongly in international markets. The federal government has also established high standards for training and licensing pilots, certifying aircraft, and establishing and maintaining airports, flight routes, and navigation and weather facilities. Bearing a significant share in the success of safe domestic and international air travel is the NTSB. Since its establishment in 1967, the NTSB has been the aviation industry's safety guardian and watchdog.

The NTSB is charged with determining probable cause of transportation accidents and promoting transportation safety. The NTSB investigates accidents involving trains, ships, automobiles, pipelines, and aircraft. The NTSB conducts safety studies, evaluates the effectiveness of other government agencies' programs for preventing transportation accidents, coordinates all federal assistance to the families of victims of catastrophic transportation accidents, and reviews appeals of adverse certificate and civil penalty actions by the administrators of agencies of the Department of Transportation (DOT) involving airman and seaman licenses.

Most importantly, the NTSB makes safety recommendations, based on its investigations and studies to federal, state, and local government agencies and to the transportation industry, regarding actions that should be taken to prevent accidents. Safety recommendations are the focal point of the NTSB's efforts to improve safety in the transportation system. This responsibility is paramount to ensuring that unsafe conditions are identified and corrective actions are taken as soon as possible.

The NTSB has no authority to regulate the transportation industry. It must rely upon the persuasive power of its investigations to achieve acceptance of its recommendations. Therefore, its effectiveness depends on its reputation for timely and accurate determination of accident causation and for issuing realistic and feasible safety recommendations to satisfy the need for prompt implementation of safety improvements (NTSB, 1998a).

Aviation accidents, that is, incidents or crashes involving airplanes, helicopters, airships, and balloons, account for the majority of investigations the NTSB performs. Since the agency's beginning, the NTSB has investigated over 75,000 accidents involving aircraft. The NTSB investigates 125 times more accidents involving aircraft than accidents involving the four other transportation modes for which it has responsibility (see Figure 1). Aviation accidents, particularly those that involve commercial aircraft, capture the public's attention. It is for these reasons that the NTSB is most identified for its role of investigating aircraft accidents.

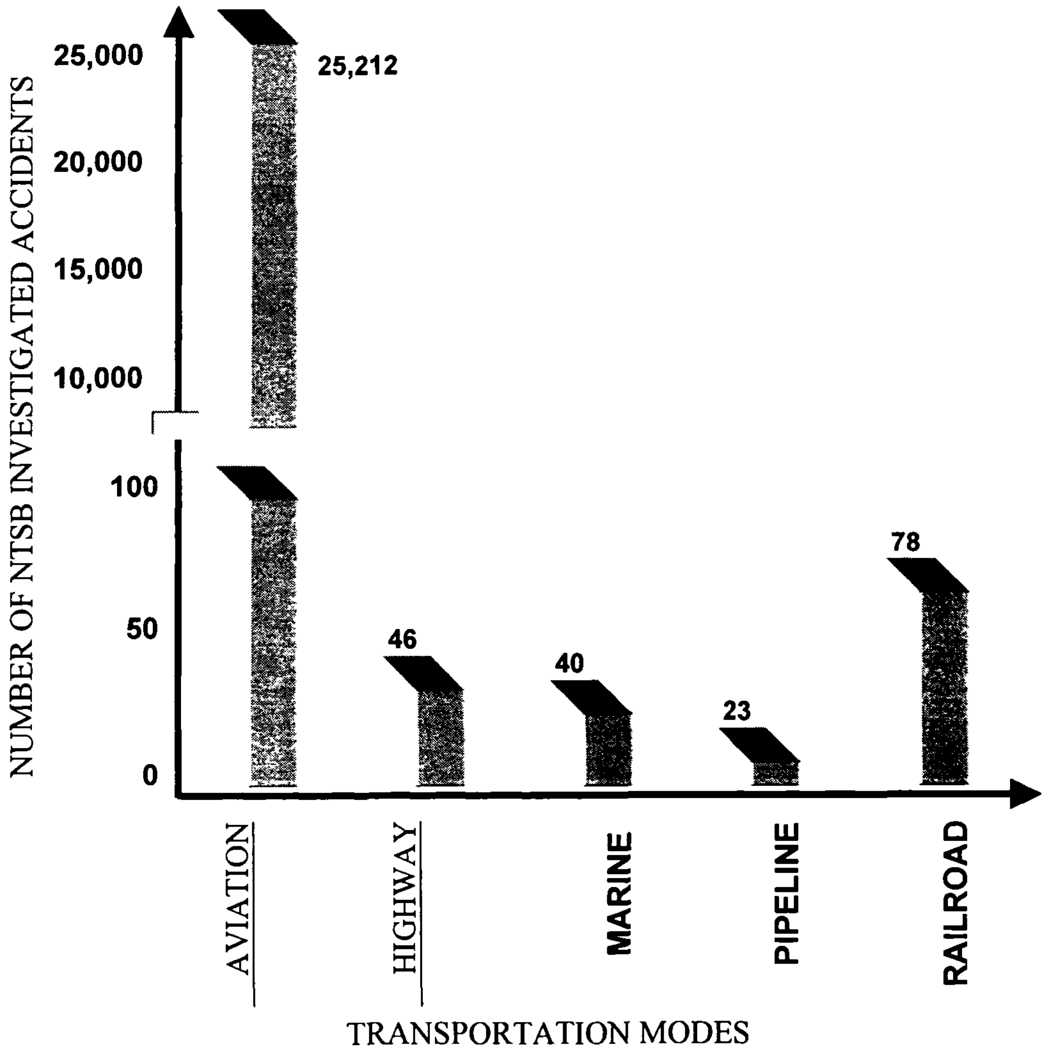

Figure 1. NTSB accidents investigated by transportation mode, 1990 to 2000. Source: NTSB, n.d.

Additionally, because of the agency's mandate under Annex 13 of the Convention on International Civil Aviation (the Chicago Convention) of 1948 and related international memorandums of agreement, the NTSB participates in the investigation of general and commercial aviation accidents throughout the world. The NTSB is recognized worldwide as a leading authority in aviation accident investigation (Congressional Record, 2001). The agency's investigators are often requested to lead investigative teams in countries that have no expertise in air accident investigation. NTSB investigators have been asked by the military services to assist in complex investigations of air accidents involving their aircraft. For example, in April 1996, the U. S. Air Force requested an NTSB team to assist them with the investigation of a CT-43 aircraft that crashed near Dubrovnik, Croatia, claiming the lives of then-Secretary of Commerce, the Honorable Ron Brown, and 32 others. The NTSB has lent its investigative expertise to the National Aeronautics and Space Administration (NASA) on several accidents involving unmanned commercial space launch vehicles. NTSB investigators were involved with the space shuttle Challenger accident and, more recently, with the breakup of the space shuttle Columbia on its return to earth in January 2003. Foreign governments, foreign and domestic commercial airline companies, and aerospace manufacturers have sought out NTSB assistance with aircraft accidents within their respective countries or of their aviation products. Many of these governments and companies have copied the NTSB investigation model for their own accident investigation bureaus and offices (NTSB, 1998a).

The NTSB's reputation for being the best at what it does rests with the ability of its investigators to solve aviation cases timely and effectively and resolve the critical safety issues. From 1967 through 1990, the agency did just that with every aircraft accident case it investigated. In those cases, NTSB investigative teams, made up of NTSB investigators, FAA inspectors, and interested party members, were successful in identifying the issues in each case and devising proper remedies to resolve them. Then, beginning in 1991, the agency ran up against several complex cases that were not readily solved. These cases stretched the agency's resources and technical abilities. NTSB investigators found themselves involved in cases that involved perplexing technical and aerodynamic issues that stretched out over several years, and involved hundreds of people from outside the agency. As these case situations lingered with no ready end in sight, senior leadership at the NTSB started to question the agency's abilities to solve future complex cases.

The first of these cases occurred on March 3, 1991, when a United Airlines Boeing 737 passenger jet, carrying 25 people, crashed into a park in the community of Widefield, Colorado, when on approach to the Colorado Springs Municipal Airport. The investigation showed that everything was normal until moments before the accident, when suddenly the airplane rolled upside-down and dove into the ground. The focus of the investigation was the airplane's rudder, the flight control on the vertical tail that provides stability to an airplane at low airspeeds. Testing of the system required detailed work with the Boeing Aircraft Company, whose technicians were convinced that turbulence was the most likely reason for the airplane's loss of control. After two years of exhaustive work, investigators were unable to come up with a reason as to why the airplane suddenly lost control and crashed. The NTSB ruled the accident's cause as undetermined.[1] This was the first time in agency history that an investigation of a major commercial airline accident was left unsolved.

Three and a half years later, the NTSB was faced with a similar complex accident. On September 8, 1994, US Air Flight 427, a Boeing 737 on approach into Pittsburgh International Airport, lost control and crashed into a ravine near Aliquippa, Pennsylvania, claiming 132 passengers and crew. The accident investigation again focused its attention on the airplane's rudder, and again, the information gathered did not lead investigators immediately to a failure in the rudder system. NTSB investigators feared they might be facing a second undetermined case. The events behind the Flight 427 accident were quite similar to the Colorado Springs accident of 1991, so much so, that the Safety Board decided to reopen the Colorado Springs case and reconsider the evidence in parallel with the Flight 427 investigation.

Voice and data recorders from both airplanes were analyzed and compared. Systems, structures, and metallurgical analyses were done. Several flight tests were conducted in an attempt to reconstruct the conditions that might have led to the

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[1] The original final report of the United Flight 585 accident ruled the cause of the crash as undetermined, on conclusion of the investigation when the lack of physical evidence could not substantiate a probable cause. When the investigation of the US Air 427 crash showed similarities to the Flight 585 accident, the docket on the United crash was reopened and amended at the conclusion of the US Air crash investigation. NTSB Major Accident Report, AAR-92-06, United Flight 585, Uncontrolled Collision with Terrain for Undetermined Reasons, 4 miles South of Colorado Springs, Colorado. (Washington, DC: U.S. Government Printing Office, 1992), p. 77.

accidents. The tests involved thousands of people from laboratories and companies outside the agency. Numerous theories were derived from the data and tested. Some of the data was useful, but most of it was inconclusive.

A problem that reoccurred in the Flight 427 case was resolving conflicting findings between NTSB laboratory tests and those tests conducted by industry party members. Repeatedly, industry party members disagreed and took issue with NTSB test results and laboratory findings.

Also during this time, two other incidents occurred involving uncommanded rudder movements on Boeing 737 airplanes. In both incidents, the pilots were able to regain control of their airplanes. The crews' testimonies and the data recorders from those airplanes provided useful information but did not lead investigators much closer to finding the causes of the two previous fatal accidents.

The Flight 427 accident case lasted four and a half years. At that time, it was the longest case ever conducted by the NTSB. Hundreds of thousands of man hours and millions of dollars were spent before the NTSB issued its ruling. The NTSB finally determined that the cause of the crash was due to an uncommanded movement of the rudder through its mechanical limit, causing it to jam. The NTSB's report also stated that the rudder most likely moved in a direction opposite to that commanded by the pilots as a result of the jam (NTSB, 1999).

Although the NTSB put forth several recommendations, including one to redesign the existing Boeing 737 rudder power control units, the reaction to the NTSB's ruling drew strong criticism from industry, the media, and the public. Some of the harshest criticism aimed at the NTSB's findings came from party members involved directly with the case.

In 1996, the NTSB faced a new challenge that exacerbated the rising problems with the parties and the increasing complexities of investigating aircraft systems: that of multiple major crashes. In May, NTSB investigators found themselves in the Florida Everglades, investigating the crash of Valuejet Flight 592, a McDonnell Douglas DC-9 passenger jet that caught fire and subsequently lost control and crashed, taking the lives of 110 people. A few months later, NTSB investigators were on Long Island, New York, beginning the investigation of Trans World Airlines (TWA) Flight 800. A few months after that, another NTSB investigative team was on the scene of a Federal Express MD-11 cargo jet that crashed during takeoff at LaGuardia Airport in New York. Then, a few weeks after the MD-11 accident, a Fine Air DC-8 cargo jet crashed into an industrial complex short of Miami International Airport, Florida. In November, a United Express Beech 1900 commuter airplane collided with a private airplane at the junction of intersecting runways at Quincy, Illinois, killing 19 people (NTSB, 1997c). And as 1997 began, the NTSB found itself at the scene of a Comair Embrear commuter airplane that crashed 30 miles south of Detroit, Michigan, taking the lives of 29 people (NTSB, 1998c).

The TWA Flight 800 case proved to be another in the increasing line of complex cases that involved party member dispute and controversy in the Safety Board's findings. On the evening of July 17, 1996, Flight 800 departed New York's John F. Kennedy Airport for Paris, France. On board the 25-year old Boeing 747 jumbo jet were 230 people: 3 pilots, 15 cabin attendants, and 212 passengers. The flight plan was to take the aircraft along the eastern shore of the Long Island coast, to Nova Scotia, across the North Atlantic Ocean, and then into France (NTSB, 2000C).

Air Traffic Control communications with Flight 800 were routine. The last transmission from the flight crew was recorded at 19 seconds past 8:30 p.m. when the crew acknowledged a clearance to climb to 15,000 feet. One minute later, Flight 800 disappeared from radar (NTSB, 2000c).

The NTSB was notified immediately. As investigators gathered in Washington, several investigators from the NTSB's Northeast Region Office in New Jersey were dispatched to East Moriches, New York, to establish a staging area for the investigation. On their arrival, they found over 500 state, federal, and local agents, officers, and workers at the scene. The major NTSB team arrived on the scene the following morning. When the team arrived at East Moriches, the Coast Guard, police, and local mariners were bringing wreckage and victims off the ocean. It was like nothing NTSB investigators had ever encountered.

Problems with the investigation started immediately. Within hours of the accident, the President, briefed that the witnessed explosion and crash could be the result of terrorism, had the FBI dispatched to the scene (Negroni, 2000). This decision caused confusion as to which agency had "first look" jurisdiction. The President's decision conflicted with the existing federal statutes that the NTSB is to direct and conduct the accident investigation until evidence is discovered that a crash is the result of a criminal act, at which point the FBI is called in (NTSB, 1977). To keep the investigation moving forward, the NTSB and FBI agreed to a protocol by which they would conduct a joint investigation. The situation led to serious difficulties and slowed the investigative process. In the 13 months following the accident, the FBI had over 200 agents at Calverton, New York, the site of the airplane's examination and reconstruction. Supplemented with agents from the Department of Alcohol, Tobacco, and Firearms (ATF), criminal investigators tagged and examined every fragment of airplane, looking for evidence of an explosive device. This process of "dusting for bomb residue" took place before NTSB investigators were allowed to examine the parts.

In the time the FBI was present, they found possible bomb material on three pieces of the wreckage. These pieces showed no evidence of pitting, cratering, hot gas washing or petaling, which would have been present had these trace amounts resulted from a bomb detonation. Further, it was determined that these trace amounts could have been transferred to these pieces in explainable ways, as when the airplane was used to ferry troops during Operation Desert Shield/Desert Storm or during dog-training to detect explosives conducted a month before the accident. The NTSB and the FBI eventually concluded that the physical evidence found was not the result of the detonation of a bomb. The FBI withdrew from the investigation, leaving the NTSB to determine what caused TWA Flight 800 to explode (Negroni, 2000).

Over the next four years, nearly all of the NTSB's 400 employees would be involved in the investigation. It was an investigation of unprecedented cost, length, and complexity, stretching the NTSB's resources to their absolute limits (Loeb, 2000).

At its conclusion, NTSB investigators determined that as the airplane climbed through 13,500 feet, an explosion occurred in the area of the airplane's center wing fuel tank. The energy expended from the explosion of the tank, located behind the forward cargo compartment and in front of the airplane's wings, fractured the keel beam, causing the nose to separate from the rest of the airplane. The nose of the airplane immediately fell into the ocean, taking with it the four flight deck crew members and the cabin crew and passengers who were on upper passenger deck and in the area of the first 22 rows of the main cabin. Radar information taken from eight different antennae locations along the eastern seaboard showed that the remainder of the airplane began a steep climb, reaching an altitude of approximately 17,000 feet before starting a dive toward the ocean. During its final plunge back to earth, the remaining airplane exploded and broke apart. The wings, engines, and remaining fuselage rained down in pieces over an eight square mile area of the Atlantic Ocean. The majority of the airplane came to rest on the ocean floor, 120 feet below the surface (NTSB, 1997d).

As with the Boeing 737 accidents at Colorado Springs and Pittsburgh, the Flight 800 investigation was mired in controversy. Manufacturers refused to believe that any component in the airplane's center wing fuel tank could have caused the explosion. Honeywell Incorporated, the manufacturer of the fuel pumps used in the tank, claimed that it had never had an airplane lost due to a failure of its product. When the U. S. Air Force produced evidence during the public hearing that several military KC-135 and B-52 airplanes had been lost due to fuel tank explosions caused by electrical faults in the very same pump used in the Boeing 747, the conflict among the party members became heated and divisive. The recommendations issued by the NTSB that all electrical wiring in commercial jet airplanes with over 15 years of service should be replaced was criticized by the FAA and airline companies, although NTSB investigators had proved that deteriorating wiring was occurring in the many aging commercial airline fleets and posed a hazard for arcing. Several years later, the recommendations calling for new wiring were adopted. But the fact that NTSB investigators could not determine the exact ignition source that caused the explosion to occur on TWA Flight 800 only added to the mounting problems the agency was facing.[2]

As the NTSB began its 30th year, it found itself involved in seven high-profile, major accident investigations. As the TWA Flight 800 investigation was beginning, NTSB investigators were engaged in the Valuejet Flight 592 crash and in the ongoing research of the Boeing 737 rudder system, the suspect behind the crash of United Airlines crash at Colorado Springs and US Air Flight 427 crash at Pittsburgh. Several of these investigations involved complex systems issues whose solutions eluded investigators. All of the cases involved numerous interested parties with vested interests in the outcomes of those cases. Many of the companies involved as parties were employing private consultants and engineering firms to conduct their own investigations so as to create alternative theories to what NTSB investigators were

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[2] The ignition source was traced to the aft side of a baffle wall in the rear portion of the Boeing 747's center wing fuel tank where a fuel scavenge pump was located. The scavenge pump was separated from the wall during the explosion and was never recovered (NTSB, 2000c).

finding. Many of these alternative theories found their way into NTSB investigative discussions. Although NTSB investigators were quick to discount most of these alternatives, some of these theories did find their way to the public through the media, casting doubt and swaying opinion against NTSB findings and recommendations. The nation's focus was riveted on what the federal government was going to do about an airline industry whose safety was being called into question and whose safety agencies were failing to provide answers.

Action by the President's administration and the Congress was swift. Within weeks of the Flight 800 accident, commissions and task forces were established to examine aviation safety and airline security (White House Commission on Aviation Safety and Security, 1997). As Congress was considering provisions of the Federal Aviation Reauthorization Act in anticipation of the upcoming fiscal year, it established a Civil Aviation Review Commission to examine financing and restructuring the FAA, to devise improvements to the nation's air traffic control system, and to determine ways of reducing the aircraft accident rate (U.S. DOT, 1997). Additionally, Congress examined the plight of the families of the victims who perished in aviation accidents and passed legislation to resolve those issues involving domestic air carriers (Congressional Record, 1996). Following the loss of a Korean Air Lines Boeing 747 on the island of Guam in August 1997, the provisions of the Airline Disaster Family Assistance Act of 1996 were incorporated into new legislation designed to provide assistance to family members of victims on foreign air lines that crash on American soil (Congressional Record, 1997).

The president and Congress, heeding the warnings of groups promoting the public's concern, took a hard look at aviation safety, airline security, and the issues facing family members of victims of airline accidents. The efforts put forth placed needed emphasis on safety deficiencies and created programs that were long sought after and badly needed. The much-needed focus on some of these problems took root, as with the family assistance laws. In other areas, however, the attention was short-lived, as with aviation security. However, the attention placed on improving aviation safety caused the NTSB to re-evaluate how effective it was in accident prevention. It was a critical crossroads that found the agency questioning whether it could continue to be effective in the face of the rapidly evolving and increasingly complex aviation industry.

The Rand Report

In fall 1998, NTSB Chairman Jim Hall asked the RAND Corporation, a Santa Monica, California-based nonprofit think tank, to analyze the agency in two areas. The first area involved the agency's interaction with external parties during an investigation to determine the extent to which these external parties influence the investigative process. The second area had to do with the NTSB staff's internal ability to train itself to meet existing and emerging challenges. RAND selected its own researchers from several different programs, including the Institute for Civil Justice, the Science and Technology Policy Institute, and Project AIR FORCE. The Institute for Civil Justice was responsible for examining the NTSB's mandate under federal law. It also examined the effect that increasing litigation in the wake of aircraft accidents was having on the NTSB investigative process. The Science and Technology Policy Institute looked at the NTSB investigative process and examined the interaction between NTSB, other government agencies, and other named parties during the course of an accident investigation. Project AIR FORCE examined training policies, management and leadership practices, and resources to include procurement, hiring criteria, budgets, and the effectiveness of the current NTSB organization structure. The project's staff included aeronautical engineers, public policy analysts, and attorneys to address the diverse set of issues presented by the NTSB. The analysis examined both external and internal factors influencing NTSB operations. External factors included the volume and types of accidents, advances in technology, and the legal environment. Internal factors examined included policies and procedures the NTSB follows to staff and train its workforce and to conduct its investigations (Institute for Civil Justice, 1999). RAND created a five-phase research plan to identify critical issues and highlight the challenges facing the NTSB. The analysis created a general historical perspective of the agency and identified current procedures and capabilities. The central purpose of the study was to identify and present solutions that would be responsive to projected demands and to present flexible and resilient alternatives to present NTSB policies and techniques. With this in mind, RAND researchers focused attention on the environment in which the agency would operate in the future. The five phases of the research plan consisted of (1) a baseline development that examined information about the NTSB's operating budget, staff size, accident volume, and duration of investigations; (2) an assessment of what changes are likely to occur in the aviation environment and how these changes could shape NTSB operations; (3) an examination of the current civil legal system as it affects the settlement and litigation of aviation accident cases and the behavior of stakeholders in the party process; (4) an analysis of current staffing, workload, and investigator training; and (5) a critical assessment of NTSB internal management and operating processes (Institute for Civil Justice, 1999).

Researchers used internal records, budgets, and accident reports to characterize NTSB operations. Researchers augmented the records data with questionnaires distributed to all professional staff. Researchers conducted structured interviews of senior NTSB management, the technical staff, and a sample of stakeholders in the aviation community. Researchers examined materials related to NTSB investigative procedures such as federal regulations, published and unpublished judicial opinions, and legal articles. They conducted site visits of the reconstruction of TWA Flight 800, aircraft manufacturing plants, flight simulator facilities, and aviation safety schools. The researchers also conducted three workshops held with stakeholders from government, industry, and the families of accident victims to discuss many disparate viewpoints. RAND researchers also relied on extensive telephone interviews, an exhaustive literature review, and extensive use of Internet-based quantitative and qualitative data to augment their data. RAND claimed that the numerous data sources provided a rich set of information with which to perform its case studies so as to address the project's objectives (Institute for Civil Justice, 1999).

RAND determined that the two areas examined--the agency's interaction with external parties during an investigation and the NTSB staff's internal ability to train personnel to meet existing and emerging challenges--were related. Ultimately, the RAND Corporation's analysis focused closely on the internal operations of the NTSB and examined its relationship with outside stakeholders in the aviation community. After nearly a year of gathering data, examining policies and practices, interviews, and quantifying its findings, RAND researchers presented their findings and recommendations to Board Chairman Hall. RAND concluded that the agency's founding concepts of its investigative mission--pursuing safety objectives and purpose to issue recommendations for improvements--were sound, but the agency urgently needed more resources and internal improvements.

RAND argued that the "party process," the statute that provides for persons, other government agencies, companies, and associations who can provide technical and operational expertise to an accident investigation team, should continue to exist as an important source of vital information for the NTSB. However, researchers noted that when the economic stakes become unusually high, the potential for the process to falter also becomes high. RAND stated that in these cases, especially when a modern airliner crashes and the evidence points to design flaws that have fleetwide effects and portend large economic losses, the NTSB should be prepared to augment the party process through other less biased resources for technical support.

RAND determined that the NTSB's technical leadership had historically balanced the party process. However, when the party process places the integrity of the investigative process at risk, the NTSB base of expertise and strength of its professional staff must serve as a counterbalance. The steady erosion of the staff and loss of technical expertise due to attrition must then be the greatest concern the agency faces. RAND stated that workload was the key factor here. RAND argued that the NTSB staff was working too hard and the training necessary to retain proficiency and to exercise leadership had been neglected. Researchers noted that it was unlikely that the workload would abate any time soon (Institute for Civil Justice, 1999).

RAND called for additional staff, increased and better training, and upgraded laboratory facilities. Researchers noted that in cases in which the NTSB did not have adequate resources to meet the challenges of a complex investigation, its staff often relied on the resources and laboratories of the manufacturer party members. "This reliance increases the risk of conflict of interest, threatening the Safety Board's independence, especially on the high-profile accident cases where leadership is most important" (Institute for Civil Justice, 1999, p. 45). RAND also noted that additional resources alone would not ensure a "return to responsiveness and excellence at the NTSB" (p. 45).

RAND summarized its conclusions by stating that the NTSB must revise its practices substantially, more closely manage its resources, and break the cultural insularity that is widening the gap between itself and the broader aviation community. NTSB leadership must make the needed improvements as it continues to ensure the independence of its investigations and the leadership of its professional staff, and as it meets the challenges that lie ahead, the agency as a whole must acquire sufficient resources to support needed modernization (Institute for Civil Justice, 1999).

The RAND report cited eight recommendations that were designed to assist the NTSB in meeting its future requirements for accident investigation. The recommendations supported three general themes that the researchers determined were essential in preserving and enhancing the NTSB's mission and reputation. First, the NTSB must strive to be a model of technical and managerial leadership. Next, it must remain an open and impartial agent pursuing the cause of aviation safety. And finally, the NTSB must exemplify efficient operations.

The most radical of the recommendations put forth by RAND researchers was for the NTSB to strengthen the "party process" by seeking out other federal laboratories, universities, and independent corporate resources to supplement the traditional "parties"--the manufacturers and agencies with "vested economic interests." This would require the agency to identify tools, facilities, and experts outside the current party system that could be brought into an investigation as needed. Formal guidelines would also be established to govern how these new independent party members should behave during the course of an investigation. The new procedures would require revisions to the current party pledge governed by present federal regulations. Other recommendations included (a) creating a more expansive statement of causation, (b) modernizing NTSB investigative procedures, (c) streamlining internal operating procedures, (d) developing tools and practices to better manage NTSB resources, (e) assessing long-range staffing requirements that account for fluctuations in the labor market and meeting the evolving needs in future investigations, (f) streamlining its training practices, and (g) improving its facilities for engineering and training (Institute for Civil Justice, 1999).

The NTSB After the Rand Report

In the years following the release of the RAND Report, the NTSB made many of the improvements based on the substance of the recommendations put forth. All the agency's financial functions were streamlined within a centralized financial management system. Rapid draft checks for procuring equipment and services at accident scenes were done away with in lieu of government travel and purchase cards, thus providing better control over expenses. The travel voucher system was also revised, providing for quicker payment to investigators on their return from the field. RAND researchers evaluated management and chains of command for their efficiency. Several offices and divisions were combined to streamline channels of communication and promote greater effectiveness. A NTSB communications center was established at the headquarters in Washington to allow staff to communicate directly with investigators in the field and to coordinate with other support agencies and decision makers. New equipment was purchased to improve the capabilities of investigators deployed in the field. NTSB management bought state-of-the-art laptop computers, pagers, cellular telephones, global positioning satellite receivers, and digital cameras with the goal of easing the burden on the staff. NTSB procedures from on-site safety practices to report-writing were examined and revised. An attempt to streamline training practices came in the form of a NTSB training academy. The proposed training academy would be initially responsible for training new NTSB investigators. Later, advanced aircraft investigation subjects such as fire and explosion analysis and composite materials failure would be offered to current investigators so they could keep the edge on their skills.

In spite of the improvements made, however, in the post-RAND study era, one issue still remains for NTSB: that of the party process and the concern over its reliance on the manufacturer or operator representatives to assist with many of the technical issues in a crash investigation. Little action has been taken with respect to the RAND report's ideas that independent resources outside of the traditional parties should be brought in to augment an accident investigation. This is because presently such resources are not available or as reliable as those provided under the present party process. The party process continues to be an issue of concern for the NTSB. It leaves NTSB investigators with the difficult task of weighing the value of the technical expertise provided during an investigation against what a party member might attempt if that member perceives his or her company's product or practice contributed to the accident.

But a more daunting problem that the NTSB faces is whether the party process can serve as a vehicle for investigation capture when treating an aircraft accident investigation as an independent entity. And going one step further, can several captured investigations open the door for possible agency capture with respect to one or more aviation manufacturers or companies? How NTSB investigators and staff face the potential for capture sets the stage for the problem this study seeks to examine.

The Party Process

The integrity of the NTSB aviation accident investigation rests with the ability of its investigators to remain professional and independent at all times and in all situations. This requires that a lead investigator, the investigator-in-charge (IIC), and his or her assistant group chairmen adhere strictly to the laws governing how aircraft accident investigations are to be conducted. It also requires that those persons entrusted with an aviation accident investigation be disciplined, be of high moral character, and show willingness to adhere to an ethical standard that puts the integrity of the investigation above self. Professionalism, though it comes from within the individual, can be enhanced through training. This function rests with management, as are also the responsibilities of oversight, monitoring, equipping, and motivating the investigator. The staff is indeed the NTSB's greatest resource. Workload, staffing, and training are key determinants in the professionalism equation.

The integrity of an NTSB aviation accident investigation is also dependent upon the accuracy of information provided by organizations, corporations, and persons designated by the IIC to assist as "parties" in the investigative process. The party process has been a key part of aircraft accident investigation since its creation as part of the early Civil Aviation Authority. Through the party process, the NTSB gains technical expertise about the aircraft and its systems; insights into the operator's training, maintenance, and corporate culture; and an understanding of how directives and regulations impact an operation, all equally important in identifying the factors that contribute to an aircraft accident.

The party process allows the NTSB to remain fast and flexible. If a large crash requires the expertise of several companies and agencies, the NTSB can expand the size of its investigative team to enlist the needed resources. If an investigation requires the expertise of only airframe and engine manufacturers, an investigative team can remain small, hence saving valuable resources for future investigations. To maintain a staff with the expertise to investigate the crash of jumbo jets, as in the case of TWA Flight 800, would require the agency to be five times its present size. If the agency were required to employ experts to conduct investigations of every model of aircraft or every engine currently manufactured, the agency would have to employ thousands of people. The party process makes the NTSB one of the most efficient agencies within the federal government. Nothing is wasted, and only those resources that are needed to complete the investigation are tasked.

The party process is outlined in Title 49 Part 831 of the Code of Federal Regulations. The regulation states that the NTSB IIC designates who is to participate in the investigation, but there are limits as to who can participate. Specifically only those persons, government agencies, companies, and associations whose employees, functions, activities, or products were involved in the accident and who can provide qualified technical persons to assist may be involved. No entity is afforded the right to participate, with the exception of the FAA in aviation cases (Code of Federal

Regulations [CFR], 1997). Party members must be responsive to the NTSB's direction. Failure to do so can result in the loss of party status and expulsion from an accident site. The regulation denies party status to those persons who represent claimants or insurers or occupy a legal position. Party status affords those participants outside the NTSB access to all information gathered during an investigation. The process is designed so that full disclosure is gained in a reciprocal relationship. Information discovered by the NTSB is readily provided to party members, and information gained by the party members is disclosed to NTSB investigators. Last, for a company, agency, union, etc., to be represented and to provide members to the investigative team, they must sign a Statement of Party Representatives to NTSB Investigations form provided them by the NTSB investigator-in-charge (see Figure 2). A party member's signature on this form is a statement on the part of his/her company or agency that they will comply with the provisions and behave in accordance with the provisions described in the regulation (CFR, 1997).

The party process has been a concern for the NTSB. Although in theory it should, and in most cases does, provide the NTSB with an efficient, integrated team, there are times when the parties can become stumbling blocks to an investigation. Stakes in the outcome of present-day investigations are high. Because of its reputation, the public hangs on every word uttered by the NTSB. A statement of probable cause is regarded as practically absolute. The results of a NTSB accident investigation have often been the basis made for subsequent investigation supporting

STATEMENT OF PARTY REPRESENTATIVES TO NTSB INVESTIGATION

Aircraft Identification

Registration Number ____________
Make and Model ______________
Location ____________________
Date ______________________

The undersigned hereby acknowledge that they are participating in the above-referenced aircraft accident or incident investigation (including any component tests and teardowns or simulator testing) on behalf of the party indicated adjacent to their name, for the purpose of providing technical assistance to the National Transportation Safety Board.

The undersigned further acknowledge that they have read the attached copy of 49 C.F.R. Part 831 and have familiarized themselves with C.F.R § 831.11, which governs participation in NTSB investigations and agree to abide by the provisions of that regulation.

It is understood that a party representative to an investigation may not occupy a legal position or be a person who also represents claimants or insurers. The placement of a signature hereon constitutes a representation that participation in this investigation is not on behalf of either claimants or insurers and that, while any information obtained may ultimately be used in litigation, participation is not for the purposes of preparing for litigation.

By placing their signatures hereon, all participants agree that they will neither assert, nor permit to be asserted on their behalf, any privilege in litigation, with respect to information or documents obtained during the course of and as a result of participation in the NTSB investigation as described above. It is understood, however, that this form is not intended to prevent the undersigned from participating in litigation arising out of the accident to above or to require disclosure of the undersigned's communications with counsel.

SIGNATURE	NAME (Print)	PARTY	DATE

(Continued on reverse side)

Figure 2. Statement of party representatives to NTSB investigation form.

litigation. Aircraft and component manufacturers, airplane operator companies, even deceased pilots' estates are vested in the outcome of an aircraft accident investigation. Any effort to influence an investigation so as to shift blame away from the companies, operators, pilots, and so forth would certainly be a concern for an NTSB IIC and the agency as a whole. The public also shares this concern over possible impropriety or undue influence exercised by party members during the NTSB investigative process. This concern becomes amplified when an investigation is drawn out over several years.

Overall, the public's trust in the NTSB investigative process and the outcomes has remained high. However, considering the series of drawn out, complex cases that the NTSB has encountered recently and that future accident investigations hold the prospect of being increasingly challenging, can the NTSB hold on to the public's trust? Should the public perceive that any impropriety is taking place within an investigation, that trust will erode quickly. Thus, NTSB investigators, staff, and board members face a dilemma. Can the agency determine how much it needs to rely on the parties to effect an investigation that leads to accurate outcomes? Can the agency's investigators recognize when assistance and expertise lent by outside resources is influence? And can the NTSB, being independent by law, discern those behaviors, events, and interactions that can lead to a capture situation? These issues and concerns are the basis for the previously stated research questions this study explores.

The Plan for This Study

This study is designed to examine the capture theory as it has been previously researched with respect to state and federal regulatory agencies and the industries that they oversee and then, using the qualitative method of interviews, to try to determine if the elements of capture are going on in aircraft accident investigations conducted by the NTSB and FAA. Over the course of the research, the study also addresses questions with respect to how, when, and why capture occurs; which events during an investigation help perpetuate capture (if capture occurs); whether NTSB investigators or FAA inspectors can identify when capture or other influences are occurring as they investigate; and, if capture is not occurring, whether there are other theories found in the study of regulation that can explain the relationship between federal investigators and interested party members.

To get to the heart of the research questions, we must first understand what capture is, when it occurs and how, and why we must be concerned with it. In this study, several authors provide descriptions of what capture is. Lowi (1969) describes capture with respect to conflict among organized groups, stating that inequities among groups drive an agency toward capture by one of the groups. Berry (1984), McCraw (1975), and Meier and Plumlee (1978) support the premise that regulatory agencies come to favor their regulated industries but ignore the public interest. Agencies are seen as tools for the advancement of private groups. Most capture theorists cite that an agency's loss of public and Congressional support leaves the agency vulnerable to industry and group influence. Eventually, the agency turns to industry for support and ultimately provides regulation favorable to industry in return for that industry's compliance.

Regulation theorists appear to group their perspectives on capture into three areas. Authors such as Berstein (1955) support the idea that capture of a regulatory agency occurs as part of the life cycle of that agency in its evolving and changing relationship to the public, Congress and the regulated industry. Huntington (1952), Benson (1955), Kolko (1963), Parrish (1970), and Culhane (1981) support a perspective that sees capture as the ultimate and purposeful goal of a group in its effort to control the actions of the regulatory agency. The third perspective supports that some regulatory agencies are established to be purposefully captured by its regulated industry. McConnell (1966), Redford (1969), and Behrman (1980) support that capture is a good thing--that it actually promotes efficiency in both the industry and the regulatory agency.

Those authors who criticize the capture theory cite factors that they believe prevent an agency from being captured. Welborn (1977) argues, with respect to commissions, that their chairpersons, by virtue of their position and access, wield considerable power in regulatory policymaking. Other critics support that public and/or consumer influence has a major role in agency and commission policies. Berry (1989), Sabatier and Mazmanian (1980), and Culhane (1981) provide support for the position that capture is curtailed by public participation, by commissions' decision makers' skills and resources available to them, and by organized constituencies that monitor the activities of regulatory agencies and intervene directly to influence commission decisions.

As the capture theory is but one of several theories that describe how agencies regulate groups, this research looks at four alternative regulation theories that could also possibly explain the relationship between the NTSB and other actors in aircraft accident investigations. The first of these alternatives, put forth by McFarland and Reich (1999), Dahl (1967), and others, examines countervailing power among interest groups and how that affects regulatory agency policies. Williamson (1975), Moe (1984), Salanie (1991), and others provide an economic perspective and focus on the dynamics between political principals and their agents. The third alternative, put forth by Selznick (1949), examines cooptation of outside groups into regulatory organizations and its affect on agency actions and policy. Mosher (1968), Katzman (1980), Culhane (1981), Simon (1997), and others examine the dynamics of agency professionalism and look at how professionalism strengthens or weakens a regulatory agency in its relations with industry.

This study looks at the NTSB and its mission of investigating aircraft accidents. Through a presentation on the growth and evolution of the commercial aviation industry and the history of accident investigation, the NTSB's relationship to the FAA and industry, and how it interacts with interested parties during an accident investigation are revealed.

Through qualitative interviews of past and present NTSB investigators, FAA inspectors, investigators from several aircraft and engine manufacturing companies, and family members with vested interests in the outcome of previous investigations, we gain a new perspective of the capture theory and the alternative theories on regulation. And we answer some of the research questions as to whether elements of the capture theory of regulation manifest themselves in aircraft accident investigations conducted by the NTSB and the FAA, when functioning as an investigative agent of the NTSB.

Final Introductory Remarks

The purpose of this study is to cast additional light on a continually and lively debated political science theory. But I also propose that this study has an important secondary purpose--that of educating investigators and managers in the NTSB and FAA about the possible threats to the investigative process. Therefore, in addition to seeking answers to the research questions I have posed, it is my intention that this study identify those elements within the NTSB and the FAA, particularly with respect to the investigative process and with respect to the staff, investigators, and inspectors who could lead to an investigator, a team, and/or an agency to become captured by an interested party. Last, this study attempts to define those safeguards that exist in the NTSB and FAA that can be drawn on to counter the influences of capture.

CHAPTER 2

CAPTURE AND REGULATION: A RETROSPECTIVE

Passengers, when they board a commercial airliner, generally do not fear that the airplane will not reach its intended destination. This is because they are confident in the technology, in the pilots who are at the controls, and in the air traffic system that helps the crew get them safely to their destination. They may not know specifically, but subconsciously, they know there are regulations that govern the airplane, the pilots, and the flight operation and that there are government agencies charged with holding the airplane's manufacturer, airline, pilots, mechanics, air traffic controllers, and countless others involved to the standards set in the regulations. The passengers are confident that this combination of regulations and regulatory agencies protects them. But, what if a particular airline cannot compete in the industry and seeks protection from its overseeing regulatory agency in the form of favorable regulation? And what if, in its desire to protect the overall industry, the regulatory agency agrees? Perhaps company mechanics are allowed to skip a few routine inspections so as to keep an airplane on the flying schedule a day or two longer. Perhaps pilots and flight attendants are occasionally allowed to extend their crew duty day beyond the normal 16 hours. These actions seem reasonable and harmless in light of the airline's willingness to comply with the overseeing regulatory agency's rules. But perhaps this proves not to be enough. Perhaps the airline faces more problems and seeks and receives more concessions. A cycle begins. The airline's influence begins to undermine the regulatory agency's control. Soon, the airline is not as regulated or vigorously monitored as the public is led to believe. This is the nature of capture.

To best understand the potential capture relationship in independent aircraft accident investigation, we must first see what capture is and from where it derives. As mentioned earlier, the capture theory comes out of the study of the relationship between industry or groups and the regulatory agency whose responsibility it is to oversee the industry's or the group's activities and how industry influences the regulatory agency to the point that the agency readily and regularly puts forth policy that is in line with the interests of industry. Therefore, to understand the capture theory, it is important to also understand what regulation is and why it is important.

This chapter begins by exploring what capture is. Several authors provide clear definitions of capture and give perspectives on how capture happens and why. In defining capture, we have to look at why regulatory agencies are formed, with what powers over industry they are charged, and how industries or groups apply influence such that an environment fosters where capture can occur.

We will look at the capture theory from three different perspectives. The first supports the idea that capture of a regulatory agency occurs as part of the life cycle of that agency in its evolving and changing relationship to the public, Congress, and the regulated industry. The second perspective examines capture as the ultimate and purposeful goal of industry in its effort to control the actions of the regulatory agency.

The third perspective examines capture from the perspective that some regulatory agencies are established to be captured by its regulated industry and that capture actually promotes efficiency in both the industry and the regulatory agency.

Much of the literature on the capture theory is found in case studies featuring the relationship between industries and their regulatory agencies. Hence, during the discussion of the capture perspectives, we look at several case studies that provide historical accounts showing why certain regulatory agencies were established, what their authority and relationship to industry were, and how the relationship with the industries they were charged to oversee evolved into one where the regulatory agency was deemed captured by industry.

Many of these case studies feature elements that affect the influence relationship between government and industry. Hence, literature is also discussed that examines interest group interaction, the role and impact of public participation, the actions of agency executive committees, expertise of knowledgeable individuals, and staff professionalism and its impact on industry's attempts to capture the regulatory agency.

Next, we examine research that tests the capture theory and look at what conclusions are drawn from the test results. The discussion then turns to those writers who have criticized the case study and research findings regarding the capture theory and to those who discount capture as a mainstream regulation theory.

Finally, the chapter turns to several writings that present four distinct alternative theories to capture that provide other explanations as to the influence relationship between regulatory agencies and their regulated industries. In this last section, we look at those studies that examine conflicting interests among groups, principal-agent relationships, cooptation, and agency professionalism.

What is Capture?

As mentioned, the capture theory comes out of the study of regulation, specifically focusing on the relationship between regulatory agencies or commissions and the industries those agencies and commissions regulate. The capture theory finds its roots in the study of influence--specifically, the degree of influence that regulated industries achieve over their regulatory agencies. Some perspectives on capture show that this influence does not happen immediately on establishment of a regulatory relationship but is a function of time, occurring over a period of years in which the relationship evolves between regulatory agencies and regulated interests. Over time, the agency loses public and Congressional support and wears down as industry enjoys a progressive strengthening. In the end, a regulatory agency is considered fully captured when it can no longer exert its authority over the regulated industry.

To define what the capture theory is, it is important to look at several descriptions provided by previous researchers on the subject. For instance, Berry (1984) argues that the capture theory of regulation was developed primarily through a set of case studies that found that regulated groups were able to control or "capture" the agencies that regulate them, thereby insuring that regulatory decisions are uniformly consistent with the interests of the regulated.

Some researchers describe capture as the result of group conflict. Lowi (1969) starts by saying that inequalities among organized groups drive agencies toward capture. In supporting this position, Lowi argues that group conflict requires politics to resolve the inequalities among the groups. The public, the beneficiary of industry regulation, though powerful, is not organized so as to be able to effectively participate in processes as agenda building, policy formulation, or conflict resolution. Lowi goes on to say that the public should not participate in these things except insofar as they vote in competitive elections. This position is counter to the pluralist argument, which holds that citizens participate in policy formulation indirectly through membership in interest groups or by identifying with groups supporting their goals. For the pluralists, political power is dispersed among institutions and interest groups. Lowi argues that an influential interest is countered by other competitive interests to level political conflict. In competition among powerful interest groups, those groups with money, clout, expertise, influence, and knowledge in best applying those traits win most of the time. Powerful interests always overwhelm the weak and make government agencies the instruments of influence.

Lowi (1969) states that group interest motivations are fueled in reaction to the three types of policies that government enacts, specifically distributive, redistributive, and regulatory policies. For example, distributive policies are those in which money, influence, or both are provided to one group. Granting benefits or favorable policies to powerful interests is an example of a distributive policy and fits well into this discussion. Redistributive policies take resources from one group and give them to another. Taxation and tax-supported social programs for the underprivileged is an example of a redistributive policy. Another example would be a tax cut program, in which the lowest wage earners receive the greater percentage in tax returns. Regulatory policies involve controlling the behavior of some group in order to protect the public interest. As we examine previous capture research, we see examples of all three policy types and examine how powerful groups or industry attempt to influence those regulatory agencies that formulate, enact, and regulate such policies, so that at the end, those policies collaborate with their interests.

McCraw (1975) states in his capture thesis that regulatory agencies are perceived as systematically favoring the regulated industries and ignoring a larger public interest. Public agencies are seen as tools for the advancement of private groups. Economists have adopted a similar view that regulation is often created by industry and operated primarily for its benefit (Steigler, 1971). This view argues that in order to survive, regulatory agencies supply "regulation" to meet industry demands for favorable policy. Industry's control of regulatory policy, therefore, can be viewed as a result of group competition; industry's superior resources and its concentrated attention allow it to overwhelm weaker consumer demands of government (Peltzman, 1976). Meier and Plumlee (1978) state that the problem of regulation concerns not only businessmen, politicians, and consumers but economists and political scientists as well. They argue that the growth of the consumer movement as a force in national politics has added a new impetus to demands that something must be done about regulation. The problem of private versus public power may be seen as one of designating the beneficiaries of regulation, that is, whom is regulation meant to benefit, and whom does it benefit? Although the question of who actually benefits varies from agency to agency, the dominant perspective holds that regulation has mostly benefited the regulated and not the consuming public.

Gormley's (1983) research on capture views regulatory agencies as the captives of the industries they are supposed to regulate. His model portrays administrative decisions as responses to external pressure, exerted primarily and sometimes exclusively by regulated industries. Gormley does not deny the importance of regulatory agency staff members but does regard them as conveyors of industry demands. His model also does not deny the existence of competing pressure groups but views them as uninterested or ineffectual.

McConnell (1996) shows that capture can happen with no effort on the part of the interested party. In his study of the U. S. Department of Agriculture (USDA), he describes how the agricultural industry convinced the federal government to create the Agriculture Department and, by doing so, establish an "iron triangle" relationship between the agricultural industry, the USDA, and the Congressional committees. The important thing to note here is that in McConnell's capture description, the USDA was designed to be captured from its inception. The Department of Agriculture was created to be an advocate for agriculture, and the relationship established was such that the agricultural industry directly benefited. Many capture theorists also hold that capture is a direct result of the independence of regulatory agencies and commissions. They argue from the perspective that because the chief executive (example, the president, governor, etc.) lacks authority over regulatory commissions, he or she quickly loses interest in them. Without his or her leadership, the legislative branch also loses interest, and public awareness wanes. In contrast, the attentiveness of regulated industries increases as they respond to the potential threat of vigorous regulation. Besieged by regulated industries and lacking political support, regulatory commissions must come to terms with regulated industries or be overwhelmed by the litigation they can spawn. Thus, as a regulatory commission continues over time, regulation yields to accommodation, and public interest goals are displaced by the preferences of private interests (Gormley, 1983).

Before leaving this section on regulation and describing what capture theory is, it is important to consider industry self-regulation. Self-regulation can be considered a subcategory of regulation in which a powerful interest convinces government to allow it to regulate a service that it provides in the name of public interest. Licensing associations such as the American Medical Association or the American Bar Association, which seek out government to license doctors, lawyers or other professionals in the name of protecting the consumer, are examples of self-regulation. Insurance companies seeking self-regulation from state regulators establish oversight commissions. To the public and state governments, this gives the perception that someone is keeping a watch over the independent agents and thereby protecting the interests of consumers (Meier, 1988).

To conclude, many researchers have looked at the relationship between government agencies and their regulated industries and described an influence relationship being exercised by industry on the regulatory agency. This relationship, carried to its extreme, is considered capture and the founding principle of the capture theory of regulation. Knowing what capture is, however, is one thing. Knowing how an agency gets to the point in its life where it is captured is presented in the next sections.

The Life Cycle Theory of Regulatory Agencies and Capture

The first perspective as to how regulatory capture happens is that where capture is part of the life cycle of a regulatory agency. Of the researchers who have examined regulation from this perspective, Bernstein's (1955) work is the most descriptive and thus is one of the most influential formulations of the capture theory of regulation presented. Bernstein contended that the creation of a regulatory agency is characterized by a struggle between a diffuse majority-favoring regulation, the public, and a powerful minority-resisting regulation, the regulated group. Once an agency is created, the public loses interest, content that the threat to the "public interest" has been averted. In contrast, the regulated group maintains its interest and watch on regulatory agencies because it has a greater stake in regulatory outcomes. As the agency settles into its oversight role, it sees its support from the public and Congress fade. To remain effective, the agency gradually adopts a managerial role from which it finds itself negotiating for what is best for the industry overall. Regulatory changes purposely have a lesser impact on the regulated industry's interests. Faced with the continuing pattern of group interests, the regulatory agency gradually adopts a posture from which it is serving and defending the regulated group.

Bernstein (1955) formulated a theory describing the stages that a regulatory commission experiences during its life, a life cycle similar to that which animals experience as they age. Bernstein said that the life cycle of an independent regulatory commission could be broken down into four periods: gestation, youth, maturity, and old age. Bernstein devotes a chapter of his book, "Regulating Business by Independent Commission," to describe the life cycle that a typical regulatory commission experiences. He uses the cases of several regulatory commissions as examples, beginning with the Interstate Commerce Commission (ICC). In gestation, the regulatory agency is created. This occurs at the peak of organized fever for reform. The ICC was formed at a time when farmers insisted on railroad reform because of the monopolistic rates the railroads demanded for transporting agricultural commodities. Another example Bernstein uses is the creation of the Securities and Exchange Commission (SEC). To combat the fraudulent practices of the stock exchange, investigated by the Senate between 1932 and 1934, the Securities Act of 1933 and the Securities Exchange Act of 1934 were introduced and passed. These acts established the SEC and charged that it watch over Wall Street.

In the youth phase, the commission is established. Bernstein (1955) states that the commission's real and potential capacities contrast sharply with those of the regulated groups. The commission lacks administrative experience, and its policies and objectives are vague. On the other hand, the regulated groups are well organized, with interests to protect from the regulators. It is during the youth phase that the commission begins to formulate its program and map out its major policies. Bernstein points out that having public support is important to a commission's life; however, he assumes the public's interest and support are the first things that decline. The loss of public interest usually occurs almost immediately after the commission is established because people believe the problem has been solved by the creation of the commission. Not far behind is a decline in executive and then legislative support, leaving the commission to act alone in the face of regulated industry.

In describing what occurs in the youth phase, Bernstein uses the Federal Communications Commission (FCC) as an example. Bernstein (1955) argues that the assignment of broadcast frequencies influenced the radio industry in 1927 to ask for regulation over its industry, and thus, the Federal Radio Commission (FRC) was established. But its authority was used sparingly. There was little public interest in broadcast regulation. The FRC's program and the industry went relatively unmonitored, and corruption grew. As part of a New Deal program, in 1934, the FRC was abolished and the FCC was established. However, the already widespread corruption in the radio industry eventually led Congress to investigate. This put the FCC on the defensive from the beginning. The lack of Congressional interest in radio broadcasting and the capacity of the industry to dominate the commission early on nearly eliminated the adolescent phase in the life cycle of the FCC.

In the mature phase, controversy tends to fade out of the regulatory setting, and the commission adjusts to conflict among the stakeholders. The commission relies more and more on set procedures and adapts itself to fight its political battles on its own. In maturity, regulation becomes more positive in its approach. Its functions are less those of a policeman and more those of a manager of an industry. The commission becomes more concerned with the general health of the industry and tries to prevent changes that adversely affect it. Bernstein (1955) states, "It is unlikely that the commission, in this period, will be able to extend regulation beyond the limits acceptable to the regulated groups" (pp. 86-87).

Bernstein (1955) mentions other characteristics that describe a commission in the mature phase. The most marked development in the mature commission is the growth of a passivity that borders on apathy. This tendency to be passive toward the public interest is a problem of ethics and morality as well as an administrative method. In the mature stage, Congress is reluctant to increase the commission's authority and finds it is difficult to overcome its traditional particularism and localism and devote constructive attention to national economic policies. The mature commission finds its approach heavily judicialized, devoting much of its time to adjudicating individual cases. The staff becomes gradually entrenched. Professional interests of the staff narrow to one point of view adopted with respect to regulatory matters. Dependency on precedent and maintaining the status quo become entrenched. The closure of the mature period is marked by the commission's surrender to the regulated. Politically isolated, lacking a firm basis of public support, lethargic in attitude and approach, bowed down by precedent and backlogs, unsupported in its demands for more staff and money, the commission finally becomes a captive of regulated groups.

Bernstein (1955) states that the old age phase is similar the mature phase but only more entrenched. As commissions continue to operate in a controversial and hostile environment, they tend to relate their goals and objectives to the demands of the dominant interest groups in the economy. Ignored or abandoned by an unorganized public, commissions tend to play for safety in policy decisions. Passivity deepens into debility.

During old age, the working agreement that a commission reaches with the regulated interests becomes so entrenched that the agency has no creative force left to mobilize against the regulated groups. The debilitation of the commission does not go unnoticed in the executive and legislative branches. Budgeters become increasingly reluctant to approve funds needed to permit the agency to dispose of growing backlogs. The budgetary decline takes its toll on commission personnel that remain. Employees become less able and imaginative in meeting their responsibilities. Their morale suffers from lack of public support. The commission finds itself becoming dependent upon the regulated industries to supply staff, reinforcing the staff's commitment to maintaining the status quo in the industry. The agency does not die but fades away (Bernstein, 1955).

With advancing age, commissions tend to become the servants rather than the governors of the industry that they regulate and attain a sort of dignified stability far from the objectives that they originally sought. Bernstein (1955) states that the old age phase continues until some scandal or emergency calls dramatic attention to the failure of regulation and the need to redefine regulatory objectives and public policies, at which time reform may be made and more zealous enforcers of the original law may be recruited into the agency.

Industry Motivated Capture: Case Studies

The second perspective on how regulatory capture happens examines capture as the ultimate and purposeful goal of industry in its effort to control the actions of the regulatory agency. In this section, we examine the purposeful capture of the ICC by the railroads, the SEC by the Stock Exchange, public utilities commissions by the utility companies, and the Grazing Service by public land users, primarily cattlemen.

As previously mentioned, the capture theory was formulated out of several historical case studies by which researchers examined the relationships between regulatory agencies and the industries they regulated. Hence, this section presents industry-motivated capture by examining the case studies from which this perspective on capture theory is formed.

The ICC and the Railroads

Some of the first studies that described a capture phenomenon were those that examined the ICC and railroad interests in the late part of the 19^{th} century. The studies of the ICC and the railroads cover a broad range of events and do not completely agree as to how capture came about. Huntington (1952) states that powerful railroad interests aggressively moved against the weaker ICC to gain control of it. Benson's (1955) study describes a movement for national railroad regulation that was a many-faceted phenomenon that embraced the interests of agriculture, mercantile, and eventually the railroads themselves. Benson goes on to state that it was New York merchants who constituted the single most influential group behind the passage of the Interstate Commerce Act.

Arguably the most influential and thoroughly documented study of the railroad industry's capture of the ICC was conducted by Kolko (1963). Kolko, a historian, wrote that the capture model is inherent in American politics because of the centrality of capitalist power. Railroad men themselves were the greatest advocates of federal regulation from 1877 to 1916. Kolko argues that from the beginning,

> the Interstate Commerce Commission entered into a condition of dependency on the railroads, and the railroads quickly began using the commission as a means of attaining their own ends. Regulation of the railroads was designed by the industry and subsequently carried out by the ICC. The railroads were thus able to use the ICC as a vehicle to reach its own ends, while those of the public and the commonwealth were ignored. (p. 233)

Kolko's (1963) analysis of the ICC and the railroad industry is a straightforward deductive argument, similar to the deductive models of economists and sociologists. Kolko's model argues not only that capture usually begins when an agency is created, but also that the American political economy makes the design and subsequent behavior of commissions inevitable and, therefore, predictable. His capture theory has immense appeal because it presents a clear explanation of contemporary experience (Kolko, 1963).

The Securities and Exchange Commission (SEC)

Parrish (1970) examines the creation of the SEC during the New Deal. It was well known prior to the stock market crash that the robber barons of the period were having their way with the stock market. Insider trading, uncontrolled high-risk investments, and speculative practices by financial institutions were suspected but left unchecked until after the stock market crash in October 1929. Congress set out to investigate how these events led to the economic disaster and was determined to rid the stock exchange and banking institutions of their fraudulent practices and bring stability and control to the nation's financial institutions. As mentioned earlier, the culmination of the Congress's work was the passage of two new laws, the Securities Act of 1933 and the Securities Exchange Act of 1934, and the establishment of a new federal agency, the SEC Commission. The SEC's primary responsibility was to watch over Wall Street, security holders, and directors and officers in the banking system.

Parrish's (1970) study emphasized the intelligence and professionalism of the architects and the early members of the SEC, but he also noted the effects of concentrated industry pressure on the shape of the legislation and on the policies of the SEC. Parrish states that the SEC confronted entrenched economic arrangements that predated the New Deal and that were likely to be upset by an overturning of the exchange apparatus, with devastating effects not only on the guilty few but also on multitudes of innocent investors. Parrish detailed the financial community's utter hostility toward regulation and its near willingness to hold the national recovery hostage in their determination to avert reform. Parrish documents the postenactment period and its mutual reliance between industry and the commission for information and the recruitment back and forth of important personnel, characteristics consistent with agency capture. At the end of his discussion, Parrish cautions that these elements are not in themselves conclusive of capture. However, the evidence he presents demonstrates evidence of capture intent on the part of the finance industry toward the SEC.

Public Utilities Commissions

Gormley (1983) did a comparative study that examined the capture model as well as other models of regulation as they pertain to public utility commissions. Gormley found, as predicted by the capture model, that utility companies wield more power than any other outside participant in the public utility regulatory process. There are several reasons for this. First, utility companies determine the timing of major rate increases. When a utility company files a rate hike request, a public utility commission must hold a proceeding, whether they are ready or not. In many states, the commission is required to render a decision within a specified time; otherwise, requested rate hikes automatically go into effect. Hence, the utility companies determine the tempo of regulatory decisions.

Second, utility companies control the flow of information to public utility commissions. By virtue of their familiarity with customers, investors, and fuel suppliers, the companies are in an excellent position to predict demand, the cost of capital, and the cost of fuel. Unfortunately, they are also likely to base their predictions on questionable assumptions to justify their request for more money. Public utility regulators must rely heavily on the analyses and prognoses of utility company officials.

Third, utility companies are natural monopolies. Because the companies generally do not compete with one another, the marketplace provides no barometer of managerial efficiency. Although audits sometimes reveal instances of glaring mismanagement, it is difficult to know whether another utility company might be more efficient. Finally, utility companies have abundant financial resources they can use to present a strong case before the public utility commission. Because utility companies can pass along their costs to rate payers, they are able to respond effectively to obstreperous interveners, aggressive regulators, or both. Furthermore, public utility regulators know that if they fail to satisfy a utility company, the company will take them to court--a prospect that disheartens and sometimes intimidates already overburdened regulatory officials (Gormley, 1983).

Federal Lands Management

Group influence as an important feature in the study of regulation and agency capture can be seen in the client relationships between public land users and federal land management agencies as the Bureau of Land Management (BLM). Culhane (1981), in his book *Public Lands Politics*, describes group influence as the real effect or consequence that a group's activity has on policy.

Culhane (1981) examines group influence on several land management agencies, but where capture best shows itself is in the influence wielded by district advisory boards on the BLM's predecessor, the U. S. Grazing Service. The Grazing Service was established by the Taylor Grazing Act of 1934 for the purpose of managing the public rangelands by preventing over-grazing and soil deterioration; providing for orderly use, improvement, and development; and stabilizing the livestock industry dependent upon the public rangelands.

The district advisory boards were created to directly assist local ranchers. The rationale for establishing the advisory boards was that local ranchers did not have enough information regarding the extent of the grazing lands and other important information needed from local stockmen. The Grazing Service believed that an organized, official venue like the advisory boards would regularly quantify and distribute this information where needed. The early Grazing Service needed the advisory boards to be able to gain consensus about which ranchers used which grazing lands over a given period.

But the boards themselves were made up of local ranchers and soon it became apparent that the district advisory boards were exerting pressure on the Grazing Service to buckle to their interests, which for the ranchers was keeping sheepherders off the grazing lands. The advisory boards also fought fiercely against cuts in grazing lands.

Farrington Carpenter, the rancher-lawyer appointed by Secretary of Interior Harold Ickes to set up the Grazing Service, could not himself help but convey the impression that the grazing districts somehow conferred range rights either by priority of use or through what was called "commensurate" property holdings in the vicinity of the public grazing lands. Lending practices of local banks confirmed the views that grazing permits were property. Driven by pressure from other grazing lands users, Congress in 1946 abolished the Grazing Service and established its functions and those of the General Land Office as the BLM.

Culhane (1981) tested the extent of group influence by examining the decisions made by local U. S. Forest Service rangers and BLM officers with respect to whether they took the interests of their clients into account. By formalizing this central proposition into a set of functions, analyzing data on interest groups (livestock industry, conservationists, recreationalists, forest products industry, etc.) and policy outputs from a specific policy system (grazing permits, as commonly measured in animal–units–months), and using statistical procedures, Culhane was able to gain a quantifiable measure of group influence. Although he cautioned that the findings did not conclusively confirm group theory and applied only to public lands policymaking at the lowest levels, Culhane presented interesting factors that are important to this study. He found that group influence did have an effect on the lowest levels of public land management. The elements of group theory such as legitimacy, leader's tactical skills, group cohesion, power, and interest did not seem to affect rangers' and area managers' decisions as much as the distribution of the interest groups in their constituencies. The model thus demonstrates responsiveness to group influence when it comes to agency decisions.

Capture by Design

The third perspective on the capture theory examines capture from the approach that some regulatory agencies are established to be captured by its regulated industry from the beginning and that the capture relationship itself promotes efficiency in both the industry and the regulatory agency. In this section, we look at two agencies and their respective industries that best define this perspective, the USDA and the agricultural industry (farmers, packaging houses, dairy farms, and so forth) and the Civil Aeronautics Board (CBA) (currently the FAA) and the airline industry.

The USDA and the Produce Industry

Earlier, we touched on McConnell's (1966) study of the USDA and how the dairy and produce industries convinced the federal government to create the USDA so as to promote and protect the interests of farmers. Here, the intent from the start was to create a vehicle by which regulation would favor the industry and reflect the interests of consumers through legislative interest. Subsidies for farmers and controls on production and price brought stability to the industry. Regulation was designed to reflect the wishes of industry and of the Congress. In turn, the industry performed and behaved, in a sense, as Congress intended. The relationship among the produce industries, the USDA, and the Congressional committees overseeing agriculture provided a balance between public and private interests that, for the most part, favored farmers. Thus, the USDA essentially captured from the start.

The CAB and the Airline Industry

Redford (1969) examined the CAB and its functions with respect to the promotion and regulation of domestic commercial civil aviation. Redford states that the CAB was created in an environment of remarkable consensus as reflected in the Civil Aeronautics Act of 1938. This consensus between the industry and legislators was to promote aviation transportation by guaranteeing public safety and developing a sound air-transport industry, subsidized to the extent necessary to provide adequate service. The consensus reflected the views of the airline industry, the administration, congressional leaders, and experts from other modes of transportation, through which guidelines for the new airline industry were created. It also set the framework within which government and industry policies were developed. Among other things, it sought to delegate to administrative structures the decisions concerning licensing of pilots, granting of routes and determination of subsidy rates to companies.

Redford (1969) argued that for consensus to work, a subsystem was created in the form of a triangle. Forming the aviation triangle, at the administrative corner were the CAB and the FAA, the former responsible for economic regulation and promotion and the latter for safety and grants for airport construction. At the congressional corner were the committees on commerce and the appropriations subcommittees. Within the commerce committees there were subcommittees: in the House, one on transportation and communications, and in the Senate, one on aviation. At the industry corner were a large number of trade associations representing general aviation, the commercial industry, and other interests. The trade associations each represented competing yet complementary interests. For example, general aviation's interests in competing with those of commercial aviation actually benefited both industries. For as general aviation would train future commercial pilots, technology developed for commercial jets was eventually made available to smaller aircraft.

Redford (1969) states that the policy-making process sometimes forges general consensus into law, as in the Civil Aeronautics Act and the chief provisions of the Federal Aviation Act. In doing so, it reconciles conflicting and complementary interests outside government as well as positions taken within government. Redford notes that most of the issues are mediated in the subsystems by persons in strategic positions, and that powerful interests have greater opportunities for access through association representatives. He concedes that sometimes, competing interests find representation.

Redford (1969) draws several conclusions from his subsystem theory about government relations with industry. Important to this study is Redford's proposition that subsystems provide continuous access and superior opportunities for influence to large, aggregated interests. He notes,

> There is a danger, however, that the significant fact stated in the second proposition will lead to distorted or exaggerated conclusions. There is much talk about captive agencies, and there should be some about captive congressional committees. But access for high-quantity interests does not necessarily mean that agencies or committees are completely captured by any single interest, for both agencies and committees often have multiple clienteles. (p. 104)

Other researchers who have studied the CAB also conclude the agency was highly responsive to the airline industry, specifically when drafting regulation that allowed for growth as it protected airline interests. Drawing from the economists' view of capture, a reciprocal relationship then formed between the airline industry and the CAB, in which the airlines sought out regulation for their own benefit and the CAB provided the airline industry with favorable regulation in order to gain industry compliance (Behrman, 1980).

Testing the Capture Theory

With the evidence supported by the numerous case studies and somewhat crystallized in Bernstein's (1955) research, the idea of regulatory agency capture had become conventional wisdom in political science but without any serious empirical examination. In an effort to remedy that omission, in 1978, Meier and Plumlee set out to demonstrate that Bernstein's theory, with some adjustments, was empirically testable and set out to do that using a limited data set.

Meier and Plumlee (1978) extracted four variables from Bernstein's theory--the age of the agency, the type and amount of political support for the agency in terms of elites and the balance between the public and regulated interests, the relationship of the agency to the regulated industry, and the ability of the agency to respond to demands placed on it by the environment--to build their rigidity cycle model. From their model, Meier and Plumlee derived and tested several general hypotheses, including: (a) the greater the age of the agency, the lower the diffuse support for the agency, (b) as an agency ages, it develops a more positive relationship with the regulated agency, and (c) as an agency ages, its behavior becomes more rigid.

Using information taken from federal budgets, agency annual reports, the Government Organization Manual, and standard biographical sources, Meier and Plumlee (1978) gathered data over the life spans of eight regulatory agencies, including the FAA and the NTSB. From Bernstein's (1955) theory of regulatory agency decay, Meier and Plumlee derived and tested their hypotheses. What they found was that (a) as predicted, diffuse political support is negatively related to agency age, but this is because new agencies' support drops rapidly. After the first few years, diffuse political support has no relationship with an agency's age; (b) the relationship between the industry and the agency fails to conform to the prediction. The interchange of personnel between agency and industry actually declines with time. Public statements of interest group support do increase with time, but the relationship is slight; and (c) the key aspect of Bernstein's theory is the relationship between rigidity and age. Meier and Plumlee found that as an agency aged, the average age of its executives went up and more of those executives had legal training. Contrary to the initial predictions, however, aging agencies did not show increased turnover, decreased expertise, increased backlogs, or decreased efficiency. Age was not fundamental to the decline of regulatory agencies.

Although there are contradictions in Meier and Plumlee's (1978) adapted test of Bernstein's (1955) theory of regulatory agency decay, their exercise did confirm many of their initial predictions. The study tested only the relationship between agency age and the other three variables. It did not probe the relationship between political support and rigidity, between interest relationship and rigidity, or between political support and the interest relationship.

With respect to the NTSB, at the time of Meier and Plumlee's (1978) study, the agency was in its infancy. The NTSB, having been established as a separate agency from the new FAA, did not, in fact, gain its independence from the DOT until 1974 with the passage of the Independent Safety Board Act. Meier and Plumlee specifically noted that from its inception, the NTSB placed a high value on expertise. Their findings also noted that regulatory agencies, as they age, tend to bring in more lawyers. This was not the case with the NTSB in 1978. Finally, Meier and Plumlee noted that of the eight agencies examined, only the NTSB was faced with a constantly growing backlog.

At the end, Meier and Plumlee (1978) called for a revised model eliminating the age variable and for additional testing with respect to political support, agency-industry relationship, and agency rigidity. More importantly, Meier and Plumlee's study provided a strong argument for more rigorous testing of the capture theory of regulation.

Criticisms of the Capture Theory

The capture theory is not without its critics. Studies conducted in the late 1970s and throughout the 1980s have put the theory, with respect to regulatory agencies, through rigorous scrutiny. In doing so, these studies argue that regulatory agencies and commissions are not captured, that is, not dominated by the industries they regulate.

Critics allege that at the root of the capture theory are certain inherent features of the regulatory process and environment that determine the fundamental nature of the regulation and guarantee the dominance of the regulated group in influencing regulatory decisions. These studies challenge key hypotheses implied by the capture theory: (a) characteristics of an individual regulatory commission cannot appreciably change the fundamental nature of the regulatory process (the dominance of the regulatory group), and (b) the public has little effect on the nature of regulatory outcomes.

Regulation theorists challenge the proposition that the character of a regulatory commission has little effect on the nature of regulatory outcomes. Several studies point out that the characteristics inherent in commission personnel have a profound influence on the nature of regulatory policies. Welborn's (1977) study emphasizes that Congressional committee chairpersons, by virtue of their position and access, exercise considerable power in regulatory policymaking and in the execution of commission policy.

Other studies suggest that the public can and does have an impact on regulatory policies under certain conditions. These studies challenged the implicit assumption by capture theorists that all regulatory contexts are characterized by the same basic pattern of group interests--a cohesive regulated group pitted against a completely unorganized public. Wilson (1980) argues that in some regulatory situations the costs of a prospective policy are widely distributed but the benefits are highly concentrated, thus leading to the likelihood of capture by the prospective beneficiaries. But in other situations in which either benefits are less concentrated or costs are more concentrated, various types of regulatory outcomes are expected, some consistent with a greater degree of public or consumer influence over policy.

Critics of the capture theory clearly note that a reasonable theory of regulation must recognize the possibility of public and/or consumer influence on agency and commission policies. Berry (1984) found that specific characteristics of individual commissions do affect the nature of regulatory outcomes. Berry states that intervention in the regulatory process by representatives of consumers and the public exists and does affect the nature of regulatory outcomes. The presence of a consumer intervener in regulatory proceedings affected the price of electricity established. Berry argues that regulatory commissioners are partially motivated by the objective of setting prices consistent with the cost-of-service standard. The greater the level of professionalism of a commission, the higher the correlation between the cost of producing electricity and the price established. The resources available to state commissions proved to be important determinants of the nature of regulatory outcomes. According to Berry, public and consumer intervention in the electric utility regulatory process does affect the nature of policy outcomes.

Sabatier's (1975) study of air quality regulation in Chicago found that the cycle of decay recognized by Bernstein (1975) is not inevitable. He contended that decay can be prevented by the presence of an organized "supportive consumer constituency" that monitors the activities of a regulatory commission and intervenes directly to influence commission decisions. Similarly, in a study by Keiser (1980), the FDA's consumer constituency was found to act as a deterrent to industry domination of the agency.

Mazmanian and Sabatier's (1980) multivariate model of policy making applied to regulation by the California Coastal Commissions looked at a broad set of factors. These factors include the socioeconomic environment in which commissions operate, elite and mass attitudes, and the nature of citizen participation, and found that these factors did influence regulatory policies.

Culhane's (1981) application of group theory of regulation to the Forest Service and BLM argues that a group's influence over regulatory policy is a function of its access to decision makers, its own power (e.g., financial resources and skills), and its value preferences.

Gormley's (1983) research on public utilities commissions proposed that if pressure groups other than utility companies are at least moderately influential participants in public utility commission proceedings, then capture does not occur. Gormley goes on to say that the capture model is usually incompatible with the organizational model. The capture model postulates that regulated industries are the only formidable interest groups in the regulatory agency's environment. Without access to alternative sources of information and alternative points of view, most staffs become mere conduits for the demands of regulated industries. However, highly professional staffs may be able to generate their own information and ideas, thus resisting capture. Gormley states that regulatory staff influence is diminished by lopsided outside pressure, but it is not diminished by outside peer pressure. The presence of competing pressure groups, with conflicting objectives, may actually enhance the influence of the regulatory staff.

Regarding influence, Gormley (1983) argues that the capture model errs by blurring the distinction between influence and control. Utility companies are highly influential, but they do not control the public regulatory process. The failure of the capture model is due not so much to competing interest groups as to proxy advocacy. He believes that both the interest group model and the capture model understate the importance of the regulatory agency staff. He states that when studying these models, we must look at who influences regulatory commissioners instead of focusing on who influences regulatory commissions.

Gormley's (1983) findings suggest that there is some truth to the capture model. But they also suggest that there is truth to the other models he examines in his study--the interest group model and the organizational model. He also suggests the need for perhaps a fourth model, described as a surrogate representational model, which would account for the emergence of proxy advocates as a response to the weakness of interest group politics.

Gormley (1983) concludes by noting that independence from politicians does not necessarily mean independence from outside pressure.

> The absence of gubernatorial and legislative involvement emboldens regulated industries, whose support for the regulatory scheme becomes crucial. Under these circumstances, one expects utility companies will be especially influential. Some might even go so far as to predict capture by utility

> companies, as they have more expertise than anyone else, and expertise is very important to this issue area. (p. 123)

Gormley states that current public utilities issues are too controversial to be relegated to regulated industry officials. Utility companies may be natural monopolies, but they no longer monopolize the politics of public utility regulation. If complexity encourages capture, conflictuality does not.

Alternatives to the Capture Theory

Capture is just one of several theories that describe the relationships between regulatory agencies and industry. Many of these theories are similar to capture by virtue of the influence mechanism but are different due to other perspectives on which the theories are founded. Any study that seeks to fully explain the influence relationship exercised by interested parties from industry on an independent agency conducting aircraft accident investigations must examine these alternative theories to capture to fully understand what dynamics may be occurring during the course of an investigation. Therefore, this study looks at four alternative regulation theories whose properties hold close to the capture dynamic and could present an explanation of the dynamics occurring between the NTSB and the interested parties. The first of these theories examines countervailing power among interest groups. The second alternative theory comes from the economic regulation perspective and focuses on the dynamics between political principals and their agents. The third alternative examines cooptation of outside groups into regulatory organizations so as to counter the influence mechanism through participation within the oversight agency. And the final alternative theory presented examines the dynamics of agency professionalism and looks at how those dynamics strengthen or weaken a regulatory agency in its interaction with industry. This alternative also examines the effects of norms, communications, standard operating procedures, identification with the agency and its mission, composite decisions, and other aspects of a professional agency when practicing its oversight mission over industry.

Countervailing Power

The interaction between countervailing groups provides one alternative to the capture theory. Countervailing power is that influence wielded by one interest group against another. It is the ability of one group to counter the influence of another to such an extent as to negate the influence of the other group. Countervailing power has been used to describe the actions derived from liberal interest groups (as proequal employment opportunity, proabortionists, and certain environmental groups) in their efforts to counter a Republican administration's more conservative policy decisions. McFarland (1992) argues that countervailing power exists in most issue areas and is reflected in the interactions of economic producers, autonomous government agencies, and power lobbies with particular policy areas. The pluralist position cites countervailing power as to why the political system is self-regulating and self-correcting. If one group accumulates too much power, countervailing forces are likely to become active, which can check or limit the first group's actions. Dahl (1967) states that with countervailing power, the power of the state to regulate the political process is limited. Government officials play a primarily meditative role, reconciling conflicting group demands when particular interests are unable to resolve their differences by themselves.

The concept of countervailing power has been used to describe balance in the American economy. Galbraith's (1952) study shows the power of big business being offset by the countervailing power of large unions, thus protecting consumers by competing centers of power. More recently, Reich (1999) cites that countervailing power continues to play a role in economic accountability, stating that although big corporations, big labor, and the military industrial complex no longer dominate the economic landscape, a balance must still be struck, indirectly among telecommunications, institutional investors, and venture capitalists. Countervailing power provides an alternative argument to capture in that an agency can not be captured because the powers exerted by multiple groups with interests vested in the regulation put forth by an agency partially or completely negate each other, thus leaving the agency its rightful position to regulate as it was designed.

Economic Regulatory Perspective: Agency Theory

Some economic theories present alternative approaches to capture and find application in describing what goes on in organizations, including those that regulate industries. The contractual paradigm describes organizational interactions as contractual agreements based on type of incentives. Organizational arrangement is based upon the team approach where typically cooperation produces a gain and subsequently a reward (Alchian & Demetz, 1950). Each member knows that his effort has some impact on the team's reward, but this reward is split among all the members creating potential problems. One such problem is that the cooperative effort is plagued by a public goods problem that promotes shirking among members. This can be countered by monitoring the productive efforts of the members, but then there would be hierarchy problems such as who on the team would take on the role. Other solutions include mutual accommodation where the entrepreneur serves as monitor.

Williamson (1975) poses that relatively efficient organizations arise from the joining of uncertainty, small numbers bargaining, and bounded rationality to limit reliance on long-term contracting—which requires speculation on future contingencies--and encourages the substitution of internal organization, in which uncertainty can be absorbed through adaptation, learning, and sequential choice. Similarly, small numbers combine with opportunity to limit reliance on frequent short-term contracting. If an economic agent relies on the market in contracting and recontracting for the myriad of services needed for production, service-suppliers gain specialized knowledge and skills through their performance of these tasks and become better qualified than others in the market. Thus, in subsequent contracting situations, large-number exchanges tend to transform into small-number exchanges in which the moderating effects of the market competition are largely absent and, due to opportunity, service suppliers use information to their own advantage to extract concessions. The way around this is to avoid engaging in short-term contracting, producing instead by an organizational arrangement. Given appropriate rewards and monitoring structures, transaction costs can be reduced significantly.

Agency theory addresses incentive and information problems inside and outside of the organization. In agency theory, one person--the principal--wants to induce another person--the agent--to do something that the agent does not want to do. Also, the agent has hidden information or hidden action because it is hard or expensive for the principal to monitor the agent. Often in agency theory, principals and agents have different attitudes toward risk (Eisenhardt, 1989).

There are three basic families of principal-agent models. In adverse selection, the agent has hidden information about his characteristics and the principal moves first in the formal model. The principal's problem is to offer a contract that induces the agent to reveal his true type. An example of an adverse selection problem is a corporate board of directors (the principal) trying to determine the abilities of potential CEOs (the agents) (Moe, 1984). In signaling, the agent has hidden information regarding his type and moves first. The agent's problem is to take some visible action that the principal can correctly interpret as revealing the agent's type. An example of a signaling problem is a CEO (the agent) taking an extraordinary action to signal his type to his board of directors (the principal) (Hermalin & Weisbach, 1998). In moral hazard, the agent moves first and takes some action that the principal cannot observe. The principal's problem is to establish a contract that induces the agent to take actions that the agent does not want to take but that the principal values (Moe, 1984). An example of a moral hazard problem is a manager (the principal) offering a sales agent (the agent) incentives to increase sales. With respect to macropolitics, regulation, and agency behavior, principal-agent theory is used to assess the degree to which agency policy changes when principles exert their influence and to describe how and to what degree agencies react to those influences.

The principal-agent theory has been used to assess presidential and Congressional influence and effectiveness on agency policy, as in the case of the SEC's antitrust regulations during the Reagan administration (Eisner & Meier, 1990; Wood & Anderson, 1993), agency performance and its ability to shape the preferences of political superiors (Krause, 1996), and the effects of changing presidential administrations on regulatory policies (Moe, 1982). The way in which principal-agent and derivatives of the theory provide a capture alternative is that capture describes a situation in which control is exerted to the degree that an agency's ability to regulate is negated or, on the macro scale, a political appointee is unable to manage the bureaucracy beneath him/her and there is an ongoing struggle between principals and agents in which neither seems to gain complete control over the other.

Cooptation

Another concept that must be considered in lieu of capture when examining the relationship between an agency and outside groups or industry is that of cooptation. Cooptation is defined as the inclusion of outsiders in the leadership and decision-making processes of an organization. Individuals may be coopted purely for their personal qualities, but often they are coopted from other organizations.

Interorganizational cooptation is an integrative strategy that creates links and builds relationships among organizations or strengthens and defines those that already exist. Cooptation is a common practice for organizations that seek to build external relationships. Processes of cooptation underlie the familiar phenomena of interlocking directorates in business, the creation of prestigious advisory or editorial boards for academic journals, and charitable organizations or the composition of cabinets in coalition governments (Selznick, 1949).

The classic example of cooptation is Selznick's (1949) study of the Tennessee Valley Authority (TVA). Selznick considered the motives for cooptation as a deliberate organizational strategy and its unintended consequences for organizational autonomy and power. Cooptation is seen as a defense mechanism, motivated by security needs, a means of averting external threats to the integrity and survival of the coopting organization. Incorporating outside elements into the leadership of an organization was seen as a means of defusing external threats or diffusing external opposition. Cooptation is an especially useful strategy in the early stages of an organization's development when it must come to terms with established organizations in its environment and carve out a role for itself without provoking unnecessary hostility and conflict. The act of cooptation symbolizes a commitment to building cooperative rather than adversarial relationships, to claim complementarities rather than to pose a competitive challenge.

Selznick (1949) distinguishes two forms of cooptation with different defensive functions: formal and informal cooptation. Formal cooptation is the visible inclusion of individuals representative of outside interests in the governance structure of an organization. Its symbolic function is legitimation. Formal cooptation legitimizes the mission and objectives of the focal organization and secures acceptance of its actions among relevant constituencies. Informal cooptation, in Selznick's terms, is the covert sharing of power, the participation of representatives of powerful outside interests in the internal processes of organizational policy formulation and decision making. Whereas formal cooptation shares the responsibilities of power, informal cooptation shares power itself. This distinction highlights a dilemma that bears upon any instance of cooptation. There is often a tension between the overt legitimizing function of cooptation, which enhances its effectiveness in dealing with its external environment, and the covert encroachment of external interests on organizational power, which deflects organizational activity from its intended goal.

Cooptation could be viewed as capture at its most extreme, but the two concepts are different, and thus cooptation is provided as an interesting alternative to capture. Whereas capture is not necessarily expected by the regulatory agency, and this includes those situations previously described in which the agency was designed to be captured by its industry, cooptation is a purposeful act on the part of the agency and is considered as necessary by the agency for its success. As with capture, however, cooptation can be bad and create a situation in which an agency is rendered ineffective in its ability to regulate.

Agency Professionalism and Administrative Behavior

Agency professionalism provides an interesting argument in that the tools that underlie professionalism and by which influence is countered are found within the management, staff, and character of the agency itself. Professionalism in government is not a new concept. Its roots can be traced to the 1920s and is found referenced in documents of the time. Mosher (1968) defines the professions as "social mechanisms whereby knowledge is translated into action and service and the means by which intellectual achievement becomes operational" (p. 94).

Professions display several common characteristics that are significant for democracy and public service. One of these is the continuing drive of each profession to elevate and, in many cases, maintain its stature and strengthen its public image as a profession. In this way, professions seek to establish stringent entrance requirements, build and strengthen clear paths and advancement opportunities, focus on continued education, seek upgraded pay and pay levels, and improve their prestige before their associates and the public. Another is their focus on specialized knowledge, science, and rationality. Government professions are focused on solving public problems and doing things right. Professions avert politics, seeing themselves as constituting negotiation and compromises. Politics to the professions is as ambiguity is to truth or expediency is to rightness (Mosher, 1968).

Professions are comprised of elites, staff, and workers, all with the same standards and goals. The elites set the standards and goals for the agency, and the staff and workers carry them out. In a profession, these groups see the mission and its accomplishment as the same goal.

Professionals often see themselves as instruments called to a higher purpose. Studies of the public lands policy conducted by Culhane (1981) pointed to the importance of professional norms among agency personnel having an important impact in the way public lands policies were carried out by the BLM and the U. S. Forest Service. The importance of norms was also reflected in Katzman's (1980) study of the Federal Trade Commission (FTC) arguing that established professional norms among its commissioners and personnel played a key role in determining the objectives of staff and the nature of policy outcomes with respect to the cable industry.

The motivations and objectives of the professional staff must also be considered a counter to outside influences. However, it is important that researchers not assume that the policy outcomes of the regulatory process will necessarily match the objectives of regulatory personnel. Such an assumption ignores the potential limitations of regulators in terms of information, analytical capabilities, and other resources (Porter & Sagansky, 1976).

Recent studies of regulation have pointed to the impact of the availability of the commission's resources in influencing the degree of effectiveness of regulation. Welborn and Brown (1979) identify legal authority and staff competence as important agency resource variables. A competent, well-trained staff educated on the legal boundaries of its authority and confident in its mission can be an effective counter to outside influences.

In addition to staff, professional agencies have physical resources available to achieve their goals and impact the nature of regulatory policy. Mitnick's (1979) incentives model hypothesizes that the size of a commission's budget is a key determinant of the nature of regulatory outcomes.

Organization communications, identification of employees with the organization, and the process of cooperative decision making are also key aspects found within professional organizations. These features bring professional members to accept an organization's authority and, in turn, hold to its mission and its rules.

Simon's (1997) landmark study on administrative behavior found that communication within the organization is important in predisposing administrators to act in accordance with organization procedures. Clear, concise, and consistent communication of the organization's procedures from managers to its employees--formal communications channels as operating manuals, agency orders, memorandums, letters of agreement, reports, and other written documents, and informal channels of communication built around social relationships--help create and solidify leadership relationships and form norms that enhance compliance within the organization. Recorded communications provide for a repository of corporate memory, providing step-by-step guidance when engaging in an operation or reacting to a new situation, and thus providing managers confidence in executing decisions. "Identification" is an important characteristic found in the professional agency and is a key to organizational control. "Identification is the process whereby the individual substitutes organizational objectives for his own aims as the value indices which determine his organization decisions" (Simon, 1997, p. 295). How employees get to where they identify with an organization is a function of a professional agency's structure and can include education, training, symbols, and an agency's unique culture and language.

Kaufman's (1967) study of the U. S. Forest Service found that rangers are recruited before they go to college. Internships and cooperative education programs provide students insights into the service. Once in forestry school, students learn about the history of the agency, the lore, and the profession of forestry. When coming to the agency, there are conferences and on-the-job training, all for the purpose of indoctrinating recruits with the agency's policies, norms, and ideologies. The many facets of the Forest Service help develop conformity by building a sense of belonging to a peer group. Frequent transfers break the rangers' ties to a community, leaving only fellow rangers to be one's primary long-term friends. Forest Service people generally socialize together. Rangers look forward to inspections because the inspectors provide gossip and news on what is happening in the agency. Because all rangers work their way up through the ranks, they share similar backgrounds and experiences. Symbols reflected in the Forest Service, such as the "greens" (uniform), Forest Ranger badge, "Smokey the Bear" hat, and signage at the entrances to national forests, laboratories, and offices, reflecting U. S. Forest Service and the Forest Service badge, provide a heightened sense of belonging to a special group. Even the language usage and references to themselves as "in-Service" people (Forest Service employees) versus "out-Service" people (those outside the agency) help distinguish forest rangers and other Forest Service personnel as part of a unique and close family. The psychological basis of identification is obscure but seems to consist of employees' personal interest in institutional success, a transfer to public agencies of a private-management philosophy, and limitations on the area of attention that prevent more than a restricted sphere of values from coming within its focus.

Professional agencies also practice composite decision making. Simon (1997) states that a decision is the basic act of organization behavior, but few significant decisions in an organization are ever the act of a single person. Most organizations' actions consist of composite decisions, a flow or sequence of decisions made by various people in the organization with respect to some project or proposal.

Professional agencies, by virtue of their characteristics, resources, processes, and goals, are well-equipped to meet any influences coming from outside groups, meaning that with respect to regulation theory, the professional agency should be able to regulate its industry without serious opposition. Thus, professionalism provides yet another suitable alternative to the capture theory.

Chapter Summary

This chapter presented a review of literature with respect to the capture theory of regulation. Additionally, we examined other theories with respect to regulation that criticize capture and argue that something other than capture occurs with respect to the interactions between regulatory agencies and the industries they are charged to oversee.

In the next chapter, we look at the NTSB, first reviewing the literature documenting the history of aircraft accident investigation in the U.S., which also shows how the NTSB evolved into the independent agency it is currently. We look at several publications that examine the agency directly, explaining how it conducts aircraft accident investigations, determines cause, and develops and drafts recommendations. We also examine what has been written on the party process and look at manufacturing companies' perspectives on their role within the investigative process. Chapter 3 concludes by looking at several articles that criticize the current party process at NTSB.

CHAPTER 3

NTSB HISTORY AND THE AIR ACCIDENT INVESTIGATIVE PROCESS

In this chapter, I continue to examine pertinent literature with respect to the study of the capture theory. However, the focus of the review now moves away from the theoretical literature on regulation, capture, and capture theory alternatives to the historical and operative writings on the NTSB, aircraft accident investigation, and the party process. In this chapter, I look at the NTSB from a historical perspective, beginning with its founding in the early days of commercial aviation and through its establishment as an independent investigative agency. This historical perspective is important in understanding the agency's relationship with key actors in the investigative process, particularly the FAA. By looking at the statutes that established the aviation regulatory and safety investigative functions in a single agency and then following the evolution of the two functions, later separated into the two agencies, it is shown how the need for a party process came about and hence was subsequently created.

To provide an understanding of the investigative process, I examine many of the federal regulations and agency publications that govern accident investigation. This discussion also examines the role of the FAA as a proxy for the NTSB in aircraft accident investigation and how transportation statutes and the party process impact that role. I then turn to the party process itself and look at that guidance that describes the relationship between the government and industry in an aircraft accident investigation and the tools established that investigators and group chairmen use to maintain an investigation's integrity and credibility.

Throughout this discussion, I examine the manuals, documents, and publications concerned with the proper conduct of interested parties during an investigation. This section also looks at publications from companies within the aerospace industry describing investigative practices and interested parties' behavior from the parties' perspective. Finally, I conclude this chapter by looking at some of the publications and articles that criticize the present investigative process and offer alternatives to the party process.

History of Aircraft Accident Investigation in the U. S.

To understand how aircraft accident investigation evolved into what it is today, it is necessary to examine the beginnings and growth of commercial aviation in the U.S. The origins of the American air-transportation industry began with Congress' passage of the Airmail Act of 1924 (commonly referred to as the Kelly Act), which authorized the Post Office Department to use competitive bidding to award air-mail contracts to private airlines to transport mail in the U.S. Up to that time, the commercial airline industry was virtually nonexistent (U.S. Statutes at Large, 1925). With the passage of the Kelly Act, the government essentially established a federal air-mail contract program for private carriers. Prior to that time, the U.S. Army carried the airmail. Revenues generated from mail pay would be the basis for the fledgling airline industry until the mid-1930s.[3]

In 1931, mail pay accounted for over 91.0% and passenger revenues for only 8.1% of the air-mail carriers' $18.5 million in total revenues. In 1935, airline passenger revenues exceeded mail pay. By 1938, passenger revenues made up 58.2% and mail pay 36.7% of the airlines' $40.1 million in total revenues (Annual Report of the Civil Aeronautics Board, 1941). Government payments often exceeded the revenue produced by airmail.

Nonetheless, many airlines suffered operating losses, and the possibility of abandonment of services arose. New legislation increasing the level of airmail subsidies was adopted in 1930. Because passenger service was just beginning to catch on in the 1930s, carrying the mail continued to be a major source of revenue for the airlines. As a consequence of the national economic collapse brought by the Great Depression, however, by the mid 1930s the airlines were once again in financial distress, and again there emerged a demand for favorable government action to bail them out.

It was widely agreed among industry and governmental officials that there was a need for new economic and safety regulation. Because it appeared that there were more airlines than could be supported by available revenues, policymakers feared that

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[3] Between 1918 and 1925, airmail was carried by the U. S. Army Signal Corps. After the passage of the Kelly Act, the commercial airlines began carrying the mail. Until the mid-1930s, air-passenger travel was light. The airlines derived most of their revenues from mail pay (Cushman, 1941).

unregulated competition among the many small companies making up the industry would degenerate into "destructive competition." The airlines themselves were in favor of restrictive legislation. Between 1934 and 1938, the enactment of legislation was delayed by problems in resolving two issues: whether regulation should be handled by the ICC or by a new independent commission and whether the same agency should administer both economic and safety regulation. These issues were resolved by passage of the Civil Aeronautics Act of 1938 (Redford, 1961).

The Civil Aeronautics Act, as modified in 1940 by a presidential executive order, established the CAB to handle economic regulation and the Civil Aeronautics Authority (CAA) in the Department of Commerce to administer safety regulation; to control air traffic; and to maintain a national airway system of navigation aids, air routes, and airports. However, in 1956, the collision of two passenger airplanes over the Grand Canyon led to questions about the adequacy of air traffic control and safety regulation (Redford, 1961).

Consequently, Congress enacted the Federal Aviation Act of 1958, which replaced the CAA with a new independent agency, the FAA, which was given a strengthened air safety mandate. The FAA would later become an agency within the DOT and be responsible for air traffic control and safety.

Within the FAA was the CAB, an independent safety commission headed by a five-member board. Each of the board members served a six-year, staggered term of office. Appointed by the president and approved by the Senate, no more than three of the five board members could come from the same political party, and the majority party members on the board reflected the president's political party. The CAB was authorized to regulate entry into the commercial airline industry through the issuance of certificates of "public convenience and necessity" (Anderson, 2000, p. 297), which were also used to determine the particular routes than an air carrier could service.

The origins of the NTSB's investigative authority and its need for independence in its functions can also be traced back to the beginnings of commercial aviation and the industry's regulation. The aircraft accident investigation process also found its beginnings with the creation of commercial airmail service in the 1920s. The first government charge to an agency for the purpose of investigating aircraft accidents came in 1926 with the passage of the Air Commerce Act. The law charged the Department of Commerce with investigating the cause of aircraft accidents. This responsibility was placed in the hands of the Air Accident Bureau, a three-person office within the CAA (NTSB, 2000b).

Government handling of aircraft accident investigation came under fire early when on March 31, 1931, a Fokker F-10A operated by Transcontinental and Western Air crashed in Kansas, killing eight people including Notre Dame football coach Knute Rockne. The secretive nature of the investigation was publicly criticized and led to changes in the Air Accident Bureau's practices (NTSB, 2000b).

In 1934, Congressional legislation amended the Air Commerce Act to require that reports on probable causes of fatal aircraft accidents be made public. The amended act also banned the use of accident reports and related evidence in court proceedings. The purpose of this change was to encourage pilots and other flight crew, passengers, airplane manufactures, and witnesses to aircraft accidents to come forward with information to investigators without fear of reprisal or possible litigation (NTSB, 2000b).

In 1935, a Douglas DC-2 crashed in Missouri, killing five persons, including Senator Bronson M. Cutting. In the months following the accident, a Congressional debate ensued over the cause of the accident and the methods by which the cause was determined. Originally, the Air Accident Bureau determined the cause of the accident to be a mechanical problem with the way the airplane's flight controls were rigged. But later, following several alleged meetings with the Douglas Company, the cause was amended, citing a failure on the part of the captain (pilot) to complete a critical checklist item that subsequently caused the airplane to lose control. The debate was aired in public through the media. The resulting criticism over the cause of the accident and the process by which the cause of the accident was reached demonstrated the need for an independent investigative body (NTSB, 2000b).

In 1938, the Civil Aeronautics Act was passed, creating the CAA. Within the CAA was a three-person Air Safety Board. This Air Safety Board was granted the authority to exercise both investigative and judicial powers in determining the cause of accidents. Overall, the CAA had responsibility for establishing federal regulations governing the licensing of pilots and navigators, the establishment of Victor airways--air routes for commercial airliners--and the certification of airports and radio navigation stations.

In 1940, the CAA was reorganized. The Civil Aeronautics Authority became the Civil Aviation Administration and gained the additional responsibilities of aircraft certification, establishment of a nationwide air traffic control system, and creating Federal Aviation Regulations (FARs). The CAA also carried the equally important responsibility of creating an environment favorable for airline companies to grow and flourish. The Air Safety Board was abolished in favor of the five-member CAB. Air accident investigative duties were absorbed into the newly formed CAB's Bureau of Aviation Safety (NTSB, 2000b).

In 1967, Congress passed the Safety Board Act, which created the independent NTSB within the newly formed DOT, and expanded the NTSB's authority to look at mishaps in all modes of transportation, such as railroad, highway, and marine (NTSB, 2000b).

In 1974, with the passage of the Independent Safety Board Act, Congress made the NTSB completely independent of the DOT. In making the NTSB independent, Congress stated,

> Proper conduct of the responsibilities assigned to this Board requires vigorous investigation of accidents involving transportation modes regulated by other agencies of government . . . and calls for the making of conclusions and recommendations that may be critical of or adverse to any such agency or its officials. No federal agency can perform such functions unless it is totally separate and independent from any other . . . agency of the United States. (NTSB, 200b, p. 9, 12-13)

Investigative Authority

In the U.S., the NTSB has the task of investigating transportation accidents. The NTSB's mandate to investigate aircraft accidents, independent of federal departments designed to oversee and regulate aircraft activities, is spelled out in several federal publications. These publications cite the agency's authority to conduct such investigations and describe, in general, the procedures by which the agency is to carry out accident investigation.

The source of the NTSB's authority to investigate transportation accidents is founded in the Independent Safety Board Act of 1974, specifically Section 304, which states,

> The Board shall (1) investigate or cause to be investigated (in such detail as it shall prescribe) and determine the facts, conditions, and circumstances and the cause or probable cause or causes of any (A) aircraft accident which is within the scope of the functions, powers, and duties transferred from the Civil Aeronautics Board; . . . (B) highway accident, including any railroad grade crossing accident; . . . (C) railroad accident in which there is a fatality, substantial property damage, or which involves a passenger train; (D) pipeline accident in which there is a fatality or substantial property damage; (E) major marine accident; . . . and (F) other accident which occurs in connection with the transportation of people or property which, in the judgment of the Board, is catastrophic, involves problems of a recurring character, or would otherwise carry out the policy of this title. Any investigation of an accident conducted by the Board . . . shall have priority over all other investigations of such accident conducted by other Federal agencies. (Public Law 93-633, 1975, p. 2)

The NTSB's organization and functions are described in federal regulations, specifically U. S. Title 14, Code of Federal Regulations Part 800, which states,

> The primary function of the Board is to promote safety in transportation. The Board is responsible for the investigation, determination of facts, conditions, and circumstances and the cause or probable cause or causes of: All accidents involving civil aircraft, highway accidents, . . . railroad accidents, . . . pipeline accidents, . . . and major marine casualties and marine accidents involving a

> public or nonpublic vessel or involving Coast Guard functions. The Board makes transportation safety recommendations to federal, state, and local agencies and private organizations to reduce the likelihood of recurrence of transportation accidents. It initiates safety studies and special investigations pertaining to safety in transportation, assesses techniques and methods of accident investigation, evaluates the effectiveness of transportation safety consciousness and efficacy in preventing accidents of other government agencies, and evaluates the adequacy of safeguards and procedures concerning hazardous materials. (U.S. Title 14, 1989, p. 2)

In exercising its functions, duties, and responsibilities, the NTSB utilizes its staff, divided into offices that have responsibility over particular areas of transportation safety and perform technical work for the Board (U.S. Title 14, 1989). "The staff advises the Board and performs duties for the Board that are inherent in the staff's position in the organizational structure or that the Board has delegated to it" (p. 2). Procedures and policies exercised by the NTSB are set forth in the agency's internal directives. These directives include administrative rules that govern the activities of employees and organizational components that provide structure for communications and procedures for executing the agency's activities. The internal directives system is designated as the NTSB Manual and consists of instructions, which include NTSB Orders and NTSB Notices (U.S. Title 14, 1989).

General guidelines that address what constitutes an airplane accident are spelled out in U.S. Title 49, Code of Federal Regulations Part 830. This section covers rules pertaining to initial notification of an accident, the need to preserve the aircraft wreckage to include mail, cargo, and records on the accident aircraft or at the aircraft's maintenance base facility, and the reporting of an accident (U.S. Title 49, 1995).

Delegated authority to the NTSB investigative team, specifically the IIC, is further defined in U.S. Title 49, Code of Federal Regulations Part 831. This section reiterates the provisions of the Safety Board Act, stating that the NTSB investigation of an accident has priority over all other investigations of such accidents or incidents. Part 831 also describes rules pertaining to the protection of trade secrets and other proprietary information, the authority of the IIC to receive reports on autopsies conducted on victims in an accident, imposing restrictions on the degree of access by persons outside of the investigation to airplane wreckage, direction on the flow and dissemination of accident information, and instructions on the receipt of additional submissions of information pertaining to an accident that originate outside the scope of the investigation. Part 831 also describes the purpose of "parties to the investigation" and the rules by which party members must abide during the course of an investigation (U.S. Title 49, 1997).

The Investigative Process

The NTSB investigative process with respect to aviation crashes is documented in several internal agency publications but most specifically in the Board's Aviation Investigation Manual series. *Major Team Investigations* (NTSB, 1995a) describes activities pertaining specifically to major aircraft accidents, primarily those involving commercial airlines. *Regional Investigations* (NTSB, 1995b) describes those activities pertaining to the investigation of aircraft accidents that are localized in scope. Regional investigations also can involve commercial airlines but are more specifically centered on the investigations of smaller general aviation aircraft. The investigative process described to the general public reflects mostly the activities that surround major commercial airline accidents. However, the elements and methods that underlie the investigative process are applicable to all the modes of transportation under the responsibility of the NTSB. For the purpose of this discussion, we present the process that is used with respect to all aviation accidents investigations. We start with major team investigations (NTSB, 1995e).

Major Team Investigations

At the core of a major NTSB investigation is the major investigations team or "Go Team." The purpose statement of the NTSB Go Team is simple and effective: Begin the investigation of a major accident at the accident scene as quickly as possible, assembling a broad spectrum of technical expertise that is needed to solve complex transportation safety problems (NTSB, 1995a).

The team can number from three or four investigators to more than a dozen specialists from the NTSB's headquarters staff in Washington, D.C., who are assigned on a rotational basis to respond as quickly as possible to the scene of the accident. Go Teams travel by commercial airliner or government aircraft, depending on circumstances and availability. NTSB Go Teams have rapidly responded to catastrophic airline crash sites for more than 30 years. A wire diagram of a typical full Go Team is provided at Figure 3.

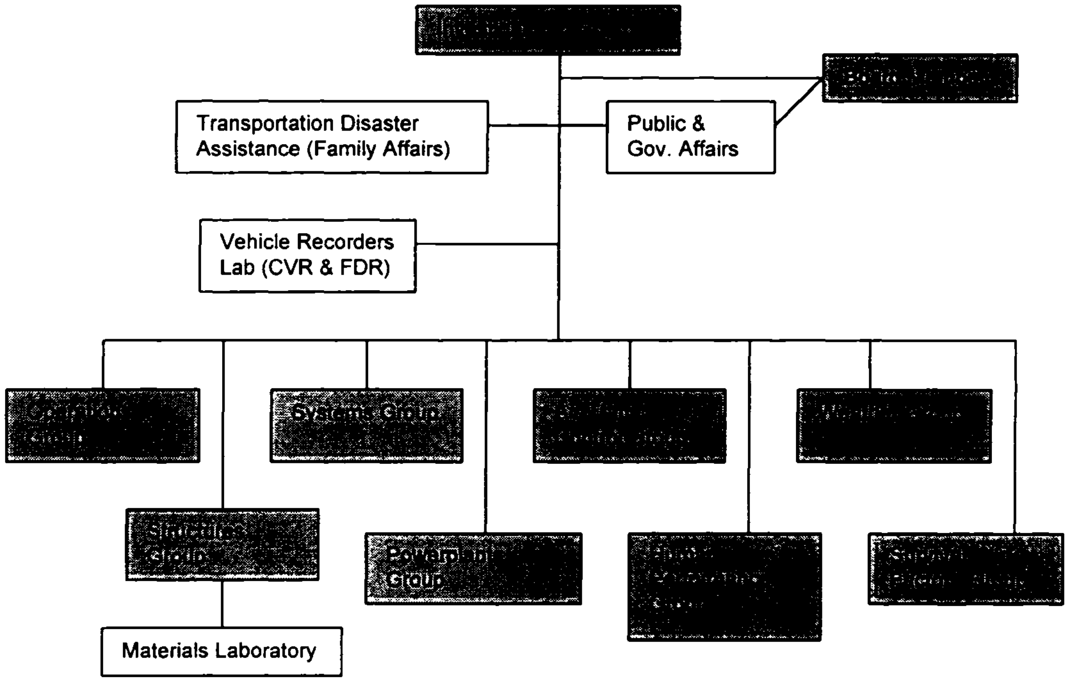

Figure 3. NTSB major investigations team organization.

During their time on duty rotation, Go Team members must be reachable 24 hours a day by telephone at the office or at home or by pager. Most Go Team members do not usually have suitcases prepacked because there is no way of predicting where the next accident scene will be. NTSB Go Teams in the 1990s responded to accident sites in the swamps of the Florida Everglades in late spring, the wind-swept plains of South Dakota in midwinter, and the jungles of Guam, Indonesia, and Africa. Go Team members do keep the tools of their trade handy: carefully selected wrenches, screwdrivers, and devices peculiar to their specialty. Common equipment to all Go Team investigators includes flashlights, tape recorders, digital cameras, measuring devices, and lots of extra cassettes, batteries, and discs (NTSB, 1995a).

The Go Team's immediate boss is the IIC, a senior investigator with years of NTSB and industry experience. Each investigator on the team is a specialist responsible for a clearly defined portion of the accident investigation. In aviation, these specialties and their associated responsibilities fall into categories or groups. Each group has a named chairman responsible to the IIC for ensuring that the work in his or her specialty is met by its members. The groups can have as few as two or three persons in them, as in the case of examining aircraft records, to as many as 20 or 30 people examining airplane structure and matching parts together (NTSB, 1995a). The following are the common groups associated with a major air safety investigation.

Operations Group. The Operations Group documents and examines the history of the accident flight and the crewmembers' duties for as many days prior to the crash as appear relevant.

Structures Group. The Structures Group documents the airframe wreckage and the accident scene, including calculation of impact angles to help determine the plane's preimpact course and attitude.[4]

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[4] The Structures Group chairman is usually an aircraft design specialist in aerospace, mechanical, or structural engineering. Members assigned to the Structures Group come to the crash scene with similar credentials. The Structures Group is responsible for reassembling or "laying out" the fractured parts of an airplane to determine how the airplane came apart. During the TWA Flight 800 investigation (NTSB, 2000a), the Structures Group reassembled the entire fuselage of the Boeing 747, airplane including body fuel tanks, cargo compartments, the two passenger decks, and the flight deck, to determine the origin of the explosion that tore the airplane apart in flight and to document how the airplane came apart after the explosion. The reassembly involved hundreds of thousands of broken airplane pieces and required the 50-person team 14 months to complete (NTSB, 1995a).

Powerplants. This group is responsible for examining the airplane's engines, propellers (if applicable), and engine accessories such as fuel pumps, fuel distribution components, ignitors (spark plugs), and other associated components.

Systems Group. This group examines the components of the airplane outside of the engines. The "systems" this group examines include hydraulic systems and associated components such as landing gear, brakes, and flight control actuators; electrical systems such as generators, lighting, and electric motors that power flaps and trim tabs; pneumatic systems such as cabin heating and cooling, pressurization and oxygen, and flight instrumentation; and elements of the flight control system such as ailerons, spoilers, elevators, rudders, and flaps (NTSB, 1995a).

Air Traffic Control Group. This group examines air traffic services given the airplane's crew to include in-flight weather briefings, traffic separation, and flight clearances. This group, with the assistance of the FAA, also acquires air traffic control (ATC) radar data and transcripts of controller-pilot radio transmissions to aid in reconstructing the events leading up to the accident.

Weather Group. This group of specialists gathers and examines all pertinent weather data pertaining to the area at the time of the crash. The group uses data obtained from National Weather Service and National Oceanographic and Atmospheric Agency stations and sometimes from local TV stations. Most of this group's members hold degrees in meteorology or have experience in weather prediction modeling and forecasting.

Human Performance Group. This group studies the crew's performance and all before-the-accident factors that might have led to human error, including fatigue, medication, alcohol consumption, illicit and prescription drugs, medical histories, training, workload, equipment design, and work environment.[5]

Survival Factors Group. This group is responsible for documentation of impact forces and injuries to crew and passengers. This group also examines evacuation routes and procedures and survival equipment and assists local jurisdictions with community emergency planning and crash-fire-rescue efforts.

Working under the direction of the IIC, each of the group chairmen charges his or her group in their area of expertise. Each of these groups is, in effect, a subcommittee of the overall investigating team. The groups are staffed by representatives of the "parties" to the investigation. In a major team investigation, the party members include the FAA, the airline, the pilots' and flight attendants' unions, airframe and engine manufacturers, and the like. Senior pilots from the airlines assist the operations group; manufacturers' experts, the structures, systems, and powerplants groups and so forth. Often, added groups are formed at the accident scene--aircraft performance, maintenance records, and witnesses, for example. Flight data recorder and cockpit voice recorder teams assemble at NTSB headquarters (NTSB, 1995a).

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[5] Human performance is often equated to examining and determining "pilot error" as the most probable cause of an accident. However, human performance involves not only examining the actions of pilots but also examining and determining if the actions of aircraft maintainers, manufacturers, company corporate culture, and even other federal regulatory agencies contributed to an accident (NTSB, 1995a).

In surface accident investigations, teams are smaller and working groups fewer, but the team technique is the same. Locomotive engineers, signal system specialists, and track engineers head working groups at railroad accidents. The specialists at a highway crash usually include a vehicle expert with mechanical knowledge and a highway engineer. The NTSB's weather, human performance, and survival factors specialists respond to accidents in all transportation modes (NTSB, 2000a).

At least once daily during the on-scene phase of an investigation, one of the five members of the NTSB itself, who accompanies the team, briefs the media on the latest factual information developed by the team. Although a career investigator runs the inquiry as IIC, the board member is the primary spokesperson for the investigation. A public affairs officer also maintains contact with the media. Confirmed, factual information, reviewed by the IIC, is regularly released. The public affairs officer takes special care to insure that hypothesis and speculation over the cause of an accident, often the products of the groups' discussions, are not released (NTSB, 1995a).

At major accidents, family affairs specialists also accompany the team to fulfill the NTSB's responsibilities under the Aviation Disaster Family Assistance Act of 1996. Family assistance specialists coordinate with other federal, state, and local agencies and offices to ensure that victims' remains are recovered and identified, that next-of-kin are notified and coordinated with regarding the disposition of remains and the victims' personal effects, that family members are protected from media representatives, and that crisis counseling is available to family members who might need it (NTSB, 1996b).

The individual working groups remain at the accident scene as long as necessary to see their respective functions completed. How long the groups are on scene can vary from a few days to two weeks. Some groups then travel to other locations to conduct more detailed examinations. For instance, the powerplants group proceeds to the engine manufacturer or to an overhaul facility to conduct an engine teardown and examination. The operations group might proceed to the airline's training base to examine training practices and aircrew records. Some failed airplane components might exhibit corrosion or signs of fatigue. The structures group would then employ the expertise of the metallurgists at the NTSB Materials Laboratory in Washington, D.C. The groups' work continues at the headquarters in Washington and at locations around the country, even overseas, where expertise and proper facilities can be obtained. The groups form the basis for later analysis and drafting of a proposed report that goes to the NTSB itself, perhaps 12 to 18 months from when the accident occurred. Safety recommendations may be issued at any time during the course of an investigation (NTSB, 2000a).

Aviation Go Teams respond only to accidents that occur on U.S. territory or in territorial waters. Elsewhere in the world, when accidents involving a U. S. company or manufactured aircraft occur, the lead investigative authority is the government in whose country or territory the accident happens. In most of these situations, the host country is offered the assistance of a U. S. "accredited representative," a staff senior investigator from the NTSB. The accredited representative acts as an advisor with respect to investigative issues, coordinates with other U. S. government agencies who might have an interest in the accident, and oversees the work of U. S. manufacturers whose aircraft or component is involved and whose assistance is requested by the host country (NTSB, 2000d).

Investigations Discovering Criminal Involvement

In crashes in which suspected criminal activity is discovered, other agencies may become involved and even lead the investigation. The NTSB does not investigate transportation mishaps as the result of criminal activity. Once it has been established that a transportation tragedy is, in fact, a criminal act, the Federal Bureau of Investigation (FBI) then becomes the lead federal investigative body. The NTSB may remain with the investigation, providing vehicle investigative expertise in a supporting role.

An example of this was the crash of a Pacific Southwest Airlines (PSA) aircraft in San Luis Obispo, California, on December 7, 1987. All 43 persons aboard the British-built BAC-146 jet died in the crash. Because of information conveyed over the radio by the flight crew to an air traffic control facility shortly before the crash, the FBI initiated its own low-profile investigation to determine if a criminal act had been committed. Within days of the crash, NTSB vehicle performance technicians listening to the cockpit voice recording, determined that someone else was in the airplane's cockpit with the crew and that several "popping sounds inconsistent with normal flight activity were heard" (NTSB, 2000a, p. 3). NTSB investigators immediately contacted the FBI. Soon after that, the NTSB learned that a former employee of the airline had boarded the plane with a pistol. While the airplane was at cruise altitude along the California coast, the employee shot the flight crew, subsequently causing the aircraft to lose control and crash. When this was revealed, the FBI assumed control of the investigation. NTSB investigators were asked to stay on and advise FBI agents on aircraft investigation techniques. The advice helped the FBI resolve the criminal case in a timely manner.

The relationship among federal agencies with respect to discovery of criminal activity in transportation accidents has been further defined by legislation passed in 1998. Currently, so as to avoid confusion during the initial chaotic moments immediately following a crash over who is to have jurisdiction to investigate the mishap, the NTSB is charged to have "first look" authority. Should evidence of criminal activity be discovered, the NTSB chairman then notifies the Attorney General. Only then will the NTSB relinquish control over a crash investigation (NTSB, 1977).

Safety Recommendations

Safety recommendations are the most important part of the NTSB 's mandate. The NTSB must address safety deficiencies immediately, and therefore, it often issues recommendations before the completion of the investigation. Safety recommendations are based on findings of the investigation and may address deficiencies that do not pertain directly to what is ultimately determined to be the cause of the accident (NTSB, 1995c).

During the investigation of the crash landing of a DC-10 passenger jet in Sioux City, Iowa, in 1989, the NTSB issued recommendations on four separate occasions before issuance of its final report on the case. One of the recommendations had to do with solving the material failure of a turbine disk in an engine that, when it came apart, sent pieces of metal through the hydraulic flight control component, which subsequently rendered the airplane without flight controls. The recommendation asked the FAA to demand more stringent inspections of engine components for fatigue, cracks, and other material deficiencies. The recommendation was issued and adopted a full year before the NTSB concluded its investigation of the crash. In the case of the crash of a French-built ATR-72 in Roselawn, Indiana, in 1994, the NTSB issued urgent safety recommendations regarding tail plane icing less than a week after the accident. In the TWA Flight 800 investigation, once it was determined that an explosion in the center fuel tank caused the breakup of the aircraft, the NTSB issued urgent safety recommendations aimed at eliminating explosive fuel/air vapors in airliner fuel tanks. These recommendations were issued three years before the investigation was complete (NTSB , 2000a).

NTSB recommendations are not issued for all transportation crashes that occur. Some accident cases do not warrant recommendations. This is especially true with most human-error/operator-caused accidents, although sometimes recommendations in this area are formulated. Recommendation proposals may originate from numerous sources. They do not always find their origins in the NTSB. Manufacturers, operating companies, other government agencies, and even private citizens have put forth ideas from which safety proposals have been formed. Recommendations are the product of many people with technical, economic, and political expertise. Safety recommendations cannot go forward if they are not feasible with respect to technology available and cost involved. This is why it may be several years following an accident before the NTSB issues safety recommendations.

Safety recommendations have no power in and of themselves. A safety recommendation cannot force a company, an agency, or any group to act. Some safety recommendations are rejected, mostly because of a lack of feasibility and cost. But because it is the NTSB that issues a recommendation, by virtue of its reputation to get the right answers to transportation safety problems, over 85% of NTSB recommendations are adopted as issued. Safety recommendations that are not adopted are often placed on the NTSB's "Most Wanted Recommendations" list. The list is heard, adopted, and published annually by the NTSB. It shows the public that the NTSB is continuing its pursuit of safety changes, in particular, safety deficient areas. Some areas that have been or are currently on the most wanted list include airport runway incursion accidents, front seat passenger airbags in automobiles, smoke detectors and fire extinguishers on cargo airplanes, and improved railroad grade crossing technology (NTSB, 2000a).

Public Hearing

The NTSB gathers information in transportation accidents through numerous sources. One of the tools investigators use is the public hearing. The NTSB may hold a public hearing as part of a major transportation accident investigation. The purpose of the hearing is twofold: first, it is used to gather sworn testimony from subpoenaed witnesses on issues identified by the NTSB during the course of an investigation, and second, it allows the public the opportunity to observe the progress of an investigation. Hearings are usually held within six months of an accident, but may be postponed for complex investigations (NTSB, 1995a).

During a public hearing, companies whose products or operations are involved in an accident may be called to testify to questions about their products or operations. Outside experts are often called in to testify about complex or abstract circumstances that might surround an accident. During the public hearing involving the crash of TWA Flight 800, astrophysicists and mathematicians were called to testify as to what the chances were that the Boeing 747 involved in the accident was brought down by a meteor striking the airplane. During the same hearing, ballistics and explosive experts were brought in to address the possibility that the airplane was shot down by a surface-to-air missile (NTSB, 1996c).

Final Actions and Issuance of a Blue Cover Report

An accident investigation continues until all known aspects possibly underlying the accident have been addressed. This process takes several months and often involves specialized testing and analysis. During this time, additional witnesses are interviewed. Their statements are prepared, and reviewed, compared, and analyzed. Records are obtained and reviewed. Discrepancies in the records are addressed and resolved. The results of medical tests and autopsies, conducted shortly after the accident, are obtained and analyzed. The results of group analyses, air traffic control data, voice recordings, vehicle performance data, and so forth are all gathered, integrated, and analyzed by the investigative team. When the IIC is satisfied that every aspect pertaining to an investigation has been addressed, the team is then ready to prepare a final draft report for presentation to the NTSB.

During the time that the report draft is being prepared, the investigative team holds technical review meetings to determine that their work is complete and accurate. Companies and agencies that are participating in the investigation as party members attend these meetings. Party members do not participate in the data analysis or the draft-report writing phases of NTSB investigations, but they are invited to submit their proposed findings of cause and proposed safety recommendations, which are made part of the public docket.

When the report is ready, the NTSB members are polled to set a date for a board meeting to hear the case, its findings, and proposed recommendations. NTSB meetings on major transportation accidents are held at NTSB headquarters in the agency's boardroom, a 500-seat auditorium located in the mall level of L'Enfant Plaza, Washington D.C. Board meetings are subject to the sunshine laws and are open to the public and the media. Accident victims' family members and non-NTSB investigative persons, such as the party members, can also attend the board meeting. But during the meeting, the party members cannot interact with the NTSB team or members as they present and consider the case. All board meetings are videotaped and retained for public record. Many of the major accident cases, such as the TWA Flight 800 case and the USAir 427 crash at Pittsburgh, have been televised live over C-Span and other cable outlets.

During the meeting, the IIC and his/her team present the case, their research, and their findings. They also present a list of proposed recommendations for the NTSB to adopt. As the team makes its presentation, NTSB members may interject questions for the purpose of clarification. At the end of the presentations, the NTSB members deliberate over the final report during the open session. On completion of their deliberations, the members vote on whether to accept the report, its findings, and the proposed recommendations as they are or to make changes or to reject the findings, close the meeting, and send the investigative team out to reformulate its findings for another board meeting at a later time. Should the NTSB adopt the investigative team's findings, the NTSB members then determine and issue a statement of the accident's most probable cause (NTSB, 1996a).

Once a major report is adopted at a board meeting, a final "blue cover" report is prepared and published. The blue cover report contains an abstract of the case. It also contains a narrative of the events leading to the accident and describes research and examination results discovered during the course of the investigation (NTSB, 1996a). An abstract of that report containing the NTSB 's conclusions, probable cause, and safety recommendations is also placed on the NTSB 's website under "Publications." The full report appears typically on the website several weeks after the board meeting on the case has concluded (NTSB, 2000a).

Regional Investigations

Regional investigations are so named because they involve aircraft accidents that are localized in scope. These accidents are usually investigated by air safety investigators assigned to one of the NTSB regional offices across the county. Regional investigations involve small, usually two- to four-seat, single-engine or twin-engine, propeller-driven aircraft and result in a small number of fatalities or serious injuries, such as one or two individuals. Small airplane accidents do not usually draw the attention of the entire nation as does the crash of a large commercial jet operated by a major airline and carrying hundreds of people. The attention paid, if any, to the crash of a single-engine Cessna airplane in which one or two people are killed is usually confined to the area where the crash occurs (NTSB, 1991). There are exceptions to this, however. Occasionally a small airplane accident draws the attention of the entire nation or the world. The 1996 crash in Cheyenne, Wyoming of a four-seat, single-engine Cessna Cardinal that took the life of seven-year-old Jessica Dubroff, as she attempted to become the youngest person to pilot an airplane across the U.S., drew national attention. The crash also took the lives of her father and her flight instructor. Another example of a small airplane crash that drew national attention was the accident that took the lives of John F. Kennedy, Jr., his wife, and his sister-in-law. In that accident, a six-seat, single-engine Piper Saratoga was involved (NTSB, 2000d).

Six NTSB regional offices and four field offices are located in the continental U.S. and Alaska. Each office is located near a large city with a large commercial airport nearby. This strategic location serves two purposes. First, the larger airports provide more flights, enabling a regional investigator to respond quickly following an aircraft accident. Second, the major airports are often a nucleus for commercial air carrier incidents. Commercial jets occasionally experience problems that might involve the failure of a critical system or cause damage to the aircraft but not necessarily injure people. These aircraft are easily accessed at the major airports. Each regional office has responsibility for investigating small aircraft accident or incidents within their designated geographical area (see Figure 4). The regional offices vary in size and number of investigators assigned to them based on the size of the geographical area they must cover and the degree of aviation activity common to that area (NTSB, 2003b). For example, the NTSB North Central Regional Office, Aviation, in Chicago, has responsibility for 11 states that make up the central plains and the Great Lakes states. Within this region are six major airports. Two of them are located in Chicago. The office, when at full personnel strength, has eight investigators poised to respond to a crash at a moment's notice. On average, this office investigates more than 350 aircraft accidents annually (NTSB, 1997a).

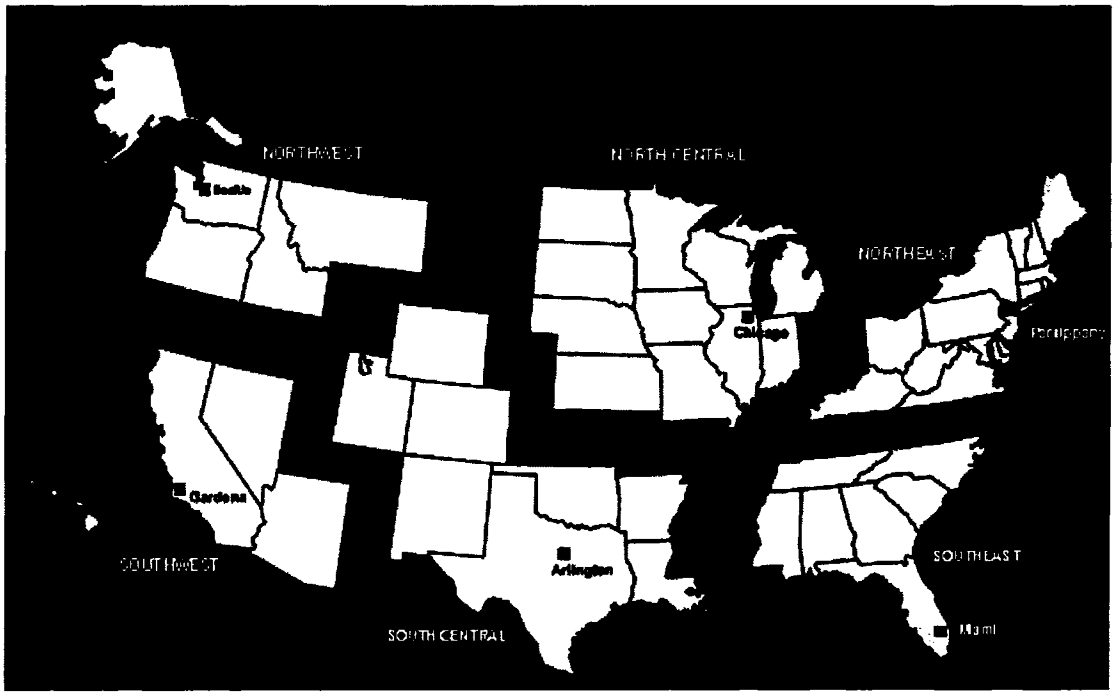

Figure 4. NTSB aviation regional offices geographical areas of responsibility.

Overall, the NTSB investigates approximately 2,500 to over 3,000 aircraft accidents each year. The majority of these investigations (roughly 96%) are conducted by air safety investigators assigned to the regional offices (NTSB, 1997a).

Regional investigations are unique in that they usually involve dispatching a single air safety investigator. This investigator, in essence, performs all the functions that a major team investigation IIC and all of the group chairmen do on a major accident. The regional investigator, on arrival at an accident scene, must rapidly assess the situation and then set the tone for conducting the investigation. The regional investigator first coordinates with on-scene incident commanders to determine the extent of rescue and recovery of survivors. Then he/she begins working with the local medical examiner or coroner so as to coordinate victim recovery and future autopsies and toxicology examinations. Once the scene is stabilized and secure, the regional investigator gets down to the business of investigating the crash.

The regional investigator, in addition to performing the tasks of examining aircraft structures, systems, and powerplants, must also interview witnesses, review aircraft and pilot records, look into the pilots' training, talk to the media as the investigation's spokesperson, and interact with the victims' family members (NTSB, 1995b).

Regional investigators can be called upon by the NTSB to present their findings at a public NTSB meeting once the investigation has concluded. Regional investigators draft proposals for safety recommendations and work with operators and manufacturers to effect changes for improving safety, just as do their major team counterparts (NTSB, 1995b).

Not all regional investigations involve small airplanes or are localized in scope. Regional investigators have found themselves as the IIC of accidents involving noteworthy people such as entertainment celebrities and politicians. As previously mentioned, the crash of a single-engine Piper Saratoga airplane off the coast of Cape Cod, Massachusetts, on July 16, 1999, which took the lives John F. Kennedy, Jr., the son of the former president; his wife; and his sister-in-law was a regional investigation that gained national attention. The lead investigator responded from the NTSB regional office at Parsippany, New Jersey. He received assistance from other regional investigators from the regional offices in Chicago, Washington, Atlanta, and Miami.

The human interest in the accident, by virtue of who was killed in the crash, was global in scale and so was the media coverage of the investigation (NTSB, 2000d).

Although a regional investigator is sometimes referred to as a "one-man-band" when he or she responds to a crash, the investigator does receive resistance. The nearby FAA Flight Standards District Office is also notified of an accident at the same time the NTSB receives notification. The FAA usually dispatches two persons, an operations inspector and a maintenance inspector, to the scene to join with the NTSB investigator as a part of his or her investigative team. The regional investigator can also draw on resources from the headquarters in Washington, if necessary. For example, if an accident involved the collision of two airplanes when under air traffic control, the NTSB headquarters would dispatch, at the investigator's request, an air traffic control specialist to assist the investigator. Another example would be if an accident involved the catastrophic failure of an engine. In this case, the regional investigator could request assistance from a powerplants specialist from the headquarters. When specialists are called upon from the regions, they serve as group chairmen and prepare reports for the regional investigator to include in his or her final report, just as they do for a major team investigation (NTSB, 1995b).

Regional investigators also receive technical assistance from parties to the investigation, principally aircraft and engine manufacturers. Within the first hours following the initial notification of an aircraft accident, a regional investigator assesses the type of aircraft involved and the complexity of its systems and, from that, determines the degree of assistance he or she will need to adequately conduct the investigation. As the investigator prepares to travel, he/she often contacts the manufacturers and invites them to participate in the investigation. To be a party member, the exception being the FAA, a manufacturer, operator, or union representative must be invited by the NTSB investigator to participate. Manufacturers cannot just show up at the accident site expecting to be a part of the investigative team (NTSB, 1995b).

The Role of the FAA in Aircraft Accident Investigation

The FAA is one of several agencies that fall under the DOT, one of the 13 presidential cabinet-level positions. At the time this research was conducted, the Honorable Norman Minetta was the Secretary of Transportation. The FAA administrator was Ms. Jane Garvey, an appointee from the previous administration of President Bill Clinton. The FAA is a regulatory agency that provides oversight in nine areas of responsibility. The largest area the FAA maintains responsibility for is air traffic control services. This includes training, staffing, and oversight of all airport control towers, local radar approach controls, and the 22 air traffic control centers in the continental U.S., Alaska, and Guam. Almost two-thirds of the agency's employees are affiliated with air traffic control. The other areas of FAA responsibility include airport certification and oversight, navigation facilities, establishing and maintaining the national airway system, aircraft certification, pilot licensing and medical certification, ground-based automated weather facilities, airport security, and aviation safety. The FAA employs approximately 49,900 people. Of that number, about 6,200 inspectors are involved with regulation, certification, and safety. It is through these employees that the FAA oversees the air carrier industry as well as all licensed pilots and aircraft operators (FAA, 2002s).

The FAA's safety responsibility falls into two areas. The first is to act as a party member under the NTSB party process. In this way, inspectors from the FAA's headquarters or from out of one of the flight standards district offices (FSDO) travel to support an NTSB investigative team or individual IIC in an aircraft accident investigation. As a party member, the FAA adheres to the rules regarding interested parties as spelled out in Title 49 (1977), Code of Federal Regulations, *Transportation*, Part 831. FAA inspectors provide information to the NTSB with respect to an aircraft's certification, its planned route of flight, a pilot or crew's communications with air traffic control facilities, weather data, radar data obtained from air traffic control facilities, and pilot certification and medical information.

The second safety area the FAA provides for is to act as an NTSB investigator's hands, eyes, and ears in "limited" accident investigations. Limited investigations are those in which an aircraft accident occurs that usually does not involve injuries to persons on board or on the ground but does substantial damage to the aircraft. What constitutes substantial damage is somewhat subjective; however, it usually involves the bending or breakage of some major structure on the aircraft, such as a wing spar or cabin pressure bulkhead. Substantial damage can be anything from a bend in an airplane's firewall to an insurance company's declaration that the aircraft is "totaled," that is, beyond reasonable repair. During a limited investigation, FAA inspectors perform most of the tasks that a NTSB IIC does on an accident site with respect to the aircraft. Unlike a NTSB investigator, FAA inspectors usually do not conduct media interviews or interact with family members. Usually, two inspectors are dispatched from a nearby FSDO. One of these inspectors must have experience in aircraft maintenance. The other is experienced with aircraft operations. The inspectors take photographs, interview witnesses, gather and review maintenance records, and, if provided the opportunity, speak with the pilot and any passengers on board the aircraft. The information gathered by the FAA inspectors is conveyed to the NTSB IIC assigned to the case.

From his/her regional office, the NTSB IIC coordinates and gathers additional information to add with the information gathered by the FAA to put together a factual report on the accident. The NTSB investigator sends paperwork to the pilot involved in the accident to fill out and return. This paperwork provides the pilot the opportunity to tell his or her story with respect to the aircraft accident. Once all of the information is gathered, the NTSB investigator writes and submits his/her factual report and recommendations for causes and factors relating to the accident.

There are 83 FSDOs in the 50 states, employing approximately 1,000 inspectors. The number of inspectors assigned to a FSDO is based on the geographical area to be covered and the volume of aviation activity in that area. For example, Wyoming has a few pockets of concentrated commercial air activity (Casper, Cheyenne, and Jackson) but overall is considered a small aviation area. Therefore, the Casper office, responsible for overseeing aviation activity in the entire state, has six inspectors assigned. A major aviation hub such as Chicago has two FSDOs within 15 miles of each other. One FSDO, the O'Hare FSDO at Schiller Park, Illinois, is dedicated entirely to aviation activity within the immediate five-mile radius vicinity of O'Hare International Airport. This FSDO has authorized 46 inspectors, the majority of whom are dedicated to air carrier issues (FAA, 2002).

As the inspectors are gathering information for the NTSB, they are also using the information for their own parallel investigation involving possible violations to theFAA or to identify safety deficiencies best solved through the issuance of airworthiness directives. Under the party process, the NTSB conveys information to the FAA inspectors that the IIC obtains through his/her work back at the regional office. The NTSB can bring in other interested parties on a limited investigation. In these situations in which an interested party sends a representative to an accident site, the FAA inspectors provide oversight for the NTSB. The interested party representative, prior to his or her arrival on an accident site, coordinates with the NTSB IIC and signs a party statement as required under Part 831 (U.S. Title 49, 1997). All information gathered by a party member is shared with the FAA at the site and passed on to the NTSB IIC.

The limited investigation was born out of an NTSB restructuring in 1991. Prior to this time, similar nonfatal accidents were delegated to the FAA. The NTSB still produced a report on a delegated accident, but they had little involvement. FAA inspectors were responsible for overseeing and conducting the investigation. After gathering the information, the inspector would send the data to the NTSB regional office to turn into a report. This system produced too many errors and drew criticism, mostly from airframe and engine manufacturers but also from surviving family members who belived the investigation was not getting a proper look. The limited investigation format provides more direct involvement by the NTSB and conserves its investigator resources for fatal and serious injury accidents and air carrier incidents.

Supporting Aviation Crash Investigations: The Party Process

As mentioned earlier, the NTSB investigates approximately 2,500 to 3,000 aviation accidents and incidents each year. Additionally, the NTSB investigates about 20 to 25 accidents in the other modes of transportation--rail, highway, marine, and pipeline. With approximately 400 employees, the agency cannot possibly cover all technical issues involved in so many accident investigation cases without some help. Therefore, the NTSB is given the authority to bring in outside resources with the expertise needed to conduct and complete its accident cases successfully. The primary vehicle used to gain these resources is for the NTSB to designate parties to its investigations.

A party member is a representative from a company or agency outside of the NTSB who possesses some technical knowledge or expertise specific to his/her company's product or his/her company's operation, which the NTSB investigative team needs to conduct and resolve its investigation. The description, roles, and responsibilities of party members are described in federal law, specifically U. S. Title 49 (1997) Code of Federal Regulations Part 831, and in NTSB publications, such as accident investigation manuals (NTSB, 1995a), board orders (NTSB, 1995c, 1996a), and memorandums of agreement (NTSB, 1991).

A party member is usually designated by the IIC, with one exception, that being the FAA. By law and design, the FAA is automatically designated as a party in all NTSB aircraft accident investigations (NTSB, 2000a).

The NTSB has complete discretion over which organizations it designates as parties to the investigation. All persons participating in the investigation must be in a position to contribute specific information or skills that would not otherwise be available to the NTSB. Also, no participating organization can be represented by a person whose interests lie beyond the safety objective of the accident investigation. Public law and NTSB rules specifically prohibit any party from being represented by a person who also represents claimants or insurers (U.S. Title 49, 1997).

In aviation accident investigations, the primary role of organizations outside the agency participating in an investigation is to assist the NTSB in developing a complete factual record of the accident. Likewise, allowing responsible safety officials whose product or services might be involved to participate as parties enables them to have immediate access to facts regarding the accident from which they may initiate preventive and/or corrective actions (NTSB, 1995a).

During the field portion of an accident investigation, manufacturing and operator representatives participate as members of the investigative team. In major team investigations, the party members may be assigned to various groups, depending upon their specific expertise. For example, a chief pilot from an airline would be assigned to the operations group and would be relied upon for information regarding the crew, the passenger manifest, dispatcher activities prior to the flight, the planned route of flight, and any information regarding preflight briefings and actions. Engine manufacturer representatives would be assigned to participate as members of the powerplants group and would provide technical assistance, manuals, publications, and other information to the powerplants group chairman regarding the airplane's engines.

Being a team member at the accident site does not necessarily mean the same individual would represent his or her company at an NTSB public hearing or any formal proceedings prior to an NTSB meeting of the accident or of NTSB safety proceedings or studies that might originate as the investigation progresses. The individual would act as a party coordinator, however, allowing the opportunity for other members of the company, perhaps more knowledgeable in areas of interest to the NTSB, to participate in those activities (NTSB, 1995a). Participation in the field investigation does not automatically guarantee party status at such hearings or meetings, if one or several are held. Likewise, participation in the investigation is not a prerequisite for participating in a hearing.

Party members must be responsive to the direction of the NTSB. Party members may be expelled from the investigation if they conduct themselves in a manner prejudicial to the investigation or if they do not comply with their assigned duties (U.S. Title 49, 1997).

In regional investigations in which a single NTSB investigator is dispatched, the use of manufacturers and company representatives is often necessary to the investigation's overall success. With hundreds of variants in the makes and models of aircraft, engines, systems, and avionics in the U. S., one investigator cannot be an expert on all of them. Party members thus provide the specific expertise on their product that an investigator needs in conducting the investigation. Regional investigators carefully select party members on a case-by-case basis. Investigators are not required to designate interested parties to participate in the investigation. As previously mentioned, representatives must be invited by the NTSB to participate. Party membership on an investigative team is not a "right" (NTSB, 1995b).

When considering potential party representatives, the IIC must have an idea of the kind of expertise he or she needs from a particular company. Conversely, the company involved must be able to provide a person with the expertise that an IIC needs. All parties must satisfy the IIC that their personnel are suitably qualified and can be of assistance. Approval is not automatic. For example, if a company provides a representative with a particular expertise but that expertise is not of the type needed in this specific investigation, the company's representative has an obligation to inform the IIC of this fact. It is then the IIC's responsibility to deny the representative party status and request of the company a person who does meet the IIC's investigative needs in that particular area. If the company is unable or unwilling to provide the desired expertise, the IIC declines to designate that entity as a party.

Similarly, if an individual has demonstrated in the past an inability to follow NTSB direction or makes no contribution to the investigation, either the IIC does not invite the company he/she represents to be a party or the IIC directs the company to designate someone else to represent that company as a party. In essence, the determinations of whether to have any parties other than the FAA and, if so, which organizations to grant party status to are based on the needs of the NTSB and not the needs or interests of individuals representing party organizations or private interests (NTSB, 1995b).

It is important to note that the party relationship lasts for the duration of the investigation only. On completion of the written reports and review of the final draft of a factual or blue cover report, the party relationship with the NTSB is dissolved. Under the party process, interested parties do not become permanent fixtures within the federal investigative arena. However, the same representatives do tend to serve as party members when repeated accidents involving products from their company occur. For example, the Cessna Aircraft Company might send to the site of a Cessna 172 in-flight breakup that occurred this week the same individual who participated in the crash of a Citation business jet in Green Bay, Wisconsin, a month earlier. As long as the company's representative possesses the knowledge and expertise to assist the NTSB with the investigation of the 172 and the IIC feels the representative can serve as a valued member of the team for the duration of that investigation, then the representative and his/her company will be signed on as a party.

The companies that provide representatives to the NTSB to serve as party members are not under any obligation to do so. The companies, although their product or operation might be involved in an accident, are not draftees. There is no obligation on the part of a company to participate in an NTSB investigation as a party member. There have been cases in which companies have declined the NTSB's invitation to participate as a party in an investigation. This, however, happens infrequently.

Interested parties are invaluable resources to NTSB accident investigations. Party members assist NTSB investigators and FAA inspectors with documentation of wreckage, tracking down aircraft maintenance records, compiling pilot training and certification records, providing technical drawings and operations manuals for their products, and explaining company practices and procedures. Party companies provide facilities and laboratories to conduct testing of manufactured components involved in a case. Companies have also facilitated correcting safety deficiencies identified during an investigation. Because their participation is in realtime, delays in fixing critical components or devising corrections in operating procedures are minimized, thus enhancing overall air safety (NTSB, 2000a).

Contributions to Accident Investigations: Interested Parties' Perspectives

The manufacturers see the need to provide guidance to their people so that they know what to expect at an aircraft accident site and to know what the NTSB expects of them on their arrival. The major aircraft and engine manufacturers, such as Boeing, McDonnell Douglas, Pratt and Whitney, General Electric, and others, realize that aircraft accidents involving their products do not occur every day. However, they see the need to be prepared to respond to aircraft accidents and incidents involving their products, and most of these companies are prepared to do so. Most large companies have a product safety or accident investigation branch or office in place, staffed with specialists knowledgeable about their products and who are prepared to respond to an accident when called. These people provide the liaison between the government's investigation and the manufacturer whose product is involved (Welch, 2001).

Manufacturers espouse publicly that their purpose as party members is to provide technical assistance and information to the investigative entity, that is, in the U. S., the NTSB and the FAA. They have determined that they must provide information regarding airworthiness and operational issues. McDonnell Douglas's safety department publishes guidance that states that their specialists will immediately report to the NTSB any airworthiness problems regarding their product. McDonnell Douglas determines that if, during the course of an investigation, a company participant uncovers a Douglas product airworthiness item that could affect the rest of that fleet of aircraft, this information is immediately conveyed back to McDonnell Douglas' safety department, which then alerts other affected operators (Lund, 1989).

The Boeing Company (1997) recognizes its responsibility as a party member to render technical support in any follow-up testing of suspect components and to provide expert witnesses to public hearings held to elaborate on the facts, conditions, and circumstances surrounding an accident.

Boeing also notes the special differences in the roles of the federal agencies involved in aircraft accident investigation. They address specifically that aircraft accident investigation in the U. S. is the responsibility of the NTSB, stating in its company directives:

> The NTSB consists of a five-member panel appointed by the President of the United States with congressional approval. The Board is currently staffed with about 300 people and is an independent government agency reporting to Congress, not to the Department of Transportation (DOT). . . . DOT, however, has a statutory responsibility to participate in aircraft accident inquiries; consequently, the Federal Aviation Administration (FAA), part of DOT, is automatically involved in all NTSB investigations. (Boeing Company, 1997, p. 14)

But McDonnell Douglas and Boeing also note their responsibility to their stockholders and to senior management. Boeing Product Safety states that it will move immediately on a safety issue identified in an investigation before the government does so as to be proactive toward product deficiencies and preclude any possible recourse against the company (Boeing Company, 1997).

Other manufacturers convey similar sentiments with respect to their motivation to serve as party members to an investigation. In all cases, manufacturing company product safety departments openly state that their purpose is to identify deficiencies in their products early and take immediate action so as to protect other operators and passengers. However, these company representatives also express the need to identify early on critical safety issues so as to protect themselves from potential legal action (Pratt & Whitney, 1998).

Criticisms of and Alternatives to the Party Process

Strictly from the government perspective, the party process provides NTSB investigative teams with the technical and operational expertise and information needed to successfully conduct aircraft accident investigations. The party process allows the NTSB the flexibility to stay lean during simple investigative cases yet expand as necessary to handle large complex cases. The party process provides much to the success of an accident investigative. But the party process is also a reciprocal relationship. Interested parties who participate in NTSB investigations also gain something for themselves by virtue of being a part of the investigative team: information. Under the party process, NTSB investigators are obligated to share with interested party representatives information discovered outside of the parties that pertain to the investigation. In many cases, such information can be useful to a manufacturer or airline company in early preparation for possible legal action against them later on.

Party representatives work closely with NTSB investigators, be it in one of the working groups of a major aircraft investigation or as a company's sole representative assisting a regional investigator with a local accident. NTSB and manufacturing representatives, company safety directors, and product safety representatives spend much time together during the course of an accident case and develop a rapport with each other. Additionally, it is not unusual for the same NTSB investigators and the same manufacturer or company representatives to work repeated accidents together just by virtue of the large number of aviation accidents that occur each year. These realities tend to raise questions as to the true independence of the NTSB with respect to aircraft accident investigations.

The public's perception is that the interested parties, especially aircraft manufacturers and airline companies, are afraid of being sued and will do whatever they have to do to shift blame away from themselves (AVWeb, 2001). In May 2000, an independent aviation group conducted an informal survey of U. S. licensed pilots and mechanics. When asked if potentially biased parties (airframe manufacturers, engine manufacturers, etc.) should be allowed to assist the NTSB with their investigations, 24% responded, "No, the practice can lead to conflicts of interest" (p. 2). The 76% who answered "yes" stated that the practice needed to continue because "The NTSB doesn't have the in-house resources to cover all areas" (p. 5).

The RAND study lent support to this position by stating that

> public confidence in the NTSB has wavered due to its failure to unravel the mysteries surrounding several high-profile airline crashes. . . . Several areas require immediate action. The NTSB's practice of allowing unions, aircraft manufacturers, the FAA, and airlines to participate in crash investigations (the "party system") challenges its independence and could corrupt its findings. ("Safety Board," 2000, p. 30)

Another public perception is that the NTSB cannot control the parties in spite of what is said. The same study conducted in May 2002 also asked, "Does the NTSB let politics sway their conclusions/recommendations on certain high-profile aircraft accidents?" Out of the same respondents to the survey, 58% agreed that politics does influence the NTSB on high-profile cases. Written comments included, "The major companies have political clout. They use that clout to pressure their congressional representatives to put pressure on the NTSB. The NTSB is political and therefore, is susceptible to the influence of political forces outside its boundaries" (AVWeb, 2001, p. 1).

The public is not the only critic of the party process. Party members themselves and aviation attorneys have been critical of the process and the political undertones. After the NTSB released its findings in the crash of USAir Flight 427 stating that the Boeing 737's rudder had jammed and was aggravated by the crew's reaction, causing the aircraft to lose control, pilot groups took strong exception and openly criticized the NTSB. The Air Line Pilot's Association (ALPA) (2001) published in a press release, "Looking at the conclusions and probable cause, we must remember that there were many parties who were applying their best efforts to implicate our crew" (p. 2). Several legal publications that cover aviation litigation cases also criticized the NTSB and the use of the party system with respect to the USAir Flight 427 investigation, citing, "Isn't it time that our governmental authorities worry more about insuring public safety than they do about minimizing the economic impact of their actions on the airline industry and those who manufacture aircraft?" (Wolk, 1994, p. 2).

In light of these criticisms and the way the Safety Board is structured, one must ask, what then are the alternatives to the party process? One possible alternative is to increase the size of the agency, hiring specialists with expertise now provided by manufacturers and company representatives. Another is to employ the use of outside sources independent of the government agencies and current manufacturers. A possible repository for these sources might be found in the nation's colleges and universities. Department research laboratories might be able to provide the same resources the manufacturers currently do, and it is possible that they can be unbiased in their examinations conducted on behalf of the NTSB, as long as the rules and guidelines are spelled out specifically. Using the resources of other federal agencies is another option (Institute for Civil Justice, 1999). In the past, the NTSB has sought out several federal research laboratories to test airplane components and conduct special studies. The NTSB could be authorized to contract private engineering firms, materials laboratories, and other operators to provide expertise in various areas of an investigation. The NTSB could select consultants whose specialties directly apply to an aspect of a specific investigation. These new ideas could stand alone, or they could be combined with the current party process, such that a team would be made up of parties and consultants or parties and NASA engineers, etc. This integrated party/team concept would provide a counter to any biased information provided by a manufacturer or company, establishing a form of checks and balances within the investigative structure (AVWeb, 2001).

Chapter Summary

In this chapter, we looked at the NTSB and the investigative process with respect to aviation accidents. We began with a brief history of aircraft accident investigation by examining the history of commercial aviation, beginning with the Kelly Act, moving through the Civil Aeronautics Act of 1938, and finishing with Congress's passage of the Independent Safety Board Act of 1974. This description showed how the NTSB and the FAA evolved together, first as parts of a single agency but eventually splitting apart into two separate agencies, each with distinct but complementary roles. We then examined how the investigative process works. We looked at how major investigations differ from regional investigation, how the major team groups are established and comprised, and how other divisions within the NTSB support major team and regional investigations. We then examined the party process and showed how FAA inspectors and industry representatives support the NTSB Go Team, group chairmen, and regional investigators through the course of accident investigations. In looking at the party process, we saw how manufacturers and companies integrate investigative structure into the NTSB. We then looked at the investigation process from the perspective of several aerospace manufacturing companies and showed how they view their role as party members and how they see their relationship with the NTSB. Finally, we looked at several positions that criticize the present investigative process and presented some potential alternatives and augmentations to the existing party process.

This look at the NTSB and the FAA, the accident investigative process, and the party process combined with the previous discussion of regulation and the capture theory establishes the theoretical foundation for this study of capture in the independent investigation of aircraft accidents. We now move to the real meat of this study, the field research conducted on the NTSB and agencies and companies involved in aircraft accident investigation. The next chapter begins by presenting and explaining the methodology chosen to examine the research questions posed at the beginning regarding whether capture occurs, and to what extent, in the independent aircraft accident investigation process.

CHAPTER 4

METHODOLOGY

In this chapter, I discuss the research tool used to find information in support of the questions regarding capture that I presented in the first chapter. The method used to gather useful information for this study had to be one that could get to the richest and deepest data about capture and influence. The method that I believed best suited this need was to conduct a series of qualitative interviews of persons associated with aircraft accident investigation. My intent was to gather a sample that included line NTSB investigators, managers, and investigators from industry and other federal agencies who have been interested parties in previous aircraft accident investigations. To derive the information from the interviews, I applied a series of codes against the interviews so as to derive theme data. The coding iterations were applied several times until clear and solid themes emerged from the data.

I begin this chapter with a discussion of the method itself and how it differs from other research methods. I then describe the constructs of my interview sample--where they came from and where I would have to go to get data from the participants. Next, I look at how the interviews were set up and conducted. Following that, I explain the coding process and conclude with themes development. However, before describing the methodology, it is important to address the key threats to the validity of the findings derived from this method, namely, my personal bias and my underlying motivation in conducting the study.

Personal Bias and Motivation

First, it is important to say that I am not neutral in my approach to this research topic. I entered this study with strong feelings toward the subject matter. Other researchers who examine and debate the findings of the study need to understand that at the time the study was conducted, I was employed as an air safety investigator with the NTSB. At the beginning of my research, I had already been involved in over 300 aircraft accident and incident investigations, either as the IIC or as a group chairman. During most of those investigations, I worked closely with representatives from aircraft and engine manufacturing companies, unions, airline companies, and safety investigators from other federal and state agencies who provided assistance, technical expertise, facilities, and equipment in conducting and accomplishing those investigations.

I came to the NTSB in August 1995, having spent the previous 20 years of my life as a pilot in the military and in commercial aviation. In those years before I came to the NTSB, and over the years since, I have seen numerous aircraft accidents and have read hundreds of aircraft accident investigation reports. I have lived in and around communities of professional pilots who, when an accident occurs, want to know the truth about "why" that accident occurred. More times than we cared to see, the answers to that question were nebulous or simply not there. Many of the reports we read most often contained a phrase such as "the most likely cause of the accident was" and then conclude with something such as "pilot error" or "unknown" or an "undetermined failure" of some aircraft component as the engine or a system such as the flight controls.

These generic answers did not satisfy our need to know. As professional pilots, we needed to know why a fellow pilot made a mistake that ultimately caused an accident. Was it because the pilot was distracted, perhaps because of some personal issue? Was it because the pilot was not trained adequately? We also needed to know more about why, how, and when airplanes' systems fail. Was a failure due to the system's components not being properly manufactured, or was the failure because a system was not maintained properly? Or was it because there was an undetermined life limit to the system that was exceeded? Professional pilots need to know the lessons from these accidents so they can avoid making the same mistakes themselves or so they can make the best determination on whether an airplane is safe to take into the air.

On coming to the NTSB, I made it my personal commitment to find the answers to those "whys" and then go on to create solutions to prevent future "whys" from happening. I soon learned about the party process and experienced working with representatives from industry. I also listened to other investigators vent their frustrations as they described their experiences with the interested parties in their own cases. I soon experienced my own frustrations when I could not get prompt information from some interested parties as I pursued safety issues in my own cases.

Although I never experienced direct pressure from a manufacturing company representative to deviate from my course during an investigation, there were occasional promptings from managers at the various levels in my agency to look at taking a particular case in a certain direction. There were also occasions in my interactions with the interested parties in my investigations when I sensed that the party members were holding back information that might be critical to a case.

As I continued in my graduate studies, I learned of the capture theory and of other influence theories in regulation. I began to question whether there was some relationship between the support investigators, who work with manufacturing representatives and receive information during an investigation, and the quality of the final findings of that investigation. Then the results of the RAND report were released. On reading the report and considering its findings and conclusions, I realized that there was a serious problem with the party process and how it played out in aircraft accident investigations, and that this concern required a deeper look. In this I realized I had found a research topic that needed to be developed and explored.

My interests, values, and close familiarization with the research topic have formed my motivation to do this study. As an air safety investigator, my ultimate goal is to get to the heart of why any aircraft crash occurs and to create a resolution that prevents future accidents. To get to that end means making multiple decisions on what and who can provide the best methods and resources to achieve that end. Many of those resources have to come from the manufacturers, the operators, and other party members. It goes without saying that the conclusions drawn from this study directly benefit myself and other NTSB investigators in our pursuit of the truth.

I recognize in choosing this topic that I have a vested interest in the research outcome. But I did not go into the study expecting the outcome to favor any one influence or regulation theory. I went into this study willing to accept what came along, that is, to see where the interviewees would take me. From my work in other qualitative exercises, I know that interview answers can take me to places I least expect. I prepared myself for this possibility.

I am driven by a passion that evolves from the concerns of my own experiences, and that passion has sustained me through the course of this research. I recognize that all scientific investigation begins with the observer's biased curiosity and follows its course, bolstered and nourished by that curiosity. I concede it is not possible for a researcher to keep his or her research pure, objective and untarnished by his or her interests, values, and experiences. It is possible and preferable to search for, recognize, and state such bias and to be aware of ideas that seem important to us, "that desire introduces them, interest holds them, and fitness fixes their order and connection" (Locke, Spirduso, & Silverman, 1993, p. 114).

The Research Tool: Qualitative Interviewing

Interviewing is a way of finding out what others feel and think about their worlds. Through interviews, the researcher can understand experiences and reconstruct events in which the researcher did not participate. Interviewing requires intense listening, a respect for and curiosity about what people say, and a systematic effort to really hear and understand what people relate (Rubin & Rubin, 1995).

Through interviews, the overarching objective is to learn about the world of others. This can be difficult as real understanding can be elusive. The reason for this is that an interviewer may go into an interview situation without understanding the cultural differences between interviewer and subject. Therefore, to improve communications and increase the chance of real understanding, the researcher engaged in this methodology encourages the respondents to teach them about the meaning of their words that are specific in that research setting (Rubin & Rubin, 1995).

In addition to learning more about what the interviewees are trying to communicate, the researcher must listen to him or herself and learn what he or she is conveying to the interviewee. Researchers' biases, angers, fears, and enthusiasms influence their questioning style and how they interpret what they hear (Rubin & Rubin, 1995).

Underlying the interviewing approach are three guiding themes. First, successful interviewing requires an understanding of the culture. Culture affects what is said and how the interview is heard and understood. Second, interviewers are not neutral actors but participants in an interviewing relationship. Their emotions and cultural understandings have an impact on the interview. Third, the purpose of interviewing is to hear and understand what the interviewees think and give them a public voice. Interviewers try to avoid dominating the interviewing relationship so the voice and thoughts of the conversational partner can come through. To do this successfully, the interviewer must learn the interviewee's cultural definitions and ensure that both interviewer and interviewee can understand one another (Rubin & Rubin, 1995).

There are several categories of interviews based on the degree of structure the researcher wishes to use. The unstructured format has the researcher introduce a topic with little idea about the direction the conversation may take. An example might be when the researcher asks a college student in a master's degree program what it feels like to be a graduate student and then lets the interviewee answer the question the way he or she wishes. The semistructured or focused format is used when the researcher seeks more specific information. In the focused interview, the interviewer introduces the topic and then guides the discussion by asking specific questions. Using the same example of the master's student, a researcher might ask the student a question such as "What happened when you discussed your thesis topic with your advisor?" Cultural interviews are those in which the interviewer seeks to understand persons of a different group or background. Topical interviews are those in whic the researcher seeks to learn about particular events or processes, such as how an antidrug program is run. Oral histories are interviews, in which the researcher may ask respondents about a particular time in history in which the latter may have lived. Life histories are interviews, in which the major life events of those being interviewed are studied. And finally, evaluative interviews are those in which the researcher learns in depth and detail how those involved view the successes and failures of a program or project (Rubin & Rubin, 1995).

The interview model I chose to use in this study followed a focused interpretive approach in which the researcher lets ideas emerge from the interviewees. In this approach, the interviewer does not dominate the interview relationship. Also, the interviewer is not completely neutral in his approach and must consider his own beliefs, needs, and interests as he works out questions and tries to understand answers. Knowledge in this interviewing style is situational and conditional. The underlying assumption is that if you cannot understand something specifically first, you cannot generalize later (Rubin & Rubin, 1995).

My approach began with a tentative plan that applied a focused set of questions designed to invoke deeper insight into the area of investigative procedures, actions, successes, and pitfalls. As answers came back from the respondents, other subject areas emerged. This caused me to redesign and refocus the research and reconsider and redevelop the lists of persons I wanted to use as subjects so I could gain the deepest, richest insight and understanding into the subject matter that could be achieved.

The focus of a qualitative research design can change in the middle of employing the design. This is different from quantitative studies in which the researcher begins with a set hypothesis and moves through the research phase with an instrument designed to prove or disprove that hypothesis. In the qualitative design, once the researcher has had an opportunity to look at some of the results and after he or she has reconsidered the direction the researcher intends to go with the research, then a proposal can be created indicating how the researcher plans to proceed with the remainder of the study (Rubin & Rubin, 1995). I, too, had this experience with employing this design.

If employed in its purest sense, the topical interpretive approach should allow for a research topic to emerge from out of the interviews as data themes are drawn from the thoughts expressed by the interviewees. This study, however, did not follow that pattern entirely. I began by forming research questions regarding capture, its characteristics, and other influence and regulation theories and their characteristics and whether those characteristics manifest themselves during the course of an aircraft accident investigation. From the questions, I then developed overarching research questions. In this sense, my approach seems similar to a quantitative study as quantitative studies begin with access to raw data from which a hypothesis can be drawn and tested.

With respect to the capture theory and other regulation and influence theories as they might apply to independent accident investigation, I had no raw data to begin with. The data needed to be created. Interviewing provided a sound method for gathering the needed data.

Finally, it is important to note that as I proceeded with the interviews, I had to make some adjustments to the research questions posed. Hence, all things considered, the way I conducted the study did adhere to the intent of the qualitative approach.

Potential Threats to the Study's Findings

The greatest threat to the internal validity of this study would be researcher bias, which I have addressed. I identified myself as an air safety investigator for the NTSB and that the results of this study could have a direct impact on my agency and me. To counter any potential bias and enhance the validity of the study as I protected the subjects who participated in this research, I brought in an independent research assistant who had no ties to any of the agencies or companies represented in this study to examine interview results, coded words and phrases, and developed themes. My research assistant was provided access only to the collected data and not to the names of the persons who were interviewed in the study or to the locations where the interviews took place. I created this safeguard to help me maintain objectivity during the interviews and assist me in hearing clearly the information being conveyed during the interviews. In this way, I was able to take myself out of the role of safety investigator and insert myself into the role of an independent researcher bent on discovering the truth as related by the interviewees.

Several authors have described other threats to the internal validity of research studies. Although most of these ideas were developed with respect to quantitative research, some of these concepts can apply to qualitative studies. These threats include maturation, a bias that comes from a change in the age of the subjects, and history, referring to events that occur and that influence the subjects with respect to the research between the start and end of the data collection. These threats did not affect the study, as the subjects I interviewed were, in most cases, interviewed just once.

Some of my subjects were interviewed more than once, but the time between the first and follow-up interviews was kept to a minimum (Posavac & Carey, 1992).

Selection bias is another threat that could affect the results of this type of study. With selection bias, the researcher, instead of choosing subjects randomly, chooses specific persons whose responses could direct study results toward support or intended nonsupport of a particular theme. In my approach, I tried to minimize this threat's potential by choosing subjects for this study randomly from several investigator populations to include active NTSB air safety investigators, former NTSB investigators, FAA employees engaged in aircraft accident investigations, and representatives from the aviation industry who serve as party members. Other possible threats to the research validity such as mortality (attrition), regression effects, testing, and instrumentation bias, were considered but discounted as a concern because these concepts are more applicable to the iterations of pretest-posttest, randomly selected control, and experimental group research designs (Posavac & Carey, 1992).

Research Role

The role the researcher plays during the course of the study can have a direct effect on his or her success in gathering the best data possible. The researcher's role can determine whether he or she gains access to certain key persons who possess information vital to the study. For example, playing the role of a doctoral student conducting research for a dissertation might endear that person to professors, fellow colleagues, or students in a university setting but may receive little tolerance from a chief executive officer in a corporation or a federal agency director who has little time to conduct daily business and operations, let alone have time to sit for an interview. A researcher must be flexible with the role he or she plays. At times, it is may be necessary for a researcher to change his or her research role, depending on the person or persons to whom they are trying to gain access. For a researcher to change roles, however, he or she must have some experience in the subject areas on which to draw. A researcher who is also employed in government can play the role of doctoral candidate in an education venue on one day and the next day, play the role of local official when interviewing administrators in a sister agency by virtue of the researcher's position in government. However, the switching of roles can get a researcher into trouble if that researcher is not comfortable playing one role to one person and another role to another person. But however a researcher gets to where he or she needs to be, the role they play is crucial to getting there.

It is important to insure that on going into an interview situation the subject being interviewed knows as much about the researcher as possible. An interviewee may be hesitant to share his or her experiences with someone whom he or she may not trust or with whom he or she not comfortable. Openness and honesty on the part of the researcher are important considerations in determining the research role.

For my purposes, I found it easy to convey to the majority of my interviewees that I was conducting my study as a doctoral candidate. What made my experience successful was that the majority of the subjects I interviewed knew that I was an air safety investigator employed at the NTSB. And although I did not know many of the subjects personally and vice versa, those persons knew of my professional reputation within the agency and also knew whom to call to confirm that I was legitimate. By holding to the combined role of doctoral student/air safety investigator, it was easy for me to be honest and forthright with my interview subjects. Likewise, because I was comfortable in my role, it was easy for the respondents to be at ease with me during the interviews.

Selection of Participants for the Study

The participants selected for this study consisted of a sample taken from present and former NTSB employees. This included past and present NTSB members, major accident IICs, group chairmen, division chiefs, regional directors, senior air safety investigators, and field air safety investigators. Additionally, several FAA inspectors involved with aircraft accident investigation were randomly identified as study participants. The inspectors came from five FAA FSDOs located in the west and midwestern states.

I believed that the perspective of the aviation industry, including the manufacturers of aircraft, aircraft engines and, avionics components and the companies that operate aircraft, were important to the study. As interested parties to the NTSB investigations, gaining a perspective of their insights and motivations had a tremendous impact on this study. Therefore, I invited several company air safety investigators, product service managers, managers in product safety, aircraft company representatives, and union officials involved with pilot issues to participate in the study.

Finally, I believed some useful information could be gathered from participants outside of the investigative sphere who are affected by the results coming out of aircraft accident investigations, particularly surviving family members of the victims of aircraft accidents. Therefore, I chose to interview three family members who experienced the tragedy of losing loved ones in various airplane accidents and who actively followed the progress of the NTSB and FAA accident investigations through to the release of those cases' final reports.

How Participants Were Located

Persons who were current employees of the NTSB during the research phase of the study were located in two general areas: the NTSB headquarters in Washington, D.C., and the regional offices located throughout the country. My original intention was to interview randomly selected investigators and supervisors in each of the regional and field offices across the country. However, time and scheduling restraints forced me to limit my selection to interviewees from five of the nine offices.

A total of 38 persons were interviewed for this study. Of the 38 persons interviewed, 17 were employees of the NTSB at the time of the research phase, six persons were former NTSB investigators who were retired or employed by other agencies and companies, five persons were FAA air safety inspectors, and five persons were aircraft and engine manufacturer product safety representatives and air safety investigators in industry. One person interviewed represented a pilot union. Another person represented a public use operator. And finally, three persons were family members whose husbands or brothers perished in airplane accidents.

Interviews of the NTSB headquarters employees--the major investigators, division directors, and major investigations group chairmen--took place at three different times in the fall of 2002. Interviews of the NTSB air safety investigators and supervisors in the regional and field offices took place in the spring and fall of 2002. The investigators interviewed were assigned to the regional and field offices in West Chicago, Illinois; Denver, Colorado; Atlanta, Georgia; Arlington, Texas; and Miami, Florida.

Interviews of the FAA air safety inspectors took place during the months of August, September, and October 2002. The FAA inspectors interviewed were from FSDOs in West Chicago, Illinois; Schiller Park, Illinois; Rapid City, South Dakota; Casper, Wyoming; and Denver, Colorado.

The interviews of aircraft, engine, and components manufacturer representatives took place in May and October 200, at their respective manufacturing plants. The interviews of persons who represented the operator and pilot union were conducted in August and September 2002 at their respective locations.

The final interviews involving family members whose husbands and brother perished in airplane accidents were conducted in November and December 2002. The interviews took place at the family members' residences in Missouri, Illinois, and Texas.

I arranged the interviews through direct contact by telephone, electronic mail, and face-to-face meetings. Interviews involving senior-level NTSB headquarters staff were scheduled through their assistants in advance. In some cases, as much as three weeks lead time was necessary to schedule the interviews. Interviews of persons not employed by the agency were arranged by telephone, electronic mail, and letter correspondence.

The interviews of current federal employees were conducted outside of the time the interviewees were actively working at their jobs. The majority of these interviews took place after normal duty hours in the early evenings. Some interviews were conducted on weekends, and some were done over lunch breaks. I purposely made every attempt to insure that the interviewee did not violate any federal or ethics law or agency policy.

I conducted several follow-up interviews of respondents. These were done mostly by telephone. On some occasions, I received letter correspondence and electronic-mail messages in response to my request for conducting second interviews. The additional and clarifying information I gained from these interviews and from the letters and message responses deepened the richness of my research data.

The Interview Process

The interviewing process used in this study was designed to closely follow the interview method developed by Rubin and Rubin (1995). The approach I used could best be described as open ended; however, there was a structure in that I would develop five to eight topical questions to ask each participant before the interview--a variation on the focused approach previously discussed. The questions were modified based on the background or profession of the interviewee. For example, a question written for a NTSB field investigator, such as, "Tell me how you feel about being a part of the NTSB," was rewritten so that a similar form of the question could be asked of an FAA inspector.

The open-ended but weakly focused format was better than a more rigid, structured interview process because it allowed for the participants to speak freely and at length about their experiences. The format allowed the interviewees to tell stories and give detailed accounts of events that impacted them in ways that provided focus on the subject matter being explored. The open-focused format provided room for us --myself and the interviewee--to explore tangential topics at length that came up during the interview. When tangential topics occurred, they were explored in depth by asking subsequent follow-up questions. Sometimes these topics were set aside to bring the respondent's focus back to the important subjects. Tangential topics were often revisited in follow-up interviews. In most cases, the interviewee was allowed to go wherever his or her thought process took them.

Personal interviews were conducted at locations that were mutually agreeable to the interviewer and the participant. Personal interviews were planned for 75 to 90 minutes duration, depending on the participant's schedule and willingness. Interviews of senior staff members took an average of 75 minutes. Interviews of other managers, major and field investigators, and employees of other federal agencies or companies ran, on average, 60 minutes. If the interviewee indicated a willingness to go beyond the allotted time, the interview continued until a point was reached where the interviewee was prepared to stop. Occasionally, I would extend an interview if the interviewee wanted to continue and the richness of the information being conveyed was revealing and important. However, rarely did an interview exceed 90 minutes.

Each interviewee and I negotiated a time and place to conduct the interview, and I monitored the time during the interview so as to finish on time. The interviews followed a basic format, providing 5 to 10 minutes for introduction and conversational pleasantries so as to make the interviewee (and in some situations, the interviewer) comfortable before delving into the questions. Open interview questions and answers were conducted within a 55- to 70-minute time block, depending on the agreement between the participants. Approximately 10 minutes were allocated at the end of the interview session for final thoughts, inquiring if subsequent interviews could be scheduled, describing the format those interviews would take (personal or by telephone), and for good-byes.

During the interviews, my job was to ask the open questions first and allow the participant to speak. When I encountered terms, phrases, or colloquialisms that I did not understand, I would gain clarification by asking probing questions. These questions were interjected at natural pauses in the interviewees' answers. Follow-up questions were formed during the course of the questioning-response portion of the interviews and were asked as the opportunity presented itself. This usually occurred near the end of the interview when most of the formatted questions had been asked and answered.

I took notes during each interview in a five-inch by eight-inch stenographer's notebook. A separate notebook was dedicated to each personal interview. Informal interview notes that I took during subsequent interviews of an interviewee were recorded in empty pages of the same notebook. My reasons for using separate notebooks for each interview were to ensure I had an adequate number of pages for clean, readable notes, and this aided with organizing my data. I entered my notes in pen. This eliminated the temptation to erase when I made mistakes. I used a line-through, top overwrite method to correct mistakes I made when recording information. Following each interview, I reviewed my notes and filled in and clarified points as they were fresh in my mind. On my return from the interview, I transcribed my notes to a laptop computer and backed up the data on a disc. The notes for each interview were filed with the interviewee's consent form, the interview transcript, and coding notes.

I decided to use note taking rather than taped interviews because of the potential distraction a tape recorder can be. I was confident in my abilities to record information as I actively listened to each participant. The note-taking technique made my participants comfortable and thereby confident to speak freely and without interruption. Because I was actively listening for and hearing information as it was revealed and writing quickly to record the information, there was little time or temptation to interject a question or comment that might have disrupted the participant's train of thought. Finally, note taking provided for natural pauses in the conversation, allowing the participant to gather additional thoughts as I caught up with my notes. The notes I took during the course of the interview, with respect to a subject area, were brief so as to trap the thought but not keep me from maintaining good eye contact with the participant, thus encouraging the participant to continue revealing information. This brevity was similar to a kind of shorthand, known to and interpretable by me alone.

I typed interview notes verbatim into a transcript format identifying the date, time and location of the interview: the names of the interviewer and the participant: the type of interview (personal or telephone]); the questions asked, and the complete responses to those questions provided by the participant. I then made the transcript available to each respondent for his or her review. Interviewees were allowed to make edits, clarifications, and changes. Questionable passages that made a participant uncomfortable with having his or her remarks published were removed from the transcript. Total anonymity was afforded only when a participant would absolutely not allow his or her remarks to be published with his or her name associated with them. As often as possible, I encouraged the interviewee to take credit as the source of the material provided.

It's important to note that how something is said and the facial expressions shown as something is said are just as important (and sometimes more important) than what is said (Rosetree, 1998). Awareness of body language, hidden messages, and inferences on the participant's part must be a part of the interviewer's total appreciation of the information being communicated (Pease, 1981). Such communication can lead an interviewer to question the information provided by the interviewee. Such notable inferences do not appear in the transcripts of the interviews but are recorded in comments describing the nonspoken cues along the margins and in the text of my rough notes. The body language cues were used only to form additional probing or follow-up questions.

Profiles

Transcripts of the interviews were selected for profiles. A profile is composed from the transcript of an interview series. In this study, that series consisted mostly of just one interview but, in practicum, could consist of three or more interviews of each participant. The words of the interviewer are omitted and the participants' responses stand alone (Seidman, 1997). The words are entirely those of the participants unless it is necessary, for reasons of clarity, to add a word or phrase, which then appears in brackets. A team process was used for constructing the profile. The steps involved included:

1. I shared with at least one other person familiar with but not an expert on events that took place within or outside of an investigation that showed a propensity for capture or other influence elements as supported by the research material and method. I had this person read the transcript individually and highlight the words, phrases, or sections he/she felt strongly should be included in the final rendition.

2. On the computer, backed up by a disc, I edited the manuscript appropriately.

3. I took responsibility for the final version of the profile, edits, punctuation, paragraphs, and rearrangements for coherence and flow of the story, coding and

otherwise disguising identifiable material and proper names and omitting repetitive passages and awkward expressions that might do damage to the participant or that added nothing to the narrative.

4. The second person reviewed the edited version, seeking out unclear passages and making suggested revisions or omissions for sense and strength of the final rendition.

5. I completed the final version.

Because of time constraints placed on me by scheduling conflicts and some unforeseen events, I found it necessary to do most of the profiles from the interviews myself. I did enlist the help of another person, i.e., a trusted assistant who was peripherally familiar with my research and with events surrounding air safety investigations. The team approach provided several advantages that proved important and added to the richness of the profile. I attempted to hold to the team approach as often as possible. A fresh unbiased look at the material, a validation on the choice of the most meaningful material, and another set of eyes looking for proper edits, structure, and format proved most useful. The important thing that I kept coming back to when constructing the profiles was that the participant's words, not those of the interviewer, were the only ones being heard, read, and comprehended.

Interpreting the Data: Coding, Theme Development

In order to gain understanding of the information gathered through the interview method, researchers rely on conceptual frameworks and research questions as the best defense against overload (Miles & Huberman, 1994). We also cannot escape the fact that data collection is a selective process and that one cannot and does not get it all, although we might think we do. With data retrieval, the challenge is to remain explicitly mindful of the purpose of the study and the conceptual areas one trains one's mind on, and allow oneself to be open to and reeducated by things one did not know about or expect to find. At the same time, when collecting data, one must strike a balance--resisting overload but at the same time avoiding being sketchy. This is not an easy thing to do. It requires a variety of safeguards against such threats as tunnel vision, bias, and self-delusion. Also important with each wave of data collected is exercising some sort of condensing, followed by analysis. This is where coding comes into play (Miles & Huberman, 1994).

Coding is analysis. It requires reviewing a set of field notes, transcribed or synthesized, and then dissecting them meaningfully, keeping the relationship between the parts intact. Coding involves differentiating and combining the data retrieved and reflecting on that information. Codes are tags or labels used for assigning units of meaning to the descriptive or inferential information compiled during the study. Codes usually are, and were in this research, attached to chunks of words, phrases, sentences, or whole paragraphs, connected or unconnected to a specific setting. They can take the form of a straightforward category label or a more complex one (e.g., a metaphor) (Miles & Huberman, 1994).

In coding data, it is not the words themselves but their meaning that matters. A word or phrase does not contain its meaning within itself, but has the meaning it does by having a choice made about its significance in a given context. That choice excludes other choices that could have been made to "stand for" that word or phrase, and that choice is embedded in a particular logic or a conceptual lens whether the researcher is aware of it or not. As a researcher, it is best to be aware (Miles & Huberman, 1994).

Codes are used to retrieve and organize chunks or segments of data in a way that the researcher can quickly locate, retrieve, and cluster the segments relating to a particular research question, hypothesis, construct, or theme. Clustering is the method used for displaying the condensed chunks of data in such a way that conclusions can be drawn from them (Miles & Huberman, 1994).

There are types of codes that I employed in my research. One type is descriptive codes. Descriptive codes entail little interpretation. With descriptive codes, one attributes a class of phenomenon to a segment of text. Interpretive codes assume that one has background knowledge of the subject area. These codes allow a researcher to interject his or her concept on the sentence, phrase, or paragraph being coded. A third type, pattern codes, is even more inferential and explanatory. In this type, a researcher codes a segment of field notes that reflect an emergent pattern or theme. This type of coding is usually reserved for more in-depth data collection that occurs later in the field research (Miles & Huberman, 1994).

The coding method I employed was continual but flexible throughout my field research. As I began the interview process, I started with a list of preset descriptive codes that I used in analyzing the transcripts produced from my first interviews (see Figure 5). The process I used was to first consolidate my field notes and then generate a

INV	Investigator
SUP	Supervisor
BD	Safety Board
UMGT	Upper management
MMGT	Midlevel management
GP	Group (GPC–chairman, GPM–member)
NT	NTSB
FAA	Federal Aviation Administration
INSP	Inspector/Auditor
MX	Maintenance inspector or activity
OPS	Operations inspector or activity
PART	Party (member or organization)
AMAN	Aircraft manufacturer
EMAN	Engine manufacturer
UNI	Union
ALPA	Pilots' union
PLT	Pilot
FAM	Family member
VIC	Victim
CAP	Capture/captured
INFL	Influence/influenced
FRST	Frustration
TNG	Training
ADQ	Adequate
INDQ	Inadequate
AUDT	Audit/inspection
FLD	Field
MAJ	Major investigation or activity
ANGR	Anger/angry
JAZ	"Jazzed"--excited
FATG	Fatigued/tired
ENDR	Endured/endurance
SUC	Success/succeed
FAIL	Failure/failed
HQ	Headquarters: when used refers to interviewee's respective agency
1 (one)	Lowest or no activity/dead-lifeless
2 (two)	Fair, minimal activity
3 (three)	Average, normal activity/responsive
4 (four)	Good, better than normal activity
5 (five)	Excellent, highest level of activity/alert

Figure 5. First iteration codes for interview transcripts.

transcript of the interview from those notes. Because I prepared the transcripts on my computer, it was easy to print several for coding use. Before I performed coding on the transcripts, I made it a practice to file one clean printed copy of the transcript with the interviewees' consent form and the rough field notes. I hand-coded the first transcripts using the codes I had formed prior to the first interviews. I quickly discovered that the codes were grossly inadequate for the depth of data that I had obtained. I went through the transcripts a second time, creating and applying additional codes, which I then added to my list. For validation, on several occasions I employed my trusted assistant to use the coding lists I came up with and apply them to clean interview transcripts, to see what would emerge. I also allowed my assistant to make marginal notes regarding item "codes" not reflected in the code list. I later used a code checking method to determine if the coding process I was using would generate percentage reliability (see Figure 6). In the first six tries, I obtained a coding reliability of less than 70%. Later, as I mastered the hang of the coding method, reliability went up to over 95% (Miles & Huberman, 1994).

$$\text{Reliability} = \frac{\text{Number of Agreements}}{\text{Total Number of Agreements + Disagreements}}$$

Figure 6. Code checking method formula.

Coding was an actively changing process through the 38 interviews, especially when I began to interview outside of the NTSB investigator sample. Various ideas emerged out of the different subject groups, which required additional codes.

Coding was done on a subject's transcript several times so as to get to the depth of the meaning that was being conveyed by the subjects. The process required maintaining an open mind with respect to what was emerging. Everything was important, and in spite of the thematic concepts developed at the beginning of the study and the temptation to force material into predetermined categories, I fought myself so that the real ideas would come through. The coding process was laborious. It was all done by hand and required several sessions for each profile. No profile saw less than three iterations of coding before thematic development took place.

Themes were drawn in the fourth and fifth iterations. Similar codes were identified for clustering into concepts. Phrases, sentences, and paragraphs were cut out and grouped into subject piles, where they were pasted together and titled by concept area. The concepts were given labels such as training, resources, influence, support, lack of support, etc. The cut-and-pasted pages were then photocopied into clean pages and combined into folders reflecting the concept subjects' titles.

Concept subject groups' pages were then coded, this time for emerging themes. The themes were grouped and labeled. Theme titles reflected such subject matter as "lapse in keeping up with emerging technologies" and "deficiencies in oversight of limited investigations." The themes were then readied for comparison with what I had learned from the literature and the questions I had formed prior to the field research.

Chapter Summary

In this chapter, I described the qualitative research method used to determine if capture or some other influence model is happening at NTSB and/or the FAA as they conduct aircraft accident investigations, which was interviews following the focused interpretive approach. I looked at how the interviews were set up and conducted. I explained my research role and the importance of insuring the respondents involved knew as much as they could about me before delving into the questions. I addressed the potential threats to the research results, and I explained my personal bias and motivations underlying my approach to this research. I examined my coding method, and I explained how themes were derived.

When comparing the emerging themes with what was gained from the capture theory and the other regulation theories, a picture evolves showing what is going on at NTSB with respect to the party process and the conduct of independent aircraft accident investigation. In the next chapter, I examine my research findings and look at the themes that evolved from the coding. Then I begin to compare the data to the research questions originally posed and see whether capture or other regulation theories affect the process and outcomes of aircraft accident investigations.

CHAPTER 5

FINDINGS AND DISCUSSION

This chapter examines the results of the field research and compares those results with the premises described in the literature previously presented on the capture theory and other theories of regulation, which pertain to possible outside influences on independent aircraft accident investigations. The 38 interviews conducted produced a wealth of rich information with respect to the research questions posed. The respondents represented a cross-section of a highly educated and experienced field of professionals. To best understand the field results, it is important to understand what comprises the backgrounds and experiences of the interviewees. This information is examined first.

The coding process led to the development of 21 themes. These themes fell into several theme categories that described human behaviors and addressed issues explaining interactions among investigators and other players within the aircraft accident investigative process. I examine these themes and the supporting interview material.

The research then compares the theme data with those elements of the capture theory and those of the four alternative theories previously discussed. Drawing from the elements underlying countervailing group power, principal agent theory, cooptation, and professionalism, I determine if the theme data lend support to parts or all of any of the competing theories. At the end of the chapter, I compare the research data to the questions posed at this study's beginning and determine if I can definitely state that capture does occur within independent aircraft accident investigations.

Respondents' Backgrounds

In total, 38 persons were interviewed in the study. Of the 38 interviewees, 17 were current NTSB employees, six were former NTSB employees, and five were current FAA inspectors with investigative experience. Seven of the interviewees represented interested parties. Five of these persons were product safety investigators for airplane, engine, and component manufacturers. One of the interested party members represented a union. The remaining party member represented an aircraft operator. The final three interviewees represented families who had lost a loved one in an aircraft accident.

The 17 current NTSB employees represented managers, group chairmen, major investigators, and field investigators. Six of the current employees were managers at the division, director, or board level. The remaining employees represented investigators at the headquarters and regional levels. All had college backgrounds. One respondent had an associate's degree. The others had completed, at a minimum, a bachelor degree from an accredited four-year college/university program. Of the 16 investigators with bachelor degrees, 14 had majored in science or engineering. Additionally, 8 of the 17 investigators had other formal trade training, such as FAA certification as an airframe and powerplant (A&P) mechanic. Most the current employees had aviation backgrounds. Thirteen of the 17 had at least private pilot certificates, 11 of the 17 had commercial pilot certificates, and of those 11, eight had obtained airline transport pilot [ATP] certificates. Over two thirds of the current employees had aviation careers prior to coming to the NTSB. Eight of the current employees had flown aircraft in the military. Four of the current investigators had experience flying for an airline company. The average flight time possessed by the current investigators ranged from as low as 53 hours to as high as 23,750 hours. Altogether, the 17 NTSB investigators interviewed represented over 200 years of experience in over 150 different aircraft. Interestingly, 15 of those 17 employees said that the reason they found themselves at the NTSB was their love for aviation. All the investigators mentioned that as investigators, they believed they made a difference. All the current investigators mentioned cases that led to safety proposals and accomplishments that they had drafted and seen implemented and that made significant improvements in aviation safety.

The former NTSB employees interviewed possessed backgrounds similar to the 17 current employees. Two of the six employees were former managers at the division, director, and board levels. The remaining former employees represented investigators at the headquarters and regional levels. Five of the six had college degrees. Half of the degrees were in aviation science or engineering. All four of the investigators were pilots and held at the least commercial pilot certificates. Two of the six were actively flying for an airline company. All six of the former employees had

had other careers before coming to the NTSB: four had been in aviation and the other two had been in industry. All six former employees mentioned as one of their reasons for coming to the NTSB their wanting to make a difference in aviation. Of the six former employees who left the agency, two retired from federal service, and the other four left the agency for better-paying positions in the aviation industry.

The backgrounds of the five FAA inspectors interviewed were varied. Three of the five inspectors had college degrees. Two had pilot licenses and had come to the FAA from earlier careers at airline companies. Three of the inspectors came from jobs not directly related to flying. One of the inspectors had been a road manager for a rock-and-roll band. Another had been a high school mathematics teacher. The other inspector had worked as an auto mechanic. The three inspectors without pilot licenses had obtained A&P mechanic licenses and had worked for airline companies as mechanics. In response to why the inspectors found themselves at the FAA, four of the five stated they were unemployed at the time and needed the work. The other said that he was tired of the long hours and difficult shifts at his airline company and needed a more stable schedule for himself and his family.

The five party members who worked for manufacturers also had varied backgrounds; however, all five stated they had worked most of their lives in the aviation field. All five of the party members had, at minimum, private pilot licenses. Four of the five had A&P licenses and had come to their respective companies after working in the aviation industry as mechanics. Two of the five party members had college degrees. One had a degree in aeronautical engineering, the other in education.

Regarding how the five party members from industry came to work for the companies they represented, one said that he started with his company right out of high school and had worked his way up through assembly lines to production quality control, supervision, and then product safety. Another said that he had worked in a number of different component repair shops with varying pay and benefits. He said that coming to his company provided job stability and a certain measure of security. Another said that he had flown for several small charter companies, trying to accumulate enough hours to get on with one of the big airline companies. He said that an associate informed him of the safety position in his company. The others had worked for airline companies as mechanics before coming to their respective companies. Two of the party members said that they came to work in product safety because the job was open but came to realize the importance of the position as they came to know it. All the party members mentioned that they believed their work added to the safety and improvement of their respective products and had a positive impact on the aviation industry.

The union representative said he came to his position at the union after being laid off by his airline company in the early 1990s. He said he wanted to stay in aviation and close to the airline industry and he had hoped that the economy would turn around and he would eventually be called back to his company. However, after a few years, he found he liked doing what he did and decided to stay. The union representative had a master's degree in management and held an airline transport pilot license. The union representative said that he had participated in several major NTSB investigations as a party member. He felt that his contribution, although he described it as small, was useful to the NTSB in resolving cases and identifying key operations issues that led to changes in the industry.

The aircraft operator was a career employee with another federal agency. He said he had a bachelor degree in forest management and an A&P license. He said he also held a commercial pilot certificate and was qualified to fly as a U. S. Forest Service lead pilot in one of their Beechcraft Baron airplanes. A lead pilot is the flight coordinator for air tanker operations. The lead pilot tells the air tankers where to drop fire retardant when fighting a wildfire from the air. The aircraft operator said he had participated in few NTSB aircraft accident investigations as a party member. He did, however, talk about one case involving the crash of an air tanker in California for which he was called by the NTSB investigator to explain how the operator maintained these airplanes and what types of inspections they performed to ensure the airplanes' airworthiness. The aircraft operator said that he had worked as an airplane mechanic before he went to college. He described himself as an "airport bum." He said he liked being around airplanes, so he did everything he could to learn aviation as a trade. He said he did everything at the airport, from pumping gas to "manning the radios." He said he even learned how to give weather reports. As he did these things, other mechanics at the airport taught him the trade. He took the tests, received his certification, and worked as a mechanic to earn money for college. He said he also obtained his private pilot license before attending college. He said he loved being in the outdoors and was fascinated with the work the Forest Service did. When he discovered in college that he could combine his aviation experience with forestry, he was hooked. The aircraft operator described his 22-year career with "the Service" as "a calling."

I interviewed three family members who had lost loved ones in aircraft accidents that were investigated by the NTSB and FAA. All three family members were female. One family member was the wife of a corporate pilot and was a pilot herself. The second family member was the sister of a pilot who had perished in a small twin-engine airplane along with his wife. And the third family member was the 36-year old daughter of a private pilot who had lost his life in a private homebuilt airplane. The wife I interviewed had a college degree in education and a commercial pilot certificate. She said that prior to marrying her husband, she was a women's basketball coach at a small college. At the time of the interview, she said she was teaching a foreign language at a nearby high school and "moonlighted" as a corporate pilot for a friend's company. She mentioned that before they married, her husband had taught her to fly. She said she met her future husband when she was a college student enrolled in the aviation course he taught. She said that after she graduated, she stayed on with the college to coach basketball. As she described her husband in explicit detail, it was evident that she loved and missed the man very much. At one point during her interview, she expressed how difficult the three years had been for her, living without him in her life.

The sister had a college degree in musical theater and worked as a producer of a children's theater company in the Midwest. At the time of the interview, she was preparing for a summer variety show that involved over 100 children ranging in age from 5 to 21. The sister said she had been very close to her brother. She said that he and his wife had lived in the same community most of their lives. She said that her family and her brother's would get together weekly for dinners, barbeques, volleyball games, and movies. She said she had liked his wife very much and that before they had left the area, his wife had become involved with assisting in some of the children's theater productions. She said that about one year before the accident that took his life, her brother had left the area to take a better paying job in the computer software industry, her brother being educated and experienced in that field. The sister said that in the months following the accident, her sister-in-law's family had retained an attorney and was in the process of suing her brother's estate in the "negligent death" of his wife. The sister said that because she was the executor of her brother's estate, she was charged with handling the issues associated with the lawsuit. During the interview, the sister expressed her frustration with the length of time it was taking to get answers from the NTSB regarding the circumstances of her brother's crash. She also expressed frustration that she had little time to mourn her brother's death before the legal problems began.

The daughter was a 36-year-old homemaker and mother of three children, ages 12, 10, and 5 years. She was married to a businessman. The daughter had a degree in marketing and had worked in the field after completing her undergraduate degree. She said she had decided to take a break from work to raise her children. Neither she nor her husband had aviation experience, but she said that her 12-year-old son had an interest in flying and had flown with his grandfather in his homebuilt Rans RV-6 airplane on several occasions. During her interview, the daughter said that in the months following her father's accident, many of his friends, who were also pilots, expressed to her their opinions of what happened to cause the accident. At the time of the interview, her father's case was still under investigation by the NTSB. She said that she had spoken with the NTSB IIC on three separate occasions and expressed that the investigator was "cordial, easy to talk to, and took the time to explain what his investigation entailed." The daughter expressed frustration because what she was hearing from her father's friends was totally different from the information she heard from the investigator. She also expressed that waiting for the NTSB to issue a report was hard.

Themes Derived from the Research

This part of the chapter presents the results of my research, specifically the themes that ultimately arose from the interviews' data collection and coding iterations. It is important to note for the reader and subsequent researchers that I set the level of depth at which I believed the themes communicated adequate pictures of what was happening as related by the respondents. The following theme statements are the culmination of several months of field research and data interpretation. These themes set the stage for the coming discussion and formulation of conclusions relating to the questions of capture and regulation theories as they relate to aircraft accident investigation. The themes are grouped into four broad subject areas for easier comparison. Tables presenting a breakdown by percentages of how each respondent's data either rendered support toward a theme or showed little or no support for a theme are provided in this section.

NTSB Investigators and Party Members

The following nine themes establish the relationship between NTSB investigators and party members and define degrees of influence. Table 1 shows the breakdown of support for each theme by percentage.

Table 1

Respondent Percentage Support in Theme Block Development: Themes that Establish the Relationship Between NTSB Investigators and Party Member and Assess the Degree of Influence Exerted

Themes	Participating respondents providing information in the subject area compared to total respondents	Percentage of Respondents providing information to support theme development
1. Mutual support between Investigators and party members	35 of 38	85.71
2. NTSB distrust of party members	35 of 38	80.00
3. Little influence exerted, field phase	35 of 38	94.29
4. Influence, fact gathering, and follow-up on research phase	35 of 38	71.43
5. Influence against high-level managers	38 of 38	76.32
6. General Counsel involvement	33 of 38	69.70
7. NTSB safety recommendations highly political	38 of 38	94.74
8. Other methods to make safety changes	35 of 38	94.29
9. More senior, more resistant	35 of 38	82.86

Theme 1: Mutual Support

Theme 1 states, "There is mutual respect among accident investigators in both government and industry at the regional level."

Of the 38 respondents, 30 made statements in their interviews that presented evidence supporting this theme, five respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Of the interviewees supporting this theme, the respondents made statements indicating that the working relationship between NTSB regional field investigators and air safety investigators from aircraft, engine, and components manufacturers was highly cooperative, friendly, and professional.

Theme 2: Distrust

Theme 2 states, "There is greater distrust of party members by NTSB group chairmen and IICs at the major investigations level."

Of the 38 respondents, 28 made statements in their interviews that presented evidence supporting this theme, seven respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Investigators and inspectors who had served on groups, chaired them, participated as interested parties, or run major investigations repeatedly voiced caution when working with party members from manufacturers and unions.

Theme 3: Little Influence in the Field Phase

Theme 3 states, "There is little influence exerted by party members during the field phase of an accident investigation."

Of the 38 respondents, 33 made statements that showed evidence supporting this theme, two showed little support, and three respondents were not asked questions seeking information in this area. The questions that gained the responses supporting the theme were focused specifically on the time that investigators and inspectors are physically at the aircraft crash site. Questions were designed to seek information regarding the specific interactions among investigator, inspectors, group chairmen, and the airframe and engine manufacturers and company operators--the dominant party participants The data showed the degree of party influence on the investigation during this time period to be minimal.

Theme 4: More Influence in the Research Phase

Theme 4 states, "There is more influence exerted by party members during the fact gathering and follow-up on research phases of an investigation."

Of the 38 respondents, 25 made statements in their interviews that presented evidence supporting this theme, 10 respondents' interviews showed little or no support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. The interview responses supporting the theme focused attention on the period of time following the field phase of the investigation through the final determination of an accident's most probable cause. The investigators and inspectors and interested party respondents said that when and if interested parties or other outside influences exerted pressure on an investigation, it started on the investigative team's return from the accident site and continued in the succeeding months. Outside interests continued to exert pressure through the public hearing, technical support meeting, and draft report reviews. Respondents expressed that pressures usually continued up to the NTSB meeting, when an accident case's probable cause is determined and recommendations are issued. Investigators stated that interested parties had attempted to influence NTSB members with respect to specific cases prior to their consideration. Supporting evidence provided showed where factual reports had been changed prior to NTSB consideration without the IIC's knowledge. However, the research revealed no evidence that showed that a NTSB member had voted on a case based on an interested party's influence.

Theme 5: Influence on High-level Managers

Theme 5 states, " The greatest application of influence is exerted on high-level managers and staff."

Of the 38 respondents, 29 made statements in their interviews that presented evidence supporting this theme, and nine respondents' interviews showed little or no support or failed to reference the theme. Of those respondents presenting evidence supporting the theme, the majority of them argued that if factual reports, draft final reports with proposed statements of probable cause, or proposed safety recommendations were to be changed, it would happen at this level. These changes usually occur at a time usually between the final technical review of a case, when the interested parties have the opportunity to review the draft factual report, and the presentation of the case for consideration and final determination of the accident's most probable cause. A former investigator respondent said,

> I had a case where a controversial report was changed at the headquarters. It started as a simple stall-spin accident involving a training airplane on an instructional flight. During a maneuver, the student pilot entered a spin. The instructor attempted to regain control of the airplane but failed. It crashed in a cornfield. The student pilot was critically injured. The instructor pilot died shortly after the crash. I called the airplane manufacturer to assist with the investigation. Everything pertaining to the field investigation went well. Before I left the accident scene, I asked the airplane representative to provide me with the original flight-test and certification data about the airplane. He said he would when he got back [to his company].
>
> Several months went by and there was no information from the airplane manufacturer. In the meantime, I learned of previous accidents involving this particular airplane. I came to realize that this airplane was prone to spin whenever it stalled, and the recovery maneuver was extremely difficult to perform. I requested information from the FAA small airplane certification office. At first, they were very cooperative. Then all of a sudden, they stopped sending me information. I was told that they couldn't provide the information because it didn't exist. When I asked why, the inspector told me the company that built the airplane had gone bankrupt and later emerged under a new certification. Since the original company did not exist, the design and technical support for the airplane was gone.
>
> During this time, I received letters and phone calls from former employees of the company that designed and built the airplane. I was told of a production airplane that was not the airplane certified by the FAA. The original airplane design had stronger wings and a straight tail. The production airplane had weaker wing structure and a t-tail that made stall recovery more difficult to achieve. I was also able to obtain some of the original flight test data on the airplane prototype. I went back to the FAA and the airplane manufacturer with this information. The airplane manufacturer claimed they were not aware nor were they responsible. The FAA certification office backpedaled too. I wound up writing my report, which addressed the design problem, without the parties' inputs. I also submitted a safety proposal requiring the FAA to issue a directive that would preclude practice stall maneuvers in the airplane and create solutions to the wings and tail deficiencies.

> When I sent the factual report out for review, all hell broke loose. The company called the [NTSB] chairman, who in turn called my boss. My boss called me with all kinds of questions addressing my motives. At this point, nobody told me to change anything in my report or proposal, and for the most part, no one appeared to be upset with me.
>
> A few months later, I called the headquarters about the status of my recommendation proposal. I was told it was in our Office of Research and Engineering for study. When asked who was working the proposal, I got all kinds of doubletalk. I waited another month and called again. This time I was told that the proposal was rejected. When I asked why, the engineer said my proposal did not reflect the information released in the factual report. The safety issue was no longer relevant. I asked how could it not reflect what was in the report? She told me that it didn't, and maybe I had better look at the factual report again. When I did, I found that the report had been changed significantly. It no longer spoke to any of the design issues. The probable cause the Board issued on it blamed the student pilot for failure to maintain aircraft control. I was shocked. I never found out what happened. I suspect the manufacturer got to someone at the headquarters.

Theme 6: General Counsel Involvement

Theme 6 states, "When controversial issues emerge during an investigation, the General Counsel's Office is more likely to become involved."

Of the 38 respondents, 23 made statements in their interviews that presented evidence supporting this theme, 10 respondents' interviews showed little support or failed to reference the theme, and five respondents were not asked questions seeking information in this area. Investigators stated that when they uncover controversial or highly publicized safety deficiencies involving a manufacturer's product or in the way a company operates, they almost immediately see agency legal involvement in the case. The current and former NTSB respondents stated that most of the disputes involve investigative procedures spelled out in federal law. Respondents said that attorneys try to be present at systems examinations and witness interviews, although the law states they are barred from such events. Attorneys have also attempted to sue for access to investigative materials and meetings, although so far, these efforts have been denied.

However, the investigators said that the majority of times when the General Counsel's Office weighs in usually involve requests under the Freedom of Information Act (FOIA). Respondents said that with high-visibility cases or cases with controversial issues, FOIA requests appear soon after investigators return from the field. Respondents said they were concerned that personal field notes containing theories or hypotheses over possible causes to an accident, which are most times ruled out, often get released to plaintiff's attorneys in civil lawsuits, resulting in investigators being deposed and questioned over issues not related to the specific case. Respondents also said they were concerned over graphic or company proprietary materials given in good faith being nondiscriminately turned over to attorneys "with self-interested agendas disguised as promoting safety."

Theme 7: Political Influence of Safety Recommendation

Theme 7 states, "Safety recommendations are highly political. Recommendations are accepted only when forces outside of the NTSB have applied political influence."

Of the 38 respondents, 36 made statements in their interviews that presented evidence supporting this theme, and two respondents showed no support or failed to reference the theme. Respondents to the questions providing evidence supporting this theme said that safety recommendations issued by the NTSB are not always accepted. Many of the respondents stated that public outcry over an aircraft accident such that it draws national media attention is the only way a manufacturer or the FAA will fix a mechanical, procedural, or certification problem. Several respondents said that recommendations are often used as a lever to get the FAA to act on an issue before pressure from Congress forces the FAA Administrator to act. One investigator respondent said,

> It was the crash of a rescue helicopter that was heading home after lifting a stranded hiker off the side of a mountain. As the crew was taking off, the tail rotor came apart. The helicopter went into a spin and crashed into the mountainside. The two paramedics managed to get out. The pilot didn't. He died on impact. The investigation found that the tail rotor trunnion, that piece that holds the tail rotor to the drive shaft, had overheated, fatigued, and came apart. Our metallurgists found all kinds of cracks in the piece. We went back to the manufacturer, a European company, to see if they wanted to take it on themselves to fix the problem. Basically, the part was made of aluminum alloy. Most U.S. helicopters use stainless steel for that piece. But the company stalled. Their argument was that it was a one-time occurrence and that they'd not experienced problems before. They also said that we couldn't prove that it was overheating that caused the failure. They wanted to convince us that improper installation of the part caused the cracks to form. They were right. We didn't know enough to go forward with a change recommendation. We needed flight testing. We asked for it through the recommendation process. We wanted the FAA to mandate the manufacturer provide this data, otherwise, they'd decertify the helicopter for use in the U.S. Firestorm! The Europeans and the State Department went nuts. The FAA backed down. We were basically left out to dry. Then one of the board members received a call from the Coast Guard Commandant. It seems that they were operating the military version of that helicopter for sea rescue and city defense around Washington, DC. After the 9-11 bombings, well, now a lot of people had a vested interest in seeing the Safety Board put out a recommendation. The recommendation was submitted. But before it hit the streets, the manufacturer issued a service bulletin requiring all operators of that helicopter to replace the aluminum part with their new stainless steel trunnion.

Another investigator respondent related this account.

The airplane was responding to a medical call from a hospital in Wyoming to pick up a patient who'd been involved in a car accident and had a broken neck. The airplane flew up from Colorado to pick up the patient and transport him to the larger facility in Casper. It was night and stormy. There were snow showers all over the place. The flight had been delayed for some time because they couldn't get into the small airport near the hospital where the patient was. Later that evening, the weather broke and the crew chanced it. On approach to the airport, the airplane picked up severe ice. It stalled and crashed on a ridge three miles short of the runway. Three of the four crew members on board were killed.

This would have just been another Part 135 commercial flight accident investigation for us had this not been the 10th crash of an EMS [Emergency Medical Service] aircraft within the past two years. Most of those accidents had involved helicopters. But it was the loss of life that was getting the attention. Over those two years, 31 people, including four patients, had died. We were receiving calls from people concerned to have their children or wives transported by air.

Our investigations were turning up all kinds of problems with air ambulance operators, including in many cases poor oversight by the FAA. We knew that any safety changes in this industry would have to be worked through recommendations. We were not getting cooperation from the FAA. We thought we had enough evidence to go forth with a recommendation. And we went forward.

The Board recommended all air ambulances fall under the same rules as passenger-carrying-for-hire aircraft. We asked for risk management, cockpit resource management, all the things that air carrier and other passenger flight operators practice. We also called for stricter oversight. The recommendations made it through the process up to the highest management levels at the Board. Then they balked. Criticism of the FAA stalled them. The FAA administrator's office and the Board had been negotiating. It looked like they'd die in committee. They'd never be issued. Well, now forces outside have gotten involved. Medical crew associations have gotten the DOT inspector general involved. Congressional inquiries are popping up everywhere. The flight nurses are getting on the news and telling the public how afraid they are to fly these missions. The recommendations are going forward. It will be interesting to see what they look like though when finalized.

Theme 8: Other Methods

Theme 8 states, "As they gain experience and time in their agencies, investigators and inspectors use other means to effect safety changes, such as direct negotiation with companies and industry, rather than use the recommendation proposal process."

Of the 38 respondents, 33 made statements in their interviews that presented evidence supporting this theme, two respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that NTSB investigators get more done "in back rooms with doors shut" with respect to making changes in aviation safety than they do going through the safety recommendation process. Respondents stated that to get a safety recommendation proposal through the "red tape" of the recommendation process, an investigator has to (a) find a "champion" or "sponsor," that is, someone at the headquarters who believes in the idea and is in a position to help the investigator get the proposal through; or (b) have a high enough "body count" that the public cannot tolerate the recommendation proposal not be accepted. Respondents agreed that investigators presenting their findings on a product or procedural deficiency directly to a manufacturer or an operator and then working with that manufacturer or operator to develop solutions to fix the problem is the most efficient and expeditious means in improving aviation safety. As one investigator respondent stated,

> Recommendations are hard to get through on field accidents. They just don't carry the weight or support from the senior staff or the Board. I've found it is

> easier to it down with the manufacturer and discuss the findings of an investigation and then deal with the issues there. I've rarely had a time when the manufacturer or company has not wanted to make changes following an accident. We get more done, safety-wise, this way, that is, by back channels than we ever do trying to submit a recommendation through the formal process. It takes too long, and frankly, the people at headquarters don't care about the field. If it's a major accident, they'll write the recommendations with the blue cover [major aircraft accident report] and issue them during the Board Meeting. With a field investigation, you have to find someone in the headquarters who'll walk the recommendation through. You have to follow up on it constantly. It's best to agree to get the headquarters person's name on the recommendation proposal. That way, she'll be motivated to help it through. If you try to do it on your own from the field, it winds up in someone's terminal in-basket. I had a call on a recommendation proposal last week that I had submitted three years ago. Well, when I submitted it, I followed up on it constantly for about four months. I was told that it had been assigned to someone in RE [NTSB Office of Research and Engineering] and I would hear back on it. Other things happened in the meantime, and frankly, I lost track of it. Just one more thing, recommendations are our product, but we don't do this well from the field. It's because we don't have the time to follow up on it once it leaves the office. Before you know it, you're back in the field on the next case, and then the next, and so on. We investigate accidents better than anyone. We help determine probable cause better than anyone. But safety recommendations, our product, we don't do that as well as we should.

Theme 9: The More Senior, the More Resistant

Theme 9 states, "The more senior (more years of service) an investigator is, the more resistant he or she is to party influence during the field investigation phase."

Of the 38 respondents, 29 made statements in their interviews that presented evidence supporting this theme, six respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that the investigators/inspectors who had approximately 10 years or more experience with their agency could ignore party pressure when in the field conducting the crash investigation. The respondents said that in most cases, they could beat back any party pressure up to the point where the General Counsel's Office or a NTSB Member became involved. One respondent recounted:

> We were in the middle of a field. The airplane had pretty much nosed in, and all indications were telling me it was a stall-spin accident. I had an FAA maintenance inspector and an engine manufacturer representative with me. After documenting the site, we pushed the airplane back on its wheels so we could look at the engine. One propeller blade was bent straight back and had little cordwise scratching on it, indicative of little to no rotation. I knew I would have to do a check of the engine. I expressed that I wanted do a field teardown of the engine at the scene. This involved removing the valve covers and spark plugs, turning the propeller to observe mechanical continuity and performing a compression check. I also wanted to remove the filters and check for debris and other contamination. I was particularly interested in looking at the fuel for evidence of contamination. When I mentioned this, the engine representative lobbied to have the engine shipped back to the factory to have a complete inspection done. I told the guy I had witnesses who saw the airplane get slow, stall, and turn one-and-a-half times before hitting the ground. One of my witnesses said she heard the engine running before the crash. She said she then heard the engine sputter and quit. The airplane came down after that. I felt I had a pretty good idea of what we were dealing with at the scene.
>
> The engine manufacturer representative was insistent that the engine not be touched while it was in the field. I considered what he said but decided to do the field teardown anyway. The FAA inspector and I began removing valve covers. The engine representative stormed over to his car and pulled out his cell phone. He did nothing to help us. About half an hour [had] passed when I got a call on my cell phone. It was my boss asking me why I wasn't allowing the engine manufacturer representative to participate in the investigation. I told him their representative was at the scene but was upset that I wouldn't ship the engine back to the factory. I told my boss that if we found a problem with the continuity check, then I'd consider shipping the engine. I asked him how he knew there was a problem. My boss told me he'd just got off the phone with the engine company's director of product safety. I explained that was not the way I understood things should happen. I then asked my boss if he or AS [the director of the Office of Aviation Safety] was directing me to ship the engine back to factory. He said no and reaffirmed I was the IIC and it was my decision. I proceeded with the field teardown.
>
> Later, when I removed the carburetor and opened it up, I found water in the fuel bowl. When I went to discuss this with the engine representative, he

> tersely blurted out, 'Why, you don't listen to me.' I let it go. However, I decided not to conduct an out-briefing. When I got ready to leave the scene, I told the engine manufacturer representative that I was revoking his party status and that I'd call his company when I got back. To this day, I don't know what his motivation was to be that way.

The respondents related that younger investigators showed more of a tendency to trust the party members and rely on the information they provided. The respondents voiced that young investigators would immediately call the manufacturers soon after their notification of an accident and offer them party status. The experienced investigators showed a tendency to wait and evaluate the need for a manufacturer's expertise before calling them and offering them party status. Many of the respondents stated that many young investigators lack confidence in their abilities, although they are, by the fact that they are more recently trained, more up-to-date on investigator techniques and the laws governing accident investigation. They tend to seek wisdom from those persons who have years of experience, whether they be from within the agency or from outside.

FAA Inspectors and Party Members

The next block of themes establishes the relationship between FAA inspectors and party members and define degrees of influence. Table 2 shows the breakdown of support for each theme by percentage.

Table 2

Respondent Percentage Support in Theme Block Development: Themes that Establish the Relationship Between FAA Inspectors and Party Members and Define the Degree of Influence

Themes	Participating respondents providing information in the subject area compared to total respondents	Percentage of respondents providing information to support theme development
10. FAA inspectors lapses in interest, limited investigations	35 of 38	85.71
11. Parties exert greater influence over FAA inspectors	35 of 38	71.43

Theme 10: Lapses of Interest

Theme 10 states, "There are lapses in interest on the part of FAA inspectors when conducting limited investigations on behalf of the NTSB."

Of the 38 respondents, 30 made statements in their interviews that presented evidence supporting this theme, five respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that when conducting limited investigations, FAA inspectors acting on behalf of the NTSB IIC are more interested in "slapping a pilot or mechanic with a violation" than with identifying the underlying safety issues surrounding an accident. An investigator respondent talked about problems he encountered when working with the FAA on a limited investigation.

> This airplane had experienced a loss of engine power while in bad weather. The pilot set up for a glide, not knowing when he'd break out into the clear. He called the center [air traffic control] and told them he was going down. The

> airplane wound up crashing into a densely wooded area. It took rescue more than two hours to get to him. The pilot was alive at the time, so we decided not to launch on the case. The local FAA FSDO said they would send a couple of inspectors to the scene and document the site. That night, the pilot died. I got ready to travel, but my boss said not to. We were short of people, I guess. The FAA went to the site, documented the scene, and inspected the airplane. When they were done, the FAA called and told me that there was rust in the engine filters, as if water had gotten into the system somehow. The FAA said everything else was fine. The lead FAA inspector sent to the scene told me that the pilot must have put bad fuel in the airplane. So I started writing my report based on that information. A few weeks later the engine manufacturing company asked me if they could examine the airplane's engine. I told them that would be fine and related to them what the FAA had found. A few days later, I got a call from the engine company representative. He said they pulled the accessories off the back of the engine and found some broken gear teeth. They tested the fuel taken from the tanks, lines, and fuel strainer and didn't find any evidence of water. I told them to ship the engine back to the factory and I'd be down in a week or two to look at it. When I went down there, we split the engine case and found the camshaft gear had come apart. The airplane engine failure had nothing to do with water in the fuel. When I confronted the FAA inspector, he referred me to his supervisor. His supervisor told me their workload made it impossible to leave inspectors in the field to investigate accidents for the NTSB. The supervisor didn't respond to why his inspector failed to find the real problem with the engine.

Another investigator respondent stated that on one case he ran into "blatant bias" on the part of the FAA.

> I had a case where a pilot crashed a business jet into a hillside with passengers on board while on approach into an airport in bad weather. A month to the day after I had finished the fieldwork, I got a call from the FAA inspector assigned to the case. He said they were closing out their case file and determined that the pilot intentionally tried to duck under the weather to get into the airport and didn't make it. I asked the inspector if he didn't mind me waiting to rest on this information as a possible cause until I saw the autopsy and toxicology reports. As the months passed, I began to uncover issues about the relationship the pilot had with the FAA office that was supporting my investigation. As best I can describe the situation, there was a feud going on between the pilot and a few inspectors in that office, and it had been going on for nearly a year. Our human factors people determined that the pressure being put on the pilot by the FAA contributed to an overall fatigue, which the pilot experienced during the approach and prior to the crash. I wound up mentioning the improper inspector procedures on the FAA's part as a finding in my factual

> report. When the Board considered the case, they changed the report and factored the FAA as actually contributing to the accident.

NTSB and interested party respondents said that the limited investigations "shortchange" the public, especially if an accident shows evidence of a safety deficiency and the FAA fails to inform the NTSB. FAA respondents said that often the NTSB does not delve deep into the issues surrounding a limited investigation because the accident did not kill anyone. NTSB investigators argued that they would investigate every accident that caused an injury to any person if they could, but because there are more accidents than there are NTSB investigators to investigate them, they must rely on the FAA inspectors and do the best they can.

Theme 11: Greater Influence at the FAA

Theme 11 states, "Parties to an investigation exert greater influence during limited investigations conducted by the FAA."

Of the 38 respondents, 25 made statements in their interviews that presented evidence supporting this theme, 10 respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that the limited investigations offer almost a "free spin" to the parties, as they can be asked by the NTSB to participate and then do their examination of the accident with little oversight from the government. An inspector respondent said,

> First, I need to tell you that I'm an air carrier maintenance inspector. I deal primarily with overseeing [company name] Airlines' heavy maintenance operation. I pull accident duty about twice a year. On my last tour, I had a

run-in with an engine manufacturer. The communications center notified our office that a new Cessna airplane had crashed after experiencing an engine failure. I was sent out to take a look at it. The pilot was actually able to land the airplane on a road and did a pretty good job. But during the landing roll, he hit a road sign with the left wing, tearing the wing open and bending the outer third of the wing backward, making it an accident. The pilot got out of the airplane unharmed. I was informed that an investigator from the engine manufacturer was coming out to assist me. I queried the NTSB investigator, and he told me he had granted party status to the engine company. By the time the engine manufacturer's representative got to the site, I already had the airplane moved to a hanger at the nearby airport. I had a local mechanic remove the cowling so that the engine was exposed. The engine representative came in, looked the engine over for maybe 15 minutes, and then announced that the owner had failed to service the engine properly with oil, causing the engine to overheat and eventually seize. As the engine seized, the number 3 cylinder let go, punching a hole in the top of the crankcase. The engine representative went on to show me that the plug in the crankcase had not been safety-wired properly, indicative of poor servicing, and he showed me in the engine logbook when the airplane had been last serviced, which had been two weeks earlier. I asked the engine representative why then was there oil all over the top of the engine at the hole and also down the firewall and along the bottom of the airplane. I said sarcastically, "Seems to me that's a lot of oil for an engine that hadn't been serviced properly." He rebutted that this newer engine had a larger oil capacity than the preceding model.

The inspector went on to say that this would have probably been as far as the investigation would have gone, except that the inspector was also a certified airframe and powerplant mechanic and before coming to the FAA had worked doing maintenance on small airplane engines. He said he did not reveal this information to the engine manufacturer's representative.

As soon as we were done with the airplane and the engine representative had left, I called the NTSB and gave the IIC a briefing on what we found. I told him that I was not convinced that we had oil starvation and told him of an independent repair shop we could take the engine to, to have it examined properly. Of course, it was his call. The IIC agreed, and I set it up. Turns out, when we took the engine apart a few weeks later, we found that one of the number 3 rod bolts to the rod clamp at the crankshaft journal had snapped, freeing the number 3 rod to punch a hole through the top of the case. All of the oil in the engine subsequently got sucked out through the hole, hence why there was oil down the firewall and along the bottom of the airplane. We [FAA] were aware that this model of engine was experiencing this problem. We also knew that the manufacturer was dragging their feet issuing a service bulletin to fix the problem. I understand the NTSB fought the manufacturer

> hard to fix the problem. We wrote it up for our report, citing the rod bolt as the problem.

In this case, the investigation was not compromised. But NTSB respondents argued that most FAA inspectors, who perform accident investigator duty perhaps only once a year, are more willing to accept and use what information the parties tell them. FAA respondents admitted that many times they are at an experience disadvantage with some aircraft, especially if their specialized experience is in air carrier operations or avionics maintenance. In cases for which there is little evidence to support a mechanical deficiency with an aircraft, respondents agreed that FAA inspectors were more willing to give interested manufacturer party representatives the benefit of the doubt. One investigator respondent recounted,

> I was sent to an accident site in western Wisconsin to do an investigation on a one-fatal Citabria [airplane]. After half a day's travel to get there, I arrived to find the airplane in a field behind a farm house, with a sheriff's deputy sitting in a folding chair with a cooler beside him at what I surmised was an entry control point to the site.
>
> Also next to his chair was one of the airplane's main landing gear wheels. The airplane was approximately 50 yards from the wheel and where the deputy was. The accident site was surrounded by police tape. I asked the deputy if anyone else had been out to look at the airplane. I expected the FAA to be there, gathering preliminary information. The deputy told me that the inspector showed up, walked around the airplane once, took a few pictures, and then told the deputy that the airplane had touched down where the wheel was found. The wheel broke off, the airplane then tumbled, balled up, winding up where it now rested. The inspector then got back in his vehicle and left. The deputy pointed to several tire marks in the grass that led from the tire to the airplane. There were a lot of tire marks, at least six to seven pairs. I asked the deputy if the medical examiner or any of the rescue vehicles had driven through the area. He said yes, right up to the airplane. I looked at the airplane wheel. Half of the wheel was covered with dirt. The other half was clean. The fracture at the wheel hub was a clean break. I looked at the tire marks and realized the pairs were too close together to be made by this airplane's tires. I then looked at the airplane. The wings were crushed aft along the leading

edges. The engine, cowling, and propeller were pushed back into the pilot's seat. The fuselage and tail were twisted and broken. There was no aircraft debris strewn about. Everything, except for that one tire, was right there with the airplane. It was a classic stall-spin signature, one that I'd seen many times before. Still there was that tire. I then noticed [that] where the main landing gear strut was, there was a half-moon shaped hole in the ground. The strut and brake line showed a clean aft, or in this case upward, break. It was easy to deduce that the airplane hit straight down. The tire compressed as it broke during impact, and the recoil shot the tire out of the hole, landing it behind the airplane. After I had spoken to several witnesses who saw the airplane flying in the area before the crash, I was convinced that this is what had indeed happened.

A few days later, when I was back in my office, the inspector called me. He proceeded to tell me what he'd found and that he'd spoken to the airframe and engine manufacturers and agreed with them that the pilot had botched the landing to the field and that's why the pilot had died. I asked the inspector why he though the pilot would try to land the airplane in that particular field versus him flying back and landing at his home airport. The inspector hesitated to answer. I then asked the inspector if he looked at the engine and flight controls to establish that they were functioning properly. He said he looked at them and didn't see any problems. I then asked the inspector if he saw the three-inch hole in the engine crankcase just above the number 2 cylinder. There was silence. Knowing what I knew about the wheel and the crash dynamics and what he had told the sheriff's deputy, I knew this was going to need lots of work. I told the inspector not to write his report just yet and that he'd better wait until I got the engine manufacturer out to look at the engine with me.

I later learned the inspector was from the air carrier operations unit at that FAA office. He had been an airline pilot before coming to the FAA. He knew little about small airplanes and even less about their systems, especially reciprocating engines. I probably saved the guy massive embarrassment. I also found out that the engine manufacturer pressed him to close out his report right away. Everyone seemed to be in a rush to get this done and move on. A person had died in an airplane accident. People would want to know why, including me. I slowed things down.

Future Effectiveness of NTSB

The next series of themes define concerns and issues faced by the NTSB with respect to accident investigation and the future effectiveness of the agency. Table 3 shows the breakdown of support for each theme by percentage.

Table 3

Respondent Percentage Support in Theme Block Development: Themes that Define Concerns and Issues Faced by the NTSB with Respect to Accident Investigations and Future Effectiveness

Themes	Participating Respondents providing information in the subject area compared to total respondents	Percentage of Respondents providing information to support theme development
12. Party members want to know as much about NTSB investigators as possible.	35 of 38	97.14
13. Technology advances, NTSB frustrations	35 of 38	88.57
14. NTSB training, sporadic	33 of 38	90.91
15. NTSB investigators want to be proactive, frustrations	33 0f 38	87.88
16. Party members oppose NTSB use of outside laboratories	35 of 38	85.71
17. NTSB selectivity	35 of 38	94.29
18. NTSB is a calling, symbolism	23 of 38	95.65
19. NTSB too reliant on the parties	35 of 38	68.57

Theme 12: Party Member ' Knowledge of NTSB Members

Theme 12 state, "Party members want to gain as much information about NTSB investigators as they can. Party members actually know more about individual NTSB investigators than the investigators know about each other."

Of the 38 respondents, 34 made statements in their interviews that presented evidence supporting this theme, one respondent's interview showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that FAA and interested parties are more likely to know more about an investigator than other investigators and staff within the agency. NTSB respondents stated that party members, by virtue of the fact that their participation spans all regional office boundaries, know something about every investigator in the agency. Respondents said that they actually learn about other people in their agency through their conversations with the party members. Party members often tell NTSB investigators who the good investigators are in the agency and, sometimes, who the bad investigators are. Respondents argued that interested parties seek to know as much about individual investigators and inspectors so that they have some idea of how to approach them and how to work with them. Some respondents went further in stating that interested parties want to know as much as they can about an investigator so that they might be able to influence that investigator. A former investigator respondent said,

> They [the party representatives] know everything about you. Don't think they don't. After they've been out in the field with you, the first time or the second,

they make a decision about you and write up a dossier. They have your name, numbers, location, NTSB phone book pictures. They write up what your concerns are, where they stand with you, and what they can expect your accident emphasis is going to be. They know more about you and others in your agency than you ever will. It's funny how they know more about us than we will ever know about them.

One party respondent said,

We've enjoyed a good working relationship with the major investigations team. Our people are there to provide the information the IIC or group chairmen need to conduct a smooth and successful investigation that identifies the issues. Whatever the Board needs from us, we try to provide, be it crews' training records, company procedures, coordinating for witness interviews, and so forth. When we were assisting with the US Air [Flight] 427 investigation, we got with US Air to provide a [Boeing] 737 full motion flight simulator for the IIC and his team to use in reconstructing those final minutes of the flight. We work well with the major investigators, the Board members, the director of Aviation Safety, and most of the folks in Washington. We don't enjoy that same understanding with the regional offices. We've tried to get a handle on this for about five years now. It seems that whenever something happens in the regions, we don't get notified. The FAA and industry seem to get the word, but we usually don't find out an incident or accident has occurred until the following day when the FAA *Daily Bulletin* comes out. We want to help, but as I said, the regional offices don't always call us. We'd like to fix that.

Theme 13: Technology Advances

Theme 13 states, "As technology in aviation advances rapidly, NTSB investigators are frustrated that they are not on top of the most modern technologies or procedures."

Of the 38 respondents, 31 made statements in their interviews that presented evidence supporting this theme, four respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that investigators want to know about the latest technologies that are being applied to aviation and what clues these technologies can afford to assist in investigations. NTSB respondents said that they want to keep their piloting skills fresh and they want to update those skills with additional training through simulators and flight programs. Respondents said that investigators and inspectors want to visit airframe, engine, and components manufacturers on a regular basis. NTSB investigators also want the industries to keep them apprised of new technologies, their applications, operations, and procedures. A group chairman respondent stated,

> "I had a case where I was deeply involved in issues with an airplane's flight control system software programming. I needed to learn more about the system. Our folks in Washington didn't have anyone knowledgeable with the system, so I decided I would become the expert. The company offered me the opportunity to travel to their training facility in Miami, go through an abbreviated ground school, and get three hours in their simulator. It involved going TDY [temporary duty assignment] to Miami. The headquarters wouldn't approve it."

<u>Theme 14: NTSB Training</u>

Theme 14 states, "NTSB investigator training is sporadic and hit-and-miss. Other than the basic air safety investigator course, there is no set training plan for NTSB management to follow in developing its investigators. On the other hand, the FAA has a training plan for its inspectors, which is funded and rigidly followed."

Of the 38 respondents, 30 made statements in their interviews that presented evidence supporting this theme, three respondents' interviews showed little support or failed to reference the theme, and five respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that NTSB investigators want management to develop, fund, and implement a training plan that provides for investigators' continued development. They wanted to see levels of experience established, i.e., an apprentice level, followed by a journeyman status, and then, after several years, a master or senior investigator level. Investigators wanted a continuing training program that allows them to hone their skills. Investigators wanted flexible training that addresses the introductions of new aviation technologies so they can remain at the forefront of the aviation industry. FAA respondents said that although accident investigation is not their primary responsibility or job focus, they are required to attend a three-week accident investigation course conducted by the Transportation Safety Institute at Oklahoma City. FAA inspectors said that when they come into the agency, they have a set training plan designed to develop an inspector and that each inspector follows as he or she progresses through his or her career. The training plan includes courses that an inspector must be scheduled for each year. These courses cover a variety of aviation topics, from conducting surveillance to aircraft certification.

Theme 15: Proactive vs. Reactive

Theme 15 states, "NTSB investigators want to be proactive in their approach to aviation safety rather than what they are now--reactive. NTSB field investigators are frustrated at the lack of support they see from other offices within the agency, from the FAA, and from other parties."

Of the 38 respondents, 29 made statements in their interviews that presented evidence supporting this theme, four respondents' interviews showed little support or failed to reference the theme, and five respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that some investigators experience frustration to a greater degree than others. Respondents stated that because of major cases having priority, combined with staff shortages, there are often backlogs in some agency laboratories. Investigators state that this often slows the investigation process, allowing time for negative sentiment toward these protracted cases to grow. Respondents argued that investigators are frustrated that they have to relate to families, Congressional staffers, party members, even agency management; that these cases are delayed; and in turn, so too are recommendations for change, which are often critical to aviation safety. Investigators said that interested parties, particularly manufacturers, are often "backlogged" with other cases, thus causing delays in their submitting factory reports that sometimes are critical to the NTSB investigation of an accident. NTSB investigator respondents voiced frustration with FAA offices, arguing that they are either "too lazy" or "don't care about accident investigations" because investigations cut into the inspectors' primary duties. Investigators stated that because accident investigation is "an additional duty" for FAA inspectors, they are not motivated to get witness statements, pilot and aircraft records, and other materials to NTSB investigators in a timely manner. NTSB regional investigators stated that there is lack of support from other regional offices. Investigators argued that some regional offices are less willing to assist another office during an investigator shortage in that office than are others. These investigators described unsupportive offices as having "all kinds of excuses as to why they can't help, although they are fully staffed." An example cited by several investigator respondents is that a regional office with a major airport or aircraft manufacturer in their region must monitor on it a regular basis. This "supposedly ties up investigators with extra work . . . so the office can make the excuse that they can't spare a body." Other investigators stated that they have received generous support from other regional offices. One investigator said, "You can tell the people who will come running when you need help. They come from the offices dedicated to the mission and that care about more than just their little territory."

Theme 16: Use of Outside Laboratories

Theme 16 states, "Party members are opposed to NTSB investigators using independent laboratories and engineering facilities to assist in gaining expertise on aircraft and aircraft systems."

Of the 38 respondents, 30 made statements in their interviews that presented evidence supporting this theme, five respondents' interviews showed little or no support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that the interested parties argue that only they can provide the level of expertise required on their respective products or operations to effect a successful air safety investigation. Party member respondents stated that because their products are always changing with updates in technology, an independent consultant would not be current on them as they are. One party member respondent said,

> I don't think it can be done. Take the models of propellers being produced today. You just can't train someone to know everything about every propeller. The same is true with airplanes and their composite materials or new avionics. And even if you could train an independent consultant to do this, would they be knowledgeable in related components as [propeller] governors or in how the components mesh to produce an airplane? Investigating propellers is just one piece of the investigation puzzle. You can't just look at a propeller at a crash site with both blades bent straight back and say the crash was the result of an engine problem. You have to look at all of the systems and the circumstances the airplane was operated under. What if the airplane, say, went through several trees before actually hitting the ground? There'd be all kinds of strange bends in the metal. If there was power, there should be chopped branches and limbs, leaves and slash marks in tree trunks. See, accident investigation requires knowledge in all of the systems. Can the NTSB train someone right out of college to do this? Not right away. You could try to hire away former manufacturers' representatives from their companies, but you'd still lack the full support of their companies. Here we have scientific resources, engineers, materials people, etc. who can do anything to support a fatal crash. I think with such a Board proposal, they'd actually be losing support. The Safety Board wants answers quickly. They wouldn't be able to get them from an independent or trained and hired outside source. That source would still have to come to us for information on recent service bulletins, letters, specifications, and so forth.

Another party member respondent said,

> I'm learning new materials and manufacturing processes as they are created and discovered. We're having a rough time as safety investigators just keeping up with all the changes our engineers are throwing at us. We have to stay knowledgeable on our products to help you [NTSB], and it's a full-time job. How can an independent agent ever be up to speed enough to be of any help to the NTSB or FAA?

Party members argued that independent laboratories, especially on university campuses, have their own agenda--seeking new knowledge. This can sidetrack an air safety investigation, turning it into a research venue. This also cuts into the timeliness of putting out results and subsequent recommendations. Investigator and inspector respondents said that using independent consultants has produced reports filled with speculations and theories based loosely on factual evidence. Respondents also said the consultants' reports were still subject to scrutiny by NTSB experts in the field and therefore subject to the party members' review. One party respondent said,

> What can a college know about airplane engines? Sure they can teach a class, maybe do a lab, but can they strip and inspect an engine involved in an aircraft crash in the field, as we often do with NTSB investigators? They probably can't, because consulting firms and universities don't operate in the real world. They don't look at crashed airplanes daily like we do. I've been in the business for 22 years. I've taught airframes, engines, and propellers to the FAA at their 2-week aircraft accident investigations course. I'm afforded a half a day, but I could spend two weeks easy on each topic. There is so much to know about investigating an engine failure or a structural breakup. A few hours of teaching this is barely scratching the surface with these new inspectors. All I can do is give them a couple of things to look for. The rest takes time and experience. The kind of experience you can only get from having actually run an accident investigation and made mistakes along the way.

Theme 17: NTSB Selectivity

Theme 17 states, "The NTSB has too few resources to effectively investigate all safety issues it would like. Therefore, Board Members, senior staff, and investigators choose what they consider the most critical issues to resolve."

Of the 38 respondents, 33 made statements in their interviews that presented evidence supporting this theme, two respondents' interviews showed little support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that there are many safety issues the NTSB is investigating that "get pushed to the back burner" because they have more pressing issues and because they do not have the personnel to go after all issues.

Respondents stated that NTSB safety issues get triaged. The pressing issues, such as updating aircraft electrical wiring in commercial jets or installing new rudder control systems on Boeing 737 jets, receive the NTSB's attention first. The lesser issues, such as fractional ownership of business jets or migratory bird studies, get pushed down to the safety study level. Some issues, such as updating the aging fleet of U. S. Forest Service-contracted air attack tankers or pressing for the development of a global positioning satellite-based emergency locator beacon system for increased rescue capability, are important but are bumped because of the more "explosive" issues that abound.

Industry respondents argued that because many safety issues involving problems with manufactured components that are installed on their aircraft or in their engines are pushed back to a lesser priority by the NTSB or FAA, the aviation industry has many "time-bombs ticking away." One respondent stated, "The longer we wait to get these issues resolved, the greater the potential that one of these issues will grow into a bigger problem later, possibly causing a serious injury or loss of life."

Theme 18: NTSB as Calling

Theme 18 states, "NTSB investigators see their jobs as a calling, not a vocation. They display the symbols of their agency with pride and speak with enthusiasm about improvements they have helped to make in aviation safety."

The questions seeking information in this area were asked of the 17 current and six former NTSB investigators. Of the 23 respondents, all but one made statements in their interviews that presented evidence supporting this theme. The respondents supporting the theme said that the NTSB has the most important mission in all of aviation. They all said that what they do is acknowledged and respected by other aviation agencies, aircraft companies, manufacturers, and the public. One investigator respondent said,

> This is the only place I know where you can have a direct impact on aviation safety. You are maybe three levels removed from impacting policy that can affect the entire industry. I can identify a problem during an investigation, write a proposal to fix it that goes to the chairman, and next thing, it's a green sheet [safety recommendation] mandating changes in the industry. You get a tremendous sense of worth from what you do.

The respondents stated numerous accounts demonstrating dedication and sacrifice in performing aircraft accident investigation. Several respondents discussed instances when their actions made a direct impact on an aviation safety deficiency. One respondent said,

> I investigated an air ambulance helicopter that broke up in flight while transporting a patient. The pilot, flight nurse, and patient were killed in the crash. An FAA maintenance inspector came out with me the first day. A representative from the helicopter manufacturer caught up with us the following day. Together, we discovered that a swash plate pin in the inner ring of the main rotor head was manufactured using the wrong tolerances. This produced an inadequate interference fit in the swash plate assembly that, in

> turn, caused an imbalance in the blades. When centrifugal loading was introduced, the stress induced caused the main rotor assembly to come apart. The manufacturer immediately drafted a service bulletin calling for an on-ground inspection of the swash plate pins. The FAA issued an airworthiness directive calling for the same thing and directed the grounding of all other helicopters of this model until the inspection had been completed. Air Transport Canada, the Canadian equivalent of the FAA, also directed the grounding of the same model helicopter in their country until the same inspection was done. The helicopter manufacturer also went back and reviewed the rotor head design, compared it with the information gained from the accident investigation, and made major modifications to the design, producing a safer main rotor blade assembly. It was great. Everyone cooperated during the investigation. The inspections of over 150 helicopters found several other defective pins. By the time it was over, the manufacturer had a replacement pin ready. We identified the problem and worked through the issues. Everyone was on board to fix the problem. The Board got a safety recommendation out of the deal and I got to make a direct impact on safety.

A former investigator respondent recalled a major accident investigation he led. The respondent said,

> What really sticks out about this case was not the field work. That was a mess. We were in one of the roughest environments we could get into. It wasn't the public hearing. That was well done, though. Our research and engineering division put on a dramatic demonstration reconstructing the events that most likely brought the airplane down, and it did grease the tracks for the recommendations we eventually issued. No, what really sticks out was how everything came together just before the Board meeting. We held a ton of meetings with the parties, AS [NTSB Office of Aviation Safety], and the managing director. I spoke to the Board members individually about this case. I wanted to know what their issues were. We really were concerned about the same things. Neither I nor the Board figured the FAA would ever push our recommendations, even though 110 people were dead. We really thought they would say our proposals were too expensive and that the [airline] industry would balk. But at the 11th hour, the FAA joined us. The unions folded. We won. We got our 14 recommendations out, and the FAA forced the airlines to implement every one of them. That day I realized that it didn't matter what I'd do from here on out. I had been the IIC of a major investigation that changed the future of the airline industry. Not all of the investigations I've been involved with have gone my way, though I don't lose many. But all the things I've done pale in comparison to that day when we made a significant part of aviation safer. That's a day I've never forgotten. Every once in a while, you win big.

Theme 19: NTSB Reliance on Parties

Theme 19 states, "The NTSB is too reliant on the parties to effectively conduct its mission."

Of the 38 respondents, 24 made statements in their interviews that presented evidence supporting this theme, 11 respondents' interviews showed little or no support or failed to reference the theme, and three respondents were not asked questions seeking information in this area. Respondents to the questions providing evidence supporting the theme said that, in some cases, NTSB investigators rely too heavily on the information provided by interested parties. Investigator respondents argued that when unions such as the air traffic controllers union or an airline pilot's union are involved these groups will go out of their way to shift the focus away from controllers or pilots, putting the burden on manufacturers to prove the airworthiness or reliability of their products. NTSB investigators are left with "closing all the doors" with respect to every possible theory of what might have caused an accident. One investigator said that those times when an accident case has involved a mechanical deficiency, the party members have been very "tight and specific" with the information they provided. The investigator said,

> I had one case where a double-engine flameout happened on a passenger airliner during landing and involved worn chines on the nose wheel tire. Chines are a rubber ridge around the outside hub of a wheel and are used to deflect water or slush away from the airplane so as to prevent hydroplaning. They also deflect water away from the engine inlets. In this case, because the chines were worn, the water went into the engines. The airplane's brakes failed on the runway and the airplane slid off the surface. Fortunately, no one was hurt. I asked the airline company for specifications and drawings of the gear assembly and tire. They would give me little bits and pieces of information and never exactly what I would ask for. The company kept

> passing me off from one maintenance facility to another. I even got passed off to the tire manufacturer who no longer made that particular model tire. When I was finally at my wits' end, they turned the tables on me and dumped tons of paper on me. It took me weeks to go through. At the end of it all, I wound up having to go through other companies and the FAA to find the data I needed.

Another investigator said that he was involved in a case that found several air traffic controller mistakes that caused an airplane to be inadvertently directed into a thunderstorm. The airplane was subsequently torn apart, leaving four people dead. The investigator said,

> I went to interview the controllers and supervisors at their facility. First, I had to go through the facility quality assurance manager and then the regional quality assurance manager. Then the controllers' attorneys began dictating where and when and for how long I could interview the controllers. Then the union, who was also a party to the investigation, said they needed to be in on the interviews. Even after quoting the law to them, they continued to stonewall me. I finally had to get the GC [NTSB General Counsel] involved.

Respondents also argued that when it comes to the most modern aircraft systems, such as computer-driven flight controls or electronic instrument displays or advanced composite material structures, NTSB is lacking in expertise. The expertise can be found only in industry. Therefore, if investigators want to get to the bottom of a failure in an advanced system, they must rely on the manufacturers. Until an effective stable of reliable independent resources can be developed so as to effectively support NTSB aircraft accident investigations, the party process needs to continue to provide the technical assistance and resource support necessary to assist the NTSB.

Customer Perspectives

This final series of themes explores the customer perspective about the effectiveness of the independent accident investigation process. Table 4 shows the breakdown of support for each theme by percentage.

Table 4

Respondent Percentage Support in Theme Block Development: Themes that Explore the Customer Perspective about the Effectiveness of the Independent Accident Investigation Process

Themes	Participating respondents providing information in the subject area compared to total respondents	Percentage of respondents providing information to support theme development
20. Victims are not just those who perish in aircraft accidents	25 of 38	92.00
21. Families gain understanding from NTSB investigations	25 of 38	84.00

Theme 20: Victims

Theme 20 states, "The victims of aircraft accidents are not just the persons who die in the crashes."

Three respondents participated directly in questions that supported the theme. However, in the interviews of 22 other respondents, responses regarding assistance to family members were recorded. Of the 25 respondents providing data, 23 made statements in their interviews that presented evidence supporting the theme, and two respondents showed little or no support toward the theme. Thirteen respondents were not asked questions seeking information in this area.

The responses indicate that senior staff and the NTSB members are more capable of detaching themselves from the tragedy that accompanies an aircraft accident. They can remain objective and act from indifference. Most investigators and inspectors in the field are aware that pilots, cabin crew, and passengers are not the only victims of aircraft accidents. Family members often show up at an accident site seeking the answer from investigators to their one question: why? Investigators are pressured to find answers so as to "give peace" to family members who lose loved ones in aircraft accidents. Investigators stated that they believed they were inadequately prepared to handle the emotions of family members at accident scenes. Investigator respondents stated that over time, the cumulative effects of experiencing so many tragedies can weigh upon investigators and inspectors, thereby eventually making them victims, too.

Theme 21: Understanding for Families

Theme 21 states, "Family members gain a sense of understanding from the NTSB investigations of aircraft accidents involving the loss of their loved ones."

Three respondents participated directly in questions that supported this theme. However, in the interviews of 22 other respondents, responses regarding assistance to family members were recorded. Of the 25 respondents providing data, 21 made statements in their interviews that presented evidence supporting the theme, and four respondents showed little or no support toward the theme. Thirteen respondents were not asked questions seeking information in this area.

Family member respondents frequently used the term "closure" to describe what they hoped to find by traveling to the crash scene. Psychologists describe closure as the process by which a person gains the ability to compartmentalize the sensations of an overwhelming event, such as an aircraft accident, so as to gain a sense of understanding and meaning (Karp & Yoels, 1979). However, investigator respondents who said they observed and spoke to social workers who assisted family members at major aircraft accident sites stated that family members who suffer the tragedy of losing a loved one in an airplane crash and who travel to the accident site do not achieve closure. Many said that what the family members gain is some comfort from being at the location where their loved ones experienced their final moments. Family members confirmed that area but went on to say that talking to the NTSB investigator directly provides some peace in that eventually they will know why the accident happened. The NTSB accident investigation and the agency's publication of an accident report provides information to the families that help them make some sense of the tragedy. Investigators and managers said that when safety issues are discovered and recommendations are issued, the families seem to gain some peace that their loved ones did not die in vain and that through the tragedy, other passenger lives can be saved and other families can be spared the experience of having to live through such an event.

One respondent said,

> Following my husband's crash, I had the opportunity to meet the NTSB investigator-in-charge. I also spoke with him several times over the next year. A few days before they were to release the final report, the NTSB investigator called me to let me know and to tell me what the findings were. I was not

> completely happy with the probable cause, but the Safety Board did address all of the issues that I had brought to their attention. There were several findings that exonerated my husband from being the reason the airplane crashed. I later found out that the NTSB issued recommendations based on the investigation that changed the way charter jet operations are conducted today. I met with one of the Board members in Washington about a month after they released the report. He said that because of what their investigators found with my help, aviation had been made safer. He was also kind enough to say that my husband had not died in vain. I knew that already, but it was nice to hear. Nothing that's been said to me over the past three years has lessened the pain of losing my husband. I don't know if I'll ever get over it. I take each day as it comes.

Research Findings with Respect to the Capture Theory

To determine if we have a case for capture in aircraft accident investigation and, if so, to determine to what degree, we need to refer once again to the literature that describes the elements of the theory. Berry (1984) states that regulated groups were usually able to control or "capture" the agencies that regulate them, thereby insuring that regulatory decisions would be uniformly consistent with the interests of the regulated. McCraw (1975) states in his capture thesis that regulatory agencies are perceived as systematically favoring the regulated industries and systematically ignoring a larger public interest. Public agencies are seen as tools for the advancement of private groups. The economists' perspective is that regulation is acquired by industry and operated primarily for its benefit and that, in order to survive, regulatory agencies supply "regulation" to meet industry demands for favorable policy. Gormley's (1983) capture model views regulatory agencies as the undisputed captives of the industries they are supposed to regulate, portraying agency administrative decisions as responses to external pressure exerted primarily, and sometimes exclusively, by regulated industries. His model regards regulatory agency staff members as conveyors for industry sentiments.

With respect to the NTSB, the party system is the most visible vehicle through which the agency could be influenced or captured by outside interests. It is important to reiterate, the NTSB is an independent agency with no regulatory authority over any entity within the aviation industry. Their mission is accident investigation. Their product is the safety recommendation. Due to limited resources, accident investigation requires an IIC to be a generalist, not a specialist. Hence, the agency uses the party system to supplement its resources to accomplish its mission. Going into the research, I knew that this arrangement gave party actors a vested interest in the outcomes of accident investigations into the very location where they can exercise the most influence, on the investigative team. The interested parties' motivation for being on the investigative team on the surface might be safety, but underneath, it is to ensure that their products are not found to be to the cause for the accident. The potential harm to a company as a result of being the manufacturer of a product implicated as contributing to an accident, especially if loss of life is involved, can be devastating. Litigation is a major concern of most party members, especially aircraft manufacturers and companies providing passenger service. Therefore, there is tremendous motivation for a party member to deflect, fog, or misdirect an NTSB investigation in such a way that probable cause does not implicate them. By becoming familiar with NTSB staff, through common training, outside activities, general meetings, and repeated on-site investigative work, party members work their way into a position with the agency that could be considered a posturing for capture.

The evidence gathered from the field research with respect to the party process shows that the potential to influence is present and does occur. NTSB investigators rely on the parties to investigate complex aircraft accidents, and the parties are in a position to exercise their influence. This does not mean, however, that the NTSB as an agency or the investigative process is the captive of interested parties. My research shows that many investigators are able to keep the parties' influence in check. My research also showed that some investigators are influenced more than others. With respect to the FAA serving as the NTSB's agents in "limited" investigations, interested party influence occurs more frequently. However, from the evidence gathered, I cannot quantify how much the investigative process is compromised in this regard,. Overall, there is no evidence that party influence has placed the NTSB or its investigators in a position such that their actions would be ineffective due to the kind of influences described by Berry (1984), McCraw (1975), and Gormley (1983). But this still does not rule out that some investigations, in part or in total, are not captured to a degree.

Continuing with the literature, Bernstein (1955) argues that capture occurs as a result of the autonomy granted to regulatory agencies and commissions. The executive branch, with no direct authority over the regulatory agencies, quickly loses interest in them. Without executive leadership, the legislature also loses interest, and public support wanes. In contrast, the attentiveness of regulated industries increases as they respond to the potential threat of vigorous regulation. Besieged by regulated industries and lacking political support, regulatory agencies either come to terms with regulated industries or else become overwhelmed by the litigation they can spawn. As the regulatory agency ages, regulation yields to accommodation, and public interest goals are displaced by the preferences of private interests.

Bernstein (1955) also points out that having public support is important to an agency's life; however, the public's interest and support are the first things that decline. Public interest begins to decline almost immediately after the commission is established. Not far behind is the decline in executive and legislative support, leaving the commission to act alone in the face of regulated industry.

Regarding the NTSB, the research shows that presidential and Congressional support for the agency has remained consistently high. This support is stepped up in times of crises, namely when a major airline or high-profile accident occurs. This was especially true in the mid-1990s when the NTSB was investigating the Valuejet and TWA Flight 800 accidents. However, in the case of the TWA Flight 800 investigation, and other accident cases involving complex issues, as these cases became protracted with no apparent resolve in sight, public support began to wane. The agency was still held in high esteem, but its continued effectiveness was questioned. Presidential support rose as anniversaries of the accidents passed and media interest increased and then decreased as those events passed. Congressional support for the NTSB has remained consistently high throughout this period of the agency's history. In fact, overall support from Congress for the NTSB has been consistent since the agency's founding, an anomaly in contrast to what Bernstein (1955) claims. This is evidenced by consistent budget and personnel increases. The NTSB annual budget has increased at an average rate of 3% since 1995.

Bernstein (1955) argues that as an agency reaches maturity, it adjusts to conflict among the interested parties. The agency relies more and more on set procedures and adapts itself to fight its political battles on its own. The agency becomes more positive in its approach. Its functions are less those of an enforcer (the NTSB is more an influencer) and more those of a manager of an industry. The agency becomes more concerned with the general health of the industry and tries to prevent changes that adversely affect it. With regulatory agencies, Bernstein states that it is unlikely that the agency will be able to extend regulation beyond the limits acceptable to the regulated groups.

If you replace the word "regulation" with "recommendation," Bernstein's (1955) discussion now becomes disconcerting. My research shows that investigators do factor in the health of the aviation industry when considering proposing recommendations to improve safety. Questions are raised as to the cost to industry of potential safety proposals. NTSB investigators state that party members are often consulted on ideas considered for safety proposals. The agency has published procedures outlining accident investigation and the recommendation proposal process, but investigators state that these rules are mostly used for guidance. The agency is not in a position to manage the industry directly, but my research shows that negotiation occurs and compromises are struck in order to gain significant safety changes.

Bernstein (1955) states that the most marked development in the mature agency is the growth of a passivity that borders on apathy. He states that the tendency to be passive regarding the public interest is a problem of ethics and morality as well as an administrative method. When an agency is mature, Congressional representatives are reluctant to increase the agency's authority. The mature agency finds its approach heavily judicialized, devoting much of its time adjudicating individual cases. Objectivity gradually entrenches within the staff. The agency's interests' narrow points of view that have been adopted with respect to regulatory matters. The agency becomes dependent on precedent and maintaining the status quo. In the mature phase, the agency's surrender to the regulated group is complete. Politically isolated, lacking a firm basis of public support, lethargic in attitude and approach, bowed down by precedent and backlogs, unsupported in its demands for more staff and money, the agency finally becomes a captive of the regulated group.

My research shows that the NTSB does not fit this scenario. Although investigator respondents said that they do experience frustrations with aspects of their investigations, they still see the purpose of their mission. Apathy was not a characteristic that appeared in any of the NTSB investigator interviews. NTSB investigators are anything but passive in their approach to getting to the facts of an accident or resolving a flight safety issue. The NTSB still issues recommendations that are not favorable to the aviation industry. In fact, many recommendations issued by the NTSB have been vigorously opposed by the aviation industry. However, the NTSB has not backed down on these issues. They remain on the agency's "most wanted" list, which is published annually. As to adjudication, my research shows that more recent investigations have involved the General Counsel's Office, namely when a controversial issue with no previous precedent turns up in an accident investigation. However, these events do not occur often, and they are usually resolved with few problems. There have been some investigations or situations surrounding an investigation in which the NTSB's attorneys have had to directly confront attorneys for industry, especially with respect to investigation procedures. My research does show that case reconsideration requests have increased and so have the number of FOIA requests.

The research shows that the NTSB does not meet Bernstein's (1955) criteria for capture as a mature agency. The NTSB does not lack political or public support, and it is not unsupported in its requests for needed resources. The agency experiences case backlogs, but the research shows that aggressive, positive management and the introduction of new information technology systems have helped to reduce the backlogs. The agency's reliance on interested parties is a concern, but my findings tend to lean toward other factors that define the degree of party influence.

In regard to the FAA and its investigative role, many of the elements of the capture thesis did show up in the inspectors' interviews. Many researchers already consider the FAA as "captured" by the aviation industry, so the inspectors' responses were not unexpected. The spillover of capture into their investigative role, as previously mentioned, is a concern to NTSB investigators who work regularly with FAA inspectors.

Continuing with the FAA investigation role and referencing Bernstein (1955), the agency seems to fit his description of an agency in old age. The research touches on many of the characteristics described by the mature phase with greater regularity. Inspector respondents described routine operations in an environment that is hostile and controversial and plays to the objectives and demands of interest groups in the aviation industry, particularly the airline companies. The agency tends to play for safety in its policy decisions. Respondents expressed that in many cases, the agency has given up. One FAA respondent stated, "struck a balance in working with manufacturers and operators." As Bernstein describes, the situation becomes so fixed that the agency has no creative force left to mobilize against the regulated groups. This debilitation does not go unnoticed in the executive and legislative branches. The federal budget for the FAA over the previous three years has stabilized, particularly in the flight standards mission area. Inspector losses are not being backfilled, causing an increased workload to fall on the remaining inspectors. Respondents see the FAA as relying more on the regulated industries to supply compliance in return for fewer inspector visits. Bernstein would support from this description of the FAA that the agency has become the servant rather than the governor of the industry that it is supposed to regulate and has attained a dignified stability far from the objectives that were originally sought. Redford (1961) argues that this situation is efficient and serves both the airline industry and government's best interests. In counter, Bernstein states that this is fine up until some emergency such as an airline accident occurs that would dramatically draw attention to regulatory and agency failure.

I mention Bernstein's (1955) points with respect to the FAA because many of these points are noted and raise concerns as to using the FAA in NTSB accident investigation. Inspectors interviewed during the field research stated that entrenchment was a problem. FAA inspectors said that important safety issues tend to get bogged down in precedent. They said that the FAA relies heavily on rules and regulations and agency directives derived from those rules to perform their inspection functions. The inspectors stated that they have more flexibility in making decisions with accident investigation but said that because the two functions, inspection and investigation, run simultaneously, their supported investigation can be subjected to their unique problems. The inspectors were reluctant to say that they were dependent upon the airline or other aviation industries as being the source for staffing; however, their own backgrounds and discussions as to inspector development indicate that the FAA has historically depended greatly on industry as a hiring source for inspectors.

Considering the data against Bernstein's (1955) description of an agency's life cycle and the definitions of capture put forward by Berry (1984), McCraw (1975), and other capture theorists, the findings derived show some evidence that the NTSB could fit into Bernstein's second or "youth" stage description of an agency tending toward capture. There is also evidence to show the NTSB has mechanisms in place to counter the tendency, such as training, for example. But the evidence presented seems to indicate the agency is not using its resources efficiently to do that. The situation with FAA inspectors in their role as investigator agents for the NTSB complicates the picture of independent aircraft accident investigation on the NTSB's part.

Comparing Research Findings to Other Regulation Theories

The next section of this chapter examines the research findings as compared to the other regulation theories that describe the influence mechanism between the regulating agency and the overseen industry, and describes whether these alternate theories provide a viable description of the interaction between independent accident investigation agencies and the participating parties from industry.

Research Findings with Respect to Principal-Agent Theory

In looking at the principal-agent model as an explanation for what happens in the investigative process, it is necessary to view the NTSB investigative team with its respective party members as a contractual relationship in which the IIC plays the role of principal and the party members the role of agents. From this perspective, the IIC considers entering into a contractual agreement with one or more party members, thus expecting those agents to choose actions that produce outcomes desired by the principal. This contractual agreement is not an exchange of money for services but for information in exchange for expertise. The principal would seek out the agent for his or her specialized knowledge, much in the way Moe (1984) describes how patients seek doctors and plaintiffs seek attorneys.

The party member is one who possesses specialized knowledge or skills the principal (IIC) needs to conduct his investigation. In the case of a major investigation, because of the size and complexity of the tasks involved, there must be multiple principals, i.e., group chairmen and multiple agents with whom to coordinate. The agents are not directly contracted by the main principal, the IIC, but by subprincipals, i.e., group chairmen. There is no direct link to the main principal or the agents, i.e., interested party members, in this situation.

In applying the principal-agent model, the problems rest with the IIC in employing a qualified agent to do what that agent is supposed to do because there is no guarantee that the agent, once integrated into the investigative team, will in fact choose to pursue the principal's best interests or do so with efficiency. The agent, say an engine manufacturer, has his/her own interests at heart and is induced to pursue the IIC's objectives only to the extent that the situation--that is, providing expertise on his company's product--is such that it poses no threat to the interested party's company.

Adverse selection could play a role in that the IIC, in placing an interested party member in one of the investigation groups, has little more information on the agent than that he or she is a representative of a company whose product is involved in the accident. The IIC hopes he/she has allowed a person who is highly qualified and motivated to achieve the ends of the investigation, but he/she cannot know for certain how knowledgeable, experienced, or forthright the party member will be. This is very much like the employer-hiring-an-employee scenario described by Moe (1984), when in seeking to hire a potential employee, the employer suffers from inadequate information. The employer would like to hire a highly qualified and motivated individual, but he/she cannot know with any given applicant, that person's true intelligence, aptitude, or work habits. Similar to the applicant, a party member should hold the advantage because he/she knows what his/her true background and education are; how motivated, creative, and intelligent he/she is; and how dedicated to supporting the investigation and its outcome he/she is. But unlike the hiring scenario, there is no price that is being negotiated for the qualifications of the party member. The party member knows he/she needs the information that can only come from the investigative process and that the IIC holds this information. Knowing this, and also knowing that a failure to comply with the appropriate NTSB party process can result in his/her dismissal from the investigation and hence the loss of a communication vehicle between the investigation and his/her company, the party member-agent is less an adverse selection problem than would be the applicant in the employer hiring scenario. The data collected in the research discounts adverse selection as a relevant explanation of what occurs in the party process.

Moral hazard might better describe the dynamics occurring in the party process. Once a party member has been brought on board, the IIC faces a situation much like that of the employer-employee situation after hiring has taken place. The IIC, like the employer, cannot know for sure to what extent the individual party member is productive, that is, providing accurate and timely information on his/her product. The IIC must rely on some type of feedback mechanism or proxy measure to insure he/she is getting what he/she needs from the party member. This can be achieved through such means as how timely information required by the IIC arrives or by deliverance of proprietary documents describing the manufacturer's product.

However, moral hazard, like adverse selection, applies weakly to the investigative scenario. In the principal-agent relationship, the agent has an incentive to redirect his/her efforts toward the proxy measures rather than the abstract goals implicit in the employment contract. The agent also has an incentive to substitute leisure for productive effort, because the unobservability of his/her marginal product allows him/her to achieve these benefits at low cost. Shirking behavior is an aspect of moral hazard. In an accident investigation, shirking behavior would be detrimental to the agent in that his company would not get the information it seeks. Also, with a less than needed effort on the part of an interested party, there could be motivation on the part of the IIC to dismiss the party member from the investigation. Again, this would leave the manufacturer without a representative; hence, it could not represent its interests before the IIC. The principal-agent model applied to the NTSB investigative process might explain some of the problems with information asymmetry and conflicts of interest, but it is not a strong argument in describing the dynamic taking place between the investigative agency and the interested parties.

Research Findings with Respect to Countervailing Groups Theory

The power wielded by countervailing groups was also considered as an alternate explanation as to the dynamics that occur between investigators and interested parties during an aircraft accident investigation. Here, I must consider that several interested individual party members might attempt to apply countervailing power against each other so as to negate one group's interests in the investigation versus another group's interests, and so forth. Such a scenario might involve an aircraft accident in which a component in an airplane's engine failed, subsequently setting up an emergency situation in which the pilot of a passenger-carrying airplane had to land immediately. In the subsequent landing attempt, the pilot was forced to land short of the runway and crashed into an industrial park area, killing everyone on board the airplane. In the accident investigation to follow, the engine manufacturer's party representative would be expected to try to influence the investigation such that the focus would be redirected toward one of the other party member groups, most expectedly the operating company and possibly the pilots union. The engine manufacturer's argument would be that engine failures do not cause airplane accidents. It is the pilot's reaction to the engine failure and his or her actions to follow that determine if the airplane lands safely or crashes. The company and the union, in response to the engine manufacturer, would remind the IIC or the operations group chairman that it was the engine failure that prevented the pilot from having adequate power and airspeed such that his crippled airplane could not reach the runway. Running out of options, the pilot chose to put the airplane down in the industrial park, so as to save lives on the ground.

The problem becomes more convoluted when an investigation fails to uncover evidence to support a probable cause in a reasonable time period. In the case of an accident in which an airplane crashes and there are no witnesses or useful data on the flight recorders, aircraft and engine manufacturers are more aggressive to focus potential blame on the pilots as causing the accident. The unions and companies, in turn, are just as aggressive to convince the IIC to look for a systems deficiency. As an investigation draws out, the countervailing arguments often force the IIC to recommend the case go undetermined.

Group influence may be more prevalent in regional investigations involving small general-aviation airplanes operated by private pilots. Here, in most cases, a union or advocacy group does not represent the pilots. This is dependent on the flight activity, however. Accidents involving performing aerobatics may see some interest from international aerobatic clubs, and accidents involving kit-built or experimental certificated airplanes may see some interest from the Experimental Aircraft Association. But rarely do these organizations become parties by virtue of statistics that state the majority of those accidents are the result of pilot mistakes. The majority of flight activities involving these airplanes are usually in the categories of training or personal use. In accidents involving these activities, the pilots are their own representatives. If there are fatalities in the accidents, then there is no representation on their behalf. In such situations, then, the manufacturers are in an advantage position to push their case for pilot error, as there is no one present to counter for the pilots.

The problem with the countervailing power argument is that with accident investigation, the facts are the key to probable cause determination. A broken engine or a wing spar that shows indications of positive overload or metal fatigue are certainties that opinions cannot change. Unlike the actions of left-wing interest groups such as African Americans, proabortionists, environmentalists, etc., in their efforts to counter a right-wing administration's policy decisions, the accident investigation process does not rest on emotion or values. As an investigation moves away from the phase when factual evidence is gathered, the world does become more uncertain. Public hearings and technical meetings are held in which interested parties voice their opinions. In some cases, advocacy groups for surviving family members are afforded opportunities to state their position. McFarland (1992) argues that advocacy groups do form to counter the potential power of large interest groups and that they are successful. However, at the end of these processes, the facts found during an accident investigation are still the bases for determining probable cause and forming safety recommendation proposals. There is little evidence from the research to show that interest groups--be they interested parties, other government agencies, or public advocacy groups--can affect the IIC's final determination of the facts or the NTSB's rulings through the use of countervailing power.

Research Findings with Respect to Cooptation

Cooptation, at first, certainly appears to be what is going on at the NTSB with respect to the party process. As previously examined, cooptation involves the inclusion of outside groups into the leadership and decision-making processes of an organization. Persons coopted for an agency's purposes come from interest groups or organizations with an interest in the agency's activities and are sought after for their personal and professional qualities. Cooptation is an integrative strategy designed to build relationships among organizations for the purpose of achieving a common goal.

The relationship between NTSB and aircraft manufacturers and operators under the party process certainly resembles this concept. With an accident investigation, the agency brings in representatives from outside groups and organizations for the purpose of achieving a common goal--solving the mystery behind the aircraft accident and taking measures to improve aviation safety.

But with the cooptation approach, one has to examine the agency's motivations as to why it would coopt outside organizations. The underlying goal of cooptation is to achieve a complementary rather than competitive or adversarial relationship. As Selznick (1949) described, cooptation is a defense mechanism motivated by an agency's security needs. It is a means of averting external threats to the integrity and survival of the coopting agency. Incorporating outside elements into the leadership of an organization is seen as a means of defusing external threats or opposition.

The underlying motivation at NTSB in using the party process is to gain information, not to formally or informally integrate outside interests into the agency's decision-making processes. In aircraft accident investigation, there is sharing of opinions, theories, and information, but the power to investigate still rests with the NTSB investigator or the FAA inspector when acting in the representative role of investigator. Although in formal cooptation, individuals representing outside interests are integrated into the governance structure of an agency, the NTSB under the party process brings individuals representing outside interests in but keeps them at an arm's length from roles where final decisions are made. There is no sharing of the responsibilities of power or the direct sharing of power as in informal cooptation. The

NTSB does not have to legitimize its mission and objectives or secure acceptance of its actions among the relevant interested parties. In fact, there have been many occasions when the NTSB has purposely gone against the wills of interested parties in the interest of aviation safety. NTSB investigators retain the option to deny an interested party participation in an investigation, though this rarely occurs. The NTSB formulates proposed policy and recommendations with the assistance of the interested parties, but the final determination to cause or call for safety changes are reserved for the NTSB.

It is possible to make an argument for interorganizational cooptation between the NTSB and FAA, when the FAA is acting in its role as regulator. The NTSB certainly maintains a close relationship with the FAA and continually seeks to strengthen that relationship, as the FAA is a key actor in achieving safer aviation through regulation and enforcement. Safety changes have been achieved as the result of close discussions with FAA officials. FAA specialists are brought in to assist NTSB investigators and engineers when developing safety proposals by providing help with certification issues, feasibility, cost information, implementation, and the potential impact on safety. Close relations with the FAA have also helped facilitate major safety changes initiated by the NTSB. But again, as with manufacturers, operators, and other groups that assist the NTSB in its mission under the party process, the FAA is not integrated into the NTSB's decision-making processes.

One final point regarding cooptation, Selznick (1949) stated that cooptation is a useful strategy in the early stages of an organization's development when it must come to terms with established organizations in its environment and carve out a role for itself without provoking unnecessary hostility and conflict. The act of cooptation symbolizes a commitment to building cooperative rather than adversarial relationships and to claim "complementarity" rather than to pose a competitive challenge.

The NTSB began in 1967 with an established mission and solid support from the president and Congress for that mission. The NTSB, in many ways, was designed to stir up the pot with respect to aviation safety. The agency is often in conflict with outside agencies and companies that make up the majority of its environment. But out of the conflict, NTSB investigators, staff, and members build consensus with the interested parties and make improvements in safety by determining the facts of a case, discovering the deficiencies underlying aircraft accidents, and designing solutions to solve those deficiencies. Cooperation, in the best of circumstances, rather than cooptation is a better describer of the party process relationship in aircraft accident investigation.

Research Findings with Respect to Agency Professionalism

Agency professionalism may be the best area of study presented that can explain why the NTSB has been successful in accomplishing independent aircraft accident investigation within the structure laid out under the party system. As described by Mosher (1968), professions are social mechanisms whereby knowledge is translated into action and service and the means by which intellectual achievement becomes operational. Professions display characteristics that are significant to public agencies, such as a continuing drive to elevate its stature and strengthen its public image; establishing stringent requirements for entrance; a career ladder with defined paths and advancement opportunities; established pay; and a focus on education, specialized knowledge, and rationality. The tools that underlie professionalism are inherent within the management and staff of the agency itself. Professions are made up of management elites, staff and workers who identify with their agency. In a profession, the elites, staff, and employees are unified in mission and purpose. They establish standards or norms (Culhane, 1981; Katzman, 1980) on which rules and standard procedures are created and followed. Professionals see themselves as instruments called to a higher purpose. The research shows that these characteristics manifest themselves within the NTSB organization.

Many of the attributes inherent within professionals can be identified in the research conducted on administrative behavior. Simon (1997) identified several features of organizations that bring its members to accept its authority and in turn hold to its mission and its rules. Simon states that good communication within the organization is important in that it predisposes administrators to act in accordance with organization procedures. Formal and informal communication channels are important in communicating organization procedures. NTSB shows strength in both. The research shows that social relationships occur within the agency, which has given rise to informal leader-follower relationships, which leads to informal norms that enhance compliance with the organization's policies.

Simon (1977) mentions that "identification" is the primary mechanism of organizational control. Through identification, organized society imposes on individuals the scheme of social values in place of a person's personal motivations. An organization's structure is socially useful to the extent that the pattern of identifications it creates corresponds to the relationship of social values to organizational values.

The research shows that the features described by the professional agency are evident at NTSB. Respondents stated that NTSB investigators show a high level of dedication to the agency's mission. The agency publishes guidelines as NTSB orders and manuals to guide and direct its investigators. However, it is mentorship and investigator interaction that seem to have the greatest impact on normalization and standardization of the investigative process. These norms and rules entrench themselves in the investigators and are demonstrated in the way investigators systematically run their investigations.

The majority of NTSB investigators identify with the agency and its purpose. The sense of mission runs high among most people in the agency, but especially in the investigator corps. One investigator respondent stated,

> I remember the chairman commenting in a directors' meeting once. She said where else do you get to wear the white hat in government? She went on to say that Congress holds the agency in high esteem and respect. I don't think I ever felt prouder to be part of the NTSB.

A former investigator said,

> "If you think about it, you are one of maybe a hundred people in the whole country that does what you do. It's a tremendous honor just to be selected to be an ASI [investigator]. The people who come to the Board are some of the

> best the country has to offer. It was great working with folks that have so much talent. I was proud to be a part of it. It's a time that I'll never forget.

One additional point from Simon (1997) regarding administrative behavior is that a decision is the basic act of organizational behavior. Few significant decisions in an organization are ever the act of one person. Simon pictured organizations' actions as consisting of composite decisions, a flow or sequence of decisions made by various people in the organization with respect to some project or proposal. The research findings indicate that aircraft accident investigation reflects that design in that through the course of an investigation, competing ideas are considered about the factors and circumstances that might play a role in the cause of an accident. The party process is designed to provide a sounding board for investigators and inspectors to try various approaches and theories. Investigator and inspector respondents said that they consult regularly with other investigators within and outside the agencies. With the larger investigations in which there are groups who participate, group members and chairmen introduce ideas into the investigative process. These ideas can influence the IIC to take the investigation in a different direction and perhaps drive the IIC to draw on other experts and resources. One investigator said that he considers advice from many people, party members, FAA inspectors, and other investigators who may have conducted similar investigations before settling on a direction in which to take an investigation. He also said that he tries to be flexible and open-minded in his decision making, allowing for new evidence and ideas to be presented later.

Kaufman (1967) describes three mechanisms that the Forest Service used to maintain its unity of purpose and focus on its mission. The first is the use of procedural devices such as operating procedures and directives in which many of the decisions a ranger may face have been already predetermined and codified. The second is the use of certain methods designed to detect and discourage deviations from the agency's policies, such as rangers submitting periodic reports to supervisors regarding occurrences and actions performed; keeping detailed diaries to account for their time, expenditures, and key actions; and periodic inspections from a ranger's supervisors throughout the year. Kaufman also mentions the use of routine and frequent transfers of rangers from one district to another so that a ranger does not become too familiar with vendors, manufactures, ranchers, or others with whom he interacts. The third is that certain symbols in the Forest Service provide a heightened sense of belonging to a special group, things such as the "greens" [uniform], the Forest Ranger badge, "Smokey the Bear" hat, and signs with the U.S. Forest Service emblem posted at the entrances to national forests, laboratories, and offices. Kaufman also said that the language used and the references, such as "in-Service" people (Forest Service employees) and "out-Service" people (those outside the agency), help identify forest rangers and other Forest Service personnel as part of a unique and close family.

The research findings show that similar to the Forest Service, the NTSB and the FAA have operating directives such as regulations and Board orders in place to provide guidance to investigators and inspectors. But unlike the Forest Service as described by Kaufman (1967), NTSB investigators use the manuals and orders as guides in performing their duties. There remains a degree of flexibility built in to the way in which investigators make decisions in the field and afterward, through to publishing the final report and the presentation of the case at a Board meeting. Investigators said that they have to be able to make decisions on their own that are often not covered by what is published in the manuals. Still, the investigators said that the manuals do provide a basis for starting a decision process.

In a major accident case, NTSB investigators put out regular progress reports to keep the agency's management and Board members informed of the investigation's progress. NTSB investigators and FAA inspectors are required to track expenses with respect to travel, purchases of equipment, and procurement of services. Investigators must submit a travel voucher citing their expenses on their return from the field or their return from follow-up on inspections or laboratory work. Investigators are issued government purchase cards and convenience checks to procure services on site such as a towing company to pick up, load, and move wreckage from the accident site to a secure location where the investigative team can look at the aircraft in greater detail or to contract a security service to watch the wreckage through the night so it cannot be tampered with by persons not associated with the investigation. Immediate supervisors occasionally travel with their field investigators to an accident site to observe and note any deficiencies that might manifest themselves. Because the major investigators travel to an accident site with a Board member and some senior staff (managing director, director of Aviation Safety, director of Research and Engineering, etc.) the IIC and group chairman often receive direct feedback on problems or deficiencies when in the field.

NTSB investigators do not move often during their career. A field investigator is usually hired in a regional or field office and remains there through his/her development to the journeyman level, i.e., Grade GS-13. Some field investigators have spent their entire government careers at the same office. These investigators almost always work with the same party representatives and are well known by area law enforcement, first responders, FAA inspectors and supervisors, and the pilot community. Investigators seeking greater responsibility beyond the level of a journeyman investigator can bid for a senior or supervisor grade, which in most cases requires the investigator to move to a new location, either in the regions or to the headquarters in Washington.

FAA inspectors face similar situations. The inspectors are often hired into a FSDO, develop there to the journeyman level (GS-12), and most times remain there for their career. However, promotion opportunities are greater within the FAA due to the agency's greater size. Inspectors often bid for supervisory (GS-13, 14, and 15) positions, which in most cases demand that the inspectors move to another location. Permanent Change of Station (PCS) moves are not common unless they are associated with a promotion. This is due to the cost incurred by the agency in moving an investigator or an inspector from one location to another.

The research findings show that there is a high sense of belonging on the part of NTSB investigators. This sense of belonging, however, is manifested more in the purpose of mission than in symbols. Major NTSB investigators and group chairmen will don the agency's familiar blue jump suit, jacket, and baseball cap embossed with the gold capital letters "NTSB" at major accident sites. The four letters themselves, along with the round patch displaying the Federal eagle and "National Transportation Safety Board," seem to manifest the same sense of pride in the investigators as was described by Kaufman (1967) with respect to the rangers. Field investigators stated that they do not usually wear all of the federal uniform and symbols when performing their tasks. This is due more to personal protection than a lack of pride in the agency's symbols. As one field investigator stated,

> We go into areas of the country where the federal government is not welcome. It is better sometimes to blend in with the locals than risk being a target for some nut with a shotgun and an axe to grind with the IRS. Believe me, some of these people don't care that you are there to make aviation safer. They see that blue jumpsuit and think FBI, ATF, not NTSB.

Kaufman's (1967) references to an agency's language or to its employees seeing themselves as being part of an exclusive group does not seem to show as bonding factors in the NTSB or the FAA. Field investigators, though sometimes wary of party members, welcome the factory representatives as team members. At gatherings of investigators and inspectors from government and industry, mutual respect and admiration are displayed as if they are all brothers and sisters bound by a common cause. NTSB investigators try not to be exclusive within the investigator community, although the public's perception of them does tend to set them apart from other aviation investigative populations.

Data Impact on the Research Questions

At the beginning of this study, I posed several questions that formed the purpose for this study being conducted. In this final section of the chapter, I revisit those questions and apply the theme research against them so as to see what answers we get with respect to capture and independent aircraft accident investigation.

I first reconsider the overarching research question: "Do elements of influence defined by the capture theory of regulation manifest themselves in aircraft accident investigations conducted by the NTSB and FAA when functioning as an investigative agent of the NTSB?"

The evidence gathered from comparing the themes derived from the 38 respondents support this question. It is evident that capture occurs. I am not speaking of a complete capture when the agency becomes ineffective but of elements of capture, and degrees of capture. Events within the NTSB are the target of capture, such as individual accident investigations, legal proceedings ruling on investigative procedures, safety suggestions, proposals for safety recommendations, and the formulation of probable cause. Many of the respondents, not knowing anything about the capture theory, provided information conveying an unsettled feeling that something "capture-like" was going on. They could not define it but instead provided descriptions. One investigator respondent said,

> It's that feeling you get, like the hair is standing up on the back of your neck, when I'm around the parties. We get into these discussions. As an IIC, you are a facilitator of discussion and ideas. You lend structure to the process, but you keep the air open so that discussion can go on. I often feel I'm losing it when the parties get on a tangent. Sometimes they won't let go. And it permeates beyond our meetings. Company presidents talk to Congressmen

who talk to our chairman. Their lawyers talk to our General Counsel. I've been circumvented so many times my head spins. All you can do is roll with it. Am I saying I am [a] pawn of the parties, of industry? No, maybe, not me. Some people, yes. I can say that some of my investigations have been steered by forces outside my control.

Another investigator respondent said:

I was cornered at a safety conference by the director of product safety for an airplane manufacturer. I was doing the investigation of a crash involving one of their airplanes. The investigation had gone on for almost 10 months, and I was in the process of wrapping it up. He was concerned that I had not addressed all the issues behind the accident. I told him that I allowed his investigator to present his company's theories. They had three different scenarios, which they wanted addressed in the accident's factual report. I told him the physical evidence gathered only supported one of the theories and not totally. I told the guy that references to the company's theories would not be in the report. He wasn't happy.

Three weeks later, I received a call from my boss. He started chewing me up one side and down the other about how I was not addressing this company's concerns in my report. After I calmed him down and explained the facts to him, he seemed to understand that what I was presenting in my report was correct. I figured that was that.

About two months after that conversation, we held the technical review meeting in Washington. Everyone was there, including the aircraft company product safety director, his investigator who was the party member on my investigation team, an aeronautical engineer, and their attorney. My boss threw the attorney out right away, though under protest. The meeting went downhill from there. I was accused of being biased toward the company's aircraft because of its inadequate anti-icing equipment. The company's safety representatives attacked everything we did, including safety studies on the aircraft from five years earlier. We never got to the facts of the case in the meeting. After about four and a half hours, we adjourned without much accomplished. I knew we would have to do this again and feared that the company could drag this out for months.

A few days later, my boss called me and told me to put the company's information in the factual report as an addendum. When I asked him why, he told me it wasn't worth the fight, and we needed to move on to other things.

With respect to the other research questions posed in the first chapter, the research data supports the following conclusions:

Research Question 1 asked, "If capture occurs, does it occur in degrees or in total?" There is good evidence that capture occurs in part. As mentioned with respect to my overarching question, capture occurs in part. The data does not support that the independent investigative agencies involved in this study are captured in total. We do see that interested parties exercise their influence during the course of investigation, from its beginning at the accident scene through to its end, the assigning of a most probable cause. There is also evidence that supports the idea that parts of an investigation can be captured in ways that affect the whole investigation. One investigator respondent stated,

> Our investigation involved a cabin pressurization issue, which resulted in the crew and passengers to become unconscious while the airplane was in the air. Because the airplane was on hard autopilot, it continued to fly until it ran out of fuel, some three and a half hours after it took off. In the months after we finished our work on scene, we conducted several tests involving the airplane's pressurization system. These tests were conducted at the manufacturers where the components were made. My systems group chairman oversaw that work and made several trips in support of those tests. As we got close to the technical meeting where we were all to come to a consensus as to why the accident occurred, my systems group chairman kept pushing this idea that what we had was not a systems failure but a crew mistake. Evidently, the aircraft manufacturer had convinced my investigator that the first officer could have inadvertently flipped the wrong switch on the pressurization panel, resulting in the cabin pressure to be turned off. Over several minutes at the altitude they were flying, everyone would pass out from hypoxia [a condition in which the human body is deprived of oxygen, resulting in incapacitation and ultimately, death]. I told him that he had to produce physical evidence to support that theory. He was not convincing. When we went to the technical meeting, I found the same idea being posed by the airframe manufacturer representatives. They really put on the pressure. I began to understand what was going on. It was their last opportunity to influence where we would go with the case when

> presented to the Safety Board. I could now see why my systems group chairman was being such a pain.

In looking at data that covered events occurring outside of but related to the investigative process, there is evidence that interested parties attempt to exercise their influence at the highest management levels of the agency. Former investigator respondents supported that instances of "top down-directed" changes to factual reports, the Board issuing "most probable cause statements" that are not supported by the factual report evidence, and changing or rejecting recommendation proposals so as to favor industry interests do occur.

Research Question 2 asked, "At what times during an investigation is capture most likely to occur?" The research data supports that capture can occur at any phase of the investigation. The majority of the NTSB respondents favored the time period following their return from the accident scene up to the time they were finalizing their factual reports as the period when interested parties were most likely to apply influence or pressure. FAA respondents stated that they were more likely to experince interested party influence when at the scene of an accident. This was the time when they were most dependent on the parties for technical information and advice about the manufacturers' products. The inspector respondents said they were "most vulnerable" to the interested parties' wishes when they were with them in person at the scene.

Research Question 3 asked, "What events during an investigation perpetuate capture?" Found here was that the greater the stakes are to an industry in question, in the outcome of an accident investigation, the greater the influence that interested party will exercise during the course of the investigative process. This was evident in the study respondents' statements that support that when great loss of life is involved in an accident, the manufacturers, the airline companies, and the pilot unions "will be very involved in every stage of the investigation and will not be shy about presenting their theories and voicing their opinions."

Additionally, when there is little "upper management interest" in an accident investigation, the interested parties are more likely to exercise their influence so as to see the investigation go their way. One respondent said,

> I see a lot of stall-spin accidents where the pilot loses control of the airplane and can't recover before it hits the ground. The physical evidence is right there. The airplane is usually stuck nose down in the ground. The engine is pushed back into the cabin. The wings are crushed backward along the leading edges, and the tail is usually twisted off, just behind the baggage compartment. It is clearly a pilot mistake. We try not to spend a lot of time on these kinds of accidents. I was on one scene like this when I got a call from the airframe manufacturer. He wanted to offer his services, that is, he wanted party status. I told him that the physical evidence pointed to a stall-spin accident. He still wanted to come. So I granted him party status, not thinking it was any big deal. While on the scene, he really didn't do much for me. What he did do was at the end of the field phase, when we were doing the out-briefing, he wanted assurance from me that I was going to write my report to support pilot error as the cause. I was [expletive deleted], but the evidence did support the pilot not maintaining control. The report was eventually adopted that way.

Research Question 4 asked, "If capture is not occurring, are there other theories of regulation that can explain influence effects during aircraft accident investigation?" In this study, other regulatory theories besides capture were examined that might be able to explain what might be occurring in the NTSB or FAA when conducting aircraft accident investigation. We compared the premises of these theories against the research data gathered from the themes. The evidence reflects characteristics that occur in the capture theory more so than other theories I examined. However, other regulation theories do help explain some of the dynamics that occur with how the independent investigative agencies unknowingly counter capture influences.

Research Question 5 asked, "Do countervailing interests of interested parties play a role in accident investigation, and if so, to what degree?" The theory that countervailing groups exercise their influence against each other so that the effects of one group negate the effects of the other and thus neither group's influence can be applied against the oversight agency works well with regulatory agencies. But in the case of independent accident investigation, the evidence does not support this position. Competing groups, which would be the interested parties, do put forth their position and exercise their influence, but that influence is directed at the investigative agency and not at each other. As one party respondent said,

> We want to help get to the bottom of why an airplane crashes, so we can prevent it from happening again. Sure we have a stake in the outcome, so we do everything we can, and present everything we have to the IIC. If our product is at fault, we want to know it and fix it quickly. If it is someone else's problem, well, poor [expletive], I hope they'll get on it right away. No one wants to be sued.

Research Question 6 asked, "Do the actions of agents exercising influence on their principals explain the dynamics occurring in the investigative process?" As noted earlier, principal-agent theory better explains the relationship between Congress and an agency head, or a board of directors for a corporation and that corporation's CEO. In this study, the theory was applied to the accident investigation scenario in which the NTSB plays the role of principal and party members the agents. In this light, it seems that principal-agent theory would provide an attractive alternative to the capture theory to describe party influence in an accident investigation. However, as we found when considering the evidence derived from the themes, many of the ideas presented in principal-agent theory do not adequately describe the influence exercised by interested parties.

Respondents said that because they work together so often, most investigators and inspectors know the qualifications of the interested party members who come out to support the investigation, if not through previous association then by reputation. If an IIC does not know about a particular party member, he or she can contact another agency investigator who has worked with the party member to get that information.

Research Question 7 asked, "Is the FAA, when exercising its investigative responsibilities, more susceptible to influence or capture than the NTSB?" Most of the investigator respondents lean toward the premise that FAA inspectors are more susceptible to capture by interested parties when exercising their investigative duties than are the NTSB investigators. This is supported by the fact that most inspectors see accident investigation as less important than their primary mission as enforcers of federal aviation regulations. Also, accident investigation duty is not a regular function for the FAA. Most inspectors find themselves on call for accident investigation duty perhaps once or twice a year. In some cases, through luck or not being called during the few rotations they serve, some inspectors might not be called to travel in support an accident investigation for years. When they are called to investigate as the eyes, ears, and hands of an NTSB investigator, they are often rusty with respect to investigator techniques. Many inspectors are trained in large aircraft such as those operated by the air carriers. Inspector respondents admit that when an air carrier operations inspector or an avionics inspector is thrust into a situation in which he or she has to investigate the crash of a small airplane, they are not well prepared. Some of these inspectors relate that in these situations, they have relied heavily on the party members, not just for technical information but for investigative techniques as well. These situations provide an easy time for party members to see their interests met. Because NTSB investigators must rely on the FAA inspectors for their observations and data collection in their limited investigations, the parties' interests carry over. For the NTSB, the potential for FAA capture by interested party members in these type of investigations is of great concern.

Research Question 8 asked, "Can NTSB investigators or FAA inspectors identify when capture or other influences are occurring when they investigate?" According to the investigator respondents, many do sense when a party member is trying to steer an investigation or some portion of an investigation in a direction favorable to their interests. The investigator respondents did not recognize this influence as capture, but in many of the interviews, the investigator respondents recounted having seen or experienced events that described capture elements occurring. FAA inspectors tended not to identify what the parties provided them as influence or capture. They saw the party members' assistance as just that, assistance.

The inspector respondents did describe several accounts that were indicative that party influence was in progress. But as these respondents recounted the events, they did not recognize what was occurring as a problem. This is not to say that the FAA inspectors were ignorant or naïve. Neither is it to say that the FAA inspectors are not aware that party members want to see their own interests attained. What it might imply is that FAA inspectors, in their role as investigators, do not readily recognize what is occurring when an interested party influences an investigation so that the eventual NTSB-issued probable cause does not implicate his or her company as contributing to the accident. The evidence might also mean that FAA inspectors, when thrust into the role of independent investigator, do not take the importance of the job to the degree that NTSB investigators do.

Research Question 9 asked, "Do elements described in agency professionalism and administrative behavior theories provide an explanation for why capture would not occur in accident investigation?" The evidence gathered from the respondents support the premise that agency professionalism and the concepts drawn from the study of administrative behavior provide some explanation as why NTSB investigations and the agency itself do not capitulate to the will of the interested parties. NTSB investigators see what they do as a profession. They recognize that they are an elite group with specialized knowledge. Investigator demographics show that NTSB investigators are highly educated and that the agency places a high value on education. NTSB investigators identify with the mission of improving aviation safety and take pride in the fact that one person can make a difference in protecting lives. They see what they do as an awesome responsibility. NTSB investigators identify with the symbols of their organization, such as the crest displaying the federal eagle and embellished with the words "National Transportation Safety Board." They are readily identified at accident scenes by their navy blue jumpsuits and baseball caps emblazed with the gold letters "NTSB." An aircraft accident investigation mirrors much of what Simon (1997) referred to as exercising composite decision making. Many investigations involve numerous offices within the NTSB and outside the agency. Party members contribute to the investigation with their experience and technical expertise. FAA inspectors and air traffic control specialists draw on data and recount previous cases in which similar issues underlying an accident occurred. An investigator's recommendation to the NTSB as to the probable cause of an aircraft accident or the proposed recommendations to rectify a serious flight safety deficiency are often the result of the numerous decisions provided by group chairmen, outside technical experts, operators, and other party members. The characteristics of professional agencies and many of the theories that come from the study of administrative behavior provide a viable explanation as to why the NTSB can keep capture influences in check.

With respect to FAA inspectors serving as on-scene investigators for the NTSB in limited investigation situations, some of the profession premises cited with respect to the NTSB are not as apparent. Inspector respondents see themselves more as a cog in an overwhelming bureaucracy than as a professional in a unique organization with a critical public service mission. Inspector respondents reiterated the fact that accident investigation was an additional duty for them. Several stated that they do not receive credit in their annual evaluations for any work done in accident investigation. As one respondent said,

> Accident investigation, though important, is not what I'm about. If the pilot screwed up, my job is to get him or her reexamined. If there are violations, I need to get on them right away, especially if the situation involves one of my operators.

Another inspector respondent said,

> My caseload doesn't allow me a lot of time to chase after manufacturers or operators outside of my area of responsibility. I get the pilot's statement as to what happened, check the airplane systems, and write my report. I then send the information on [to the NTSB]. My supervisors don't want me wasting time chasing every possible safety issue. If the NTSB wants to go after an issue with one of the limited investigations we do for them, they need to get an investigator out here.

This respondent went on to say,

> I have 63 operators I'm responsible for. I have to visit each one of them twice a year. I'm supposed to conduct a thorough inspection of each operator's maintenance program. This involves looking at all the records, checking the training and backgrounds of each mechanic, ensuring their licenses are correct, and evaluating the overall effectiveness of the program with respect to [FAA Form] 337 major repairs, SDRs [Service Difficulty Reports] reporting, and manufacturer support. I pull accident duty for one week, twice a year. The last time I did it, I had five accidents occur. Two of them involved fatalities. The NTSB came out on those. However, those five cases cut into my workload big time. The three that I had to gather information on myself, I got witness statements, wrote my report, and got them off my desk. I had to get back to being what I am, an inspector.

Chapter Summary

In this chapter, I presented the research's findings in the form of 21 themes that evolved from the interviews' coding data. I then compared the gathered data against the capture theory and the alternative regulation theories, which were presented in

Chapter 2. Considering the data, I chose to discount some of these alternatives as providing the best explanations of the dynamics that occur in aircraft accident investigation. The research data did support some of the concepts identified in the capture theory and many of those found in agency professionalism and administrative behavior with respect to the NTSB. This was not the case when compared against accident investigation duties conducted by FAA inspectors.

In the final chapter, I summarize what I have discovered through the research and draw some conclusion as to what this means to the future of independent aircraft accident investigation. Following that, I provide some ideas for future directions following this research and present some recommendations directed toward the agencies involved in this study.

CHAPTER 6

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Research Summary

This study examined the capture theory of regulation to determine if there were elements inherent to the theory that might impact the outcomes of aircraft accident investigations conducted by an independent federal agency with no regulatory oversight, specifically the NTSB. I described the problems facing the NTSB in the mid-1990s with respect to several high-profile accident cases it encountered. These accidents involved issues of greater complexity and technology than investigators at that time had previously seen, requiring the agency to rely more on manufacturers and operators to help them solve the cases.

A 1997 RAND study on the NTSB identified the "party process" as an issue, pointing out that the agency's increased reliance on interested parties could jeopardize the final outcomes of the agency's investigations. RAND suggested that the NTSB should develop independent resources to provide the technical expertise currently provided by the parties. RAND was telling the NTSB that it was losing its independence and that if it continued to rely on the party system to gain the technical skills to solve its cases, the agency could become reliant on the parties in all aspects of its investigations. With respect to the RAND report, the implication was that the

NTSB was on the way toward capture. But the issue was not explored in depth. This area needed to be looked at further; this is the source of the base for this study.

Previous research on capture was founded mostly in case studies. Capture research was focused on regulatory agencies and commissions with oversight authority, that is, organizations that oversee a particular industry and regulate its activities. The reciprocal relationship results in the regulated industry seeking favorable regulation for good behavior. Over time, this relationship becomes entrenched, negating the agency's ability to effect regulatory change. Capture theory literature cites numerous examples in which intentional capture manifested itself, as in the relationship between the ICC and the railroad industry, and where capture by design was prevalent, as in the FAA and the commercial airline industry. The skeptics of the capture theory argued that public participation, experience of key people within the agency, competing groups, reputation, and agency expertise are among many factors sufficient to break any hold that an industry has on the regulatory agency. Additionally, administrative behavior theorists suggest that composite decision making, employee identification with the organization, and professionalism contribute to minimizing the influence of outside interests.

Some researchers believe that capture is not an adequate explanation for what occurs between an agency and its regulated interest. Other theories, such as principal-agent, cooptation, and countervailing interests, have been offered to explain the dynamics between a regulatory agency and its regulated group. By the early 1980s, the capture theory had fallen into disfavor among most political scientists.

It would be easy to walk away at this point and say that there is nothing to the idea of capture, especially as it applies to an independent federal agency such as the NTSB, which has no clear regulatory mission. Nevertheless, when looking at the dynamics that occur at the NTSB when the agency conducts an aircraft accident investigation involving parties with a vested interest in that investigation's outcome, that dynamic raises concerns and questions.

I decided to look at the overall investigative process with respect to parties' involvement, starting in the field at the accident scene to the issuance of the final report and of safety recommendations. I examined the process with respect to major investigations, particularly investigations of commercial airline accidents, regional investigations of small general aviation aircraft, and FAA-led limited investigations, usually involving small aircraft, but also incidents with air carriers. As the research gained momentum, it became apparent that there was something to the RAND (Institute of Civil Justice, 1999) study's suggestions. The capture theory seemed to present an appropriate explanation regarding what was happening in the NTSB investigative process. I found it necessary to gather new data through interviewing a sample of past and present employees in the investigative agencies, as well a sample of interested party members and other outsiders.

The interviews provided a wealth of information for this study. Respondents in the study were open and insightful with their responses to the questions asked. As for the research questions posed in Chapter 1, the interview data, coded and developed into themes, provided sufficient evidence to draw conclusions on whether capture theory still offers a viable explanation of the relationships between regulatory and nonregulatory agencies and the industries with which they are involved.

Research Findings

The research data provided excellent evidence to support three specific findings. The first is that there is a definite capture-by-design effect occurring at the NTSB in its investigations. The second finding is that the NTSB retains tremendous power by virtue of producing investigative factual reports citing facts found in its investigations and later producing and releasing final reports citing the probable causes of the accidents. This can result in a tendency for the parties to circumvent the investigative process and apply influence at the macropolitical level. The third finding is that NTSB investigators exercise influence on the manufacturers by virtue of their findings within the investigations, and this influence can drive positive changes. The following text explains these three findings in detail.

Capture by Design

The theory behind capture by design is that when a regulatory agency is established to oversee a particular industry, that agency's mission and structure is designed by the legislative statute or the implementing executive such that the interaction between the agency and the regulated industry creates a capture relationship that promotes regulatory compliance and, for the industry, operational efficiency (McConnell, 1966, p. 1). The classic case with the FAA is that the agency in being captured by the commercial airline industry provides an environment in which the industry can grow and prosper. Regulation is designed so that safety is maintained but flexibility for industry to venture into untested areas is allowed. One example in particular would be contracted maintenance, when an airline seeks out an independent repair station to conduct regular and heavy maintenance on its aircraft. The FAA allowed this, as it provided for the airline to reduce overhead costs in maintaining facilities and mechanics, allowing it to invest in expanded domestic and international routes, and consequently creating growth of the company. The company, in return, would agree to comply with any regulation or policy-governing procedures to insure the company's aircraft meet airworthiness standards.

In the case of the NTSB, the party system has been central to the agency's accident investigation strategy since the establishment of the agency. Throughout its history, federal aircraft accident investigation has had to rely on the expertise provided by manufacturers and operators to understand the systems and procedures underlying the operation of aircraft. Aircraft accident investigation agencies have historically remained small. The underlying logic seems to be that an investigator in charge of a crash investigation should be an expert on the investigative process, be savvy and flexible enough and enough of a leader to pull a team together in a crisis, and be just knowledgeable enough about aircraft and its operations to know where to go to get specific information applicable to the case being worked. It is this third characteristic that involves the parties and the party process.

As seen from what we know about the NTSB, the agency has a mandate to investigate all aircraft accidents that occur within the U.S, about 3,000 cases per year. We know that not all of these cases involve fatalities, but they all involve substantial damage to the aircraft. We know that there are hundreds, perhaps thousands, of different aircraft when including all the experimental and kit-built types, operating in the U. S. There is no way that any one investigator or specialist at the NTSB or FAA can know everything about every airplane. In addition, each model of aircraft can have numerous modifications to its systems. For example, there are at least two different models of engines on Boeing 777 commercial jets; one model is manufactured by Pratt and Whitney, the other by General Electric. These engines have different fuel controls and different monitoring systems, and each is manufactured by different companies. An investigator could go into an investigation of a Boeing 777 airplane thinking he was dealing with a certain set of systems and find that he or she is dealing with different systems and different manufacturers.

There are also the numerous types of operations in which aircraft are used. Each operation has different rules and guidelines. For example, a helicopter can be involved in transporting workers to oil platforms in the Gulf of Mexico. This operation would be a commercial one, covered by specific regulations. But two or three different companies could perform the same operation. Each company would be covered by the same regulations but might operate differently and have specific directives covering those operations. These directives might have to do with how weather information is gathered prior to a flight or how flight duties are handled during an emergency. In short, no one NTSB investigator goes into an aircraft accident knowing everything about every aircraft and every operation that exists.

To be able to go into an accident investigation with the resources to know everything about every aircraft and operations out there, the NTSB would have to be many times its existing size, employing hundreds, perhaps thousands, of experts on the numerous airframes, engines, fuel controls, environmental systems, hydraulic systems, brakes, steering systems, and so forth that exist, and would have to have experts who understand every commercial, air taxi, air ambulance, wildlife survey, aerial photography, aerial fire fighting, crop dusting, and numerous other applications for which aircraft are used.

Considering the RAND (Institute for Civil Justice, 1999) study argument that the NTSB could find this expertise with independent laboratories or engineering firms, examination of the agency's procedures and data gathered from the respondents show that these resources do not presently exist in a form that the NTSB would need to employ them to gain the information it requires or to maintain its independence. Respondents related that even on an isolated scale, as with determining if a part failed under overload versus fatigue, independent laboratories have their own agendas and biases, and therefore, the subsequent reports received by the investigators are often not usable. Respondents cited that they are reluctant to use outside laboratories and experts because they may not behave in accordance with Part 831, the statute that governs the manufacturers and operators. Without a legal contract between an outside laboratory or specialist and the NTSB stating that they will not divulge information they obtain through the investigation, there is nothing to stop the specialists from releasing extraneous and possibly inaccurate information before an investigation has concluded. Additionally the same specialists can be hired by a plaintiff's attorney to gather information and even testify in a civil law suit against parties involved in the same case.

Thus is created the situation in which NTSB investigators must draw on the resources available from industry to gain the information they need about the aircraft or the understanding of the operating procedures of the company involved when going into an accident investigation. The vehicle used to gain this expertise and experience is the party system. Where capture by design comes into play is that when this process was codified in the federal regulations, it provided both the NTSB and manufacturers and operators with a vehicle to gain what they require most of an investigation--information. The relationship, though unintentional between the parties and the NTSB or FAA, establishes that the NTSB cannot do its job effectively without the assistance of the manufacturers and operators. A kind of symbiotic relationship has formed from the start where the manufacturers and operators seek from the investigation needed information about how their products may have failed or how deficiencies in training, procedures, and so forth may have contributed to an accident. The parties likewise provide to the NTSB investigative team the expertise and information they require in exchange for the information the manufacturers and operators seek. Because the NTSB is a small agency, the investigators cannot afford to alienate the party members during the course of an investigation for fear that something critical to future aviation safety could be missed. They need the parties' openness and willingness to provide them what they need to solve the case effectively and efficiently. The parties need to know what the NTSB finds in realtime so as to prepare for any litigation against their respective companies, as explained further below. The parties tend to behave because they know that by being an integral part of the NTSB investigative team, they help themselves by becoming aware of identified safety deficiencies early enough that they can resolve those deficiencies before the release of a public report. In short, though apparently through an accident at its beginnings as a separate agency, the NTSB and the party process are locked in an unintentionally designed capture relationship.

The Power Underlying Safety Board Factual Reports

The research data lead to the conclusion that there is real power in the NTSB's issuance of a factual report and subsequent final reports to include investigation briefs and blue cover reports. As previously mentioned, hard physical facts gathered in an investigation form the basis for the direction an investigation will take. The physical facts manifest themselves in evidence gathered from the accident scene, the crash dynamics involved, survival factors, and information gained from the cockpit voice and flight data recorders. From information gathered from these sources, investigators and group chairpeople determine what additional information they need from the parties to determine the course the investigation should take.

Party members are usually named at the beginning of the investigation. They arrive in the field at the accident site and are therefore privy to all information investigators gather at the start. If the vehicle recorders show that viable information is present, recorder groups are formed. The parties provide representatives to sit on these groups. Their purpose is to assist the group chairmen in determining what may have been said on a voice recorder, who said it, and what it means or what specific recorder parameters on a flight data recorder equate to with respect to the measured system. The party members are afforded access to information early in the investigative process and, by virtue of that access, can assess early the direction an investigation takes, that is, whether the investigation will look specifically into operational issues as with the pilots or with how the aircraft was maintained or into mechanical issues as with how parts or the aircraft as a whole may have been manufactured, tested, and certified.

As cited previously, the stakes involved in what an investigation finds are high with the parties, especially if an investigation reveals a flaw in a manufactured component that resulted in a catastrophic failure and, subsequently, in a crash. In the case of an operator, an insufficient training program may have contributed to a flight crew's inability to recognize a situation that resulted in their making improper decisions, ultimately resulting in their losing control of the aircraft and resulting in a crash. If an investigation's findings determine such things, the company in question could and usually does face litigation on the part of the families who lost loved ones in the accident. Such investigative findings could cost the company involved millions of dollars, not just from the potential lawsuits but, as in the case of a design flaw of a manufactured component, the costs of having to redo the research, development, and certification of a replacement component and the recall of all aircraft involved to resolve the deficiency. Many companies cannot survive the costs involved under these circumstances and ultimately go into bankruptcy or out of business completely, resulting in unemployment of the company's labor force and loss of value to stockholders as market shares of the company plummet.

The NTSB has no power to force any company or other government agency to comply with recommendations it forms as a result of findings in an investigation. But the NTSB's influence does not derive from its ability to directly regulate the industry. The NTSB's power is manifest in the reports it produces and the recommendations it issues. The NTSB report does not specifically speculate on a party's intent. It only identifies the facts found. However, if one of those facts shows that improper hardening of a component during the manufacturing process led to its eventual failure and the subsequent accident, that fact casts a certain spotlight on the manufacturer. That company may now be viewed as negligent, inattentive, or corner-cutting, although the manufacturing deficiency identified may be just an honest mistake. The NTSB report drives public opinion. It can lead to presidential and congressional actions. It most certainly should lead a manufacturer to the realization that if their product is at fault, they should change it immediately. This is where the NTSB's power truly lies.

However, findings in this study have shown the propensity of some parties to circumvent the investigative process when they see that their product might be implicated in the investigation. Some investigative findings have been changed at the macro-political level. The research shows that in many instances, company product safety directors have gone outside the investigative sphere and spoken directly to NTSB senior managers. How often this occurs was not quantified in this study, but the research shows that it does occur, and it happens early on, when a company sees that the investigation is looking at their product or operation. Power then must reside in the senior staff and board members to resist company officials from exercising such influence. But how much resistance can the agency muster against an interested congressman who may represent a district with an endangered manufacturer or company? By virtue of the fact that these circumventing attempts occur at all is evidence of the tremendous truth and power vested in NTSB reports.

Influence of NTSB Investigative Findings

The research showed that investigative findings identified to the parties during the course of an investigation and direct negotiation with the parties can drive the party process to make positive safety changes long before factual reports, final reports, and recommendations are issued.

To many of the respondents interviewed in this study, the NTSB recommendation process is long, difficult, and cumbersome. The process works well in major investigations because the investigations' results and the recommendations drafted will almost always be presented at a public meeting. The public does not want to see the results of a year-long investigation of a major crash produce no safety improvements. Therefore, any issue found in the investigation will most likely lead to recommendations for safety improvement.

However, this is not the same with safety issues identified in the regions. This is not to say that what the regional investigations find in accident investigations is not important to aviation safety. Almost every investigation seems to produce some issue that should be examined. Regional investigations are often touted as being the proactive tool in aviation safety, as they often identify safety issues early, before they grow into problems resulting in major accidents. But the evidence suggests that recommendations are harder to get through if they originate in the regions.

In many instances, years pass before a recommendation proposal makes its way through the staffing process to the directors' review and NTSB notation. Meanwhile, a problem that the recommendation was researched and designed to fix languishes. The process appears to be designed so as to insure viable recommendations are issued that will result in overarching safety improvements throughout the aviation industry. One problem is that many of the safety changes that originate in the regions and need to be made are often targeted to specific or smaller issue areas.

However, many regional investigations reveal problems that impact large issue areas of the aviation industry. An example would be the engine modification to all Boeing 727 air freighters where the new engine's high-pressure fuel pumps have integration problems with the pre-existing fuel system and result in engine flame outs. This is not an overarching aviation safety issue, as it may affect a fleet of perhaps only

50 to 60 airplanes, but it is a major air safety issue just the same, especially if one of these airplanes loses total engine power and crashes into a metropolitan or residential area. Such an issue should drive a recommendation proposal and in most instances will. But the issue that is the subject of the proposal requires action now, not two to three years from now when the issue might be looked at, because it is not overarching to the whole fleet of Boeing 727s.

But this issue and many critical safety issues do get resolved, and they are resolved by the NTSB through the findings in its investigations. As shown, early on in an investigation, physical facts begin to reveal themselves as to what underlies the cause of an accident. Experienced regional investigators meet with the party members under the party system and share this information with them. By showing the parties what the investigation is revealing, especially if the facts involve a party's product, that party can in essence begin to resolve the problem long before the investigation concludes and safety proposals are considered. Investigators work with the parties, attending meetings set up by their company presidents, engineers, directors, and other key officers to share and discuss what the investigation is revealing. In these meetings, the company works with the NTSB to come up with ideas to fix the problems identified. Sometimes the solution is to call for fleetwide inspections of all the company's aircraft so as to insure no other similar components are out there that could cause another accident to occur. Sometimes the solution is a published procedures modification to a checklist and subsequent training for air crew members in the change. Sometimes the solution is more complex and may require interim checklist procedures during the development of replacement parts to fix the problem. When the issues come to this level of complexity, the FAA certification offices are often called in to provide information and assistance in the process.

The FAA, under these circumstances, can facilitate changes by issuing airworthiness directives to all companies operating aircraft with the component in question installed. The directives can specify a certain time period and a deadline in which and by which the changes must be made.

In these situations, aviation safety is achieved then through direct negotiation on the part of NTSB investigators with the parties, based on their investigative findings. This is not to say that investigators prefer this vehicle over the recommendation process to see safety changes. Most investigator respondents related that they'd rather be credited for submitting a proposal that results in a safety recommendation. But for issues identified in the regions that are not overarching, this informal influence of the investigations' findings and investigators' direct negotiation with the parties appears to achieve the positive safety changes desired without the formal process of a safety recommendation proposal.

Implications for Future Research

The finding cited with respect to the power of NTSB products and this potential of the parties to circumvent the investigative process is a concern that drives to the heart of the capture theory. This research only scratched the surface of this area. Of interest certainly would be to discover how often and how extensive this influence occurs. A serious study at the macropolitical level certainly is called for. Such a study could be done from the quantitative approach by gathering information on factual investigation reports prior to submittal for the NTSB for review and consideration for probable cause and then looking at the final outcome to see if the reports were changed and to what degree. A general statistical study based on an in-depth content analysis of NTSB records on cases in which the final outcomes, statements of probable cause, contributing factors, and proposed recommendations differed from what was gained from the investigations and cited in the factual reports prior to their submission for review and consideration might show what combination and types of parties involved in specific cases would be more or less likely to lead to outcomes other than those predicted. The problem here is that the data could be somewhat limited. NTSB investigators claim that they retain only those notes, documents, and such writings that support the factual evidence in cases. Most investigators, as a general practice, discard their field notes and non-case-related documents at the conclusion of their cases. Field notes typically cite personal observations and theories on the accident. They can list brainstorming ideas on what participants think might have happened, on what direction the investigation should go, and on what to do in the following phases of the investigation, many of which are later deemed to be not important to the specific case. These materials are subject to request for information under the Freedom of Information Act. So as not to be deposed later because of what could be biased or misleading information, investigators discard these materials. This is not to say that all materials do not exist and that this kind of research should not be attempted. I mention this so that researchers who take this approach can be aware of what they may face.

Another issue area would be examining further this idea that the NTSB party system situation is a form of capture by design. Although the qualitative evidence helped formulate a strong argument in this area, the approach to this study focused on all aspects of capture and other influence theories of regulation. A quantitative study using a survey to gather information on how much interaction is occurring between parties and NTSB and at the various stages of the investigation could produce an interesting insight into this area.

Another area to examine would be looking at the relationship of the NTSB to the parties as perhaps a reverse principal-agent situation, with the NTSB having the information the principal--in this case a manufacturing or operating company president or Congressman--seeks in order to determine their following course of action. And in such a situation, although the party process states that both agency and industry must be forthcoming with information, if indeed an information asymmetry exists, with NTSB wielding the upper hand. Such a study might provide additional measures of influence exerted on the NTSB at the executive level in giving up information the parties seek.

The idea that capture occurs outside of the regulatory realm should be explored further. The focus of this study was aircraft accident investigation, but there may be other state and federal functions to which the theory of capture might apply. These would have to be agencies that rely on outside groups with vested interests in those agencies' procedures and outcomes to conduct their work. They would also have to be autonomous in their mission and investigative in function.

This study looked predominantly at the NTSB's investigation process with respect to aviation. However, the NTSB also conducts investigations into railroad accidents, pipeline accidents, maritime accidents, and certain highway accidents. As with the NTSB's Office of Surface Transportation, Rail Division, railroad investigators have to rely on train engine and rail car manufacturers for some information. The Federal Railroad Administration within the Department of Transportation is not an automatic party, as is the FAA in aviation accidents, but would certainly be involved in some capacity during a train accident. The railroad companies themselves would be involved not just with providing information and expertise on a train's operation, but as the companies also own the tracks and grade crossings, they would be providing information in these areas as well. In the same manner as aviation parties are involved, seek information, and have a vested outcome in the results of an aircraft accident, the companies, manufacturers, and oversight agencies involved in a railroad accident would have similar agendas and goals. A study into the relationship between NTSB and railroad parties should then provide additional data about the capture theory outside of its traditional regulation focus. This study's approach and focus could also be applied to the other NTSB surface divisions and the manufacturers and companies involved in investigations involving their respective modes of transportation.

Other studies of the capture theory might look at agencies whose missions involve investigative-type functions as audits, inspections, or research. Basically, such a study would look at situations in which the agency of interest, in order to perform its mission, would rely on bringing in outside sources, which are the focus of their task and have a vested interest in the outcomes of that task, and examine or measure the interaction and outcomes between the agency and those outside "parties." Research conducted on such agencies would provide a greater depth of information with respect to capture dynamics outside of regulation.

There is also the additional area of what crash victim's families should expect. They are not parties to NTSB and FAA investigations, but they have a vested stake in the outcome of those investigations. Should they be involved in the investigative process? How and to what extent? The interviews with the family members in this study raise such questions as, what should the investigation provide to them? Are they the investigative agencies' true customers? For social scientists studying this area, is there a significant relationship between the outcomes published by the NTSB with respect to an aircraft accident investigation and the rate or degree of healing, closure, and so forth experienced by surviving family members? Although perhaps not directly related to the study of capture, it drives toward influence and is an area worthy of future research.

Conclusions

This research examined the possible capture tenants in a federal process outside of regulation, that process being independent aircraft accident investigation. In this study, it was apparent that some elements of capture could manifest themselves in the crash investigation process. The NTSB, with respect to the party process, may be exhibiting an unintended capture of the agency by design. There is apparently real power in the NTSB's products, specifically the factual reports. And it is also apparent that concepts that lie within the study of regulation theory as professionalism and administrative behavior manifest themselves in the NTSB and might provide an explanation for how the agency can operate successfully within the structure laid out under the party system

This research is but a start. There is more that needs to be done in this area, and several ideas have been presented. There are things that the key agencies examined in the study--NTSB and FAA--can learn from this research. This information can be valuable in helping them develop strategies to better prepare in dealing with the interested parties in an aircraft accident investigation.

Capture of any degree occurring within an aircraft accident investigation cannot be ignored. The stakes are too high. At the beginning of this study we surmised that capture run amok could ultimately result in terrible tragedy and lost lives. A former investigator respondent provided what could be considered a warning if no one learns from what capture could lead to.

> Before the Valuejet accident [Valuejet Flight 592 crash in the Florida Everglades, May 11, 1996], the FAA and the airline industry knew that

> commercial jets needed smoke detectors and fire extinguishers in cargo compartments. We learned that lesson eight years earlier when a fire occurred on a McDonnell Douglas DC-9 at Cincinnati. Twenty-three people died in the accident. An electrical fire had broken out. No one on board the airplane knew it, the crew, passengers, nobody. The tower saw it and radioed they were trailing smoke. I think they turned around and taxied back to the ramp. Maybe they stopped. Anyway as they are taxiing, the fire is getting bigger and hotter. Finally, it broke out and burned up the sides of the airplane. The captain stopped, shut down, and tried to emergency evacuate everyone. It was too late for many of the folks, especially in the front of the plane. Plus, when they opened the cabin doors to get out, the vacuum pulled the flames right into the cabin. The NTSB put out a recommendation to the FAA to mandate that the airlines equip their aircraft with this stuff. The FAA told us it was too expensive for the industry. The chairman had smoke detectors and extinguishers added to our 10 most wanted safety recommendations. He testified before Congress on the recommendations. But there it sat; until Valuejet 592 crashed. . . . I was at the CVR [cockpit voice recorder] readout with the FAA, the company, ALPA, and the rest of the alphabet groups. You never heard anything more horrific. People were screaming. You could hear banging against the cockpit door. The captain was declaring an emergency and getting the airplane turned around. The whole thing happened in less than 10 minutes. We determined that the fire probably burned through the control system; . . . they went straight in, nose first.

Continuing, the investigator said that several congressional committee members who oversee transportation approached the NTSB on the issue.

> We told them the truth. . . . We referred them to our most wanted recommendations. Some of them were already aware of our previous efforts. There was enough outrage and pressure to get the recommendation through this time. It only cost 110 lives.

There are real consequences that occur when regulatory and other agencies bend to the will of industry or outside interest groups and forget about the common good. This research data is revealing. The concept of capture continues to be an important political science theory that needs to be discussed, considered, and researched further.

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APPENDICES

APPENDIX A

DEFINITIONS

Definitions

Throughout this study, several abbreviations are used repeatedly to describe certain agencies, companies, unions, persons, or items. To better understand the terms used in the study, I have provided the following abbreviations and their definition:

ALPA	Air Line Pilots Association (union)
AOPA	Airplane Owners and Pilots Association
ASI	Air Safety Investigator
ATA	Air Transport Association
ATF	Bureau of Alcohol Tobacco and Firearms
CAA	Civil Aeronautics Agency
CAB	Civil Aeronautics Board
CFR	Code of Federal Regulations
DOT	Department of Transportation
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FBI	Federal Bureau of Investigation
FSDO	Flight Standards District Office
FTC	Federal Trade Commission
GAO	General Accounting Office
GSA	General Services Administration
ICAO	International Civil Aviation Organization
ICC	Interstate Commerce Commission

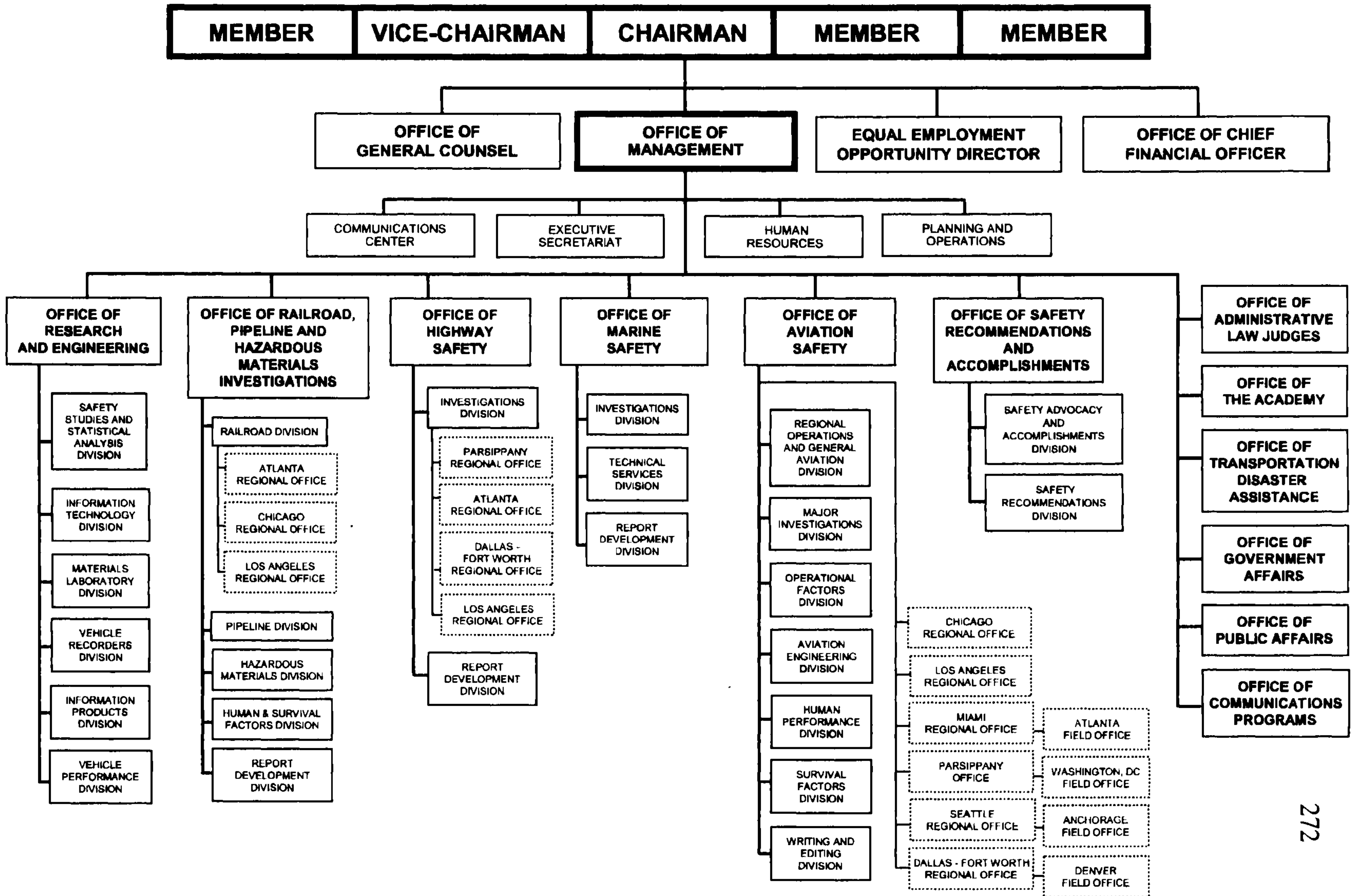
IG	Office of the Inspector General (DOT)
IIC	Investigator-in-Charge
IPA	Independent Pilots Association (union)
NASA	National Aeronautics and Space Administration
NATCA	National Air Traffic Controllers Association (union)
NTSB	National Transportation Safety Board
OSHA	Occupational Safety and Health Administration
PSA	Packers and Stockyard Administration
PMI	Principal Maintenance Inspector (FAA)
POI	Principal Operations Inspector (FAA)
RD	Regional Director (NTSB)
SEC	Securities and Exchange Commission
TCM	Teledyne Continental Motors
TWA	Trans World Airlines
USDA	U. S. Department of Agriculture

APPENDIX B

NTSB ORGANIZATIONAL CHART

2

NATIONAL TRANSPORTATION SAFETY BOARD



272

7/24/2002

APPENDIX C

INSTITUTIONAL REVIEW BOARD
APPROVAL LETTER
AND
RESEARCH SUBJECT INFORMED CONSENT FORM

Associate Provost for Graduate Studies and Research, and Dean
(815) 753-1883

Associate Dean
(815) 753-9402

Assistantship/Fellowship Specialist
(815) 753-0142

Director of Support Services
(815) 753-8564

Business Manager
(815) 753-0722

Assistant to the Dean for Recruitment
(815) 753-1946

Assistant to the Dean for Research Compliance
(815) 753-8588

FAX
(815) 753-6366

Information
(815) 753-9471

Homepage:
www.grad.niu.edu

E-Mail
gradsch@niu.edu

NORTHERN ILLINOIS UNIVERSITY

The Graduate School
Office of the Dean
DeKalb, Illinois 60115-2864

March 11, 2002

Mr. David Bowling
825 Roberts Lane
Batavia, IL 60510

Dear Mr. Bowling: Social Security: 427-06-6753

I am pleased to inform you that upon your successful completion of your candidacy examination, and the recommendation of your academic department, you have been officially admitted to candidacy for a doctoral degree at Northern Illinois University. Congratulations on your having reached this significant point in your degree program. You should consult the *Graduate Catalog* chapter on Requirements for Graduate Degrees to ascertain what doctoral degree requirements remain to be satisfied, and I wish to emphasize the university's expectations with regard to the doctoral dissertation.

The dissertation is the undertaking that distinguishes a doctoral degree from other academic degrees and that contributes to the view that the doctorate is the highest degree that academe can offer. Over the years, the Graduate Council at Northern Illinois University has stated the following guidelines for inclusion in the *Graduate Catalog*:

1. The dissertation is to be "a substantial contribution to knowledge in which the student exhibits original scholarship and the ability to conduct independent research."

2. The dissertation research is to be performed under the supervision of a faculty member nominated by the major department and approved by the dean of the Graduate School to be the dissertation director, and this approval should be obtained by the end of the first term in which the student is enrolled in course number 699.

3. The subject of the dissertation must be approved by the student's adviser or advisory committee and is to be in the student's major (e.g., the dissertation of a student in Adult Continuing Education or in Biological Sciences is to be on a research topic in adult continuing education or in biological sciences, respectively). The anticipated title of the dissertation is indicated when the dissertation director is approved; if the title is changed thereafter, it should be communicated to my office.

4. Students must be registered during any academic term during which they utilize the services of the faculty or facilities of the university, and once a student has begun registration in course number 699 he or she must register in that course in each successive term (unless a formal leave of absence is requested from and granted by the Graduate School) until the dissertation receives final acceptance by the Graduate School.

Mr. David Bowling
March 11, 2002
Page 2

5. If the research involves the use of human subjects, live vertebrate animals, or recombinant DNA, it must have formal approval, before data are collected, through the Graduate School's Office of Research Compliance, in accordance with federal guidelines. (Human-subjects research includes studies that involve data collection through surveys, questionnaires, and interviews.)

6. The dissertation may not be published prior to awarding of the degree.

7. The dissertation must be submitted to the Graduate School in accordance with the regulations and specifications in *The Graduate School Manual for Theses and Dissertations* (available at the university bookstore) and by the deadline dates specified in the Graduate School Calendar (available at the Graduate School).

3. The dissertation research must be successfully defended in an oral examination, part of which will be open to the public.

9. As all NIU dissertations (or their abstracts) are to be microfilmed by University Microfilms International (UMI), a UMI contract must be completed and submitted by doctoral students, along with the required microfilming fee.

It is very important that you be aware of these stipulations, for failure to adhere to them can seriously delay the completion of a doctoral degree program.

Also, please note the catalog requirement that graduate students must submit an "Application for Graduation" form to the Graduate School early in the academic term in which they plan to graduate, and they should consult the Graduate School Calendar for each term's deadline date.

Lastly, please be aware that the Graduate School maintains the official record of a student's progress toward a graduate degree. If you receive advice or information that conflicts with written communication from the Graduate School, the latter communication will prevail. If you have questions about these matters you may consult the *Graduate Catalog* or the Graduate School for clarification.

Best wishes for continued success in your graduate program.

Sincerely,

Jerrold H. Zar
Vice Provost for Graduate Studies and Research
and Dean of the Graduate School

JHZ: dm

c: Graduate School file
Professor Paul Culhane, Department of Political Science

NORTHERN ILLINOIS UNIVERSITY

February 28, 2005

MEMORANDUM

OFFICE OF RESEARCH COMPLIANCE
INSTITUTIONAL REVIEW BOARD
THE GRADUATE SCHOOL
DEKALB, ILLINOIS 60115-2864
(815) 753-8588
FAX (815) 753-6366
E-MAI[redacted]
WEB www.grad.niu.edu/orc

TO: David Bowling
Department of Political Science
6279 N. Cheyenne St.
Parker, CO 80134-5703

FR: Michael T. Peddle, Vice-Chair
Institutional Review Board #2

RE: Graduate student research involving human subjects for the project titled ***Determining if capture occurs in independent air safety agencies charged with conducting aircraft accident investigation and cause determination***

This is to inform you that your request for continuation of approval for the above-named project (data analysis only) has been approved by Subcommittee Review. Please be advised that federal regulations require that the Institutional Review Board (IRB) be made aware of all research activities that place human subjects at maximum or minimum risk. Your application will be brought to the attention of the IRB at its next meeting. This approval is effective for one year from the date of previous approval, until **March 26, 2006**.

If your project will continue beyond that date, or if you intend to make modifications to the study, you will need additional approval and should contact the Office of Research Compliance for assistance.

It is important for you to note that as a research investigator involved with human subjects, you are responsible for ensuring that this project has current IRB approval at all times and for retaining the signed consent forms obtained from your subjects in a secure place for a minimum of three years after the study is concluded. If consent to participate is being given by proxy (guardian, etc.), it is your responsibility to document the authority of that person to consent for the subject. The committee also recommends that the informed consent include an acknowledgment by the subject, or the subject's representative, that he or she has received a copy of the consent form. In addition, you are required to promptly report to the IRB any injuries or other unanticipated problems involving risks to subjects and others.

Please accept my best wishes for success in your research endeavors.

MTP/ska

cc: D. Kempton
P. Culhane
Institutional Review Board Members
ORC (#1343)

Attachment 1: Example Research Subject Informed Consent Form

* *

AIRCRAFT ACCIDENT INVESTIGATION PROCEDURES INTERVIEW

Note: In accordance with Title 45 Public Welfare, Department of Health and Human Services, National Institutes of Health, Office for Protection from Research Risks, Part 46 Protection of Human Subjects, August 1991, Section 46.116 General Requirements for Informed Consent, an investigator may not involve a human being as a subject in research covered by this policy unless the investigator has obtained the legally effective informed consent of the subject's legally authorized representative. An investigator shall seek such consent only under circumstances that provide the prospective subject or representative sufficient opportunity to consider whether or not to participate and that minimize the possibility of coercion or undue influence. The information given to the subject or representative will be in a language understandable to the subject or representative. No informed consent, whether oral or written, may include exculpatory language through which the subject or legal representative is made to waive or appear to waive any of the subject's legal rights or releases or appears to release the investigator, the sponsor, the University of Northern Illinois or its agents from liability for negligence.

Please real the following items prior to granting your consent to participate in this study:

1. The duration required of this interview is approximately 60 minutes. The interview will begin following you granting consent to participate. You will be asked broad-based questions to which you can state what you would like in answering them. There are no specific correct answers being sought from you. I want to know what you think, believe, and feel about the subjects covered in the questions. During your responses, I will be taking notes. Please do not construe my taking notes as disinterest toward you while you give your responses.

2. Because this is a discussion, I encourage you to be open. However, there may be times when you feel uneasy answering a question or during response you relate something that you may regret or think twice about. If you encounter this during the interview, let me know and I will shift to other questions or amend my notes of your answer.

3. This research is important to the future effectiveness of transportation accient investigation policies and procedures. Your participation in this study is of extreme importance. You have been identified and approached for this study because of your unique position and expert knowledge of the subject matter. I extend my thanks to you on behalf of the National Transportation Safety Board and myself for your willingness to participate.

4. Please note, if at any time you feel this is not right for you, we will stop the interview at that point. If at any time during the interview, you need to take a break, let me know and we will recess for a few moments. We can resume the interview whey you a ready.

5. The noted I gain from this session will be transcribed for research purposes. All transcripts of this interview will be held in strict confidentiality. Only I will review this material. No other persons will ever see my notes or transcripts of this interview. For the purpose of your protection, you can tell me now if you want your name and/or position attributed to these comments. I do not purposely intend to attribute information attained from this interview in my final dissertation to you by your name specifically. An example of the type of attribution I plan to use is, "An NTBS field investigator said." Should I require deeper attribution, I will contact you and we can discuss the degree of that attribution. The record of this conversation will be destroyed three years following the acceptance of my final research. Information obtained during this study may be published in scientific or professional journals or presented at scientific meeting. Any information that could identify you will be kept confidential.

6. There are risks in revealing candid information about personal experiences during investigations, and in revealing such information, there could be the threat of sanction or reprisal by the agency should the source of that information become known. I have gained assurances from NTSB management that learning is the most important issue and the subjects who participate will be protected. However, because the potential exists that in providing information, some or all of that information could cause the subject and/or other persons in the agency embarrassment, the identity of that information will be held in confidentiality. The interviews will be documented through note taking. I will not use any recording device in the interviews for this research. I will transcribe all notes to produce a transcript of the interview. The interview notes and transcripts will be held confidential. I will provide you an opportunity to review the transcript of the interview. Any information that becomes contentious will be negotiated, especially if it is information valuable to the study. However, you will be given the greatest consideration. If you insist, following the negotiation, that the subject information be struck from the transcript, it will be done so, and all notes referring to that information will be deleted. I along will keep all notes and transcripts from the interviews on file during the research. At the appropriate time following the completion of the research, a time determined not to exceed two years following the interview, the notes and transcripts from the interviews will be returned to you--the participate--or destroyed.

7. Your participation is voluntary. Your decision whether to participate will not negatively affect you, and you are free to withdraw from participation at any time without penalty or prejudice.

8. Any questions about this study should be addressed to David C. Bowling, Nation al Transportation Safety Board, (303) 583-0593, or Dr. Paul Culhane, Division of Public Administration, Northern Illinois University, (815) 753-0311 or (847) 392-1233. You may also contact the Office of Research Compliance at NIU at (815) 753-8588 if you desire more information regarding your rights as a research participant.

I agree to participate in this research study and acknowledge that I have received a copy of this consent form.

______________________________ ______________________________

Signature of Subject Date

* *

The informed consent requirement in this policy is not intended to preempt any applicable federal, state, or local laws that require additional information to be disclosed in order for informed consent to be legally effective.

Nothing in this policy is intended to limit the authority of a physician to provide emergency medical care, to the extent the physician is permitted to do so under applicable federal, state, or local law.

(Approved bythe Office of Management and Budget under Control Number 999-0020.)

APPENDIX D

SAMPLE RESEARCH QUESTIONS

Sample of Focused Interpretive Format Questions used in some of the Interviews

Interview Questions for Former Regional Air Safety Investigators (ASI)

(Because of limited space, please provide answers on separate pages of paper)

1. Describe your background. You can start with your college major and/or work experience. As you work through your thoughts, relate how your education, work, and life experiences brought you to the NTSB.

2. Describe the investigative process you went through as an ASI. Start with initial notification. Take me through the preparation, work at the accident site, your post-accident actions and follow ups, through to submission of a final report. Describe and relate corresponding activities as public hearings and final meetings (NTSB Board Meetings for example), if they apply.

3. What are some of the problems you typically encountered during the course of an accident investigation?

4. Tell me about a successful investigation that you were in charge of. What made it successful? Why does this investigation stick out in your mind?

5. Tell me about a difficult or bad investigation you were a part of. What things made it a difficult or bad investigation? Why does this investigation stick out in your mind?

6. Tell me about how you interacted with the members of your investigative team, especially the Federal Aviation Administration, and the party members (manufacturers, operators, etc.). How well did they cooperate? Tell me about how the party process works, how well it works or if it doesn't work. If it doesn't, why do you think that is?

7. Tell me about the training you received during your time at the Safety Board. Do you feel the training you received helped to make you a better investigator? What training would you like to have had and why?

8. In general, tell me how you felt about being a part of the NTSB. Did you like being an ASI and a part of the agency? What made you decide to leave the agency? How long were you with the agency?

9. What is your job/vocation today? If you feel it necessary to my understanding, describe you're present duties.

I want to thank you again for being a willing participant in this study and relating your experiences.

APPENDIX E

PART 831 ACCIDENT/INCIDENT INVESTIGATION PROCEDURES

Title 49: Transportation
PART 831—ACCIDENT/INCIDENT INVESTIGATION PROCEDURES

Section Contents

§ 831.1 Applicability of part.

Unless otherwise specifically ordered by the National Transportation Safety Board (Board), the provisions of this part shall govern all accident or incident investigations, conducted under the authority of title VII of the Federal Aviation Act of 1958, as amended, and the Independent Safety Board Act of 1974. Rules applicable to accident hearings and reports are set forth in part 845.

§ 831.2 Responsibility of Board.

(a) *Aviation.*

(1) The Board is responsible for the organization, conduct, and control of all accident and incident investigations (see §830.2 of this chapter) within the Untied States, its territories and possessions, where the accident or incident involves any civil aircraft or certain public aircraft (as specified in §830.5 of this chapter), including an investigation involving civil or public aircraft (as specified in §830.5) on the one hand, and an Armed Forces or intelligence agency aircraft on the other hand. It is also responsible for investigating accidents/incidents that occur outside the United States, and which involve civil aircraft and/or certain public aircraft, when the accident/incident is not in the territory of another country (*i.e.,* in international waters).

(2) Certain aviation investigations may be conducted by the Federal Aviation Administration (FAA), pursuant to a "Request to the Secretary of the Department of Transportation to Investigate Certain Aircraft Accidents," effective February 10, 1977 (the text of the request is contained in the appendix to part 800 of this chapter), but the Board determines the probable cause of such accidents or incidents. [1] Under no circumstances are aviation investigations where the portion of the investigation is so delegated to the FAA by the Board considered to be joint investigations in the sense of sharing responsibility. These investigations remain NTSB investigations.

[1] The authority of a representative of the FAA during such investigations is the same as that of a Board investigator under this part.
(3) The Board is the agency charged with fulfilling the obligations of the United States under Annex 13 to the Chicago Convention on International Civil Aviation (Eighth Edition, July 1994), and does so consistent with State Department requirements and in coordination with that department. Annex 13 contains specific requirements for the notification, investigation, and reporting of certain incidents and accidents involving international civil aviation. In the case of an accident or incident in a foreign state involving civil aircraft of U.S. registry or manufacture, where the foreign state is a signatory to Annex 13 to the Chicago Convention of the International Civil Aviation Organization, the state of occurrence is responsible for the investigation. If the accident or incident occurs in a foreign state not bound by the provisions of Annex 13 to the Chicago Convention, or if the accident or incident involves a public aircraft (Annex 13 applies only to civil aircraft), the conduct of the investigation shall be in consonance with any agreement entered into between the United States and the foreign state.

(b) *Surface*. The Board is responsible for the investigation of: railroad accidents in which there is a fatality, substantial property damage, or which involve a passenger train (see part 840 of this chapter); major marine casualties and marine accidents involving a public and non-public vessel or involving Coast Guard functions (see part 850 of this chapter [2]); highway accidents, including railroad grade-crossing accidents, the investigation of which is selected in cooperation with the States; and pipeline accidents in which there is a fatality, significant injury to the environment, or substantial property damage.

[2] Part 850 also governs the conduct of certain investigations in which the Board and the Coast Guard participate jointly.

(c) *Other accidents/incidents*. The Board is also responsible for the investigation of an accident/incident that occurs in connection with the transportation of people or property which, in the judgment of the Board, is catastrophic, involves problems of a recurring character, or would otherwise carry out the policy of the Independent Safety Board Act of 1974. This authority includes, but is not limited to, marine and boating accidents and incidents not covered by part 850 of this chapter, and accidents/incidents selected by the Board involving transportation and/or release of hazardous materials.

§ 831.3 Authority of Directors.

The Directors, Office of Aviation Safety, Office of Railroad Safety, Office of Highway Safety, Office of Marine Safety, and Office of Pipeline and Hazardous Materials Safety, subject to the provisions of §831.2 and part 800 of this chapter, may order an investigation into any accident or incident.

§ 831.4 Nature of investigation.

Accident and incident investigations are conducted by the Board to determine the facts, conditions, and circumstances relating to an accident or incident and the probable cause(s) thereof. These results are then used to ascertain measures that would best tend to prevent similar accidents or incidents in the future. The investigation includes the field investigation (on-scene at the accident, testing, teardown, etc.), report preparation, and, where ordered, a public hearing. The investigation results in Board conclusions issued in the form of a report or "brief" of the incident or accident. Accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties. They are not subject to the provisions of the

Administrative Procedure Act (5 U.S.C. 504 *et seq.*), and are not conducted for the purpose of determining the rights or liabilities of any person.

§ 831.5 Priority of Board investigations.

Any investigation of an accident or incident conducted by the Safety Board directly or pursuant to the appendix to part 800 of this chapter (except major marine investigations conducted under 49 U.S.C. 1131(a)(1)(E)) has priority over all other investigations of such accident or incident conducted by other Federal agencies. The Safety Board shall provide for the appropriate participation by other Federal agencies in any such investigation, except that such agencies may not participate in the Safety Board's determination of the probable cause of the accident or incident. Nothing in this section impairs the authority of other Federal agencies to conduct investigations of an accident or incident under applicable provisions of law or to obtain information directly from parties involved in, and witnesses to, the transportation accident or incident, provided they do so without interfering with the Safety Board's investigation. The Safety Board and other Federal agencies shall assure that appropriate information obtained or developed in the course of their investigations is exchanged in a timely manner.

§ 831.6 Request to withhold information.

(a) *Trade Secrets Act (18 U.S.C. 1905), Exemption 4 of the Freedom of Information Act (5 U.S.C. 552) (FOIA), and The Independent Safety Board Act of 1974, as amended.*

(1) *General.* The Trade Secrets Act provides criminal penalties for unauthorized government disclosure of trade secrets and other specified confidential commercial information. The Freedom of Information Act authorizes withholding of such information; however, the Independent Safety Board Act, at 49 U.S.C. 1114(b), provides that the Board may, under certain circumstances, disclose information related to trade secrets.

(2) *Procedures.* Information submitted to the Board that the submitter believes qualifies as a trade secret or confidential commercial information subject either to the Trade Secrets Act or FOIA Exemption 4 shall be so identified by the submitter on each and every page of such document. The Board shall give the submitter of any information so identified, or information the Board has substantial reason to believe qualifies as a trade secret or confidential commercial information subject either to the Trade Secrets Act or FOIA Exemption 4, the opportunity to comment on any contemplated disclosure, pursuant to 49 U.S.C. 1114(b). In all instances where the Board determines to disclose pursuant to 49 U.S.C. 1114(b) and/or 5 U.S.C. 552, at least 10 days' notice will be provided the submitter. Notice may not be provided the submitter when disclosure is required by a law other than FOIA if the information is not identified by the submitter as qualifying for withholding, as is required by this paragraph, unless the Board has substantial reason to believe that disclosure would result in competitive harm.

(3) *Voluntarily-provided safety information.* It is the policy of the Safety Board that commercial, safety-related information provided to it voluntarily and not in the context of particular accident/incident investigations will not be disclosed. Reference to such information for the purposes of safety recommendations will be undertaken with consideration for the confidential nature of the underlying database(s).

(b) *Other.* Any person may make written objection to the public disclosure of any other information contained in any report or document filed, or otherwise obtained by the Board, stating the grounds for such objection. The Board, on its own initiative or if such objection is made, may order such information withheld from public disclosure when, in its judgment, the information may be withheld under the provisions of an exemption to the Freedom of Information Act (5 U.S.C. 552, see part 801 of this chapter), and its release is found not to be in the public interest.

§ 831.7 Right to representation.

Any person interviewed by an authorized representative of the Board during the investigation, regardless of the form of the interview (sworn, unsworn, transcribed, not transcribed, etc.), has the right to be accompanied, represented, or advised by an attorney or non-attorney representative.

§ 831.8 Investigator-in-charge.

The designated investigator-in-charge (IIC) organizes, conducts, controls, and manages the field phase of the investigation, regardless of whether a Board Member is also on-scene at the accident or incident site. (The role of the Board member at the scene of an accident investigation is as the official spokesperson for the Safety Board.) The IIC has the responsibility and authority to supervise and coordinate all resources and activities of all personnel, both Board and non-Board, involved in the on-site investigation. The IIC continues to have considerable organizational and management responsibilities throughout later phases of the investigation, up to and including Board consideration and adoption of a report or brief of probable cause(s).

§ 831.9 Authority of Board representatives.

(a) *General.* Any employee of the Board, upon presenting appropriate credentials, is authorized to enter any property where an accident/incident subject to the Board's jurisdiction has occurred, or wreckage from any such accident/incident is located, and do all things considered necessary for proper investigation. Further, upon demand of an authorized representative of the Board and presentation of credentials, any Government agency, or person having possession or control of any transportation vehicle or component thereof, any facility, equipment, process or controls relevant to the investigation, or any pertinent records or memoranda, including all files, hospital records, and correspondence then or thereafter existing, and kept or required to be kept, shall forthwith permit inspection, photographing, or copying thereof by such authorized representative for the purpose of investigating an accident or incident, or preparing a study, or related to any special investigation pertaining to safety or the prevention of accidents. The Safety Board may issue a subpoena, enforceable in Federal district court, to obtain testimony or other evidence. Authorized representatives of the Board may question any person having knowledge relevant to an accident/incident, study, or special investigation. Authorized representatives of the Board also have exclusive authority, on behalf of the Board, to decide the way in which any testing will be conducted, including decisions on the person that will conduct the test, the type of test that will be conducted, and any individual who will witness the test.

(b) *Aviation.* Any employee of the Board, upon presenting appropriate credentials, is authorized to examine and test to the extent necessary any civil or public aircraft (as specified in §830.5), aircraft engine, propeller, appliance, or property aboard such aircraft involved in an accident in air commerce.

(c) *Surface.* (1) Any employee of the Board, upon presenting appropriate credentials, is authorized to test or examine any vehicle, vessel, rolling stock, track, pipeline component, or any part of any such item when such examination or testing is determined to be required for purposes of such investigation.

(2) Any examination or testing shall be conducted in such a manner so as not to interfere with or obstruct unnecessarily the transportation services provided by the owner or operator of such vehicle, vessel, rolling stock, track, or pipeline component, and shall be conducted in such a manner so as to preserve, to the maximum extent feasible, any evidence relating to the transportation accident, consistent with the needs of the investigation and with the cooperation of such owner or operator.

§ 831.10 Autopsies.

The Board is authorized to obtain, with or without reimbursement, a copy of the report of autopsy performed by State or local officials on any person who dies as a result of having been involved in a transportation accident within the jurisdiction of the Board. The investigator-in-charge, on behalf of the Board, may order an autopsy or seek other tests of such persons as may be necessary to the investigation, provided that to the extent consistent with the needs of the accident investigation, provisions of local law protecting religious beliefs with respect to autopsies shall be observed.

§ 831.11 Parties to the investigation.

(a) *All Investigations, regardless of mode.* (1) The investigator-in-charge designates parties to participate in the investigation. Parties shall be limited to those persons, government agencies, companies, and associations whose employees, functions, activities, or products were involved in the accident or incident and who can provide suitable qualified technical personnel actively to assist in the investigation. Other than the FAA in aviation cases, no other entity is afforded the right to participate in Board investigations.

(2) Participants in the investigation (*i.e.*, party representatives, party coordinators, and/or the larger party organization) shall be responsive to the direction of Board representatives and may lose party status if they do not comply with their assigned duties and activity proscriptions or instructions, or if they conduct themselves in a manner prejudicial to the investigation.

(3) No party to the investigation shall be represented in any aspect of the NTSB investigation by any person who also represents claimants or insurers. No party representative may occupy a legal position (see §845.13 of this chapter). Failure to comply with these provisions may result in sanctions, including loss of status as a party.

(4) Title 49, United States Code §1132 provides for the appropriate participation of the FAA in Board investigations, and §1131(a)(2) provides for such participation by other departments, agencies, or instrumentalities. The FAA and those other entities that meet the requirements of paragraph (a)(1) of this section will be parties to the investigation with the same rights and privileges and subject to the same limitations as other parties, provided however that representatives of the FAA need not sign the "Statement of Party Representatives to NTSB Investigation" (see paragraph (b) of this section).
(b) *Aviation investigations.* In addition to compliance with the provisions of paragraph (a) of this section, and to assist in ensuring complete understanding of the requirements and limitations of party status, all party representatives in aviation investigations shall sign "Statement of Party Representatives to NTSB Investigation" immediately upon attaining party

representative status. Failure timely to sign that statement may result in sanctions, including loss of status as a party.

§ 831.12 Access to and release of wreckage, records, mail, and cargo.

(a) Only the Board's accident investigation personnel, and persons authorized by the investigator-in-charge to participate in any particular investigation, examination or testing shall be permitted access to wreckage, records, mail, or cargo in the Board's custody.

(b) Wreckage, records, mail, and cargo in the Board's custody shall be released by an authorized representative of the Board when it is determined that the Board has no further need of such wreckage, mail, cargo, or records. When such material is released, Form 6120.15, "*Release of Wreckage,*" will be completed, acknowledging receipt.

§ 831.13 Flow and dissemination of accident or incident information.

(a) Release of information during the field investigation, particularly at the accident scene, shall be limited to factual developments, and shall be made only through the Board Member present at the accident scene, the representative of the Board's Office of Public Affairs, or the investigator-in-charge.

(b) All information concerning the accident or incident obtained by any person or organization participating in the investigation shall be passed to the IIC through appropriate channels before being provided to any individual outside the investigation. Parties to the investigation may relay to their respective organizations information necessary for purposes of prevention or remedial action. However, no information concerning the accident or incident may be released to any person not a party representative to the investigation (including non-party representative employees of the party organization) before initial release by the Safety Board without prior consultation and approval of the IIC.

§ 831.14 Proposed findings.

(a) *General.* Any person, government agency, company, or association whose employees, functions, activities, or products were involved in an accident or incident under investigation may submit to the Board written proposed findings to be drawn from the evidence produced during the course of the investigation, a proposed probable cause, and/or proposed safety recommendations designed to prevent future accidents.

(b) *Timing of submissions.* To be considered, these submissions must be received before the matter is calendared for consideration at a Board meeting. All written submissions are expected to have been presented to staff in advance of the formal scheduling of the meeting. This procedure ensures orderly and thorough consideration of all views.

(c) *Exception.* This limitation does not apply to safety enforcement cases handled by the Board pursuant to part 821 of this chapter. Separate *ex parte* rules, at part 821, subpart J, apply to those proceedings.

Authority: Independent Safety Board Act of 1974, as amended (49 U.S.C. 1101 *et seq.*); Federal Aviation Act of 1958, as amended (49 U.S.C. 40101 *et seq.*).

Source: 53 FR 15847, May 4, 1988, unless otherwise noted.