

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO
Judge Kathryn H. Vratil

Civil Action No. 07-cv-02181-KHV-BNB

EXCEL-JET, LTD., a Colorado corporation,

Plaintiff,

v.

THE UNITED STATES OF AMERICA,

Defendant.

Consolidated with:

Civil Action No. 08-cv-01218-KHV-BNB

U.S. SPECIALTY INSURANCE COMPANY, a Texas Corporation,

Plaintiff,

v.

THE UNITED STATES OF AMERICA,

Defendant.

MEMORANDUM AND ORDER

I. INTRODUCTION

THIS MATTER came before the Court for a bench trial from May 3 through 14, 2010. This Court has jurisdiction under the Federal Tort Claims Act, 28 U.S.C. § 1346(b), 28 U.S.C. § 2671 *et seq.* After carefully considering the evidence, the pleadings, the arguments of counsel and the relevant legal authorities, the Court makes

the following findings of fact and conclusions of law pursuant to Fed. R. Civ. P. 52(a).¹

II. BACKGROUND

This action arises out of the crash of an experimental prototype jet aircraft — the Sport-Jet — that occurred June 22, 2006, at the Colorado Springs Municipal Airport in Colorado Springs, Colorado. This case was originally filed as two separate actions. Plaintiff Excel-Jet, Ltd., which developed the aircraft, and its subrogee, U.S. Specialty Insurance Company, brought separate suits under the Federal Tort Claims Act (“FTCA”). On September 10, 2008, Chief Judge Wiley Y. Daniel consolidated the cases. (Docket #37.) On October 16, 2008, Chief Judge Daniel granted the parties’ joint motion to bifurcate. (Docket #44.) Accordingly, the Court conducted this bench trial solely on the issue of liability.

Plaintiffs allege that air traffic controllers at the Colorado Springs Municipal Airport negligently failed to provide adequate separation distance between the Sport-Jet and a larger aircraft, a De Havilland DHC-8-200 (the “Dash 8”) which took off just before the Sport-Jet. Plaintiffs further allege that air traffic controllers violated Federal Aviation Administration Air Traffic Control (“ATC”) procedures relating to wake turbulence and flight separation. Plaintiffs allege that defendant’s negligence exposed the Sport-Jet to wake turbulence from the Dash 8 and caused the Sport-Jet to crash, resulting in property losses and economic damages.

The government denies negligence and alleges that the crash resulted from

¹ To the extent that any of the findings of fact might constitute conclusions of law, they are adopted as such. Conversely, to the extent that any conclusions of law constitute findings of fact, they are adopted as such.

aerodynamic stall caused by pilot error. It alleges that ATC procedures did not require a three-minute separation interval between the takeoff of the Dash 8 and the takeoff of the Sport-Jet, and that any wake turbulence of the Dash 8 had completely dissipated before the Sport-Jet turned onto the runway for takeoff.

III. FINDINGS OF FACT²

On June 22, 2006, at approximately, 9:53 a.m.³, an experimental prototype jet aircraft — the Sport-Jet — crashed just seconds after takeoff from the Colorado Springs Municipal Airport. Almost immediately after it lifted from the runway, the aircraft rolled to the left, contacted the ground with its left wing, cartwheeled down the runway and came to rest in a grassy area to the left of the runway. The two occupants escaped with minor injuries, but the Sport-Jet suffered substantial damage.

The Sport-Jet was a small, single jet-engine aircraft weighing approximately 3,000 to 3,500 pounds. It had an experimental research and development certificate from the FAA, which placed restrictions on the aircraft. Among other things, Excel-Jet was required to affix placards warning that the aircraft was “EXPERIMENTAL,” and to “advise each person carried of the experimental nature of the aircraft.” 14 C.F.R. § 91.319. The Sport-Jet was restricted to day-VFR (visual flight rules) flights and could

² This memorandum and order assumes complete familiarity with the record of proceedings and all evidence in the case. The law which governs this case is well settled and the Court’s decision is essentially a fact-based one under Colorado negligence law. Due to the highly technical nature of the evidence, the Court will let the record speak for itself and discuss the evidence only to the extent necessary to frame the basis for its legal conclusions.

³ All references to time are in Mountain Daylight Time.

only fly within 25 miles of its home base in Colorado Springs.

Robert Bornhofen designed and manufactured the Sport-Jet. In 1997 and 1998, prior to his work on the Sport-Jet, Bornhofen designed and manufactured an aircraft called the Maverick. The Maverick test program included more than 250 flight hours. Bornhofen began manufacturing the Sport-Jet in 2006. The design of the Sport-Jet was substantially similar to that of the Maverick and Bornhofen characterized the test program of the Sport-Jet as conservative. As of the date of the accident, however, the Sport-Jet had not undergone stall testing

Ronald McElroy, vice-president of Sport-Jet Flight Operations and test pilot for the Sport-Jet, got involved with the Sport-Jet project in 2005. McElroy piloted the Sport-Jet and designed the flight test program. In his opinion, compared to similar aircraft in the industry, the Sport-Jet performed favorably.

In test flights before the crash, the Sport-Jet experienced a left-wing roll problem or drop. On June 20 and 21, 2006 (one and two days before the accident), Excel-Jet performed mechanical work on the ailerons, the devices that made the plane roll to the right or left. The intent of the adjustment was to make the ailerons more responsive with respect to the roll axis of the aircraft, *i.e.* to make the Sport-Jet roll a little faster as the pilot turned the wheel. The purpose of the flight on June 22, 2006, was to continue flight testing of the Sport-Jet. At that time, Colonel James Stewart, the pilot in command, had flown the Sport-Jet 11 or 12 times for 12.2 hours of actual flight time.

On the morning of June 22, three FAA air traffic controllers were working the tower at the Colorado Springs airport: (1) Matthew North, who was operating the

Clearance Delivery/Flight Data position; (2) Donald Wegener, who was operating the Ground Control position; and (3) Jeanne Gardner, who was operating Local Control West position. Mark Lewis was Gardner's supervisor or front line manager. Lewis has more than 33 years of experience as an air traffic controller, and he was located in the TRACON, *i.e.* the radar room at the bottom of the tower.

At 9:46:20 a.m., before he taxied the Sport-Jet for takeoff, Stewart contacted Clearance Delivery on the aircraft radio to obtain a departure clearance to fly VFR just east of Schreiver Air Force Base and climb to 17,000 feet. North instructed Stewart to fly "runway heading" and maintain visual flight rules at or below 9,000 feet. At that point, Stewart switched radio frequencies to talk with Wegener, the ground controller who was responsible for aircraft and vehicular traffic in movement areas except active runways, and for providing pilot instructions on the taxi route to the active runway.

At 9:47:18 a.m., Stewart informed Wegener that the Sport-Jet was located near the Colorado Aviation facility — an area to the west of runway 17R — and that he was ready to taxi to a runway for takeoff. Wegener told Stewart to taxi to runway 17R, which is one of two north-south runways at the airport.⁴ After completing this communication, Stewart began to taxi to runway 17R using taxiway Alpha. At 9:51:03 a.m., while he was toward the end of runway 17R on taxiway Alpha, Stewart switched to local control frequency (also known as "tower frequency"), where Gardner was responsible for providing takeoff and landing clearances. At that time, Stewart stated that the Sport-Jet

⁴ 17R (or 17 Right) means that the takeoff end of the runway is aligned with a compass heading of approximately 170 degrees (180 = south). An aircraft taking off on runway 17R would be heading in a southerly direction.

was “ready to go at one seven,” *i.e.* runway 17R. At 9:51:11 a.m., Gardner replied, “hold short of runway one seven right.” Stewart acknowledged the transmission and held short of runway 17R.

Meanwhile, at 9:48:30 a.m., while the Sport-Jet was taxiing toward runway 17R, Gardner cleared the Dash 8 — a propeller-driven 38-passenger commuter aircraft — for takeoff on runway 17R. Gardner instructed the Dash 8 to “turn left on runway 12, runway 17 right cleared for takeoff.” This communication authorized the Dash 8 to turn left from taxiway Charlie onto runway 12 and then turn left from runway 12 onto runway 17R for takeoff. This instruction gave the Dash 8 latitude to taxi onto runway 17R at either the threshold markings (at the northernmost end of the runway) or the runway designation markings.

At 9:50:09 a.m., the Dash 8 asked Gardner to confirm its clearance for takeoff. The Dash 8 received that confirmation, pulled onto runway 17R, came to a complete stop and then took off without incident. After takeoff, the Dash 8 proceeded to climb in a southerly direction. Gardner instructed it to contact radar for further air traffic services. The handoff occurred at 9:51:19 a.m. when Gardner stated, “air shuttle seventy fifty two, contact departure, good day.”

At 9:51:45 a.m., 26 seconds later, Gardner advised the Sport-Jet “caution wake turbulence for the de previous uh dash 8 departure wind 090 at 6 runway 17 right cleared for takeoff.” Stewart acknowledged the clearance for takeoff and pulled onto runway 17R from the hold short line on taxiway Alpha. At that point, Stewart turned onto runway 17R, put the Sport-Jet nose on the centerline, increased its power and took

off. After takeoff, Stewart experienced an “instantaneous” upset that he could not correct. Just after the accident (in which he sustained a head injury), Stewart denied receiving a wake turbulence warning from the tower. At trial, he admitted that he received — but did not process — a wake turbulence caution. Also, although the Dash 8 was in plain sight and nothing obstructed his vision, Stewart testified that he never saw that plane.

Wake Turbulence Standards

All aircraft generate wake turbulence while in flight. This turbulence is caused by a pair of counter-rotating vortices which trail from the wing tips of the aircraft. The intensity of the vortices is directly proportional to the weight of the aircraft and inversely proportional to the wing span and speed of the aircraft. An aircraft will create vortices with maximum strength during the takeoff, climb and landing phases of flight.

Vortices trail behind each wing and as an aircraft takes off, they sink backward, interact with the ground, drift with prevailing winds and dissipate. The time of dissipation varies with atmospheric conditions. Vortices from larger aircraft pose problems to encountering aircraft, and can impose rolling forces which upset smaller aircraft at short range.⁵ To avoid such risk, the FAA has issued separation standards which are found in FAA Order 7110.65. Paragraphs 3-9-6 and 3-9-7 of FAA Order 7110.65 provide wake turbulence separation standards for small aircraft taking off behind large aircraft. For wake turbulence separation purposes, the FAA classifies

⁵ To avoid a wake vortex when departing behind a larger aircraft, the FAA recommends that a pilot note the larger aircraft’s rotation point and rotate prior to that rotation point.

aircraft into three categories: Small, Large and Heavy. Small aircraft are those with gross takeoff weights up to 41,000 pounds. Large aircraft have gross takeoff weights between 41,001 and 255,000 pounds. Heavy aircraft have gross takeoff weights in excess of 255,000 pounds. The FAA classified the Dash 8 as a “large” aircraft and the Sport-Jet as a “small” aircraft. Dash 8 airplanes actually come in four models, however, the 100, 200, 300 and 400. The 100 and 200 models each weigh about 36,000 pounds, and the 300 and 400 models weigh more than 41,000 pounds. To keep things simple for air traffic controllers, the FAA placed all four Dash 8 models in the category of “large” aircraft. Based on weight, however, the Dash 8 in this case was a “small” aircraft. This point is important because, as noted above, the strength of wake vortices are directly proportional to the weight of the aircraft. The Dash 8 in this case is therefore properly viewed as a “small” aircraft for purposes of its ability to generate wake vortices. With one exception not relevant here, the FAA has no separation standards for small aircraft departing behind other small aircraft because their wake vortices decay so rapidly.

Air Traffic Control

The primary purpose of the Air Traffic Control system is to prevent collisions between aircraft and to organize and expedite the flow of traffic. To this end, the FAA adopted FAA Order 7110.65, which governs same runway separation. Paragraph 3-9-6 of that order instructs local controllers to separate departing class III aircraft from preceding aircraft using the same departure runway by ensuring that the second aircraft does not begin its takeoff roll until (a) the first aircraft has departed and crossed the runway end or turned to avert any conflict, or (b) the first aircraft is airborne and is at

least 6,000 feet from the second aircraft. For purposes of this regulation, the Sport-Jet was a class III aircraft. Under paragraph 3-9-6, a controller could use suitable landmarks to determine whether the separation distance was 6,000 feet.

In this case, the 6,000-foot separation requirement was met and exceeded. Runway 17R measures 11,022 feet in length. The Dash 8, also a category III aircraft, took off when it was 3,815 feet down runway 17R. Gardner did not issue a takeoff clearance to the Sport-Jet until the Dash 8 was more than 6,000 feet down the runway.⁶

In addition to the general rules on same runway separation, paragraph 3-9-7 of FAA Order 7110.65 imposes specific requirements concerning intersection departures such as that involved in this case. Paragraph 3-9-7 directs controllers to order wake turbulence separations, as follows:

1. Separate a small aircraft taking off from an intersection in the same runway (same or opposing direction takeoff) behind a preceding departing large aircraft by ensuring that the small aircraft does not start takeoff roll until at least 3 minutes after the large aircraft has taken off.

* * *

4. Inform an aircraft when it is necessary to hold in order to provide the required 3-minute interval.

PHRASEOLOGY -
HOLD FOR WAKE TURBULENCE

The “three-minute rule” is not required, however, when “the intersection is 500 feet or less from the departure point of the preceding aircraft and both aircraft are taking off in the same direction.” Paragraph 3-9-7.b.2. When the three-minute interval is not

⁶ Radar data demonstrated that when the Sport-Jet was cleared for takeoff, the Dash 8 had traveled more than 4,400 feet past the south end of runway 17R.

required, paragraph 3-9-7 instructs as follows:

1. Issue a wake turbulence advisory before clearing the aircraft for takeoff.
2. Do not clear the intersection departure for an immediate takeoff.
3. Issue a clearance to permit the trailing aircraft to deviate from course enough to avoid the flight path of the preceding large departure when applying subparagraph b1 or b2.
4. Separation requirements in accordance with para.3-9-6, Same Runway Separation, must also apply.

Paragraph 3-9-7.c.

According to the airport diagram (Ex. 40), the distance from the north end of runway 17R to its intersection with taxiway Alpha is 600 feet — from which the Sport-Jet departed — and Gardner knew this, and also knew that the threshold markings at the north end of runway 17R are 150 feet long. She therefore understood that the intersection of runway 17R and taxiway Alpha was less than 500 feet (and in fact was about 450 feet) from the departure point of the Dash 8.⁷ When Gardner cleared the Sport-Jet to take off 26 seconds after the Dash 8, she applied the exception to the three-minute rule set forth in paragraph 3-9-7.b.2. She considered the departure point

⁷ Plaintiffs' expert, Richard Burgess, did not disagree that in fact, the intersection from which the Sport-Jet departed was 500 feet or less from the departure point of the Dash 8. Also, he did not claim that Gardner erred in concluding that the two points were 450 feet apart. In his opinion, Gardner should not have relied on her own knowledge of the distances in question because the Colorado Springs Airport manager provided a diagram which stated that the distance was 600 feet. The FAA does not require air traffic controllers to rely on such diagrams, however, to the exclusion of information based on actual measurements, suitable landmarks, etc.

of the Dash 8 to be the point where it began its departure roll,⁸ 450 feet from the intersection from which the Sport-Jet took off. She also knew that both aircraft were taking off in the same direction, and therefore believed that ATC rules did not require a three-minute separation.

As to paragraph 3-9-7.c., Gardner issued the Sport-Jet a wake turbulence advisory before clearing it for takeoff, and she did not clear it for immediate takeoff from the intersection of runway 17R and taxiway Alpha. She did not issue a clearance for the Sport-Jet to deviate from course to avoid the flight path of the Dash 8 because Stewart did not request a deviation, and she expected the pilot to indicate whether he needed clearance to deviate from course.⁹

Seconds after liftoff, about 2,763 feet down the runway, the Sport-Jet rolled sharply to the left, touched the ground, cartwheeled and came to rest in a grassy area on the left side of the runway.

Accident Reconstruction

Bornhofen opined that the Sport-Jet could not stall and did not stall on the day of

⁸ The FAA does not officially define “departure point,” and air traffic controllers have different understandings of that term. Lewis, for example, generally uses a different definition of “departure point” than Gardner. In this case, however, since the Dash 8 came to a complete stop on runway 17R, he would have calculated the departure point of the Dash 8 as she did.

David Canoles, an expert in air traffic control with 40 years of experience at the FAA, agreed with Gardner that the definition of “departure point” is commonly understood as the point on the runway where the aircraft commences its takeoff roll.

⁹ The FAA does not require a controller to issue a clearance to deviate prior to takeoff.

the crash. Since he eliminated aerodynamic stall as the cause of the crash, he assumed that the Sport-Jet had experienced a wake turbulence encounter which caused the accident. McElroy agreed that the Sport-Jet was not in aerodynamic stall and also ruled out pilot error as a contributing cause of the accident. He therefore concluded that the accident resulted from wake turbulence from the Dash 8.¹⁰ Stewart also testified that the Sport-Jet was not in aerodynamic stall and that pilot error was not a contributing cause of the accident. He stated that as a test-pilot, he would have recognized the signs of an impending stall and he did not sense them on the day of the crash or do anything to cause the Sport-Jet to stall. Stewart opined that the cause of the accident was wake turbulence from the Dash 8. He based his opinion on his experience test-piloting the Sport-Jet, his years of flight experience and the fact that he eliminated other potential causes of the accident — pilot error, mechanical failure and aerodynamic stall.

The government offered Captain Robert Gibson as an expert in the areas of aerospace engineering, piloting, test piloting, and air traffic control procedures from a pilot's perspective.¹¹ Gibson opined that the Sport-Jet was being flown at too slow a

¹⁰ McElroy was not present and has no personal knowledge regarding the accident. He admittedly is not an expert in accident reconstruction, aircraft design, aeronautics or wake turbulence, and has not conducted any studies or analyses on wake decay or longevity. McElroy's wake turbulence opinion is based on his experience in developing and test-piloting the Sport-Jet. McElroy has never written any publications on wake turbulence or performed any calculations on the wake turbulence created by the Dash 8.

¹¹ Gibson is an aerospace engineer and Navy Test Pilot School graduate. Gibson is also a former Navy (Top Gun) fighter pilot, Navy test pilot, NASA astronaut and airline pilot. He has over 41 years of experience flying jet aircraft and has encountered wake

speed — 65 knots — to generate sufficient lift at the time of the accident. Since the Sport-Jet had not been stall tested and a stall speed had not been identified, Gibson based this opinion, in part, on calculations of the aerodynamics of the Sport-Jet, of the Sport-Jet wing and how much lift coefficient the Sport-Jet would have been capable of generating in its takeoff configuration. Gibson criticized the Sport-Jet test program because it lacked stall testing and wind tunnel testing, which prevented its pilots from knowing the actual Sport-Jet stall speeds. Gibson also testified that the Sport-Jet had no angle of attack instrumentation or stall warning devices. Gibson therefore concluded that it was impossible to rule out a stall as the cause of the accident.

Gibson further testified that from his perspective as a pilot, Stewart did not employ the appropriate standard of care in flight-testing an experimental prototype aircraft with limited flight time. After receiving the warning for “caution, wake turbulence,” Stewart should have been aware of the Dash 8 and should have delayed his takeoff if he had any concern about wake turbulence. Gibson opined that based on his extensive experience with wake vortex encounters, the characteristics of the Sport-Jet and the conditions that were present on June 22, he would not expect the wake from a Dash 8 to last more than two minutes. He therefore opined that the Sport-Jet did not encounter wake turbulence from the Dash 8 and that Gardner was not negligent and did not play a role in causing the accident.

The government offered Dr. Kenneth Orloff, a pilot, as an expert in the area of

vortices thousands of times.

aircraft accident reconstruction.¹² In Orloff's opinion, plaintiffs' wake turbulence theory was contrary to scientific knowledge. Orloff's analysis of the recorded radar data revealed that when the Dash 8 was in position on runway 17R just prior to beginning its takeoff, it was no more than 351 feet (plus or minus 32 feet to account for the radar limitations) from the intersection where the Sport-Jet took off.¹³ Orloff also opined that Stewart could have seen the Dash 8 on runway 17R.¹⁴ Orloff testified, from altitude information in the radar data, that the Dash 8 wheels left the ground at 3,815 feet down the runway. Orloff agreed with plaintiffs' expert that 126 seconds elapsed from the moment the Dash 8 shed its wake vortex to the time of its alleged encounter with the Sport-Jet. Based on these factors, Orloff concluded that for the vortex to travel back to the Sport-Jet, about 1,225 feet over 126 seconds, the average head wind would have had to exceed 9 knots.

Weather Conditions

The government offered Dr. Lee Ray Hoxit as an expert in forensic

¹² Orloff earned a master's degree in physics and a Ph.D. in mechanical engineering, with an emphasis on aeronautical engineering, from the University of California. He worked as a NASA research scientist for 13 years and he did a significant amount of research in various areas of low-speed aircraft and wake turbulence.

¹³ This opinion was consistent with Gardner's testimony as to where the Dash 8 began its departure takeoff run.

¹⁴ This opinion was based on Orloff's research, including the physical size of the Dash 8, his visits to the Colorado Springs airport, and his observations of the geographical layout of taxiway Alpha and runway 17R.

meteorology.¹⁵ Hoxit presented several opinions with respect to weather conditions at the time of the accident, based in part on data from five wind sensors at the Colorado Springs airport. Hoxit testified that at the time of the accident, thermal mixing was present because the earth surface was warming. He further testified that winds over the north central part of runway 17R were from the southeast and that headwinds and crosswinds relative to runway 17R were blowing between four and five knots. Given these wind speeds, Hoxit opined that the atmosphere had a moderate level of background or turbulent mixing, creating conditions such that wake vortices would not last longer than normal. Finally, Hoxit opined that as the Sport-Jet traveled down the runway and lifted off, the headwinds were decreasing.

Wake Turbulence

Plaintiffs' expert, Anton de Bruin, testified that the cause of the crash was most likely wake turbulence.¹⁶ The government's experts criticized his initial opinions. At trial, de Bruin admitted that his initial report contained mistakes and was unreliable, and that he had issued a supplemental report to correct those mistakes. This included recalculating the liftoff point of the Dash 8, the wake creation altitude, air density and the wake vortex. Based on his calculations, de Bruin concluded that the Sport-Jet was in the wrong position when it engaged in the intersection departure on June 22. According

¹⁵ Hoxit has a Ph.D. in Atmospheric Science from Colorado State University and has approximately 40 years of experience working in meteorology and atmospheric science.

¹⁶ De Bruin is a research scientist in Helicopter and Aeroacoustics at the National Aerospace Laboratory ("NLR") in Amsterdam, Netherlands. Since 1996, de Bruin has participated in various wake-related studies in Europe.

to de Bruin, this reduced the Sport-Jet's distance from the Dash 8, which affected the safety margin with respect to the wake of the Dash 8. De Bruin agreed with Hoxit's opinion that the atmosphere was unstable at the time of the accident and deferred to Hoxit's opinions because he is not a weather expert.

De Bruin agreed that at the time of the encounter with the Sport-Jet, the wake vortex of the Dash 8 was about 126 seconds old. He admitted that he could not say whether the wake more likely than not remained over the runway during the two-minute period. He conceded that he could not say with any degree of scientific certainty that the left vortex was straight or parallel to the ground at the time of the encounter, which would have caused the Sport-Jet to roll to the left. De Bruin further admitted that his rolling calculations should have been reduced by 15 percent, that he only used data from one wind sensor at the airport and that his calculations did not factor in a crosswind. De Bruin admitted that he is not an expert on radar or aircraft accident reconstruction. In addition, he has never personally measured a wake vortex outside a wind tunnel.

The government offered Dr. James Hallock as an expert on wake turbulence including the motion and decay of aircraft wake vortices, particularly in the airport environment.¹⁷ Hallock opined that no wake encounter occurred in this case. In part,

¹⁷ Hallock earned a bachelors of science, masters of science and Ph.D. in physics from the Massachusetts Institute of Technology (MIT). For almost 40 years, he worked for the United States Department of Transportation's Volpe Center in the area of aircraft wake vortices research. Hallock was the lead analyst for extensive wake vortex data collection studies at New York's Kennedy, Denver's old Stapleton, London's Heathrow, Toronto's Pierson, Chicago's O'Hare, and Frankfurt's and San Francisco's International Airports. Hallock conducted numerous field tests on wake vortex decay

he based this opinion on his conclusion that the Dash 8 vortex could not have lasted 126 seconds, and that nine knots of headwind would have been required to blow the vortex back to the location where the Sport-Jet began its roll. Hallock testified that such a headwind was not present and that any vortices created by the Dash 8 would have dissipated in 40 to 55 seconds due to decay and ground effect.

IV. CONCLUSIONS OF LAW

Summary of the Law

The Court has jurisdiction over the claims against the United States under the Federal Tort Claims Act, 28 U.S.C. §§ 1346(b) and 2671-80. Under the FTCA, the United States may be held liable for damages caused by the negligence or wrongful act or omission of an employee of the government acting within the scope of his employment under circumstances where the United States, if a private person, would be responsible to the claimant in accordance with the law of the place where the act or omission occurred. 28 U.S.C. § 1346(b). In actions under the FTCA, the Court must apply the whole law of the state where the negligent act or omission occurred. See *Richards v. United States*, 369 U.S. 1, 11(1962). The accident in this case occurred in Colorado, and the parties agree that the law of Colorado applies to the liability issues in this case.

To establish negligence under Colorado law, plaintiffs must show (1) legal duty;

where he has personally measured wake decay and movement. Hallock has studied over 350,000 takeoffs and landings and documented them in 111 publications. In 2008, Hallock retired from the U.S. Department of Transportation but continues to serve on international wake vortex working groups.

(2) breach of that duty; (3) proximate cause; and (4) damages. *Keller v. Koca*, 111 P.3d 445, 447 (Colo. 2005); *Redden v. SCI Colo. Funeral Servs., Inc.*, 38 P.3d 75, 80 (Colo. 2001); *Walcott v. Total Petroleum, Inc.*, 964 P.2d 609, 611 (Colo. App. 1998); *Miller v. United States*, 463 F.3d 1122 (10th Cir. 2006) (government employee liable to same extent as a private person). To determine whether the law imposes a duty on a defendant, relevant factors include (1) the risk involved; (2) the foreseeability of harm to others and likelihood of injury as weighed against the social utility of the actor's conduct; (3) the magnitude of the burden of guarding against the injury or harm; and (4) the consequences of placing the burden on the actor. See *Montoya v. Connolly's Towing, Inc.*, 216 P.3d 98, 104-05 (Colo. App. 2008). In this case, the FAA air traffic controllers owed Excel-Jet a duty of reasonable care. *Montoya*, 216 P.3d at 104.

Under Colorado law, the test for causation in a negligence action is the but for test. *Smith v. State Comp. Ins. Fund*, 749 P.2d 462, 464 (Colo. App. 1987). Plaintiffs must show by a preponderance of the evidence that the injury would not have occurred but for defendant's negligent conduct. *Kaiser Foundation Health Plan v. Sharp*, 741 P.2d 714, 719 (Colo. 1987). This test is satisfied only when a defendant's conduct "in a natural and continued sequence, unbroken by an efficient, intervening cause, produces the results complained of, and without which that result would not have occurred." *Smith*, 749 P.2d at 464. Also, plaintiffs must show that negligence was a substantial factor in producing the harm. *Id.*; see also Restatement (Second) of Torts §§ 431–33 (1965).

The Law Applied to the Facts of this Case

A. Duty

Air traffic controllers at the Colorado Springs airport clearly had a duty to use reasonable care to promote safety in air transportation on June 22, 2006. Specifically, they had a duty to maintain adequate takeoff separation between the Dash 8 and the Sport-Jet. Plaintiffs focus on the three-minute rule, FAA Order 7110.65, Paragraph 3-9-7, and whether Gardner properly applied the exception to the three-minute rule, FAA Order 7110.65, Paragraph 3-9-7. b.2. However, plaintiffs do not proceed on a theory of negligence *per se*. The Court therefore looks to the relevant FAA standards but is also mindful of the fact that functionally, the Dash 8 is a “small” aircraft to which no relevant FAA separation standards apply.

B. Breach

Gardner did not give a three-minute separation interval. Instead, based on her (mathematically correct) calculation that the intersection from which the Sport-Jet departed was less than 500 feet from the departure point of the Dash 8, she invoked the exception in Paragraph 3-9-7. b.2. The FAA has no official definition of “departure point,” and air traffic controllers have different understandings of the term. According to the airport manager’s diagram, the intersection was 600 feet from the end of runway 17R, and the Dash 8 took off 450 feet from that intersection.

Gardner did not breach her duty to separate the Sport-Jet from the Dash 8. Even though she did not follow Paragraph 3-9-6 of FAA Order 7110.65, she properly applied the exception set forth in Paragraph 3-9-7.b.2 and satisfied the four requirements in

Paragraph 3-9-7.c. In this regard, the Court credits the testimony of Lewis and Canoles and agrees that Gardner did not violate FAA procedures or otherwise depart from a reasonable standard of care.

C. Causation

Plaintiffs contend that Gardner's failure to separate the Sport-Jet from the preceding Dash 8 exposed the Sport-Jet to wake vortices created by the Dash 8. Under Colorado law, plaintiffs have the burden of proving that but for Gardner's breach of duty, the Sport-Jet would not have encountered wake turbulence and crashed. See *Smith*, 749 P.2d at 464. Under plaintiffs' theory, this test is satisfied if Gardner's failure to separate the Sport-Jet from the Dash 8 by three minutes produced the crash in a natural and continued sequence. Plaintiffs have not met their burden in this regard. They have not shown by a greater weight of the evidence that Gardner's breach of duty was the "but for" cause of the accident.

Plaintiffs offered six hypothetical causes of the accident (1) mount rotor; (2) improperly rigged ailerons; (3) asymmetric flaps; (4) wake vortices; (5) aerodynamic stall; and (6) pilot error. (Trial Tr. Vol. 1, 13-17, May 3, 2010.) Plaintiffs ruled out the first three for lack of evidence. Plaintiffs then sought to exclude aerodynamic stall and pilot error to establish that wake turbulence was the only plausible cause of the accident. Basically, in presenting their theory of liability, plaintiffs employed a methodology known as "differential diagnosis." *Best v. Lowe's Home Center, Inc.*, 563 F.3d 171, 178 (6th Cir. 2009); see *In re Paoli R.R. Yard PCB Litigation*, 35 F.3d 717, 757 (3d Cir. 1994). In a medical context, "[d]ifferential diagnosis is the method by

which a physician determines what disease process caused a patient's symptoms. The physician considers all relevant potential causes of the symptoms and eliminates alternative causes." *Best*, 563 F.3d at 178. Courts consider this approach to be "a standard scientific technique of identifying the cause of a medical problem by eliminating the likely causes until the most probable one is isolated." *Id.* (quoting *Hardyman v. Norfolk & W. Ry. Co.*, 243 F.3d 255, 260 (6th Cir. 2000)).

Outside the medical context, the Tenth Circuit has characterized differential diagnosis "as a process of reasoning to the best inference." *Bitler v. A.O. Smith Corp.*, 391 F.3d 1114, 1124 (10th Cir. 2004). Plaintiffs argue "backwards to the cause . . . and to do so requires a process of eliminating possible causes as improbable until the most likely one is identified." *Id.* When employing a differential analysis, experts must provide objective reasons for eliminating alternative causes. *Id.* An inference to the best explanation for the cause of the accident must eliminate other possible sources as "highly improbable," however, and must demonstrate that the cause identified is highly probable. *Id.*

Because they eliminated other potential causes of the accident — including pilot error, mechanical failure and aerodynamic stall — Stewart, Bornhofen and McElroy all opined that wake vortices caused the accident. Plaintiffs have nonetheless failed to satisfy their burden in employing the differential diagnosis theory of liability or in affirmatively establishing that wake turbulence caused the accident in question. Their witnesses are not experts in wake turbulence and they did not credibly establish a probability that wake vortices could or did cause the accident.

The far greater weight of the credible evidence shows that the Sport-Jet did not encounter wake vortices created by the Dash 8. The Court found the expert testimonies of both Hoxit and Hallock to be persuasive to this regard. Hoxit presented credible evidence of the weather conditions at the time of the accident. Hallock presented reliable evidence that the wake turbulence created by the Dash 8 could not have lasted 126 seconds in order to affect the flight path of the Sport-Jet. Hallock's testimony was infinitely more credible than that of plaintiffs' wake expert, who admitted multiple mistakes and uncertainty in connection with his opinions. Taking into account all of the expert testimony, the Court finds that plaintiffs have not satisfied their burden of proving that wake turbulence caused this accident.

V. CONCLUSION

The Court finds that in electing not to apply the three-minute separation interval, Gardner did not breach her duty of care or violate FAA orders. Furthermore, even if a breach occurred, a wake turbulence encounter did not cause the accident. Therefore the Court finds in favor of the United States of America. The Clerk is directed to enter judgment in favor of defendant and to close this case.

Dated: June 17, 2010

BY THE COURT:

s/ Kathryn H. Vratil _____
Kathryn H. Vratil
United States District Judge