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THE SPACE SHUTTLE COLUMBIA AND THE LEGAL HIGH FRONTIER: POSSIBLE CLAIMS AND DEFENSES

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ABSTRACT

When a major aerospace accident occurs, attention immediately focuses on causation to determine safety of flight issues. A secondary, but equally important, determination focuses on the question of liability. Such was the case in the wake of the space shuttle Columbia accident on February 1, 2003. The recently published Columbia Accident Investigation Report provides a roadmap for the safe return to flight of the space shuttle program, but also raises interesting liability questions. This paper attempts to address those issues as they relate to international law and the domestic law of the United States. Those laws raise difficult barriers to would-be claimants and pose serious questions for the assessment of liability in future cases.

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INTRODUCTION

The recent release of the Columbia Accident Investigation Board (CAIB) report on August 26, 2003,[1] culminates a painful but necessary step in the return of NASA to manned space flight. Director O'Keefe has vowed to move forward by adopting the report as a blueprint for the safe and successful resumption of space shuttle operations.[2] However, while NASA looks forward, there are many problems from the past that remain unresolved, including the thorny issues surrounding a regrettable, but preventable disaster. These issues are further complicated because they involve overlapping considerations of international law under the Liability Convention, the substantive laws of the United States, including the Federal Tort Claims Act (FTCA) and the Federal Employees Compensation Act (FECA), and the myriad tort laws of up to 50 local state jurisdictions. This article will examine these legal cross currents and outline the legal hierarchy that may ultimately lead to their resolution.

THE COLUMBIA ACCIDENT INVESTIGATION BOARD REPORT

As might be expected, the CAIB report contains an exhaustive analysis of the physical and organizational causes of the Columbia crash. It describes in almost prosaic terms the anatomy of a disaster:

The physical cause of the loss of Columbia and its crew was a breach in the Thermal Protection System on the leading edge of the left wing. The breach was initiated by a piece of insulating foam that separated from the left bipod ramp of the External Tank and struck the wing in the vicinity of the lower half of Reinforced Carbon-Carbon panel 8 at 81.9 seconds after launch. During re-entry, this breach in the Thermal Protection System allowed superheated air to penetrate the leading-edge insulation and progressively melt the aluminum structure of the left wing, resulting in a weakening of the structure until increasing aerodynamic forces caused loss of control, failure of the wing, and breakup of the Orbiter.[3]

The problem of foam separation was well known to NASA officials prior to STS 107.[4] According to the CAIB report, foam loss occurred on more than 80% of the shuttle missions for which imagery was available to make such a determination.[5] In addition, foam loss similar to that which was observed during Columbia's last launch occurred in almost 10% of the observable cases.[6] These losses were tolerated by NASA despite design specifications precluding the shedding of debris during launch and pre-launch operations.[7] This phenomenon occurred so frequently that by the time of STS 107, it was regarded as a turnaround, or maintenance event, rather than a safety of flight issue.[8]

Various theories were advanced for this problem, from cryopumping[9] to cryoingestion[10] to subsurface defects[11] but no serious actions were taken to correct the problem. Only belatedly did NASA contractors attempt a limited effort to harden the Thermal Protection System to withstand greater impacts,[12] a solution designed to treat the symptom and not the disease.

The block of foam that separated from Columbia's external fuel tank on January 16, 2003 was 21 to 27 inches long, 12 to 18 inches wide and weighed approximately 1.67 pounds.[13] It struck Columbia's left wing in a tumbling motion at a relative speed of 400 to 600 miles per hour,[14] causing the damage that would lead to calamity on February 1, 2003. Unfortunately, the CAIB report was unable to isolate a single causative factor for this event:

Analysis of numerous separate variables indicated that none could be identified as the sole initiating factor of bipod foam loss. · The Board therefore concludes that a combination of several factors resulted in bipod foam loss.[15]

Specifically, the CAIB found:

Negligence on the part of NASA, Lockheed Martin, or United Space Alliance workers does not appear to have been a factor.[16]

In the Board's view, NASA's organizational culture and structure had as much to do with this accident as the External Tank foam.[17] That culture led

to overconfidence on the part of NASA officials that resulted in an acceptance of risk as a cost of doing business without any meaningful analysis of the cumulative impact of those risks.[18] More tragically, that culture resulted in a failure to assess the extent of damage to the shuttle before its fateful re-entry.[19] In fact, the CAIB report documents no fewer than eight missed opportunities to do so.[20]

In the final analysis, and despite the Board's assertion that no one factor caused the debris impact problem, there is plenty of blame to go around for Columbia's catastrophic failure. One member of the CAIB, Brigadier General Duane Deal, felt so strongly about the safety issues uncovered during the Board's investigation that he issued his own "minority report"[21] which is certain to fuel additional controversy and potential litigation. Even the CAIB report itself hints at a certain tension bubbling just below the surface of the investigation when it refers to speculation by NASA scientists that foam installation defects attributable to private industry caused the foam separation which led to Columbia's end.[22] It is against this ominous background that an analysis of legal liability must take place.

THE INTERNATIONAL FRAMEWORK

The obvious starting point for any analysis of legal liability for the Columbia disaster is the Convention on International Liability for Damage Caused by Space Objects.[23] That document was negotiated for the purpose of creating:

...international rules and procedures concerning liability for damage caused by space objects and to ensure, in particular, the prompt payment under the terms of [the] Convention of a full and equitable measure of compensation to victims of such damage...[24]

Article I of the Convention provides a broad definition of damage to include loss of life, personal injury and property damage, and goes on to define a space object to include its component parts as well as the launch vehicle and the parts thereof[25]. Article II then states the well-known principle of the Convention that:

A launching state shall be absolutely liable to pay compensation for damage caused by its space object on the surface of the earth or to aircraft flight.[26]

Article III of the Convention then goes on to discuss liability for space collisions, placing liability upon a launching state only if its object strikes another space object due to its fault.[27]

The Convention carves out a large exception concerning liability in Article VII, exempting damage caused by space objects of a launching state to its own nationals or to foreign nationals participating in the operation of the space object.[28] This provision effectively bars recovery under the Convention by any of the seven astronauts aboard Columbia, including Israeli Colonel Ilan Ramon. Also exempted would be anyone on the ground in the Columbia flight path over Texas and Louisiana who came in contact with shuttle debris or experienced damage as a result of falling components. Thus, it appears

that the only persons who would be able to file a claim under the Liability Convention would be non-U.S. citizens on the ground. While they still have time to file a claim under the Convention within its one-year statute of limitations,[29] the probabilities are remote that anyone will actually avail themselves of this international remedy.

REMEDIES UNDER U. S. LAW

If the international framework for recovery by U. S. plaintiffs is bleak, the picture under U. S. domestic law is not much better, at least with respect to Columbia's crew and their families. Although the Congress has established an elaborate compensation scheme for federal employees injured in the line of duty, including military personnel, that largesse comes with a price. That price tag is a virtual immunity from liability for the negligent acts of the federal government. Thus while the Federal Tort Claims Act,[30] provides for a limited waiver of federal sovereign immunity, that waiver does not apply to federal employees in general under the Federal Employees Compensation Act,[31] or to military personnel in particular under the Supreme Court doctrine enunciated in Feres v. United States.[32] In Feres, the Supreme Court held that a member of the armed forces could not sue the federal government for personal injuries, death, or property loss sustained "incident to service".[33] The latter term equates roughly to being in the line of duty, although a soldier need not be "on duty" for Feres to apply. The Court pointed to a number of reasons for this rule, including the peculiar and special relationship between the Government and members of its armed forces, the disadvantages faced by a soldier contemplating litigation, and the safety net of compensation and benefits available to members of the armed forces through such agencies as the Department of Veteran's Affairs.[34] Essentially, the same rule applies to federal civilian employees under FECA, which is their exclusive remedy for personal injury and death claims.[35] In a subsequent decision, the Supreme Court barred a government contractor sued by a service member from cross-claiming against the government for indemnification, Stencel Aero Engineering Corp v. United States.[36] This latter case effectively sealed the last chink in the armor of federal sovereign immunity against any and all liability claims arising from the injury or death of federal employees caused by the negligent acts of their employer.

The effect of the preceding discussion is that the heirs of USAF Colonel Rick Husband, Navy Commander William McCool, USAF Lieutenant Colonel Michael Anderson and Navy Captains Laurel Clark and David Brown would be barred from suing the federal government under the Feres doctrine, and NASA employee Kalpana Chawla would be barred by FECA. Ironically, the only shuttle passenger who might not be barred under the FTCA would be Israeli Colonel Ilan Ramon. However, as discussed below, he would face the same hurdles confronting non-federal employees who may have suffered debris-related damage/injuries on the ground. Another possible complication in this case would be the existence of a Status of Forces Agreement between the United States and Israel, which could preclude recovery by his surviving family members.

As mentioned above, the FTCA would apply to those injured by falling/fallen debris, including those participating in the recovery effort, assuming they are not employed by the federal government.[37] For these plaintiffs (and Colonel Ramon), the FTCA opens the door to possible liability claims, assuming that an administrative claim has first been filed within two years[38] and that any number of exceptions do not apply. Chief among these is the discretionary function exception, which provides that the FTCA's waiver of sovereign immunity does not apply to:

Any claim...based upon the exercise or performance or the failure to exercise or perform a discretionary function or duty on the part of a federal agency or an employee of the Government, whether or not the discretion involved be abused.[39]

This discretionary function exception to the waiver of sovereign immunity under the FTCA requires planning, rather than operational level activity,[40] and a demonstration by the federal government that (1) the function involved an element of choice and was not mandated by regulation, statute or policy requiring a particular course of action and (2) the discretionary nature of the function is of a kind that the exception was designed to shield.[41] Needless to say, the discretionary function exception to the FTCA can (and does) provide an exceptionally large loophole through which the federal government can escape liability under the Act. In addition, it is hard to imagine a more discretionary governmental function than space flight or the operation of a spacecraft such as the space shuttle. Notwithstanding, there is one other avenue of recovery that may not require a prospective plaintiff to rebut a discretionary function claim by the government if negligence of a government contractor can be demonstrated. Even this avenue of recovery has become difficult to pursue due in part to the same discretionary function exception discussed above.

THE CIVILIAN CONTRACTOR DEFENSE

For many years, federal employee plaintiffs were able to obtain some relief from the limitations of the FTCA and FECA by suing civilian contractors who created the dangerous condition or instrumentality that led to their death or injury. However, that avenue of recovery was narrowed substantially in Boyle v. United Technologies Corp.[42] In that case, the Supreme Court found a limited immunity for government contractors under the discretionary function exception of the FTCA:

Liability for design defects in military equipment cannot be imposed, pursuant to state law, when (1) the United States approved reasonably precise specifications; (2) the equipment conformed to those specifications; and (3) the supplier warned the United States about the dangers in the use of the equipment that were known to the supplier but not to the United States.[43]

The Boyle Court explained its reasoning in the following terms:

...It makes little sense to insulate the Government against financial liability [under the FTCA] for the judgment that a particular feature of military

equipment is necessary when the Government produces the equipment itself, but not when it contracts for the production.[44]

The presence of a significant federal interest in the program that initiated the contracting activity has been suggested as a fourth element of Boyle.[45] While this fourth "requirement" should be more properly understood in the context of whether federal law should pre-empt state law in a particular procurement context,[46] it was clear that the Boyle Court was concerned about the impact of state tort lawsuits on the national defense.

In arriving at its decision, the Court implicitly recognized that the government contractor defense would not apply to commercial, off the shelf, items for which there was no government input.[47] The active participation of a contractor in the design process, however, would not preclude assertion of the defense, especially where the design selection reflected a "significant policy judgment" by the government.[48] In the view of at least one commentator, this could apply to every situation in which design specifications are incorporated into a government contract.[49] That same commentator observed that the defense would apply to any person injured by a defective product purchased by the government, and that it would not be limited strictly to defense related products.[50]

In the years since Boyle was decided, however, the question as to whether the government contractor defense applies to non-defense, as well as defense, contractors remains unresolved.[51] Obviously, such a determination could be significant, since NASA is a non-DOD, civilian agency of the federal government.[52] While noting that the federal circuits are split on the issue, several commentators have argued persuasively that the defense should not be extended beyond noncommercial military products.[53] They point to the Boyle Court's reference to "military equipment" in its holding and note the majority's concern that state tort law will be used to "second guess" military decisions and that defense contractors will raise their prices to the government in order to cover their increased liability.[54] The Court may have also signaled a reluctance to extend Boyle in its decision in Hercules, Inc. v. United States.[55] In that case, certain contractors involved in making Agent Orange for the Department of Defense sought to apply the government contractor defense through an implied indemnification theory.[56] However, the Court refused to extend the defense that far and, as in Stencel Aero, preserved the immunity of the United States from collateral attack by civilian contractors found to be liable to civilian plaintiffs.[57]

In addition to the non-DOD argument discussed above, various theories have been suggested to circumvent the holding in Boyle. The most obvious involve a frontal assault on the three pronged test enunciated in Boyle.[58] Frankly, these may be the most productive avenues of attack for a prospective plaintiff, especially where the government specification is not precise or the contractor deviates from that specification in a way that is not approved by the government. However, if the government accepts a known deviation, the contractor may again

escape liability.[59] This may be of great significance in the Columbia disaster where NASA accepted a known problem with foam separation without seeking meaningful corrections from the manufacturer. In addition, as the federal procurement system leans more and more toward the purchase of commercial, off the shelf items, the defense could lose some of its vitality. Still, it is hard to procure tanks, aircraft and submarines, including their components, off the shelf. Thus, Boyle will probably retain its potency with respect to many government procurement actions.

Some commentators have suggested asserting liability under state tort law requirements that impose a duty to warn potential users of hazardous products.[60] However, one wonders how such warnings would be of any utility when combined with the inherently dangerous instrumentalities of war or space flight. At least one court has noted that a military member injured in a weapon system failure could hardly have refused to use the system based upon some hypothetical safety warning on the device.[61] Other courts, however, have allowed plaintiffs to prove their case.[62]

Commentators have also suggested asserting claims based on a failure by the manufacturer to incorporate obvious safety features into a design.[63] The trade-offs implicit in the production of any complex piece of equipment such as the space shuttle, however, involve precisely the kinds of discretionary decisions that the FTCA and Boyle were designed to protect. In fact, the Boyle Court itself recognized "...the trade-off between greater safety and greater combat effectiveness."[64]

THE FUTURE

While the CAIB report provides a comprehensive roadmap for the recovery of the space shuttle program, it also opens some interesting possibilities for recoveries of another kind. These include monetary awards from personal injury lawsuits based upon negligent space shuttle design issues, the negligent manufacture of shuttle components, and failure to comply with government-furnished specifications.

As discussed above, there are many hurdles that must be overcome before a successful lawsuit can be maintained, assuming that any of these circumstances can be proven. In the final analysis, however, all parties recognize that space flight is an inherently dangerous activity. In this regard, Congress has seen fit to provide for the indemnification of users of space vehicles, including the space shuttle, for death, bodily injury or property loss/damage to the extent that such claims are not compensated by the liability insurance of the user.[65] In fact, United Space Alliance, which is a joint venture formed by Lockheed and Boeing to conduct space shuttle maintenance and launch operations, has such an indemnity agreement in place.[66] It should also be noted that the families of the victims themselves may be reluctant to sue out of a sense of loyalty and respect.[67] And Congress may step in directly, having set a compensation precedent in the wake of the September 11, 2001 terrorist attack on the World Trade Center towers. Whatever the source, there will be compensation for the families of the brave crew of Columbia, not necessarily because it's legal, but because it's the right thing to

do. However, the most meaningful way to "compensate" the Columbia crew and their families will be NASA's safe and responsible return to manned space flight in the near future.

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Notes

[1] Columbia Accident Investigation Board Report, Volume 1, August 2003 [hereinafter cited as CAIB Report].
[2] *Aviation Week and Space Technology*, Vol. 159, No. 9, September 1, 2003, p. 22.
[3] CAIB Report, *supra*, at 49.
[4] *Id.* at 121. STS 107 is the mission designation for Columbia's 28th, and final, flight.
[5] *Id.* at 53.
[6] *Id.*
[7] *Id.* at 122.
[8] *Id.* at 130.
[9] *Id.* at 53. "Cryopumping" involves the freezing/liquification of air that seeps beneath the foam and is trapped in voids at or near the surface of the liquid oxygen and liquid hydrogen tanks. After launch, as propellant levels decrease and aerodynamic heating occurs, the trapped air can boil away or evaporate, building up pressure beneath the foam. This rapid increase in subsurface pressure could cause the foam to break away from the External Tank.
[10] *Id.* "Cryoingestion" involves the same fluid mechanics as "cryopumping" except that the fluid involved is gaseous nitrogen which may seep from the intertank, which is filled with nitrogen during tanking operations.
[11] *Id.* at 52-53.
[12] *Id.* at 130. The material used to improve impact resistance of space shuttle tiles suffers from a higher thermal conductivity than normal tiles and is therefore of limited utility.
[13] *Id.* at 59; *Aviation Week and Space Technology*, *supra*, at 23.
[14] CAIB Report at 59-60.
[15] *Id.* at 55.
[16] *Id.* at 53.
[17] *Id.* at 177.
[18] *Id.* at 139.
[19] *Id.* at 169.
[20] *Id.* at 140.
[21] CAIB Report, Appendix.
[22] CAIB Report at 52. Similar concerns were expressed at the factory that built the fuel tanks in question, Garcia, Kidwell and Greene, *Michoud Space Center to Come Under Scrutiny in Shuttle Probe*, The Miami Herald, February 16, 2003.
[23] U.N. Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, 961 U.N.T.S. 187 (entered into force September 1, 1972) [hereinafter cited as Liability Convention].
[24] Liability Convention, Preamble.
[25] *Id.* at Article I.
[26] *Id.* at Article II.
[27] *Id.* at Article III.
[28] *Id.* at Article VII.
[29] *Id.* at Article X.
[30] 28 U.S.C. §§ 1291, 1346(b) and (c), 1402(b), 2401(b), 2402, and 2671-80.
[31] 5 U.S.C. §§ 8101-8193.
[32] 340 U.S. 135 (1950).
[33] *Id.* at 146.
[34] Id. at 143, 145.
[35] 5 U.S.C. 8116. The same rule applies for non-appropriated fund employees under the Longshore and Harbor Workers' Compensation Act, 5 U.S.C. § 8173; 33 U.S.C. §§ 910-50.
[36] 431 U.S. 666 (1977).
[37] An interesting problem is presented by the various volunteers who participated in the search and recovery effort in that their volunteer status may or may not confer rights (and bar recovery) under FECA. The receipt of these so-called "gratuitous" services by the federal government must generally be approved in advance and include a waiver of any right to compensation. The ban on the receipt of volunteer services has numerous exceptions, including emergency situations involving the safety of human life or the protection of property, 31 U.S.C. § 1342.
[38] 28 U.S.C. §§ 2675 and 2401(b).
[39] 28 U.S.C. § 2680(a).
[40] Dalehite v. United States, 346 U.S. 15, 42 (1953).
[41] Black Hills Aviation, Inc. v. United States, 34 F.3d 968 (10th Cir. 1994).
[42] 487 U.S. 500 (1988).
[43] *Id.* at 512.
[44] *Id.*
[45] Wagner, *Note: Tate v. Boeing Helicopters: Government Contractors Increasingly At Risk Despite the Government Contractor Defense*, 23 N. Ky. L. Rev. 377, 384 (Spring 1996).

[46] Loy, *Note: The Government Contractor Defense: Is It a Weapon Only for the Military?*, 83 Ky. L.J. 505, 512 (1994).
[47] *See*, Cantu and Young, *The Government Contractor Defense: Breaking the Boyle Barrier*, 62 Alb. L. Rev. 403, 421.
[48] Boyle, *supra*, at 513.
[49] Nash & Cibinic, *The Government Contractor Defense: The Supreme Court Expands Protection*, 2 N&CR ¶48 (August 1988).
[50] *Id.*
[51] Seidelson, *From Feres v. United States to Boyle v. United Technologies Corp.: An Examination of Supreme Court Jurisprudence and a Couple of Suggestions*, 32 Duq. L. Rev.219, 264 (Winter, 1994).
[52] 42 U.S.C. § 2472.
[53] Loy, *supra*; Townsend, *Comment: Ambulance Chasers Beware: Carley v. Wheeled Coach and the Questionable Expansion of the Government Contractor Defense*, 78 Minn. L. Rev. 1545 (June, 1994).
[54] Loy, *supra*, at 514-515.
[55] 516 U.S. 417 (1996)
[56] *Id.*
[57] *Id.*
[58] *See*, Cantu and Young, *supra*.
[59] Landgraf v. McDonnell Douglas Helicopter Co., 993 F.2d 558 (6th Cir. 1993). In effect, acceptance of the deviation by the government constitutes a de facto conformance with the specification.
[60] Wagner, *supra*, at 386.
[61] Quiles v. Sikorsky Aircraft, 84 F. Supp. 2d 154 (D. Mass. 1999).
[62] Oliver v. Oshkosh Truck Corp., 96 F.3d 992 (7th Cir. 1996).
[63] Wagner, supra, at 401-404.
[64] Boyle, supra, at 511. The Boyle Court, however, did hint that under the right circumstances a state requirement for certain safety features not in conflict with federal specifications might not trigger pre-emption under Boyle. *Id.* at 509.
[65] 42 U.S.C. 2458b.
[66] Berman, *The Legal Cleanup: Lawyers Consider Issues Stemming From Crash of Space Shuttle Columbia*, 89 A.B.A.J. 19 (August, 2003).
[67] Johnson, *Shuttle Contractors May Face Liability Suits; But Contract and Court Ruling Could Prevent Repeat of Challenger's $10 Million in Settlements*, The Washington Post, February 4, 2003, p. E1.