

REPORT OF THE INDEPENDENT REVIEW TEAM

September 2, 2008



MANAGING RISKS IN CIVIL AVIATION: A Review of the FAA's Approach to Safety

A Blue Ribbon Panel Appointed May 1, 2008
by Secretary of Transportation, Mary E. Peters
to Examine the FAA's Safety Culture and
Approach to Safety Management

Panel Members:

Ambassador Edward W. Stimpson (Chair) | J. Randolph Babbitt
William O. McCabe | Professor Malcolm K. Sparrow | Hon. Carl W. Vogt

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INDEPENDENT REVIEW TEAM
Washington, DC

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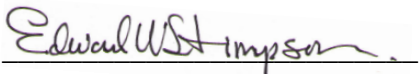
Secretary Mary E. Peters
U. S. Department of Transportation
1200 New Jersey Avenue
Washington, DC 2xxxx

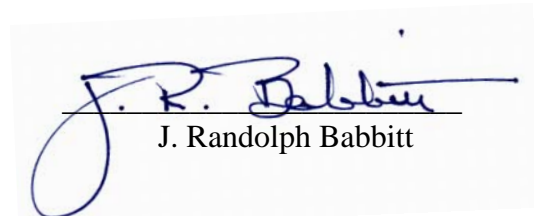
Dear Madame Secretary:

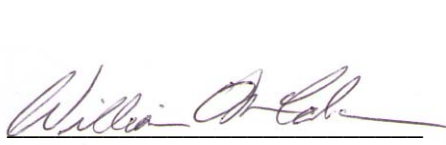
We are pleased to transmit to you Managing Risks in Civil Aviation: A Review of the FAA's Approach to Safety. We were charged with the task of evaluating and crafting recommendations to improve the FAA's safety culture and the implementation of an aviation safety system. We believe that our recommendations can enhance the continuation of the ever improving aviation safety record and hope that they will be useful to you and FAA leadership.

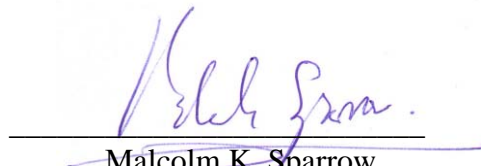
We were privileged and honored to serve on the Independent Review Team. During our four-month assignment, we met extensively with FAA staff and industry experts who volunteered their time and analysis to make this effort possible. We were extremely impressed with the cooperation provided by all. Please thank them on our behalf.

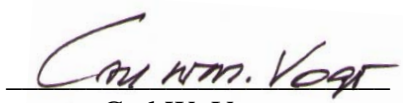
Sincerely,


Edward W. Stimpson, Chairman


J. Randolph Babbitt


William O. McCabe


Malcolm K. Sparrow


Carl W. Vogt

**MANAGING RISKS IN CIVIL AVIATION:
A Review of the FAA’s Approach to Safety**

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Acknowledgements

Many individuals and organizations voluntarily contributed to this effort, motivated overwhelmingly by their devotion to aviation safety.

Secretary Mary Peters allowed full and open access to her staff and closely followed our progress on this project. While several hundred Department of Transportation employees contributed in interviews, we want to acknowledge the particular contributions of a number of staff who supported us during this work. First, we thank Acting FAA Administrator Robert “Bobby” Sturgell for his leadership and commitment to giving us unfettered access to all of the FAA’s data and knowledge. Second, we greatly appreciate the administrative and research efforts of Executive Director, Clifford Eby and his supporting staff including Cynthia Dominic, Robin Jallow, Monica Nemecek, Nakia Poston, Bill Rayball, Karen Swindell, and Col. John Wood. We also benefited from the technical contributions of Bill Jarrott and Kent Hollinger of The MITRE Corporation. The cover was designed by Melissa Ureksoy of Oliver Wyman.

The members of the Independent Review Team particularly appreciate the extra work undertaken by Ambassador Edward W. Stimpson as Chair of the Review Team, and by Professor Malcolm K. Sparrow in drafting the report.

The responsibility for the recommendations and findings of this report rests solely with the panel.

Executive Summary

Context and Task: The Independent Review Team (IRT) is grateful to Secretary Mary Peters for granting us the opportunity to review the FAA's approach to safety. We believe that the events of this spring have provided a valuable opportunity to check the agency's course, and to identify some adjustments that can help to optimize the FAA's future contribution to safety.

On April 3, 2008, the House Committee on Transportation and Infrastructure, chaired by Representative James L. Oberstar, conducted a hearing into safety issues at Southwest Airlines, and possible lapses in FAA oversight. The committee's investigation, based on whistleblower complaints received from FAA inspectors, explored allegations that Southwest Airlines, with FAA complicity, had allowed at least 117 of its planes to fly in violation of regulations. The central issue running throughout the April 2008 congressional hearings, and all the attendant publicity, was whether the FAA had succumbed to excessively "cozy" relationships with the airlines, routinely failed to take proper enforcement action, and allowed non-compliant airlines to escape penalties by using the voluntary disclosure programs without fixing their underlying safety problems.

In response to the congressional and public concern arising from the Southwest Airlines incident, the FAA ordered an immediate and nationwide audit of compliance with Airworthiness Directives (AD). As a direct result of these "special emphasis" AD audits, problems quickly surfaced with American Airlines' fleet of MD-80s. On April 8, faced with the prospect of imminent enforcement action by the FAA, American Airlines chose to ground its entire fleet of MD-80's (more than 350 planes), putting these planes back into service only once the AD requirements had been completely met, and to the FAA's satisfaction. From April 8 to 11, American Airlines cancelled 3,100 flights, stranding or inconveniencing more than 250,000 passengers.

The grounding of American's MD-80 fleet came only days after the April 3 congressional hearing into the Southwest *non*-grounding—which has led many to suggest that the FAA overreacted, and that the disruption to American's schedule was unnecessary. The combination of these events, and the extraordinary coincidences in term of timing, produced, for the FAA, a perfect storm. First the agency was broadly accused and roundly condemned for having slipped into excessively cozy relationships with industry. Then, within days, it was accused of acting in an unusually harsh and legalistic manner, causing severe disruption and economic damage.

It is certainly plausible, given these conflicting criticisms and intense scrutiny, that some FAA staff might have felt for a while disoriented, or that different parts of the agency could have reacted by pulling in different directions. But this rather intense squall now seems to have mostly subsided. The task for the IRT relates less to determining what happened within the squall, and has more to do with helping the FAA emerge from its buffeting facing the right direction, set steadfastly on the best possible

long-term course, and poised to advance flight safety in the most efficacious way possible.

Secretary Peters charged the IRT with the task of examining the FAA's safety culture, and its implementation of safety management. She has asked us to prepare recommendations that might help to optimize the agency's regulatory effectiveness as it relates to airline safety. Our task, therefore, is more forward-looking and prescriptive than backward-looking and investigative. We recognize the importance of this challenge, and we very much appreciate the trust Secretary Peters has placed in us.

Methodology: The IRT began its work on May 1, 2008. Secretary Peters asked us to report within 120 days. During the intervening four months, we were granted broad access to FAA executives, managers, and front-line inspectors. We conducted meetings with industry management teams (particularly airline executives responsible for flight safety) at nine different airlines. We also met with the staff of the specific FAA offices responsible for overseeing those nine airlines. In addition, we met with representatives from a broad range of industry associations, other stakeholder groups, and labor unions. We visited other organizational units within the FAA, including seven Flight Standards District Offices (FSDOs). We talked with FAA whistleblowers, including Bobby Boutris and Douglas Peters from the Southwest Airlines Certificate Management Office (CMO). We also met with a representative of the National Transportation Safety Board, with Special Counsel Scott Bloch, with Inspector General Calvin Scovel, and former Inspector General Ken Mead. We also had discussions with Chairman Oberstar, Ranking Member Mica, and members of their staffs.

The IRT is enormously grateful to these individuals, several hundred in fact, who freely gave of their time, and their very frank advice, to make sure we were properly informed. We regret that, given time constraints, we were not able to meet with all the groups that asked to brief us. We hope this report does justice to these generous contributions.

We are phenomenally impressed with what the FAA and the aviation industry have achieved, driving accident rates down to extraordinarily low levels. Our recommendations are designed to help optimize the agency's future contributions to safety in an increasingly complex environment.

Airworthiness Directives: The FAA has already recognized the need to improve the AD process and the quality and clarity of ADs themselves. Acting Administrator Robert Sturgell has commissioned an *AD Compliance Review Team*, which includes FAA executives and airline industry representatives, and it will, in due course, recommend ways of improving the drafting, review, and integration of ADs; and the audit and enforcement of AD-compliance. The IRT supports the reexamination of the AD and Alternative Means of Compliance (AMOC) processes, now underway.

We do not expect that work, however, to entirely eliminate conflicts in interpretation. To the extent that parties may still differ on the issue of just how literally one has to read an AD's requirements, we very much hope that the introduction of *progress-*

towards-compliance reviews will lower the stakes substantially when such differences do surface. We propose that the FAA should provide timely information about new AD requirements, in advance of compliance dates, to all relevant FAA field offices. Those offices should then be responsive to any carrier that requests assistance in the form of *progress-towards-compliance* audits or reviews, in advance of the AD compliance dates. The IRT imagines that this particular form of collaboration should benefit the airlines and the FAA, while benefiting the traveling public by reducing the chances of major disruptions.

The IRT strongly opposes any move to require or expect inspectors to make safety-of-flight determinations, or other risk assessments, before taking enforcement action in relation to AD non-compliance. Of course, a regulator should not be prohibited from applying his or her professional judgment and discretion. Indeed, society relies on the professional judgment of regulators, and sensible application of the law, to prevent regulatory regimes from becoming oppressive, unresponsive, or absurd. But *mandating* the use of evaluative criteria, which themselves could never be unambiguously defined, would likely undermine the FAA's ability to take effective enforcement action when necessary. We feel that it is vital for the FAA to retain the right to ground *any* aircraft found out-of-compliance with *any* relevant AD, without having to prove anything else at that moment.

Voluntary Disclosure Programs: We re-affirm the value of the FAA's voluntary disclosure programs as vital to continuing improvement. These programs are in line with modern regulatory practice, and are suitably circumscribed. Such programs are *more* vital to the FAA, in our view, than to other regulatory agencies, given the essentially preventive nature of the residual risk-control task, and the resulting importance of learning about and learning from precursor events.

We also re-affirm the importance of FAA compliance with the guidelines and restrictions surrounding the voluntary programs, which are designed to guarantee these programs' integrity and prevent the erosion of industry's compliance incentives. Abuse of these programs will surely lead to the loss of them, and that would be a tragedy. We see an important role for the Department of Transportation Inspector General's office in monitoring the FAA's compliance with the conditions and restrictions governing these programs.

The Culture of the FAA: We have found the FAA's aviation safety staff to be unambiguously committed to its core mission of safety. However, we find a remarkable degree of variation in regulatory ideologies among the field office staff, which, in places, creates the likelihood of generating wide variances, and possible errors, in regulatory decision-making. We believe agency leadership should pay particular attention to this issue, and create intervention mechanisms to help guarantee coherence and rationality in regulatory practice, and to elevate a task-focus above tool-based preferences and ideologies. We believe the FAA still needs some mechanisms for identifying and dealing with potentially troubled offices, where sharp conflicts of regulatory ideology persist. Potentially, such conflicts could escalate if and when some high-stakes decisions arise.

We believe the FAA needs a method for reviewing the overall regulatory functioning of CMOs, using teams of experienced managers drawn from other regions, and we note the recent creation of the *Flight Standards Service Internal Assistance Capability* (IAC). Although this is a new program, and not yet much exercised within the agency, we recognize the alignment of its design purpose with the type of office-based interventions that we feel might be helpful with respect to regulatory culture. We have recommended some methods for identifying potentially troubled field offices, as candidates for review by IAC teams.

The IRT has considered the possibility of creating another independent office (inside the FAA, reporting directly to the FAA Administrator) to receive and handle complaints regarding critical safety issues. DOT Inspector General Scovel offered this proposal during congressional testimony in April. On balance, we think such a structure should now be unnecessary, especially if alternate means for identifying and resolving clashes of regulatory ideology, where they exist within particular FAA offices, can be provided.

We have also considered the proposal to mandate rotation of managers and/or supervisors on a 3-yearly or 5-yearly basis. We understand the enhanced risk of regulatory capture that long-standing relationships between regulators and regulated entities might produce. We also understand the countervailing value in accumulating a detailed knowledge of a specific airline's operations. We believe that any enhanced risk of capture can be properly mitigated without mandated rotation, and propose alternate means for dealing with this risk. Specifically, the FAA could routinely schedule IAC reviews of any offices where the managerial team has remained intact for more than some preset number of years (e.g. 3 years, or 5 years). This approach avoids the costs and disruption of mandated rotations and provides a more focused and diagnostic way of dealing with the same risk.

Safety Management Systems: The IRT has found it useful, in assessing the FAA's approach to Safety Management Systems (SMS) to distinguish three different contributions the FAA can make:

- a) FAA's Oversight role: Specifying requirements for SMS systems to be constructed and operated by regulated entities, and then auditing them for adequacy, effective operation, and compliance.
- b) FAA's Operational role: Establishing systems *within* the agency for identification and mitigation of risks that transcend individual regulated entities, or which straddle multiple sectors of the industry, and which rise to the level at which they require national or governmental attention. (i.e. actually *dealing* with risks that belong at the FAA level).
- c) FAA policy and rule-making role: Policy and rule-making at the FAA should rest on sound risk-assessments and analysis.

With respect to the FAA's oversight of industry's SMS implementations, we note that the agency will have trouble meeting the International Civil Aviation Organization's

(ICAO) deadlines for rulemaking by November 2009. We also note that the FAA's SMS program engages with airlines on a voluntary basis and in a healthy fashion, even in advance of any final rule. We are confident that the FAA, in its SMS oversight role, will help those airlines not so advanced in this area to catch up, and will also be able to overlay some more standardized framework on the various approaches to SMS now being pursued across the industry.

We are encouraged by the general level of SMS understanding and implementation among the airlines we have visited. To us, several of the airlines' systems seemed excellent, reflecting a clear understanding of the myriad methods of hazard discovery, the need for formalized assessment, analysis and resolution of them, and the need for follow-through and methodological rigor in assuring continued suppression of those risks over time.

We observe a widespread confusion throughout the FAA regarding the nature of the FAA's operational role under SMS (i.e. (b) above). Even though the FAA has already demonstrated a capacity to conduct sophisticated analyses of policy issues (i.e. (c) above), and of some high-profile risk concentrations, we do not believe the FAA stresses sufficiently its own potential to contribute to safety through the expansion and development of its own operational risk-management capabilities. The FAA is developing certain technical capabilities that will be pivotal to this operational role (such as the Aviation Safety Information Sharing (ASIAS) project, and the aggregation of voluntary disclosure data), and has begun the work of assembling the requisite analytic teams, but has paid less attention to the organizational challenges involved in structuring this work.

ATOS, Information Technology, and the role of FAA Inspectors: It is evident from the IRT's interviews with inspectors, which covered fifteen different FAA field offices, that the Air Transportation Oversight System (ATOS) still needs further attention for it to live up to its promise. The IRT believes that the process of further refining this system must be informed by a solid empirical understanding of the way in which inspectors now spend their time. We urge the leadership of the Aviation Safety Office to commission a time-and-motion study of the daily work-life for front-line inspectors, particularly to discern the effects of ATOS and other IT systems on the productivity and effectiveness of the inspection workforce.

Agency Structure: Finally, for longer-term consideration, we would flag the issue of the FAA's carrier-specific oversight structure. Alternative forms of organization, applied to suitable functions, might better balance the agency, helping to mitigate the dangers of capture, promote consistency across airlines, and eliminate obvious inefficiencies in the oversight of certain categories of facilities.

We hope these observations will be useful as the FAA seeks to meet the increasingly complex demands of aviation safety.

Summary of Recommendations

Subject: Airworthiness Directives (AD)

Recommendation 1: The FAA should retain the right to ground any plane not in compliance with an applicable AD. Inspectors should not be required or expected to conduct any type of risk-assessment before taking action on AD non-compliance. [Main report paragraph 4.1]

Recommendation 2: The FAA should provide timely information about new AD requirements, in advance of compliance dates, to all relevant FAA field offices. Those offices should then be responsive to any carrier that requests assistance in the form of *progress-towards-compliance* audits or reviews, in advance of the AD compliance dates. [Main report paragraph 4.2]

The FAA should revise its workload management systems (including ATOS), so that they can accommodate such requests. The IRT believes that this particular form of collaboration should benefit the airlines and the FAA, while protecting the traveling public by reducing the chances of major disruptions.

Subject: Voluntary Disclosure Programs

Recommendation 3: The FAA's Voluntary Disclosure Programs are vitally important to the future of aviation safety, and should be retained. [Main report paragraph 5.1]

The use of voluntary disclosures, appropriately circumscribed, is a well accepted component of any modern regulatory toolkit. In the FAA's case (just as in the case of the Nuclear Regulatory Commission) accidents are now sufficiently rare that the potential for further safety enhancements, and the identification of emergent risks, belongs firmly in the realm of early precursors to an actual disaster. Given that most precursor events are known only to those directly involved, and might otherwise remain hidden from the authorities, the FAA depends heavily on voluntary disclosures and collaborative interventions to identify and mitigate risks. For these reasons we believe that these programs have even greater significance within the field of commercial aviation safety than in most other regulatory settings.

Recommendation 4: The FAA must abide by the rules circumscribing these programs in order to prevent the erosion of compliance. [Main report paragraph 5.2]

We believe that the rules currently in place are sufficient. We also believe that recent actions by the FAA, as suggested by the DOT Inspector General, to require higher level managerial approval of acceptances and to emphasize

comprehensive fixes and monitor their effectiveness, should all help to guard against abuses and preserve the integrity of these regulatory instruments.

Recommendation 5: Voluntary Disclosure Reporting Program (VDRP) data have not been routinely analyzed at a higher level within the FAA. There are two quite different purposes for such analysis, both of which the FAA should formally recognize. [Main report paragraph 5.3]

One purpose treats VDRP data, along with Aviation Safety Action Program (ASAP) and Flight Operational Quality Assurance (FOQA) data (and data from many other sources) as a potential contributor to the identification of trends and patterns that represent risks. In this regard, VDRP data becomes one input, amongst many, for the analytic operations that belong at the heart of the FAA's Safety Management System.

The second purpose guarantees the integrity of the voluntary programs themselves, eliminating any of the downside risks to compliance that might result from abuse. Audits of the disclosures and acceptances can validate adherence to program rules, and ensure that the FAA is not accepting repeat or duplicate disclosures from the same regulated entity. Such repeat disclosures could indicate a failure to implement effective or sufficiently comprehensive fixes the first time. Any willingness on the part of the FAA (real or perceived) to accept such repeat disclosures would undermine incentives for compliance.

Even though aggregate VDRP data may eventually reside in one place within the FAA, these two purposes remain quite separate and should never be confused.

Recommendation 6: The number of voluntary disclosures made by a regulated entity is a composite measure, and should not be used either as a performance metric or as a risk-factor, in any context. [Main report paragraph 5.4]

The rate at which an airline or its employees *disclose* problems is the product of the underlying rate at which they *experience* problems, multiplied by the rate at which they report the problems they experience. When all is well, the underlying problem-rate would be low, and the reporting rate would be close to 100 percent. The disclosure rate, based on that combination, would be middling. Exactly the same disclosure rate, however, might be produced if the problem rate were high and the reporting rate was very low—in other words, in the worst of all possible worlds. When such composite measures move up or down, or vary across airlines, one cannot normally tell which is different: the underlying problem rate, or the willingness to report. So in the absence of systematic or scientific approaches to unbundling them, it is misleading and potentially dangerous to interpret variation in such metrics as either good or bad.

Recommendation 7: It is clear to the IRT that participation in all of the voluntary disclosure programs is dependent on the assurance of confidentiality for information submitted. The IRT believes the FAA should resist any efforts to relax or eliminate any restrictions on disclosure. [Main report paragraph 5.5]

Subject: Culture of the FAA

Recommendation 8: The FAA should explicitly focus on wide divergences in regulatory ideologies, where they exist, as a source for potentially serious error. [Main report paragraph 6.4.1]

To that end, the leadership of the Aviation Safety Office should devise means for identifying field offices where excessive divergence in regulatory ideologies exists.

Diagnostic analyses should include identification of those offices or teams where initiation of enforcement is severely skewed across the inspection team. Finding such situations does not mean, of course, that the enforcement-generating minority is wrong, or in need of correction. Nor does it mean that *anyone* is necessarily wrong. It just indicates a worryingly wide divergence in regulatory preferences, and that situation needs to be examined carefully before it does damage to the coherence, reasonableness or rationality of regulatory decision-making processes.

Analysis of the distribution of hotline calls by originating field office (where known), or by the field office subject of the complaint, might also serve to provide early warning of emerging problems in specific locations.

Recommendation 9: Training for Managers and Principal Inspectors should explicitly cover:

- the management of contrasting regulatory views within the workforce,
- methods for moderating extremes in regulatory style, and
- methods for optimizing the regulatory effectiveness and coherence across a diverse team of inspectors.

[Main report paragraph 6.4.2]

Recommendation 10: The FAA should deploy the Internal Assistance Capability (IAC), recently established, to review the composition and conduct of any offices or teams identified under recommendation 1 above. [Main report paragraph 6.4.3]

Recommendation 11: The FAA should also deploy the IAC on a routine basis to review the culture and conduct of any CMO where the managerial

team has remained intact for more than 3 years. [Main report paragraph 6.4.4]

Rotation of managers might be recommended as the result of an IAC review, but would not be routinely required.

Subject: Safety Management Systems

Recommendation 12: The IRT would urge the FAA to embrace its own operational role in risk identification and risk mitigation as formally and energetically as it has embraced its role in overseeing industry's SMS implementations; and to expedite its implementation planning in this area. [Main report paragraph 7.1]

Subject: ATOS, Information Technology, and the role of FAA Inspectors

Recommendation 13: We recommend that without delay the FAA commission a time-and-motion study of its front-line inspection operation, to empirically assess the time-demands of ATOS and other IT implementations. With the results of such a study in hand, agency leadership should establish some clear expectations regarding the proportion of an inspector's work-week that data-entry, data-analysis, and other computer-related tasks should reasonably consume, and monitor progress towards more reasonable ratios as ATOS and other IT systems are improved over time. [Main report paragraph 8.1]

Report of the Independent Review Team

1.0 Introduction

It was exactly one hundred years ago this month that the first death of an airplane passenger occurred. Orville Wright was giving a demonstration flight to an audience in Fort Myer, Virginia, with one other aviator as passenger. The plane crashed when its propeller shattered, and the crash seriously injured Wright and killed his passenger.¹

One hundred years later, flying is accepted as an ordinary part of daily life, and is remarkably safe. Commercial airlines in the U.S. now carry more than 750 million passengers a year. The last passenger fatalities to result from scheduled operations of a major U.S. carrier occurred when a Comair regional jet crashed on takeoff in Lexington, Kentucky, in August 2006.² Since then, the U.S. air carrier system has moved roughly 1.5 billion people with no on-board fatalities, and just one ground fatality.³

Before the Lexington accident, one has to look back another five years, to November 2001, in order to find the next most recent crash for a major U.S. carrier.⁴ Commercial airline crashes have become such rare events that the metric the Federal Aviation Administration (FAA) now uses to track progress towards its safety goals is “Fatalities per 100 million persons on board.”⁵

Immediately after World-War II, U.S. air carriers averaged a major passenger accident every 16 days. The fatality rate *per 100 million passengers flown* exceeded 1,300. By the mid-to-late 1950’s, that rate had fallen to roughly 440. By the mid-1990s that rate had been cut again by a factor of ten, to 45. For the past five years (FY 2003 to FY 2007), the fatality rate averages approximately 2.5 per 100 million passengers flown.⁶ By any measure, reaching this level of safety across the commercial aviation industry is a remarkable achievement. The credit must be broadly shared among aircraft manufacturers, aircraft operators, regulatory oversight agencies, and those who have

¹ Orville’s crash happened on September 17, 1908. The centenary of this event was highlighted in: “Flight’s First Fatal Trip,” by Matthew L. Wald, *New York Times*. July 27, 2008.

² 47 passengers were killed. The Comair pilot attempted to take off on the wrong runway, which was too short. See Appendix 2 for a detailed tabulation of aviation-related fatalities involving U.S.-based carriers, from 1993 to the present (August 2008). Appendix 3 shows line graphs for “Air Carrier Fatal Accident Rates/Targets” dating back to 1946 [Appendix 3(a)], and projecting safety goals through FY 2025 [Appendix 3(b)]. The second graph starts with FY 1996, a very bad year. Three major crashes, involving TWA, ValuJet, and American Airlines each claimed more than 100 victims. In total, FY 1996 produced 506 fatalities.

³ Statistics reported to us by the FAA.

⁴ On November 12, 2001, the rudder and vertical stabilizer on an American Airlines jet separated, causing the plane to crash just after takeoff from JFK, New York. Two hundred and sixty people on board were killed, and five on the ground.

⁵ The number of miles flown does not much affect aviation risk, as most accidents occur during, or close to, take-off or landing.

⁶ Statistics reported to us by the FAA.

designed and introduced a whole series of new technologies and procedures critical to flight safety.

Even while the accident rate remains at historic lows, and even *without* a major crash, a series of events earlier this year has put the FAA very firmly in the public spotlight. These events led to Congressional inquiries, significant media attention, and a broader questioning of the regulatory style and regulatory methods on which the FAA relies to keep the skies safe.

1.1 Southwest Airlines: On March 7, 2008, Representative James L. Oberstar, Chairman of the House Committee on Transportation and Infrastructure, held a press conference on Capitol Hill to announce plans for a congressional hearing into safety issues at Southwest Airlines, and possible lapses in FAA oversight. His committee had conducted an investigation, based on whistleblower complaints received from FAA inspectors, into allegations that Southwest Airlines, with FAA complicity, had allowed at least 117 of its planes to fly in violation of regulations.⁷

A year earlier (on March 15, 2007) Southwest Airlines had reported to the FAA that it had violated an Airworthiness Directive (AD 2004-18-06) mandating fuselage inspections for structural cracks on its fleet of Boeing 737s. Under FAA rules, any aircraft violating an Airworthiness Directive may not fly, and should be grounded until the non-compliance is corrected. In this case, an FAA Principal Maintenance Inspector (PMI), who was notified of the breach by the airline, agreed with the airline's proposal to rectify the matter within ten days, and did not require that the 46 affected Boeing 737s be withdrawn from service. Southwest Airlines continued to operate the non-compliant aircraft on 1,451 flights over the next nine days while the required inspections were conducted. When the planes were finally inspected, five of them were found to have the types of fuselage cracks subject to this specific Airworthiness Directive. The Department of Transportation's Inspector General later estimated that Southwest had flown more than six million passengers over nine months on non-compliant planes.⁸

As early as 2003, one inspector from the FAA office that oversees Southwest—later to become a whistleblower—had raised concerns about the airline's compliance with ADs, but had been unable to persuade his superiors to conduct system-wide reviews.⁹ In relation to Southwest's non-compliance with AD 2004-18-06, this inspector and one other whistleblower from the same office reported the Principal Maintenance Inspector for illegally permitting the airline to continue flying non-compliant planes, and also for encouraging the airline to "self-disclose" violations under the Voluntary Disclosure Reporting Program (VDRP) in order to avoid enforcement penalties. The PMI had accepted the voluntary disclosure on March 19, 2007 despite multiple prior AD

⁷ Press Release, Transportation and Infrastructure Committee, Washington D.C. March 7, 2008.

⁸ "Review of FAA's Safety Oversight of Airlines and Use of Regulatory Partnership Programs," Calvin L. Scovel III, Inspector General, Department of Transportation. Report No. AV-2008-057. June 30, 2008. p.3.

⁹ *ibid.* p. 6.

violations reported by Southwest. Under the rules of the VDRP, disclosures of repeat or duplicate violations should not be accepted.

The whistleblowers' allegations and revelations were aired publicly before the Transportation and Infrastructure Committee, chaired by Representative Oberstar, on April 3, 2008. Senior FAA officials who were called to testify admitted that serious errors had been made in the Southwest Certificate Management Office (CMO). They expressed their own disappointment about it, and assured the committee that they were dealing with the personnel responsible. During March 2008, the agency had already fined Southwest Airlines \$10.2 million for its earlier violations, and launched an immediate audit of AD-compliance more broadly, covering all airlines.

Even though they admitted serious problems with the Southwest CMO, FAA executives defended the agency and its methods before the congressional committee, arguing that the problems had been specific to and isolated within that office, and that they did not reflect any broader problems across the agency.¹⁰

The central issue running through the April 2008 congressional hearings, and all the attendant publicity, was whether the FAA had succumbed to excessively "cozy" relationships with the airlines, routinely failed to take proper enforcement action, and allowed non-compliant airlines to escape penalties by using the voluntary disclosure programs without fixing their underlying safety problems.¹¹

1.2 American Airlines: In response to the congressional and public concern arising from the Southwest Airlines incident, the FAA ordered an immediate and nationwide audit of other airlines, to see if they too had any compliance problems with any ADs that affected their fleets.¹² This broader review of airline AD-compliance was ordered on March 15, 2008, and began on March 19. Each FAA office that oversees Part 121 air carriers with aircraft seating ten or more passengers was asked to audit 10 percent of the ADs applicable to each aircraft type they operate.¹³ As a direct result of these "special emphasis" AD audits, problems quickly surfaced with American Airlines' fleet of MD-80s.

One particular airworthiness directive issued back in 2006 (AD 2006-15-15) specified the manner in which wiring harnesses should be insulated and secured within the wheel

¹⁰ See Statement of Nicholas A. Sabatini, Associate Administrator for Safety, FAA, before the Committee on Transportation and Infrastructure. Hearing on "Critical Lapses in FAA Safety Oversight of Airlines: Abuses of Regulatory Partnership Programs," April 3, 2008.

¹¹ If these broader allegations turned out to be true, then the FAA would have become the latest regulatory agency to fall into a rather well known trap—that of *regulatory capture*—whereby a regulator draws so close to those with whom it deals on a daily basis (i.e. the *regulatees*) that it ends up elevating industry's private interests above its own regulatory mission. For a discussion of this phenomenon see: The Regulatory Craft: Controlling Risks, Solving Problems, and Managing Compliance, Malcolm K. Sparrow, Brookings Press, 2000, pp. 35-36, 63.

¹² FAA's Director of Flight Standards Service issued Notice N 8900.36, "Special Emphasis Validation of Airworthiness Directives Oversight," on March 13, 2008.

¹³ Airworthiness Directives (ADs) generally relate to one specific type of aircraft, and therefore an airline that operates multiple aircraft types needs to manage all of the relevant sets of ADs.

wells of MD-80s to prevent chafing of electrical cables and thus eliminate the possibility of arcing in the vicinity of the central fuel-tank. Special attention to such arcing followed the explosion of TWA flight 800 (a Boeing 747) off Long Island in July 1996, when fuel vapors ignited due to an ignition source inside the central fuel tank.¹⁴ This specific AD, relating to MD-80s, granted airlines an 18-month period to carry out the necessary alterations and repairs; the compliance date was March 5, 2008—just two weeks before these special-emphasis AD-audits began. Given its only-just-in-force compliance date, compliance with AD 2006-15-15 had not previously been checked. On March 25 and 26, 2008 FAA inspectors found discrepancies with some of American Airlines’ MD-80s, and American grounded part of its fleet, canceling a few hundred flights. American then re-inspected its MD-80 fleet and assured the FAA a few days later that it was now in compliance.¹⁵

On April 7, 2008, just three days after the congressional hearings arising from the Southwest Airlines events, FAA inspectors re-inspected 17 of AA’s MD-80s and found 16 of them to be out of compliance with AD 2006-15-15. On April 8, faced with the prospect of imminent enforcement action by the FAA, American Airlines chose to ground its entire fleet of MD-80’s (more than 350 planes), putting these planes back into service only when the AD requirements had been completely met, and were to the FAA’s satisfaction.¹⁶ By April 12, the FAA had accepted all these planes as compliant, and they were returned to service. MD-80s make up almost half of American Airlines’ overall fleet, and account for 40 percent of American’s daily flights. From April 8 to 11, American Airlines cancelled 3,100 flights, stranding or inconveniencing more than 250,000 passengers.

The grounding of American’s MD-80 fleet came only days after the April congressional hearing into the Southwest Airlines *non*-grounding—which has led many to suggest that the FAA over-reacted, and that the disruption to American’s schedule was unnecessary.

Views on this point differ. Virtually all the airline officials we interviewed and many within the FAA believe the agency’s actions represented a substantial departure from business as usual, and that the agency used an uncommonly literal interpretation of the AD, foreclosing any possibility of a compliance resolution that might have avoided the groundings.

The FAA team at the American Airlines Certificate Management Office, with whom we met, acknowledged that *discovery* of the AD non-compliance resulted directly from the special emphasis audits and hence could be traced back to Southwest’s troubles. But they expressed to us the conviction that their *response* to American’s non-

¹⁴ Flight TWA-800 was a Boeing 747-100. In September 1998, Swissair Flight 111 (an MD-11) crashed off Nova Scotia as a result of an onboard fire caused by faulty wiring in an entertainment system. These two crashes heightened the level of attention given to wiring installations.

¹⁵ Report to U.S. Transportation Secretary Mary E. Peters on American Airlines MD-80 Groundings,” Federal Aviation Administration, May 2, 2008, tab 1 (“Timeline”).

¹⁶ Letter to Secretary of Transportation from Robert W. Reding, Executive Vice President, Operations, American Airlines, May 2, 2008, p 4.

compliance, once discovered, was not materially affected by the preceding events and the criticism swirling around the agency at the time.

Immediately after the grounding, when asked by Secretary of Transportation Mary Peters to explain how and why the grounding had come about, FAA management responded by presenting evidence which, in its view, demonstrated that “the aircraft did not meet minimum standards for compliance and presented safety of flight concerns,” and the grounding was therefore justified.¹⁷

1.3 FAA’s “Perfect Storm”: As of the date of this report, several whistleblower complaints remain under investigation, and the Southwest and American AD-compliance issues remain the subject of continuing litigation and appeal. Investigations by the DOT Inspector General’s office, the Office of Special Counsel, and a number of FAA-directed project teams will, in time, interpret these events in greater detail and help us all understand which actions were appropriate and which were not. We, the members of the Independent Review Team (IRT), do not feel we can add much to the forensic examination of these events. Nor should we, given ongoing litigation.

Whatever conclusions one might reach about each of these events, one thing is certain: the *combination* of them, and the extraordinary coincidences in terms of timing, have produced, for the FAA, a “perfect storm.” First the agency was broadly accused and roundly condemned for having slipped into excessively cozy relationships with industry. Then, within days, it was accused of acting in an unusually harsh and legalistic manner, to the significant detriment of the traveling public.

In terms of the FAA’s regulatory toolkit, the grounding of a fleet represents one of the heaviest hammers it has available. With Southwest, the agency was accused of failing to use it when they should; the following week, with American, it was accused of using it unnecessarily and thereby causing severe disruption and economic damage.

It is certainly plausible, given these conflicting criticisms and intense scrutiny, that some FAA staff might have felt for a while disoriented, or that different parts of the agency could have reacted by pulling in different directions. But this rather intense squall now seems to have mostly subsided.

The task for the IRT relates less to determining what happened within the squall, and has more to do with helping the FAA emerge from its buffeting facing the right direction, set steadfastly on the best possible long-term course, and poised to advance flight safety in the most efficacious way possible.

¹⁷ Report to U.S. Transportation Secretary Mary E. Peters on American Airlines MD-80 Groundings,” Federal Aviation Administration, May 2, 2008. See cover memo from Robert A. Sturgell, Acting Administrator, FAA. Secretary Peters also asked American Airlines for a report on the matter. In its response, American Airlines contended that, as lead airline on MD-80s, it had worked with Boeing to develop the Service Bulletin content of the AD in question, and that there had never been a safety of flight issue with regard to American’s compliance with the AD.

Secretary Peters has charged the IRT with the task of examining the FAA's safety culture, and its implementation of safety management.¹⁸ She has asked us to prepare recommendations that might help to optimize the agency's regulatory effectiveness as it relates to airline safety. Our task, therefore, is more forward-looking and prescriptive than backward-looking and investigative. It is not so much focused on the FAA's uses (or non-uses) of any particular enforcement tool or of enforcement methods in general, but with its broader organizational approach and long-term strategy for guaranteeing flight safety. We recognize the importance of this challenge, and we very much appreciate the trust Secretary Peters has placed in us.

1.4 Methodology and limitations of this study: The Independent Review Team began its work on May 1, 2008. Secretary Peters asked us to report within 120 days. During the intervening four months we were granted broad access to FAA executives, managers, and front-line inspectors. We conducted meetings with industry management teams (particularly executives responsible for flight safety) at nine different airlines,¹⁹ spending half a day with each group. We also met with the staff of the specific FAA offices responsible for overseeing those nine airlines. Typically, we met with the airline management team in the morning, and spent the afternoon with the relevant FAA CMO staff, so we could hear how the regulatory relationship appeared to be working when viewed from both sides of the regulatory fence. At the CMO we would meet first with the supervisors and managers,²⁰ and then meet with as many of the front-line inspectors as wanted to attend, while their managers were excluded from the room.

In addition, we met with representatives from a broad range of industry associations, other stakeholder groups, and labor unions. We visited other organizational units within the FAA, including seven Flight Standards District Offices (FSDOs).²¹ We talked with FAA whistleblowers, including Bobby Boutris and Douglas Peters from the Southwest Airlines CMO. We also met with a representative of the National Transportation Safety Board, with Special Counsel Scott Bloch, DOT Inspector General Calvin Scovel, and former DOT Inspector General Ken Mead. We had discussions with Chairman Oberstar, Ranking Member Mica, and members of their staffs.²²

The IRT is enormously grateful to these individuals, several hundred in fact, who freely gave of their time, and offered their very frank advice, to make sure we were properly informed. We regret that, given time constraints, we were not able to meet with all the groups that asked to brief us. We hope we can do justice to these generous contributions.

¹⁸ Commissioning letter to IRT team members, from Mary E. Peters, Secretary of Transportation, April 25, 2008. See Appendix 6.

¹⁹ Alaska, American, Compass, Continental, Delta, jetBlue, Northwest, Southwest, and United.

²⁰ The Office Manager for the CMO, Principal Maintenance Inspector(s), Principal Avionics Inspector(s), and Principal Operations Inspector(s), plus others of similar rank.

²¹ FSDOs visited: Atlanta, Boise, Chicago, New York, Philadelphia, Seattle, Washington D.C.

²² See Appendix 5 for a full listing of stakeholder groups and individuals interviewed by the IRT.

Despite the wealth and range of opinions we have heard, this review does have some obvious limitations which we should declare. We had no power to subpoena or otherwise compel witnesses, and therefore could only interview volunteers. We undertook this study on a part-time basis, and within a compressed timeframe. We have had neither the time nor resources to conduct any broad surveys to measure staff attitudes or behaviors; so we cannot produce any statistically significant empirical evidence on prevailing attitudes or practices. We can therefore state with greater confidence the way some things *ought* to be, rather than reliably determine the way they are, or have been.

Our work has also focused on the Aviation Safety (AVS) side of the FAA, and not on the Air Traffic Organization (ATO). We understand that the majority of whistleblower complaints from the FAA that come to the U.S. Office of Special Counsel relate to ATO. We are not able, given our prescribed focus on AVS, to make any comments or recommendations with regard to Air Traffic Control.

Several witnesses have also raised with us issues relating to repair stations, including the growing use of foreign repair stations by U.S. carriers. We have not had an opportunity to visit any such repair stations, or to inquire systematically into issues regarding the adequacy of the FAA's oversight for these. This report does not contain any conclusions or recommendations about the safety or oversight of maintenance operations conducted within the U.S. or abroad.

2.0 History and Context

We do not propose to include here an entire history of aviation safety. But a few historical observations are in order—those that bear directly on the nature of regulatory relationships with the airline industry, the importance of voluntary disclosure programs, and the recognized need for a rigorous and systematic approach to safety management.

2.1 Accomplishments, and limitations, of the forensic approach: Most risk-control operations rely heavily on data about failures (accidents, crimes, oil spills, epidemics) to inform the control operation. Trends and clusters found within a mass of incident data reveal concentrations or “problems” which authorities can then address by identifying and dealing with their underlying causes.

In commercial aviation, the strategy of problem-identification-through-analysis-of-accident-data has just about reached its limits. In the opening paragraphs of this report we described the extraordinary reduction in the accident rate since World War II. Advances in aviation technology have taken a series of substantial bites out of aviation risk. In the 1940s, stall warning systems were invented, and they substantially reduced approach-and-landing accidents. Instrument landing systems (ILS) in the 1940s and 1950s and the introduction of radar cut this category of accidents yet further. Pressurized cabins allowed planes to fly high above most of the weather and terrain.

During the late 1950s, the advent of the jet engine (in place of piston engines) increased engine reliability 50-fold in just a few years, dramatically cutting the rate of engine failure in flight. The 1970s saw the introduction of Ground Proximity Warning Systems (GPWS), which alert pilots when flying low or towards terrain. These helped reduce the problem of “Controlled Flight into Terrain” (CFIT), often related to navigational errors and poor visibility. The later appearance of Enhanced GPWS, or “Terrain Alert Warning Systems” (TAWS), has substantially reduced accidents of this type.

In the 1980s major improvements were made in cabin safety (fire-resistant seats, less toxic materials, emergency lighting, etc.) and, as a result, more passengers have survived what would previously have been regarded as non-survivable accidents. In the late 1980s and early 1990s, the development of the six-axis simulator offered flight crews the chance to train for a broad range of real-world scenarios (wind shear, engine failure, loss of hydraulic or electrical systems, in-flight fire, etc.) without any risk at all. The 1990s also saw the introduction of technologies by which planes could land themselves, in zero visibility, at a suitably equipped airfield.

Given these significant advances, almost every accident that happens now is unique. Moreover, exhaustive investigation and analysis of each accident leads inexorably to yet more safety enhancements, mandated across the industry, designed to reduce the risk of *that accident* happening again. The forensic approach has been pushed to its limits.

The FAA’s role is preventive. The residual risk in aviation today is almost *catastrophic* in nature: that is, very low probability, but very high impact. Just like the Nuclear Regulatory Commission (which works to prevent catastrophic failure of nuclear power plants), or intelligence and security agencies seeking to protect us from major terrorist attacks, nearly all of the FAA’s work now belongs in the realm of precursors to an accident, and precursors to the precursors. As accidents become more rare, the work of accident prevention moves further and further back in the unfolding chronology of the risk, identifying contributory factors, and *potential* contributors, long before they manifest themselves in a disaster.²³

Given the predominantly preventive nature of this task, the question then arises: how will we know about the precursors? Ubiquitous surveillance is not at all possible. Being there, at the very moment when circumstances combine to produce an unusual but potentially dangerous situation, seems generally unlikely. The answer to the question “How will precursors be known?” is “Only if those experiencing them report them.” Voluntary reporting of events, which would otherwise pass undeclared and therefore undetected by the aviation community at large, becomes critical. The higher the level of reporting, the more complete the map of risk factors and risk behaviors

²³ For a general discussion of the difficulties faced by agencies tackling *catastrophic risks*, in particular the problems associated with demonstrating performance, justifying budgets and defining the role of analysis, see: Chapter 10, “Catastrophic Harms” in The Character of Harms: Operational Challenges in Control, Malcolm K. Sparrow, Cambridge University Press, 2008, pp 217-229.

available for analysis. The more we can learn about precursor risk factors, the greater the opportunity to drive down accident probabilities even further.

Very much at issue, during the recent scrutiny of the FAA, is the place for voluntary disclosures from the airline industry, and the agency's management of its voluntary disclosure programs. At this stage in the evolution of aviation safety, voluntary disclosures, and the pool of information they generate, are critically important. Without them, safety analysis (which is the only sure basis for future safety enhancements) would have very little reliable data to work on.

2.2 Singularity of Mission: 1996 was a very bad year for aviation safety. The 1990s produced a horrific series of crashes including the ValuJet crash in Florida (fire in the cargo hold due to negligent carriage of oxygen-generator canisters). The explosion of TWA-800 off Long Island garnered a great deal of attention and prompted the establishment in 1996 of the White House Commission on Aviation Safety and Security, chaired by Vice President Gore. The Gore Commission recommended that actions be taken to reduce the accident rate by 80 percent in the next ten years. The National Civil Aviation Review Commission ("Mineta Commission"), established by Congress, made similar recommendations in December 1997 and emphasized the need for

"...a much stronger emphasis placed on cooperative interaction, information sharing, and collaborative development of solutions to safety issues."²⁴

This direction heralded the end of an era in which the FAA relied principally on enforcement, and where industry was therefore reluctant to tell them anything, fearing the consequences. The Mineta Commission Report, in its conclusion, states:

"A number of approaches are in their infancy and should be expanded throughout the industry. Examples include programs in which airlines and pilots self-report safety issues with no risk of punitive action, airline internal safety audit programs, and programs to use digitally recorded flight data to analyze real world operations. For these programs to become widespread and tools in the effort to reduce the accident rate, the data from these programs need to be shared and protected from inappropriate uses or punitive actions. The FAA and the industry very much need to cut through the thicket of legal and bureaucratic tangles that are preventing these important safety and accident prevention programs from being implemented."²⁵

The FAA and the industry did "cut through the thicket," with the result that voluntary reporting and collaborative engagement around safety issues have become core elements of the FAA's regulatory approach.

²⁴ "Avoiding Aviation Gridlock & Reducing the Accident Rate: A Consensus for Change," Report of the National Civil Aviation Review Commission, (Norman Y. Mineta, Chair), December 1997. Section VI, p.III-38.

²⁵ *ibid.*

During this transition period, the FAA's Charter was also amended, moving the agency to a singular focus on safety. Previously, the FAA's mandate had combined aviation safety with a responsibility for promoting the growth and development of civil aviation.²⁶ One might expect an increased focus on industry partnerships to be associated with an *increased* emphasis on industry's business concerns. In fact, exactly the opposite was happening towards the end of the 1990s. The FAA was being urged to engage more closely with industry at precisely the same time as it formally dropped its business-promotion role. Closeness and cooperation were for the sake of safety, and nothing else.

Cooperation, for the sake of safety, not only brought the regulators and the regulated closer together; it also brought competitors together. The aviation industry today has an extraordinary array of professional associations organized around safety issues, industry-wide data-sharing agreements, and collaborative risk-management forums.²⁷

One of the most prominent of these is the Commercial Aviation Safety Team (CAST), established in 1997 as a government-industry group which set out to reduce the risk of fatal accidents by 80 percent in 10 years, a goal set by the Gore Commission. CAST brings together all major players in the commercial aviation business, including airlines, manufacturers, and industry associations, as well as the FAA, NASA, Department of Defense, and the Flight Safety Foundation.

Accidents, in this industry, hurt everybody. As a result, many ordinary barriers to communication have been broken down in order to advance the cause of accident prevention.

2.3 Accomplishments, and Limitations, of Process Management: Myriad processes underpin flight safety, and so *quality management*—which is the art of perfecting process-based performance and accuracy—counts a great deal. Maintenance operations can be precisely specified (in manuals), and must be precisely followed. Lots of core, high-volume, processes—from pilot training to the manufacture of aircraft parts—all need to be designed intelligently, constantly improved, and audited for quality. *Business Process Improvement*, *Process Re-engineering*, and more recently *Quality Management Systems (QMS)*, all of which originated with private sector manufacturing processes, have been widely imported into government and regulatory operations to help them manage their essential processes. Any regulator that oversees industry processes, and has a role in guaranteeing the accuracy and repeatability of those processes, clearly needs to understand the art of process management. Not only

²⁶ The Federal Aviation Reauthorization Act of 1996, Section 401, entitled “Elimination of Dual Mandate,” established safety as the FAA's highest priority, eliminating the dual mandate of the FAA in promoting air commerce. The Federal Aviation Act of 1958 contained the FAA's original charter.

²⁷ Examples include the *U.S. Commercial Aviation Safety Team* (CAST); international bodies such as the *International Civil Aviation Organization* (ICAO) and the *Flight Safety Foundation*; and numerous trade associations spanning every sector of the industry (e.g. AIA, GAMA, EIA, ARSA, IATA, ATA, RAA, NBAA, AOPA, AAPA, ACI, AAAE, etc.)

do regulatory agencies need to be able to audit the quality control systems operated by industry; they also need to manage their own processes.

The FAA's Office of Aviation Safety has done extremely well on this front, and is one of very few federal regulatory bodies to achieve ISO-9001 certification for its *Quality Management Systems*.

As the FAA's regulatory strategy continues to evolve, however, *Quality Management* will inevitably become a less-sufficient (while always necessary) methodology for advancing safety. The residual risks in aviation safety, given the progress already made, are now more one-off, complex in origin, and less clearly aligned with established processes.

Safety, which is the absence of risks, is quite different from *quality*, which is the absence of process-errors. Residual risks, over time, will align less and less often with specific process errors. Hazards will appear that belong in the "white space" between established processes. Hazards will result from complex and difficult-to-predict interactions between multiple systems, rather than in the failure of any one system.

The 2006 Comair crash in Lexington, Kentucky, helps illustrate this point. There was nothing wrong with the plane at the time; nor, as far as we know, with flight crew training. But, according to the National Transportation Safety Board (NTSB), human factors, some unusual features in the airport layout, construction underway, and other factors combined to produce a fatal attempt to take off on the wrong runway, which was too short.

The FAA, as it transitions to *Safety Management Systems*, faces many of the same organizational challenges that other regulators face, when they realize their major *problems* no longer align with their major *processes*. The Internal Revenue Service (IRS), in 1991, confronted the fact that the single most important tax-non-compliance problem in the U.S. tax system was *non-filers*,²⁸ and IRS executives realized that none of their core operational processes (tax-returns processing, audit and examination, taxpayer assistance) addressed this issue at all. The Environmental Protection Agency (EPA), traditionally organized around industrial facilities and discharge-permitting processes, had to work out quite different approaches and ways of organizing themselves in order to address problems like agricultural run-off, endangered species, and radon in homes.

Risks often don't fit. A central challenge in *risk-management*, for any organization, is to understand which risks have a natural home within the organization, and which ones do not. *Risks* that are related to failures or inaccuracies within specific processes may well be contained by applying the techniques of process improvement. All the others, which do not align with specific processes, will not.

²⁸ IRS officials use the term "non-filers" to describe people who have never filed a tax return, many of whom run cash-based businesses, and who can therefore remain invisible to the tax system. In 1991 there were an estimated 13-million *non-filers* in the U.S.

Aviation safety has now reached the point at which more significant gains are likely to come from the use of *Safety Management Systems* (SMS) than from further enhancement of *Quality Management Systems* (QMS). QMS guarantees processes and requires conformance with existing requirements; SMS is intended to mitigate residual risks. The FAA is currently in the process of designing its own approach to SMS, even while it holds on to all the important gains it has already made in the realm of QMS.

3.0 Observations on the Southwest and American Airlines incidents

As we consider more broadly the FAA's safety culture and approach to safety management, there are some particular observations that we believe we should make, regarding the events of this spring. We believe we can do so without trespassing at all on the territory of continuing inquiries or litigation, or revealing anything which has not already been publicly disclosed.

Our observations about the FAA's Southwest CMO relate to divergences of opinion inside the agency over regulatory style and methods, and the ways in which the FAA deals with conflict inside the agency. Our observations about American's grounding relate to opportunities to improve the AD procedure.

3.1 The Southwest Airlines Certificate Management Office: After the fact, no one disputes that the FAA office overseeing Southwest Airlines was dysfunctional, and had been for some years. The relationship between the Office Manager and the Principal Maintenance Inspector was "strained," and inspectors (including those who eventually became whistleblowers) had been complaining since 2003 that the PMI obstructed a number of enforcement actions they proposed to take against the airline.

In September 2005, an internal review was ordered, following allegations that the PMI permitted voluntary disclosure of violations already discovered by an FAA inspector (acceptance in these circumstances would violate the rules surrounding voluntary disclosure programs). In November 2005, the CMO manager asked the regional office to review the conduct of the PMI in permitting Southwest Airlines to make changes to its maintenance program without FAA approval. In December 2005, the CMO Manager asked for another independent review of the PMI's conduct, this time for issuing "carrier notifications" (which are relatively mild) rather than enforcement actions.²⁹

In early 2006, managers from the relevant Regional Office intervened on the basis that ongoing personality conflicts appeared to be adversely affecting the effectiveness of the Certificate Management Office, and provided counseling to the Office Manager and the

²⁹ "Actions Needed to Strengthen FAA's Safety Oversight and Use of Partnership Programs," Statement of The Honorable Calvin L. Scovel III, Inspector General, Department of Transportation, before the Committee on Transportation and Infrastructure, U.S. House of Representatives, Washington DC. CC-2008-046. April 3, 2008, pp. 10-11.

PMI.³⁰ In June 2006, an FAA Work Environmental Assessment Team (WEAT) was sent to conduct an on-site evaluation, and concluded that a “tense relationship” still persisted. Both managers were put on notice that such conflicts in the workplace were unacceptable, and would not be tolerated.³¹ Team building exercises were prescribed, and the WEAT action plan was completed by the end of 2006. Even so, the schism within the office deepened, with camps forming around the two managers and their starkly differing ideologies. In September 2006, a former FAA inspector (who had overseen Southwest’s maintenance operations) went to work for the airline as its Regulatory Compliance Manager, furthering the “appearance of impropriety.”³²

In April, 2007, the Regional Office called the WEAT team back in for a follow-up review, which revealed that the situation had actually worsened over time. In September 2007, another review by the FAA’s Security and Hazardous Materials Division produced a confession from the PMI that he had knowingly permitted SWA to continue flying 47 aircraft which should have been grounded:

“...I permitted unairworthy SWA aircraft to operate in revenue service, and I was wrong to do so. However, politically, I felt that grounding the SWA aircraft would have negative consequences for the FAA.”³³

During 2007, inspectors from the Southwest CMO began making the series of hotline complaints that culminated in the congressional inquiries of 2008.

According to the management team we interviewed at Southwest Airlines, it was largely oblivious of the schism within the FAA office, even though airline staff had daily contact with FAA inspectors and managers from that office throughout this troubled period. The agency apparently treated the problem as if it was about a conflict of personalities, rather than a conflict of regulatory ideologies or attitudes towards the law. Most of the early attempts at intervention emphasized “getting along,” team-building, and “presenting a united [FAA] face” to the outside world; not on resolving deeply incompatible beliefs about the choice of regulatory methods, or making principled determinations about who was wrong.

We will refer back to this observation in a later section of this report, which focuses on the FAA’s organizational culture. There, we will comment on the ways in which conflict is interpreted and handled within the agency.

3.2 Compliance with Airworthiness Directives at American Airlines: Reviewing the chronology of the events surrounding the grounding of the American Airlines MD-80 fleet, we cannot help but notice how quickly and easily the issue of compliance with

³⁰ See Statement of Nicholas A. Sabatini, Associate Administrator for Safety, FAA, before the Committee on Transportation and Infrastructure. Hearing on “Critical Lapses in FAA Safety Oversight of Airlines: Abuses of Regulatory Partnership Programs,” April 3, 2008, p. 9.

³¹ *ibid.*

³² “Actions Needed to Strengthen FAA’s Safety Oversight and Use of Partnership Programs,” Calvin L. Scovel III, p. 12.

³³ *ibid.* p. 18.

AD 2006-15-15 was resolved as soon as both sides (the FAA and American Airlines) were clearly focused on it, and were under some pressure to work it out. In fact, it only took five days from the discovery of continuing non-compliance (on April 7) for American's maintenance crews to carry out whatever re-work or repairs were needed, and for the FAA to approve their work. All the planes were deemed compliant, and back in service, by April 12.

It strikes us as obviously regrettable that this issue could not have been worked out earlier. From the issuance of the AD in 2006, American had 18 months to do the work on its MD-80s, and could presumably have asked the FAA inspectors to render their opinion on the adequacy of that work, even before the compliance date of March 5, 2008. When ADs are formulated and issued, there is currently no routine system for notifying the relevant AVS field offices. The airlines are told, of course, so they can get on with the work. But the ADs do not figure in the FAA's inspection scheduling or workload planning until the compliance date has already passed. So any differences of opinion about how literally an AD should be interpreted would not routinely surface until too late—when non-compliance has already become a potential enforcement or grounding issue. Both the FAA and the airlines would clearly benefit from the opportunity to raise and resolve such differences in advance, without all the stress and adversarial interactions that accompany grounding decisions.

We will address the implications of this observation under the following section, which relates to the management of the AD process in general.

4.0 Airworthiness Directives

Airworthiness Directives are federal regulations and one of the FAA's strongest instruments for compulsion. Carriers are prohibited from operating any plane that is out of compliance with any applicable AD.

While the legal position is unambiguous, the practical realities of the AD process are quite complex. Airlines receive hundreds of ADs relevant to their fleets, each year. Most aircraft come in multiple configurations, and AD prescriptions may be easier to follow for some configurations than for others. ADs quite commonly incorporate an aircraft manufacturer's Service Bulletin (SB) by reference, in which case all of the details of the Service Bulletin's recommended approaches acquire the force of law. Some ADs lack clarity. Older ADs sometimes remain in force (i.e. are not rescinded or adjusted) even after replacement or substitute materials or technologies have rendered them obsolete. Also, ADs can accumulate, in the sense that multiple successive ADs relating to the same aircraft system may remain in force at the same time, leaving the airline to integrate all the requirements, and the mandated inspection schedules, and to sort out any apparent contradictions.

Law is almost never perfect, and can always be improved. Imperfections in law, and simple differences of interpretation, produce the possibility of *nasty shocks* for a regulated industry. As a general rule, regulators ought not to be in the business of

delivering nasty shocks. Clarity of the rules, advance warnings, sufficient discussion, open communication channels, and rapid resolution of disagreements, all go a long way towards eliminating the chance of such unpleasant and disruptive shocks.

The FAA has already formed an *AD Compliance Review Team*, which includes FAA executives and airline industry representatives, to examine the AD process and to improve all of these protections.³⁴ That review team will, in due course, recommend ways of improving the drafting, review, and integration of ADs; and the audit and enforcement of AD-compliance.

While the IRT believes such work is important, we do not expect any amount of improvement in the quality of ADs themselves to entirely eliminate the scope for differences in interpretation. Different airlines, and different inspectors, may well interpret the detail of AD specifications more or less literally; and where differences of opinion do emerge, the potential for grounding will always remain.

In our view there are four possible approaches to potential development of the AD process, and we support just three of these. The four possibilities are:

- (a) Improve the quality and clarity of the ADs themselves.**
- (b) Improve the accessibility, timeliness of response, and efficiency of the AMOC process:** (whereby airlines can seek and obtain FAA approval for deviations through approved “Alternative Means of Compliance” orders).
- (c) Introduce *progress-towards-compliance* audits, in advance of AD compliance dates:** so that airlines and their FAA counterparts can identify and resolve discrepancies in advance:
- (d) Expect FAA inspectors to apply risk-assessments to AD non-compliance determinations, in terms of whether or not deviations present *safety-of-flight* concerns.**

On the subject of AD enforcement, at least two contrasting points of view have been expressed to us. One commonly expressed view is that:

- drawing a distinction based on the presence or absence of *safety-of-flight* issues has underpinned the FAA’s ordinary use of discretion in relation to AD non-compliance;
- traditionally, the FAA has informally resolved minor AD non-compliance issues with the carriers without halting airline operations;
- such common sense ought to prevail;
- grounding entire fleets over trivial issues makes no sense;
- the FAA is “supposed to be risk-based.”

³⁴ Acting FAA Administrator Robert A. Sturgell created the team in April 2008, in response to the SWA and AA incidents, and the resulting concerns surrounding AD compliance. As of the date of this report, the AD Compliance Review Team approaches completion of Phase I, which examines the history and management of AD 2006-15-15 in particular. Under Phase II, the team is obliged to examine the AD process more broadly, and recommend improvements.

A different view, expressed by the majority of FAA inspectors, is: “An AD is an AD. If you don’t comply, you don’t fly! That’s the law.” The vast majority of inspectors we interviewed did not *want* to have to establish whether or not a non-compliance issue they identified represented a “safety-of-flight” issue, or was a “major” discrepancy. Trying to apply any such evaluative criteria, at that point during an enforcement encounter, would introduce to the enforcement decision process all kinds of subjective judgments, and possibly some complex engineering questions, all of which should have been addressed during the formulation of the AD itself. Being required to conduct “risk-assessments” after discovering AD non-compliance would, in the inspectors’ view, completely undermine their authority.

The IRT strongly opposes any move to require or expect inspectors to make safety-of-flight determinations, or other risk assessments, before taking enforcement action in relation to AD non-compliance. Of course, a regulator should not be prohibited from applying his or her professional judgment and discretion. Indeed, society relies on the professional judgment of regulators, and sensible application of the law, to prevent regulatory regimes from becoming oppressive, unresponsive, or absurd. But *mandating* the use of evaluative criteria, which themselves could never be unambiguously defined, would likely undermine the FAA’s ability to take effective enforcement action when necessary.

We feel that it is vital for the FAA to retain the right to ground *any* aircraft found out-of-compliance with *any* relevant AD, without having to prove anything else at that moment. ADs ought, by definition, to relate only to issues of *airworthiness*. Thus *out-of-compliance* means *unairworthy*. Safety would not be well served, in our view, by introducing ambiguity or complexity, or permitting obfuscation of this basic principle.

We believe the question of whether a “safety-of-flight” issue exists should be resolved during the formulation of an AD (during the rule-making process) so that this question does not *need* to be raised after the fact. The FAA has a variety of softer tools available (e.g. issuing advisories, providing information, education, and guidance) for issues that do not require the force of law, and the agency may need to apply more selective filters to the AD process. Moreover, better-drafted ADs would clearly distinguish which items in a service procedure were mandatory, and which were advisory. To the extent that parties may still differ on the issue of just how literally one has to read an AD’s requirements, we very much hope that option (c)—the introduction of *progress-towards-compliance* audits—will lower the stakes substantially when such differences do surface.

The IRT supports the AD Compliance Review Team’s examination of the AD and AMOC processes, already underway. We imagine its examination will include, among other matters, the following:

- the filtering of issues to be dealt with through the AD process rather than through alternate (less prescriptive) mechanisms;

- accuracy and clarity in the drafting of ADs;
- consideration of prohibiting *unsafe* configurations, as an alternative approach to mandating one particular *safe* alternative;
- integration of multiple ADs addressing similar or related issues, rather than permitting possibly contradictory ADs to accumulate, which the carriers then have to reconcile;
- sufficiency of the opportunities for stakeholders to engage in discussion, during the notice-and-comment period, before the language of an AD is finalized;
- clear delineation, within the text of an AD, of what is mandatory and what is advisory or procedural, particularly when highly detailed Service Bulletins are incorporated by reference, or where sketches or diagrams are used to illustrate a configuration;
- preliminary feasibility assessments of ADs for practicality (e.g. through collaboration with *lead-airlines* where these are designated for a particular aircraft type);
- accessibility, timeliness, and efficiency of the AMOC process, for use after an AD has been finalized;
- availability of engineering clarifications when carriers and their respective CMOs differ in technical interpretation of an AD's requirements.

The IRT has two recommendations regarding the management of Airworthiness Directives:

4.1 Recommendation: The FAA should retain the right to ground any plane not-in-compliance with an applicable AD. Inspectors should not be required or expected to conduct any type of risk-assessment before taking action on AD non-compliance.

4.2 Recommendation: The FAA should provide timely information about new AD requirements, in advance of compliance dates, to all relevant FAA field offices. Those offices should then be responsive to any carrier that requests assistance in the form of *progress-towards-compliance* audits or reviews, in advance of the AD compliance dates. The FAA should revise its workload management systems (including ATOS), so that it can accommodate such requests.

The IRT believes that this particular form of collaboration should benefit the airlines and the FAA, while protecting the traveling public by reducing the chances of major disruptions.

5.0 Voluntary Disclosure Programs

The congressional hearings in April raised serious concerns about the value and conduct of the FAA's voluntary disclosure programs. Congressional investigators, as well as the DOT Inspector General's office, continue to examine the extent to which

repeat or duplicate submissions may have been improperly accepted by the FAA from Southwest Airlines, and from other carriers too.

In the worst-case scenario, voluntary disclosure programs could be undermining compliance while offering nothing in terms of safety enhancements. They could, in essence, provide an easy way for airlines to avoid enforcement action, even while the airlines repeatedly failed to fix the safety issues disclosed.

The FAA operates multiple voluntary disclosure programs. The three most prominent ones are the FOQA, ASAP, and VDRP programs.³⁵

- *Flight Operations Quality Assurance (FOQA)*: FOQA collects and makes available for analysis digital flight data generated during normal operations. It provides objective data not available through other methods, supporting analysis and enhancement of operational procedures, flight paths, air traffic control procedures, maintenance, engineering, and training. The final FOQA rule, issued in 2001,³⁶ codifies protections for airlines from the use of FOQA data for enforcement purposes, except where criminal or deliberate acts are involved. Only redacted versions of the data (de-identified and aggregated) are reviewed for operational trends.
- *Aviation Safety Action Program (ASAP)*: This program encourages industry employees to report safety information that may be critical in identifying potential precursors to accidents. Safety issues are normally resolved through corrective action rather than through punishment or discipline. ASAP reports are discussed, and corrective actions formulated, by an *Event Review Committee (ERC)*, which typically comprises representatives from the company, the employee's union (when applicable), and the FAA.
- *Voluntary Disclosure Reporting Program (VDRP)*: This program encourages regulated entities themselves (e.g. airlines, repair stations, etc.) to voluntarily report instances of regulatory non-compliance. This enables the FAA to participate in root-cause analysis of events leading up to violations, and to propose and monitor corrective actions.

All three of these programs are now well established. Twenty airlines now participate in FAA-approved FOQA programs. As of April 2008, 73 operators had established a total of 169 ASAP programs, covering pilots, mechanics, flight attendants and dispatchers.³⁷ The number of VDRP disclosures nationally, from air carriers, now exceeds 100 per month.

Each program has rules and restrictions attached, designed to protect those who make well-intentioned disclosures at the same time as preventing the erosion of compliance that might result from abuses of voluntary reporting. Under these guidelines, the

³⁵ Summary information on these programs, released April 2 2008 as an FAA Fact Sheet, can be found at: http://www.faa.gov/news/fact_sheets/news_story.cfm?newsID=10199&print=go

³⁶ 14 CFR Part 13.401. Issued October 31, 2001.

³⁷ FAA Fact Sheet, April 2, 2008.

protection against enforcement will not apply to any actions which are intentional or criminal, which had already been detected by the FAA, which resulted in accidents, or which were not reported in a timely fashion. The rules also prohibit the acceptance, by the FAA, of disclosures that duplicate prior events. Companies submitting a voluntary disclosure (under the VDRP) program are obliged to develop, implement, and demonstrate the effectiveness of a “comprehensive fix,” sufficient to prevent further occurrences of the same violation.

The IRT has discussed the FAA’s voluntary programs with virtually everyone we have interviewed. We have found no other subject on which there is such unanimity. Industry representatives and regulators alike all understand the central role these programs play in the pursuit of safety enhancements. They all understand that the majority of the information on which such enhancements now depend would not surface at all if not voluntarily disclosed. Interviewees expressed considerable anxiety over the possibility that the FAA, accused of excessive coziness, would react by distancing itself from industry in a manner that would undermine the trust and collaboration on which these programs depend.

The IRT emphatically reaffirms the value of these programs. Equally emphatically, we reaffirm the importance of the controls designed to prevent the erosion of compliance. For these programs to survive, and for them to operate in a healthy manner, strict and demonstrable adherence to the rules is crucial.

The rules in place, designed to preserve the integrity of these programs, seem to us quite adequate. We have compared the protections against abuses of voluntary reporting across a number of other major Federal agencies. The EPA, Occupational Safety and Health Administration (OSHA), Department of State (DOS), Department of Defense (DOD), IRS, Transportation Security Administration (TSA), Department of Health and Human Services (DHHS), Nuclear Regulatory Commission (NRC), and Securities and Exchange Commission (SEC) all operate voluntary disclosure programs.³⁸

In all nine of these (other) regulatory settings, the voluntary programs focus primarily on disclosure of *violations*, as opposed to other kinds of incident. So, in this regard, these programs are more like the FAA’s VDRP Program than the FOQA or ASAP programs (ASAP reports are prompted by any kind of safety concern, not necessarily involving a violation). Seven out of these nine programs (EPA, OSHA, DOD, TSA, DHHS, NRC & SEC) also focus on disclosure by *companies*, rather than by individuals; and the fact of the disclosure primarily affects the likelihood or severity of enforcement action against the regulated commercial entity itself, rather than its officers or employees. In this regard, too, these programs have more in common with VDRP than with either FOQA or ASAP.³⁹

³⁸ The DHHS and DOD programs are each operated by those agencies’ Inspector General’s Office.

³⁹ Some of these other agencies (e.g. EPA, NRC) also collaborate extensively with industry on data and information sharing programs, in arrangements more analogous to FOQA.

The IRT notes that the FAA's VDRP program has drawn most of the congressional criticism of late, rather than ASAP or FOQA. In part, this focus results from specific perceived breaches of the guidelines in relation to recent VDRP submissions and acceptances. In part, this particular focus may also stem from the fact that *corporations violating the law* evoke considerably less public sympathy than *individuals making mistakes*. So the fact that the majority of the other Federal voluntary programs focus on corporate violations seems significant to us. It points to the general value in regulators knowing more, rather than less; even in cases where the violators might not naturally attract much public sympathy.

These other nine Federal agencies also use guidelines similar to the FAA's to restrict what types of violation they will accept as voluntary disclosures. The most common restrictions are:

- a) exclude serious violations, such as criminal or deliberate acts. (EPA, NRC, SEC);
- b) require some level of prior good behavior. (EPA, OSHA⁴⁰, NRC);
- c) require a demonstration that the violation has been corrected, and the underlying problem fixed so it will not recur. (EPA, OSHA, TSA, NRC, SEC);
- d) require prompt discovery and/or disclosure of the violation. (EPA, DOD, TSA, SEC);
- e) exclude violations detected or about to be detected by the regulator or by any other means, including reports from third parties. (EPA, OSHA, DOD, TSA, SEC);
- f) exclude violations that resulted in actual harm. (EPA, OSHA);
- g) exclude violations that indicate a lack of qualification or adequate training. (TSA).

Several agencies also offer no guarantee against enforcement action in any case, reserving the full range of their discretion (DOS, DOD, IRS, DHHS, NRC, SEC). The incentive to disclose, in the absence of any formal guarantees, thus depends only on the regulated community's observations, accumulated over time, about the way in which the regulator treats those who choose to disclose.

The FAA's restrictions on the VDRP Program include (a), (c), (d), (e), (f) and (g) above.⁴¹ This combination makes the VDRP more tightly circumscribed than most of these other Federal programs. The problem, if there is one, is in the FAA's adherence

⁴⁰ OSHA operates several different voluntary programs. These observations relate to the Voluntary Protection Programs (VPP), where OSHA establishes partnership arrangements with corporations willing to establish comprehensive safety and health programs.

⁴¹ FAA Advisory Circular 00-58A, dated 9/8/2006. "Voluntary Disclosure Reporting Program." Paragraph 6. Pages 3-5. In relation to (e), it should be noted that violations, or the possibility of violations discovered first through the ASAP program (i.e. reported by an individual employee of the company) can lead to submission of a voluntary disclosure by the company under the VDRP program. This is expressly permitted (FAA Advisory Circular 00-58A, at paragraph 7(c), page 5), provided the disclosure is made promptly once the violation or potential violation is established.

to these rules, and not in the nature of the programs, or in the adequacy of the rules themselves.

The FAA has recently taken additional steps to ensure adherence to the existing program rules.⁴² As of May 1, 2008, acceptance of a (VDRP) voluntary disclosure requires the signatures of the FAA CMO Office Manager and of a designated corporate officer for the carrier. Greater emphasis is also to be placed on the requirement for a comprehensive fix, and for both parties to monitor the impact of that fix.

The IRT believes these enhancements are appropriate, and that the overall package of restrictions on disclosure acceptance by the FAA is sufficient. Ongoing congressional review and inquiries by the DOT Inspector General's office will reveal to what extent the FAA may have operated these programs in an overly permissive manner in the past.

The IRT believes that routine audits of voluntary submissions—in order to make sure the FAA is not accepting disclosures in contravention of the guidelines—is important to preserve the health of these programs. Conducting or validating such routine audits appears to us a natural task for the DOT Inspector General's office.

The IRT therefore reaffirms the importance of the FAA's voluntary programs. In the immediate wake of the congressional hearings, some airlines reported to us that their ASAP report-submission rates had dropped substantially, indicating a decline in the extent to which their employees trusted the FAA to treat them appropriately. Fortunately, the passage of time seems to be settling the situation. As of the date of this report, industry-wide reporting rates seem to have stabilized close to their prior levels.

The IRT would like to offer the following recommendations regarding the FAA's voluntary programs:

5.1 Recommendation: The FAA's Voluntary Disclosure Programs are vitally important to the future of aviation safety, and should be retained. The use of voluntary disclosures, appropriately circumscribed, is a well-accepted component of any modern regulatory toolkit. In the FAA's case (just as in the case of the Nuclear Regulatory Commission) accidents are now sufficiently rare that the potential for further safety enhancements, and the identification of emergent risks, belongs firmly in the realm of early precursors to an actual disaster. Given that most precursor events are known only to those directly involved, and might otherwise remain hidden from the authorities, the FAA depends heavily on voluntary disclosures and collaborative interventions to identify and mitigate risks. For these reasons, we believe these programs have even greater significance within the field of commercial aviation safety than in most other regulatory settings.

5.2 Recommendation: The FAA must abide by the rules circumscribing these programs in order to prevent the erosion of compliance. We believe that the rules

⁴² On May 1, 2008 the FAA issued an amendment to the Voluntary Disclosure Reporting Program Notice, strengthening controls on acceptance of voluntary disclosures. Reference: N 8900.39.

currently in place are sufficient. We also believe that recent actions by the FAA, as suggested by the DOT Inspector General, to require higher level managerial approval of acceptances and to emphasize comprehensive fixes and monitor their effectiveness, should all help to guard against abuses and preserve the integrity of these regulatory instruments.

5.3 Recommendation: VDRP data have not been routinely analyzed at a higher level within the FAA. There are two quite different purposes for such analysis, both of which the FAA should formally recognize.

One purpose treats VDRP data, along with ASAP and FOQA data (and data from many other sources) as a potential contributor to the identification of trends and patterns that represent risks. In this regard, VDRP data becomes one input, among many, for the analytic operations that belong at the heart of the FAA's Safety Management System (which is discussed later in this report).

The second purpose guarantees the integrity of the voluntary programs themselves, eliminating any of the downside risks to compliance that might result from abuse. Audits of the disclosures and acceptances can validate adherence to program rules, and ensure the FAA is not accepting repeat or duplicate disclosures from the same regulated entity. Such repeat disclosures could indicate a failure to implement effective or sufficiently comprehensive fixes the first time around. Any willingness on the part of the FAA, real or perceived, to accept such repeat disclosures would undermine incentives for compliance.

Even though aggregate VDRP data may eventually reside in one place within the FAA, these two purposes for analysis of it remain quite separate and should never be confused.

5.4 Recommendation: The number of voluntary disclosures made by a regulated entity is a composite measure, and should not be used either as a performance metric or as a risk-factor, in any context.

The rate at which an airline or its employees *disclose* problems is the product of the underlying rate at which they *experience* problems, multiplied by the rate at which they report the problems they experience. When all is well, the underlying problem-rate would be low, and the reporting rate would be close to 100%. The overall disclosure rate, based on that combination, would be middling. Exactly the same disclosure rate, however, might be produced if the problem rate were high and the reporting rate was very low—in other words, in the worst of all possible worlds. When such composite measures move up or down, or vary across airlines, one cannot normally tell which is different: the underlying problem-rate, or the willingness to report. So, in the absence of systematic or scientific approaches to unbundling them, it is misleading and potentially dangerous to interpret variation in such metrics as either good or bad.

Where the two factors cannot be separated, the product of the two remains essentially ambiguous.⁴³

The FAA should avoid using *disclosure rates* within its own risk-assessment methodologies, unless it combines them with independent assessments of the *reporting culture* of regulated entities. Also, the FAA, in assessing the *safety-culture* of different entities,⁴⁴ might pay particular attention to any airline that sets performance goals, or incorporates metrics into executive performance bonus plans, that reflect a desire to drive down the number of voluntary reports submitted.⁴⁵ Such pressures, however subtly or unwittingly transmitted through the organization, might lead to the suppression of reports.

5.5 Recommendation: It is clear to the IRT that participation in all of the voluntary disclosure programs is dependent on the assurance of confidentiality for information submitted. The IRT believes the FAA should resist any efforts to relax or eliminate any restrictions on disclosure.

6.0 Culture of the FAA

Secretary Peters asked the IRT to pay particular attention to the culture of the FAA, and to assess the ways in which various aspects of the culture might affect the FAA's contributions to aviation safety. In addressing this question, we have found it useful to segregate our assessments under three different headings: *safety culture*, *regulatory culture*, and *organizational culture*.

Under *safety culture* we consider the weight the FAA gives to safety vis-à-vis other competing organizational or performance imperatives.

Under *regulatory culture* we consider the range of beliefs or preferences held by different staff members with respect to choice of regulatory style and regulatory methods. We also consider the degree to which multiple regulatory tools are properly integrated within the organization, so that the FAA's overall regulatory posture and strategy appears coherent and appropriate.

Under *organizational culture* we consider the prevailing nature of supervisory and peer-to-peer relationships, the frequency and nature of conflict, the approach of the

⁴³ For a discussion of the behavior of such metrics, see Chapter 8, "Invisible Harms," in The Character of Harms: Operational Challenges in Control, Malcolm K. Sparrow, Cambridge University Press, 2008, pp. 181-194.

⁴⁴ Which it is required to do under the developing SMS Program.

⁴⁵ Any pressure to change voluntary disclosure rates is liable to produce perverse incentives. Pressure to *decrease* the reporting rate is liable to undermine "willingness to report." Pressure to *increase* the reporting rate would likely produce a flurry of spurious and trivial reports, with little or no value other than the appearance of openness.

organization to dealing with conflicts when they arise, and the treatment of whistleblowers.

6.1 The FAA's Safety Culture: During the course of this project, the IRT has met with over 400 FAA employees in total, representing every level of the organization and spanning four major regions as well as headquarters. In general, we have been impressed with the motivation and dedication of the FAA workforce. The vast majority of FAA employees are proud of the organization and its accomplishments, pleased to work where they do, and wholeheartedly committed to the mission of advancing aviation safety.

We noted earlier that the FAA's charter was amended in 1996, when those parts of its earlier mandate that related to the promotion of civil aviation were removed, leaving the agency with a solitary focus on safety. In that sense, the phrase "safety culture" should not and does not present the same challenge for the FAA as it might for a business enterprise. In a commercial setting, business imperatives tend to dominate safety concerns unless management takes deliberate steps, and builds the requisite culture and systems, to prevent that from happening. The FAA has no competing purpose, and so one would expect all the staff and every unit within the agency to display an unambiguous focus on the safety mission. It seems to us that they do.

The FAA, like all other regulators, faces the danger of *regulatory capture*. Capture occurs when a regulatory agency draws so close to those with whom it deals on a daily basis (i.e. the regulated) that the agency ends up elevating their concerns at the expense of the agency's core mission.⁴⁶ One feature of the FAA's current structure has the potential to increase this risk: the inspection teams are mostly organized around *airlines*, rather than cutting across multiple airlines and organizing around some other dimension, like geography, or type of plane. Most regulatory agencies organize by broad functional areas (like enforcement, education, etc.) and also by geography; as a result, any one inspector normally deals with multiple corporations on a daily basis. By contrast, the majority of FAA airline inspectors are assigned to a specific Certificate Management Office, and deal with exactly one airline, full time, and for many years at a stretch (e.g. the "Southwest CMO" deals only with Southwest, and is responsible for Southwest Airlines' operations everywhere).

Fortunately the risk of regulatory capture is mitigated to a degree by another factor. Safety risks represent very substantial *business* risks, both for aircraft manufacturers and for aircraft operators. For any airline, a serious accident represents a business catastrophe as well as human catastrophe.⁴⁷ Thus, on the issue of safety, the business interests of the airlines and the public mission of the FAA do not diverge so much as they might in other regulatory settings.

⁴⁶ For a discussion of the phenomenon of *regulatory capture* see: The Regulatory Craft: Controlling Risks, Solving Problems, and Managing Compliance, Malcolm K. Sparrow, Brookings Press, 2000, pp. 35-36, 63.

⁴⁷ Consequently—to borrow a concept from economics—the airlines *internalize* safety risks more than they might occupational or environmental risks, the effects of which fall outside the corporation's interests (i.e. these are "*externalities*.")

It would still be a mistake, of course, for the FAA to allow any confusion on the question “Who are the customers?” to persist. Given the accusations of excessive coziness, and the existence of the FAA’s *Customer Service Initiative*, some have considered proposals to regulate or restrict the use of terms such as “customer” and “customer service” within the FAA.

In our view, regulating the FAA’s use of language should be unnecessary. It would be awkward in any case to try to control the use of language or attitudes through statute.

Moreover, *all* regulatory agencies—not just the FAA—have to grapple with the fundamental realities of regulatory life, which include the following points:⁴⁸

- A regulator’s job is primarily to deliver *obligations*, not *services*.
- All regulatory functions constitute an anomaly in the context of “customer-driven government.” The person *dealt with* is often not the person *served*. The person *dealt with* is not usually paying for the service, has no choice as to whether or not to accept the service, and is often not the one that benefits from the service. There is generally no reason to expect that the person *dealt with* will be “pleased.” Social regulation exists, after all, to provide public goods rather than private satisfaction.
- Regulators need a more nuanced vocabulary to describe different parties to regulatory action, so as to avoid the confusion generated if the only word used, or not used, is “customer.” Regulators use a broader set of terms to describe the various parties with whom they deal, and the various interests they need to recognize. Common terms used include *beneficiaries*, *stakeholders*, *regulated entities*, *regulated communities*, *industry*, *client groups*, *public*, *citizens* and *taxpayers*.
- Regulators are obliged in any case to treat *all parties* with dignity, civility and respect, and to recognize the rights of all groups with whom they interact. This notion does not in any way conflict with retention of an uncompromising focus on regulatory objectives.

FAA managers appear to us to be keenly aware of these truths, and the leadership of the Aviation Safety Organization has already taken steps to promulgate that message throughout the agency, especially since this spring.

The FAA’s *Customer Service Initiative* (CSI) is intended to provide an appeal mechanism for regulated entities, for use when they felt unfairly or inconsistently treated. Most carriers have used this mechanism seldom or never, and do not feel they need it. The IRT absolutely understands and supports the need for speedy resolution of regulatory disagreements, and recognizes the need for higher level review of critical enforcement decisions. We do feel the CSI was poorly named, and this may have

⁴⁸ For a more detailed discussion of the limitations of a “customer-service” mindset, in regulatory settings, see: Chapter 4, “Customer Service: Merits and Limits,” in *The Regulatory Craft: Controlling Risks, Solving Problems, and Managing Compliance*, Malcolm K. Sparrow. Brookings Press, 2000.

provided fuel for perceptions of inappropriate coziness. On balance, the IRT feels that the existence of such an appeal mechanism is important.

6.2 The FAA’s Regulatory Culture: While FAA staff may all agree about the regulatory *goals*, they display a remarkable range of views when it comes to regulatory *style* and *methods*. Some believe passionately in the importance of enforcement, and see close relationships with industry as inherently dangerous and potentially corrupt. A larger number believe (equally passionately) in the value of close collaborative partnerships, and these officials worry that harsh enforcement will damage trust, forcing the regulated entity to withdraw from collaboration and “clam up.”

Modern regulatory agencies have at their disposal a broad range of tools. The most effective agencies can use them all, whenever appropriate, and can also put on different regulatory “faces” at different times. There is no reason why a regulator should not run the toughest of enforcement campaigns against persistent and egregious offenders, and the very next day use less adversarial behavior-modification methods and collaborative risk-mitigation approaches with audiences and on problems for which such methods work better. Ordinary professional judgment, for any regulator, involves picking the right tool for the task, over and over again, across a diverse range of tasks.

For any one task, there will always remain some room for disagreement about which tool is best, or which combination of tools. But what is genuinely harmful, within a regulatory agency, is where differences of professional opinion rise to the level of competing ideologies, or fundamentally irreconcilable beliefs about “*who we are and how we operate*.” When that happens, schisms appear, camps develop, enmities form, and—in the worst cases—professionals actively seek to undermine each other’s careers, genuinely believing they are each acting in the public interest.

The IRT has observed a surprisingly wide range of regulatory ideologies alive and well within the FAA. In the case of the Southwest CMO, contrasting beliefs about the right way to manage the airline turned into a bitter professional feud, which continued to fester for several years despite several attempts by management to intervene.

The IRT cannot say with any confidence that potentially dangerous conflicts do not exist anywhere else in the organization. However, we have not found any other CMOs where such conflicts have produced the level of dysfunction that reportedly existed in the Southwest CMO prior to its shake-up and managerial overhaul earlier this year.

We can say, for sure, that in *most* of the FAA offices we visited we found inspection teams to be harmonious, professional, and mutually supportive, even while they accommodated a range of personalities and viewpoints. These tended to be the offices with experienced and widely respected management teams, who were clearly effective in establishing an appropriate regulatory tone, were happy to discuss—at length if necessary—different points of view about what ought to be done, and not the least bit threatened by the idea of calling in a second or third opinion when views did not align. In these offices, conflict was healthy. Differences were aired. Nothing festered. Managers would make the decisions commensurate with their pay grades, and explain

them openly. Difficult cases were discussed at greater length, and calling in independent views (from outside the office if necessary) was regarded as a perfectly ordinary part of professional life.

We have found other regions where sharp differences of opinion seem to exist. Potentially, such conflicts could escalate if and when some high-stakes decisions arise.

Two particular phenomena tend to confirm our fears that sharply conflicting regulatory ideologies not only exist, but are allowed to persist within the FAA with little or no attempt to resolve or manage them. First, we are told that in some CMOs, a very high proportion of the enforcement actions taken and penalties imposed result from the activities of a very small proportion of the inspection team. In at least one case reported to us, the bulk of the enforcement actions against a major airline is initiated by just one inspector. Perhaps surprisingly, this situation apparently persists even now, long after the events of this spring provided the agency a rather serious opportunity to reflect on its methods, style, and regulatory decision-making processes. We would assume that a team of inspectors, dealing with the same airline, sees roughly the same degree of compliance day by day. In which case, the fact that one or two inspectors take virtually all of the enforcement actions, while the others obviously reject that approach, ought to concern the management and leadership of the organization. Maybe it does. But the situation persists.

Secondly, some enforcement-oriented inspectors are described in quite different ways by different parties. Airline officials frequently have referred to them, in discussions with the IRT, as “rogue inspectors,” and sometimes go on to characterize their behaviors as aggressive and belligerent. Those that do refer to inspectors in these terms expect the CMO management (the Office Manager and Principal Inspectors) to manage the “rogues” and keep them under control, so that the collaborative relationship between the CMO and the airline is not destroyed.

We have heard FAA management use the same term, and we have no doubt that some genuine “rogues” exist within any large workforce. But we are disturbed by the frequent association of the term “rogue inspector” with an apparent preference for enforcement methods. We seldom heard any inspector referred to as a “rogue” who was not also forceful on the enforcement front. If “rogueness” related to personality, demeanor and civility, rather than to choice of regulatory instruments, then there is no reason why the rogues would all turn out to be enforcement-minded.

We have also met several inspectors whom we had previously heard others describe as “rogues.” Several of them seemed articulate, sophisticated and professional, as far as we could tell from our meetings. Of course, from the *rogues’* point of view, they are the ones doing the vital work of the agency, while everyone around them has gone soft and is no longer providing adequate protection for the public. Substantial numbers of their peers see more enforcement-minded inspectors in this somewhat heroic light too, and applaud their stance. From that camps’ perspective, any attempt by the CMO management team to “manage” them would constitute improper managerial interference with the enforcement authority or professional judgment of an inspector.

It is remarkable to us just how often we have heard precisely the same situation, involving the same inspectors, described by different people in diametrically opposite ways.

The prevailing wisdom, in the wake of the Southwest CMO events, was that the most serious errors were made by one Principal Maintenance Inspector who obstructed enforcement actions proposed by subordinates. That is what ultimately embarrassed the agency most of all, in that instance. Perhaps the public airing of that case, and the resulting actions taken against that particular PMI, are still having the effect of inhibiting managers elsewhere from interfering too much in lower level enforcement decisions. Perhaps that explains to some degree why significant disparities in opinion about choice of regulatory methods persists in some offices, even now.

The IRT views the persistence of such starkly contrasting regulatory ideologies in a small number of FAA offices as worrisome. We cannot say, though, whether these contrasting beliefs have as yet resulted in any regulatory negligence, or in any regulatory oppression.

From these observations, the IRT suggests a number of improvements:

- We believe the FAA still needs some mechanisms for identifying and dealing with potentially troubled offices, where sharp conflicts of regulatory ideology persist over time, and where these conflicts could in time produce serious errors in regulatory decision making.
- We believe the role of Office Managers and Principal Inspectors is pivotally important, and that training for these ranks should cover:
 - the management of contrasting regulatory views within the workforce,
 - methods for moderating extremes in regulatory style, and
 - methods for optimizing the regulatory effectiveness and coherence across a diverse team of inspectors.
- We believe the FAA needs a method for reviewing the overall regulatory functioning of CMOs, using teams of experienced managers drawn from other regions.

We note the creation, as of March 26, 2008, of the *Flight Standards Service Internal Assistance Capability* (IAC). Although this is a new program, and not yet much exercised within the agency, we recognize the alignment of its design purpose with the type of office-based interventions that we feel might be helpful with respect to regulatory culture. We also note the suitability of the staffing model proposed, with intervention teams consisting of experienced managers drawn together on a geographic or regional basis, but with visible independence from the office to be reviewed.⁴⁹

⁴⁹ The *Flight Standards Evaluation Program* (FSEP), created in October 2001, has some similar features, and was designed to “conduct independent reviews of programs within the Flight Standards Service in order to identify and correct systemic weaknesses.” The FSEP program emphasizes a structured and systematic approach, focused on the implementation and consistent application of

6.3 The FAA’s Organizational Culture: Under this heading, the IRT considered the nature of supervisory and peer-to-peer relationships, the frequency and nature of conflict, the range of reporting mechanisms and hotlines available within and outside the agency, the approach of the organization to dealing with conflicts when they arise, and the treatment of whistleblowers.

6.3.1 Whistleblowers: The treatment of whistleblowers, and protections for them, are already tightly prescribed by federal law and regulation. Several inquiries, past and current, conducted or directed by the DOT Inspector General’s office, and by the U.S. Office of Special Counsel, are examining the extent to which the FAA is living up to its obligations with respect to the treatment of whistleblowers. We do not propose to comment on these matters, which are still under investigation.

6.3.2 Characterization of conflict: We have previously noted (in the introductory section of this report) how the persistence of dysfunction within the Southwest CMO might have resulted, at least in part, from the agency’s mischaracterization of the problem as *personality*-based, and its failure to identify and resolve conflicting beliefs about regulatory strategy.

6.3.3 Sign-off on critical or contentious decisions: In general, we recognize the need for higher-level managerial review and sign-offs for important enforcement decisions, and for acceptance of voluntary disclosures under the VDRP. We believe changes already instituted take care of these needs.

6.3.4 Availability of reporting mechanisms: We have reviewed the number of FAA and other government-operated hotlines available to staff within the agency and throughout the airline industry. The principal avenues for the resolution of safety issues, complaints or grievances are as follows:⁵⁰

- a) Line Management: FAA or industry staff can raise issues with their own line management, in the normal fashion
- b) Consumer Hotline: This provides consumers (i.e. airline customers) an avenue “to report or ask questions on matters within FAA’s purview.”⁵¹
- c) Whistleblower Hotline: This is for air carrier and industry whistleblowers, seeking to report safety issues to the FAA. The Whistleblower Protection

regulations and policy. The IRT therefore assumes that FSEP audits might also constitute relevant means for identifying wide variations in regulatory approaches within and across field offices. It is not clear to the IRT, having never witnessed either an IAC or FSEP audit, how these two types of review actually differ in practice. We recognize, however, that FSEP audits could quite plausibly be deployed instead of, or in conjunction with, IAC reviews. For details of the FSEP program, see: Quality Procedures Manual. AFS-40. Appendix 19. Effective November 21, 2002.

⁵⁰ Information compiled by the FAA in response to IRT request. Briefing paper: “FAA Hotlines and Related Programs.”

⁵¹ Established in June 1985. The consumer hotline received 7,060 calls in FY 2007.

Program was established in April 2001,⁵² and is broadly publicized throughout the industry.

- d) FAA Safety Hotline: This is designed to capture and respond to potentially urgent safety matters, by ensuring that *anyone* “with knowledge of unsafe aviation situations, improper recordkeeping, or safety violations [can] report these without fear of recrimination.” This hotline is open 24 hours a day, seven days a week, and is broadly advertised throughout the industry and to the traveling public.⁵³
- e) FAA Safety Recommendations Program: This program provides an opportunity for FAA employees to submit recommendations to change particular safety practices or policies, and is actively promoted within the organization.⁵⁴
- f) Safety Issues Reporting System (SIRS): Recently added, as of April 30, 2008, this system supplements the FAA’s Safety Hotline and Safety Recommendations Programs, providing another avenue for employees to report issues they do not believe are being adequately addressed through normal channels. SIRS promises “a process for a documented review.” SIRS submissions can be made so they are visible to the employee’s immediate supervisors (called “Supervisor Review”). The supervisors are then obliged to respond to the issue, and to document their response, within a limited time period. Alternatively, submissions can go directly to program managers, bypassing the immediate supervisors (called “Direct Review”). Employees can also report to the SIRS program anonymously.
- g) FAA Administrator’s Hotline: FAA staff can call the Administrator’s hotline for “higher-level management attention for concerns not being resolved by established administrative procedures.”⁵⁵
- h) Inspector General’s Hotline: This avenue is available to any employee within the Department of Transportation.⁵⁶
- i) Whistleblower Disclosure Hotline: This program is operated by the U.S. Office of Special Counsel and is available to all Federal employees.

Overall, the IRT regards this collection of reporting mechanisms (including the very recent addition of SIRS) to be fairly extensive and sufficient.

Concerned or aggrieved FAA employees can, if they trust line management, use (a), (d), (e), the *Supervisor Review* option under (f), or (g). If they do not trust their own agency line management, they can use the *Direct Review* or anonymous options under (f); or they can use the DOT Inspector General’s hotline (h), which moves the

⁵² Codified at 49 USC 42121. This hotline received 574 inquiries in FY 2007.

⁵³ Established in July 1985. Operated by the Office of Accident Investigation during the daytime, and by FAA’s Washington Operations Center at night. During FY 2007 this hotline received 5,526 calls.

⁵⁴ Established in 1987. This program now receives roughly 350 recommendations per year. Between 1990 and mid-2008 the program had examined 5,750 suggestions, 64 percent of which were “accepted” and therefore lead to some type of FAA action.

⁵⁵ Established in August 1984. FAA Order 1070.1

⁵⁶ The DOT Inspector General’s office reported that from August 1, 2007 to August 5, 2008 the IG hotline received 180 calls pertinent to the FAA, of which 26 related to aviation safety issues.

complaint outside the FAA. If they do not trust the Department of Transportation, or want protected whistleblower status, they can use the Whistleblower Disclosure Hotline (i). If they do not trust any governmental structure at all, they can use the courts, the press, or appeal directly to Congress.

The IRT has considered the possibility of creating another independent office (inside the FAA, reporting directly to the FAA Administrator) to receive and handle complaints regarding critical safety issues. DOT Inspector General Scovel offered this proposal during congressional testimony in April.⁵⁷ On balance, we think such a structure should now be unnecessary, especially if alternate means for identifying and resolving clashes of regulatory ideology, where they exist within particular FAA offices, can be provided. The following considerations tilt us in this direction:

- If an FAA employee does not trust his or her supervisors, or the FAA Safety Hotline, or the SIRS program, or the Administrator's hotline, then it seems unlikely that they would trust any other group operating within the FAA.
- In regard to the *substance* of safety issues, these ought to be adjudicated within the existing Aviation Safety organization. Having another independent group within the FAA offering alternate and potentially conflicting judgments on highly technical matters could create confusion, and render the status of AVS' judgments ambiguous.
- In regard to *malfeasance* or *neglect* by agency employees, the range of reporting options already available to staff, both within the agency and outside, appears sufficient.
- SIRS, recently added, provides a documented and auditable resolution procedure.
- From what the IRT has seen, the most likely sources of festering trouble within FAA offices will involve conflicts over regulatory means, not ends. We will propose (below) that the newly created Internal Assistance Capability (IAC) be deployed energetically and often, to uncover and help moderate such localized disagreements.

We have also considered the proposal to mandate rotation of managers and/or supervisors on a three-yearly or five-yearly basis. We understand the enhanced risk of regulatory capture that long-standing relationships between regulators and regulated entities might produce. We understand also the countervailing value in accumulating a detailed knowledge of a specific airline's operations.

We believe that any enhanced risk of capture can be properly mitigated without mandated rotation, and propose alternate means for dealing with this risk. Specifically, the FAA could routinely schedule IAC reviews of any offices where the managerial

⁵⁷ See: "Actions Needed to Strengthen FAA's Safety Oversight and Use of Partnership Programs," Statement of The Honorable Calvin L. Scovel III, Inspector General, Department of Transportation, before the Committee on Transportation and Infrastructure, U.S. House of Representatives, Washington DC. CC-2008-046. April 3, 2008. p. 21.

team has remained intact for more than some preset number of years (e.g. three years, or five years). If an IAC review of such an office indicates a need to break up the team and bring in a “fresh set of eyes,” then FAA leadership can act on such findings. This approach avoids the costs and disruption of mandated rotations that would, in most cases, serve no positive purpose. We believe this proposal provides a more focused and diagnostic way of dealing with the same risk.

6.4 Summary observations regarding the FAA’s culture, and recommendations:

Secretary Peters asked us to examine the FAA’s culture. We would summarize our most significant findings in this regard in the form of three questions and answers, thus:

Question:	IRT Assessment:
Are the FAA and its staff genuinely and unambiguously committed to its safety mission?	Yes. (In our minds, without doubt.)
How broad a range of views regarding regulatory style and choice of regulatory methods exists within the agency?	Unusually broad; and, in some specific offices, sufficiently broad to provoke concern and warrant attention.
How effective has the agency been in handling and managing these differences in regulatory ideology?	Handling of such differences needs attention. We recommend an explicit focus on this issue.

We propose the following recommendations in this area:

6.4.1 Recommendation: The FAA should explicitly focus on wide divergences in regulatory ideologies, where they exist, as a source for potentially serious error.

To that end, the leadership of the Aviation Safety Office should devise means for identifying field offices where excessive divergence in regulatory ideologies exists.

Diagnostic analyses should include identification of those offices or teams where initiation of enforcement is severely skewed across the inspection team. Finding such situations does not mean, of course, that the enforcement-generating minority are wrong, or in need of correction. Nor does it mean that *anyone* is necessarily wrong. It just indicates a worryingly wide divergence in regulatory preferences, and that situation needs to be examined carefully before it does damage to the coherence, reasonableness or rationality of regulatory decision-making processes.

Analysis of the distribution of hotline calls by originating field office (where known), or by the field office subject of the complaint, might also serve to provide early warning of emerging problems in specific locations.

6.4.2 Recommendation: Training for Managers and Principal Inspectors should explicitly cover:

- the management of contrasting regulatory views within the workforce,
- methods for moderating extremes in regulatory style, and
- methods for optimizing the regulatory effectiveness and coherence across a diverse team of inspectors.

6.4.3 Recommendation: The FAA should deploy the Internal Assessment Capability (IAC), recently established, to review the composition and conduct of any offices or teams identified under the recommendation above.

6.4.4 Recommendation: The FAA should also deploy the Internal Assessment Capability on a routine basis to review the culture and conduct of any CMO where the managerial team has remained intact for more than three years.

Rotation of managers might be recommended as the result of an IAC review, but would not be routinely required.

7.0 Safety Management Systems

The international aviation community uses the term “Safety Management System” (SMS) to describe a formalized risk-management approach to the enhancement of flight safety. The International Civil Aviation Organization (ICAO) has provided extensive guidance on the components of an SMS approach.⁵⁸ The ICAO manual defines SMS as

“an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.”⁵⁹

Despite the breadth of this definition—the requirements which ICAO imposes on its member states (which include the U.S.) focus more particularly on the role of regulators in overseeing private corporations. Airlines and air-traffic organizations (which have been privatized in many other countries) should design and build their own Safety Management Systems, and the appropriate governmental oversight agencies should make sure that these systems meet acceptable standards. As the ICAO manual states in its overview section,

“...States shall require that individual operators, maintenance organizations, ATS providers and certified aerodrome operators implement SMS accepted by the State.”⁶⁰

⁵⁸ For the most comprehensive source of ICAO guidance, see: “Safety Management Manual,” First Edition, 2006. Doc 9859. AN/460.

⁵⁹ *ibid.* Chapter 1, p. 2.

⁶⁰ *ibid.* paragraph 1.4.5.

ICAO goes on to specify minimum requirements for those SMS systems, which should be sufficient to:

- identify safety hazards
- ensure that remedial actions necessary to mitigate the risks/hazards are implemented; and
- provide for continuous monitoring and regular assessment of the safety level achieved.⁶¹

The remainder of ICAO's 290-page manual provides highly detailed organizational and technical recommendations, and establishes guidelines for minimum standards. Thus ICAO has focused, so far, on enabling its member states' regulatory bodies to specify SMS requirements to be imposed on the private sector.

The Canadian counterpart to the FAA—*Transport Canada*—has moved quicker than the FAA in implementing ICAO's guidance. Transport Canada defines SMS as:

“A documented process for managing risks that integrates operations and technical systems with the management of financial and human resources to ensure aviation safety or the safety of the public.”⁶²

Transport Canada then requires airlines and other service providers within the aviation industry to design and construct their own SMS. The Canadian requirement has been introduced on a phased basis for different sectors of the industry, and Canadian authorities have allowed broad discretion to each organization to decide the details of their SMS approach, and to determine just how complex it needs to be.⁶³ Among the range of possible regulatory approaches to SMS, the Canadian version is rather “hands-off”: the authorities provide broad guidance, the corporations build whatever version they think is suitable, and then the authorities check to see whether they consider it adequate and appropriate.

In the IRT's view, for the FAA to optimize its contribution to aviation safety, the agency needs to do more in the realm of risk-management than simply require SMS systems of industry. That's an important role, but not the only one. FAA management is keenly aware that the agency itself needs to have an SMS system, and has already set performance targets that include designing and implementing SMS within the Aviation Safety organization by 2010.⁶⁴ What the AVS SMS will involve exactly, and how it might be implemented, remains somewhat vague at this point.

⁶¹ *ibid.*

⁶² Transport Canada's website, at: <http://www.tc.gc.ca/CivilAviation/SMS/basic.htm>

⁶³ The Canadians recognize that smaller organizations need less complex, and in some cases, less formal structures to carry out their risk-management work.

⁶⁴ “2008-2012 FAA Flight Plan: Charting the Path for the Next Generation,” Federal Aviation Administration. Objective 6, p. 25.

The IRT has found it useful to distinguish three different contributions the FAA might make, as SMS doctrines develop, to improve aviation risk-management. They are:

- a) FAA's Oversight role: Specifying requirements for SMS systems to be constructed and operated by regulated entities, and then auditing them for adequacy, effective operation, and compliance.
- b) FAA's Operational role: Establishing systems *within* the agency for identification and mitigation of risks that transcend individual regulated entities, or which straddle multiple sectors of the industry, and which rise to the level at which they require national or governmental attention. (i.e. actually *dealing* with risks that belong at the FAA level).
- c) FAA policy and rule-making role: the FAA (like all regulatory agencies) should consider carefully the costs and benefits of any proposed rule or policy, conducting relevant risk-assessments, taking into account ancillary effects, and minimizing the associated costs both public and private. In other words, policy-making should rest on sound risk-assessments and analysis.

We would offer the following observations, based on the discussions we have had, regarding relative strengths and weaknesses in the FAA's planning across these three different areas of contribution:

- ICAO offers clear guidance on (a) and (c), but says relatively little about (b).
- The FAA is somewhat behind schedule on (a), as the ICAO deadline of November 2009 for design and implementation of an SMS regulation approaches. Hence much urgency attaches, within the agency, to accelerating the development of (a). The scope and complexity of the U.S. aviation system, and the disparate approaches already taken by airlines to SMS, complicate this task substantially.
- The FAA's policy documents on SMS implementation, to date, are more precise with respect to (a), than with respect to (b) or (c). These documents do acknowledge the need for an FAA AVS approach to SMS, separate from supervision of industry's systems, but they describe the AVS approach only in generic terms (drawn largely from standard industry documents) and have yet to lay out implementation specifics or schedules.⁶⁵
- FAA staff in general seem relatively clear about the nature of the FAA's role with respect to (a), and vague or confused about the FAA's own operational contribution. Several FAA managers have told us that the FAA's own SMS approach has been in place for some time; others regard it as yet to come. Many who regard it as yet to come cannot say what it will look like, or what difference it will make to their own responsibilities or to the daily operations of the agency.

⁶⁵ The most current FAA guidance is FAA Order VS 8000.367, "Aviation Safety (AVS) Safety Management Systems Requirements," dated May 14, 2008.

- Responsibility for (a) and for (c) has been clearly designated within the structure of FAA Headquarters. It is not clear to the IRT that responsibility for (b) has been located and assigned unambiguously.
- Several senior managers have told us that the FAA's proper role with respect to SMS consists of running a risk-based policy process (i.e. (c)), and supervising industry's implementation of SMS (i.e. (a)). Most managers do not raise the possibility of (b), and some appear to have explicitly rejected it.

We recognize that part of the confusion surrounding the FAA's operational role might simply be a labeling issue. It would be plausible for the agency to understand its own operational *risk-management* role, but not to regard that as a part of "SMS." Maybe the term "SMS" has acquired a narrower definition, more limited to the regulatory oversight role, and more in line with ICAO's historical focus.

But referring back to ICAO's up-front definition of SMS—"an organized approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures"—we have to wonder why that should not be an appropriate requirement for the FAA itself. In our view, the essential organizational *structures* and *procedures* for effective risk-management include the following:

- the ability to identify hazards or risk-concentrations early in their life cycle, using a broad range of detection, notification and reporting methods.
- a commitment to scan proactively for emergent and unfamiliar risks, using a broad range of analytic and information gathering techniques.
- the organizational fluidity to elevate risks identified to the appropriate level, so that the organization can gather relevant resources and attention around them, taking care to respect the natural size and dimensions of the risk itself.
- a willingness to engage in an open-minded search for tailor-made solutions, sufficient to mitigate the risk to an acceptable degree in a resource-efficient manner.
- a formal managerial system for managing and monitoring a portfolio of risk-mitigation projects.
- a system for organizational *learning*, so that those engaged in risk-mitigation projects can access the experience and knowledge accumulated by others as a result of similar or related projects.

The future of aviation safety would be best served if all these capabilities existed at the level of each airline (to deal with risks specific to one airline), across the airline industry (for risks that span multiple airlines), within other industry sectors, across industry sectors, and within the FAA. Each risk has its rightful place. The risks most likely to be dealt with effectively are those that have a natural home within an existing organizational structure. The risks *least* likely to be dealt with are those that fall through the cracks. The FAA's operational role under an SMS doctrine is critical precisely with respect to those risks that no other player, alone, could be expected to address. The FAA's *operational* contribution to SMS is to identify and tackle risks that

would not otherwise be identified or tackled, even if every other organization in the system operated its own SMS, at its own level, as required.

Is the FAA currently positioned to make this contribution, and do its SMS plans adequately cover this aspect? We note several comments from airline executives to the effect that they have, on various occasions, identified industry-wide risk issues and offered them to the FAA; but the agency appeared to them to lack a natural home or a central clearinghouse for such concerns, and therefore did not seem to know exactly what to do with them.

Some risks do have a natural home in specific parts of the FAA structure. If the FAA learns of a hazard *specific to one airline*, then that naturally belongs with the relevant CMO (i.e. there is a structure to receive it). But risks more naturally described in other dimensions appear not to find a home so easily within the FAA's current modes of operation.

That is not to say that the FAA cannot address or has not addressed its attention to serious risk issues—including those of an organizationally awkward shape. The FAA has engaged in work of this type on different occasions. The IRT respects the analytic capabilities of FAA staff and its scientific advisors. But we are concerned about the apparent lack of explicit organizational attention, looking forward, to expanding this type of work. We would urge the FAA to pay much more attention to investments in this area, and to codify and formalize its organizational approach. We consider this type of work central to the FAA's future contributions to safety, and we hope that in the very near future such risk-based or hazard-specific projects will be much more numerous, not limited to high-profile issues, informed by a broad range of risk-identification mechanisms, and properly connected to other aspects of the FAA's work. This, after all, is the fundamental challenge of risk-management.

The role of ASIAs in SMS: It appears to the IRT that FAA leadership, when considering the agency's operational risk-management role, has been betting heavily on the potential of a relatively new data-mining project called the *Aviation Safety Information Analysis and Sharing* initiative, or ASIAs. This project promises, in time, to provide a rich integration of multiple databases as a foundation for risk-identification and analysis.

The Office of *Aviation Safety Analytical Services*, located at FAA Headquarters, is responsible for the project, and will provide the (human) analytic resources, while the technical work and data-platforms are being managed by The MITRE Corporation (MITRE), as a Federally Funded Research and Development Center. Under ASIAs, the FAA plans to bring together data from all three of the major voluntary disclosure programs (FOQA, ASAP, and VDRP), as well as to aggregate inspection data drawn from the Air Transportation Oversight System (ATOS) for analysis.

Integration of these multiple data sources presents complex technical challenges, including data de-identification, data security (especially when data actually belongs to

the airlines), integration across platforms and formats, and construction of the requisite data-feeds from widely distributed systems.

Given the technical complexities of this data-integration task, and the fact that the ASIAs Project is as yet in its infancy, relatively little attention seems to have been given to the accompanying issues of commissioning, managing and prioritizing analysis. What analyses will be done? What is the mechanism for opening a new analytic project, or for closing one? What forms of analysis will be conducted routinely and on a periodic basis? What is the managerial system for choosing and prioritizing among the hundreds of forms of analysis that *could* be done? These are the managerial and organizational questions that will determine when and how the technical capacities of ASIAs, as they develop, will be deployed.

The IRT believes that, in time, ASIAs will form a vital component of the FAA's operational contribution to SMS. But we caution against depending solely or too heavily on ASIAs, for the following reasons:

- First, risks can be identified through multiple mechanisms, of which data-mining is only one.
- Second, the technical nature of the ASIAs Project, and the complex technical challenges it presents, may mask the broader organizational challenges involved in building an operational risk-management system.
- Third, the challenges of database construction and integration frequently absorb so much attention (and money) that organizations fail to launch projects and conduct analyses that are perfectly feasible already, given existing data sources and analytic tools available on an ad-hoc basis. Analysis should never be made to wait for data-systems to be perfected; otherwise, analysis waits forever.

While MITRE grapples with the technical aspects of ASIAs, the analytic team within the office of *Aviation Safety Analytical Services* currently focuses on major policy analyses. Such work is obviously important too, and—when it is appropriately risk-based—might be legitimately swept into the definition of SMS.

But in order for the FAA to optimize its own contribution to safety management, we feel the agency will need to embrace a much clearer and broader risk-management mandate for this analytic team, and a broader context for its linkage with ASIAs. There are lots of ways of identifying risk-concentrations *other than data-mining*; and there are lots of ways of dealing with identified risks *other than through the policy-making (or rule-making) process*.

The FAA, in our view, needs to develop a clearer and more comprehensive vision for its own operational SMS than we have seen to date; and to communicate it effectively throughout the organization.

We would summarize our observations on the FAA's approach to Safety Management Systems as follows:

- a) With respect to the FAA's oversight of industry's SMS implementations, we note that the agency will have trouble meeting ICAO's deadlines for rulemaking by November 2009.
- b) We also note that the FAA's SMS Program engages with airlines on a voluntary basis and in a healthy fashion, even in advance of any final rule. We are confident that the FAA, in its SMS oversight role, will help those airlines not so advanced in this area to catch up, and will also be able to overlay a more standardized framework on the miscellaneous approaches to SMS now being pursued across the industry.
- c) We are encouraged by the general level of SMS understanding and implementation among the airlines we have visited. To us, several of these seemed excellent, reflecting a clear understanding of the myriad methods of hazard discovery; the need for formalized assessment, analysis and resolution of them; and the need for follow-through and methodological rigor in assuring continued suppression of those risks over time.
- d) We observe widespread confusion throughout the FAA regarding the nature of the FAA's own operational role under SMS.
- e) The FAA has already demonstrated a capacity to conduct sophisticated analyses of policy issues, and of some high-profile risk concentrations.
- f) We do not believe the FAA stresses sufficiently its own potential to contribute to safety through the expansion and development of its own operational risk-management capabilities.
- g) The FAA is developing certain technical capabilities that will be pivotal to this operational role (such as ASIAs, and the aggregation of voluntary disclosure data), and has begun the work of assembling the requisite analytic teams, but has paid less attention to the organizational challenges involved in structuring this work.

7.1 Recommendation: The IRT would urge the FAA to embrace its own operational role in risk-identification and risk-mitigation as formally and energetically as it has embraced its role in overseeing industry's SMS implementations; and to expedite its implementation planning in this area.

8.0 ATOS, Information Technology, and the role of FAA Inspectors

During the course of our interviews, we have met with several hundred inspectors, at fifteen different field offices. In every location, without exception, the inspectors wanted to talk to us about the Air Transportation Oversight System (ATOS), which supports and governs the majority of their inspection and surveillance work.

ATOS was introduced in 1998 to provide a structured process for the regulatory oversight of air carriers, and is now applied to all Part 121 operators. The system plays

a central role in the professional lives of most inspection teams based at CMOs and other field offices. ATOS was designed to fulfill three primary functions:⁶⁶

- a) to ensure that an air carrier fulfilled all the regulatory and safety obligations required for its certification;
- b) to assess the performance of the air carrier's operating systems, to make evidence-based determinations as to whether it was producing the intended results; and
- c) to provide risk-management processes (embedded within the ATOS system) to help target FAA inspection resources in accordance with risk-based priorities.

None of the staff we interviewed doubts the importance of focusing inspection efforts on priority areas, or questions the importance of developing a system to manage inspections in a risk-based and accountable way. But the inspectors claim, and field-office management agrees, that ATOS was hurriedly implemented at the outset, and that the ATOS training provided to inspectors was inadequate. The system has already been through multiple revisions since introduction, in attempts to increase its value and usability. The revisions have not quieted the criticism, however, and the requirements and nature of the system still causes considerable consternation at the level of front-line inspection teams. A GAO report in 2005 provided an excellent perspective on residual deficiencies in the system.⁶⁷

The IRT has not had the opportunity to spend much time examining the contents and use of ATOS in real time, nor to observe inspectors and their use of the system for any length of time. But what we have seen, and heard, about ATOS concerns us in two ways.

First, many of the inspectors report that they still feel inadequately trained on the system, and they claim to spend an extraordinarily high percentage of their surveillance time (time available for inspections and inspection-related activities) answering ATOS questions and entering data into the system. Across the inspection teams we met, inspector claims of the proportion of the day spent in front of their computers⁶⁸ fell within in a remarkably tight range: 70 to 80 percent. This ratio seems to us remarkably high, for any inspectional operation. We have discussed with others more familiar with ATOS what proportion of time available for surveillance ought to be spent entering data into the system, and understand that 20 to 30 percent would be reasonable.

The inspectors identified for us a range of factors that help to explain these extraordinarily high levels of ATOS-related computer time. These include the detailed nature of the system's questions (ATOS covers 97 safety elements with over 9,000 questions), the lack of effective training, the absence of administrative support staff to

⁶⁶ Briefing paper on ATOS prepared for the IRT by The MITRE Corporation.

⁶⁷ "Aviation Safety, FAA's Safety Oversight System is Effective but Could Benefit from Better Evaluation of its Program's Performance," Statement of Gerald L. Dillingham, Ph.D., Director, Physical Infrastructure Issues. Report no: GAO-06-266T.

⁶⁸ Using ATOS and a range of other IT systems.

assist, and the inflexible architecture of the system that makes it awkward and time-consuming to find *where* to enter a specific observation.

Second, it seems that ATOS is not yet supporting the risk-management process in the manner originally envisaged. Many inspectors reported to us that they do not much trust the quality of the data within ATOS, in part because the only way to get through the data-entry task in a reasonable amount of time is to answer “yes” to most of the questions, so one can move on. (Many of the questions within the certification module have the form...“Does the carrier operate an adequate system for ensuring xxx?” If an inspector answers “no,” they are obliged to provide an accompanying text-based description of the inadequacy.) Also, inspectors report that the system’s logic and data-structure is inflexible, with the consequence that important observations about hazards identified—if those hazards do not relate specifically to one of the certification conditions—do not fit easily within the logical and hierarchical structure of ATOS, and therefore require extra effort to report.

ATOS does have a separate *Risk-Management* Module, in which an inspector can report the discovery of a particular hazard. The data fields within this module are free-text format, so that *any* risk or hazard, of any shape or size, can in theory be reported. In practice, the *Risk-Management* Module is not heavily used, as the scheduled and routine parts of ATOS-directed inspection activities take up most or all of the time available. Moreover, given the free-text format, the data contents of the Risk-Management Module cannot easily be aggregated or analyzed to reveal emergent trends or patterns across the industry. By contrast, “yes” and “no” answers to standardized questions are easy to count, and to aggregate, and to compare across carriers, regardless of how accurate or meaningful these answers might be.⁶⁹

Based on our brief examination of the Risk-Management Module, it is not clear to the IRT whether entering a hazard into this module prompts the type of rigorous analysis, open-minded search for mitigation strategies, and monitoring of impact that a mature risk-management approach would require. The fact that this module exists does not guarantee its effective use.

If this module is *not* properly used, then the rigidity and logical structure of the rest of ATOS imposes restrictions on the types of hazards that will be effectively addressed. ATOS data, for the most part, is organized around specific certification requirements for specific carriers. Risks that align with those requirements have a natural home, and can be monitored at a managerial level through national aggregation and analysis of ATOS data. We are concerned that risks and hazards that do not fit this structure may not find a natural home, and may not receive equally rigorous attention.

We believe ATOS requires substantial further improvement over time, and that the nature of its contributions to effective risk-management, as the FAA’s operational approach to SMS develops, still deserves considerable attention and thought.

⁶⁹ ATOS data—at least those components that lend themselves to aggregation and analysis at a regional and national level—will be available in time to the ASIAs project.

In the short term, the IRT is most concerned by the widespread complaints about the time-consuming nature of ATOS data-entry requirements, and the consequences for the effectiveness of the inspection workforce.

ATOS is not alone in drawing criticism. We have heard widespread complaints about the demands of other IT systems deployed within the FAA. The Labor Distribution Reporting System (in which inspectors are required to record how they spend their time) draws considerable criticism, not least because many inspectors believe they are prohibited from entering more than 40 hours of activity per week, but frequently work more than forty hours. Also, *GovTrip*—the system staff must use to obtain authorization for travel, record their travel expenditures, and claim reimbursement—is apparently so user-unfriendly that it is universally treated as an object of derision. Staff complain that these other IT systems, like ATOS, have been implemented hurriedly and poorly, and the agency does not provide sufficient support or training in their use. The net result seems to be far too much time spent in front of computer screens, for one purpose or another, much of it frustrating and perceived as unproductive; and no more than 30 percent or so of the working day available, on average, for inspection activities.

The IRT proposes that the agency leadership should, without delay, commission a substantial time-and-motion study of front-line inspection teams, so it can fully understand the positive and negative impacts of various IT implementations, of ATOS in particular, and of the level of administrative support available to inspectors. We suggest that such studies should empirically assess the proportion of surveillance time devoted to data entry, and the proportion of an inspector's average workweek that is typically spent on actual inspection activities other than data entry. Following such a study, FAA leadership should establish some clear sense of what these ratios ought to be, and monitor them over time as further versions of ATOS and improvements to other IT implementations are made.

8.1 Recommendation: We recommend that without delay the FAA commission a time-and-motion study of its front-line inspection operation, to empirically assess the time-demands of ATOS and other IT implementations. With the results of such a study in hand, agency leadership should establish some clear expectations regarding the proportion of an inspector's workweek that data entry and other computer-related tasks should reasonably consume, and monitor progress towards more reasonable ratios as ATOS and other IT systems are improved over time.

9.0 Long-term development in the structure of the FAA

The IRT's mandate emphasized practical and feasible recommendations. We very much hope that we have identified some. In the course of our discussions, however, one potential direction for long-term development kept coming up, and could potentially affect several of the areas we have addressed more directly already.

The question is whether the agency should adjust the balance in its use of geographic and carrier-specific responsibilities. Historically, the agency respected the integrity of geographic regions more, before ATOS, than it does now. The arrival of ATOS coincided with a greater focus on the certification of carriers, and rigorous monitoring of certification requirements. Given that focus, the United CMO, for instance, takes responsibility for the operations of United Airlines *everywhere* in the world, and the same is true for all the other carrier-specific CMOs.

The justification given for a carrier-oriented supervisory structure is that each carrier is unique. Some fly short haul, some long haul. Some fly over saltwater, others over land. Some carry fish (the potential leakage of brine in the cargo hold produces particular risks of corrosion) and others do not. As a result, where several airlines all use the same type of plane, each airline constructs its own maintenance manuals by combining the aircraft manufacturer's recommendations with its own needs, protocols, and maintenance traditions. The FAA makes sure that each of the resulting maintenance manuals, and each carrier's maintenance procedures, are *adequate*; but does not require them to be the *same*. The benefit of a carrier-specific structure, for the FAA, is that CMO managers and inspection teams, working full time on one carrier, become expert in the unique operations of that one airline.

The dominance of the carrier-specific model creates some rather obvious inconsistencies and inefficiencies. For example, in a line of planes waiting to take off from a New England airport in icy conditions, each is bound by the governance of its respective CMO's interpretation of de-icing requirements, and these interpretations are not always consistent.

For another example, consider a repair station used by three different major airlines for repairs on exactly the same type of aircraft. Even though the same maintenance workforce, in the same facility, works on the same type of planes for three airlines, it is required to abide by three different maintenance manuals (as these are carrier-specific) and, as it does so, it falls under the jurisdiction of three separate CMOs located in different parts of the U.S. Each CMO is obliged to send some of its staff to periodically inspect the facility and its operations; and each visiting FAA inspection team will impose slightly different standards on the same facility, for conformance with different maintenance procedures.

We understand the need for carrier-specific structures sufficient to deal with carrier certification and compliance with certification requirements. In the longer term, however, we question whether carrier-specific structures should continue to dominate to the extent they do now. For how much longer, in the modern jet age and with increasingly complex aircraft and systems, does it make sense to permit each different airline to develop its own unique maintenance manual? As the use of repair stations grows over time, is the CMO model the best way of overseeing their operations? Where planes from different carriers are co-located (i.e. on the ramps at all major airports) does it not make sense to have a local inspection team qualified and able to inspect any and every plane on the ramp? If a CMO were to become a little *less* solely responsible for one airline, then would not the natural dangers of regulatory capture and

excessive coziness be reduced? If inspectors worked on the same planes, but for multiple carriers, would not the identification of risks associated with a plane, and inconsistencies in maintenance standards, be more easily identified?

We have not considered this issue deeply enough to arrive at any conclusions, nor to propose any specific recommendations. But we would like to flag this issue as an important one, looking forward. Civil aviation will only get busier and more complex over time. As it does so, we believe the FAA may require greater versatility in its organizational form. We also believe that the agency might acquire better balance, and improved efficiency, from such versatility.

10.0 Conclusion

The Independent Review Team is grateful to Secretary Peters for the opportunity granted us to review the FAA's approach to safety. We believe that the events of this spring have provided a valuable opportunity to check the agency's course, and to identify some adjustments that can help to optimize the FAA's future contribution to safety.

We are phenomenally impressed with what this agency has achieved, in collaboration with the aviation industry, in driving accident rates down to extraordinarily low levels.

We re-affirm the value of its voluntary disclosure programs as vital to continuing improvement. These programs are in-line with modern regulatory practice, and are suitably circumscribed. Such programs are more vital to the FAA, in our view, than to other regulatory agencies, given the essentially preventive nature of the residual risk-control task, and the resulting importance of learning about and learning from precursor events.

We also re-affirm the importance of FAA compliance with the guidelines and restrictions surrounding the voluntary programs, which are designed to guarantee these programs' integrity and prevent the erosion of industry's compliance incentives. Abuse of these programs will surely lead to loss of them; and that would be a tragedy. We see an important role for the DOT Inspector General's office in monitoring the FAA's compliance with the conditions and restrictions governing these programs.

Regarding organizational culture, we have found the FAA's aviation safety staff to be unambiguously committed to the core mission of safety. However, we find a remarkable degree of variation in regulatory ideologies among the staff, which, in places, creates the likelihood of generating wide variances, and possible errors, in regulatory decision-making. We believe agency leadership should pay particular attention to this issue, and create intervention mechanisms to help guarantee coherence and rationality in regulatory practice, and to elevate a task-focus above tool-based preferences.

Regarding Safety Management Systems, the FAA is working to meet its obligation to create an SMS rule governing regulated entities across the aviation industry. The agency will have trouble meeting the imposed ICAO deadline of November 2009, but is working constructively with all the major carriers on a voluntary basis in the meantime.

We believe the FAA needs to pay more explicit attention to the formulation of its own operational SMS contribution. Towards this end, ASIAs and the risk-management aspects of ATOS may in due course offer important contributions, but agency leadership needs to pay explicit attention to the organizational challenges involved as well, and prioritize the development of practical implementation plans.

ATOS needs further attention for it to live up to its promise, but refinements for this system must be informed by a solid empirical understanding of the way in which inspectors now spend their time.

Finally, for longer term consideration, we would flag the issue of the agency's carrier-specific oversight structure. Alternative forms of organization, applied to suitable functions, might better balance the agency, helping to mitigate the dangers of capture, promote consistency across airlines, and eliminate obvious inefficiencies in the oversight of certain categories of facilities.

We hope these observations will be useful as the FAA seeks to meet the increasingly complex demands of aviation safety.

Madam Secretary, we submit this report for your consideration.

The Independent Review Team

September 2, 2008.

Appendix 1: Glossary of Acronyms and Technical Terms

A		E	
AA	American Airlines	EDT	Enforcement Decision Tool
AAAE	Association of Airport Executives	EIA	Electronics Industries Alliance
AAPA	Association of Asia Pacific Airlines	EPA	Environmental Protection Agency
AC	Advisory Circular	ERC	Event Review Committee
ACI	Airports Council International	F	
ACO	Aircraft Certification Office	FAA	Federal Aviation Administration
AD	Airworthiness Directive	FAR	Federal Aviation Regulation
AMO	Aircraft Maintenance Organization	FOQA	Flight Operations Quality Assurance
AMOC	Alternative Means of Compliance	FSDO	Flight Standards Directorate Office
ARSA	Aeronautical Repair Station Association	FSF	Flight Safety Foundation
AOPA	Aircraft Owners and Pilot's Association	FSEP	Flight Standards Evaluation Program
ASAP	Aviation Safety Action Program	FSO	Flight Safety Organization
ASIAS	Aviation Safety Information Sharing	FY	Fiscal Year
ASRS	Aviation Safety Reporting System	G	
ATA	Air Transport Association	GAMA	General Aviation Manufacturers Association
ATC	Air Traffic Control	GAO	Government Accountability Office
ATO	Air Traffic Organization	GA	General Aviation
ATOS	Air Transportation Oversight System	GovTrip	Government employees' expense reporting system
AVS	FAA Office of Aviation Safety	GPS	Global Positioning System
C		GPWS	Ground Proximity Warning System
CASS	Commercial Aviation Safety Survey	I	
CAST	Commercial Aviation Safety Team	IAC	Internal Assistance Capability
CFIT	Controlled Flight Into Terrain	IATA	International Air Transport Association
CMO	Certificate Management Office	ICAO	International Civil Aviation Organization
CMU	Certificate Management Unit	IG	Inspector General
Comair	A Delta-owned regional airline	ILS	Instrument Landing System
CRJ200	Bombardier twin-engine regional jet	IOSA	IATA Operational Safety Audit
CSI	Customer Service Initiative	IOTA	Institute of Transport Administration
D		IRS	Internal Revenue Service
DA	Design Assessment	IRT	Independent Review Team
DC-10	McDonnell Douglas three-engine commercial jet	ISO	International Organization for Standardization
DCT	Data Collection Tools	ISO	Quality Management Standards
DFDR	Digital Flight Data Recorder	9000 / 9001	
DHHS	Department of Health and Human Services (US)	L	
DOD	Department of Defense (US)	LDR	Government employees' time distribution system
DOJ	Department of Justice (US)	LOSA	Line Operations Safety Audits
DOS	Department of State (US)		
DOT	Department of Transportation (US)		

M

MD 80 / McDonnell Douglas twin-engine
MD 90 commercial jet
MEL Minimum Equipment List
MRO Maintenance Repair Organization

N

NASA National Aeronautics and
Space Administration
NBAA National Business Aviation Association
NRC Nuclear Regulatory Commission
NTSB National Transportation Safety Board
NWA Northwest Airlines

O

OEM Original Equipment Manufacturer
OIG Office of Inspector General
OSC U.S. Office of Special Counsel
OSHA Occupational Safety and
Health Administration

P

PA Performance Assessment
Part 121 Scheduled. commercial airlines
Part 135 Chartered commercial airlines
PI Principal Inspector
PMI Principal Maintenance Inspector
POI Principal Operating Inspector
PTRS Program Tracking and Reporting Subsystem

Q

QMS Quality Management System

R

RAA Regional Airline Association
RJ Regional Jet
RMS Risk Management System
RSI Remotely Sited Inspectors

SA

Safety Assessment

SAI

Safety Attribute Inspection

SB

Service Bulletin

SEC

Security and Exchange Commission

SIRS

Safety Information Reporting System

SMM

Safety Management Manual

SMS

Safety Management System

SOP

Standard Operating Procedures or Practices

SRM

Safety Risk Management

SWA

Southwest Airlines

T**TCAS**

Traffic Alert and Collision Avoidance

TSA

Transportation Security Administration

TWAS

Terrain Alert Warning Systems

TWA

Trans World Airlines. Acquired by
American Airlines in 2001

U**UAL/UA**

United Airlines

V**ValuJet**

East Coast regional airline. Now operating as
AirTrans Airways

VDP

Voluntary Disclosure Programs

VDRP

Voluntary Disclosure Reporting Program

VFR

Visual Flight Rules

W**WEAT**

FAA Work Environmental Assessment Team

737

A Boeing twin-engine mid-range jet

747

A Boeing wide-body four-engine jet

S

Appendix 2: Air Carrier Fatal Accidents⁷⁰

Date	Operator	CFR	Location	Circumstances	Fatalities			
					Pass	Crew	Ground	Surv
<u>FY 2008 = 2 fatal accidents, 3 fatalities</u>								
07/07/08	Kalitta	121	Bogota, Columbia	Crashed short of the runway on an emergency return			2	8
07/06/08	USA Jet Airlines	121	Saltillo, Mexico	Crashed on approach		1		1
<u>FY 2007 = 2 fatal accidents, 3 fatalities</u>								
07/10/07	Sky King	121	Tunica, MS	Mechanic fell onto Ramp from airplane door			1	
12/14/06	Penninsula Air	135	Port Heiden, AK	Crashed under unknown circumstances	1	1		
<u>FY 2006 = 4 fatal accidents, 71 fatalities</u>								
08/27/06	Comair	121	Lexington, Ky	Crashed on Takeoff	47	2		1
01/16/06	Continental Airlines	121	El Paso, Tx	Mechanic injected into engine			1	
12/19/05	Chalks International Airlines	121	Miami, Fl	Crashed shortly after takeoff	18	2		
12/08/05	Southwest Airlines	121	Chicago, Il	Crashed after runway overrun			1	103
<u>FY 2005 = 2 fatal accidents, 14 fatalities</u>								
06/07/05	US Airways	121	Washington, DC	Ramp Employee Ran into Fuselage			1	
10/19/04	Corporate Airlines	121	Kirkville, MO	Crashed on Night / IMC non-precision approach.	11	2		2
<u>FY 2004 = 1 fatal accident, 1 fatality</u>								
08/13/04	Air Tahoma	121	Covington, Ky	Crashed on final. Fuel starvation, improper crossfeed.		1		1

⁷⁰ Note:

- This compilation covers events relating to the operation anywhere in the world of commercial U.S.-based carriers.
- It covers all Part-121 (transport category) carriers (i.e. major airlines), as well as the scheduled operations of Part-135 carriers (i.e. minor and regional operators).
- It shows fatalities to passengers, crew, and anyone on the ground
- It shows survival rates for those on board, including passengers and crew
- It does not include the operations of foreign airlines within the U.S.

Appendix 2: Air Carrier Fatal Accidents contd.

Date	Operator	CFR	Location	Circumstances	Fatalities			
					Pass	Crew	Ground	Surv
<u>FY 2003 = 3 fatal accidents, 24 fatalities</u>								
09/12/03	Northwest Airlines	121	Norfolk, VA	Ground employee pinned between tug and airplane			1	
07/13/03	Air Sunshine	135	Treasure Cay, Bahamas	Ditched in the ocean	2			8
01/08/03	Air Midwest	121	Charlotte, NC	Crashed on takeoff	19	2		
<u>FY 2002 = 3 fatal accidents, 278 fatalities</u>								
11/12/01	American Airlines	121	Rockaway, NY	Rudder and vertical stabilizer separated after takeoff	251	9	5	
10/10/01	Peninsula Airways Inc.	135	Dillingham, AK	Crashed shortly after takeoff	9	1		
10/03/01	West Isle Air	135	Decator Island, WA	Collided with trees shortly after takeoff	2	1		
<u>FY 2001 = 2 fatal accidents, 2 fatalities</u>								
08/05/01	US Airways/Piedmont	121	Reagan National, VA	Ground employee struck by propeller during taxi operations			1	
11/20/00	American Airlines	121	Miami, FL	Flight attendant fatally injured during emergency evacuation		1		
<u>FY 2000 = 4 fatal accidents, 102 fatalities</u>								
09/18/00	Cape Smythe Air Service	135	Nuiqsut, AK	Crashed during go around following a gear-up landing	4	1		5
02/16/00	Emery Worldwide Airlines	121	Rancho Cordova, CA	Crashed into auto salvage yard after takeoff		3		
01/31/00	Alaska Airlines	121	Point Mugu, CA	Structural failure resulting in crash into ocean	83	5		
12/07/99	Grant Aviation	135	Bethel, AK	Collided en route with remote, snow covered terrain	5	1		

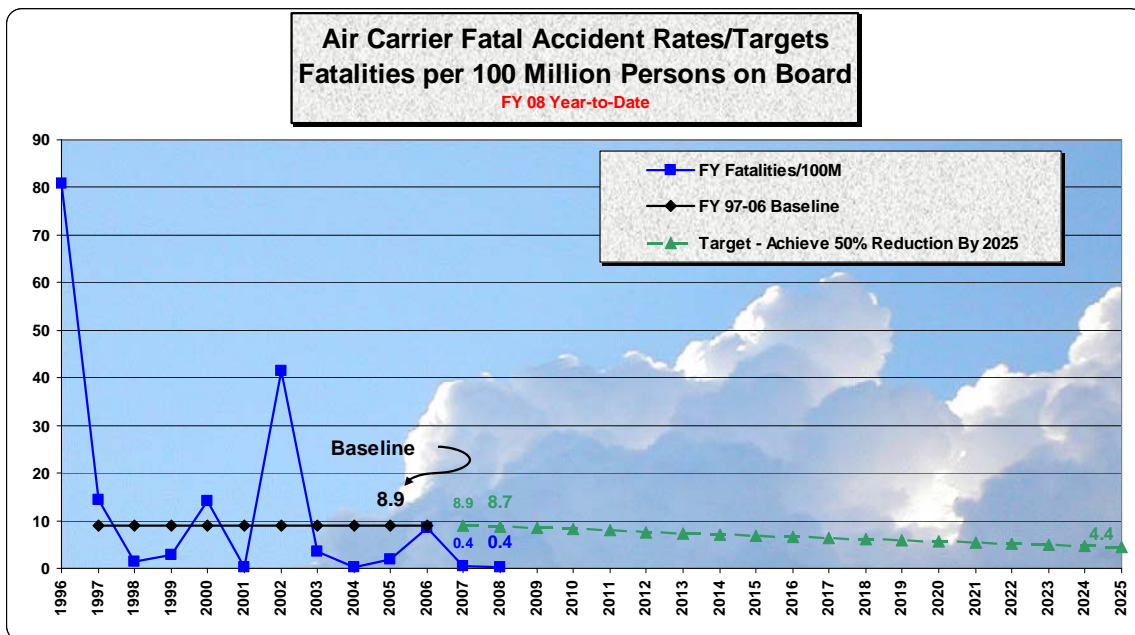
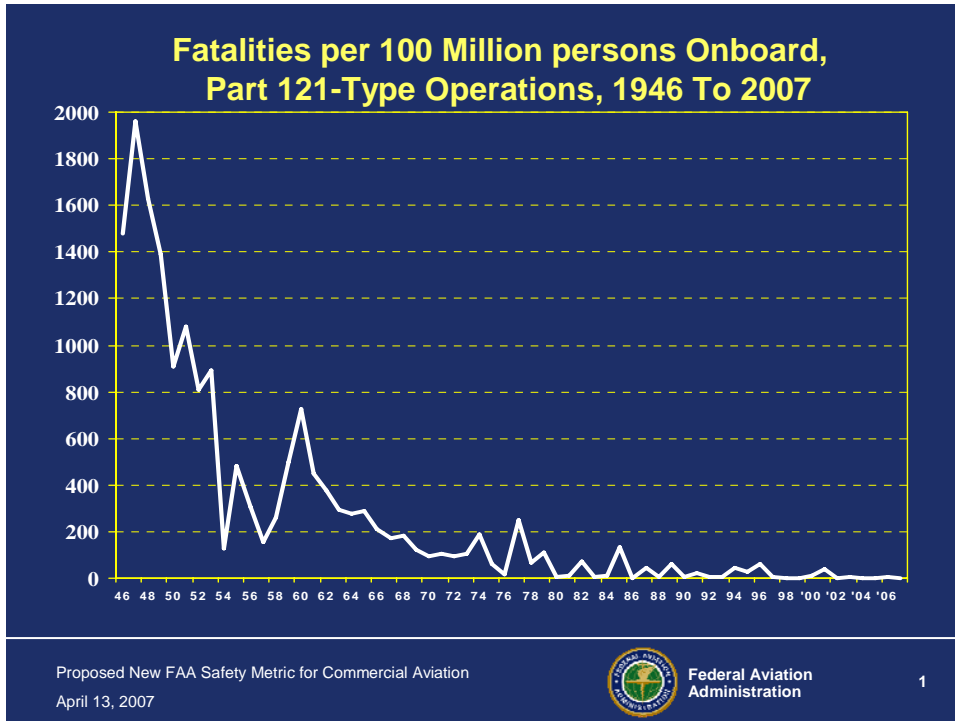
Appendix 2: Air Carrier Fatal Accidents contd.

Date	Operator	CFR	Location	Circumstances	Fatalities			
					Pass	Crew	Ground	Surv
<u>FY 1999 = 7 fatal accidents, 19 fatalities</u>								
09/05/99	New England Airlines	135	Westerly, RI	Crashed shortly after takeoff	2	1		
09/03/99	Servant Air	135	Bettles, AK	Crashed into mountainous terrain		1		
07/28/99	Continental Express	121	Little Rock, AR	Rotating propeller struck ground crew member			1	
06/11/99	Larry's Flying Service	135	Tanana, AK	Collided with trees, then crashed into a river after takeoff		1		
06/01/99	American Airlines	121	Little Rock, AR	Landing overrun and collision with approach light structure	10	1		134
04/14/99	Camai Air	135	Kotzebue, AK	Crashed into an ice and snow covered lagoon		1		
11/03/98	Express Airlines One, Inc.	121	Memphis, TN	Ground crew member walked into a rotating propeller			1	
<u>FY 1998 = 2 fatal accidents, 9 fatalities</u>								
12/28/97	United Airlines	121	Pacific Ocean	Unrestrained passenger during turbulence encounter	1			392
11/08/97	Hageland Aviation Services	135	Barrow, AK	Crashed into ocean shortly after departure	7	1		
<u>FY 1997 = 9 fatal accidents, 93 fatalities</u>								
08/07/97	Fine Air	121	Miami, FL	Cargo - Crashed on departure end of runway		4	1	
08/02/97	Continental Airlines	121	Lima, Peru	Elderly Passenger fell through catering door	1			149
06/27/97	Olson Air Service	135	Nome, AK	Collide with radio antenna while landing	1	1		
04/10/97	Hageland Aviation Services	135	Wainwright, AK	Crashed into ocean on attempted landing	4	1		
03/27/97	Delta Air Lines	121	Jamaica, NY	Ground crew member crushed			1	
02/08/97	Air Sunshine	135	St. Thomas, VI	Landing gear problem. Crashed into sea	2			3
01/09/97	Comair Airlines	135	Monroe, MI	Crashed while being vectored for approach	26	3		
11/19/96	Great Lakes Aviation	135	Quincy, IL	Collided with GA aircraft at runway intersection	10	2	2	
10/22/96	Million Air	121	Manta, Equador	Cargo - Crashed into residential area		4	30	

Appendix 2: Air Carrier Fatal Accidents contd.

Date	Operator	CFR	Location	Circumstances	Fatalities			
					Pass	Crew	Ground	Surv
<u>FY 1996 = 5 fatal accidents, 506 fatalities</u>								
07/20/96	Northern Air Cargo	121	Russion Mission, AK	In flight fire		4		
07/17/96	TWA	121	East Moriches, NY	In flight explosion	212	18		
07/06/96	Delta Air Lines	121	Pensecola, FL	Uncontained engine failure	2			145
05/11/96	Valujet	121	Miami, FL	In flight fire	105	5		
12/20/95	American Airlines	121	Cali, Columbia	Crashed during landing	152	8		4
<u>FY 1995 = 8 fatal accidents, 107 fatalities</u>								
08/21/95	Atlantic Southeast Airlines	135	Carrolton, GA	Propeller Blade loss on climbout	7	1		21
06/27/95	Salair Airlines	121	La Romana, DR	Cargo - Reported fire during climb		2		
02/28/95	Million Air, Inc.	121	Guatemala City, Guat.	Ran off runway into residential area			6	3
02/25/95	Yute Air Alaska	135	Kotzebue, AK	Crashed in Box Canyon		1		
12/13/94	Flagship Airlines	135	Morrisville, NC	Crashed 4 miles from airport	13	2		5
12/10/94	Ryan Air Service	135	Elim, AK	Crashed into Mountain in IMC	4	1		
11/22/94	TWA	121	Bridgeton, MO	Collided with Cessna 441 on runway			2	
10/31/94	Simmons Airlines	121	Roselawn, IN	Inflight loss of control	64	4		
<u>FY 1994 = 5 fatal accidents, 193 fatalities</u>								
09/08/94	USAir	121	Aliquippa, PA	Inflight loss of control	127	5		
07/02/94	USAir	121	Charlotte, NC	Struck ground on missed approach	37			25
01/07/94	Atlantic Coast Airlines	135	Columbus, OH	Crashed 1.2 miles from airport	2	3		3
12/01/93	Express Airlines	135	Hibbing, MI	Crashed 3 miles short of airport	16	2		
11/05/93	Northeast Express Airlines	135	Newwark, NJ	Ground Crew struck by propeller			1	

Appendix 3: Fatalities



Appendix 4: List of interviewed stakeholders

The Independent Review Team received tremendous cooperation from the airline industry, its experts, and government agencies in conducting this study. We thank the following organizations and individuals for their preparation, discussion time and follow-up data. Without this cooperation and dedication to aviation safety, we could not have accomplished our goal.

Congress

James L. Oberstar, Chairman of the Transportation and Infrastructure Committee
John Mica, Ranking Member of the Transportation and Infrastructure Committee

Government

DOT OIG – Department of Transportation Office of Inspector General
FAA – Federal Aviation Administration
 Certificate Management – American, Alaskan, Compass, Continental, Delta, jetBlue, Northwest, Southwest, and United
 FSDOs – Atlanta, Boise, Chicago, Philadelphia, New York City, Seattle, and Washington, DC Regional Offices – Atlanta, Chicago, Fort Worth, and Seattle
 Over 350 Inspectors at various locations
NTSB – National Transportation Safety Board
OSC – U.S. Office of Special Counsel

Industry Associations

AFA – Association of Flight Attendants - CWA
AIA – Aerospace Industries Association
ALPA – Air Line Pilots Association
ARSA - Aeronautical Repair Station Association
ATA – Air Transport Association
ATA Safety Council
FSF – Flight Safety Foundation
IAM - International Association of Machinists and Aerospace Workers
NBAA – National Business Aviation Association
PASS - Professional Aviation Safety Specialists, AFL-CIO
RAA - Regional Airline Association
TWU - Transport Workers Union of America AFL-CIO

Carriers and Manufacturers

American Airlines
Alaska Airlines
Boeing
Compass Airlines
Continental Airlines

Delta Air Lines
jetBlue Airlines
Northwest Airlines
Southwest Airlines
United Airlines

Industry Experts

Anthony J. Broderick
K. Scott Griffith
Kenneth P. Mead
Kenneth P. Quinn
Ray Valeika

Appendix 5: Brief biographical sketches for the IRT

J. Randolph Babbitt is a Partner in the Aviation and Aerospace Section of Oliver Wyman, a global strategy consulting firm. During the 1990's he served as President and CEO for US ALPA, the world's largest professional organization of airline pilots. He is the past chairman and a current member of the FAA Management Advisory Council. He began his aviation career as a pilot for Eastern Air Lines and flew for more than 20 years.

William O. McCabe, Colonel, USAF (Ret), is President, The McCabe Group, LLC, an aerospace consulting firm. He serves as a member of the Flight Safety Foundation Board of Governors. He founded and led the DuPont Aerospace Enterprise and was the Director of DuPont Aviation. He represented DuPont on the Board of Governors of the Aerospace Industries Association of America (AIA) and chaired the AIA Civil Aviation Council. He is a former member of the National Business Aviation Association's safety committee. He holds an Airline Transport Pilot rating.

Malcolm K. Sparrow is Professor of the Practice of Public Management at the Harvard Kennedy School of Government. He is Faculty Chair of the school's Master of Public Policy (MPP) Program, and of the Executive Program on Strategic Management of Regulatory and Enforcement Agencies. He has authored several books on regulatory policy and operational risk-management, and has advised a broad range of Federal regulatory agencies. Before moving to Harvard University, he served 10 years with the British Police Service, rising to the rank of Detective Chief Inspector. He holds a Ph.D in Applied Mathematics.

Ambassador Edward W. Stimpson was appointed by President Clinton in July 1999 as the Representative of the United States of America on the Council of the International Civil Aviation Organization (ICAO). For 25 years, Mr. Stimpson was President of the General Aviation Manufacturers Association (GAMA), representing more than 50 companies involved in the manufacture of aircraft and component parts. He now serves as Chair of the Flight Safety Foundation.

Hon. Carl W. Vogt has served as Chairman of The National Transportation Safety Board; a member of The White House Commission on Aviation Safety and Security; a member of the FAA Aviation System Capacity Advisory Committee and the FAA Ninety Day Safety Review Committee; a Director of the Air Transport Association Aviation Safety Alliance; Chair of the Flight Safety Foundation; Chair of the American Bar Association Forum on Air and Space Law; a member of The MITRE Corp. Aviation Advisory Committee; and, a member of The Board of Visitors of the Aircraft Owners and Pilots Association Air Safety Foundation. He is a Fellow of The Royal Aeronautical Society and an Elder Statesman of Aviation of the National Aeronautic Association. In the U.S. Marine Corps he served as a Naval Aviator and carrier based jet fighter pilot. He holds a commercial pilot's license.

Appendix 6: Charter



THE SECRETARY OF TRANSPORTATION
WASHINGTON, D.C. 20590

APR 25 2008

Edward Stimpson
105 E. Highland View Drive
Boise, ID 83702-1641

Dear Mr. Stimpson:

I appreciate your willingness to be part of the Independent Review Team to assess the implementation and culture of the Federal Aviation Administration's (FAA's) Safety Management System.

While we are currently in the midst of the safest period in the history of aviation, I have initiated a number of improvements in how the FAA's Safety Management System is implemented. The creation of this team is a major component of my initiative. Your work will be invaluable in assisting FAA Acting Administrator Sturgell improve upon an already sound record of safety.

I stated in my April 18th announcement that this independent, non-partisan team will evaluate and craft recommendations to improve the FAA's safety culture as well as the implementation of the aviation safety system. I look forward to seeing your report within 120 days. During this time, I invite you to provide me with regular updates on your progress.

As you know, there is vast agreement among aviation experts that the current, risk-based Safety Management System, as directed by the 1997 White House Commission on Aviation Safety and Security, is the best approach to ensuring that each time a passenger boards a plane, that plane is safe. The data show this approach is working. Your task is not to reinvent the FAA's safety regime. Rather, I would like you to develop actionable recommendations that will result in a more robust safety program. As I stated in my announcement of this initiative, "[t]here is simply no question that our approach is sound and our results decisive. But there is also no doubt a good system can always be made better."

Your personal contributions will be crucial to reassuring the flying public that our aviation safety system is safe. Thank you for your service on this team and for your commitment to aviation safety.

Sincerely,

A handwritten signature in cursive script, reading "Mary E. Peters".

Mary E. Peters