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## A Legal Analysis of 14 C.F.R. Part 91 See and Avoid Rules to Identify Provisions Focused on Pilot Responsibilities to See and Avoid in the National Airspace System

Ernest E. Anderson

William Watson

Douglas M. Marshall

Kathleen M. Johnson

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## **A LEGAL ANALYSIS OF 14 C.F.R. PART 91 “SEE AND AVOID” RULES TO IDENTIFY PROVISIONS FOCUSED ON PILOT RESPONSIBILITIES TO “SEE AND AVOID” IN THE NATIONAL AIRSPACE SYSTEM**

PROFESSOR ERNEST E. ANDERSON, J.D.\*

PROFESSOR WILLIAM WATSON, J.D.\*\*

DOUGLAS M. MARSHALL, J.D.\*\*\*

KATHLEEN M. JOHNSON, J.D.\*\*\*\*

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\* Ernest Anderson, J.D., is an Associate Professor in the Department of Aviation at the University of North Dakota. Prior to joining UND in 2003, he served as an attorney with the Southwest Region of the Federal Aviation Administration. He also served six years active duty with the Marine Corps as a helicopter pilot. During his eleven-year association with UND, Professor Anderson has taught courses in aerospace law, helicopter systems, and a Master's degree course in aviation policy and regulation.

\*\* William D. Watson, J.D., is an Assistant Professor of Aviation at the University of North Dakota. He teaches Aviation Law, Helicopter Aerodynamics, and the Safety Management System (SMS) in the graduate school. He researches in the area of Unmanned Aircraft Systems (UAS). Prior to his tenure at UND, Professor Watson piloted helicopters in the U.S. Army, practiced aviation law in Los Angeles, CA, and was a Deputy Attorney General for the state of California.

\*\*\* Owner, TrueNorth Consulting LLC, a UAS support and service organization founded in 2007; previously served as Division Manager, UAS Regulations & Standards Development at New Mexico State University; and Professor of Aviation at the University of North Dakota. He is co-editor of two books related to aviation, co-author of *Introduction to Unmanned Aircraft Systems*, and is author of numerous published articles on aviation law, regulations, and remotely piloted aircraft. Prior to his academic appointments he practiced aviation, maritime, and employment law in California.

\*\*\*\* Kathleen M. Johnson, J.D., graduated from the University of North Dakota School of Law in 2014. She is a judicial law clerk for the South Central Judicial District in North Dakota.

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## I. EXECUTIVE SUMMARY

**T**HIS RESEARCH ASSIGNMENT looked at the general operating and flight rules contained in 14 C.F.R. Part 91 that identify regulatory provisions that impose upon the pilot the duty to see and avoid other aircraft. The research focused on three objectives. First, a section-by-section review of Part 91 was conducted to identify specific regulations that assign a duty or responsibility to a pilot to see and avoid other aircraft. Second, upon identification of specific regulations, this effort looked into the history and background behind these provisions to clarify the intent, or legal purview, behind their promulgation. In this effort, support for determining purview was sought from historic and current documents, including historic and current rulemaking continued in the Federal Register, Advisory Circulars, Manuals, and judicial treatment arising from adjudication of these provisions. Lastly, the research looked at systems that have been employed, or have the possibility to be employed, that may enhance or supplement the pilot’s responsibility for separation from other aircraft.

A complete summary of each section of this report would be a daunting task. Instead, each section of the report provides its own summaries and conclusions. The following provides a brief background of the contents of this report.

## A. PART 91 REGULATIONS IMPOSING DIRECT DUTY TO “SEE AND AVOID”

A number of regulatory provisions were found to impose this direct duty on aviators.<sup>1</sup> The history and development of these regulations was examined to identify the specific duty each demands. For example, 14 C.F.R. § 91.113 states that pilots have a duty to be vigilant.<sup>2</sup> This research looked behind this term, seeking answers for what constitutes vigilance. It further considered how the term is interpreted by the FAA, or its predecessors, and whether there are any exceptions that apply to relieve a pilot of this duty. Other examples include 14 C.F.R. § 91.111, which prohibits operations so close to other aircraft so as to create a “collision hazard.”<sup>3</sup> The questions considered here include: Is there a precise distance that creates such a hazard? Who, or what, particular circumstances decide if a collision hazard exists? And is

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<sup>1</sup> See 14 C.F.R. §§ 91.3, .13, .111, .113, .123, .126–.131, .155, .185 (2014).

<sup>2</sup> *Id.* § 91.113.

<sup>3</sup> *Id.* § 91.111.

this standard objective or subjective? In many cases the regulations themselves do not offer any definition. In developing answers to what the relevant agencies intended by these terms, aviation policy documents and judicial decisions were review and analyzed to address these questions and clarify the intent behind these duties involved with seeing and avoiding other aircraft.

#### B. PART 91 REGULATIONS FACILITATING "SEE AND AVOID" RESPONSIBILITIES

In addition to regulations that directly impose a duty to see and avoid other aircraft, regulations were also found that facilitate this duty.<sup>4</sup> These provisions support the ability of aircraft to see other aircraft and facilitate safe separation.<sup>5</sup> As an example, 14 C.F.R. § 91.117 restricts aircraft speeds.<sup>6</sup> Early era aircraft operated at lower speeds that allowed other aircraft to see them with ample time to avoid collisions.<sup>7</sup> However, by the mid-1940s, aircraft speeds had significantly increased, and the time from first seeing another aircraft until possible collision was significantly reduced.<sup>8</sup> Accordingly, it was found that this provision required reduced airspeeds in high density airspace to facilitate collision avoidance.<sup>9</sup> Similarly, 14 C.F.R. § 91.209, and its predecessors, required aircraft operating at night to use position and anti-collision lighting to facilitate seeing and avoiding conflicting traffic at night.<sup>10</sup>

#### C. REGULATIONS PROVIDING USAGE OF ENHANCED SYSTEMS

Part of the research focused on regulations that have embraced new technology that enhances or supplements the traditional concept of see and avoid for aircraft separation.<sup>11</sup> Section 91.221 requires that certain aircraft install and utilize Traffic Alert and Collision Avoidance System (TCAS) equipment.<sup>12</sup> Sec-

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<sup>4</sup> See *id.* §§ 91.105, .117, .181, .209.

<sup>5</sup> See *e.g., id.* § 91.209 (laying out regulations regarding aircraft lights).

<sup>6</sup> *Id.* § 91.117.

<sup>7</sup> See Richard P. Hallion, *Airplanes That Transformed Aviation*, AIR & SPACE MAG. (July 2008), <http://www.airspacemag.com/history-of-flight/airplanes-that-transformed-aviation-46502880/?all&no-ist>.

<sup>8</sup> See *id.*

<sup>9</sup> See 14 C.F.R. § 91.117.

<sup>10</sup> See *id.* § 91.209.

<sup>11</sup> See *id.* §§ 91.221, .225.

<sup>12</sup> See *id.* § 91.221; see also FED. AVIATION ADMIN., ADVISORY CIRCULAR NO. 120-55C, AIR CARRIER OPERATIONAL APPROVAL AND USE OF TCAS II (2011).

tion 91.221 requires the TCAS equipment to be on and operating, but only if it is installed.<sup>13</sup> The implementation of TCAS equipment in the National Airspace System made a large change to the relationship between ATC and the aircraft it controlled. Historically, under 14 C.F.R. § 91.123, and its predecessors, a pilot could only deviate from a clearance in an emergency, or upon receipt of an amended clearance.<sup>14</sup> With the recent requirement for TCAS, the pilot is authorized to deviate in response to a TCAS resolution advisory.<sup>15</sup> The transition from traditional concepts to more current concepts has led to serious problems. For example, in 2002 there was a collision in Eastern Europe involving a Russian aircraft that was instructed to climb by TCAS but instead descended in compliance with the ATC’s instructions.<sup>16</sup> This is a challenging dilemma.

Section 91.225 requires the future employment of ADS-B Out technology for most aircraft in support of NextGen objectives.<sup>17</sup> The FAA rules direct that full implementation will not occur until January 1, 2020.<sup>18</sup> Very little controversy and discussion were located on ADS-B. Most research has addressed the engineering behind this technology.<sup>19</sup> This was not felt to be unusual, given the effectiveness of this regulation is well in the future. Research conducted at the University of North Dakota was presented, which sought pilot comments on the ADS-B technology’s collision avoidance and traffic acquisition potential.<sup>20</sup> Overall, those comments favored this technology for enhancing natural sight for seeing and avoiding other aircraft.<sup>21</sup>

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<sup>13</sup> See 14 C.F.R. § 91.221.

<sup>14</sup> *Adm’r v. Moore*, N.T.S.B. Order No. EA-4992, at \*4 (2002).

<sup>15</sup> FED. AVIATION ADMIN., AERONAUTICAL INFORMATION MANUAL § 4-4-16(b) (2014), available at [http://www.faa.gov/air\\_traffic/publications/atpubs/air/In-dex.htm](http://www.faa.gov/air_traffic/publications/atpubs/air/In-dex.htm) [hereinafter *AJM*].

<sup>16</sup> GER. FED. BUREAU OF AIRCRAFT ACCIDENTS INVESTIGATION, UBERLINGEN INVESTIGATION REPORT (May 2004), available at [http://cfappicao.int/fsix/sr/reports/02001351\\_final\\_report\\_01.pdf](http://cfappicao.int/fsix/sr/reports/02001351_final_report_01.pdf).

<sup>17</sup> See 14 C.F.R. § 91.225.

<sup>18</sup> See *id.*

<sup>19</sup> See, e.g., Pengfei Duan, Automatic Dependent Surveillance-Broadcast (ADS-B) Space-Oriented Message Set Design (Aug. 2011) (unpublished M.S. thesis, Ohio University), available at [https://etd.ohiolink.edu/!etd.send\\_file?accession=ohiou1305656769&disposition=inline.pdf](https://etd.ohiolink.edu/!etd.send_file?accession=ohiou1305656769&disposition=inline.pdf).

<sup>20</sup> FED. AVIATION ADMIN., EVALUATING THE EFFECTIVENESS OF ADS-B IN THE COLLEGIATE FLIGHT TRAINING ENVIRONMENT, No. 04-C-GA-ERAU-067 (2008).

<sup>21</sup> See *id.*

## II. INTRODUCTION

Regulation of aviation is primarily in the federal domain, under the watchful eye of the FAA. This has not always been the case. Indeed, one of the earliest aviation-related court cases that held a pilot liable for the operation of an aircraft came out of the Supreme Court of New York long before anyone ever envisioned regulation of aviation.<sup>22</sup> In *Guille v. Swan*, the court found a balloon operator liable for damages his balloon caused when it descended onto the property of another, destroying garden crops as it was dragged by the wind along the ground.<sup>23</sup> It appears that during his landing, Guille was observed to be hanging perilously outside of the car.<sup>24</sup> Bystanders seeing his predicament, rushed onto Swan's property to assist, causing additional crop damage.<sup>25</sup> In *Guille*, the court clearly declared that an aircraft is not free to float around like a bird and alight anywhere free of responsibility.<sup>26</sup> Thus from the outset of aviation, courts have established that a pilot has legal responsibilities, or duties, while operating an aircraft.

Federal regulation of aviation would not show up for another one hundred years. Our present federal system of aviation oversight has its foundation in the passage of the Air Commerce Act of 1926.<sup>27</sup> This act grew out of an era of generally unregulated aviation, which realized a fatality rate of one fatality per 13,500 hours.<sup>28</sup> This was in contrast with airmail operations by the Post Office from 1918 through 1925, which had a much lower fatality rate of one per 463,000 hours.<sup>29</sup> Airmail operations by the Post Office were enhanced by an internal Post Office policy of self-regulation.<sup>30</sup> These policies included hiring experienced pilots who had passed a qualifications exam; requiring medical examinations; performing routine aircraft and engine inspections; and employing specialized aviation mechanics.<sup>31</sup> Obviously, a safer environment could be generated by merging postal policy

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<sup>22</sup> *Guille v. Swan*, 19 Johns. 381, 381-82 (N.Y. 1822).

<sup>23</sup> *Id.* at 381, 383.

<sup>24</sup> *Id.* at 381.

<sup>25</sup> *See id.*

<sup>26</sup> *See id.* at 383.

<sup>27</sup> Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568 (1926).

<sup>28</sup> ANTHONY J. ADAMSKI & TIMOTHY J. DOYLE, INTRODUCTION TO THE AVIATION REGULATORY PROCESS 79 (5th ed. 2005).

<sup>29</sup> *See id.*

<sup>30</sup> *See id.* at 76, 79.

<sup>31</sup> *Id.* at 76.

into enforceable regulation. Congress recognized this through the enactment of the Air Commerce Act, and federal oversight and regulation was welcomed by the aviation industry.<sup>32</sup>

While federal agencies were authorized to promulgate regulation, during the early development of aviation regulations, the agencies were not required to provide much of the rationale behind their final pronouncements—at least very little found its way into the public domain. For the researcher, locating supporting rationale behind the earliest aviation regulations can be elusive.

Fortunately, during this era of early aviation regulation, contemporary authors did offer insight into the legal issues guiding regulation. One such publication is *Law of the Air* by Carl Zollmann.<sup>33</sup> Less than one year after the enactment of the Air Commerce Act of 1926, he explored legal issues related to the regulation of this new transportation mode: (1) historic concepts of property law versus freedom of the air arising with the development of air commerce<sup>34</sup>; (2) need for centralized governmental control<sup>35</sup>; (3) development of rules of the air to prevent collisions<sup>36</sup>; and (4) rules of liability, including liability for collisions based on negligence.<sup>37</sup>

Zollmann recognized that technological changes generated by the introduction of aircraft would challenge established concepts of law and regulation.<sup>38</sup> He further understood that answers to the aviation arena of 1927 required looking at past principles of law for guidance.<sup>39</sup>

The twentieth century will, therefore, develop the law of the air exactly as preceding centuries have developed the law of the land and the law of the sea. Just as the law of automobiles and railroads has grown up within living memory, a similar body of law will develop very shortly in regard to the air. In this process, old

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<sup>32</sup> NICK A. KOMONS, *BONFIRES TO BEACONS: FEDERAL CIVIL AVIATION POLICY UNDER THE AIR COMMERCE ACT, 1926–1938* (1978).

<sup>33</sup> CARL ZOLLMAN, *LAW OF THE AIR* (1927).

<sup>34</sup> *Id.* at 1–20. Prior to the introduction of aircraft, landowners thought to own land and air above their land to the edge of the universe. With the advent of air commerce, if this concept remained unchecked, a pilot would technically be required to obtain landowner permission to cross every ownership along a route of flight. Obviously, this would be an impossibility.

<sup>35</sup> *Id.* at 30–62.

<sup>36</sup> *Id.* at 50–52.

<sup>37</sup> *Id.* at 78–79.

<sup>38</sup> *Id.* at 30–62.

<sup>39</sup> *Id.*

principles of law are being probed to their foundation and new principles will be evolved to cover situations hitherto undreamed of.<sup>40</sup>

The focus of our research is of this very nature. Specifically, to analyze earlier principles of aviation law and regulation that define the current responsibility for pilots to see and avoid other aircraft.

More recently, with the passage of the Federal Register Act<sup>41</sup> and the Administrative Procedures Act of 1946,<sup>42</sup> federal rulemaking and the intentions behind those rules were opened to greater public scrutiny and understanding. The Administrative Procedures Act requires that informal rulemaking provide for public notice and comments.<sup>43</sup> Notice is published in the Federal Register, typically as a Notice of Proposed Rulemaking (NPRM).<sup>44</sup> A time frame for written comments from the public is then provided.<sup>45</sup> Lastly, the final rule is published in the Federal Register.<sup>46</sup> In the NPRM, the agency typically provides the rationale behind its proposal.<sup>47</sup> In the final rule, the agency will generally discuss the comments that were received, and the rationale for adopting its final version of the regulation.<sup>48</sup> These discussions are fertile ground for identifying agency intention behind specific regulations.

Two faculty members and three graduate research assistants at the University of North Dakota worked on the research objectives. This collective effort identified seventeen Part 91 regulations that deal with assigning a legal responsibility for a pilot to see and avoid other aircraft. These regulations are:

*Part 91 Regulations Directly Imposing on Pilots "See and Avoid" Responsibilities*

- § 91.3 (and § 91.123)
- § 91.13
- § 91.111
- § 91.113

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<sup>40</sup> *Id.* at 1.

<sup>41</sup> Federal Register Act, Pub. L. No. 74-220, 49 Stat. 500 (1935).

<sup>42</sup> Administrative Procedure Act, Pub. L. No. 79-404, 60 Stat. 237 (1946).

<sup>43</sup> *Id.* at 239.

<sup>44</sup> *Id.*; OFFICE OF THE FED. REGISTER, A GUIDE TO THE RULEMAKING PROCESS 4 (2011), available at [https://www.federalregister.gov/uploads/2011/01/the\\_rulemaking\\_process.pdf](https://www.federalregister.gov/uploads/2011/01/the_rulemaking_process.pdf) [hereinafter A GUIDE TO THE RULEMAKING PROCESS].

<sup>45</sup> See A GUIDE TO THE RULEMAKING PROCESS, *supra* note 44, at 5.

<sup>46</sup> See *id.* at 7.

<sup>47</sup> See *id.* at 4.

<sup>48</sup> See *id.* at 7.

- §§ 91.126 – 91.131
- § 91.155
- § 91.185

*Part 91 Regulations that Facilitate “See and Avoid” Responsibilities*

- § 91.105
- § 91.117
- § 91.181
- § 91.209

*Part 91 Regulations Providing for Usage of Enhance Systems to Facilitate See and Avoid Responsibilities.*

- § 91.221
- § 91.225

### III. REGULATIONS IMPOSING DIRECT DUTY TO “SEE AND AVOID”

#### A. 14 C.F.R. § 91.3 RESPONSIBILITY AND AUTHORITY OF THE PILOT IN COMMAND, AND SECTION 91.123 COMPLIANCE WITH ATC CLEARANCE AND INSTRUCTIONS

##### 1. *Introduction*

14 C.F.R. § 91.3 assigns the responsibility for the conduct of flights to the pilot in command (PIC) and authorizes deviations from the FARs to handle emergencies.<sup>49</sup> The current regulation is set forth in Appendix B.

##### 2. *History of Section 91.3*

It is probably no accident that Section 91.3 is cited at the outset of the General Operating and Flight Rules. The responsibilities of pilot are many, but this regulation establishes up front that the PIC is “directly responsible” and has “final authority” over the operation of his or her aircraft.<sup>50</sup> Recognizing that deviation from regulations may be necessary to handle emergencies, a limited authority to deviate is granted, but only to the extent required to meet that emergency.<sup>51</sup>

The first introduction of this provision can be found in the post-World War II Civil Aeronautical Regulations (CAR). In the 1940 regulations, no equivalent to Section 91.3 existed.<sup>52</sup> In the 1945 supplement, the Air Traffic Rules included Section 60.100

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<sup>49</sup> See 14 C.F.R. § 91.3 (2014).

<sup>50</sup> See *id.*

<sup>51</sup> See *id.*

<sup>52</sup> See generally 14 C.F.R. § 1.1 et seq. (1940).



entitled "Authority of the Pilot": "The pilot in command of an aircraft shall be directly responsible for its safe operation."<sup>53</sup> However, no emergency exception was included.<sup>54</sup>

By 1947, this section of the CAR was expanded to include language addressing emergencies and requiring reports to the Civil Aeronautics Board (CAB) if requested.<sup>55</sup> This version permitted the PIC to deviate from the CAR for emergencies but required reports of a deviation to be submitted to the Administrator if requested.<sup>56</sup> If no deviation occurred, but air traffic control (ATC) was required to handle the situation as a priority, a report was to be made without being requested.<sup>57</sup> From 1947 until 1962, this provision remained virtually the same.<sup>58</sup> Over the years, regulatory treatment contained in the Federal Register related to this provision was generally cosmetic, mostly focusing on the reporting requirements.<sup>59</sup>

In 1963, the Federal Aviation Agency initiated a recodification of its regulations, changing the title from "Civil Aviation Regulations" to "Federal Aviation Regulations."<sup>60</sup> The recodification was to streamline and clarify the existing regulations.<sup>61</sup> No serious substantive changes were proposed.<sup>62</sup> One of those changes

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<sup>53</sup> 14 C.F.R. § 60.100 (1945 & Supp 1946).

<sup>54</sup> *See id.*

<sup>55</sup> 14 C.F.R. § 60.01 (1947 & Supp. 1948).

The pilot in command of the aircraft shall be directly responsible for its operation and shall have final authority as to operation of the aircraft. In emergency situations which require immediate decision and action the pilot may deviate from the rules prescribed in this part to the extent required by consideration of safety. When such emergency authority is exercised, the pilot, upon request of the Administrator, shall file a written report of such deviation. In an emergency situation which results in no deviation from the rules prescribed in this part but which requires air traffic control to give priority to an aircraft, the pilot of such aircraft shall make a report within 48 hours of such emergency situation to the nearest regional office of the Administrator.

*Id.*

<sup>56</sup> *Id.*

<sup>57</sup> *Id.*

<sup>58</sup> *Compare id.*, with 14 C.F.R. § 60.2 (1962).

<sup>59</sup> *See* Air Traffic Rules, 20 Fed. Reg. 2512, 2514 (Apr. 16, 1955) (to be codified at 14 C.F.R. pt. 60).

<sup>60</sup> Air Traffic and General Operating Rules, 28 Fed. Reg. 6702, 6702 (June 29, 1993) (to be codified at 14 C.F.R. pt. 91).

<sup>61</sup> *See id.*

<sup>62</sup> *See id.*

created a new Section 91.3, which adopted the language used for the current Section 91.3.<sup>63</sup>

### 3. Analysis of Section 91.3

Virtually all discussions accompanying the regulatory changes focused on the report requirements for deviations. Little, if any, rulemaking has addressed what constitutes a bona fide emergency. The AIM offers some substance on this issue.<sup>64</sup> Under Chapter 6, Emergency Procedures, the AIM provides:

An emergency can be either a *distress* or *urgency* condition as defined in the Pilot/Controller Glossary. Pilots do not hesitate to declare an emergency when they are faced with *distress* conditions such as fire, mechanical failure, or structural damage. . . . An aircraft is in at least an *urgency* condition the moment the pilot becomes doubtful about position, fuel endurance, weather, or any other condition that could adversely affect flight safety.<sup>65</sup>

Further, the Federal Aviation Administration’s (FAA) has published an Air Traffic Control Order that provides guidance for handling emergencies in Chapter 10-1-1 of the order.<sup>66</sup>

The AIM and the Air Traffic Control Order distinguish between “distress” and “urgency” conditions.<sup>67</sup> No litigation was identified during this research that would indicate that a distinction between the terms has ever been in controversy or examined. Paragraph 10-1-1(c) of the Air Traffic Control Order provides that even if the pilot has not used the proper phrases or if the air traffic controller is in doubt of the status, the controller should treat the situation as if it were an emergency.<sup>68</sup> However, based on the language of provision 10-1-1, an emer-

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<sup>63</sup> *Id.*

<sup>64</sup> AIM, *supra* note 15, at 6-1-2. The AIM is not regulatory, so a deviation from its provisions does not constitute a violation. However, it does establish the standard of care expected of pilots. Thus a deviation may constitute negligence. See *Mgmt. Activities, Inc. v. United States*, 21 F. Supp. 2d 1157, 1176 (1998) (finding the pilot’s noncompliance with AIM procedures related to wake turbulence constituted negligence, the court stated “information contained in the AIM, particularly the section concerning the nature, behavior, and danger of wake turbulence, is chargeable to all certificated pilots and is evidence of the standard of care for determining whether they exercise proper wake turbulence avoidance procedures”) (emphasis added).

<sup>65</sup> AIM, *supra* note 15, at 6-1-2(a).

<sup>66</sup> See FED. AVIATION ADMIN., DEP’T OF TRANSP., AIR TRAFFIC CONTROL ORDER NO. JO 7110.65U (2012) [hereinafter FAA ORDER NO. JO 7110.65U]. See Appendix C for an excerpt of Chapter 10-1-1.

<sup>67</sup> See *id.* at 10-1-1(a)-(b); AIM, *supra* note 15, at 6-1-2.

<sup>68</sup> FAA ORDER NO. JO 7110.65U, *supra* note 66, at 10-1-1(c).

gency determination is made by the pilot.<sup>69</sup> This order offers no direction to the controller to verify whether the emergency is authentic.<sup>70</sup>

Unfortunately, the FAA may later look back at the incident and find that the emergency defense under Section 91.3(b) does not apply.<sup>71</sup> The emergency exception does not apply where the underlying basis for the emergency was of the pilot's own making, such as flying into foreseeable deteriorating weather conditions.<sup>72</sup>

a. Emergency Must Not Be of Pilot's Own Making

In *Administrator v. Austin*, respondent, a Visual Flight Rules (VFR) rated pilot, flew into an airport that was Instrument Flight Rules (IFR) with ceilings below 1,000 feet in violation of Section 91.105(c), now Section 91.155(c).<sup>73</sup> Respondent did not deny the airport's IRF status but argued that though he was aware of deteriorating weather, he had relied on erroneous weather reports for the airport.<sup>74</sup> "It is well settled that the exculpatory effect of Section 91.3(b) is applicable only when the IFR weather conditions in which a pilot finds himself were unforeseeable and not avoidable by the exercise of sound judgment before and during the flight."<sup>75</sup> The Board concluded, "that respondent cannot avail himself of the defense of an emergency which he could have and should have avoided."<sup>76</sup>

The Federal Court of Appeals in *Quinn v. Hinson* also adopted this position.<sup>77</sup> In this case, a pilot attempting to establish radio contact after avoiding adverse weather, inadvertently flew into Class B airspace without authorization.<sup>78</sup> The pilot admitted the violation but alleged it was due to the in-flight weather emergency.<sup>79</sup> The court rejected the emergency defense because "the

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<sup>69</sup> See *id.* at 10-1-1(b), (d).

<sup>70</sup> See *id.* at 10-1-1(c).

<sup>71</sup> See, e.g., *Adm'r v. Austin*, 2 N.T.S.B. 662 (1974).

<sup>72</sup> See *id.* at 663-64.

<sup>73</sup> *Id.* at 662.

<sup>74</sup> *Id.*

<sup>75</sup> *Id.* at 663.

<sup>76</sup> *Id.* at 663-64.

<sup>77</sup> *Quinn v. Hinson*, No. 96-1551, 1996 U.S. App. LEXIS 33470, at \*6-7 (1st Cir. Dec. 19, 1996).

<sup>78</sup> *Id.* at \*2-4.

<sup>79</sup> *Id.* at \*6.

emergency was of petitioner’s own making.”<sup>80</sup> She allowed herself to become disoriented because of weather, an emergency of her own making, and flew into protected airspace.<sup>81</sup>

#### b. Emergency Must Occur In-Flight

Section 91.3 is intended to cover in-flight emergencies that require immediate attention. In *Chritton v. National Transportation Safety Board*, the Circuit Court of Appeals for the District of Columbia affirmed the National Transportation Safety Board’s (NTSB) opinion that denied application of the emergency defense for a pilot who flew into conditions of low visibility and fog, hitting power lines while transporting a patient to a hospital.<sup>82</sup> The court did not refute the medical emergency of the patient but denied that the Section 91.3(b) defense applied because a previously existing medical emergency was not the intended use of this emergency defense.<sup>83</sup> The court stated

The Board also correctly concluded that “[Mr. Chritton’s] passenger’s need for immediate medical attention is not the type of emergency that is contemplated by FAR section [sic] 91.3(b) [;] [t]he kind of emergency to which FAR Section 91.3(b) refers is an inflight emergency that requires immediate attention . . . that arises after takeoff.”<sup>84</sup>

In this case the patient’s emergency status arose before take-off.<sup>85</sup> The urgency of the mission, air ambulance, was not the type of emergency contemplated by the regulations.<sup>86</sup>

In an unusual case, *Administrator v. Mew*, a pilot was not found in violation for deviating from an assigned altitude when he reacted to a cry for help from a passenger who suffered hot coffee

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<sup>80</sup> *Id.* at \*6–7; see also *Adm’r v. Futyma*, N.T.S.B. Order No. EA-4141, at \*2, 3 (1994) (finding that respondent caused the problems that led to his dilemma and eventual landing at an Air Force Base without radio contact with the tower, the Board offered that “any resulting emergency was due solely to his own negligence, and cannot serve as an excuse for his violations. It is well-established that violations cannot be excused by an emergency of the airman’s own making.”).

<sup>81</sup> *Quinn*, 1996 U.S. App. LEXIS 33470, at \*7.

<sup>82</sup> *Chritton v. Nat’l Transp. Safety Bd.*, 888 F.2d 854, 854–55 (D.C. Cir. 1989).

<sup>83</sup> *Id.* at 861.

<sup>84</sup> *Id.* (internal citation omitted).

<sup>85</sup> See *id.* at 862; see also *Adm’r v. Clark*, 2 N.T.S.B. 2015, 2016 (1976). A VFR pilot inadvertently entered unforecast IMC weather conditions and invoked Section 91.3(b) in his defense. *Id.* The Board concurred, noting that “the principal issue is whether the emergency was of the pilot’s own making or whether it could have been avoided by the exercise of sound judgment before and during the flight.” *Id.*

<sup>86</sup> See *Chritton*, 888 F.2d at 862.

spilled on him and thus momentarily took his attention away from cockpit duties.<sup>87</sup> In finding no violation, the Board stated:

Regardless of whether the situation suddenly confronting respondent is considered the type of in flight “emergency” normally associated with Section 91.3(b), we agree with the law judge that respondent should not be found to have violated Sections [91.123] and [91.13] in this instance. When a pilot instinctively and understandably reacts to a passenger who is in extremis and is momentarily diverted so that he exceeds his assigned altitude, we do not believe that, as a matter of fundamental fairness, he should be held accountable under the regulations. To hold otherwise would be tantamount to applying a theory of strict liability which the Board views as inappropriate to the adjudication of these cases.<sup>88</sup>

c. Requests for Waiver From Regulations

If deviations can be forecast or are known prior to the flight, the regulations provide a means of seeking pre-approval for those deviations.<sup>89</sup> 14 C.F.R. § 91.903 provides guidance for a waiver application for deviations of certain Part 91 regulations.<sup>90</sup>

d. Avoiding Collisions Is an Emergency Contemplated by Section 91.3

Avoiding a collision with another aircraft is an emergency covered by Section 91.3(b).<sup>91</sup> In *Administrator v. Owen*, the Captain of a Boeing 727 was notified of traffic as he was climbing to an assigned altitude of 5,000 feet.<sup>92</sup> He observed the other aircraft directly ahead with a very rapid rate of closure.<sup>93</sup> The pilot initiated a turn to avoid the other aircraft, and because he directed his eyes outside the cockpit, he climbed to 5,600 feet—a deviation from his clearance.<sup>94</sup> The Board held that this deviation, caused by a perceived and immediate collision threat was an emergency under Section 91.3(b).<sup>95</sup>

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<sup>87</sup> *Adm'r v. Mew*, 6 N.T.S.B. 980, 980 (1989) (emphasis omitted).

<sup>88</sup> *Id.* at 981.

<sup>89</sup> *See* 14 C.F.R. § 91.903 (2014).

<sup>90</sup> *Id.*

<sup>91</sup> *Id.* § 91.3(b).

<sup>92</sup> *Adm'r v. Owen*, 3 N.T.S.B. 854, 854, 855 (1977).

<sup>93</sup> *Id.* at 855.

<sup>94</sup> *Id.* at 855–56.

<sup>95</sup> *Id.* at 856.

e. Two-Way Radio Communications Failure

Paragraph 6-4-1 of the AIM discusses radio communications failure.<sup>96</sup> It provides that communication failure could constitute an emergency but further states that this would depend on the circumstances and that the pilot should continue to comply with the FARs, specifically Section 91.185.<sup>97</sup> Paragraph 6-1-1(c) offers further guidance on lost communications: “Unless deviation is necessary under the emergency authority of 14 CFR Section 91.3, pilots of IFR flights experiencing two-way radio communications failure are expected to adhere to the procedures prescribed under ‘IFR operations, two-way radio communications failure.’”<sup>98</sup> The AIM defines “lost communications” as the “[l]oss of the ability to communicate by radio.”<sup>99</sup> Collectively, these provisions in the AIM appear to establish that lost radio communications do not by themselves arise to an emergency; rather, other circumstances, combined with lost communications, are necessary.<sup>100</sup>

While an interesting and important issue, this discussion goes beyond the objectives stated for this research. It is recommended that future research efforts explore the emergency provisions under Section 91.3(b) in greater detail.

4. *Analysis of Deviations Contemplated by Section 91.123*

Section 91.3 authorizes deviations from all Part 91 rules, including Section 91.123.<sup>101</sup> In contrast, Section 91.123 is more narrowly tailored to authorize deviations from ATC clearances and instructions, including in emergency situations.<sup>102</sup> While

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<sup>96</sup> AIM, *supra* note 15, at 6-4-1.

<sup>97</sup> *Id.* at 6-4-1(b)–(c).

<sup>98</sup> *Id.* at 6-1-1(c).

<sup>99</sup> *Id.* at Pilot/Controller Glossary.

<sup>100</sup> *See id.* at 6-1-1(c), Pilot/Controller Glossary. No case law specific to this point was located. However, in *Administrator v. Futyma*, N.T.S.B. Order No. EA-4141 (1994), the Board stated:

[E]ven if respondent’s loss of his radios could be considered a legitimate emergency, section 91.3 would not excuse his violations in this case because that section only permits deviations from the regulations “to the extent required to meet th[e] emergency.” . . . [R]espondent had more than enough fuel to continue flying to any of the nearby uncontrolled airports, where he could lawfully have landed without radios.

*Futyma*, N.T.S.B. Order No. EA-4141, at \*3.

<sup>101</sup> *See* 14 C.F.R. § 91.3 (2014).

<sup>102</sup> *Id.* § 91.123.

the body of litigation on Section 91.123 is significant, a review of the cases does not indicate a divergence from the status of what is an acceptable emergency. The Board's decisions indicate that an emergency must generally relate to an in-flight, urgent, safety-related problem.<sup>103</sup>

Originally, the deviations permitted under both regulations were solely for "emergencies." However, that changed in 1995 for Section 91.123.<sup>104</sup> In that year, the FAA amended Section 91.123 to authorize deviations based on a traffic alert and collision avoidance system (TCAS) resolution advisory (RA, together TCAS RA).<sup>105</sup> The amended language of Section 91.123 (with the TCAS provisions italicized) is:

- (a) When an ATC clearance has been obtained, no pilot in command may deviate from that clearance unless an amended clearance is obtained, an emergency exists, *or the deviation is in response to a traffic alert and collision avoidance system resolution advisory*. However, except in Class A airspace, a pilot may cancel an IFR flight plan if the operation is being conducted in VFR weather conditions. When a pilot is uncertain of an ATC clearance, that pilot shall immediately request clarification from ATC.

....

- (c) Each pilot in command who, in an emergency, *or in response to a traffic alert and collision avoidance system resolution advisory*, deviates from an ATC clearance or instruction [order] shall notify ATC of that deviation as soon as possible.<sup>106</sup>

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<sup>103</sup> See *Adm'r v. Black*, 5 N.T.S.B. 902, 903 (1986). On an air carrier flight, both pilots directed their attention to a landing gear light's failure to go out after take-off. *Id.* Their attention focused on the landing gear problem, they exceeded the assigned altitude by 800 feet. *Id.* Respondent argued this problem constituted an emergency, justifying their deviation from the clearance. *Id.* Consistent with the earlier discussion of the need for urgency, the Board rejected this defense, stating "no effort to show either that the gear problem required the *immediate, exclusive attention* of either or both pilots." *Id.* (emphasis added). See also *Adm'r v. Brandy*, 3 N.T.S.B. 2957, 2957-58, 2959 (1980). The pilot requested certain taxi direction, which was not granted, and taxied on his requested course anyway. *Id.* at 2958. The Board noted that for a deviation from ATC instructions "a pilot would need a *safety related justification* for not complying with the instructions or clearance." *Id.* at 2959 (emphasis added).

<sup>104</sup> Notification to Air Traffic Control (ATC) of Deviations From ATC Clearances in Response to Traffic Alert and Collision Avoidance System Resolution Advisories, 60 Fed. Reg. 50,676 (Sept. 29, 1995) (to be codified at 14 C.F.R. pt. 91).

<sup>105</sup> *Id.*

<sup>106</sup> *Id.* at 50,679.

The FAA acknowledged that the earlier language (without reference to the TCAS RA) did not provide for a deviation except in emergency situations.<sup>107</sup> By adding the TCAS RA provision, the FAA codified its existing policy permitting,

pilots to deviate from an air traffic control (ATC) clearance, in non-emergency situations, when responding to a TCAS resolution advisory (RA). The language contained in the current regulations [earlier version lacking the TCAS RA provision] suggests that deviation from an ATC clearance is authorized only in an emergency situation. The intended effect of this action is to add the TCAS RA as a reason to deviate from a clearance, and to require that whenever a pilot deviates from an ATC clearance, ATC will be advised as soon as possible.<sup>108</sup>

TCAS, Advisory Circulars, and AIM provisions will be considered in detail in Part 3.

## B. 14 C.F.R. § 91.13 CARELESS OR RECKLESS OPERATION

### 1. *Introduction*

14 C.F.R. § 91.13 prohibits persons from operating an aircraft in the air or on the surface in a careless or reckless manner so as to threaten persons or the property of others.<sup>109</sup> The current regulation is set forth in Appendix B.

### 2. *Background and Analysis of Section 91.13*

Section 91.13 continues a long history of legal actions that seek to reduce intentional and unintentional injury to persons or property. The body of law treating these careless injuries is referred to as “tort law,” and the most common form is negligence.<sup>110</sup> Negligence was stimulated by the industrial revolution and the arrival of new forms of transportation, specifically rail-

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<sup>107</sup> FED. AVIATION ADMIN., ADVISORY CIRCULAR NO. 120-55A, AIR CARRIER OPERATIONAL APPROVAL AND USE OF TCAS II 2 (1993) (cancelled by Advisory circular No. 120-55B, which was cancelled by Advisory Circular No. 120-55C, published Mar. 18, 2013) (policy in place prior to amendment was, in looking at deviations, that the FAA would not “initiate enforcement action solely on the basis of a TCAS event”).

<sup>108</sup> Notification to Air Traffic Control (ATC) of Deviations From ATC Clearances in Response to Traffic Control Avoidance System Resolution Advisories, 60 Fed. Reg. at 50,676.

<sup>109</sup> See 14 C.F.R. § 91.13 (2014). The FAA traditionally cites to Section 91.13 and refers to careless or reckless collectively. These two terms are not synonymous. Accordingly, each will be treated separately.

<sup>110</sup> Less S. Ureindler, *Development of Negligence Law in the United States*, 14 N.Y. PRAC., N.Y. LAW OF TORTS § 6:2 (2014).



ways.<sup>111</sup> Negligence describes the conduct of an individual that falls short of what is expected of a reasonable person.<sup>112</sup> A reasonable person has a duty to use reasonable care to avoid danger or injury to others.<sup>113</sup> When reasonable care is not exercised, the negligent individual is considered to have breached this duty, and consequences including damages arise.<sup>114</sup> Under Section 91.13, a violation of some FARs could be considered negligent.<sup>115</sup>

While Section 91.13 does not use the term negligence, this regulation section reflects that concept. It insists that pilot's duty is to exercise the level of care of a reasonable pilot.<sup>116</sup> This is shown in an early aviation case. In *William Edward Angel*, on take-off from the then Los Angeles Municipal Airport, the respondent collided with another aircraft.<sup>117</sup> The CAB initiated a certificate action for a violation of Section 60.3301(b).<sup>118</sup> The accident occurred after Angel landed his open cockpit Waco on

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<sup>111</sup> *Id.*

<sup>112</sup> *Id.* § 6:3.

<sup>113</sup> *Id.*

<sup>114</sup> *Id.*

<sup>115</sup> See *Abdullah v. Am. Airlines, Inc.*, 181 F.3d 363, 371 (3d Cir. 1999).

Moreover, our move from specific to general regulation is not without support in FAA regulations themselves. For example, 14 C.F.R. § 91.13(a), which governs "Careless or Reckless Operation," supplies a comprehensive standard of care to be exercised by pilots and flight crew. It provides, "No person may operate an aircraft in a careless or reckless manner so as to endanger the life or property of another." In a case then where there is no specific provision or regulation governing air safety, § 91.13(a) provides a general description of the standard required for the safe operation of aircraft.

Thus, in determining the standards of care in an aviation negligence action, a court must refer not only to specific regulations but also to the overall concept that aircraft may not be operated in a careless or reckless manner. The applicable standard of care is not limited to a particular regulation of a specific area; it expands to encompass the issue of whether the overall operation or conduct in question was careless or reckless. Moreover, when a jury is determining what constitutes careless or reckless operation of an aircraft, expert testimony on various aspects of aircraft safety may be helpful to the jury.

*Id.* The court went on to apply this standard of care to the use of seat belts. *Id.* at 371-72.

<sup>116</sup> 14 C.F.R. § 91.13 (2014).

<sup>117</sup> *William Edward Angel*, 5 C.A.B. 10, 11 (1940).

<sup>118</sup> *Id.* at 12; see also 14 C.F.R. § 60.3301(b) (1938). "A take-off shall not be commenced until there is no risk of collision with other aircraft during such take-off." *Id.*

a grass area of the airport.<sup>119</sup> On takeoff he struck another biplane, killing the one occupant.<sup>120</sup> The court found that the object of this aviation provision was

to prohibit the reckless operation of aircraft and to impose upon pilots the duty of exercising the care required by the circumstances in ascertaining whether or not there is risk of collision with other aircraft before commencing a take-off. So interpreted it is a violation of this section only if a pilot fails to maintain this standard of care.<sup>121</sup>

In rejecting the pilot's defense that he had been given a green light authorizing take-off, the court rationalized that "there still rested upon him a duty to observe the entire area he proposed to traverse before beginning his take-off." Consequently, the court found "that respondent was negligent in failing to observe the entire path of this proposed take-off before attempting such take-off."<sup>122</sup> At the time of this case, there was no comparable Section 91.13; however, pilots were still prohibited from negligent aircraft operations and held to a duty to avoid other aircraft.

The earliest civil aviation regulation covering careless or reckless operation is found in the 1945 supplement to the Civil Aviation Regulations.<sup>123</sup> Under Section 60.101, entitled "Careless or Reckless Operation," it states, "[n]o person shall operate an aircraft in a careless or reckless manner so as to endanger the life or property of another."<sup>124</sup>

In 1947, the CAB had, in its revised Part 60 of Air Traffic Rules, adopted this same language, but went further and added a note with clarifying examples for pilots.<sup>125</sup> Draft Release No. 46-5, circulated to the aviation community by the CAB, offered that this rule:

[S]hould be carefully observed, and is one of the most important regulations pertaining to flight. Interpretation of this rule should recognize that every flight of aircraft necessarily incurs some risk to persons or property on the surface. This risk is the one inherent in normal flying operations, and it is the pilot's responsibility

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<sup>119</sup> *William Edward Angel*, 5 C.A.B. at 11.

<sup>120</sup> *Id.*

<sup>121</sup> *Id.* at 12.

<sup>122</sup> *Id.* at 13.

<sup>123</sup> 14 C.F.R. § 60.101 (1945 & Supp. 1946).

<sup>124</sup> *Id.*

<sup>125</sup> Air Traffic Rules, 12 Fed. Reg. 5547, 5548 (Aug. 16, 1947) (to be codified at 14 C.F.R. pt. 60).

not to increase that risk beyond that degree to persons or property in the air or on the surface.<sup>126</sup>

Section 60.102 was adopted and incorporated with much of the above language. The final note to this section stated:

NOTE: Examples of aircraft operation which may endanger the lives or property of others are:

- (a) Any person who "buzzes", [sic] dives on, or flies in close proximity to a farm, home, any structure, vehicle, vessel, or group of persons on the ground. In rural districts the flight of aircraft at low altitude often causes injury to livestock. A pilot who engages in careless or reckless flying and who does not own the aircraft which he is flying unduly endangers the aircraft, the property of another.
- (b) The operation of aircraft at an insufficient altitude endangers persons or property on the surface or passengers within the aircraft. Such a flight may also constitute a violation of § 60.107 [Minimum Safe Altitudes].
- (c) Lack of vigilance by the pilot to observe and avoid other air traffic. In this respect, the pilot must clear his position prior to starting any maneuver, either on the ground or in flight.
- (d) Passing other aircraft too closely.
- (e) An operation conducted above a cloud layer in accordance with VFR minimums which results in the pilot becoming involved in instrument flight, unless the pilot possesses a valid instrument rating, the aircraft is properly equipped for instrument flight, and all IFR requirements are observed.<sup>127</sup>

In 1957, the "careless or reckless" provision was again revised.<sup>128</sup> This amendment focused on issues related to the flight-testing of aircraft.<sup>129</sup> This revision amended paragraph (c), above, to include additional language focused on flight-testing, which compromised the pilot's duty to be vigilant and scan for other aircraft:

Lack of vigilance by the pilot to observe and avoid other air traffic. This includes failure of the pilot to clear his position prior to starting any maneuver, either on the ground or in flight; and special flight activities which require such preoccupation by the

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<sup>126</sup> CIVIL AERONAUTICS BD., CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5 § 60.102 (1946) [hereinafter CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5].

<sup>127</sup> Air Traffic Rules, 12 Fed. Reg. at 5548.

<sup>128</sup> Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. 2575, 2576 (Apr. 16, 1957) (to be codified at 14 C.F.R. pt. 60) (emphasis added).

<sup>129</sup> See *id.*

pilot with cockpit duties as would prevent adequate vigilance outside the cockpit for the purpose of collision avoidance *without compensation for such reduced degree of vigilance by the use of a competent observer in the aircraft, a chase aircraft, or other equivalent arrangements.*<sup>130</sup>

This addition incorporated both flight and ground operations.<sup>131</sup> Also, by incorporating the phrase "or other equivalent arrangements,"<sup>132</sup> it appears to include the use of specialized technology to assist the pilot in his duty to observe and avoid other aircraft in instances where the pilot is otherwise unable serve in this capacity.

In 1967, the Federal Aviation Agency acknowledged that the careless or reckless provision used the term "operate," which meant the use of an aircraft for purposes of "air navigation."<sup>133</sup> This definition fell short of covering incidents where the use of an aircraft was not incidental to flight. Specifically, the FAA cited leaving an aircraft with rotors or propellers turning and hand propping.<sup>134</sup> These created dangers to the airport environment and were felt to be unacceptable events that needed to be included in the coverage of careless or reckless.<sup>135</sup> Accordingly, in 1966, the Agency proposed the addition of Section 91.10.<sup>136</sup> The new provision read:

No person may operate an aircraft other than for the purpose of air navigation, on any part of the surface of an airport used by aircraft for the air commerce (including areas used by those aircraft for receiving or discharging persons or cargo), in a careless or reckless manner so as to endanger the life or property of another.<sup>137</sup>

In 1989, with an extensive recodification of Part 91, the FAA recodified amended Section 91.9 as Section 91.13(a), and Section 91.10 became Section 91.13(b).<sup>138</sup>

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<sup>130</sup> *Id.*

<sup>131</sup> *See id.*

<sup>132</sup> *Id.*

<sup>133</sup> *See* Careless or Reckless Ground Use of Aircraft Not Incident to Flight, 31 Fed. Reg. 13,352, 13,353 (Oct. 14, 1966) (to be codified at 14 C.F.R. pt. 91) (existing Section 91.9 covers careless or reckless operations involving flight).

<sup>134</sup> *Id.*

<sup>135</sup> *See id.*

<sup>136</sup> *Id.*

<sup>137</sup> Careless or Reckless Ground Operation of Aircraft, 32 Fed. Reg. 9640, 9641 (July 4, 1967) (to be codified at 14 C.F.R. pt. 91).

<sup>138</sup> *See* Revision of General Operating and Flight Rules, Final Rule, 54 Fed. Reg. 34,283, 4,293 (1989) (to be codified at 14 C.F.R. pt. 91).

### 3. Careless Standard

#### a. Breadth of Section 91.13(a)

At the outset, Section 91.13(a) is without doubt the most cited violation by the FAA and its predecessors. Even using the simple measurement provided by the NTSB's Case Decision Database, since January 1, 1992, 386 cases cited to Section 91.13.<sup>139</sup> In contrast, during that same period only 154 cases cited to Section 91.7 (airworthiness); twenty-eight cited a violation of Section 91.111 (operating near other aircraft); and nine cited Section 91.113 (right-of-way).<sup>140</sup>

A primary reason for this is that Section 91.13 casts a broad net. That is, it often serves as a derivative violation for the various operational violations. As an example, in *Administrator v. Seyb*, the respondent was charged with violations of Section 91.123 (deviation from a clearance) and Section 91.129 (landing at airport with control tower without receiving a clearance).<sup>141</sup> The respondent admitted the operational violation but denied that his actions were careless.<sup>142</sup> The Board held careless operation was established by virtue of finding an underlying operational violation.<sup>143</sup>

The Administrator consistently includes a "careless or reckless" charge (i.e., a § 91.13(a) charge) in her complaints charging violation of operational regulations. This is sometimes termed a "residual" or "derivative" carelessness violation. Under the Administrator's interpretation of her regulations, a charge of carelessness or recklessness under § 91.13(a) is proven when an operational violation has been charged and proven.<sup>144</sup>

If, however, an operational violation is not found, most often neither is careless or reckless violation. Examples of operational violations subject to Section 91.13's reach that are related to the duty to see and avoid other aircraft are discussed later.

Section 91.13 is not limited to being a residual charge; it is occasionally cited as a stand-alone, independent violation.<sup>145</sup>

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<sup>139</sup> *Case Decision Database*, NAT'L TRANSP. SAFETY BOARD, [http://www.nts.gov/legal/o\\_n\\_o/query.aspx](http://www.nts.gov/legal/o_n_o/query.aspx) (last visited Oct. 7, 2014) (enter "91.13" in the FAR/Regulation search box to review cases referring to Section 91.13) [hereinafter *N.T.S.B. Case Decision Database*].

<sup>140</sup> *Id.*

<sup>141</sup> *Adm'r v. Seyb*, N.T.S.B. Order No. EA-5024, at \*1 (2003).

<sup>142</sup> *Id.*

<sup>143</sup> *Id.* at \*2.

<sup>144</sup> *Id.*

<sup>145</sup> *See, e.g., Adm'r v. Jennings*, 2 N.T.S.B. 715 (1974).

When charged as a violation independent of an operational regulation, it has "to be independently proven by a showing of actual or potential endangerment."<sup>146</sup> An example of this is *Administrator v. Jennings*.<sup>147</sup> In this case, Jennings landed gear up.<sup>148</sup> Though no regulations specifically prohibit gear up landings, he was charged with violating Section 91.9 (now Section 91.13(a)).<sup>149</sup> He alleged he had moved the toggle switch to lower the gear, however, due to the dimmed nature of the landing gear indicator lights when the navigation lights were on, he could not confirm the gear lights.<sup>150</sup> The toggle switch had "three positions: up, down, and neutral."<sup>151</sup> The court believed that Jennings only moved the switch to neutral, not down.<sup>152</sup> The court was also critical of Jennings for not turning the navigation lights off for a brief period to confirm the down light illumination.<sup>153</sup> In other words, his duty included more than just glancing at the gear position lights.<sup>154</sup> Post-incident testing of the gear system indicated no problems.<sup>155</sup> The Board held that Jennings had a duty to lower the gear and confirm it was down.<sup>156</sup> Jennings's omissions were thus held to be careless, in violation of Section 91.13(a).<sup>157</sup>

Whether a pilot's specific actions constitute a careless or reckless act may depend on the sophistication, or lack of sophistication, of the aircraft he or she is operating. In *Administrator v. Grzybowski*, the respondent, after starting his engine, realized he had left the chocks in place.<sup>158</sup> Instead of shutting down the engine, his passenger went out to remove the nose wheel chock while the propeller was turning.<sup>159</sup> The passenger's attempt to remove the chock was unsuccessful, and she was struck by the propeller and killed.<sup>160</sup> Removal of the chocks under these cir-

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<sup>146</sup> See *Seyb*, N.T.S.B. Order No. EA-5024, at \*5.

<sup>147</sup> See *Jennings*, 2 N.T.S.B. at 715.

<sup>148</sup> *Id.* at 715-16.

<sup>149</sup> *Id.* at 716-17.

<sup>150</sup> *Id.* at 715-16.

<sup>151</sup> *Id.* at 716.

<sup>152</sup> *Id.*

<sup>153</sup> *Id.*

<sup>154</sup> See *id.*

<sup>155</sup> *Id.*

<sup>156</sup> *Id.* at 716-17.

<sup>157</sup> *Id.* at 717.

<sup>158</sup> *Adm'r v. Grzybowski*, N.T.S.B. Order No. EA-4045, at \*1 (1993).

<sup>159</sup> *Id.*

<sup>160</sup> *Id.*

cumstances was found to be extremely careless.<sup>161</sup> The respondent argued in defense that being near a propeller is not uncommon as some aircraft require hand propping with chocks in place.<sup>162</sup> The Board rejected this argument stating, "we think a pilot's duty of care may fairly be linked to the level of safety the equipment he is operating affords him, and that duty is not lowered because other, less-advanced equipment may not provide the same safeguards."<sup>163</sup> The nature and complexity of the aircraft obviously plays a role in determining the standard of care to be followed.

These stand alone cases alleging a violation of Section 91.13(a) are generally fewer in number than derivative type cases. Of the 386 total cases adjudicating violations of carelessness or recklessness, only twenty-four indicate they were independent of operational violations.<sup>164</sup>

b. Actual or Potential Endangerment?

Does endangerment have to generate an actual threat or can a potential threat be enough to trigger a violation? While the language of the regulation does not treat this issue, decisions on appeal clearly side with potential endangerment—proof of actual endangerment is not required. All that is required is proof of a potential for injury or property damage; an actual injury is not required.<sup>165</sup>

c. Does Section 91.13(a) Apply to Non-Pilots?

Exemplifying the breadth of this regulation, the FAA has in fact charged an occupant of an aircraft, who was not the PIC with violating Section 91.13(a).<sup>166</sup> In *Administrator v. Thomas*, the

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<sup>161</sup> *Id.*

<sup>162</sup> *Id.* at \*2.

<sup>163</sup> *Id.*

<sup>164</sup> But see *Adm'r v. Szabo*, N.T.S.B. Order No. EA-4265, at \*2 (1994), *aff'd* 76 F.3d 375 (4th Cir. 1996). Where the operational violation has been dismissed, a careless charge could still survive. See *id.* In this case, an airman was alleged to have landed on a short runway occupied by another aircraft, in violation of Section 91.65(a) [now Section 91.111(a)]. *Id.* at \*1. The Board found insufficient evidence of a collision hazard but did find sufficient evidence of carelessness. *Id.* at \*2. While originally derivative to Section 91.111(a), sufficient proof survived to support an independent careless violation. *Id.*

<sup>165</sup> See *Adm'r v. Lorenz*, N.T.S.B. Order No. EA-5205, at \*1 (2006) (finding that landing gear up generates the potential of injury or property damage in violation of Section 91.13(a)).

<sup>166</sup> *Adm'r v. Thomas*, N.T.S.B. Order No. EA-4309, at \*1 (1995).

non-PIC occupant in the right seat of a single pilot aircraft was charged with violating Section 91.13(a).<sup>167</sup> The facts established that the aircraft narrowly missed a gear-up landing, damaging the propeller tips and antenna.<sup>168</sup> The respondent was the owner of the aircraft and held a pilot certificate.<sup>169</sup> However, he was not the PIC.<sup>170</sup> The Board acknowledged that his ownership "created no special duty equivalent to that of PIC."<sup>171</sup> However, the Board did find him careless based on his conduct during the flight.<sup>172</sup> He had played an active role during the flight, including using the radios, working flaps and propeller, calling out altitudes, and accepting a higher approach speed from ATC, even over the objection of the PIC.<sup>173</sup> The court likened these actions to functions normally expected of a second pilot, even though this aircraft did not require such.<sup>174</sup> Therefore, the respondent's participation in the cockpit duties resulted in the court finding him to be a participating pilot in the operations.<sup>175</sup>

While [respondent] may fortuitously have been the one to notice that the gear was not down, his actions as well as [the PIC's], contributed to that situation. And, respondent's holding a pilot certificate may affect the sanction (i.e., it may affect the duty of care to which he is bound), *but one need not be a pilot to violate § 91.13(a).*<sup>176</sup>

d. Application of Section 91.13(b) for Other Than Air Navigation

As stated earlier, this provision was added in 1967 to cover instances of carelessness or recklessness when actual flight is not intended.<sup>177</sup> For the vast majority of Section 91.13 cases, flight was the intended objective.<sup>178</sup> The NTSB decision database shows only five cases associated with Section 91.13(b) since 1992, out of the 386 careless or reckless decisions, that relate to ground incidents involving maintenance or aircraft movement

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<sup>167</sup> See *id.*

<sup>168</sup> *Id.*

<sup>169</sup> *Id.*

<sup>170</sup> See *id.*

<sup>171</sup> *Id.* at \*2.

<sup>172</sup> *Id.* at \*3.

<sup>173</sup> *Id.* at \*2.

<sup>174</sup> *Id.* at \*3.

<sup>175</sup> *Id.*

<sup>176</sup> *Id.* (emphasis added).

<sup>177</sup> See *supra* notes 133–37 and accompanying text.

<sup>178</sup> See, e.g., *Adm'r v. Greybauski*, N.T.S.B. Order No. EA-4045, at \*1 (1993).



in which actual flight was not contemplated.<sup>179</sup> In *Administrator v. Gianelli*, a company pilot for Colgan Air repositioned an aircraft on the airport without any intent for flight.<sup>180</sup> The evidence showed he failed to use a checklist for this ground taxi purpose and also failed to turn on the hydraulic system.<sup>181</sup> Without hydraulics the aircraft experienced a loss of braking and steering, causing it to hit another aircraft.<sup>182</sup> His omission was careless under Section 91.13(b).<sup>183</sup>

In *Administrator v. Murphy*, a pilot landed at an airport, taxied to a ramp area, and left the aircraft unattended and running.<sup>184</sup> Later that same pilot returned to the aircraft and entered the cockpit—the aircraft was still running.<sup>185</sup> Some time later, an FAA inspector who noticed the engine was running went up to the aircraft and found the pilot asleep in the front seat.<sup>186</sup> The pilot told the inspector he did not want to shut the engine down since it would not restart because of a faulty starter.<sup>187</sup> The pilot neither chocked nor tied down his aircraft.<sup>188</sup> The FAA inspector believed a reasonable pilot under these circumstances would have considered doing both.<sup>189</sup> The Board found the pilot's actions "created an unnecessary risk of injury to persons or damage to other aircraft on the ramp," in violation of Section 91.13(b).<sup>190</sup>

In another ground taxi case, *Administrator v. Taylor*, an airman had parked his aircraft at an airport, planning to stay only a brief time.<sup>191</sup> However, he ended up going with a co-worker to a local bar and grill.<sup>192</sup> Later, around 1:30 a.m., he decided to walk back to the airport and reposition his aircraft.<sup>193</sup> Repositioning did not go well.<sup>194</sup> The aircraft ended up in a ditch be-

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<sup>179</sup> See *N.T.S.B. Case Decision Database*, *supra* note 139.

<sup>180</sup> *Adm'r v. Gianelli*, N.T.S.B. Order No. EA-5356, at \*1 (2008).

<sup>181</sup> *Id.*

<sup>182</sup> *Id.*

<sup>183</sup> *Id.*

<sup>184</sup> *Adm'r v. Murphy*, N.T.S.B. Order No. EA-5015, at \*1 (2003).

<sup>185</sup> *Id.*

<sup>186</sup> *Id.*

<sup>187</sup> *Id.*

<sup>188</sup> *Id.*

<sup>189</sup> *Id.*

<sup>190</sup> *Id.*

<sup>191</sup> *Adm'r v. Taylor*, N.T.S.B. Order No. EA-5003, at \*1 (2002).

<sup>192</sup> *Id.*

<sup>193</sup> *Id.*

<sup>194</sup> See *id.*

tween the taxiway and ramp.<sup>195</sup> A blood alcohol concentration of .10 no doubt compromised his taxiing ability.<sup>196</sup> He acknowledged that he knew he could not fly while drunk but argued that no regulations prohibited taxiing while drunk.<sup>197</sup> Finding his argument without merit, the court found he was in violation of Section 91.13(b).<sup>198</sup>

#### 4. *Reckless Standards*

Traditionally, the FAA packages "careless or reckless" as one violation. However, these terms are not synonymous. Careless is most often likened to negligence, that is, one knew or should have known better. Generally, carelessness reflects inadvertent conduct. Recklessness, on the other hand, is usually reserved for more serious violations of Section 91.13(a), and often for violations that were intentional.

In *Ferguson v. National Transportation Safety Board*, omissions by an airman were found to be reckless.<sup>199</sup> In that case respondent, an airline pilot, was operating at night on a leg from Denver, Colorado, to Sheridan, Wyoming.<sup>200</sup> During the flight, he was given a clearance for a direct flight that took him over Buffalo, Wyoming.<sup>201</sup> Both pilots mistook Buffalo for Sheridan and landed at the wrong airport.<sup>202</sup> The court noted that Ferguson: (1) did not familiarize himself with navigational charts for the airports; (2) allowed the first officer to make the landing against company policy; (3) did not use navigational aids to identify the airport; and (4) did not note that visual indications showed him landing at the wrong airport.<sup>203</sup> In finding conduct of this nature reckless, the court affirmed an earlier Board decision that interpreted reckless to mean "conduct that demonstrates a gross disregard for safety when coupled with the creation of actual danger to life and property. . . . A gross disregard for safety occurs when a person engages in conduct that show[s] a disregard for foreseeable consequences."<sup>204</sup>

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<sup>195</sup> *Id.*

<sup>196</sup> *See id.*

<sup>197</sup> *Id.* at \*3.

<sup>198</sup> *Id.*

<sup>199</sup> *Ferguson v. NTSB*, 678 F.2d 821, 824 (9th Cir. 1982).

<sup>200</sup> *Id.*

<sup>201</sup> *Id.*

<sup>202</sup> *Id.* at 824–25.

<sup>203</sup> *Id.*

<sup>204</sup> *Id.* at 829 (quoting *Adm'r v. Understein*, N.T.S.B. Order EA-1644 (1981)).

In *Administrator v. Reese*, an airman's conduct was found to be reckless when he continued a flight knowing an important safety system was compromised.<sup>205</sup> During this flight, the oxygen masks aboard the Boeing 737 deployed.<sup>206</sup> The respondent, as captain, descended to 10,000 feet to check the oxygen system.<sup>207</sup> Because the masks deployed, the oxygen in them was depleted.<sup>208</sup> Knowing this, the respondent continued the flight, climbing to Flight Level 410 without the passengers having access to supplemental oxygen.<sup>209</sup> The Board affirmed a finding of recklessness stating, "[r]espondent knowingly and unnecessarily exposed eighty-eight passengers and three cabin crewmembers to the significant likelihood of sudden, serious brain injury or death in the event the aircraft experienced another pressurization problem."<sup>210</sup>

Operations that cause injury to persons on the ground may also constitute recklessness. In *Administrator v. Evanko*, a PIC was found reckless for operating his aircraft in close proximity to a person known to be near his aircraft.<sup>211</sup> A pilot, observing the erratic traffic pattern maneuvers of respondent's aircraft, left her aircraft and confronted respondent who had just landed and was in his aircraft at the run-up area, engine running.<sup>212</sup> Words were exchanged and respondent intentionally accelerated his aircraft with the other pilot hanging onto the airplane's door by her arm.<sup>213</sup> She was injured in this exchange.<sup>214</sup>

Generating a jet blast that endangers other aircraft has also been found to be reckless. In *Administrator v. Langford*, a PIC of a Learjet intentionally used excess thrust, creating a jet blast that caused considerable turbulence for a C-172 known to be behind him.<sup>215</sup> The amount of thrust was sufficient to leave a seventy-five foot skid mark as the Learjet skidded with its brakes locked.<sup>216</sup> The key to this case was the deliberate creation of un-

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<sup>205</sup> *Adm'r v. Reese*, N.T.S.B. Order No. EA-4896, at \*2 (2001).

<sup>206</sup> *Id.* at \*1.

<sup>207</sup> *Id.*

<sup>208</sup> *Id.*

<sup>209</sup> *Id.*

<sup>210</sup> *Id.* at \*2.

<sup>211</sup> *Adm'r v. Evanko*, N.T.S.B. Order No. EA-4221, at \*1 (1994).

<sup>212</sup> *Id.*

<sup>213</sup> *Id.* at \*2.

<sup>214</sup> *Id.*

<sup>215</sup> *Adm'r v. Langford*, N.T.S.B. Order No. EA-5673, at \*1 (2013).

<sup>216</sup> *Id.* at \*3.

necessary jet blast and the fact that the location of the Cessna was known to the PIC of the Learjet.<sup>217</sup>

Finally, in *Administrator v. Krueger*, the Board found a pilot’s act of flying close to another aircraft reckless.<sup>218</sup> The court held “that [recklessness] is comparable to a finding of gross negligence.”<sup>219</sup> It further stated that “[r]espondent’s behavior here was so egregiously insensitive to safety concerns, with no mitigating factors even being offered, that it warrants a recklessness finding.”<sup>220</sup>

5. *Application of Section 91.13 to Regulations Related to the Duty to “See and Avoid” Other Aircraft*

Because the FAA routinely includes violations of Section 91.13 with other operational violations, compiling a complete list of all combinations is not easy to accomplish. “FAR section 91.13’s prohibition against the creation of careless or reckless endangerments is generic because it would be impossible for the Administrator to attempt to list by regulation every unsafe practice that an airman should avoid.”<sup>221</sup> Accordingly, selected examples are offered below, showing regulations that impose a duty on pilots to be vigilant to see and avoid other aircraft and that constitute a violation of Section 91.13 when they are not complied with.

a. Section 91.111

The Board found that because the respondent had come within fifty to one hundred feet horizontally and within one hundred feet vertically of another aircraft, a violation of Section 91.111(a) (operating near other aircraft) should be sustained.<sup>222</sup> Because the respondent failed to meet his duty to see and avoid other aircraft, pursuant to Section 91.111, a violation of Section 91.13(a) also occurred.<sup>223</sup>

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<sup>217</sup> *Id.* at \*2, 3.

<sup>218</sup> *Adm’r v. Krueger*, N.T.S.B. Order No. EA-4281, at \*1–2 (1994).

<sup>219</sup> *Id.* at \*1.

<sup>220</sup> *Id.*

<sup>221</sup> *See Adm’r v. Taylor*, N.T.S.B. Order No. EA-5003, \*3 (2002).

<sup>222</sup> *See Adm’r v. Arellano*, N.T.S.B. Order No. EA-4292, at \*1 (1994).

<sup>223</sup> *Id.*

b. Section 91.113

An emergency medical helicopter en route to pick up a patient was confronted by respondent's aircraft, which approached the helicopter within a few hundred feet and eventually passed over the helicopter within one hundred to two hundred feet.<sup>224</sup> The Board found respondent's conduct grossly negligent and egregiously insensitive to safety.<sup>225</sup>

c. Section 91.155

In *Administrator v. Simmons*, the respondent was charged with a violation of Section 91.155(a) because he departed an airport and failed to maintain VFR cloud clearances while in class E airspace.<sup>226</sup> He entered IMC conditions only a few minutes after takeoff.<sup>227</sup> The court found that it was foreseeable he would enter IMC before obtaining appropriate ATC clearance.<sup>228</sup> The administrative law judge (ALJ) and the Board uniformly characterized this as "intentional, *reckless* and deliberate behavior" and prohibited the application of the Aviation Safety Reporting Program.<sup>229</sup>

6. *Aeronautical Information Manual (AIM) and Advisory Circulars*

The AIM and Advisory Circulars are used to determine how a pilot is to meet his or her duty of care (i.e., the standards that guide a pilot in properly operating in the national airspace system under the FARs) and are often cited as the standard of expected conduct by the courts.<sup>230</sup>

The [Aeronautical] Information Manual (AIM) is an FAA publication whose purpose is to instruct pilots about basic flight information, air traffic control procedures, and general instructional information. Pilots must study and know the appropriate provisions of the AIM and FAA Advisory Circulars (ACs) pertaining to

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<sup>224</sup> See *Krueger*, N.T.S.B. Order No. EA-4281, at \*1.

<sup>225</sup> *Id.*

<sup>226</sup> *Adm'r v. Simmons*, N.T.S.B. Order No. EA-5275, at \*1 (2007).

<sup>227</sup> *Id.* at \*4.

<sup>228</sup> *Id.* at \*5.

<sup>229</sup> See *id.* at \*4 (emphasis added); see also FED. AVIATION ADMIN., ADVISORY CIRCULAR NO. 00-46D, AVIATION SAFETY REPORTING PROGRAM (1997) (emphasis added).

<sup>230</sup> See, e.g., *Adm'r v. Langford*, N.T.S.B. Order No. EA-5673, at \*1 n.5 (2013); *Adm'r v. Greybowski*, N.T.S.B. Order No. EA-4046, at \*2 n.5 (1993).

their flying activities. These documents are evidence of the standard of care among all pilots.<sup>231</sup>

Given the extensive nature of the topics covered by these publications, it is not feasible to list all the duties that, if not met, would constitute careless or reckless operation of an aircraft. If a complete listing is sought, perhaps a future research effort could look into this daunting assignment.

#### C. 14 C.F.R. § 91.111 OPERATING NEAR OTHER AIRCRAFT

As stated in Section 91.111, not every close-quarters situation creates a risk of collision because of aircraft proximity alone.<sup>232</sup> For example, two aircraft in an arranged close formation are not considered to automatically present a collision hazard to each other.

Section 91.111 is not only related to the right-of-way rules in Section 91.113 but also applies whether or not the aircraft are meeting.<sup>233</sup> However, Section 91.113 is usually first violated by not avoiding the “risk” of a collision when thereafter a “collision hazard” is created under Section 91.111 (at least for unintentional violations). In other words, if a collision hazard exists, the aircraft is not well clear.<sup>234</sup>

The earliest aviation regulations in the United States were the Air Commerce Regulations promulgated by the Department of Commerce, Aeronautics Branch, pursuant to the Air Commerce Act of 1926, which took effect in March 1927.<sup>235</sup> Section 74, entitled “Flying Rules” states, “300 feet [is] the minimum distance within which aircraft, other than military aircraft of the United States engaged in military maneuvers and commercial aircraft engaged in local industrial operations, may come within proximity of each other in flight.”<sup>236</sup> By 1945, Civil Air Regulations Section 60.103(d), in regard to proximity, stated “[a]ircraft shall be

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<sup>231</sup> *Mgmt. Activities, Inc. v. United States*, 21 F. Supp. 2d 1157, 1175 (1998), *aff’d in part* 166 F.3d 343 (9th Cir. 1998).

<sup>232</sup> 14 C.F.R. § 91.111 (2013).

<sup>233</sup> *See* *Adm’r v. Krueger*, N.T.S.B. Order No. EA-4281, at \*1 (1994).

<sup>234</sup> *See, e.g., Bennett v. NTSB*, 66 F.3d 1130, 1133–34 (10th Cir. 1995).

<sup>235</sup> *See* KOMONS, *supra* note 32, at 96.

<sup>236</sup> AERONAUTICS BRANCH, U.S. DEP’T OF COMMERCE, INFO. BULL. NO. 7, AIR COMMERCE REGULATIONS § 74(c) (1928) (entitled “Give-Way Duties”) [hereinafter AIR COMMERCE REGULATIONS]. This fixed minimum proximity was set forth within the section on right-of-way rules. Under Section 74(b) (entitled “Giving-Way Order”), “[a]ircraft required to give way shall keep a safe distance, having regard to the circumstances of the case. Three hundred feet will be considered a minimum safe distance.” *Id.* § 74(b). Accordingly, less than three hundred feet

flown at least 500 feet apart except by prearrangement of the pilots in command of the aircraft."<sup>237</sup>

The FAA referenced the proximity rule in its Civil Air Regulations Draft Release No. 46-5, dated October 1, 1946, which was "circulated to the aviation industry for comment."<sup>238</sup> In the remarks section of the document, which proposed changes to Civil Air Regulation Section 60.105, referencing proximity of aircraft, it stated, "[e]xisting regulations provide for 500 feet minimum proximity of aircraft. While 500 feet may be a safe distance between two small aircraft it may not be sufficient separation for large aircraft. The 500-foot factor has, therefore been deleted."<sup>239</sup>

In 1947, following consideration of public comments, Civil Air Regulation Section 60.105, entitled "Proximity of aircraft," was changed to read:

No person shall operate an aircraft in such proximity to other aircraft as to create a collision hazard. No person shall operate an aircraft in formation flight when passengers are carried for hire. No aircraft shall be operated in formation flight except by prearrangement between the pilots in command of such aircraft.<sup>240</sup>

The 1947 amendment is, in substance, the current version of the "Operating Near Other Aircraft" aviation regulation now located at Section 91.111.<sup>241</sup>

Switching from a fixed minimum distance to the variable standard of creating a "collision hazard" caused interpretation problems for airmen and the courts. In *Bennett v. National Transportation Safety Board*, Bennett, the captain of a Citation jet, was issued a "clearance to take off and fly due south on the runway heading pending further instructions."<sup>242</sup> While the copilot acknowledged that clearance over the radio, "Bennett also heard the clearance and took off as authorized."<sup>243</sup> At the same time that the Citation was issued clearance for takeoff, a Cessna 172 "had just completed a touch-and-go landing exercise on a paral-

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violated the regulation on its face; however, if circumstances dictated, a "safe distance" could require more than three hundred feet of clearance.

<sup>237</sup> 14 C.F.R. § 60.103(d) (1945 & Supp. 1946).

<sup>238</sup> CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5, *supra* note 126.

<sup>239</sup> *Id.*

<sup>240</sup> 14 C.F.R. § 60.105 (1947 & Supp. 1948).

<sup>241</sup> Compare *id.*, with 14 C.F.R. § 91.111 (2014).

<sup>242</sup> *Bennett v. NTSB*, 66 F.3d 1130, 1133 (10th Cir. 1995).

<sup>243</sup> *Id.*

lel runway and was also climbing southbound."<sup>244</sup> As Bennett's plane took off and climbed, "the [ATC controller] asked the Citation if it observed the smaller Cessna 172 ahead and to the right."<sup>245</sup> The copilot acknowledged visual contact with the Cessna and pointed it out to Bennett.<sup>246</sup> The Citation was instructed to wait until the Cessna made a right turn to crosswind before executing its own right turn on its desired course.<sup>247</sup> The copilot acknowledged immediately with the Citation's call sign, but Bennett did not hear the exchange due to radio trouble.<sup>248</sup> The copilot then simply told Bennett that they had been cleared to execute the right turn.<sup>249</sup> Bennett then turned without waiting for the Cessna to change course, which resulted in charges of a violation of Section 91.111 being brought.<sup>250</sup> Captain Bennett asserted that "§ 91.111(a) does not establish a 'sufficiently specific objective standard prescribing or proscribing a pilot's behavior' so that a pilot may properly be held accountable for its violation."<sup>251</sup> The court held that:

In what amounts to a deprivation-of-due-process claim, Bennett complains that Reg. § 91.111(a) fails to put pilots on notice of the conduct that it proscribes when it refers only to operation of an aircraft "so close to another aircraft as to create a collision hazard." . . . [The] FAA has authority to suspend a pilot's certificate under a similarly nonspecific statutory prohibition (Section 1429(a) coupled with Section 1301(4)) whenever the pilot creates a hazard to safety:

The *potential for pilot conduct to endanger safety* in interstate, overseas, or foreign air commerce is all that is necessary to support the FAA's order of suspension. . . .

*Doe v. C.A.B.* teaches that those sought to be covered by FAA Regulations must be "informed with reasonable certainty and explicitness" of the standards by which their conduct will be judged. For that purpose *the test is whether the Regulation "delineated its reach in words of common understanding."* In that respect "'no more than a reasonable degree of certainty can be demanded' and it is not 'unfair to require that one who deliberately goes perilously close to an area of proscribed conduct shall take the risk that he may cross the line.'" *In those terms we consider that Reg.*

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<sup>244</sup> *Id.*

<sup>245</sup> *Id.*

<sup>246</sup> *Id.*

<sup>247</sup> *Id.*

<sup>248</sup> *Id.*

<sup>249</sup> *Id.*

<sup>250</sup> *Id.*

<sup>251</sup> *Id.* at 1135 (emphasis added) (internal citations omitted).



§ 91.111(a) plainly puts pilots on notice of the kind of conduct covered.<sup>252</sup>

Accordingly, if a pilot operates an aircraft so close to another aircraft as to create a "collision hazard," he or she has violated Section 91.111(a).<sup>253</sup> In interpreting what constitutes a collision hazard, courts and administrative decisions have turned on the particular facts of each case.<sup>254</sup> These decisions may objectively weigh only the proximity of the aircraft, or they may also weigh the testimony of the intruded upon aircraft's crewmembers as to whether they feared a midair collision and whether either aircraft's crew felt compelled to execute evasive maneuvers.<sup>255</sup> Most often, the courts examine both the objective and the subjective components in determining if a collision hazard existed.<sup>256</sup>

In the case of *Joseph B. Kuhn*, respondent Joseph B. Kuhn was the pilot in command of an Eastern Air Lines DC-4 that collided with a Universal Airline DC-3 on December 19, 1946, near Aberdeen, Maryland.<sup>257</sup> The faster VFR DC-4 overtook and collided with the IFR DC-3 that was ahead on the same airway, at the same altitude.<sup>258</sup> The crewmembers or passengers were not seriously injured in the accident, but the planes were extensively damaged.<sup>259</sup> The CAB held:

Respondent has excepted to the examiner's finding that he operated his aircraft within 500 feet of the Universal DC-3 without prior arrangement therefor, contrary to section 60.103 (d) [sic] of the Civil Air Regulations then in effect. This exception is based on the contention that this provision applies only where such operation is intentional and not where the pilot is unaware of the proximity of the other aircraft. Inasmuch as we have already established a policy consistent with the examiner's finding on this issue [that the regulation covers both intentional and unintentional], respondent's exception is not sustained.<sup>260</sup>

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<sup>252</sup> *Id.* (emphasis added) (internal citations omitted).

<sup>253</sup> *See id.*

<sup>254</sup> *See, e.g., id.* at 1135, 39.

<sup>255</sup> *See, e.g., id.* at 1133-34.

<sup>256</sup> *See generally id.* (showing court considered particular facts of the case and the Cessna's reactions to the other aircraft's nearness).

<sup>257</sup> *Joseph B. Kuhn*, 13 C.A.B. 139, 139 (1949).

<sup>258</sup> *Id.* at 140.

<sup>259</sup> *Id.* at 139. Cases of the aviation civil authorities having a surviving crewmember to charge with a violation following a midair collision are relatively rare.

<sup>260</sup> *Id.* at 141.

In *Joseph B. Kuhn*, the focal point of argument was Captain Kuhn's duty of vigilance for failing to see the other aircraft until just prior to impact, thereby violating the right-of-way rule relating to overtaking aircraft.<sup>261</sup> It becomes apparent then that if the right-of-way rule is violated to such an extent that the "bubble" of safety surrounding each aircraft is also violated, a violation of both Section 91.113 and Section 91.111(a) is possible. Certainly, an actual collision, as in *Joseph B. Kuhn*, is tantamount to a per se violation of Section 91.111(a).<sup>262</sup>

Since 1947, and still under the current Section 91.111, the violating pilot has not been required to be within a certain distance or "proximity," as illustrated by the case involving Robert H. Willbanks.<sup>263</sup> Captain Willbanks, the PIC of a Pacific Southwest Airlines Boeing 727, was alleged to have created a collision hazard by operating too close to a Cessna 172, which was also on an approach for landing at Long Beach, California, even though the closest proximity between the aircraft was five hundred feet or greater.<sup>264</sup> The Board held:

... [R]espondent's aircraft passed some 500' above the Cessna at a lateral distance to its left of approximately 1,000'. . . . [T]he pilot of the Cessna initiated what he believed to be a necessary evasive turn to the right to avoid either a collision with the over-

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<sup>261</sup> *Id.* at 141, 142, 144.

<sup>262</sup> *See id.* at 144; *see also* *Janka v. NTSB*, 925 F.2d 1147, 1151-52 (9th Cir. 1990) (holding a midair collision while flying in a properly planned and briefed formation was a violation of Section 91.111(a)). The *Janka* court stated:

Janka and Newman also challenge the interpretation of FAR 91.65(a) [now Section 91.111] adopted by the Board. They contend that because they were engaged in formation flight in accordance with FAR 91.65(b) [now Section 91.111], they cannot be charged with creating a collision hazard under FAR 91.65(a). . . .

Janka and Newman cite no authority for the proposition that when flying in formation, pilots are free from the obligation to avoid a collision hazard. The Board has previously held that formation flight allowed by section 91.65(b) and a section 91.65(a) violation are not mutually exclusive events. In *Administrator v. Thompson*, the Board affirmed the ALJ's finding of a 91.65(a) violation, even though the parties were flying in an arranged formation flight.

This interpretation of section 91.65(a) is reasonable. An agreement to fly in formation should not relieve pilots of the responsibility to avoid a collision hazard. The Board's determination that Newman and Janka violated FAR 91.65(a) is affirmed.

*Id.* at 1151-52 (internal citations omitted).

<sup>263</sup> *See* *Adm'r v. Willbanks*, 3 N.T.S.B. 3632 (1981).

<sup>264</sup> *Id.* at 3632-33.

taking PSA aircraft or any wake turbulence its passage might create. . . .

. . . . While the respondent was entitled, as the law judge recognized, to cancel his IFR flight plan, decline Stage II sequencing, and make a landing under visual flight rules VFR, his abandonment of ATC assistance in this instance must be viewed in the context of his decision to bring his aircraft into position for an approach to the airport by utilizing a descending left turn. That maneuver all but eliminated his ability to sight known traffic, below and to his right, and to *avoid it by a spatial margin which would have not created a substantial risk of collision or have compelled an experienced pilot to abort an approach* out of concern for that possibility as well as the danger wake turbulence from respondent's jet posed for his smaller aircraft. Even if we were to accept respondent's testimony that he had the Cessna in sight and believed it to be no problem, respondent's conscious choice to pass as closely as he did to the Cessna would demonstrate a serious lack of care in that it is extremely doubtful that he could have avoided a collision had the Cessna unexpectedly changed its heading toward respondent's flight path. . . .

*Respondent's contention that a 500' vertical separation was safe, because sections 91.109 and 91.121 permit cruising altitudes based on such a separation for VFR and IFR traffic, is not persuasive. Those provisions merely specify the proper cruising level for flights on various magnetic compass headings. They do not purport to address what distance reflects a safe separation, vertical or otherwise, when one aircraft is in the vicinity of another, nor can they be reasonably read to relieve a pilot of his duty, under section 91.65(a) [now § 91.111], not to operate his "aircraft so close to another as to create a collision hazard." In short, we cannot conclude that the cruising level requirements set forth in these sections established any basis for finding a 500' vertical separation for landing aircraft to be safe or adequate.*<sup>265</sup>

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<sup>265</sup> *Id.* at 3633-34 (emphasis added). In cases where there is not an immediate collision hazard actionable under Section 91.111 (a), but safe separation has been violated, the Administrator may use Section 91.13 [formally Section 91.9] "Careless or Reckless Operation," as the enforcement mechanism. See *Adm'r v. Whitaker*, 1 N.T.S.B. 1983 (1972). In *Whitaker*, respondent departed VFR to pick up an IFR clearance in the air but entered instrument meteorological conditions prior to receiving the clearance. *Id.* at 1984. A converging IFR aircraft had to be turned immediately, and the ATC controller stated that separation was lost, with only one mile between the two aircraft. *Id.* Respondent argued that no "endangerment" was created. *Id.* at 1987. However, the Board held that "[w]henver a pilot's careless operation results in his aircraft and another plane passing within a mile laterally, and within 1,000 feet vertically, of each other under actual IFR conditions, an endangerment has been created." *Id.* Furthermore, it is not neces-

As seen in AIM 7-6-3, the primary purpose of reporting "near" midair collisions is to enhance safety; however, subparagraph 7-6-3(g) states, "[w]hen the investigation reveals a violation of an FAA regulation, enforcement action will be pursued."<sup>266</sup> The definition of a reportable near miss uses both the objective (five hundred feet) and subjective (belief that a collision hazard existed) standards that are seen in many Section 91.111 enforcement actions.<sup>267</sup>

A violation of Section 91.111(a) may be involuntary, usually as a follow-on to violating the right-of-way rules, or it may be intentional. Intentional violations are normally in the form of "buzzing" another aircraft.<sup>268</sup> In *Stern v. Butterfield*, Stern's red and white Pitts Special was observed performing aerobatics within the Addison, Texas, Class B airspace and executing rolls 1,100 feet above the runway at Air Park airport.<sup>269</sup> A flight instructor testified that while he was giving flight instruction in the vicinity of Air Park, a red Pitts Special aircraft came out of a vertical dive and passed within three hundred feet of his aircraft so that it was necessary to seize control of the aircraft from his student.<sup>270</sup> Mr. Stern was charged with violating Section 91.111(a), among other regulations.<sup>271</sup> The court affirmed the emergency revocation of Mr. Stern's airman certificates.<sup>272</sup>

In the case *Administrator v. Hayes*, respondent was found in violation of Section 91.65(a) [now Section 91.111(a)] by flying his aircraft so close to another aircraft as to create a collision hazard.<sup>273</sup> The pilot of the other airplane testified that on respondent's second pass, respondent flew within one hundred feet of his plane, and on the third pass, he saw respondent shake his fist as he went by.<sup>274</sup> The passenger corroborated his testimony.<sup>275</sup> The court noted that the respondent should not have

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sary for the violating pilot even to see the other aircraft. See *Adm'r v. Blane*, N.T.S.B. Order No. EA-4112, at \*2, 6 (1994).

<sup>266</sup> AIM, *supra* note 15, at 7-6-3(g). See Appendix C for complete version of AIM 7-6-3.

<sup>267</sup> *Id.* at 7-6-3(b)-(c). The subjective component allows for reports in situations where the nearest proximity was in excess of five hundred feet.

<sup>268</sup> See *Adm'r v. Hayes*, 3 N.T.S.B. 1528, 1528, 1529 (1978).

<sup>269</sup> *Stern v. Butterfield*, 529 F.2d 407, 409 (5th Cir. 1976).

<sup>270</sup> *Id.*

<sup>271</sup> *Id.* at 408.

<sup>272</sup> *Id.* at 412.

<sup>273</sup> *Hayes*, 3 N.T.S.B. at 1528.

<sup>274</sup> *Id.* at 1529.

<sup>275</sup> *Id.*

resorted to buzzing and intimidating an aircraft that he considered to be an intruder on his private hunting grounds.<sup>276</sup> There are numerous cases of intentional violations of Section 91.111, including cases where aircraft spontaneously join with and fly formation on unwilling participants.<sup>277</sup>

D. 14 C.F.R. § 91.113 RIGHT-OF-WAY RULES: EXCEPT WATER OPERATIONS

14 C.F.R. § 91.113 sets forth the rules regarding aircraft right-of-way.<sup>278</sup> In accordance with Section 91.113(b), each pilot must maintain “vigilance” in order to “see and avoid” other traffic.<sup>279</sup> Once seen, the pilot without the right-of-way must avoid in a manner that is “well clear” of the other aircraft.<sup>280</sup> The general requirements in paragraph (b) of this regulation may be viewed as a three step process, with each step being a prerequisite to the next: (1) be vigilant (look); (2) see (detect target); and (3) avoid (maneuver if required to remain “well clear”).<sup>281</sup> The first two are tightly intertwined—one cannot see if he or she is not looking.

Following step two of the process (visually acquiring another aircraft), the pilot determines if there is any risk of collision. This determination is based upon projected paths, altitudes and distance. If the projected paths merge and the distance/time to the target are of concern, a risk of collision exists. After a determination that a risk of collision exists, step three of the process is to avoid the other aircraft. Section 91.113 sets forth the rules each pilot must follow during the avoidance maneuvering.<sup>282</sup> Accordingly, the rules are triggered the moment it is determined that a risk of collision exists.<sup>283</sup> The right-of-way rules provide predictability in each pilot’s actions when maneuvering to avoid

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<sup>276</sup> *Id.*

<sup>277</sup> *See* *Specht v. Civil Aeronautics Bd.*, 254 F.2d 905, 916 (8th Cir. 1958) (holding “[t]he pilot who can control his plane but cannot control himself is not a safe pilot”).

<sup>278</sup> *See* 14 C.F.R. § 91.113 (2014).

<sup>279</sup> *Id.* § 91.113(b).

<sup>280</sup> *Id.*

<sup>281</sup> *See id.*

<sup>282</sup> *Id.* § 91.113(d)–(e). *See* Appendix B for Section 91.113 in its entirety.

<sup>283</sup> To determine fault in litigation, the determination of a risk of collision is made by objective standards. For example, if a pilot of a ship is not vigilant and fails to see and perceive a risk of collision, he still bears fault. *See Ocean Marine, Ltd. v. U.S. Lines Co.*, 300 F.2d 496, 499 (2d Cir. 1962).

a collision. Therefore, each pilot is expected know and apply them in meeting situations.

### 1. Vigilance

The word “[v]igilant” is defined as “[w]atchful and cautious; on the alert; attentive to discover and avoid danger.”<sup>284</sup> The courts and the NTSB, an administrative body which adjudicates pilot enforcement actions brought by the FAA, have both determined that the pilot has a legal “duty” under Section 91.113(b) to maintain “vigilance.”<sup>285</sup> The NTSB Opinion and Order in *Administrator v. Tamargo* gives the test for determining a violation of Section 91.113(b) (then numbered Section 91.67(a)): “To prove a violation of the see and avoid provisions of Section 91.67(a), the Administrator must show, by a preponderance of the evidence, that respondent failed to maintain vigilance so as to see and avoid other aircraft.”<sup>286</sup>

It is possible for two aircraft to collide midair and a court still find that neither PIC violated the duty to keep a lookout. In *Transco Leasing Corp. v. United States*, the U.S. Court of Appeals for the Fifth Circuit held that neither pilot involved in a midair collision (one departing Addison, Texas, and one arriving at Love Field, Dallas, Texas) breached his duty to maintain vigilance.<sup>287</sup>

Without more, the fact that two airplanes collide in mid-air in visual meteorological conditions is not evidence of negligence on the part of both pilots or of negligence on the part of one, but not the other, pilot. *The duty imposed upon pilots by the regulation is a duty to exercise vigilance so as to see and avoid other aircraft; it is not an absolute duty to see and avoid.* The degree of care required is that degree of care that would be exercised by reasonably prudent pilot[s].<sup>288</sup>

In *Steering Committee v. United States*, the U.S. Court of Appeals for the Ninth Circuit followed *Transco Leasing Corp.* in holding that the standard of care necessary to meet the duty to maintain vigilance is whether the pilot in question acted at or above the level of conduct of a reasonable pilot.<sup>289</sup> The *Steering Committee*

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<sup>284</sup> BLACK’S LAW DICTIONARY (9th ed. 2009).

<sup>285</sup> See, e.g., *Adm’r v. Tamargo*, N.T.S.B. Order No. EA-4087 (1994).

<sup>286</sup> *Id.* at \*2.

<sup>287</sup> *Transco Leasing Corp. v. United States*, 896 F.2d 1435, 1439, 1447 (5th Cir. 1990).

<sup>288</sup> *Id.* at 1447 (emphasis added).

<sup>289</sup> *Steering Comm. v. United States*, 6 F.3d 572, 577–78 (9th Cir. 1997).

opinion involves the midair collision of an Aeromexico jet and a single engine Piper aircraft over Cerritos, California, on August 31, 1986.<sup>290</sup> The case is quoted extensively, in relevant parts herein, due to its thorough discussion of the standard of care regarding the vigilance requirement:

**III. Standard of Care for Pilots Under 14 C.F.R.  
[§ 91.113(b)]**

We must first decide whether the district court examined the conduct of Aeromexico's pilots using the appropriate standard of care under § 91.67(a) [now § 91.113(b)] . . . .

. . . § 91.67(a) requires pilots to exercise vigilance so as to see and avoid other aircraft. The real question is what constitutes "vigilance." The parties advance three different possibilities: (1) "Vigilance" requires a pilot to see and avoid other aircraft unless to do so would be *physically impossible*; (2) "Vigilance" requires a pilot to see and avoid other aircraft unless to do so would be *more than unreasonable*; and (3) "Vigilance" requires a pilot to see and avoid other aircraft unless to do so would be *unreasonable*. . . .

. . . .

**A.**

The United States initially argues that a pilot is not vigilant if his plane collides with another aircraft unless to see and avoid the aircraft would be physically impossible. . . . In support of its argument, the government cites *United States v. Miller*. In *Miller*, the pilot of a Beechcraft was preparing to land when he collided with a Cessna that was practicing "touch and go" landings. . . .

One of the issues in *Miller* was whether the Beechcraft pilot, Miller, failed to yield the right-of-way. . . .

. . . .

Although the "physical impossibility" standard does not impose strict liability on pilots, it comes close. If we equated "vigilance" with the "physical impossibility" rule, a pilot would be *per se* liable anytime a collision occurred under Visual Flight Rule conditions, regardless of other circumstances. We have rejected in a slightly different context the argument that "the pilot is always negligent when an air crash occurs." . . .

. . . We therefore draw upon the holding and reasoning of *Foss* and upon the persuasive authority of *Transco Leasing* in rejecting the "physical impossibility" standard.

**B.**

Alternatively, the government asserts that the term "vigilance" under § 91.67(a) requires something more than reasonable care, or an elevated degree of reasonableness. It cites a series of cases

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<sup>290</sup> *Id.* at 574.

that place a demanding standard upon pilots under various federal aviation regulations and common law standards.

Most on point is *Rudelson v. United States*, which involved a mid-air collision between a Piper and a dual-controlled Cessna, piloted by a flight instructor and his student. The court acknowledged that "[t]he Cessna pilots' upward vision may have been partially obstructed by the plane's high wing configuration" and that the student, in particular, "may have found it especially difficult to see the Piper as it approached from the right." Nevertheless, the court held that "none of these circumstances excused [the student's] duty to see and avoid other aircraft." Citing the district court's statement that "blind spots can be compensated for by head movement and aircraft movement," the court upheld the finding that the student pilot was negligent because he violated § 91.67(a).

*Mattschei v. United States* is also applicable. In that case, a Cessna and a Cherokee collided in midair under Visual Flight Rule conditions while each pilot communicated with different air traffic controllers on separate radio channels. The district court held that the Cessna pilot was 20% negligent for "his failure to see and avoid other traffic," despite the fact that the Cherokee aircraft approached from above and behind the Cessna. Because the parties appear not to have appealed the issue of the Cessna pilot's liability, however, *Mattschei*, while persuasive, is not direct circuit court authority on the standard of care question.

*Rudelson* and, to a lesser degree, *Mattschei* illustrate that pilots are held to a high standard of care. The doctrinal question, however, is how best to frame the standard. Do we adopt the government's position and label "vigilance" as an elevated standard of care demanding more than "reasonableness," or do we find that "vigilance" requires the care of a reasonably prudent pilot and that high standards are demanded of such a pilot?

. . . .

. . . Because we wish to avoid muddying the waters by introducing some amorphous concept requiring pilots to be "more than reasonable," we decline to interpret "vigilance" as denoting an elevated standard of care.

Instead, we hold that "vigilance" denotes the care that a reasonably prudent pilot would exercise under the circumstances. We find support for this holding in our own decisions, and in the decision of another circuit. Cases such as *Rudelson* and *Mattschei*, then, serve to illustrate the exacting requirements of the reasonably prudent pilot. We emphasize that in the hazardous situation of approaching a busy airport, such a reasonably prudent pilot obviously must be especially careful to see and avoid other aircraft. It is in that sense of "reasonableness" that we construe the



regulation's use of the term "vigilance" in this case. Thus although we reject the bright line "physical impossibility" rule used in *Miller*, we adopt that court's articulation of reasonable care as requiring the pilot to search "thoroughly and diligently" for other aircraft. Accordingly, the reasonably prudent pilot need not be super-human in seeing and avoiding other aircraft, but he or she must scan the sky with such frequency and respond with such precision as is possible. We hold that the district court did not err in defining "vigilance" in terms of the reasonably prudent pilot under § 91.67(a) as long as "reasonableness" is construed in accordance with this opinion.

#### IV. Whether the Aeromexico Pilots Breached their Standard of Care

The district court found "that without a warning from the air traffic controller, the crew of [Aeromexico Flight 498] may have failed to see [the Piper] without any negligence on their part." . . .

. . . [T]here was a great deal of expert evidence that a reasonably vigilant crew would not have seen the Piper until it was too late to do anything about it. The point at which the unwarned Aeromexico crew, scanning the sky, was more likely than not to have seen the approaching airplane was placed by various experts as just under 12 seconds, 6 seconds, "the last few seconds," and "the last moments prior to collision." There was also testimony placing between 8 and 12.5 seconds the amount of time required to take evasive action.

On the strength of this evidence, the district court found that the Aeromexico crew "was diligent and professional at all *relevant times*." In context, there is little doubt that the "diligence" in question was that of being reasonably vigilant. . . .

. . . [W]e cannot say that its finding that the crew was diligent and professional at all relevant times was clearly erroneous in light of all of the evidence.<sup>291</sup>

The case of *Nakajima v. United States*, in the U.S. Court of Appeals for the Eleventh Circuit, involved a midair collision between an airplane and a helicopter piloted by Mr. Nakajima at the Opa Locka airport, Florida.<sup>292</sup> The airplane was conducting touch and go traffic patterns to the north of runway 9 left, and the helicopter was working traffic patterns on the south using a helipad area adjacent to runway 9 right.<sup>293</sup> On turning to final approach the airplane apparently overshot south of correct alignment for 9 left and, while descending, hit the helicopter

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<sup>291</sup> *Id.* at 576–80 (internal citations omitted).

<sup>292</sup> *Nakajima v. United States*, 965 F.2d 987, 988 (11th Cir. 1992).

<sup>293</sup> *Id.*

“from above and from the rear on the helicopter’s blind [left] side.”<sup>294</sup> Mr. Nakajima died in the crash.<sup>295</sup> The court held that vigilance does not demand the impossible, and in this case, it was physically impossible for pilot Nakajima to see the airplane unexpectedly entering his flight pattern, as it was approaching from behind and above.<sup>296</sup>

[T]here was no reason for Keiji Nakajima to take extraordinary measures to search for an unknown and unexpected hazard. We do not interpret the rule to require a pilot under these circumstances to keep a lookout to anticipate another aircraft coming toward his aircraft from behind and above, when the ability to see the oncoming aircraft in a blind spot is an utter impossibility. While the general rule imposes on pilots an independent obligation to operate their aircraft safely and make necessary observations to avoid other aircraft, extraordinary maneuvers by Nakajima would not have brought the Cessna into view as it approached the helicopter. Thus, the duty to scan within or beyond the normal range has no application here.<sup>297</sup>

It appears that even under the demanding standard created by *Miller*, Mr. Nakajima did not breach his duty of vigilance.<sup>298</sup>

## 2. *The Reasonably Prudent Pilot and the Duty of Vigilance*

The degree of care required in maintaining vigilance is the degree of care that would be exercised by a reasonably prudent pilot. In *Rodriguez v. United States*, the U.S. Court of Appeals for the Third Circuit determined that this standard of care included not only following the law and regulations but also the good

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<sup>294</sup> *Id.*

<sup>295</sup> *Id.*

<sup>296</sup> *Id.* at 989.

<sup>297</sup> *Id.*

<sup>298</sup> See *id.*; see also *Bernard v. Cessna Aircraft Corp.*, 614 F.2d 1075, 1077-78 (5th Cir. 1980) (finding no lack of diligence where a student pilot on his first solo flight at an uncontrolled airport collided with an airplane ahead on final approach). The *Bernard* court, discussing the duty of the first aircraft on final approach, held that there was no evidence that

a pilot in such circumstances, engaged in the mechanics of landing, would or should anticipate the possibility that in violation of the “rules of the road” for aircraft another plane might be coming down on him from behind and above, and therefore would or should keep a lookout, or even glance, to the rear rather than devote his full attention to the front and below, where his descending plane is headed.

*Id.* at 1078.

operating practices put forth by the FAA in the form of the non-regulatory AIM and Advisory Circulars.<sup>299</sup>

The duties of pilots and air traffic controllers are prescribed by federal law pursuant to the Federal Aviation Act, 49 U.S.C. §§ 1301–1557. Under 49 U.S.C. §§ 106(g), 1348(c), the Administrator of the Federal Aviation Administration (FAA) is authorized to promulgate air traffic rules and regulations. The Administrator has exercised this authority by promulgating the Federal Aviation Regulations (FAR's) and by establishing the procedures to be followed by air traffic controllers. The FAR's have the force and effect of law. *The FAR's in turn require pilots to know and follow the Airman's Information Manual prepared by the FAA and FAA Advisory Circulars.*<sup>300</sup>

The pertinent parts of AIM chapters four and eight and the Advisory Circular on vision and collision avoidance are set forth in Appendix C. As can be seen, there is a large amount of information given to pilots regarding this subject. Many courts have adopted the FAA informational knowledge and recommended the operational procedures as the standard against which to compare a particular pilot's actions relating to a midair collision.<sup>301</sup> A reasonably prudent pilot would have known and complied with these guidelines.<sup>302</sup>

In *Rodriguez*, the court found that the pilots of an aircraft entering the traffic pattern at Caldwell Airport, New Jersey, breached their duty of maintaining vigilance when they collided with an aircraft nearly directly in front of them on the downwind leg:

There was evidence at trial that to comply with the duty to see and avoid, pilots should visually scan an area 60 degrees to the left and right of center and 10 degrees up and down from the flight path. . . . Based on the district court's findings as to the positions of the aircraft, 21U was within this field of vision of 98V [the overtaking aircraft] at all times after 98V reported overhead at 1321:30. The government's visibility expert, James Harris, testified that were the pilots of 98V vigilantly scanning, the

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<sup>299</sup> See *Rodriguez v. United States*, 823 F.2d 735, 739, 742 (3d Cir. 1982).

<sup>300</sup> *Id.* at 739 (emphasis added); see also *Associated Aviation Underwriters v. United States*, 462 F. Supp. 674, 680 (N.D. Tex. 1978). In 1987, the title of the AIM publication was the *Airman's Information Manual*.

<sup>301</sup> See, e.g., *Muncie Aviation Corp. v. Party Doll Fleet, Inc.*, 519 F.2d 1178, 1180–81 (5th Cir. 1975).

<sup>302</sup> See *id.*; *Associated Aviation Undewriters*, 462 F. Supp. at 680; *Rodriguez*, 823 F.2d at 739.

probability of their detecting 21U within 10 seconds of the collision was 100 percent. . . . No direct testimony introduced by plaintiffs countered this conclusion.<sup>303</sup>

. . . .

In short, the government introduced evidence that if the pilots of 98V were adequately performing their duty to scan, under the VFR conditions existing at the time of the collision and with the aircraft positions as determined by the district court, *they should have observed 21U*. Had they done so, of course they would have been under the obligation to avoid the collision. There is no evidence other than speculation as to the activities of the pilots of 98V to counter this evidence.<sup>304</sup>

Accordingly, the court found that the pilots of 98V had breached their duty to maintain vigilance.<sup>305</sup> The evidence showed that had they looked, they would have seen.<sup>306</sup> In other words, a reasonably prudent pilot would have seen the aircraft, and so should the pilots of 98V.

The duty of vigilance also encompasses situations where obstructions due to the construction of the aircraft or the flight attitude make observing more difficult as stated in the AIM:

8-1-8 j. Visual Obstructions in the Cockpit.

1. Pilots need to move their heads to see around blind spots caused by fixed aircraft structures, such as doorposts, wings, etc. It will be necessary at times to maneuver the aircraft; e.g., lift a wing, to facilitate seeing.
2. Pilots must ensure curtains and other cockpit objects; e.g., maps on glare shield, are removed and stowed during flight.<sup>307</sup>

In an early 1950 decision by the U.S. Court of Appeals for the District of Columbia, the court affirmed a CAB decision to suspend the airmen certificate of an Eastern Airlines captain for failure to maintain a proper lookout and colliding with an aircraft he was overtaking.<sup>308</sup> The captain argued the DC-3 he was overtaking was obscured by a windshield post that created a blind spot.<sup>309</sup> The court refused to accept that a visual deficiency excuses a pilot from his duty to maintain a proper lookout.<sup>310</sup>

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<sup>303</sup> *Rodriguez*, 823 F.2d at 742-43 (citations omitted).

<sup>304</sup> *Id.* at 743-44 (emphasis added).

<sup>305</sup> *See id.*

<sup>306</sup> *See id.*

<sup>307</sup> AIM, *supra* note 15, at 8-1-8(j).

<sup>308</sup> *See Kuhn v. Civil Aeronautics Bd.*, 183 F.2d 839, 841, 844 (D.C. Cir. 1950).

<sup>309</sup> *Id.* at 843.

<sup>310</sup> *See id.* at 843-44.

He was expected to move his head or body to cope with an obstruction, or at least put his copilot on a heightened lookout.<sup>311</sup> His duty of vigilance was not excused by this aircraft design limitation.<sup>312</sup>

In 1982, the U.S. Court of Appeals for the First Circuit held in the *In re N500L Cases* that, "the mere fact that a pilot may experience temporary loss of visibility due to a blind spot when looking out his window is no excuse for failing to follow Federal Aviation Regulations."<sup>313</sup> The court stated that all a pilot need do in that situation is bank slightly.<sup>314</sup> Moreover, "[a] pilot has a continuing duty to be aware of danger when, with his own eyes, he can perceive the danger."<sup>315</sup>

The duty of vigilance has also arisen in the context of a flight-testing accident. During flight-testing, pilots can be preoccupied with cockpit duties, which require his eyes to be in the cockpit.<sup>316</sup> The result is a compromise of the ability to "observe and avoid" other aircraft.<sup>317</sup> Here, the duty of vigilance to see and avoid other aircraft is not excused by the nature of the flight operations.<sup>318</sup> Instead, the regulation provides that careless or reckless operation of an aircraft may be found when pilot duties inside the cockpit *preclude* looking outside, unless the operation compensates for this reduced vigilance by use of an on-board observer, a chase aircraft, or another equivalent arrangement.<sup>319</sup> Clearly, a duty of vigilance is expected of any aircraft pilot, whether or not the pilot is performing test related duties inside the cockpit and not looking outside. If the pilot can not meet this duty, an alternative arrangement is required to compensate for the compromised duty of vigilance.<sup>320</sup>

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<sup>311</sup> *Id.*

<sup>312</sup> *Id.*

<sup>313</sup> *In re N500L Cases*, 691 F.2d 15, 32 (1st Cir. 1982) (citing *Miller v. United States*, 303 F.2d 703, 709 (9th Cir. 1962)).

<sup>314</sup> *Id.*

<sup>315</sup> *Id.*

<sup>316</sup> See Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. at 2575-76 (Apr. 16, 1957) (to be codified at 14 C.F.R. pt. 60); Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. 781, 781-82 (Feb. 8, 1957) (to be codified at 14 C.F.R. pt. 60).

<sup>317</sup> Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. at 2575-76; see also Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. at 781-82.

<sup>318</sup> See Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. at 2575-76; Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. at 781-82.

<sup>319</sup> Pilot Vigilance and Restrictions on Flight Testing, 22 Fed. Reg. at 2576.

<sup>320</sup> See *id.*

### 3. *Well Clear*

“When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless *well clear*.”<sup>321</sup> In context, for the rules of the right-of-way to be executed, the pilot must have already maintained vigilance to have seen another aircraft and then recognized a risk of collision.<sup>322</sup> The remaining requirement is to avoid the other aircraft by a margin of “well clear.”<sup>323</sup> The act of maintaining well clear during the interaction with the other aircraft is a purposeful decision—an intentional act, at least on the part of the “give-way” aircraft.<sup>324</sup>

Perhaps it is easiest to define “well clear” by what it is not and what it certainly is. It is *not* being so close to another aircraft so as to collide or create an immediate collision hazard.<sup>325</sup> It cer-

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<sup>321</sup> 14 C.F.R. § 91.113(b) (2014) (emphasis added). The regulation does not address clearance requirements when passing behind another aircraft, perhaps assuming that there is no risk of collision in such situations and therefore the aircraft are already “well clear.” Rule 16 of the International Regulations for Preventing Collisions at Sea states, “Every vessel which is directed to keep out of the way of another vessel [by the right-of-way rules] shall, so far as possible, take early and substantial action to keep *well clear*.” Convention on the International Regulations for Preventing Collisions at Sea r. 16, Oct. 20, 1972, 28 U.S.T. 3459, 1050 U.N.T.S. 16 (emphasis added) [hereinafter COLREGS].

<sup>322</sup> See 14 C.F.R. § 91.113(b) (2014).

<sup>323</sup> Roland E. Weibel et al., *Establishing a Risk-Based Separation Standard of Unmanned Aircraft Self Separation*, ATM SEMINAR 1 (June 11–14, 2011), [www.atmseminar.org/seminarContent/seminar9/papers/64-weibel-Final-Paper-4-12-11.pdf](http://www.atmseminar.org/seminarContent/seminar9/papers/64-weibel-Final-Paper-4-12-11.pdf).

One sense and avoid function is self separation, which requires that aircraft remain “well clear.” . . . The ability to perform the function of sense and avoid has been defined . . . as the performance of two separate functions: self separation and collisions avoidance. Self separation is the ability to remain “well clear” of other aircraft, typically through gentle, right-of-way compliant maneuvers. Collision avoidance is a function executed to prevent an imminent collision, and is typically more aggressive. . . . U.S. Federal Aviation Regulations require that pilots pass well clear of other aircraft when encounters occur in airspace. The term is used without a more detailed definition. Well clear is a separation standard with a subjective definition. . . . Subjectivity was likely intentional, to allow pilot judgment in implementation.

*Id.*

<sup>324</sup> See *id.* at 1–2.

<sup>325</sup> See 14 C.F.R. § 91.111 (2014). “Operating near other aircraft” is discussed separately. However, in the Air Commerce Regulations of 1928, Section 74(B) it is stated, “[a]ircraft required to give way shall keep a *safe distance, having regard to the circumstances of the case*. Three hundred feet will be considered a *minimum safe distance*.” AIR COMMERCE REGULATIONS, *supra* note 236, § 74(B) (emphasis added). Accordingly, a clearance of less than three hundred feet violated the regu-

tainly is an avoidance maneuver in a meeting situation that completely removes any risk of collision.

How far away must an aircraft be in order to be considered well clear? In the law, the answer is probably "a reasonable distance" under the circumstances. The distance may vary based upon the closure rate (as shown in Appendix 1 to AC 90-48C) and other factors, including the degree to which heading and/or altitude were changed in the initial response to the determination of a risk.<sup>326</sup>

The use of the term "well clear" was used by the U.S. Supreme Court in the 1897 case of *The Umbria*, a maritime case concerning a collision of two ships off the coast of Long Island, New York in 1888.<sup>327</sup> *The Umbria*, a British Cunard steamship, was en route from New York to Liverpool at full speed in a fog when she hit *the Iberia*, a French steamship inbound to New York City.<sup>328</sup> *The Iberia* was running slow because of the fog and was cut in half by *the Umbria*.<sup>329</sup> The Court stated:

[T]he *Umbria* was gravely in fault in the matter of speed is too clear for serious argument. She was within twelve miles of one of the most frequented harbors in the world, in the track of vessels bound into and out of this harbor, and was running at a speed of from sixteen to nineteen knots an hour through an intermittent or variable fog, which was sometimes so dense that vessels could not see each other more than one or two lengths off.<sup>330</sup>

....

We certainly do not wish to be understood as holding that it is necessary for a steamer to stop the moment she hears a whistle ahead of her in a fog, though it be directly ahead. Under such circumstances she may proceed at a reduced rate of speed. But if the whistle be repeated two or three times, and appear to be drawing nearer, the authorities generally hold that, if the fog be dense, prudent navigation requires that she shall stop her engines and drift ahead, until the approaching steamer comes in

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lation on its face, however, if circumstances required, a "safe distance" may require more than three hundred feet clearance to be well clear. *See id.*

<sup>326</sup> For example, the give-way aircraft in an overtaking situation alters course to the right and also climbs one thousand feet above the other aircraft. The well clear distance may be less than if a heading change alone was used, but the combination of the heading and altitude change has effectively eliminated the risk of collision.

<sup>327</sup> *See generally* *The Umbria*, 17 S. Ct. 610 (1897).

<sup>328</sup> *Id.* at 611.

<sup>329</sup> *Id.*

<sup>330</sup> *Id.* at 612.

sight, or her whistles indicate that the two vessels are *well clear* of each other.<sup>331</sup>

The FAA referenced the maritime rules of right-of-way in its Civil Air Regulations Draft Release No. 46-5, dated October 1, 1946, in the remarks section of that document which proposed changes, *inter alia*, in the right-of-way rules, Civil Air Regulation 60.104(c).<sup>332</sup> "When two aircraft are approaching head-on, or approximately so, each shall alter its course to the right."<sup>333</sup>

In discussing Section 60.104(c), the draft states in the remarks section, "[h]azardous situations, sometimes requiring quick action, will be avoided by this universally accepted rule *which applies to all vehicles whether in the air, on land or sea.*"<sup>334</sup> Concerning one aircraft overtaking another, the draft states in Section 60.104(d):

An aircraft which is being overtaken has the right-of-way, and the overtaking aircraft, whether climbing, descending, or in horizontal flight, shall keep out of the way of the other aircraft by altering its course to the right, and no subsequent change in the relative position of the two aircraft shall absolve the overtaking aircraft from this obligation until it is entirely passed and clear.<sup>335</sup>

In the remarks to Section 60.104(d) the draft states:

Passing on the right [and not on either side as with the maritime rules] is required because the pilot in command in side-by-side, dual-control aircraft is seated on the left side and better vision of the overtaken aircraft is thus afforded. Furthermore, in narrow traffic lanes [airways], passing on the left of the overtaken aircraft would place the overtaking aircraft in the path of on-coming traffic.<sup>336</sup>

AIM 8-1-8:

e. Collision Course Targets. Any aircraft that appears to have no relative motion and stays in one scan quadrant is likely to be on a

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<sup>331</sup> *Id.* at 614 (emphasis added).

<sup>332</sup> CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5, *supra* note 126, § 60.104(c).

<sup>333</sup> *Id.* § 60.104(c). It should be noted that with head-on situations neither aircraft has the "right-of-way" in that both aircraft are required to "give-way" to the other. Neither can continue on its present course.

<sup>334</sup> *Id.* (emphasis added).

<sup>335</sup> *Id.* § 60.104(d).

<sup>336</sup> *Id.*



collision course. Also, if a target shows no lateral or vertical motion, but increases in size, take evasive action.<sup>337</sup>

AIM 8-1-8:

c. Taking Appropriate Action. Pilots should be familiar with rules on right-of-way, so if an aircraft is on an obvious collision course, one can take immediate evasive action, preferably in compliance with applicable Federal Aviation Regulations.<sup>338</sup>

“Risk of collision” as defined in maritime law, says the “Risk of collision can, when circumstances permit, be ascertained by carefully watching the compass bearing of an approaching vessel. If the bearing does not appreciably change, such risk should be deemed to exist.”<sup>339</sup> The current Rule 7 of the International Regulations for Preventing Collisions at Sea (COLREGS), Risk of Collision, states:

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. *If there is any doubt such risk shall be deemed to exist.*<sup>340</sup>

....

(d) In determining if risk of collision exists the following considerations *shall*<sup>341</sup> be among those taken into account:

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<sup>337</sup> AIM, *supra* note 15, at 8-1-8e. “The time-honored method for determining the spatial component of risk of collision is the constant bearing-decreasing range (CBDR) test. . . . [but] the CBDR test provides no guidance for determining the range at which a CBDR contact first presents a risk of collision that will trigger the [right-of-way] rules.” See CRAIG H. ALLEN, FARWELL’S RULES OF THE NAUTICAL ROAD 215 (8th ed. 2005) [hereinafter FARWELL’S RULES OF THE NAUTICAL ROAD]. The AIM at 8-1-8e uses CBDR coupled with a perceived increase in target size to indicate that immediate avoidance action is required. See AIM, *supra* note 15, at 8-1-8e. These AIM sections seem to refer to an immediate danger of collision and not early maneuvers to avoid the *risk* of collision. The risk of a potential collision should normally be ascertainable prior to the “target blossom” effect, but certainly avoidance maneuvers would be called for at that point.

<sup>338</sup> AIM, *supra* note 15, at 8-1-8c.

<sup>339</sup> 33 U.S.C. § 101 (1925).

<sup>340</sup> COLREGS, *supra* note 321, r. 7 (emphasis added).

<sup>341</sup> In addition to the projected closest point of approach (CPA), other considerations include the initial distance between vessels: “In the courts of the United Kingdom and other countries risk of collision has not been held to apply at long distances . . . .” COCKCROFT & LAMEIJER, A GUIDE TO THE COLLISION AVOIDANCE RULES 26 (7th ed. 2012); see also *The Wenona*, 86 U.S. 41, 52 (1873) (holding the right-of-way rules do not apply to vessels, “while they are yet so distant from each other that measures of precaution have not become necessary to avoid a collision”).

- (i) *Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.*<sup>342</sup>

The U.S. Supreme Court stated in *The Victory*, regarding ascertaining a risk of collision:

It depends on their presumable courses. If at any time two vessels, not end on, are seen, keeping the courses to be expected with regard to them respectively, *to be likely to arrive at the same point at or nearly at the same moment, they are vessels crossing so as to involve risk of collision.* . . . The question, therefore, always turns on the reasonable inference to be drawn as to a vessel's future course from her position at a particular moment . . . .<sup>343</sup>

If there is any doubt, a risk of collision will be deemed to exist.<sup>344</sup> Preferably, the risk of collision may be ascertained well in advance of the ten seconds to impact minimum needed for a pilot to react with any sort of avoidance maneuver.

Once it is established that a "risk" of collision exists, each aircraft must avoid the other in accordance with the right-of-way rules to remove that risk.<sup>345</sup> *It is the risk of collision, not only the collision itself, which must be avoided.*<sup>346</sup>

In *Maritime & Mercantile Int'l v. United States*, the U.S. District Court for the Southern District of New York examined maritime right-of-way rules and determined that the duty of compliance starts when there is a "mere risk" of collision, long before getting so close as to create an immediate danger of collision:

Because this [right-of-way] rule focuses on the *mere risk* of collision, it is not limited to situations involving imminent collision. As the Second Circuit has observed:

Since the rules are designed to prevent the risk of collision as well as collision itself, *it is not necessary for a collision to be imminent or even probable before the obligation imposed by them accrues.* The courts have expressed this concept in various ways. Said Judge Addison Brown: 'There is danger or risk of collision whenever it is not clearly safe to go on.' While Judge Learned Hand put it thus: 'Risk of collision' does not mean certainty of collision; but only that prudence demands that the navigators shall watch each other's navigation, and be prepared to do whatever safety may

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<sup>342</sup> COLREGS, *supra* note 321, r. 7 (emphasis added); *see also* Mar. & Mercantile Int'l v. U.S., No. 02-CV-1446, 2007 U.S. Dist. LEXIS 19792, at \*81 (S.D.N.Y. Feb. 28, 2007).

<sup>343</sup> *The Victory*, 168 U.S. 410, 421 (1897).

<sup>344</sup> C.G. Willis, Inc. v. The Spica, 6 F.3d 193, 196 (4th Cir. 1993).

<sup>345</sup> *See* Mar. & Mercantile Int'l, 2007 U.S. Dist. LEXIS 19792, at \*81-82.

<sup>346</sup> *See id.* at \*82.

demand." In short, a situation may involve risk of collision before there is actual danger . . . .

. . . ("‘Risk of collision’ means mere chance, peril, hazard or danger of collision."). Under this Rule, as Judge Learned Hand emphasized, "it must always be remembered *that it is the risk of collision, not the collision itself, that masters must avoid.*"<sup>347</sup>

If the right-of-way rules (remain vigilant, see, avoid) are carried out correctly the risk of collision is eliminated. If there is *no* risk of collision because their projected paths no longer cross or because they are now at substantially different altitudes, the aircraft are certainly "well clear."

Air traffic controllers inform a pilot that the risk of collision with another aircraft has passed by transmitting, "traffic no longer a factor."<sup>348</sup> This phrase is defined in the AIM 4-4-14 Visual Separation as follows: "Traffic is no longer a factor when during approach phase the other aircraft is in the landing phase of flight or executes a missed approach; and during departure or en route, *when the other aircraft turns away or is on a diverging course.*"<sup>349</sup>

The harder question is whether the risk must be completely eliminated (reduced to zero) under all circumstances. Must a pilot anticipate and compensate for the risk that the other aircraft will not comply with 91.113? For example, a particular pilot's avoidance maneuver for traffic approaching head-on is to alter the aircraft's course to the right in an amount reasonably calculated to reduce the risk of collision to zero, assuming that the other aircraft also complies with the regulation by turning right. However, there is always a probability that the other pilot is not vigilant and does not see, or worse, makes a mistake in applying the rules. In any event, if he turns to the aircraft to the left, it drastically increases the risk of collision. Put another way, the situation goes from being well clear with no risk of collision, if the other pilot complies with the rules, to one where there is now a risk of collision, which may require new maneuvering to avoid. The issue is whether this "new" risk of collision is just an expansion of the hazards that should have been considered in the original calculation of the risk of collision.

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<sup>347</sup> *Id.* at \*81-82 (emphasis added) (citations omitted).

<sup>348</sup> See AIM, *supra* note 15, at 4-4-14.

<sup>349</sup> *Id.* (emphasis added).

Generally, it appears that it is not required for a pilot to factor in the risk of non-compliance by another aircraft.<sup>350</sup> However, there is support in maritime case law that the risk of meeting a non-complying vessel is foreseeable, on the theories that to err is human and lawbreaking is not uncommon.<sup>351</sup> In *The Philadelphia*, the court stated regarding the risk of collision:

[B]y departure from the rules of navigation, whether from want of good seamanship, accident, mistake, misapprehension of signals, or otherwise, a collision might be brought about. It is true that . . . *each man has a right to assume that the other will obey the law. But this does not justify either in shutting his eyes to what the other may actually do, or in omitting to do what he can to avoid an accident made imminent by the acts of the other. . . . [I]t is well known that departure from the law not only may, but does, take place, and often.* Risk of collision may be said to begin the moment the two vessels have approached each other . . . that a collision might be brought about by any such departure [from the rules], and continues up to the moment when they have so far progressed that no such result can ensue.<sup>352</sup>

In *Acaia Vera Navigation Co. v. Kezia*, the U.S. Fifth Circuit Court of Appeals held that one vessel, which mistakenly believed it was approaching head-on to another and turned right, caused the collision.<sup>353</sup> Since there was no risk of collision, the rule for head-on passage did not apply:

From the moment the . . . Blue Cloud and the . . . Omina commenced navigating with respect to each other, each remained in its original relative position with respect to the boundaries of the designated fairway. The courses of the several vessels were such

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<sup>350</sup> See *The Hortensia*, 12 F. Cas. 532, 536 (D. Me. 1877) (stating that the overtaking vessel is charged with the duty of keeping clear of overtaken vessel but has right to assume the other vessel will obey the rules of navigation). However, COLREGS 13 and 16 state that an overtaking vessel has a duty to maintain such a distance from the overtaken vessel so as to allow the overtaken vessel to conduct reasonably predictable adjustments. See COLREGS, *supra* note 321, rs. 13, 16.

<sup>351</sup> See *The Philadelphia*, 199 F. 299, 302 (E.D. Pa. 1912).

<sup>352</sup> *Id.* (emphasis added) (quoting *The Milwaukee*, 17 F. Cas. 427, 433 (E.D. Mich. 1871)). With the closure rates of aircraft and the slim probability of surviving a midair collision, the pessimistic view of human nature of *The Milwaukee* court may be more on point today than when it was written. Laurence J. Peter is quoted as saying, "A pessimist is a man who looks both ways when he's crossing a one-way street." See *The Associated Press, Today in History*, SOUTHEAST MISSOURIAN (Aug. 11, 2013), <http://www.semissourian.com/story/1991462.html>.

<sup>353</sup> *Acaia Vera Nav. Co. v. Kezia*, 78 F.3d 211, 217–18 (5th Cir. 1996).

that if each had held its own course and speed, the vessels would have passed well clear of each other and without incident.<sup>354</sup>

If one starts to avoid another aircraft by remaining well clear based upon the assumption that the other will comply with the rules, the risk may suddenly enlarge when it becomes apparent that the other aircraft is non-compliant.<sup>355</sup> The Supreme Court of Virginia in *Mackey v. Miller*, stated that, "a pilot has a right to assume that another pilot will obey air traffic regulations until he realizes, or in the exercise of ordinary care should have realized, that the other pilot is not going to do so."<sup>356</sup> Accordingly, the duty to remain vigilant to new or increasing risk remains throughout the process of executing the right-of-way rules.<sup>357</sup>

In *Colorado Flying Academy, Inc. v. United States*, the U.S. Court of Appeals for the Tenth Circuit upheld the trial court's decision that, "an air traffic controller has the right to rely upon the assumption that a pilot knows and will abide by the applicable Federal Aviation Regulations."<sup>358</sup>

#### 4. Duty to See the Invisible—The Duty to "Visualize and Avoid"

Wake turbulence is an air disturbance caused by the movement of an aircraft's wings through the air creating two counter-rotating cylindrical vortices trailing from the wing tips.<sup>359</sup> Once wake turbulence is created, the vortices drift downward and move according to wind direction and velocity.<sup>360</sup> A "heavy aircraft"<sup>361</sup> (and some others with a propensity for vortex genera-

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<sup>354</sup> *Id.* at 217.

<sup>355</sup> See *Mackey v. Miller*, 273 S.E.2d 550, 553 (Va. 1981).

<sup>356</sup> *Id.* (citing *Allegheny Airlines, Inc. v. United States*, 504 F.2d 104, 111 (7th Cir. 1974); *Baker v. United States*, 417 F. Supp. 471, 486 (W.D. Wash. 1975)).

<sup>357</sup> See *id.* Apart from the aspect of legal fault, self interest also dictates that a compliant aircraft, to the extent possible, allow for non-compliant conduct when it is encountered. Violation of the rules may later result in an enforcement action against the rule violator. However, a collision is only likely to allow the innocent pilot's relations to bring a wrongful death action in court.

<sup>358</sup> *Colo. Flying Acad., Inc. v. United States*, 724 F.2d 871, 878 (10th Cir. 1984). In this midair collision, plaintiffs asserted that the ATC controller should have advised the Colorado Flying Academy pilot that another aircraft was in dangerous proximity. *Id.* at 877–79. No liability on the part of the U.S. government was found. *Id.* at 880–81.

<sup>359</sup> See *Wake Turbulence*, VATUSA TRAINING RESOURCE CENTER, [http://www.vatusa.net/training/tiki-index.php?page=wake\\_turbulence](http://www.vatusa.net/training/tiki-index.php?page=wake_turbulence) (last visited Oct. 10, 2014).

<sup>360</sup> See *id.*

<sup>361</sup> A "heavy aircraft" is an aircraft weighing more than 300,000 pounds. See *id.*

tion), creates a dangerous amount of wake turbulence which may cause an encountering aircraft to lose control.<sup>362</sup>

Although U.S. regulations pursuant to 14 C.F.R. § 91.113 right-of-way rules do not specifically state that wake avoidance must be considered when determining the requirement to pass "well clear" of another aircraft, the international regulations are clear on this subject.<sup>363</sup> The International Civil Aviation Organization (ICAO) counterpart to 14 C.F.R. § 91.113 states specifically that wake turbulence is to be included in the computation of determining a safe passing.<sup>364</sup> "An aircraft that is obliged by the following rules to keep out of the way of another shall avoid passing over, under or in front of the other, unless it passes well clear and takes into account the effect of aircraft wake turbulence."<sup>365</sup>

U.S. courts have consistently found that the "avoid" requirements of Section 91.113 apply not only to collision risk, but to avoiding wake turbulence as well.<sup>366</sup> *In re N-500L Cases* arose out of a 1978 crash in San Juan, Puerto Rico.<sup>367</sup> N-500L, a twin-propeller aircraft (Beech D18), was on approach for landing in visual conditions at San Juan International Airport when it was overtaken by an Eastern Airlines L-1011 heavy jet which was also in the process of landing.<sup>368</sup> It was stipulated that the wake turbulence generated by the L-1011 caused the N-500L to crash, killing all six individuals aboard and causing substantial injury to the individuals and property on the ground.<sup>369</sup> The court states:

When a pilot is operating under VFR, or clear weather, conditions, he has the responsibility to see and avoid other aircraft. 14 C.F.R. §§ 91.67(a) [now 91.113 (b)], 91.659a). *This responsibility*

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<sup>362</sup> *See id.*

<sup>363</sup> *See* INT'L CIVIL AVIATION ORG., ANNEX 2 TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION: RULES OF THE AIR § 3.2.2.1 (10th ed. 2005).

<sup>364</sup> *See id.*

<sup>365</sup> *Id.* (emphasis added). The United States has not filed a "difference" to the international requirement of taking wake turbulence into consideration when determining a safe passing distance. *See* FED. AVIATION ADMIN., AERONAUTICAL INFORMATION PUBLICATION (Mar. 7, 2013) [hereinafter AERONAUTICAL INFORMATION PUBLICATION].

<sup>366</sup> *See* *Adm'r v. Willbanks*, 3 N.T.S.B. 3632, 3632–34 (1981) (finding the respondent Boeing 737 pilot in violation of Section 91.67 (now Section 91.113) by flying too close to a Cessna 172, and "with the aircraft thus positioned, the pilot of the Cessna initiated what he believed to be a necessary evasive turn to the right to avoid either a collision with the overtaking PSA aircraft or any wake turbulence its passage might create.").

<sup>367</sup> *In re N-500L Cases*, 691 F.2d 15, 18 (1st Cir. 1982).

<sup>368</sup> *Id.*

<sup>369</sup> *Id.*

*extends beyond observing and staying away from other traffic; it requires vigilance with regard to wake turbulence as well. Pilots are instructed that 'the flight disciplines necessary to assure vortex avoidance during VFR operations must be exercised by the pilot. Vortex visualization and avoidance procedures should be exercised by the pilot using the same degree of concern as in collision avoidance.*

. . . .

This is so regardless of whether a clearance has been given by the controller, because the pilot generally is in the best position to see other aircraft around him and to visualize their vortex trails.<sup>370</sup>

The court reiterated that the AIM and Advisory Circulars are evidence of the standard of care among all pilots, and it is assumed that all pilots have read and know their provisions.<sup>371</sup> Advisory Circular AC 90-23, dealing with wake turbulence avoidance, and the AIM fall into this category.<sup>372</sup> The *In re N-500L* court continued:

The AIM also contains information on wake turbulence and recommends procedures for avoiding it. Pilots are advised that air traffic controllers will warn a VFR aircraft of a wake turbulence hazard from a nearby plane but they are reminded, "WHETHER OR NOT A WARNING HAS BEEN GIVEN, HOWEVER, THE PILOT IS EXPECTED TO ADJUST HIS OPERATIONS AND FLIGHT PATH AS NECESSARY TO PRECLUDE SERIOUS WAKE ENCOUNTER." . . . Because the vortices drift behind and below the generating aircraft, pilots are advised to stay at or above the flight path of the generating plane, altering their course as necessary to avoid the area below and behind the plane.

. . . .

"Acceptance of both traffic information and instructions to follow another aircraft is pilot acknowledgment that he sees the other aircraft and will maneuver his aircraft as necessary to avoid it or maintain in-trail separation. *The pilot also accepts responsibility for wake turbulence avoidance separation under these conditions.*"

. . . .

Under the prevailing clear weather conditions, Cannon [the pilot of N500L] was in the best position to visualize and avoid the wake turbulence generated by the L-1011 after the overtaking. *He, therefore, had a duty to do so.*<sup>373</sup>

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<sup>370</sup> *Id.* at 28, 29 (emphasis added) (citations omitted).

<sup>371</sup> *Id.* at 28.

<sup>372</sup> *See id.*

<sup>373</sup> *Id.* at 28, 29, 30 (emphasis added) (citations omitted).

In *Scruggs v. United States*, the U.S. District Court for the Southern District of Florida held that the pilot Scruggs was the sole proximate cause of damage to his airplane in a near miss incident with four F-16's during which he encountered wake turbulence strong enough to blow the door open and bend the wing struts of his Maule (MX-7-180) aircraft.<sup>374</sup> The military aircraft were operating on a published IFR Military Training Route (MTR), of which Mr. Scruggs should have been aware.<sup>375</sup> As in the N-500L cases, the court determined that a pilot has a duty to avoid both a collision and wake turbulence, stating, "A pilot has a duty to remain vigilant throughout the flight; a pilot has a duty to observe, to recognize, and to avoid dangerous conditions which confront him or her."<sup>376</sup> Furthermore the court stated:

Under VFR weather condition flight rules, the pilot has a duty to "see and avoid." That duty also requires that the pilot exercise the same degree of caution to visualize and avoid wake turbulence encounters with other aircraft.

....

Nonparticipating aircraft are not prohibited from flying within an MTR; however, extreme vigilance should be exercised when conducting flight through or near these routes. . . . Thomas Scruggs failed to operate his aircraft as a reasonably prudent pilot would have under the circumstances insofar as he (1) failed to obtain NOTAMs prior to departure in an effort to determine whether there would be military aircraft along his anticipated route; (2) failed to properly plan his flight and chose a route of flight (including altitude) that would place him within the confines of IR-34; and (3) engaged in a see and avoid procedure that was ineffective.<sup>377</sup>

In *Dyer v. United States*, the U.S. Court of Appeals for the Ninth Circuit held that the crash of a light airplane which was landing on a runway two minutes following the approach and landing of a large U.S. Coast Guard helicopter (HH-3) was the fault of the airplane pilot, Mr. Franklin, even though he knew of the wake turbulence threat and took preventive action by ensuring a spacing of two minutes.<sup>378</sup> The court stated:

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<sup>374</sup> See *Scruggs v. United States*, 959 F. Supp. 1537, 1541-43, 1547 (S.D. Fla. 1997).

<sup>375</sup> See *id.* at 1546-47.

<sup>376</sup> *Id.* at 1545 (citing *Black v. United States*, 441 F.2d 741 (5th Cir. 1971)).

<sup>377</sup> *Id.* at 1545, 1547.

<sup>378</sup> *Dyer v. United States*, 832 F.2d 1062, 1070 (9th Cir. 1987).



It is undisputed that Franklin had a duty to be, and actually was, familiar with information regarding wake turbulence avoidance published in the Airman's Information Manual and in the FAA advisory circulars. He prolonged his approach in an attempt to avoid the wake left by the helicopter, but tragically, those measures were insufficient to prevent the accident.

We conclude that the primary duty was on Franklin to understand and safely avoid the hazards left by the helicopter's wake. He breached this duty by following too closely on the heels of the helicopter landing, in a position behind the helicopter's touchdown point on the runway, which placed him in an area endangered by the existing turbulence on the runway. Judging how long wake turbulence takes to dissipate is difficult, but the primary responsibility for such avoidance is on the pilot—not on an aircraft that landed safely on a runway after it clearly had the right-of-way to land.<sup>379</sup>

## 5. Air Traffic Control and "See and Avoid"

14 C.F.R. § 91.3 Responsibility and Authority of the Pilot in Command.

- (a) The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.
- (b) In an in-flight emergency requiring immediate action, the pilot in command may deviate from any rule of this part to the extent required to meet that emergency.
- (c) Each pilot in command who deviates from a rule under paragraph (b) of this section shall, upon the request of the Administrator, send a written report of that deviation to the Administrator.<sup>380</sup>

Under this regulation, the pilot is directly responsible for the operation of the aircraft, to include avoiding collisions.<sup>381</sup> However, the responsibility for collision avoidance is also placed upon the U.S. government ATC system, which was set up by Congress to, *inter alia*, prevent aircraft collisions.<sup>382</sup>

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<sup>379</sup> *Id.* (citations omitted).

<sup>380</sup> 14 C.F.R. § 91.3 (2014).

<sup>381</sup> *See id.*

<sup>382</sup> In January 1955, a TWA flight collided with a DC-3 near Cincinnati, Ohio. *See* Flight Safety Found., *Accident Description*, AVIATION SAFETY NETWORK, <http://aviation-safety.net/database/record.php?id=19550112-0> (last updated Oct. 11, 2014). In June 1956, a United Airlines flight collided with a TWA flight over the Grand Canyon, resulting in 128 deaths; the largest loss of life in an aviation accident at the time. *See Grand Canyon Collision*, DONEY & ASSOCIATES PLC, <http://www.doney.net/aroundaz/grandcanyoncrash.htm> (last updated Aug. 14, 2014).

As of 1955, there were no en route long-range radars in operation.<sup>383</sup> In 1956, President Eisenhower appointed Edward P. Curtis to head an implementation appraisal of the earlier Harding report, which studied the dramatic increase in airline traffic since the end of World War II and the pending introduction of higher speed jet aircraft:

From that commission came a proposal to create a new Federal aviation agency that would replace the Civil Aeronautics Administration and the Civil Aeronautics Board to consolidate air operations, modernize the airways and to make and enforce safety rules.

Out of that study came the “positive control”<sup>384</sup> of high altitude traffic, as he called it, in which the pilot guides his plane along fixed routes dictated by ground-control centers and makes periodic position reports.<sup>385</sup>

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The Civil Aeronautics Board stated that the probable cause of the accident was that, “the pilots did not see each other in time.” CIVIL AERONAUTICS BD., FILE NO. 1-0090, ACCIDENT INVESTIGATION REPORT (1957). This high profile accident took place in uncontrolled airspace and raised public concern about airline safety. See *Grand Canyon Collision*, *supra*. There were two additional midair collisions, one near Las Vegas, Nevada involving a United Airlines Flight 736 and a U.S. Air Force F-100 under military control collided on V-8 airway in April 1958, where forty-nine died. See generally *United Airlines v. Wiener*, 335 F.2d 379 (9th Cir. 1964.) The second accident involved Capital Airlines over Brunswick, Maryland a month later. See Flight Safety Foundation, *Accident Description*, *supra*. The day after the Brunswick collision, Senator Mike Monroney and Representative Oren Harris introduced the Federal Aviation Act of 1958. See STUART ROCHESTER, FED. AVIATION ADMIN., TAKEOFF AT MID-CENTURY, FEDERAL CIVIL AVIATION POLICY IN THE EISENHOWER YEARS 204–06 (1976). Monroney had been crafting the bill with government and industry experts, but he was afraid that in the furor over the recent crashes “hasty and ill-considered bills might be advanced by understandably angry and impatient legislators.” *Id.* at 205. “When the second midair collision shocked the country, we changed from a dry-run to an all-out effort to get the bill passed.” *Id.* Citing “recent midair collisions of aircraft occasioning tragic losses of human life,” President Eisenhower announced the White House’s support of the legislation. See *Delta Air Lines, Inc. v. United States*, 490 F. Supp. 907, 915 (N.D. Ga. 1980). The Act was passed by Congress and was signed into law on August 23, 1958. See ROCHESTER, *supra*, at 211–14.

<sup>383</sup> ANNE MILLBROOKE, AVIATION HISTORY 8–20 (1999).

<sup>384</sup> The original “positive control area” (PCA) above 18,000 feet MSL is currently styled “Class A” airspace and is restricted to Instrument Flight Rules only, with ATC sequencing and separation provided to each aircraft. See 14 C.F.R. §§ 71.33, 91.167–.193 (2014).

<sup>385</sup> Edward P. Curtis, *Eisenhower Aviation Aide*, N.Y. TIMES (Mar. 15, 1987), <http://www.nytimes.com/1987/03/15/obituaries/edward-p-curtis-eisenhower-aviation-aide.html>.

In 1957, the air traffic control radar beacon system (ATCRBS) entered service for operational testing.<sup>386</sup> The Federal Aviation Act of 1958 at Title I, Section 307 stated:

- (a) Use of Airspace—The Administrator is authorized and directed to develop plans for and formulate policy with respect to the use of the navigable airspace; and assign by rule, regulation, or order . . . to insure the safety of aircraft. . . .
- (b) Air Navigation Facilities—The Administrator is authorized, within the limits of available appropriations made by the Congress . . . (4) to provide necessary facilities and personnel for the regulation and protection of air traffic.
- (c) Air Traffic Rules—The Administrator is further authorized and directed to prescribe air traffic rules and regulations governing the flight of aircraft, for the navigation, protection, and identification of aircraft, for the protection of persons and property on the ground, and for the efficient utilization of the navigable airspace, including rules as to safe altitudes of flight and rules for the prevention of collision between aircraft, between aircraft and land or water vehicles, and between aircraft and airborne objects.<sup>387</sup>

Currently the law defines the ATC system as:

“[A]ir traffic control system” means the combination of elements used to safely and efficiently monitor, direct, control, and guide aircraft in the United States and United States-assigned airspace, including:

- (a) allocated electromagnetic spectrum and physical, real, personal, and intellectual property assets making up facilities, equipment, and systems employed to detect, track, and guide aircraft movement;
- (b) laws, regulations, orders, directives, agreements, and licenses;
- (c) published procedures that explain required actions, activities, and techniques used to ensure adequate aircraft separation; and

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<sup>386</sup> ANNE MILLBROOKE, *supra* note 383, at 8–20. “The air traffic control system of the future, unlike our present system, is designed to provide for the separation of all aircraft at all times regardless of weather. This is known as positive control. There is no element of aviation which has advocated or is ready to advocate positive control today of all airspace. To do so with the ‘men, money, and machines’ now available would instantly ground 85 percent of traffic.” CIVIL AERONAUTICS Bd., ANNUAL REPORT 19 (1958).

<sup>387</sup> Federal Aviation Act of 1958, Pub. L. No. 85-726, § 307, 72 Stat. 737, 749–50 (1958) (codified as amended at 49 U.S.C. § 1301 (1958)).

- (d) trained personnel with specific technical capabilities to satisfy the operational, engineering, management, and planning requirements for air traffic control.<sup>388</sup>

In accordance with paragraph (c) above, the ATC controllers’ manual states, “[t]he primary purpose of the ATC system is to *prevent a collision between aircraft* operating in the system and to provide a safe, orderly and expeditious flow of traffic, and to provide support for National Security and Homeland Defense.”<sup>389</sup> In order to “direct, control and guide aircraft” ATC issues a “clearance” to an aircraft.<sup>390</sup> The Pilot/Controller Glossary defines “air traffic clearance” as:

[A]n authorization by air traffic control for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified traffic conditions within controlled airspace. The pilot-in-command of an aircraft may not deviate from the provisions of a visual flight rules (VFR) or instrument flight rules (IFR) air traffic clearance except in an emergency or unless an amended clearance has been obtained. Additionally, the pilot may request a different clearance from that which has been issued by air traffic control (ATC) if information available to the pilot makes another course of action more practicable or if aircraft equipment limitations or company procedures forbid compliance with the clearance issued. Pilots may also request clarification or amendment, as appropriate, any time a clearance is not fully understood, or considered unacceptable because of safety of flight. Controllers should, in such instances and to the extent of operational practicality and safety, honor the pilot’s request. 14 C.F.R. Part 91.3(a) states: “The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.” THE PILOT IS RESPONSIBLE TO REQUEST AN AMENDED CLEARANCE if ATC issues a clearance that would cause a pilot to deviate from a rule or regulation, or in the pilot’s opinion, would place the aircraft in jeopardy.<sup>391</sup>

Once a *clearance*, or authorization to proceed under specified conditions, is issued and the pilot accepts it, the pilot must comply with the ATC *instructions* in all areas where air traffic control is exerted or authorized unless a deviation falls within the exceptions set forth below in 91.123.<sup>392</sup> Courts often struggle with de-

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<sup>388</sup> 49 U.S.C § 40102(a)(47) (2012).

<sup>389</sup> FAA No. JO 7110.65U, *supra* note 66 (emphasis added).

<sup>390</sup> See AIM, *supra* note 15, at Pilot/Controller Glossary.

<sup>391</sup> *Id.*

<sup>392</sup> See *id.*; Adm’r v. Hayes, 1 N.T.S.B. 1050, 1052–53 (1971).

fining a "clearance" versus an "instruction." An instruction is an order issued by ATC pursuant to its mandate at law to "direct" and "control" aircraft to prevent collisions.<sup>393</sup> An instruction may be viewed as the ongoing dynamic process of the pilot complying with any existing, new or changing "specified conditions" of his clearance.<sup>394</sup> In *Administrator v. Hayes*, the Board provides some clarification.<sup>395</sup>

We find no ambiguity in the tower's statement to respondent to "taxi into position and hold." To "taxi into position" is obviously a clearance permitting the respondent, if he chooses, to go onto the runway. It is well understood by pilots that a clearance is an authorization by the tower to proceed. It is not an order to do so. *However, the statement "hold" is an instruction, i.e., an order, which cannot be disobeyed*, except that section 91.3(b) permits a pilot in an emergency requiring immediate action to deviate from such instruction. However, this proceeding involves no emergency. Obviously then, respondent, in taking off without an ATC clearance at an airport with an operating tower, violated section 91.87(h), whose language is succinct and could not be more definite. Moreover, we are not persuaded by respondent's efforts to indicate confusion as to what constitutes a clearance in contradistinction to an order. Furthermore the fact that the FAA proposed rulemaking to define these terms is irrelevant, since such regulation was never adopted.<sup>396</sup>

The Board also found that Mr. Hayes, as the pilot-in-command, could not ignore ATC:

The respondent hides behind the words "final authority" in section 91.3 concerning a pilot's responsibility. Once again, this is merely a simple common sense description, particularly as it applies to a pilot's authority as against that of an air traffic controller's. If a pilot's authority were "final" per se, there would be no reason for, use for, or enforcement of Federal Aviation Regulations pertaining to his actions. The regulations, we repeat, govern a pilot's conduct, and where he is issued instructions by a controller, he violates the regulations if he does not obey them. However, the regulations provide for the extreme situations of emergencies. If a pilot disobeys a controller's instructions which involve an emergency, although the pilot has technically violated

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<sup>393</sup> See *Hayes*, 1 N.T.S.B. at 1052-53.

<sup>394</sup> See *id.*

<sup>395</sup> *Id.*

<sup>396</sup> *Id.* (emphasis added).

the regulations, his plea of “emergency,” if accepted, will exonerate him.<sup>397</sup>

### Section 91.123 Compliance with ATC Clearances and Instructions.<sup>398</sup>

- (a) When an ATC clearance has been obtained, no pilot in command may deviate from that clearance unless an amended clearance is obtained, an emergency exists, or the deviation is in response to a traffic alert and collision avoidance system resolution advisory. However, except in Class A airspace, a pilot may cancel an IFR flight plan if the operation is being conducted in VFR weather conditions. When a pilot is uncertain of an ATC clearance, that pilot shall immediately request clarification from ATC.
- (b) Except in an emergency, no person may operate an aircraft contrary to an ATC instruction in an area in which air traffic control is exercised.<sup>399</sup>

<sup>397</sup> *Id.*

<sup>398</sup> In *Furumizo v. United States*, 245 F. Supp. 981, 1008 (1965), affirmed by the Ninth Circuit in *United States v. Furumizo*, 381 F.2d 965 (1967), a wake turbulence case, the U.S. District Court for the District of Hawaii, commented on Civil Air Regulations Draft Release No. 60-1 (Aug. 26 1960), an exhibit in that case:

[W]hich, however, contains on the front page thereof a boxed-in informatory note reading as follows:

“CAR Draft Release #60-1. These definitions of Air Traffic Control instructions and clearances were never adopted as part of CAR-60. Page 3 indicates the Agency’s feeling of distinction which must be made between the two terms ‘instructions’ and ‘clearances.’”

If the government relies upon this exhibit as purported proof that air traffic control clearances are mere authorizations and not mandatory instructions that under existing regulations and practices all pilots should have known it, the Court finds that this is not so. For instance, the same release contains on page 6 thereof the following admission:

Since this amendment is a clarification and restatement of the existing regulatory situation, it could be adopted without notice and opportunity for comments. However, since the present practice may have misled some pilots as to the obligatory nature of an air traffic control instruction, the Agency is publishing this amendment as a proposal for comment, so that all pilots may be informed, and to provide them an opportunity to submit any comments they may care to make concerning it.

[M]oreover, the entire document makes it clear that the Federal Aviation Agency itself recognizes that, even in relation to air traffic control clearances, there can sometimes be instances where the controllers must issue mandatory “instructions.”

See *id.* (emphasis added).

<sup>399</sup> See 14 C.F.R. § 91.3 (2014) (discussing pilot authority and emergency actions). ATC normally does not question the pilot’s decision regarding classifying an in-flight situation as an emergency, and will assist in any way possible. However, after the aircraft is down safe the FAA will examine the facts to determine if

- (c) Each pilot in command who, in an emergency, or in response to a traffic alert and collision avoidance system resolution advisory, deviates from an ATC clearance or instruction shall notify ATC of that deviation as soon as possible.
- (d) Each pilot in command who (though not deviating from a rule of this subpart) is given priority by ATC in an emergency, shall submit a detailed report of that emergency within 48 hours to the manager of that ATC facility, if requested by ATC.
- (e) Unless otherwise authorized by ATC, no person operating an aircraft may operate that aircraft according to any clearance or instruction that has been issued to the pilot of another aircraft for radar air traffic control purposes.<sup>400</sup>

The courts have generally held that both the pilot and the controller have independent, separate but concurrent ongoing duties to prevent collisions. "Pilot responsibilities are in the Federal Aviation Regulations . . . and the air traffic controller's are in FAA Order 7110.65 . . . . Additional and supplemental information for pilots can be found in the current [AIM] . . . ." <sup>401</sup> "In order to maintain a safe and efficient air traffic system, it is necessary that every party fulfill their responsibilities to the fullest." <sup>402</sup> "The responsibilities of the pilot and the controller intentionally overlap in many areas providing a degree of redundancy. Should one or the other fail in any manner, this overlapping responsibility is expected to compensate, in many cases, for failures that may affect safety." <sup>403</sup> Pilots must maintain vigilance and controllers must diligently comply with their duties as given in the law, regulations and their manual. <sup>404</sup> These duties are for the common purpose of avoiding midair collisions. <sup>405</sup> If either breach their individual duty, a mishap may result. <sup>406</sup>

The Tenth Circuit stated in *Yates v. United States*:

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the "emergency" was of the nature contemplated under the regulations. For example, if the "emergency" was self-imposed, it will not excuse any deviations from the regulations and enforcement action may be pursued.

<sup>400</sup> 14 C.F.R. § 91.123.

<sup>401</sup> AERONAUTICAL INFORMATION PUBLICATION, *supra* note 365, at 42.1.1.

<sup>402</sup> *Id.* at 42.1.4.

<sup>403</sup> *Id.* at 42.1.5.

<sup>404</sup> *See id.* at 42.1.1–42.1.5.

<sup>405</sup> *See id.*

<sup>406</sup> *See Yates v. United States*, 497 F.2d 878, 882–83 (10th Cir. 1974) (emphasis added).

The relationship between the air controller and the pilot of a plane which is landing or taking off creates a duty of care on the part of the controller. *The government argues that plaintiff had no right to rely on instructions which the air controller gave him, and it was up to him to form his own judgment. We fail to see the controller's directions and warnings as being merely advisory.* It is true that the regulations state that a pilot is directly responsible for and is the final authority as to the operation of the aircraft, and they also say that in an emergency the pilot may deviate from the regulations to the extent required to meet the emergency. He must, however, when he has deviated, send a written report of the deviat[ion], to the administrator upon request. What appears to be a conflict can be reconciled. A pilot has a choice before he commits himself to a landing, *but after the commitment he is not free to change his course and thereafter he is controlled by the controller.* Along this same line we note that 49 U.S.C. § 1430(a)(5) declares that it is unlawful for any person to operate aircraft in air commerce in violation of any other rule, regulation, or certificate of the Administrator. This supports our view that what appears to be a conflict between the regulation declaring that the pilot is in command of the aircraft and the regulations giving traffic control authority to the government controllers are consistent after all. This becomes clear in light of considering that if the pilot could depart from the control of the tower at any time the control of the airfield traffic would soon become a shambles. We cannot, therefore, accept the view that the controllers with the complex equipment which they employ are there merely to give advice. *The recognition of these functions as legal obligations gives rise to an attendant duty to perform these functions with reasonable care.* At bar the pilot Yates was peculiarly susceptible to the control of the controllers since he was piloting a light plane in between heavy jets. Once he received and followed the controller's instructions with respect to landing he was not free to disregard the directions given and exercise independent initiative. *For all practical purposes, he was in complete control of the tower.* The hazardous traffic pattern, the direction which enhanced the danger and the failure to direct as to turbulence all contributed to the tragic result.<sup>407</sup>

From the AIM:

### 3-2-1. General

- a. Controlled Airspace. A generic term that covers the different classification of airspace (Class A, Class B, Class C, Class D, and Class E airspace) and defined dimensions within which air traffic control service is provided to IFR flights

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<sup>407</sup> *Id.* (emphasis added).



and to VFR flights in accordance with the airspace classification.

### 3-3-1. General [Uncontrolled Airspace]<sup>408</sup>

Class G airspace (uncontrolled) is that portion of airspace that has not been designated as Class A, Class B, Class C, Class D, or Class E airspace.

### 3-3-2. VFR Requirements

Rules governing VFR flight have been adopted to assist the pilot in meeting the responsibility to see and avoid other aircraft. Minimum flight visibility and distance from clouds required for VFR flight are contained in 14 C.F.R. Section 91.155.<sup>409</sup>

As shown above in the extracted relevant paragraphs from the AIM all classes of airspace, except Class G, are “controlled” by ATC to some extent, and by which ATC may offer specific services to pilots.<sup>410</sup> For example, control towers in Class D airspace offer sequencing<sup>411</sup> only for VFR aircraft, but may offer both sequencing and separation for IFR aircraft.<sup>412</sup> AIM 3-2-5e, discussing Class D airspace states, “no separation services are provided to VFR aircraft.”<sup>413</sup> The VFR pilot in Class D airspace must therefore achieve proper separation (“spacing”)<sup>414</sup> on his own. The AIM at Chapter 4, Air Traffic Control, states:

### 4-1-2. Control Towers

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<sup>408</sup> “Uncontrolled” airspace can be defined as the airspace where no air traffic control services are provided. See FED. AVIATION ADMIN., AIR TRAFFIC ORDER NO. JO 7400.2K (2014). However, this airspace is still “governed” in its entry and usage by the other applicable federal regulations. For example, to fly an airplane VFR in uncontrolled airspace at 1,200 or less above the surface in the daytime, weather conditions must allow for the pilot to maintain a flight visibility of at least one statute mile and remain clear of any clouds, in order to see and avoid other traffic. See 14 C.F.R. § 91.155 (2014).

<sup>409</sup> AIM, *supra* note 15, at 3-2-1, 3-3-1, 3-3-2.

<sup>410</sup> See *id.*

<sup>411</sup> “Sequencing” is not defined in the AIM, ATC manual, or the Pilot/Controller Glossary indicating that its meaning in aviation traffic control usage does not differ from the common usage. “Sequence” is defined in Webster’s Dictionary as, “the act of following.” WEBSTER’S DICTIONARY (9th ed. 1989). To accomplish this, controllers use the terminology: Make Right Traffic, Enter Left/Right Base, Follow, Extend Downwind, Make Short Approach, Go Around, etc.

<sup>412</sup> See AIM, *supra* note 15, at 3-2-5.

<sup>413</sup> *Id.*

<sup>414</sup> “Separation” is defined in the “Pilot/Controller Glossary” (contained in both the AIM and the ATC Manual) as “the *spacing* of aircraft to achieve their safe and orderly movement in flight and while landing and taking off.” *Id.* at Pilot/Controller Glossary. Separation “minima” is defined as “[t]he minimum longitudinal, lateral, or vertical distances aircraft are *spaced* through the application of air traffic control procedures.” *Id.* Separation is *defined* in terms of spacing. See *id.* The ATC manual, at 1-2-1i, defines “approved separation” as

Towers have been established to provide for a safe, orderly and expeditious flow of traffic on and in the vicinity of an airport. When the responsibility has been so delegated, towers also provide for the separation of IFR aircraft in the terminal areas.<sup>415</sup>

Chapter 3 “Airport Traffic Control—Terminal” of the ATC manual states:

3-1-1. PROVIDE SERVICE

Provide airport traffic control service based only upon observed or known traffic and airport conditions.

NOTE-

When operating in accordance with CFRs, it is the responsibility of the pilot to avoid collision with other aircraft. However, due to the limited space around terminal locations, *traffic information can aid pilots in avoiding collision* between aircraft operating within Class B, Class C, or Class D surface areas and the terminal radar service areas, and transiting aircraft operating in proximity to terminal locations.<sup>416</sup>

However, the sequencing and spacing of aircraft are interdependent.<sup>417</sup> The ATC manual further states:

3-8-1. SEQUENCE/SPACING APPLICATION

Establish the sequence of arriving and departing aircraft by requiring them to adjust flight or ground operation, as necessary, to achieve proper spacing.<sup>418</sup>

The AIM comments upon the tower controller’s responsibilities by stating in relevant part at paragraph 4-3-5:

ATC service is based upon observed or known traffic and airport conditions. Controllers establish the sequence of arriving and departing aircraft by requiring them to adjust flight as necessary to achieve proper spacing. These adjustments can only be based on observed traffic, accurate pilot reports, and anticipated aircraft maneuvers. Pilots are expected to cooperate so as to preclude disrupting traffic flows or creating conflicting patterns. The pilot-in-command of an aircraft is directly responsible for and is the final authority as to the operation of the aircraft. On occasion it may be necessary for pilots to maneuver their aircraft to maintain spacing with the traffic they have been sequenced to follow. The

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“separation in accordance with the applicable minima in this order.” FAA ORDER No. JO 7110.65U, *supra* note 66, at 1-2-1i. (emphasis added).

<sup>415</sup> See AIM, *supra* note 15, at 4-1-2.

<sup>416</sup> FAA ORDER No. JO 7110.65U, *supra* note 66, at 3-1-1 (emphasis added).

<sup>417</sup> See *id.* at 3-8-1.

<sup>418</sup> *Id.*

controller can anticipate minor maneuvering such as shallow "S" turns.<sup>419</sup>

In the Class D VFR tower example, the controller has a specific duty to sequence observed or known arriving and departing aircraft by directing them to *adjust flight as necessary to achieve proper spacing*.<sup>420</sup> This is an affirmative duty on the part of the controller, requires diligence in observing (vigilance) and actually "knowing" if they should have known.<sup>421</sup> The pilot brings with him to the Class D airspace the duty to maintain vigilance in order to see and avoid a collision.<sup>422</sup> The controller's sequencing directives must allow for proper spacing (separation); it is the pilot's duty to comply with the sequencing instructions and to ensure that proper separation is attained and maintained.<sup>423</sup> The following cases discuss these concurrent duties.

In *United States v. Miller*, the U.S. Court of Appeals for the Ninth Circuit in 1962 discussed these duties concerning plaintiffs' claims that the tower controller breached his duty to an inbound aircraft, by failing to advise of possibly conflicting traffic already operating in the pattern.<sup>424</sup>

[T]he safe operation of aircraft under VFR weather conditions rests with the pilot. Under such conditions he is obligated to observe and avoid other traffic, even if he is flying with a traffic clearance.

The CAA has recognized that with increasing density of traffic, increasing speed, and increasingly complex aircraft which require more attention inside the cockpit, safe operation is facilitated by providing assistance from ground personnel. Such assistance is provided by the towers. The duties of tower operators are delineated in great detail in the manuals provided for the use of those personnel. Some of these duties overlap with the duties which other regulations placed on pilots. It may be this overlap which has led some to believe that if these duties are imposed on the tower operators, the rules governing the duties of

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<sup>419</sup> AIM, *supra* note 15, at 4-3-5 (emphasis added).

<sup>420</sup> *See id.*

<sup>421</sup> *See id.*; FAA ORDER NO. JO 7110.65U, *supra* note 66, at 3-1-1.

<sup>422</sup> *See* FAA ORDER NO. JO 7110.65U, *supra* note 66, at 3-1-1.

<sup>423</sup> *See* AIM, *supra* note 15, at 4-3-5.

<sup>424</sup> *United States v. Miller*, 303 F.2d 703, 710-11 (9th Cir. 1962). The court never reached the issue of whether or not the controller breached his duty because, at the time, the law was such that if pilot Miller was contributorily negligent he could not recover from defendant U.S. government. *See id.* at 706, 711; BLACK'S LAW DICTIONARY (9th ed. 2009). Miller was found to be negligent. *Miller*, 303 F.2d at 711.

pilots under similar circumstances are only applicable where there is no tower.

The rules governing the duties of pilots, however, make it clear that none of those duties are rendered inapplicable merely because a clearance from a tower has been received. It is stated and reiterated that the function of tower personnel is merely to assist the pilot in the performance of the duties imposed, not relieve him of those duties.

The optimum of safety is sought to be achieved by imposing concurrent duties on the pilots and tower personnel. In any given case, one, both, or neither could be guilty of a breach of the duties imposed. This view is implicit in the decision of the court in *Eastern Air Lines v. Union Trust Co.* The ultimate result reached in that case recognized that both the Government and the airline had concurrently breached their duties, and each was held liable.

We conclude that Miller was not excused by reason of the control tower operation from his duty, under the VFR weather conditions prevailing at the time of the collision, to give way to the Cessna which was in the favored position, or from doing whatever was necessary to clear the area in which the Cessna was flying.<sup>425</sup>

In 1979, the Ninth Circuit in *Rudelson v. United States*, again faced the issue of claimed controller negligence relating to a midair collision.<sup>426</sup> The court found that both pilots had breached their duty to maintain vigilance and the controller had also breached his duty to scan the traffic pattern and warn the pilots; all were proximate causes of the midair collision.<sup>427</sup> The court discussed the duty of reasonable care air traffic controllers owed to pilots, including concurrent duties breached concurrently:

The government contends that because the FAA operations manual did not expressly order the air traffic controllers to monitor the position of a trainer aircraft while its student pilot practiced take-offs and landings, the controllers were under no legal duty to perform such monitoring. The argument is without merit. It is well settled that air traffic controllers' duties are not limited to

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<sup>425</sup> *Id.* (citations omitted).

<sup>426</sup> *See generally* *Rudelson v. United States*, 602 F.2d 1326 (9th Cir. 1979). By 1979, California had adopted the comparative negligence doctrine allowing recovery based on a percentage of fault, even if the plaintiff himself had some degree of fault. *See id.* at 1331, 1333, n.1. This did away with the contributory negligence bar to recovery as experienced by *Miller* in 1962. *See Miller*, 303 F.2d at 706, 711.

<sup>427</sup> *Id.* at 1329-31.

the tasks prescribed by FAA manuals. Under especially dangerous conditions, controllers must take steps beyond those set forth in the manuals if such steps are necessary to ensure the safety of pilots and passengers. The law of California is in accord. A person is not necessarily free from negligence just because he "'may have literally complied with safety statutes or rules. The circumstances may require (him) to do more.'"

The question before us is whether, notwithstanding the FAA manual's silence, considerations of safety necessitated closer monitoring of the trainer's position, at least while it was in the vicinity of the entry corridor. We answer in the affirmative. The traffic controllers knew that although the student (Rudelson) and his instructor (DuVal) were under a duty to see and avoid other aircraft, their attention would probably be distracted from time to time by the teaching exercises. The controllers were also aware that planes occasionally stray into the entry corridor unannounced and that the entry corridor is the spot in the traffic pattern where mid-air collisions are most likely to occur. We hold that, given the dangerous realities of this situation, the traffic controllers owed the occupants of the trainer, as well as the pilots of nearby aircraft, a duty to monitor the trainer's position while it was in the vicinity of the entry corridor. The controllers also owed a concomitant duty to transmit warnings by radio or light beam if the planes appeared to be heading on a collision course. . . . With only a quarter turn of his head, the local controller could easily have scanned the entire traffic pattern. By ignoring the dangerous entry corridor area for almost two minutes at a time when the local controller and others knew or should have known that a trainer aircraft was in the vicinity, the FAA tower personnel acted unreasonably and breached their duty of due care.<sup>428</sup>

Even when separation is provided by ATC, "visual" separation is an approved separation method for controllers, assuming that certain criteria are met.<sup>429</sup> The AIM explains to pilots:

#### 4-4-14. Visual Separation

- a. Visual separation is a means employed by ATC to separate aircraft in terminal areas and en route airspace in the NAS. There are two methods employed to effect this separation:

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<sup>428</sup> *Id.* at 1329 (citations omitted); *see also* *Steering Comm. v. United States*, 6 F.3d 572 (9th Cir. 1993) (where the U.S. government was apportioned 50% fault in the Aeromexico midair collision over Cerritos, California. The Aeromexico flight was receiving air traffic control services from a Federal Aviation Administration (FAA) facility on its approach to Los Angeles International Airport).

<sup>429</sup> *See* AIM, *supra* note 15, at 4-4-14.

2. The tower controller sees the aircraft involved and issues instructions, as necessary, to ensure that the aircraft avoid each other.
3. A pilot sees the other aircraft involved and upon instructions from the controller provides separation by maneuvering the aircraft to avoid it. When pilots accept responsibility to maintain visual separation, they must maintain constant visual surveillance and not pass the other aircraft until it is no longer a factor.

**NOTE-**

*Traffic is no longer a factor when during approach phase the other aircraft is in the landing phase of flight or executes a missed approach; and during departure or en route, when the other aircraft turns away or is on a diverging course.*

- b. A pilot's acceptance of instructions to follow another aircraft or provide visual separation from it is an acknowledgment that the pilot will maneuver the aircraft as necessary to avoid the other aircraft or to maintain in-trail separation. In operations conducted behind heavy jet aircraft, it is also an acknowledgment that the pilot accepts the responsibility for wake turbulence separation.

**NOTE-**

*When a pilot has been told to follow another aircraft or to provide visual separation from it, the pilot should promptly notify the controller if visual contact with the other aircraft is lost or cannot be maintained or if the pilot cannot accept the responsibility for the separation for any reason.*

- c. Scanning the sky for other aircraft is a key factor in collision avoidance. Pilots and copilots (or the right seat passenger) should continuously scan to cover all areas of the sky visible from the cockpit. Pilots must develop an effective scanning technique which maximizes one's visual capabilities. Spotting a potential collision threat increases directly as more time is spent looking outside the aircraft. One must use timesharing techniques to effectively scan the surrounding airspace while monitoring instruments as well.
- d. Since the eye can focus only on a narrow viewing area, effective scanning is accomplished with a series of short, regularly spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed ten degrees, and each area should be observed for at least one second to enable collision detection. Although many pilots seem to prefer the method of horizontal back-and-forth scanning every pilot should develop a scanning pattern that is not only comfortable but assures optimum effectiveness. Pilots should remember, however, that they have a regulatory responsibility (14 C.F.R.

§ 91.113(a)) to see and avoid other aircraft when weather conditions permit.<sup>430</sup>

As an example, the ATC manual provides for visual separation of en route traffic:

#### 7-2-1. VISUAL SEPARATION

Aircraft may be separated by visual means, as provided in this paragraph, when other approved separation is assured before and after the application of visual separation. To ensure that other separation will exist, consider aircraft performance, wake turbulence, closure rate, routes of flight, and known weather conditions. Reported weather conditions must allow the aircraft to remain within sight until other separation exists.

- c. EN ROUTE. Visual separation may be used up to but not including FL 180 when the following conditions are met:
  - 1. Direct communication is maintained with one of the aircraft involved and there is an ability to communicate with the other.
  - 2. A pilot sees another aircraft and is instructed to maintain visual separation from it as follows:
    - (a) Tell the pilot about the other aircraft including position, direction and unless it is obvious, the other aircraft's intentions.
    - (b) Obtain acknowledgment from the pilot that the other aircraft is in sight.
    - (c) Instruct the pilot to maintain visual separation from that aircraft.
    - (d) Advise the pilot if the radar targets appear likely to converge.
    - (e) If the aircraft are on converging courses, inform the other aircraft of the traffic and that visual separation is being applied.
    - (f) Advise the pilots if either aircraft is a heavy.
    - (g) Traffic advisories and wake turbulence cautionary advisories must be issued in accordance with para 2-1-20, Wake Turbulence Cautionary Advisories, and para 2-1-21, Traffic Advisories.
    - (h) If the pilot advises he/she has the traffic in sight and will maintain visual separation from it (the pilot must use that entire phrase), the controller need only "approve" the operation instead of restating the instructions.<sup>431</sup>

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<sup>430</sup> AIM, *supra* note 15, at 4-4-14.

<sup>431</sup> FAA ORDER NO. JO 7110.65U, *supra* note 66, at 7-2-1.

A “first priority” of each ATC controller is to warn an aircraft that it is in dangerous proximity to another aircraft.<sup>432</sup> The ATC manual states:

2-1-2. DUTY PRIORITY

- a. Give first priority to separating aircraft and issuing safety alerts as required in this order. Good judgment must be used in prioritizing all other provisions of this order based on the requirements of the situation at hand.<sup>433</sup>

2-1-6. SAFETY ALERT

Issue a safety alert to an aircraft if you are aware the aircraft is in a position/altitude that, in your judgment, places it in unsafe proximity to terrain, obstructions, or other aircraft. Once the pilot informs you action is being taken to resolve the situation, you may discontinue the issuance of further alerts. Do not assume that because someone else has responsibility for the aircraft that the unsafe situation has been observed and the safety alert issued; inform the appropriate controller.

NOTE-

1. The issuance of a safety alert is a first priority (see para 2-1-2, Duty Priority) once the controller observes and recognizes a situation of unsafe aircraft proximity to terrain, obstacles, or other aircraft. *Conditions, such as workload, traffic volume, the quality/limitations of the radar system, and the available lead time to react are factors in determining whether it is reasonable for the controller to observe and recognize such situations.* While a controller cannot see immediately the development of every situation where a safety alert must be issued, *the controller must remain vigilant for such situations and issue a safety alert when the situation is recognized.*<sup>434</sup>

In cases where the controller’s duty to maintain vigilance and issue a safety alert are evaluated, the factors determining whether his or her actions were “reasonable” are examined. In the case of *In re Greenwood Air Crash*, the U.S. District Court for the Southern District of Indiana, held that a safety alert should have been issued, even though the controller had communication with only one of the aircraft (which was on departure from the non-tower airport) for approximately twenty seconds prior to impact because he had handled the other accident aircraft and knew that aircraft was inbound to the same airport.<sup>435</sup>

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<sup>432</sup> See *id.* at 2-1-2.

<sup>433</sup> *Id.*

<sup>434</sup> *Id.* at 2-1-6 (emphasis added).

<sup>435</sup> *In re Greenwood Air Crash*, 924 F. Supp. 1518, 1533–34 (S.D. Ind. 1995).



The court finds by a preponderance of the evidence that, if Fritz had exercised reasonable care to observe and recognize that the aircraft were on a collision course, he could have issued a safety alert to the pilots in time for them to see the other aircraft and to take action necessary to avoid the collision.

Fritz's failure to become aware of the unsafe proximity of the aircraft under these circumstances was negligent. Specifically, he knew the Saratoga intended to land at Greenwood and less than 45 seconds later he was in radio contact with an aircraft stating that it was taking off from Greenwood. Both aircraft appeared on Fritz's scope which showed the aircraft were on a potential collision course. The court finds that Fritz's inattention to his radar scope was such that he was unaware of the unsafe proximity of the Saratoga and MU-2 and his resulting failure to issue a warning or safety alert to Mullen was a breach of his primary duty to prevent a collision between aircraft. The United States, through its agent, Fritz, was negligent in failing to remain vigilant, to observe and recognize that the two aircraft were in unsafe proximity to one another and on a collision course and to issue a safety alert or warning to Mullen in time for them to see and take action to avoid the collision.<sup>436</sup>

In *Air Service v. United States*, the court held that the controller had not breached his duty to issue a safety alert when an IFR departure (in visual weather conditions) collided with an inbound VFR aircraft approximately three miles east of the airport.<sup>437</sup> The VFR aircraft had entered the Class D airspace without contacting the control tower.<sup>438</sup> There was voluminous testimony as to what could have been seen by the tower controller even assuming he was vigilantly scanning.<sup>439</sup>

The air traffic controller did not breach any duty owed to Pilot Mohan.

Plaintiff's allegations of a mere possibility and Beck's [the intruding aircraft] intervening cause of the collision [do not establish such a breach].

At trial, plaintiffs conceded through expert witness Rudich that the sole shortcoming alleged against the government was its employee's not seeing Beck's unannounced and unexpected entry, and the failure to tell Mohan [the departing IFR aircraft] about that sudden entry.

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<sup>436</sup> *Id.*

<sup>437</sup> *Air Serv., Inc. v. United States*, No. GC81-245-LS-P, 1983 U.S. Dist. LEXIS 12176, at \*9, \*41-42 (N.D. Miss. Oct. 31, 1983).

<sup>438</sup> *Id.* at \*8.

<sup>439</sup> *Id.* at \*41-42.

The probabilities of the local controller in this case being able to detect Beck's incoming aircraft at the minimum time and distance to issue effective traffic information was exhaustively analyzed, and the expert scientific analysis was unrebutted. Given plaintiffs' own witnesses' various testimony regarding course, speed, and collision location, the probabilities ranged between the remotes of only 3 to perhaps 11%. Conversely, the likelihood that such visual detection would not have been made is therefore extremely high, from 89 to 97%. It is upon these narrow possibilities of what perhaps might have occurred which plaintiffs based their case; it is not based on nor does it proceed from allegations of certainties or even more-likely-than-nots. Plaintiffs have therefore failed to meet their burden. Any remote chance that the air traffic controller could or may have set in operation actions that could have caused Pilot Mohan to evade Beck's aircraft and avoid the head-on collision arises from conjectures and mere possibilities, does not constitute negligence, and is not a proximate cause of the head-on collision.<sup>440</sup>

E. 14 C.F.R. § 91.126 OPERATION ON OR IN VICINITY OF AN AIRPORT IN CLASS G AIRSPACE

1. *Introduction*

This section is focused on procedures for operations at Class G Airspace airports, including direction of turns, flap settings, and communications. Actually unrelated to procedures, but included in this provision, helicopters and powered parachutes are told they must avoid the flow of fixed wing aircraft.<sup>441</sup> Section 91.126 is as follows:

§ 91.126 Operating on or in the vicinity of an airport in Class G airspace.

- (a) General. Unless otherwise authorized or required, each person operating an aircraft on or in the vicinity of an airport in a Class G airspace area must comply with the requirements of this section.
- (b) Direction of turns. When approaching to land at an airport without an operating control tower in Class G airspace—
  - (1) Each pilot of an airplane must make all turns of that airplane to the left unless the airport displays approved light signals or visual markings indicating that

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<sup>440</sup> *Id.* (citing *Kramer Serv., Inc. v. Wilkins*, 186 So. 625 (Miss. 1939); *Pargas of Taylorsville, Inc. v. Craft*, 249 So. 2d 403 (Miss. 1971)).

<sup>441</sup> See 14 C.F.R. § 91.126 (2014).

turns should be made to the right, in which case the pilot must make all turns to the right; and

- (2) *Each pilot of a helicopter or a powered parachute must avoid the flow of fixed-wing aircraft.*
- (c) Flap settings. Except when necessary for training or certification, the pilot in command of a civil turbojet-powered aircraft must use, as a final flap setting, the minimum certificated landing flap setting set forth in the approved performance information in the Airplane Flight Manual for the applicable conditions. However, each pilot in command has the final authority and responsibility for the safe operation of the pilot's airplane, and may use a different flap setting for that airplane if the pilot determines that it is necessary in the interest of safety.
- (d) Communications with control towers. Unless otherwise authorized or required by ATC, no person may operate an aircraft to, from, through, or on an airport having an operational control tower unless two-way radio communications are maintained between that aircraft and the control tower. Communications must be established prior to 4 nautical miles from the airport, up to and including 2,500 feet AGL. However, if the aircraft radio fails in flight, the pilot in command may operate that aircraft and land if weather conditions are at or above basic VFR weather minimums, visual contact with the tower is maintained, and a clearance to land is received. If the aircraft radio fails while in flight under IFR, the pilot must comply with § 91.185.<sup>442</sup>

## 2. Discussion

Section 91.126(b)(2) was first introduced in a 1960 Notice of Proposed Rulemaking.<sup>443</sup> Under what was then Section 60.18(b) entitled "Controlled Airports," the following was proposed:

(6) *Helicopter entry.* Pilots of helicopters operating to a controlled airport who have landed at or taken off from such airport within the preceding 30 days shall conform to the helicopter traffic pattern procedures established by the Federal Aviation Agency for that airport. Other helicopters, unless the VFR distance-from-cloud criteria requires otherwise, and where terrain and obstacles permit, shall be flown so as to enter the airport traffic area below 1,000 feet but not less than 800 feet above the surface.

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<sup>442</sup> *Id.* (emphasis added).

<sup>443</sup> See Airport Traffic Area Rules, 25 Fed. Reg. 9868 (proposed Oct. 7, 1960) (to be codified at 14 C.F.R. pt. 60).

After entry an altitude between 1,000 and 800 feet shall be maintained as long as practicable *and the approach to land shall be made in a manner which avoids the flow of fixed-wing aircraft.*<sup>444</sup>

For uncontrolled airports, helicopters were also directed to avoid fixed wing aircraft:

(c) *Uncontrolled airports.* . . .

- (1) *Approaching to land.* When approaching for landing, fixed-wing aircraft shall be flown so that all turns shall be made to the left unless the airport displays light signals or standard visual marking which have meanings approved by the Administrator and which indicate that all turns are to be made to the right. *When approaching for landing, helicopters shall be flown in a manner which avoids the flow of fixed-wing aircraft.*<sup>445</sup>

Following up on the NPRM, the final rule adopted this treatment of helicopters at controlled and uncontrolled airports, stating clearly that "helicopters shall be flown in a manner which avoids the flow of fixed wing aircraft."<sup>446</sup>

Currently, the Code of Federal Regulations incorporates this same treatment of helicopters under Sections 91.126, 91.127, 91.129, 91.130, and 91.131.<sup>447</sup> As the latter four sections merely adopt the provisions of Section 91.126 by reference, the following discussion will refer only to Section 91.126, though it applies to all sections.

During the research on this provision, one central document emerged that discusses elements of Section 91.126(b)(2).<sup>448</sup> This legal opinion of the Chief Counsel's Office was asked by the helicopter community to clarify what is now Section 91.126(b)(2).<sup>449</sup> The first question asked was whether a helicopter can enter the traffic pattern in front of a fixed-wing air-

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<sup>444</sup> *Id.* at 9870 (emphasis added).

<sup>445</sup> *Id.* (emphasis added).

<sup>446</sup> Operation at Airports, 26 Fed. Reg. 9069, 9070 (Sept. 27, 1961) (to be codified at 14 C.F.R. pt. 60).

<sup>447</sup> See 14 C.F.R. §§ 91.126–127, 91.129–131 (2014). Sections 91.127(a) and 91.129(a) require that operations in Class E and D airspace, respectively, shall comply with section 91.126, which includes helicopters avoiding fixed-wing aircraft. Section 91.130(a) provides that operations in class C airspace must be conducted in compliance with section 91.129, which also provides for helicopter avoidance of fixed-wing aircraft. *Id.*

<sup>448</sup> See FED. AVIATION ADMIN., OPINION OF THE ASSISTANT CHIEF COUNSEL (July 3, 1987).

<sup>449</sup> *Id.*

craft.<sup>450</sup> The answer was no; it "shall not enter the traffic flow utilized by fixed-wing aircraft."<sup>451</sup> It is obligated to follow the fixed-wing traffic, unless the helicopter is on "final approach."<sup>452</sup> A reading of this clearly supports the duty of a helicopter pilot to avoid fixed-wing aircraft while entering, or in the traffic pattern, unless on "short final."<sup>453</sup> This opinion offered that equality under the right-of-way regulation applies "to all situations, other than when a helicopter and fixed-wing airplane are 'approaching to land' on 'short final.'"<sup>454</sup>

FAA Advisory Circular No. 90-66A provides pilots with recommended traffic patterns and practices for operating at uncontrolled airports.<sup>455</sup> It also offers information to the aviation community on rotorcraft operations.<sup>456</sup> It points out the helicopter pilot's duty is to avoid the flow of fixed-wing aircraft.<sup>457</sup> It also states that helicopters fly slower and approach at steeper angles; operate at lower pattern altitudes closer to the airport with turns to the right; and practice autorotations (engine out emergency) with steeper angles of approach and a high rate of descent (1,500-2,000 feet per minute).<sup>458</sup>

The AIM also provides guidance to pilots in airport operations in chapter four.<sup>459</sup> However, in reviewing discussions regarding controlled and uncontrolled airports, no discussion of helicopters or their duty to avoid fixed-wing aircraft was found. A review of judicial decisions found no violations involving helicopters, or a failure to avoid fixed wing traffic under Section 91.126(b)(2).

Section 91.126(b)(2), and its predecessors, was adopted without significant comment. Further, since adoption, it also appears that little if any litigation or controversy arose from this

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<sup>450</sup> *Id.*

<sup>451</sup> *Id.*

<sup>452</sup> *Id.*

<sup>453</sup> *Id.*

<sup>454</sup> *Id.* at 2.

<sup>455</sup> FED. AVIATION ADMIN, ADVISORY CIRCULAR NO. 90-66A, RECOMMENDED STANDARD TRAFFIC PATTERNS AND PRACTICES FOR AERONAUTICAL OPERATIONS OF AIRPORTS WITHOUT OPERATING CONTROL TOWERS § 9(a) (1993) [hereinafter ADVISORY CIRCULAR NO. 90-66A].

<sup>456</sup> *See id.*

<sup>457</sup> *Id.*

<sup>458</sup> *Id.*

<sup>459</sup> AIM, *supra* note 15, at 4-3-1.

regulation.<sup>460</sup> Some discussion in advisory circulars exists, but it evidences little discussion. The 1989 Assistant Chief Counsel’s opinion provides some substance to interpreting this provision, and Advisory Circular No. 90-66A offers some rationale for the disparity in treatment of helicopters, at least while entering and operating in an airport traffic pattern.<sup>461</sup> During these times, an enhanced responsibility to avoid other aircraft is apportioned to helicopter pilots.<sup>462</sup> Looking ahead, the rationale behind provisions like Section 91.126 may redefine the traditional see and avoid concept to a future new category or type of aircraft.

#### F. 14 C.F.R. § 91.155 BASIC VFR WEATHER MINIMUMS

##### 1. *Introduction*

14 C.F.R. § 91.155 sets out weather minimums for VFR operations in the various classes of airspace that comprise the National Airspace System (NAS).<sup>463</sup> It also sets out weather minimums for takeoffs and landings at airports in class B, C, D, or E airspace.<sup>464</sup>

##### 2. *Background and Analysis of Section 91.155*

VFR weather minimums were established very early in regulation to ensure pilots have sufficient cloud clearance and visibility to permit aircraft operators to see and avoid other aircraft. Though the 1927 regulations were silent on this issue,<sup>465</sup> by 1937, VFR weather minimums had been firmly adopted.<sup>466</sup> Under Section 60.44 entitled “Weather Minimums,” day flight in

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<sup>460</sup> See *Dyer v. United States*, 832 F.2d 1062, 1064–67 (9th Cir. 1987) (focusing on what constituted a “flow” of fixed wing traffic, which must be avoided by helicopter operations in the landing pattern, the Court of Appeals upheld the district court’s finding of pilot negligence for landing a fixed wing airplane too closely behind a larger military helicopter, causing an accident. Plaintiff’s claim the accident was the result of wake turbulence and that the helicopter negligently used a left hand traffic pattern causing the turbulence. The appellate court upheld the district court’s decision that at the time of the approach and landing, the airplane was not in the “flow” of traffic, instead it was some distance from the airport and did not appear to be landing. To be in the flow, the airplane must be present.).

<sup>461</sup> See ADVISORY CIRCULAR NO. 90-66A, *supra* note 455, at § 9(a).

<sup>462</sup> See *id.*

<sup>463</sup> See 14 C.F.R. § 91.155 (2014).

<sup>464</sup> See *id.*

<sup>465</sup> AERONAUTICS BRANCH, U.S. DEP’T OF COMMERCE, AIR COMMERCE REGULATIONS, app. III (1932); see also AIR COMMERCE REGULATIONS, *supra* note 236.

<sup>466</sup> See Air Traffic Rules, 2 Fed. Reg. 2181 (Oct. 14, 1937) (to be codified at 14 C.F.R. pt. 60).

control zones required one thousand feet and a visibility of three miles, and night required 1,500 feet and a visibility of five miles.<sup>467</sup> They were further divided into two areas, flights within control zones and flights outside control zones.<sup>468</sup> Cloud clearances were also set at three hundred feet vertically (five hundred feet in precipitation) and two thousand feet horizontal.<sup>469</sup> However, no cloud clearance was designated for operations above clouds.<sup>470</sup>

In 1947, the Civil Aeronautics Board issued revised Part 60—Air Traffic Rules.<sup>471</sup> These displayed very little departure from the 1937 provisions, with one exception. The 1947 rules acknowledged of the introduction of a new technology.<sup>472</sup> Helicopter operations were considered for the first time.<sup>473</sup> Unlike airplanes, helicopters had the ability to operate at very slow airspeeds.<sup>474</sup> Thus, helicopters were permitted to fly outside control zones at or below seven hundred feet “at a reduced speed which will give the pilot of such helicopter adequate opportunity to see other air traffic or any obstruction in time to avoid hazard of collisions.”<sup>475</sup>

In addition to recognizing helicopter operations, the 1947 regulations distinguished between “ground” and “flight” visibility.<sup>476</sup> A definition for these two visibility criteria was provided in Civil Air Regulations Draft Release No. 46-5, which was sent to the aviation community for comment and recommendations.<sup>477</sup> The resulting comments and meetings with the aviation community were incorporated in one of the earliest NPRMs for air traffic rules.<sup>478</sup> The NPRM and final rule made a distinction between ground and flight visibility, but offered no definition.<sup>479</sup>

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<sup>467</sup> *Id.* at 2184.

<sup>468</sup> *See id.*

<sup>469</sup> *Id.*

<sup>470</sup> *See id.*

<sup>471</sup> *See* Air Traffic Rules, 12 Fed. Reg. 5547 (Aug. 16, 1947) (to be codified at 14 C.F.R. pt. 60).

<sup>472</sup> *See id.* at 5549.

<sup>473</sup> *See id.*

<sup>474</sup> *See id.*

<sup>475</sup> *Id.*

<sup>476</sup> *See id.* at 5549, 5551.

<sup>477</sup> *See* CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5, *supra* note 126.

<sup>478</sup> *See* Air Traffic Rules, 12 Fed. Reg. 3423 (proposed Oct. 1, 1946) (to be codified at 14 C.F.R. pt. 60).

<sup>479</sup> *See id.*; Air Traffic Rules, 12 Fed. Reg. 5547 (Aug. 16, 1947) (to be codified at 14 C.F.R. pt. 60).

The language of the draft release did offer the following definition for ground visibility:

(a) when ground visibility at an airport within a control zone is *determined by an accredited observer* to be less than three miles, clearances for takeoff or landing or to enter the traffic pattern of such an airport must be obtained from air traffic control, and such clearances will be given by air traffic control if there is not interference with other aircraft.<sup>480</sup>

In contrast, the handling of flight visibility was described in the draft release as follows:

(b) If an aircraft in flight is proceeding on a course which passes through a control zone and avoids or passes over the traffic pattern of the airport within the control zone, no clearance for such flight is necessary from air traffic control provided the flight visibility is at least three miles . . . this rule permits aircraft to proceed above an overcast or local haze conditions without clearance from air traffic control. . . .<sup>481</sup>

While the above discussion of flight visibility does not state exactly how, or who determines flight visibility, it does not prohibit the pilot from making his or her own measurements.<sup>482</sup>

In 1958, the CAB put out for consideration of the aviation community the proposal to increase the minimum VFR weather criteria.<sup>483</sup> This proposal included: (1) increasing VFR ceiling and visibility to 1500 feet and five miles in a high density airport; (2) setting one mile as the "irreducible" minimum for all VFR; (3) introducing "basic" and "special" VFR minimums; and (4) increasing to five miles the minimums for acrobatic flight.<sup>484</sup> The rationale for offering these proposed changes was to see "how much safety will be increased by raising the VFR weather minimums and at what price to the users of the airspace."<sup>485</sup> The CAB found that the proponents of a change were those operating faster aircraft, while those pilots operating slower aircraft disagreed with a need to change VFR minimums.<sup>486</sup>

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<sup>480</sup> CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5, *supra* note 126, § 60.200(a)-(b) (emphasis added).

<sup>481</sup> *Id.*

<sup>482</sup> *See id.*

<sup>483</sup> *See* VFR Weather Minimums, 23 Fed. Reg. 6177 (Aug. 12, 1958) (to be codified at 14 C.F.R. pt. 60).

<sup>484</sup> *Id.* at 6177.

<sup>485</sup> *Id.*

<sup>486</sup> *Id.* at 6178.



The CAB ultimately rejected the proposal to increase visibility minimums.<sup>487</sup> In reviewing the accident records to date, the CAB found no correlation that decreased visibility had been a significant factor in collisions.<sup>488</sup> Accordingly, they proposed that reducing the number of collisions be handled by other means, including: (1) limitations on airspeed; (2) communications in high-density airports; (3) all weather positive control routes at higher altitudes serving faster aircraft; (4) simplification of cruising altitudes for separation of VFR and IFR aircraft; and (5) enhance visibility using high intensity lights and highly luminescent paints.<sup>489</sup>

In the note that was added to the amended Section 60.30, the CAB offered further insight into the rationale for VFR weather minimums:

Note: The minimum weather conditions prescribed in this section for flights in controlled airspace are those within which a pilot is expected to be able to observe and avoid other air traffic. When operating in weather conditions equal to or above those specified herein, irrespective of the type of flight plan an aircraft may be operated under, i.e. IFR or VFR, the primary responsibility for the avoidance of collision rests with the pilot. It should be recognized that the criteria contained herein prescribe the "minimums" required for VFR flight. Good operating practice requires that regular or continued flight in near minimum, weather conditions be avoided.<sup>490</sup>

Regarding this note, a few points need highlighting. First, the pilot is primarily responsible for seeing and avoiding other aircraft.<sup>491</sup> Second, these minimums also apply to IFR operations conducted under VMC conditions.<sup>492</sup> Lastly, this note implies that under some circumstances, operations at even these minimums should be avoided, implying a duty on the pilot to use higher criteria.<sup>493</sup> The final regulation reflects the basic VFR weather minimums as we know them today. The 1958 minimums were:<sup>494</sup>

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<sup>487</sup> *Id.* at 6177-78.

<sup>488</sup> *Id.* at 6178.

<sup>489</sup> *Id.*

<sup>490</sup> *Id.*

<sup>491</sup> *See id.*

<sup>492</sup> *See id.*

<sup>493</sup> *See id.*

<sup>494</sup> *Id.* at 6177.

Table 2 – 1958 Basic VFR Minimums

BASIC VFR MINIMUMS			
	Visibility	Distance from clouds	
Control zone.....	3 miles <sup>1</sup> .....	500 feet under <sup>2</sup> 1,000 feet over <sup>2</sup> 2,000 feet horizontally <sup>1</sup> and 1,000-foot ceiling	
Control area.....	3 miles.....	500 feet under 1,000 feet over 2,000 feet horizontally	
Continental control area.....	5 miles.....	1,000 feet under 1,000 feet over 1 mile horizontally	
		700 feet or below	Above 700 feet
Outside controlled airspace.....	1 mile <sup>2</sup> .....	Clear of clouds.....	500 feet under 1,000 feet over 2,000 feet horizontally

<sup>1</sup> If traffic conditions permit, air traffic control will issue an air traffic clearance for flight within a control zone when the weather conditions are less than the above. However, no person shall operate an aircraft VFR, irrespective of any clearance, unless the visibility is 1 mile and the flight can remain clear of clouds.  
<sup>2</sup> Helicopters are excepted from the 1-mile requirement when operated at or below 700 feet and at reduced airspeed (see § 60.39).

In 1967, recognizing that collision risk could be avoided by limiting airspeed, the FAA adopted the 250 knot speed limit below 10,000 feet.<sup>495</sup> However, this restriction did not apply to aircraft operations above 10,000 feet.<sup>496</sup> This change did not benefit aircraft operating at differing speeds above 10,000 feet.<sup>497</sup>

In 1968, a new weather minimum for operations above 10,000 feet was adopted to address this problem.<sup>498</sup> To ensure that high speed IFR aircraft did not encounter slower VFR traffic at higher altitudes, the FAA adopted a rule requiring five statute miles visibility and distance from clouds of 1,000 feet above and below, and one mile horizontal.<sup>499</sup>

Overall, Section 91.155 expects a prudent pilot to obtain accurate weather information, and comply with the minimums for visibility and cloud clearances.<sup>500</sup> Such compliance facilitates the

<sup>495</sup> General Operating and Flight Rules, 32 Fed. Reg. 15,708, 15,708 (Nov. 15, 1967) (to be codified at 14 C.F.R. pt. 91).

<sup>496</sup> See *id.* at 15,708–709.

<sup>497</sup> See *id.*

<sup>498</sup> See General Operating and Flight Rules, 33 Fed. Reg. 2992, 2992 (Feb. 15, 1968) (to be codified at 14 C.F.R. pt. 91).

<sup>499</sup> *Id.*

<sup>500</sup> See 14 C.F.R. § 91.155 (2014).

duty to observe and avoid other aircraft.<sup>501</sup> The following discussion is offered to provide substance to these duties.

a. Visibility

With respect to visibility, Section 91.155 discusses two standards: (1) "ground" visibility; and (2) "flight" visibility.<sup>502</sup> Section 91.155(a) specifies flight visibility for operations in the various classes of airspace.<sup>503</sup> Section 91.155(b) creates limited exceptions to subpart (a) for helicopters and operations within one half mile of the runway, without defining whether ground or flight visibility.<sup>504</sup> Section 91.155(d)(1) and (2) specifically refer to ground visibility for landings and takeoffs at Class B, C, D, or E airports.<sup>505</sup> The difference between the two, is that ground visibility is defined by the Federal Aviation Regulations as "prevailing horizontal visibility near the earth's surface as reported by the U.S. National Weather Service or an accredited observer."<sup>506</sup> In contrast, flight visibility is defined as "the average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night."<sup>507</sup>

In *Administrator v. Harris*, the NTSB Board offered definition for a pilot's responsibility regarding the application of ground visibility.<sup>508</sup> In *Harris*, the respondent was charged with a violation of Section 91.105(d) [now Section 91.155(d)], landing at an airport where a National Weather Service reported ground visibility at two miles.<sup>509</sup> This information was available to the pilot, but he made no effort to obtain it.<sup>510</sup> The pilot argued that the reported visibility was inaccurate.<sup>511</sup> The NTSB Board rejected this argument, stating "[t]he potential existence of an error in ground visibility report obtained from an [ATC] facility or [FSS] does not alter the fact that such information constitutes

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<sup>501</sup> See *id.*

<sup>502</sup> See *id.*

<sup>503</sup> See *id.* § 91.155(a).

<sup>504</sup> See *id.* § 91.155(b).

<sup>505</sup> See *id.* § 91.155(d)(1)–(2).

<sup>506</sup> 14 C.F.R. § 1.1 (2014).

<sup>507</sup> *Id.*

<sup>508</sup> *Adm'r v. Harris*, 5 N.T.S.B. 785, 785–87 (1985).

<sup>509</sup> *Id.* at 788–89.

<sup>510</sup> *Id.* at 786.

<sup>511</sup> *Id.* at 785–86.

reported visibility within the purview of [Section 91.155(d)]."<sup>512</sup> Is it permissible for the pilot to substitute his first hand cockpit observations of visibility for ground reported visibility? In an earlier case, *Administrator v. Kokkonen*, the NTSB Board's response was no.<sup>513</sup> In *Kokkonen*, the reported ground visibility was less than three miles and available to all pilots through numerous sources.<sup>514</sup> Respondent argued that his cockpit observations found the visibility at all times above three miles.<sup>515</sup> The NTSB Board rejected this as irrelevant, stating "[f]light visibility, which is measured forward from the cockpit of the aircraft, cannot be used as a substitute for ground visibility."<sup>516</sup> The NTSB Board's rationale was that in marginal weather, if every pilot is permitted to make an individual and subjective determination on ground visibility, chaos would result.<sup>517</sup>

However, a later NTSB Board decision somewhat clouds this question. In *Administrator v. Rolund*, the NTSB Board ruled that official reported weather regarding visibility was not necessarily controlling under Section 91.155(d)(1).<sup>518</sup> In *Rolund*, the NTSB Board permitted the weighing of various sources of information, including respondent's own estimates of visibility.<sup>519</sup> An official report made approximately thirty minutes prior to takeoff called for one and one half miles of visibility.<sup>520</sup> A certified weather observer reported three miles of visibility approximately thirty minutes after takeoff.<sup>521</sup> At the time of takeoff, one and one half miles was the last reported visibility, half of the required three miles.<sup>522</sup> It appears that respondent checked only his company's computer system for weather.<sup>523</sup> He did not seek the then-current reported weather, including visibility, from any other sources.<sup>524</sup> Based on these facts, the Administrative Law Judge

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<sup>512</sup> *Id.* at 786.

<sup>513</sup> *Adm'r v. Kokkonen*, 4 N.T.S.B. 881, 882 (1983).

<sup>514</sup> *Id.* at 881-82.

<sup>515</sup> *Id.* at 881.

<sup>516</sup> *Id.*

<sup>517</sup> *Id.* at 882.

<sup>518</sup> *See generally* *Adm'r v. Rolund*, N.T.S.B. Order No. EA-3991 (1993).

<sup>519</sup> *Id.* at \*2.

<sup>520</sup> *Id.* at \*4.

<sup>521</sup> *Id.* at \*1.

<sup>522</sup> *Id.*

<sup>523</sup> *Id.*

<sup>524</sup> *Id.*

(ALJ) found the respondent in violation of Section 91.155(d)(1) [now Section 91.155(d)(1)].<sup>525</sup>

However, on appeal, the NTSB Board reversed, finding no violation.<sup>526</sup> According to the NTSB Board, [Section 91.155(d)(1)] “states only that visibility must be 3 miles. It does not direct how that weather determination is to be made[.]”<sup>527</sup> For the proposition that official weather reports may be important, but not controlling, the Board cited *Administrator v. Gaub*.<sup>528</sup>

While on its face this conclusion conflicts with our previous discussion, there are some concerns associated with the rationale and conclusions contained in *Rolund*.<sup>529</sup> First, the conclusion that Section 91.155(d)(1) does not direct how weather determinations are made and makes no reference to use of “official weather” information ignores that this section deals only with visibility for takeoff and landings, and that Section 91.155(d)(1) clearly specifies “ground” visibility is to be used.<sup>530</sup> Though Section 91.155(d)(1) does not reference a requirement for using official reported weather,<sup>531</sup> 14 C.F.R. § 1.1 specifically states that “ground” visibility will come from the National Weather Service or an accredited observer.<sup>532</sup> Second, *Gaub* is offered as support that official reports for visibility are not controlling. In fact, *Gaub* involved cloud clearances and respondent in that case was cited for a violation of what is now Section 91.155(c), which deals solely with cloud clearance, not visibility.<sup>533</sup>

Perhaps *Rolund* stands as support for a narrow exception, where the official reported weather is so questionable as to be deemed unreliable, takeoff can be made based on sufficient “flight” visibility, under Section 91.155(d)(2).

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<sup>525</sup> *Id.* at \*6.

<sup>526</sup> *Id.* at \*3.

<sup>527</sup> *Id.* at \*2.

<sup>528</sup> *Id.* *Gaub* is considered in detail under the following discussion of cloud clearances.

<sup>529</sup> The following are opinions and observations of the authors.

<sup>530</sup> See 14 C.F.R. 91.155(d) (2014).

<sup>531</sup> See *id.*

<sup>532</sup> See *id.*

<sup>533</sup> See *Adm'r v. Gaub*, 5 N.T.S.B. 1653, 1655 (1986).

b. Cloud Clearance

Cloud clearances can be determined by many sources, including the pilot's own observations. Whether the pilot's estimates will be adopted as correct depends on the weight given to it over other competing sources of measurement. This was the case in *Gaub*.<sup>534</sup> In that case, an airman was held to have violated Section 91.155(c) (then 91.105 (c)) for operating in a control zone when the cloud ceiling was allegedly less than 1,000 feet.<sup>535</sup> The respondent contended that the ceiling he observed was greater than 1,000 feet.<sup>536</sup> The observations of others on the airport indicated less than one thousand feet.<sup>537</sup> The ALJ initially ruled that a pilot could not substitute his judgment for officially reported weather.<sup>538</sup> However, on appeal, the NTSB Board disagreed with the ALJ.<sup>539</sup> The NTSB Board reasoned that since weather is dynamic, if the weather has deteriorated since the last weather report, the pilot should be able to substitute his judgment in the interest of safety.<sup>540</sup> Whether the pilot's estimate is accepted over other estimates will be based on a credibility determination by the ALJ.<sup>541</sup> If the pilot's estimate is found most credible, he prevails.<sup>542</sup> However, the Board added that if a pilot does substitute his judgment, he is still required to comply with Section 91.155(c).<sup>543</sup>

c. Pilot's Duty to “See and Avoid” and to be Seen and Avoided

As stated earlier, weather minimums were established for flights in controlled airspace to enable a vigilant pilot to see and avoid other aircraft. Even under IFR, the pilot is primarily responsible for collision avoidance when weather conditions permit. In short, weather minimums serve as support for the pilot's duty of vigilance to see and avoid other aircraft.

A pilot's duty to comply with VFR weather minimums dovetails with the duty to be vigilant for other aircraft. Compliance

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<sup>534</sup> See generally *id.*

<sup>535</sup> *Id.* at 1654.

<sup>536</sup> *Id.*

<sup>537</sup> *Id.* at 1655.

<sup>538</sup> *Id.*

<sup>539</sup> *Id.*

<sup>540</sup> *Id.* at 1656.

<sup>541</sup> See *id.*

<sup>542</sup> See *id.*

<sup>543</sup> *Id.*

also enables the other aircraft pilots to meet their corresponding duties to see and avoid the pilot's aircraft. In *Administrator v. Richey*, the NTSB Board addressed the consequences of failing to meet this responsibility.<sup>544</sup> A general aviation (GA) pilot operating under VFR had a near collision with an Air Force T-38 jet operating under IFR.<sup>545</sup> The GA pilot was found in violation of Section 91.105(a) (now Section 91.155(a)), in that he failed to maintain a five hundred feet vertical clearance below clouds.<sup>546</sup> Pursuant to Section 91.113(b), even when an IFR aircraft encounters VMC conditions, the duty to see and avoid attaches to that pilot; respondent's operation too close to the cloud base prevented detection by the jet.<sup>547</sup> The court stated "[i]t is imperative, however, that VFR aircraft, when transiting controlled airspace, maintain the separation from clouds prescribed by [Section 91.115]. It was respondent's failure to remain at least 500 feet below the cloud deck which led to the near collision, since respondent's aircraft was not in a position from which it could see, and be seen by, other aircraft such as the T-38."<sup>548</sup> In addition to facilitating a pilot's responsibility to see other aircraft, complying with weather minimums also facilitates the other pilot's duty to see and avoid opposing aircraft.<sup>549</sup> The relevant sections of the Aeronautical Information Manual are set out in Appendix C.

G. 14 C.F.R. § 91.185 IFR OPERATIONS: TWO-WAY RADIO COMMUNICATIONS FAILURE.

Section 91.183 requires that, "[u]nless otherwise authorized by ATC, the *pilot in command* of each aircraft operated under IFR in controlled airspace must ensure that a continuous watch is maintained on the appropriate frequency. . . ."<sup>550</sup> Section 91.185 establishes the course of action required of the pilot if communications are lost between the pilot and ATC while operating on an IFR flight plan.<sup>551</sup>

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<sup>544</sup> See generally *Adm'r v. Richey*, 2 N.T.S.B. 734 (1974).

<sup>545</sup> *Id.* at 737.

<sup>546</sup> *Id.* at 741 (finding Richey was no more than 300 feet below the clouds).

<sup>547</sup> *Id.* at 736-37.

<sup>548</sup> *Id.* at 735.

<sup>549</sup> *Id.* at 736-37.

<sup>550</sup> 14 C.F.R. § 91.183 (2014) (emphasis added).

<sup>551</sup> See generally *id.* § 91.185. Section 91.185 addresses communication between the pilot and ATC. We found cases or other references regarding this regulation relating to a loss of flight control communication between a pilot in a "ground cockpit" and a remotely piloted aircraft. Assuming the pilot on the ground can

Section 91.185 is set out in its entirety in Appendix B. The primary requirement under the regulation is that, if the communications failure occurred in visual conditions or visual conditions are encountered after the failure, the pilot must remain VFR and land as soon as practicable.<sup>552</sup> This requires the pilot to maintain his own separation using the see and be seen rules in VFR conditions.

If visual conditions do not exist, then Section 91.185 provides that the pilot comply with specific rules regarding routing, altitude and clearance limits.<sup>553</sup> Since pilots are required to obey the aviation regulations, ATC will be able to predict the pilot's course of action during periods of "lost communication." Any exception to following the specified routes, altitudes and times must be based upon an emergency requiring "immediate" action.<sup>554</sup>

Relevant provisions of the AIM are set out in Appendix C.

#### IV. REGULATIONS FACILITATING "SEE AND AVOID" RESPONSIBILITY

##### A. 14 C.F.R. § 91.105 FLIGHT CREWMEMBERS AT STATIONS

###### 1. *Introduction*

The majority of this regulation is directed at the use of seat belts and shoulder harnesses. However, Section 91.105(a)(1) requires that crewmember be at his or her station, unless absence

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still communicate with ATC by radio or telephone, the situation is analogous to a manned aircraft pilot maintaining communication with ATC while the fly-by-wire digital flight control system fails, leaving the pilot without control of his own aircraft. While this would likely cause an emergency if the airplane were completely out of control, since there has been no loss of communication between the pilot and ATC (which is the subject of the regulation), section 91.185 does not apply. However, if the control link is severed and the aircraft reverts to automatic operation (the "automatic pilot" takes over), the de facto automatic "pilot" is not communicating with ATC or the human pilot, but neither is the aircraft out of control or in immediate danger. In such situations, it is likely that section 91.185 would apply, as the objective of the regulation is to supply ATC with predictability in the event of lost communications so that the appropriate airspace may be cleared and midair collisions prevented. Accordingly, the "automatic pilot" assumes the same duty of compliance (for routing, altitudes and times) with section 91.185 as the human pilot, unless a certificate of waiver or authorization (COA) specifies differently. In other words, the "lost communications" addressed by section 91.185 and "loss of control link" which may be encountered by an unmanned aircraft are different.

<sup>552</sup> See generally *id.*

<sup>553</sup> See *id.*

<sup>554</sup> See AIM, *supra* note 15, at 6-6-1(a)-(c).



is necessary. As we shall see, this requirement was put in place to ensure that the pilot is at his or her seat and “vigilant” to the greatest extent possible. The duty to be vigilant is the cornerstone of the see and avoid concept. Section 91.105 is set out in Appendix B.

## 2. Discussion

Section 91.105(a)(1) had its origin in 1959,<sup>555</sup> and under Civil Aviation Regulations read as follows:

Section 60.26 Flight Crew Members at Controls

All required flight crew members when on flight deck duty shall remain at their respective stations while the aircraft is taking off or landing, and while en route except when the absence of one such flight crew member is necessary for the performance of his duties in connection with the operation of the aircraft. All flight crew members shall keep their seat belts fastened when at their respective stations.<sup>556</sup>

This provision had previously been in place for air carrier operations.<sup>557</sup> Importantly, the rationale for this requirement was “[t]he absence of a flight crew member from his duty station for the performance of such activities reduces unnecessarily the *degree of vigilance*, attention to duty, and availability for emergency action . . . under conditions of high density traffic.”<sup>558</sup> Section 60.26 extended the reach to include all aircraft operations, civil and military (public aircraft).<sup>559</sup> Constant vigilance was deemed important for all aircraft operations.<sup>560</sup> This rulemaking narrative clarified what was intended by the exception for leaving one’s station, that is when it is necessary for the “performance of his duties in connection with the operation of the aircraft.”<sup>561</sup> This exception was “not intended to encompass activities related to furthering public relations or other activities not related to operational safety of the airplane.”<sup>562</sup>

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<sup>555</sup> See *Absence of Flight Crew Members from Their Duty Stations and Right of Way*, 24 Fed. Reg. 3153, 3155 (1959).

<sup>556</sup> 14 CIVIL AVIATION REGULATIONS § 60.26 (1962).

<sup>557</sup> See *Absence of Flight Crew Members from Their Duty Stations and Right of Way*, 24 Fed. Reg. at 3155.

<sup>558</sup> *Id.* at 3154 (emphasis added).

<sup>559</sup> See *id.* at 3155.

<sup>560</sup> See *id.* at 3154.

<sup>561</sup> See *id.*

<sup>562</sup> *Id.*

This regulation remained in place until 1965.<sup>563</sup> At that time the FAA acknowledged that there were some misunderstandings in the aviation community as to what was an acceptable reason for a crewmember's absence from his duty station.<sup>564</sup> The Agency reaffirmed that a crewmember's comfort and physical alertness was also necessary.<sup>565</sup> To clear up any confusion, the phrase “or in connection with his physiological needs” was added to this provision.<sup>566</sup>

How long may one crewmember be absent? In her memorandum, the Assistant Chief Counsel for Regulations (AGC-200) responded to this question, as well as the issue of sleeping during an unaugmented controlled rest period.<sup>567</sup> In its response, the FAA stated there were only two instances that a crewmember could leave his station. First, to perform duties in connection with the operation of the aircraft. Second, in connection with physiological needs.<sup>568</sup> Sleep is not considered in connection with operation of the aircraft, and therefore not a permitted reason for absence under the regulation.<sup>569</sup> Regarding physiological needs, the memo stated “the ‘physiological needs’ exception has been interpreted narrowly to only permit short breaks for activities such as using the restroom or stretching one's limbs briefly during a long flight.”<sup>570</sup>

A crewmember's time away from his or her station must also be reasonable. In *Administrator v. Brown*, the NTSB Board found that a first officer's absence of twenty to thirty minutes on three occasions was unreasonable and substantially in excess of what was required to satisfy any physiological needs (i.e., use the restroom).<sup>571</sup> In summary, crewmembers are expected to be at their stations and vigilant, and any absence must be necessary and as

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<sup>563</sup> See Presence of Crewmembers at Duty Stations, 30 Fed. Reg. 13120 (1965).

<sup>564</sup> See *id.*

<sup>565</sup> See *id.*

<sup>566</sup> *Id.*

<sup>567</sup> FED. AVIATION ADMIN., OPINION OF THE ASSISTANT CHIEF COUNSEL FOR REGULATIONS, AGC-200 (Jan. 20, 2012), available at [www.faa.gov/about/office\\_org/headquarters\\_offices/agc/pol\\_adjudication/agc200/interpretations/data/interps/2012/cintron-afs-800%20-%20\(2012\)%20legal%20interpretation.pdf](http://www.faa.gov/about/office_org/headquarters_offices/agc/pol_adjudication/agc200/interpretations/data/interps/2012/cintron-afs-800%20-%20(2012)%20legal%20interpretation.pdf) (Interpretation as to whether Part 91 allows a required pilot to take an in-flight rest period on an unaugmented flight as an augmented flight, would have a qualified crewmember replaced by another qualified crewmember at the crewmember station).

<sup>568</sup> See *id.*

<sup>569</sup> See *id.*

<sup>570</sup> *Id.*

<sup>571</sup> See generally *Adm'r v. Brown*, 1 N.T.S.B. 2041 (1972).

brief as possible, only long enough to perform duties in connection with the operation of the aircraft or to meet physiological needs.<sup>572</sup>

## B. 14 C.F.R. § 91.117 AIRCRAFT SPEED

### 1. Introduction

14 C.F.R. § 91.117 establishes maximum airspeed restrictions for aircraft operating at certain altitudes and within designated airspace classes. It also provides for authorizing exceptions through the Administrator or ATC. The current regulation is set forth in Appendix B.

### 2. History of Section 91.117

At the time of the passage of the Civil Aeronautics Act of 1938,<sup>573</sup> the 1938 air traffic rules contained no restrictions on airspeeds.<sup>574</sup> By 1947, it appears that aircraft speed had increased significantly and the CAB went out to the aviation community seeking comments on several issues, including airspeeds, for future regulatory action.<sup>575</sup> Providing some background, this document noted that in years prior to 1947 aircraft speeds were from seventy to 150 mph.<sup>576</sup> However, by the time of the draft release, aircraft speeds of 450 mph were possible and at that speed they required:

[A]t least six times as much visibility in order to see and avoid other traffic with an equal degree of safety. . . . Furthermore, our present proximity-to-cloud rules should be reconsidered with view toward a more practicable "see and be seen" rule which would place the responsibility on each pilot to give due regard to the speed at which he is flying and to remain a sufficient distance from any cloud or cloud formation to enable him to observe other air traffic in time to avoid any hazard of collision.<sup>577</sup>

This document clearly acknowledges a relationship between visibility, cloud clearances and speed in facilitating the see and avoid rule. It appears that the issue of speed was to be handled by each pilot and not rulemaking.

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<sup>572</sup> See *id.* at 2042-44.

<sup>573</sup> Civil Aeronautics Act of 1938, Pub. L. 75-706, 52 Stat. 973 (1938).

<sup>574</sup> See generally *id.*

<sup>575</sup> CIVIL AIR REGULATIONS DRAFT RELEASE NO. 46-5, *supra* note 126, pt. 18.

<sup>576</sup> See *id.*

<sup>577</sup> *Id.*

In 1957, the Civil Aeronautics Board adopted aircraft speed limits for the first time.<sup>578</sup> This rule was directed at “high density air traffic zones,” and is set out in Appendix B.

By 1963, the new Federal Aviation Agency had recodified the regulations so that speed restrictions were now contained in the new Part 91, and their reach was extended to below 10,000 feet and within thirty miles of an airport.<sup>579</sup> The specific language of the resulting provision was:

§ 91.75 Operating on or in the Vicinity of an Airport; General Rules.

(c) Speed. No person may operate—

- (1) An arriving aircraft below 10,000 feet MSL within 30 nautical miles of an airport of intended landing (or an airport where a simulated approach is to be made) at an indicated airspeed of more than 250 knots (288 mph); or
- (2) Unless otherwise authorized or required by ATC, any aircraft within an airport traffic area at an indicated airspeed of more than—
  - (i) In the case of a reciprocating engine aircraft, 156 knots (180 mph);
  - (ii) In the case of a turbine-powered aircraft, 200 knots (230 mph).

However, if the minimum airspeed required by the operating limitations of an aircraft or by military normal operating procedures is greater than the maximum speed prescribed in this paragraph, the aircraft may be operated at the minimum airspeed.<sup>580</sup>

In 1968, the new FAA considered the issue of speed. While acknowledging that developing technology might also enhance safety, the FAA was not ready to wait for this future development.<sup>581</sup> The 250-knot IAS was applied to all aircraft below ten thousand feet.<sup>582</sup> Other speed restrictions were set for operations within airport traffic areas.<sup>583</sup>

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<sup>578</sup> 14 C.F.R. § 60.18 (1960).

<sup>579</sup> See Proposed Recodification of Air Traffic and General Operating Rules, 28 Fed. Reg. 1004 (1963).

<sup>580</sup> *Id.*

<sup>581</sup> See Aircraft Speed, 32 Fed. Reg. 12274 (1968).

<sup>582</sup> See *id.*

<sup>583</sup> See *id.*

By 1993, Section 91.117 as we know it today, was in place and reflected the newly established airspace designations (i.e., class A, B, C, etc.).<sup>584</sup>

### 3. *Analysis of Section 91.117*

The authors have found little formal discussion to indicate that airspeed limits were being considered or proposed. The 1946 Civil Air Regulations Draft Release No. 46-5, discussed above, did acknowledge that aircraft speeds were becoming a concern. Speed, coupled with visibility and proximity-to-cloud rules, all factored into the "see and avoid" rule. It did not propose a regulatory change, but did place responsibility on the pilot to give due regard to airspeed.

The first speed restrictions were put in place at designated "high density air traffic zones."<sup>585</sup> The rationale for this was "to facilitate movement of traffic in the zone under VFR conditions in a safer and more efficient manner."<sup>586</sup> In its 1968 NPRM, the FAA substantiated the rationale behind the 250-knot limitation below 10,000 feet:

Where flight operations are permitted on a see and avoid basis in congested airspace, and in visibility as low as 3 miles, airspeeds must be limited if an acceptable standard of safety is to be maintained. It is therefore proposed to establish 250 knots as the maximum permissible indicated airspeed for all aircraft operating below 10,000 feet MSL.<sup>587</sup>

Then-recent studies were used to show that a pilot would not see another aircraft on a collision course before the aircraft were within two miles of one another.<sup>588</sup> Further, studies found that upon sighting the other aircraft, a pilot requires ten seconds to determine if a collision is imminent and to take evasive action.<sup>589</sup> With both aircraft at the 250-knot speed, seeing an aircraft at two miles provides a window of only twelve seconds or less.<sup>590</sup> This is not the first time the see and avoid concept was aligned with the "10 second" rule; in addition to the Administrator authorizing a deviation, the 1968 rule permitted aircraft unable to meet the 250-knot standard to operate at their minimum

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<sup>584</sup> See generally Airspace Reclassification, 58 Fed. Reg. 43553 (1993).

<sup>585</sup> See 14 C.F.R. § 60.18 (1960).

<sup>586</sup> Air Traffic Rules, 22 Fed. Reg. 814 (9157).

<sup>587</sup> Aircraft Speed, 32 Fed. Reg. 12274, 12725 (1968).

<sup>588</sup> *Id.*

<sup>589</sup> *Id.*

<sup>590</sup> *Id.*

safe airspeed, if that airspeed was above the regulation’s maximum.<sup>591</sup> One can see that flight altitude and airspace class are controlling, not the type of flight plan being flown.

a. Authorized Deviations

Under Section 91.117(a) and (b), deviations may be permitted. Under Section 91.117(a), permission to deviate for operations below ten thousand feet must come from the “administrator.”<sup>592</sup> This has been interpreted to mean “only the Administrator [of the FAA], or any person to whom he has delegated his authority for this matter, may issue a deviation from the speed requirement. . . . The authority to authorize such deviation is delegated the Flight Standards Service.”<sup>593</sup> However, for U.S. registered aircraft operating outside the territorial boundaries of the United States, Section 91.703(a)(3) precludes application of the speed restriction contained in Section 91.117(a), even if the aircraft is operating in airspace that is under U.S. control.<sup>594</sup>

Under Section 91.117(b), ATC may authorize deviations from the two hundred knot limitation.<sup>595</sup> Any authorized ATC deviation may not exceed the 250 knot limit below ten thousand feet.<sup>596</sup> Deviations to speeds greater than 250 knots would require the Administrator’s approval, pursuant to Section 91.117(a).<sup>597</sup> The relevant portions of the Aeronautical Information Manual and relevant FAA orders can be found in Appendix C.

C. 14 C.F.R. § 91.181 COURSE TO BE FLOWN

The full text of 14 C.F.R. § 91.181 is set out in Appendix B. This regulation clearly requires flight on an airway to be on the centerline of the airway and flight on other assigned routes to

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<sup>591</sup> 14 C.F.R. § 91.70 (1968).

<sup>592</sup> 14 C.F.R. § 91.117(a).

<sup>593</sup> FED. AVIATION ADMIN., OPINION OF THE ASSISTANT CHIEF COUNSEL FOR REGULATIONS, AGC-200 (Feb. 25, 2011), *available at* [http://www.faa.gov/about/office\\_org/headquarters\\_offices/agc/pol\\_adjudication/agc200/interpretations/data/interps/2011/bonilla%20-%20\(2011\)%20legal%20interpretation.pdf](http://www.faa.gov/about/office_org/headquarters_offices/agc/pol_adjudication/agc200/interpretations/data/interps/2011/bonilla%20-%20(2011)%20legal%20interpretation.pdf).

<sup>594</sup> FED. AVIATION ADMIN., OPINION OF THE ASSISTANT CHIEF COUNSEL FOR REGULATIONS, AGC-200 (July 10, 2008), *available at* [http://www.faa.gov/about/office\\_org/headquarters\\_offices/agc/pol\\_adjudication/agc200/interpretations/data/interps/2008/davis-afs-201%20-%20\(2008\)%20legal%20interpretation.pdf](http://www.faa.gov/about/office_org/headquarters_offices/agc/pol_adjudication/agc200/interpretations/data/interps/2008/davis-afs-201%20-%20(2008)%20legal%20interpretation.pdf).

<sup>595</sup> *See* 14 C.F.R. § 91.117(b).

<sup>596</sup> *See id.*

<sup>597</sup> *See id.*

be on a "direct" course.<sup>598</sup> However, the second sentence of paragraph (b) seems to indicate that "see and avoid" maneuvering is allowable only while on direct routes.<sup>599</sup> If the regulation is interpreted in this manner, however, it directly conflicts with Section 91.113, which requires *all* aircraft in visual conditions (including those on IFR flight plans) to comply with the right-of-way rules and to maneuver as necessary in order to see and avoid potential conflicting traffic.<sup>600</sup>

The source of the ambiguity in Section 91.181 apparently stems from a 1989 amendment of the general operating and flight rules which was supposed to make the regulations, "more understandable and easier to use."<sup>601</sup> No substantive changes were made to Section 181, but the section was condensed and renumbered.<sup>602</sup> The pre-amendment section (numbered as 91.123) was as follows:

§ 91.123 Course to be Flown.

Unless otherwise authorized by ATC, no person may operate an aircraft within controlled airspace, under IFR, except as follows:

- (a) On a Federal airway, along the centerline of that airway.
- (b) On any other route, along the direct course between the navigational aids or fixes defining that route.

However, this section does not prohibit maneuvering the aircraft to pass well clear of other air traffic or the maneuvering of the aircraft, in VFR conditions to clear the intended flight path both before and during climb or descent.<sup>603</sup>

Note that the last sentence of the pre-amendment regulation is a stand-alone paragraph which refers to the previous paragraph that contains both subparagraphs (a) and (b).<sup>604</sup> Further, this final paragraph (allowing collision avoidance maneuvering in visual conditions) uses the term "section" which indicates that the entire section (meaning Section 91.123) is subject to its terms.<sup>605</sup>

The 1989 amendment simply condensed the last paragraph into subparagraph (b), thereby causing possible confusion as to

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<sup>598</sup> See *id.*

<sup>599</sup> See *id.*

<sup>600</sup> See *id.* § 91.113.

<sup>601</sup> Final Rule, 54 Fed. Reg. 34284 (Aug. 18, 1989) (effective Aug. 16, 1990). There were substantive changes as well, but section 181 was not one of them.

<sup>602</sup> *Id.*

<sup>603</sup> 14 C.F.R. § 91.123 (1988).

<sup>604</sup> See *id.*

<sup>605</sup> See *id.*

its applicability to subparagraph (a) as well.<sup>606</sup> However, the word “section” is still used in the current regulation (91.181), indicating that the sentence applies to the whole section, regardless of the fact that it currently resides only under subparagraph (b).<sup>607</sup> It would seem that the 1989 amendment was not in accordance with generally accepted standards of statutory construction, especially since the goal of the amendment was simplification and not substantive change.

Relevant portions of the AIM can be found in Appendix C.

#### D. 14 C.F.R. § 91.209 AIRCRAFT LIGHTS

##### 1. Introduction

14 C.F.R. § 91.209(a) prohibits the operation of aircraft from sunset to sunrise (with special criteria for the State of Alaska) unless position lights are lighted.<sup>608</sup> Section 91.209(b) provides that aircraft equipped with an anti-collision light system, must have that light on at all times, unless, the PIC determines that safety interests require that it be turned off.<sup>609</sup> The current regulation is set forth in Appendix B.

##### 2. History of Section 91.209

Aircraft position lights, their location, and color has its origins in maritime law.<sup>610</sup> The first regulations of 1927 provided for the location and intensity of position lights and landing lights under its Air Traffic Rules; these rules can be found in Appendix B. Interestingly, the lighting requirements were contained in the air traffic rules, which are the responsibility of the aircraft operator, or pilot.<sup>611</sup> At that time, therefore, the responsibility for lighting was with the operator, not the manufacturer. This may reflect that early lighting was an “after market” consideration.

By 1938, the lighting requirement had shifted to the aircraft manufacturer; Section 04 of the regulations outlines the requirements for airworthiness, including lighting, and Section 15 outlines the minimum requirements for equipment that is to

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<sup>606</sup> See *id.* § 91.183.

<sup>607</sup> See *id.*

<sup>608</sup> 14 C.F.R. § 91.209 (2013).

<sup>609</sup> *Id.*

<sup>610</sup> See generally 33 C.F.R. § 83.21 (2012).

<sup>611</sup> See AIR COMMERCE REGULATIONS, *supra* note 236, §§ 30, 76.



meet Section 04.<sup>612</sup> Also in this version, the light intensity standard had changed from a measure of visibility miles to “candlepower.”<sup>613</sup>

Jumping forward to 1963, the lighting systems in place were contained in the FARs and were recodified under the current Part 91.<sup>614</sup> The new Section 91.33 required for VFR night operations that the aircraft have both position lights and anticollision lights for large aircraft or other aircraft if required by its airworthiness certificate.<sup>615</sup> The new Section 91.73 required that the position lights be on during periods of darkness.<sup>616</sup> It did not, however, contain a similar requirement that the anticollision lights be on.<sup>617</sup> Correcting this discrepancy in 1976, the FAA proposed an addition to Section 91.73, which would require that an installed anticollision light would also need to be lighted.<sup>618</sup> The final rule was adopted in 1978, and added subsection (b), which requires lighted anticollision lights, unless the PIC finds it in the best interest of safety to turn it off.<sup>619</sup> In adopting this rule change, the FAA acknowledged the use of strobe lights as an anticollision light.<sup>620</sup>

In 1989, the recodification of Part 91, Section 91.73 became the new Section 91.209 as we know it today.<sup>621</sup>

### 3. Summary of Section 91.209

Throughout the history of this regulation, we find that the responsibility to see and avoid at night relies heavily on aircraft lighting. At the outset, in 1928 it was felt the lighting of the left and right positions lights must be sufficient to be seen at least two miles. The white rear position light needed to be seen at three miles. The range of visibility conforms to VFR visibility requirement of three miles discussed in Section 91.155.<sup>622</sup> The two to three mile standard also correlates with the “10 second rule”

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<sup>612</sup> AERONAUTICS BRANCH, U.S. DEP'T OF COMMERCE, AIR COMMERCE REGULATIONS (1938).

<sup>613</sup> See *id.* at 15.204.

<sup>614</sup> See generally Air Traffic and General Operating Rules, 28 Fed. Reg. 6702, 6706, 6708 (1963).

<sup>615</sup> See *id.*

<sup>616</sup> See *id.*

<sup>617</sup> See *id.*

<sup>618</sup> Operations Review Program, 41 Fed. Reg. 56280, 56283 (1976).

<sup>619</sup> Operations Review Program, 43 Fed. Reg. 22636, 22640 (1978).

<sup>620</sup> *Id.* at 22637.

<sup>621</sup> 54 Fed. Reg. 34282, 34306 (1989).

<sup>622</sup> See 14 C.F.R. § 91.155 (2014).

previously discussed in Section II.B.<sup>623</sup> Section 91.209 ensures that the distance established to see and avoid during day VFR operations is also preserved while operating at night.<sup>624</sup>

While use of the anticollision light contains an exception if the PIC deems its use a safety problem, use of the position lights cannot be waived by the PIC. As stated by the ALJ in *Administrator v. Simonye*, “[Section 91.209] specifies, *without exception*, that no person may, during the period from sunset to sunrise, operate an aircraft unless it has lighted position lights.”<sup>625</sup> Stressing the seriousness of lighting, the ALJ found a violation in this case even though the balloon operated without lighted position lights for only fifteen minutes after official sunset.<sup>626</sup>

Section 91.209(b) was added in 1996 and requires that all aircraft equipped with anticollision lights, “to operate those lights during all operations, including daytime VFR.”<sup>627</sup> Section 91.209(a), in contrast, carries on the long established requirement that the use of position lights be demanded only between sunset and sunrise.<sup>628</sup>

Relevant FAA Circulars are set out in Appendix C.

## V. REGULATIONS PROVIDING FOR USAGE OF ENHANCED SYSTEMS

A third objective of this research was to identify how systems have been used to supplement or replace previously identified “See and Avoid” responsibilities. The authors identified two sections that met this requirement in our review of 14 C.F.R. Part 91.

First, 14 C.F.R. § 91.221 requires that all aircraft equipped with a Traffic Alert and Collision Avoidance System (TCAS) shall have that system on and operating.<sup>629</sup> TCAS I, II and III utilize interrogations and replies from airborne transponders.<sup>630</sup> TCAS I provides traffic advisories to the pilot.<sup>631</sup> TCAS II pro-

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<sup>623</sup> See *infra* Part II.B.

<sup>624</sup> See 14 C.F.R. § 91.209.

<sup>625</sup> *Adm’r v. Simonye*, 4 N.T.S.B. 159 (1982) (ALJ’s original decision) (re-manded on unrelated issue).

<sup>626</sup> See *id.* at 165.

<sup>627</sup> Airworthiness Standards, Systems and Equipment Rules Based on European Joint Aviation Requirements, 61 Fed. Reg. 5151, 5164 (1996).

<sup>628</sup> See 14 C.F.R. § 91.209(a).

<sup>629</sup> See *id.* § 91.221.

<sup>630</sup> See James V. Kucher & Ann C. Drumm, *The Traffic Alert and Collision Avoidance System*, 16 LINCOLN LABORATORY J. 277, 279–80 (2007).

<sup>631</sup> See *id.* at 281.

vides traffic advisories and resolution advisories (RA) in the vertical plane.<sup>632</sup> TCAS III provides traffic advisories and RAs to the pilot in the vertical and horizontal planes.<sup>633</sup> Under Part 91, the pilot is authorized to deviate in response to a TCAS RA.<sup>634</sup>

The second system providing supplemental and enhanced "see and avoid" is ADS-B, and 14 C.F.R. § 91.225 defines the implementation of this system.<sup>635</sup> This technology does not require ground based radar interrogations; rather, it relies on onboard equipment to provide surveillance information to ATC and eventually other airborne users.<sup>636</sup> After January 1, 2020, all aircraft (with limited exceptions) will be required to have this technology installed.<sup>637</sup> The following discussions elaborate on these technologies.

#### A. 14 C.F.R. § 91.221 TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM EQUIPMENT AND USE

##### 1. *Introduction*

Section 91.221 requires that aircraft with traffic alert and collision avoidance systems (TCAS) installed will utilize approved equipment and that equipment be on and operating.<sup>638</sup> Part 91 does not require installation, however, Part 121, 135, 125, and 129 operations mandate use of TCAS for certain passenger configurations.<sup>639</sup> Section 91.221 is set out in Appendix B.

##### 2. *Statutory and Regulatory Background*

Interest in collision avoidance systems began in 1955 with the ATA and aviation industry proposing a back up system to the FAA's ground based radar for enhanced separation in areas where surveillance coverage was lacking.<sup>640</sup> In the 1970s these

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<sup>632</sup> *Id.*

<sup>633</sup> *Id.*

<sup>634</sup> See 14 C.F.R. § 91.123.

<sup>635</sup> See generally *id.* § 91.225.

<sup>636</sup> *Fact Sheet – Automatic Responder Surveillance-Broadcast (ADS-B)*, FAA.gov, [www.faa.gov/news/fact\\_sheets/news\\_story.cfm?newsid=7131](http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=7131) (last visited Oct. 1, 2014).

<sup>637</sup> See 14 C.F.R. § 91.225.

<sup>638</sup> See *id.* § 91.221.

<sup>639</sup> These regulatory provisions and their full citations are shown in Appendix B.

<sup>640</sup> Traffic Alert and Collision Avoidance System, 52 Fed. Reg. 32268 (1987).

efforts centered on using signals from aircraft transponders as the basis for collision avoidance systems.<sup>641</sup>

On December 30, 1987, the Airport and Airway Safety and Capacity Expansion Act of 1987 became law.<sup>642</sup> Section 203 of that act required that the Administrator complete development of TCAS systems, and within eighteen months develop and certify TCAS II systems, and within thirty months of that certification, have regulations in place to require its use on civil aircraft with seating capacity of more than thirty seats.<sup>643</sup>

Following this act, the FAA published an NPRM to propose regulatory changes to require TCAS I or II on aircraft operating under Parts 121, 125, 135, and 129 of the FARs, and proposing implementation within three to five years of the final rule.<sup>644</sup> Comments from the industry were encouraged.<sup>645</sup> On January 10, 1989, the FAA published the final rule requiring the installation and use of TCAS.<sup>646</sup> This rule adopted the following schedule of compliance:<sup>647</sup>

**FIGURE 3: TCAS FINAL RULE COMPLIANCE SCHEDULE**

14 CFR part	Applicability	Equipment	Compliance
91	All	TCAS	Voluntary
121	Large airplanes	TCAS II/Mode S	2 years after effective date
125	do	do	3 years after effective date
129	Turbine powered airplanes/10 to 19 passenger seats	TCAS I	3 years after effective date
	Turbine powered/20 to 30 seats	TCAS II/Mode S	4 years after effective date
135	Turbine powered/30 seats or more	TCAS II/Mode S	3 years after effective date
	Turbine powered/10 to 19 seats	TCAS I	3 years after effective date
	Turbine powered/20 seats or more	TCAS II/Mode S	4 years after effective date

As shown, air carriers are required to have TCAS I or II depending on seating capacity.<sup>648</sup> In contrast Part 91 operators were not required to install TCAS; installation for Part 91 operators was, and continues to be, voluntary.<sup>649</sup> Section 91.221 does require that on all TCAS-equipped U.S. registered civil aircraft, whether TCAS is installed by regulation or voluntary, it must be

<sup>641</sup> *Id.*

<sup>642</sup> *See generally* Airport and Airway Safety and Capacity Expansion Act of 1987, Pub. L. No. 100-223, 101 Stat. 794 (1987).

<sup>643</sup> *See id.*

<sup>644</sup> Traffic Alert and Collision Avoidance System, 52 Fed. Reg. 32268, 32276 (1987).

<sup>645</sup> *See id.*

<sup>646</sup> *See generally* Traffic Alert and Collision Avoidance System, 54 Fed. Reg. 940 (1989).

<sup>647</sup> *Id.*

<sup>648</sup> *Id.*

<sup>649</sup> *Id.*

turned on and operating.<sup>650</sup> For 121, 125, and 129, passenger operation compliance was directed to be by December 30, 1991.<sup>651</sup> Part 135 had until February 9, 1995.<sup>652</sup>

Implementation did not go as anticipated, and in 1994, the FAA acknowledged that development and testing, equipment complexity, and supplemental type certification of TCAS I justified extending the compliance date for Part 121, 129, and 135 passenger operators to December 31, 1995.<sup>653</sup>

In 2003, responding to the Wendell H. Ford Aviation Investment and Reform Act (AIR-21),<sup>654</sup> the FAA required that all cargo aircraft of a certain weight also be equipped with TCAS.<sup>655</sup> In addition, this final rule also established the compliance dates currently contained in the FARs for 121, 125, and 129 operators contained in Appendix B.<sup>656</sup>

### 3. *Analysis of Section 91.221*

Today, operations under Part 91 do not require the installation of TCAS equipment. However, for those Part 91 operators who chose to voluntarily install this equipment, and for all air and cargo carriers who are required to have this equipment, TCAS must be on and operating. In addition to Section 91.221, TCAS is covered by Section 91.123(a), which provides that no PIC may deviate from an ATC clearance, except if amended clearance is obtained, if there is an emergency, or *the deviation is in response to a TCAS resolution advisory (RA)*.<sup>657</sup>

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<sup>650</sup> 14 C.F.R. § 90.221 (2014).

<sup>651</sup> Traffic Alert and Collision Avoidance System, 54 Fed. Reg. 940, 950–51 (1989).

<sup>652</sup> *Id.*

<sup>653</sup> Alert and Collision Avoidance Systems, 59 Fed. Reg. 67584 (1994).

<sup>654</sup> See generally Wendell H. Ford Aviation Investment and Reform Act (AIR-21), Pub. L. No. 106-181, 114 Stat. 61 (2003).

<sup>655</sup> Collision Avoidance Systems, 68 Fed. Reg. 15884, 15884 (2003).

<sup>656</sup> *Id.* at 15902–03.

<sup>657</sup> 14 C.F.R. § 91.123(a) (2014):

Compliance with ATC clearances and instructions.

(a) When an ATC clearance has been obtained, no pilot in command may deviate from that clearance unless an amended clearance is obtained, an emergency exists, or the deviation is in response to a traffic alert and collision avoidance system resolution advisory. However, except in Class A airspace, a pilot may cancel an IFR flight plan if the operation is being conducted in VFR weather conditions. When a pilot is uncertain of an ATC clearance, that pilot shall immediately request clarification from ATC.

The authors searched for any judicial interpretation of Section 91.221 but found none. The authors would not anticipate violations of this provision; the regulation requires only that if TCAS is installed that it be on and operational. It is unlikely a PIC would not use this valuable tool if it were available.

In contrast, violations of Section 91.123(a) have occurred. Some of the deviations in those cases were identified by a TCAS warning. For instance, in *Administrator v. Ted Ray Moore*, the captain of a DC-10 wandered off course while lining up for a runway at Los Angeles International Airport.<sup>658</sup> He came close enough to a Boeing 747 that TCAS in both aircraft issued warnings.<sup>659</sup>

In *Brehmer v. FAA*, two air carrier flights were flying at 39,000 feet; one eastbound and the other westbound on the same line.<sup>660</sup> The ATC controller failed to notice they were on a head-on collision course and took no action.<sup>661</sup> One aircraft did ask ATC about the other aircraft heading toward it, but before ATC could respond, TCAS alerted both pilots and each took evasive action.<sup>662</sup> In this case, TCAS averted a serious and possibly fatal incident involving many passengers onboard these flights.<sup>663</sup> The ALJ noted that in the FAA’s supporting comments for removal of the controller, the agency stated “[w]ere it not for the TCAS alert in each aircraft, a tragic accident could have resulted with the loss of hundreds of lives and millions of dollars in property damage.”<sup>664</sup> Consistent with Section 91.123(a), the deviation from ATC clearance was the result of a TCAS RA. Relevant sections of the AIM are set out in Appendix C.

#### 4. FAA Advisory Circulars

Advisory Circular 120-55C contains significant information for air carriers relating to installation, training, and inflight use of TCAS II.<sup>665</sup> It also notes that the information contained in this document is not the only means to address TCAS issues.<sup>666</sup>

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<sup>658</sup> *Adm’r v. Ted Ray Moore*, N.T.S.B. Order No. EA-4992, at \*1 (2002).

<sup>659</sup> *See id.*

<sup>660</sup> *Brehmer v. Fed. Aviation Admin.*, 294 F.3d 1344, 1346–47 (Fed. Cir. 2002) (involving a controller’s appeal of an arbitrator’s decision upholding the controller’s removal).

<sup>661</sup> *Id.* at 1347.

<sup>662</sup> *Id.*

<sup>663</sup> *See id.*

<sup>664</sup> *Id.*

<sup>665</sup> *See generally* FED. AVIATION ADMIN., A.C. 120-55C, WITH CHG. 1, AIR CARRIER OPERATIONAL APPROVAL AND USE OF TCAS II (2013) [hereinafter A.C. 120-55C].

<sup>666</sup> *See id.* at 1.

Advisory Circular 90-48C (1983) emphasizes the “see and avoid” concept and alerts pilots to problem areas relating to human factors issues to enhance scanning to reduce midair collisions.<sup>667</sup> While focused on visual surveillance under Part 91, it is included in this section to reconfirm that the see and avoid concept applies equally to IFR, as well as VFR. Access to onboard TCAS equipment should not negate the need for visual surveillance. AC 90-48C is set out in Appendix C.

### 5. *Implementation of TCAS in the National Airspace System*

The following is a general description of TCAS by the FAA:

The Traffic Alert and Collision Avoidance System (TCAS) is an airborne system developed by the FAA that operates independently from the ground-based Air Traffic Control (ATC) system. TCAS was designed to increase cockpit awareness of proximate aircraft and to serve as a ‘last line of defense’ for the prevention of mid-air collisions.

There are two levels of TCAS systems:

TCAS I was developed to accommodate the general aviation (GA) community and the regional airlines. This system issues ‘Traffic Advisories’ (TAs) to assist pilots in visual acquisition of intruder aircraft. TCAS I is mandated on aircraft with 10 to 30 seats, although TCAS II may be installed instead.

TCAS II is a more sophisticated system which provides the information of TCAS I, and also analyzes the projected flight path of approaching aircraft and issues ‘Resolution Advisories’ (RAs) to the pilot to resolve potential mid-air collisions. TCAS II is required internationally in aircraft with more than 30 seats or weighing more than 15,000 kg.

The TCAS II Minimum Operational Performance Standards (MOPS) were updated and approved by RTCA, Inc. Special Committee 147 and published in document DO-185A in December, 1997 and available through RTCA, Inc. This latest revision to the system is referred to as ‘Version 7’ in the United States. The international community adopted these standards for the Airborne Collision Avoidance System (ACAS) and it is now mandated throughout most of Europe and other countries such as Japan and Australia.<sup>668</sup>

As is typical of any new technology, the implementation of TCAS required extensive training of both pilots and ATC per-

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<sup>667</sup> See generally FED. AVIATION ADMIN., A.C. 90-48C, PILOT’S ROLE IN COLLISION AVOIDANCE (1983).

<sup>668</sup> FED. AVIATION ADMIN., THE TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM (Sept. 2013), available at <http://faa.gov>.

sonnel. In one case the results were tragic, as the role of the pilot's actions in regard to an RA versus contrary controller instructions were apparently poorly defined at the time (at least in some countries).<sup>669</sup> On July 1, 2002, a Russian airliner (TU154M) carrying children on a UNESCO-sponsored vacation to Spain collided with a DHL flight (B757-200) that was enroute from Italy to Brussels.<sup>670</sup> Both aircraft were equipped with TCAS II made by the same manufacturer in the United States.<sup>671</sup> The midair collision occurred over southern Germany, but both aircraft were under Swiss air traffic control.<sup>672</sup> The controller lost separation of the aircraft while his attention was drawn to other duties.<sup>673</sup> The control center systems were undergoing maintenance and several safety features had been rendered inoperative, without the full knowledge and understanding of the controller.<sup>674</sup> Further, the other assigned controller was taking an extended rest break, leaving a single person to control two physically separate radar screens and sectors.<sup>675</sup> Upon realizing the gravity of the separation conflict situation the controller ordered an immediate descent for the Russian airliner, which complied.<sup>676</sup> Shortly thereafter both aircraft received RA's. The DHL was instructed by the TCAS to descend and did so.<sup>677</sup> Cockpit recordings indicate that the Russian aircraft was instructed to climb by the TCAS, but continued to comply with the controller's instructions to descend after some confusion as to what to do.<sup>678</sup> The developing situation had been monitored on radar by German controllers at the Karlsruhe center, who tried to call Zurich (11 times) with a warning, but the direct lines were also out of service for maintenance (without notice to Karlsruhe or other adjoining centers).<sup>679</sup> All aboard both aircraft perished in the collision.<sup>680</sup> Excerpts from the accident report establish the following events in cockpit of the Russian airliner:

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<sup>669</sup> See generally GERMAN FED. BUREAU OF AIRCRAFT ACCIDENTS INVESTIGATION (BFU), REPORT AX001-1-2/02 (May 2004).

<sup>670</sup> See *id.* at 5.

<sup>671</sup> "Reversal RA" feature (CP 112 modification) had been developed but was not installed in either aircraft at the time of the accident. See *id.* at 35.

<sup>672</sup> See *id.* at 35.

<sup>673</sup> See *id.* at 82-85.

<sup>674</sup> See *id.*

<sup>675</sup> See *id.* at 83.

<sup>676</sup> See *id.* at 85.

<sup>677</sup> See *id.* at 100.

<sup>678</sup> See *id.*

<sup>679</sup> See *id.* at 44.

<sup>680</sup> See *id.* at 5.



At 21:34:42 TCAS generated a TA ("traffic, traffic")

Airplane approaching from the left [10 o'clock] had been previously displayed on the TCAS.

21:34:49 Zurich, ". . . descend flight level 350, expedite, I have crossing traffic."

21:34:56 the control column was pushed forward

21:34:56 TCAS generated an RA ("climb, climb")

21:34:59 Copilot [in left rear seat]: "It (TCAS) says climb". The PIC [in front left seat] replied: "He (ATC) is guiding us down."

The copilot's response: "descend?"

21:35:03 Zurich, ". . . descend level 350, expedite descent." "Ya . . . we have traffic at your 2 o'clock [traffic was actually at 10 o'clock] position now at 3-6-0."

PIC asked: "Where is it?"

Copilot answered: "Here on the left side!"

Navigator [center rear seat]: "It is going to pass beneath us!"

21:35:24 TCAS issued an RA "increase climb".

Copilot: "It says climb"!

21:35:27 Five seconds before the collision the control column was pulled back, associated with a minor increase of trust levers setting.

21:35:31 During the last second before collision the control column was pulled back abruptly and the thrust levers were pushed fully forward.

21:35:32 Impact<sup>681</sup>

The BFU Report established the causes of the accident as follows:

The following *immediate* causes have been identified:

- The imminent separation infringement was not noticed by ATC in time. The instruction for the TU154M to descend was given at a time when the prescribed separation to the B757-200 could not be ensured anymore.
- The TU154M crew followed the ATC instruction to descend and continued to do so even after TCAS advised them to climb. This [maneuver] was performed contrary to the generated TCAS RA.

The following *systemic* causes have been identified:

- The integration of ACAS/TCAS II into the system aviation was insufficient and did not correspond in all points with the system philosophy. The regulations concerning ACAS/TCAS published by ICAO and as a result the regulations of

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<sup>681</sup> See *id.* at 8–9. A relative of several of the Russian victims went to Switzerland in 2004 and stabbed the controller to death. See *Father of Air Crash Victims Held Over Stabbing*, THE GUARDIAN (Feb. 27, 2004), [www.theguardian.com/world/2004/feb/27/russia.germany](http://www.theguardian.com/world/2004/feb/27/russia.germany).

national aviation authorities, operational and procedural instructions of the TCAS manufacturer and the operators were not standardized, incomplete and partially contradictory.

- Management and quality assurance of the air navigation service company did not ensure that during the night all open workstations were continuously staffed by controllers.
- Management and quality assurance of the air navigation service company tolerated for years that during times of low traffic flow at night only one controller worked and the other one retired to rest.<sup>682</sup>

The first systemic cause of “insufficient TCAS integration” relied upon the fact that the Russian publications and training left a doubt as to whether the pilot is required to follow RA directions or has the option to override the RA and follow ATC instructions.<sup>683</sup> The TU154M Flight Operations Manual made clear that ATC has the highest priority in the avoidance of collision risks:

For the avoidance of in-flight collisions the visual control of the situation in the airspace by the crew and *the correct execution of all instructions issued by ATC is to be regarded as the most important tool*. TCAS is an additional instrument which ensures the timely determination of oncoming traffic, the classification of the risk and, if necessary, planning of an advice for a vertical avoidance [maneuver].<sup>684</sup>

It was not made clear in the description of the system philosophy that TCAS is exclusively meant as a “last line of defense” and at the RA stage the system philosophy is “follow the RA.”<sup>685</sup> Nor was it made clear that TCAS is *not* part of the conceptual design of ATC and TCAS advisories must be disconnected from instructions given by ATC controllers.<sup>686</sup>

The accident report states in its Analysis Summary:

The TU154M crew had attentively observed the development on the TCAS display showing the conflicting traffic and discussed it internally. When the distance between the airplanes was still approximately 10 NM, the commander of the TU154M visually identified the other airplane. Thus the TA was no surprise for the crew. When they received the instruction of the controller to

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<sup>682</sup> See *id.* at 110.

<sup>683</sup> See *id.*

<sup>684</sup> *Id.* at 53 (emphasis added).

<sup>685</sup> See generally *id.*

<sup>686</sup> See generally *id.*

descend the FL 350 and the explicit information about the conflicting traffic it was clear to them that the controller had also realized the situation and had made a decision to solve the problem.

They followed this instruction very swiftly because they were in a situation of uncertainty, which now could be considered as settled. After TCAS issued an RA to climb the crew stuck to their decision to follow the controller's instruction. The decision to follow the controller's instruction was even confirmed to 'correct' by the repeated instruction to descend and the information of the controller about the other airplane being at FL 360.

The BFU assumes, however, that the TU154M crew would have followed TCAS if the controller had not earlier instructed and avoidance maneuver in the form of a descent. The two avoidance [maneuver] instructions were not discussed by the two pilots, which leads to the conclusion that the decision for the already initiated descent was not questioned. Only the copilot sitting on the rear left but without any assigned function in the cockpit, referred twice to the TCAS and the instruction to climb and thus questioned the descent. But he did not find audience because the PIC had no doubt about the correctness of the controller's instruction.

This decision did not take into consideration that an RA is a vertical avoidance [maneuver] where the airplanes involved get complementary advisories for collision avoidance.

The flight operations regulations of the TU154M operator and ICAO documents do not include clear directives as to which actions the crew should take, if the instructions issued by ATC and an RA contradict each other. They include, however, a clear statement that [maneuvers] contrary to an RA are prohibited.

It is to be assumed that the crew considered the instruction to descend to FL 350 more as a [maneuver] to avoid an imminent collision than normal [maneuvers] to re-establish the prescribed separation. This fits the picture of the swift initiated and carried out descent which was not finished early enough to level off at FL 350.

After the crew initiated descent contrary to the RA, the outcome was left the chance.

The BFU considers the accomplishment of the [maneuver] contrary to the RA to be one of the immediate causal factors having led to the accident. . . .<sup>687</sup>

ACAS/TCAS as actually implemented apparently falls short of its intended purpose.

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<sup>687</sup> *Id.* at 105-06.

## 6. NASA TCAS Study

A 1993 study by the NASA Aviation Safety Reporting System (ASRS) team, provides dramatic results indicating that TCAS has improved safety by helping pilots avoid mid-air collisions with targets they never even saw previous to the traffic conflict.<sup>688</sup> A pilot is not always able to see and avoid every threat at all times. A tool such as TCAS can significantly improve a pilot’s ability to comply with his duty to see and avoid other aircraft.

Comments from the ASRS reports include:

Hazy holiday weekend in Southern California (LA basin). Many, many VFR aircraft in [the] area. My crew alert for traffic. TCAS scope cluttered with traffic. On departure . . . climbing . . . [a] traffic conflict [at] 12:30, 3 miles, 500 to 1,000 feet above [was noted] on TCAS. I hoped to climb (zoom) above it as soon as it was acquired visually. However, it was not acquired visually until after evasive action was taken based on TCAS II RA and ATC traffic advisory. TCAS and ATC saved the day.<sup>689</sup>

The study background is extracted below:<sup>690</sup>

Excerpt 1

### Research Report

## THE BEHAVIORAL IMPACT OF TCAS II ON THE NATIONAL AIR TRAFFIC CONTROL SYSTEM

by

VJ Mellone & SM Frank

### BACKGROUND AND MOTIVATION

During the latter months of 1991 through mid-1992, the ASRS analyst staff were alerted to a significant increase in Traffic Alert and Collision Avoidance System (TCAS II)-related incident reporting. In July, 1992, both the Federal Aviation Administration (FAA) Office of Aviation Safety and the National Transportation Safety Board (NTSB) tasked the ASRS to complete a database analysis of TCAS II incident reports in preparation for a congressional subcommittee hearing on TCAS II issues.

ASRS Quick Response (QR) No. 235, TCAS Incident Reports Analysis was submitted to the FAA and the NTSB on July 29, 1992. During the coding and analysis of a random sampling of 170 reports used in QR 235, the ASRS research team identified evidence of increasing air traffic controller consternation with and resistance to the implementation of TCAS II technology into the national airspace system. There were also strong indications from the data set that the aviation community, government agencies, and industry may have unwittingly underestimated the impact of TCAS II avoidance maneuvers on both the air traffic controller and flight crew constituencies. The ASRS decided to undertake this study to verify or refute the impressions that emerged from QR 235.

<sup>688</sup> See generally Vincent J. Mellone & Stephanie M. Frank, *Behavioral Impact of TCAS II on the National Air Traffic Control System*, NASA.gov, [http://asrs.arc.nasa.gov/docs/rs/47\\_Behavioral\\_Impact\\_of\\_TCASII.pdf](http://asrs.arc.nasa.gov/docs/rs/47_Behavioral_Impact_of_TCASII.pdf) (last visited Nov. 3, 2014).

<sup>689</sup> *TCAS II: Genie Out of the Bottle*, NASA.gov, [http://asrs.arc.nasa.gov/publications/directline/dl4\\_tcas.htm](http://asrs.arc.nasa.gov/publications/directline/dl4_tcas.htm) (last visited Nov. 3, 2014).

<sup>690</sup> Mellone & Frank, *supra* note 688.

Figure 4 of the study shows that of the TCAS related reports collected, 68% of the pilots were never able to visually acquire the intruding aircraft.<sup>691</sup> Accordingly, without TCAS, it is possible that a loss of required separation or even collision would have been the outcome.<sup>692</sup> Even when the target was visually acquired, 21% saw the aircraft only after a TA was issued by TCAS.<sup>693</sup>

FIGURE 4

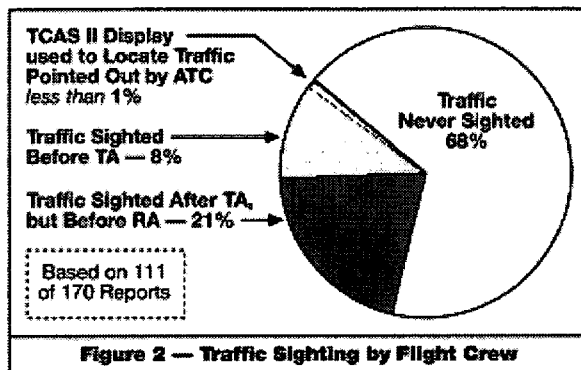
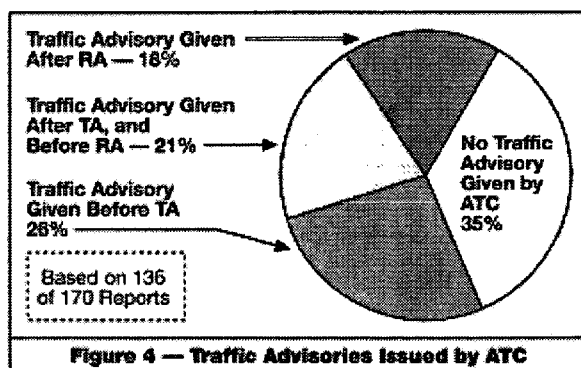


Figure 5 also provides data indicating that in 35% of the incidents controllers did not issue a traffic alert for traffic that triggered an RA in the cockpit.<sup>694</sup> In those situations it was solely the flight crews and TCAS that provided a resolution to the conflict.

FIGURE 5



<sup>691</sup> See *id.*

<sup>692</sup> See *id.*

<sup>693</sup> See *id.*

<sup>694</sup> See *id.*

Table 4, below, documents the comments made by report writers.<sup>695</sup> The comments clearly indicate the majority believe TCAS improves flight safety with regards to collision avoidance.<sup>696</sup> However, the majority of the report authors were pilots, as opposed to air traffic controllers.<sup>697</sup>

<b>Table 4 – TCAS II "Quick Response" Key Findings</b>	
TCAS II Enhanced Safety	876
TCAS II "Saved the Day"	624
TCAS II assisted in Visual Sighting of Intruder Aircraft	527
TCAS II prevented an NMAC (near-mid-air collision)	482
TCAS II Derogated Safety	66
TCAS II Increased Workload	51
TCAS II Prevented an Airborne Conflict/Less Severe	40
TCAS II Caused a Loss of Standard Separation	17
TCAS II Display is Too Cluttered or Distracting	
<b>Total Citations from 170 "QR Reports</b>	<b>2,683</b>

Despite the value of systems such as TCAS, there is always the potential for incorrect use because of improper initial or recurrent training. The following comment shows that sensory enhancing tools can be used improperly:

I was training a developmental [controller] on Arrival Control. We had an air taxi (X) for sequence to visual approach Runway 15. The developmental pointed out aircraft (Y) [to air taxi (X)] and the pilot responded, "Is he following someone out there at 800 feet?" The developmental was going to clear him for the visual approach when I stopped him and asked [the pilot of air taxi (X)] . . . if he had aircraft (Y) in sight. He said not visually, but had him on TCAS II. This seems to be happening more and more . . . It appears [that pilots] . . . are using TCAS II instead of looking out the window. As an air traffic controller I cannot have pilots using TCAS for visual separation to maintain spacing (as on one occurrence a crew offered to do). There is no TCAS II separation.<sup>698</sup>

Advisory Circular AC 120-55C, CHG 1, 3-18-13, provides details and guidance on how operators should implement TCAS training and operational procedures for flight crews including

<sup>695</sup> See *TCAS II: Genie Out of the Bottle*, *supra* note 689.

<sup>696</sup> See *id.*

<sup>697</sup> See *id.*

<sup>698</sup> *Id.*

TCAS operational use. The relevant portions of this circular are set out in Appendix C.

Relevant portions of the Air Traffic Controller's Manual are set out in Appendix C.

B. 14 C.F.R. § 91.225 AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) OUT EQUIPMENT AND USE

1. *Introduction*

Section 91.225 requires that after January 1, 2020, ADS-B meeting specific TSO or Part 21 standards will be required for most operations in Class A, B, C, and E airspace.<sup>699</sup> If the aircraft was not originally, or has not been subsequently certificated with an electrical system, some but not all operations in Class B, C, or E airspace will be authorized.<sup>700</sup> Permission to deviate for non-equipped ADS-B aircraft, or inoperative ADS-B, would have to be obtained through the ATC facility serving the jurisdiction of the flight.<sup>701</sup> ADS-B equipment that has been approved for a deviation pursuant to Section 21.618 are considered in compliance with Section 21.225.<sup>702</sup> In summary, by 2020 all aircraft will be required to have ADS-B installed and functioning for operation in the National Airspace System.<sup>703</sup> Deviations may be requested and aircraft without electrical systems will be given some relief if operating in designated airspace.<sup>704</sup> The regulation is set out in full in Appendix B.

2. *Statutory and Regulatory Background*

On December 12, 2003, the Vision 100—Century of Aviation Reauthorization Act became law.<sup>705</sup> In this act, the Congress made significant findings. First that the total impact of civil aviation on the United States economy exceeded \$900 billion annually and accounted for 11 million jobs.<sup>706</sup> Second, that future growth of air travel will necessitate increased investments in research and development.<sup>707</sup> Accordingly, Section 709 of this act

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<sup>699</sup> See generally 14 C.F.R. § 91.225 (2014).

<sup>700</sup> See *id.*

<sup>701</sup> See *id.*

<sup>702</sup> See *id.*

<sup>703</sup> See *id.*

<sup>704</sup> See *id.*

<sup>705</sup> Vision 100 Century of Aviation Reauthorization Act, Pub. L. 108-176, 117 Stat. 2490 (Dec. 12, 2003).

<sup>706</sup> *Id.* at 2493, § 4.

<sup>707</sup> *Id.* at 2493, § 4.

required the establishment of a "joint planning and development office to manage work related to the Next Generation Air Transportation System," (NextGen).<sup>708</sup> Among other assignments, the NextGen office was to coordinate development of new technologies to maximize their potential in aircraft and in the ATC system.<sup>709</sup> NextGen's goals included taking advantage of ground-based and space-based communications and navigation, and "accommodating a wide range of aircraft operations, including airlines, air taxis, helicopters, general aviation, and unmanned aerial vehicles. . . ." <sup>710</sup>

Subsequent to the passage of this act, the FAA published an NPRM that proposed Automatic Dependent Surveillance – Broadcast (ADS-B) Out equipment be used on aircraft operating in specified classes of airspace in the NAS.<sup>711</sup> The NPRM's rationale was:

The solution to managing the anticipated growth in the use of the NAS is the Next Generation Air Transportation System, or NextGen, which will assure the safe and efficient movement of people and goods as demand increases. NextGen will use technology to allow precise navigation, permit accurate real-time communications, and vastly improve situational awareness. The goal: A system flexible enough to accommodate safely whatever number, type and mix of aircraft there will be in U.S. skies by 2025.<sup>712</sup>

The NPRM stressed that ATC currently relies on radar for aircraft surveillance and separation. While transponders enhanced radar's abilities, ATC still depends on ground-based radar stations.<sup>713</sup> In some areas of the country radar coverage is not feasible, such as mountainous and remote areas.<sup>714</sup> The NPRM went on to suggest that ADS-B will be critical to NextGen, in that "ADS-B is automatic because no external interrogation is required, but is 'dependent' because it relies on onboard position sources and onboard broadcast transmission systems to provide

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<sup>708</sup> *Id.* at 2582, § 709(a)(1).

<sup>709</sup> *Id.* at 2583, § 709(a)(2)(F).

<sup>710</sup> *Id.* at 2584, § 709(c)(2) and (6). Note: This language suggests that the broad range of aircraft, including helicopters and UAS, have equal access to operating in the NAS.

<sup>711</sup> See generally Automatic Dependent Surveillance—Broadcast (ADS-B) Out Performance Requirements to Support Air Traffic Control (ATC) Service, 72 Fed. Reg. 56947 (Oct. 5, 2007).

<sup>712</sup> *Id.* at 56949.

<sup>713</sup> *Id.*

<sup>714</sup> *Id.* at 56950.



surveillance information to ATC and ultimately to other users."<sup>715</sup>

Accordingly, the NPRM proposed that aircraft operations in certain classes of airspace will require the installation and use of ADS-B OUT after January 1, 2020.<sup>716</sup> The airspace designated for ADS-B closely parallels that airspace within which aircraft were required to be equipped with mode C transponders.<sup>717</sup>

Also, similar to regulatory requirement for transponders, under Section 91.225, limited exceptions would be authorized for aircraft that were not originally certificated with an electrical system, or have not been subsequently certificated.<sup>718</sup> Examples given included balloons and gliders.<sup>719</sup> The procedure for non-equipped aircraft to enter designated airspace was proposed to be the same as aircraft not equipped with transponders.<sup>720</sup> The NPRM went on to discuss ADS-B IN technology, stating that operators choosing to voluntarily<sup>721</sup> install this added avionics feature would benefit from increased situational awareness, including while operating on airport surfaces.<sup>722</sup> Enhanced surveillance would therefore be provided for both airborne and surface operations at busy airports.

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<sup>715</sup> *Id.* at 56951.

<sup>716</sup> *See id.* at 56959. ADS-B OUT refers to aircraft appropriately equipped to broadcast information to other aircraft and ATC. *See id.* at 56951. On the other hand, ADS-B IN goes one step further and allows an appropriately equipped aircraft to receive ADS-B OUT information and display it on equipment within the aircraft. *See id.*

<sup>717</sup> *See* 14 C.F.R. § 91.130(d) (2010) (Class C airspace requires transponders pursuant to section 91.215 and ADS-B after 2020 under section 91.225. Section 91.131(d) requires transponders under section 91.215 and ADS-B under section 91.225 after 2020 in Class B airspace. *See id.* § 91.131(d). Section 91.135(c) requires transponders under section 91.215 and ADS-B under section 91.225 after 2020 in Class A airspace. *See id.* § 91.135(c). Finally, section 91.215(b)(3) requires transponders and ADS-B within the 30 NM Mode C veil.). *See* 14 C.F.R. § 91.215(b)(3) (2014).

<sup>718</sup> Automatic Dependent Surveillance—Broadcast (ADS-B) Out Performance Requirements to Support Air Traffic Control (ATC) Service, 72 Fed. Reg. 56947, 56958.

<sup>719</sup> *Id.*

<sup>720</sup> *Id.* at 56957.

<sup>721</sup> Remember, this NPRM proposed only ADS-B Out be installed, not ADS-B In.

<sup>722</sup> *Id.* at 56961.

On May 28, 2010, the FAA published the Final Rule regarding ADS-B usage and performance requirements.<sup>723</sup> The final rule made very small changes in airspace designations. The majority of changes appear to be related to engineering requirements, which are not relevant to this inquiry.<sup>724</sup> For simplicity, the differences were published in the final rule as follows:<sup>725</sup>

TABLE 3.— SUBSTANTIVE DIFFERENCES BETWEEN THE PROPOSED RULE AND THE FINAL RULE

Issue area	The NPRM—	The final rule—
Technical Standard Order ....	Proposed performance standards as defined in TSO-C166a (1090 MHz ES) or TSO-C154b (UAT).	Requires performance standards as defined in TSO-C166b (1090 MHz ES) or TSO-C154c (UAT).
Airspace .....	Proposed requiring all aircraft above FL 240 to transmit on the 1090 MHz ES broadcast link.	Requires all aircraft in Class A airspace (FL 180 and above) to transmit on the 1090 MHz ES broadcast link.
	Proposed ADS-B performance standards for operations in all Class E airspace at and above 10,000 feet MSL.	Requires ADS-B performance standards for operations in Class E airspace at and above 10,000 feet MSL, excluding the airspace at and below 2,500 feet AGL.
NACp .....	Proposed a NACp $\geq 9$ , which provides navigation accuracy $< 30$ meters.	Requires NACp $< 0.05$ NM. (NACp $\geq 8$ )
NIC .....	Proposed changes in NIC be broadcast within 10 seconds.	Requires changes in NIC be broadcast within 12 seconds.
SIL .....	Proposed a SIL of 2 or 3 .....	Requires an SDA of 2. Requires a SIL of 3.
Antenna Diversity .....	Proposed antenna diversity in all airspace specified in the rule.	Does not require antenna diversity.
Total Latency .....	Proposed latency in the position source $< 0.5$ seconds and latency in the ADS-B source $< 1$ second.	Requires uncompensated latency $\leq 0.6$ seconds and maximum total latency $\leq 2.0$ seconds.
Message Elements .....	Proposed a broadcast message element for "receiving ATC services".	Does not require a broadcast message element for "receiving ATC services."
An ability to turn off ADS-B Out.	Proposed that the pilot be able to turn off ADS-B transmissions if directed by ATC.	Does not require the pilot be able to disable or turn off ADS-B transmissions.

The FAA acknowledged that numerous comments recommended limiting the amount of airspace and altitudes.<sup>726</sup> For example, limiting the requirement for ADS-B further to Class A or B airspace only, or allowing exceptions for certain users (i.e. skydiving).<sup>727</sup> The agency declined to accept these invitations, stating:

ADS-B cannot be used for ATC surveillance if all aircraft are not appropriately equipped. Moreover, it is unreasonable to set up a regulatory framework and performance standards that are based on using two primary systems for surveillance; nor is it feasible to fund and maintain two such systems. The airspace requirements specified in this rule for ADS-B Out meet ATC surveillance needs.<sup>728</sup>

One last issue that should be addressed is the lengthy timeline for program implementation. Full implementation was not required until January 1, 2020, nearly ten years after the effective

<sup>723</sup> Automatic Dependent Surveillance—Broadcast (ADS-B) Out Performance Requirements to Support Air Traffic Control (ATC) Service, 75 Fed. Reg. 30160 (2010).

<sup>724</sup> See generally *id.*

<sup>725</sup> *Id.* at 30166.

<sup>726</sup> See *id.*

<sup>727</sup> *Id.* at 30167.

<sup>728</sup> *Id.*

date of the final rule.<sup>729</sup> Here again, the FAA offered a rationale for this decision. First, the FAA believed this time was necessary for operators to equip their aircraft to meet the requirements of this rule.<sup>730</sup> Second, this timeframe would provide sufficient operational experience to enable ADS-B to be the primary source for surveillance.<sup>731</sup> Lastly, the ground infrastructure for implementation was due to be completed in 2013; this would permit seven years of operational experience prior to full implementation in 2020.<sup>732</sup>

As with previous Part 91 provisions, the authors searched for any judicial actions directed at Section 91.225, but found none. This was not unexpected, given that the regulation will not be effective until 2020.

The FAA has also published Advisory Circular 90-114 on September 21, 2012, incorporating Change 1, to provide further guidance regarding ADS-B.<sup>733</sup>

While ADS-B does not relieve a pilot from the duty to see and avoid other aircraft, it assists in helping a pilot visually locate another aircraft that he may not have seen before. The University of North Dakota (UND) conducted an FAA-sponsored research study regarding ADS-B, "Evaluating the Effectiveness of ADS-B in the Collegiate Flight Training Environment."<sup>734</sup> Pilots with and without ADS-B IN equipped aircraft were asked how many aircraft they visually spotted during routine training flights.<sup>735</sup> Those with ADS-B IN reported visually acquiring significantly more aircraft than those without ADS-B IN. According to the study, "collected data indicates that ADS-B made a significant contribution to overall traffic awareness, visual acquisitions, and avoidance maneuvering, thus enhancing the overall level of safety. It also improved lesson preparation and enhanced in-flight decision making."<sup>736</sup>

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<sup>729</sup> See *id.*

<sup>730</sup> *Id.*

<sup>731</sup> *Id.*

<sup>732</sup> *Id.*

<sup>733</sup> See generally FED. AVIATION ADMIN., AC 90-114 WITH CHG 1, AUTOMATIC DEPENDANT SURVEILLANCE BROADCAST (A05-B) OPERATIONS (Sept. 21, 2012).

<sup>734</sup> UNIV. OF N.D., EVALUATING THE EFFECTIVENESS OF ADS-B IN THE COLLEGIATE FLIGHT TRAINING ENVIRONMENT, FAA PROGRAM COE-GA, AWARD NUMBER: 04-C-GA-ERAU, SUBCONTRACT #61061-UND (Mar. 31, 2009). Approximately sixty UND flight training aircraft based at Grand Forks International Airport were ADS-B equipped.

<sup>735</sup> *Id.*

<sup>736</sup> *Id.*

UND researchers collected over 26,000 surveys from flight crews regarding their experience with ADS-B and collision avoidance/traffic acquisition.<sup>737</sup> Pilots of ADS-B equipped aircraft on average saw 4.78 aircraft per flight, while non-ADS-B equipped aircraft pilots saw an average of only 2.28 aircraft per flight.<sup>738</sup> Significance was statistically established. ( $t=35.874$ ,  $p<.05$ ) The term 'saw' means any form of aircraft location: visual or located on the ADS-B traffic display.<sup>739</sup>

ADS-B also improved a pilot's ability to visually acquire traffic. Pilots were again surveyed on how many aircraft they were able to visually acquire within a 3-mile radius.<sup>740</sup> ADS-B equipped pilots were able to visual acquire an average of 2.97 aircraft per flight, while non-ADS-B equipped pilots only acquired 1.86 aircraft per flight.<sup>741</sup> Also statistically significant. ( $t=16.852$ ,  $p<.05$ ).<sup>742</sup>

An additional relevant question was answered during the study as well: "Considering only the times when pilots had to maneuver, did ADS-B provide significantly more primary warnings that prompted avoidance maneuvers than either ATC advisories or visual-only acquisitions?"<sup>743</sup> The study found that ADS-B provided significantly more warnings that prompted avoidance maneuvering than either ATC or visual acquisition. This was also statistically significant. ( $F(2,16916)=3.25$ ,  $p<.05$ ).<sup>744</sup>

General comments from pilots of ADS-B equipped aircraft included: "Significant safety improvement. I kind of feel naked without it[.]" and "[b]est box in the airplane. I never knew how many planes I didn't see."<sup>745</sup> These comments speak for themselves regarding the value of such technology in assisting a pilot in his duty to see and avoid other traffic.

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<sup>737</sup> *Id.*

<sup>738</sup> *Id.*

<sup>739</sup> *Id.*

<sup>740</sup> *Id.*

<sup>741</sup> *Id.*

<sup>742</sup> *Id.*

<sup>743</sup> *Id.*

<sup>744</sup> *Id.*

<sup>745</sup> *Id.*

C. DISCUSSION OF OTHER FORMS OF TRANSPORTATION:  
MARITIME ANTICOLLISION RULES AND PERSPECTIVES IN SUPPORT  
OF PART 3 OF THE CURRENT RESEARCH

Marine navigation rules were the genesis for the aviation regulations, although aviation navigation requires operation in three dimensions and so must be structured to aviation's specific requirements. However, with minor exceptions, like requiring vessel speed changes under certain circumstances, the marine and aviation right-of-way rules for vehicles in sight of each other are nearly identical.

The International Maritime Organization (IMO) is the United Nations agency with responsibility for the safety of ships and is analogous to the ICAO.<sup>746</sup> IMO currently has 170 Member States and the United States has been a member state since 1950.<sup>747</sup> The IMO Convention on the International Regulations for Preventing Collisions at Sea (COLREG) of 1972 has been ratified and adopted by the United States and codified at 33 U.S.C. § 1602.<sup>748</sup>

The Navigation Rules are divided into four functional areas: Part A is applicable to "all vessels"; Part B, Section I is applicable to vessels in "any condition of visibility"; Part B, Section II, is applicable to "vessels in sight of one another"; and Part B, Section III, consisting of Rule 19, is applicable to "vessels not in sight of one another."<sup>749</sup> The Navigation Rules are set out below.

It should be noted that the marine regulations in the first three areas are similar and analogous to the aviation rules, including the "see and be seen" rules for right-of-way contained in Part B, Section I. However, the rule pertaining to vessels not in sight of one another, Rule 19, has no counterpart in the aviation rules.<sup>750</sup> Rule 19 states in part, "[a] vessel which detects by radar

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<sup>746</sup> See *IMO—What It Is*, IMO.ORG, [http://www.imo.org/About/Documents/What%20it%20is%20Oct%202013\\_Web.pdf](http://www.imo.org/About/Documents/What%20it%20is%20Oct%202013_Web.pdf) (last visited Nov. 3, 2014).

<sup>747</sup> See *id.* at 2.

<sup>748</sup> See generally 33 U.S.C. § 1602 (2012).

<sup>749</sup> See *Navigation Rules*, U.S. DEPT. HOMELAND SECURITY, [www.navcen.uscg.gov/?pageName=navRulesContent](http://www.navcen.uscg.gov/?pageName=navRulesContent) (last visited Oct. 3, 2014).

<sup>750</sup> The Traffic Alert and Collision Avoidance System (TCAS) "was designed to increase cockpit awareness of proximate aircraft and to serve as a 'last line of defense' for the prevention of mid-air collisions." See *Related Links, SEE AND AVOID*, [www.seeandavoid.org/Home/RelatedLinks](http://www.seeandavoid.org/Home/RelatedLinks) (last visited Oct. 2, 2014). "When an ATC clearance has been obtained, no pilot in command may deviate from that clearance unless an amended clearance is obtained, an emergency exists, or the deviation is in response to a traffic alert and collision avoidance system resolution advisory." 14 C.F.R. § 91.123(a) (2014). Any deviation must be in re-

alone the presence of another vessel shall determine if a close-quarters situation is developing or risk of collision exists. If so, she shall take avoiding action in ample time."<sup>751</sup>

Rule 19 does not require compliance with the situation-specific rules (crossing, overtaking, etc.) given in the visual right-of-way rules.<sup>752</sup> No vessel has the "right-of-way" over another under Rule 19: it is a dual action rule.<sup>753</sup> The only requirement is to take early, bold action.<sup>754</sup>

In aviation, as we have seen, ground-based radar has traditionally been responsible for collision avoidance, while airborne radar generally has been limited to the role of weather depiction and avoidance. However, the military and larger ships have been using onboard radar for collision avoidance purposes since at least the 1940s.<sup>755</sup> There was not the option of placing radar control centers in the vast spaces of open water and so the sens-

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sponse to a Resolution Advisory (RA) only, which is very close quarters. "Do not deviate from an assigned clearance based only on TA [Traffic Advisory] information." Advisory Circular 120-55C. Maritime Navigation Rule 19 allows far greater latitude for earlier action and self-separation prior to reaching the last line of defense, while there is still "ample time" before close quarters or risk of actual collision. *Navigation Rules*, *supra* note 749. Generally, ocean-going ships are self-separating and do not need authority to deviate from a "clearance."

<sup>751</sup> *Navigation Rules*, *supra* note 749. It should be noted that Rule 7 of the Marine Operating Rules requires that all means available be used in collision avoidance and if the vessel has a working radar it will be on and used:

- (a) Every vessel *shall use all available means* appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.
- (b) Proper use *shall be made of radar equipment if fitted and operational*, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

*Id.* (emphasis added).

<sup>752</sup> *See generally id.*

<sup>753</sup> *See generally id.*

<sup>754</sup> *Id.* "Turns must be bold enough to be apparent to the *other* vessel by radar. A turn that might be apparent to another vessel visually, through the change in aspect or lights, might not be large enough to be apparent to the radar observer." FARWELL'S RULES OF THE NAUTICAL ROAD, *supra* note 337, at 455 (emphasis added). The rule does give guidance regarding using two specific "unusual" avoidance maneuvers, "so far as possible the following shall be avoided: (i) An alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken; (ii) An alteration of course toward a vessel abeam or abaft the beam." *See Navigation Rules*, *supra* note 752.

<sup>755</sup> *See* NAT'L GEOSPATIAL INTELLIGENCE AGENCY, THE RADAR NAVIGATION AND MANEUVERING BOARD MANUAL 2 (2001).

ing equipment had to be on the ship and the traffic information interpreted directly by the ship's personnel.<sup>756</sup>

The early radars were large, heavy, unreliable and difficult to read with accuracy. It took special training for the operators to be proficient.<sup>757</sup> Often in the early days of radar, accidents were referred to as "radar assisted collisions" because of its misuse.<sup>758</sup> Further, radar sometimes would give a false sense of security so that the traditional forms of the "lookout" were de-emphasized.<sup>759</sup>

Today, however, the bridge of a modern large ship resembles the "glass cockpit" of a modern airliner. Integrated Bridge Systems (IBS) allow centralized access to multiple sensors which may be integrated into a multifunction displays or heads-up displays.<sup>760</sup> Inputs to the IBS may include the autopilot, electronic chart display, GPS, radar, AIS, electro-optical, CCTV, infrared, laser range finding and other appropriate data; all such data is recorded and stored.<sup>761</sup>

Again, like the early radar use, an overdependence on IBS can cause problems. In 1995, the GPS input wire on the Royal Majesty came loose and the ship was allowed to drive itself onto the

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<sup>756</sup> See *id.*

<sup>757</sup> FARWELL'S RULES OF THE NAUTICAL ROAD, *supra* note 337, at 158.

For years the marine community has debated which is the best radar display for navigation and collision avoidance. Two dimensions are at issue: ship's head-up versus north-up display and true motion versus relative motion display. . . . A stabilized radar display gives the user gives the user the option of selecting head-up or north-up display. . . . Radars may also be switched to display target information in true motion or relative motion. . . . The collision regulations generally take no position on which of the possible displays constitute proper use of the equipment. *Id.*

See also generally Radar Navigation and Maneuvering Board Manual, *supra* note 757.

<sup>758</sup> See Nicholas J. Healy, *Radar and the New Collision Regulations*, 37 TUL. L. REV. 621, 635 (1962).

<sup>759</sup> See *id.* at 635.

<sup>760</sup> IBS standards are set forth in SOLAS Regulation V/19 and IMO Maritime Safety Committee Resolution MSC.64(67). See generally SOLAS Regulation V/19, IMO Maritime Safety Committee Resolution MSC.64(67). The IBS system "Smart-Bridge" was developed by Lockheed-Martin. See FARWELL'S RULES OF THE NAUTICAL ROAD, *supra* note 337, at 164.

<sup>761</sup> See generally FARWELL'S RULES OF THE NAUTICAL ROAD, *supra* note 337, at 164. Automatic Identification Systems (AIS) is analogous to ADS-B. Transponders transmit, and other vessels receive, a variety of data including vessel identity, GPS position, course, speed, etc. This information is used in determining and resolving traffic conflicts. AIS data may be received before the target is observed on radar, allowing risk detection and assessment to begin earlier.

shore of Nantucket.<sup>762</sup> The GPS malfunction went undiscovered for over thirty hours.<sup>763</sup> The NTSB issued an urgent safety bulletin, essentially requesting that operators of sophisticated ships maintain traditional vigilance methods and safeguards along with the use of any technical equipment on board.<sup>764</sup>

A number of major ports in the United States established the Vessel Traffic Services (VTS), a navigation service that is analogous to an approach/departure control.<sup>765</sup> These sites may include ground-based radar for controller usage.<sup>766</sup> The VTS regulations are contained at 33 C.F.R. 161 and authorize the VTS to “control, supervise, or otherwise manage traffic”<sup>767</sup> . . . “essentially, to issue direction to minimize the risk of collision.” Some VTSs have integrated, or are currently integrating, AIS into its control scheme.

Although it is beyond the scope of the current research, it would be interesting to visit an appropriate VTS and research AIS integration regarding any possible information of correlative value to integrating ADS-B into air traffic control.

#### Marine Collision Avoidance Terms and Perspectives:

- Well clear—no risk of collision, i.e., “*Past* and well clear” or measured by diverging heading and/or distance/time. If the vessel is not well clear the collision avoidance rules are triggered and maneuvering may be necessary.<sup>768</sup>
- Close-quarters—“That area around a ship where a collision with an approaching vessel could not be avoided by the action of the approached vessel alone, if the approaching vessel made a major, sudden and unexpected course change.”<sup>769</sup> Ships, like airplanes, are sometimes required to operate at close-quarters, like vessels traveling in opposite directions in the designated lanes of a seaway or airliners on final approach to parallel runways.
- Safe passing distance—may involve some risk of collision, but avoids the high risk of being so near as to be in “close-quarters.”<sup>770</sup>

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<sup>762</sup> See Marine Accident Report, N.T.S.B. Report No. Mar-97/01, p. 30 (1997).

<sup>763</sup> See *id.*

<sup>764</sup> See generally *id.*

<sup>765</sup> To find UTS ports, check the VTS Finder. VTS Finder, [www.worldvtsguide.org/VTS-Finder](http://www.worldvtsguide.org/VTS-Finder) (last visited Oct. 3, 2014).

<sup>766</sup> See *Vessel Traffic Service*, U.S. DEPT. HOMELAND SECURITY, [www.navcen.uscg.org/?pageName=vtsMain](http://www.navcen.uscg.org/?pageName=vtsMain) (last visited Mar. 25, 2015).

<sup>767</sup> 33 C.F.R. § 161 (2014).

<sup>768</sup> *Acacia Vera Navigation Co. v. Kezia, Ltd.*, 78 F.3d 211 (5th Cir. 1996).

<sup>769</sup> See FARWELL’S RULES OF THE NAUTICAL ROAD, *supra* note 337, at 253.

<sup>770</sup> *Id.* at 251 n.32.



- In extremis—imminent collision hazard. When an approach situation reaches the point where both vessels must maneuver if collision is to be avoided, the situation is described as *in extremis*.<sup>771</sup> Regardless of who is at fault, each vessel has to do everything it can to avoid collision.<sup>772</sup>

The relevant Navigation Rules are set out in Appendix B.<sup>773</sup>

## VI. RESULTS AND CONCLUSIONS

The first objective of this research was to identify and analyze those provisions contained in Part 91 of the Federal Aviation Regulations that impose a duty or responsibility on the pilot in command to “see and avoid” other aircraft. The authors also analyzed a second set of Part 91 regulations that relate to the pilot’s responsibility to see and avoid aircraft. Finally, a third objective of this research was to identify and analyze how new systems or technologies have been used to supplement or enhance the pilot’s ability to see and avoid other aircraft. To this end, the authors sought out and reviewed historic agency rulemaking, policy development through manuals and circulars, and judicial treatment of individual regulatory provision that are associated with the responsibility to see and avoid other aircraft.

This research was limited in scope to focus on the Part 91 regulations responsible for imposing a responsibility to see and avoid other aircraft. However, during this research, the authors uncovered other facets of the see and avoid concept. While these fell outside the scope of work for this assignment, these collateral issues should be considered in future research:

1. The duty to see and avoid is not limited to seeing and avoiding other aircraft. There is a broader responsibility to also see and avoid other hazards, including terrain and obstacles.
2. The duty to see and avoid has a long history not confined solely to the operation of aircraft. Regulation of other forms of transportation also emphasizes the see and avoid concept, including maritime and surface transportation. It would be useful to look into these other modes of transportation and

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<sup>771</sup> See *The Genesee Chief v. Fitzhugh*, 53 U.S. 443, 461 (1851).

<sup>772</sup> *The Mauch Chunk*, 154 F. 182, 183–84 (2d Cir. 1907); see also FARWELL’S RULES OF THE NAUTICAL ROAD, *supra* note 337, at 120.

<sup>773</sup> Official versions of the Navigation Rules are contained in the International Navigational Rules Act of 1977, Pub. L. No. 95-75, 91 Stat. 308 (July 27, 1977), and the Inland Navigation Rules Act of 1980, Pub. L. No. 96-591, 94 Stat. 3415 (Dec. 24, 1980).

analyze their handling of this concept for application to the aviation arena.

3. One technology that appears well-suited to enhancing the see and avoid concept is ADS-B. However, it is clear that it is in its infancy. Under the federal Aviation Regulations, it will not be fully deployed until 2020. Accordingly, much critical analysis of its deployment, specifically judicial oversight, is not yet available. Most current attention appears to be focused on its engineering. Future research should follow this developing technology and its impact on see and avoid, which in this case would perhaps be better described as “sense and avoid”.
4. New technology will continue to be developed and introduced that will challenge our traditional see and avoid concepts. One that specifically comes to mind is the employment of enhanced flight vision systems (EFVS). In its recent NPRM,<sup>774</sup> the FAA proposes to permit the pilot to use EFVS to replace natural vision and continue IFR approach descents from 100 feet above the runway all the way to touchdown.

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<sup>774</sup> See generally Revisions to Operational Requirements for the Use of Enhanced Flight Vision Systems (EFVS) and to Pilot Compartment View Requirements for Vision Systems, 78 Fed. Reg. 34935 (2013) (extending comment deadline for earlier NPRM 78 Fed. Reg. 54700 (2013)).

## VII. APPENDICES

## A. APPENDIX A: RELEVANT STATUTORY PROVISIONS

## § 121.356 Collision avoidance system

Effective January 1, 2005, any airplane you operate under this part must be equipped and operated according to the following table:

Chart 1 – § 121.356 Collision Avoidance System

**Collision Avoidance Systems**

If you operate any—	Then you must operate that airplane with—
(a) Turbine-powered airplane of more than 33,000 pounds maximum certificated takeoff weight	(1) An appropriate class of Mode S transponder that meets Technical Standard Order (TSO) C-112, or a later version, and one of the following approved units: (i) TCAS II that meets TSO C-119b (version 7.0), or takeoff weight a later version.
	(ii) TCAS II that meets TSO C-119a (version 6.04A Enhanced) that was installed in that airplane before May 1, 2003. If that TCAS II version 6.04A Enhanced no longer can be repaired to TSO C-119a standards, it must be replaced with a TCAS II that meets TSO C-119b (version 7.0), or a later version. (iii) A collision avoidance system equivalent to TSO C-119b (version 7.0), or a later version, capable of coordinating with units that meet TSO C-119a (version 6.04A Enhanced), or a later version.
(b) Passenger or combination cargo/passenger (combi) airplane that has a passenger seat configuration of 10-30 seats	(1) TCAS I that meets TSO C-118, or a later version, or (2) A collision avoidance system equivalent to has a TSO C-118, or a later version, or (3) A collision avoidance system and Mode S transponder that meet paragraph (a)(1) of this section.
(c) Piston-powered airplane of more than 33,000 pounds maximum certificated takeoff weight	(1) TCAS I that meets TSO C-118, or a later version, or (2) A collision avoidance system equivalent to maximum TSO C-118, or a later version, or (3) A collision avoidance system and Mode S transponder that meet paragraph (a)(1) of this section.

§ 135.180 Traffic Alert and Collision Avoidance System

- (a) Unless otherwise authorized by the Administrator, after December 31, 1995, no person may operate a turbine powered airplane that has a passenger seat configuration, excluding any pilot seat, of 10 to 30 seats unless it is equipped with an approved traffic alert and collision avoidance system. If a TCAS II system is installed, it must be capable of coordinating with TCAS units that meet TSO C-119.
- (b) The airplane flight manual required by § 135.21 of this part shall contain the following information on the TCAS I system required by this section:
  - (1) Appropriate procedures for—
    - (i) The use of the equipment; and
    - (ii) Proper flightcrew action with respect to the equipment operation.
  - (2) An outline of all input sources that must be operating for the TCAS to function properly.

§ 125.224 Collision avoidance system

Effective January 1, 2005, any airplane you operate under this part 125 must be equipped and operated according to the following table:

## Chart 2 – § 125.224 Collision Avoidance System

**Collision Avoidance Systems**

<b>If you operate any . . .</b>	<b>Then you must operate that airplane with:</b>
(a) Turbine-powered airplane of more than 33,000 pounds maximum certificated takeoff weight	(1) An appropriate class of Mode S transponder that meets Technical Standard Order (TSO) C-112, or a later version, and one of the following approved units: (i) TCAS II that meets TSO C-119b (version 7.0), or a later version.
	(ii) TCAS II that meets TSO C-119a (version 6.04A Enhanced) that was installed in that airplane before May 1, 2003. If that TCAS II version 6.04A Enhanced no longer can be repaired to TSO C-119a standards, it must be replaced with a TCAS II that meets TSO C-119b (version 7.0), or a later version. (iii) A collision avoidance system equivalent to TSO C-119b (version 7.0), or a later version, capable of coordinating with units that meet TSO C-119a (version 6.04A Enhanced), or a later version.
(b) Piston-powered airplane of more than 33,000 pounds maximum certificated takeoff weight	(1) TCAS I that meets TSO C-118, or a later version, or (2) A collision avoidance system equivalent to TSO C-118, or a later version, or (1) (3) A collision avoidance system and Mode S transponder that meet paragraph (a) (1) of this section.

## § 129.18 Collision avoidance system.

Effective January 1, 2005, any airplane you, as a foreign air carrier, operate under part 129 must be equipped and operated according to the following table:<sup>775</sup>

<sup>775</sup> All above regulations were in place as of October 3, 2013, on the FAA website at [http://www.ecfr.gov/cgi-bin/text-idx?SID=92b219c6a2264e3c4c536dc3738eb337&c=ecfr&tpl=/ecfrbrowse/Title14/14cfrv3\\_02.tpl](http://www.ecfr.gov/cgi-bin/text-idx?SID=92b219c6a2264e3c4c536dc3738eb337&c=ecfr&tpl=/ecfrbrowse/Title14/14cfrv3_02.tpl).

## Chart 3 – § 129.18 Collision Avoidance System

**Collision Avoidance Systems**

<b>If you operate in the United States any . . .</b>	<b>Then you must operate that airplane with:</b>
(a) Turbine-powered airplane of more than 33,000 pounds maximum certificated takeoff weight	(1) An appropriate class of Mode S transponder that meets Technical Standard Order (TSO) C-112, or a later version, and one of the following approved units; (i) TCAS II that meets TSO C-119b (version 7.0), or takeoff weight a later version.
	(ii) TCAS II that meets TSO C-119a (version 6.04A Enhanced) that was installed in that airplane before May 1, 2003. If that TCAS II version 6.04A Enhanced no longer can be repaired to TSO C-119a standards, it must be replaced with a TCAS II that meets TSO C-119b (version 7.0), or a later version. (iii) A collision avoidance system equivalent to TSO C-119b (version 7.0), or a later version, capable of coordinating with units that meet TSO C-119a (version 6.04A Enhanced), or a later version.
(b) Turbine-powered airplane with a passenger-seat configuration, excluding any pilot seat, or 10-30 seats	(1) TCAS I that meets TSO C-118, or a later version, or (2) A collision avoidance system equivalent to excluding any TSO C-118, or a later version, or (3) A collision avoidance system and Mode S transponder that meet paragraph (a)(1) of this section.

**B. APPENDIX B: RELEVANT ADMINISTRATIVE RULES****§ 91.123 Compliance with ATC clearances and instructions**

- (a) When an ATC clearance has been obtained, no pilot in command may deviate from that clearance unless an amended clearance is obtained, an emergency exists, or the deviation is in response to a traffic alert and collision avoidance system resolution advisory. However, except in Class A airspace, a pilot may cancel an IFR flight plan if the operation is being conducted in VFR weather condi-

tions. When a pilot is uncertain of an ATC clearance, that pilot shall immediately request clarification from ATC.

- (b) Except in an emergency, no person may operate an aircraft contrary to an ATC instruction in an area in which air traffic control is exercised.
- (c) Each pilot in command who, in an emergency, or in response to a traffic alert and collision avoidance system resolution advisory, deviates from an ATC clearance or instruction shall notify ATC of that deviation as soon as possible.
- (d) Each pilot in command who (though not deviating from a rule of this subpart) is given priority by ATC in an emergency, shall submit a detailed report of that emergency within 48 hours to the manager of that ATC facility, if requested by ATC.
- (e) Unless otherwise authorized by ATC, no person operating an aircraft may operate that aircraft according to any clearance or instruction that has been issued to the pilot of another aircraft for radar air traffic control purposes.

#### § 91.13 Careless or Reckless Operation

- (a) Aircraft operations for the purpose of air navigation. No person may operate an aircraft in a careless or reckless manner so as to endanger the life or property of another.
- (b) Aircraft operations other than for the purpose of air navigation. No person may operate an aircraft, other than for the purpose of air navigation, on any part of the surface of an airport used by aircraft for air commerce (including areas used by those aircraft for receiving or discharging persons or cargo), in a careless or reckless manner so as to endanger the life or property of another.
- (a) No person may operate an aircraft so close to another aircraft as to create a collision hazard.
- (b) No person may operate an aircraft in formation flight except by arrangement with the pilot in command of each aircraft in the formation.
- (c) No person may operate an aircraft, carrying passengers for hire, in formation flight.

#### 91.113 Right-of-Way Rules: Except Water Operations

- (a) Inapplicability. This section does not apply to the operation of an aircraft on water.
- (b) General. When weather conditions permit, regardless of whether an operation is conducted under instrument

flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

- (c) In distress. An aircraft in distress has the right-of-way over all other air traffic.
- (d) Converging. When aircraft of the same category are converging at approximately the same altitude (except head-on, or nearly so), the aircraft to the other's right has the right-of-way. If the aircraft are of different categories:
  - (1) A balloon has the right-of-way over any other category of aircraft;
  - (2) A glider has the right-of-way over an airship, powered parachute, weight-shift-control aircraft, airplane, or rotorcraft;
  - (3) An airship has the right-of-way over a powered parachute, weight-shift-control aircraft, airplane, or rotorcraft.

However, an aircraft towing or refueling other aircraft has the right-of-way over all other engine-driven aircraft.

- (e) Approaching head-on. When aircraft are approaching each other head-on, or nearly so, each pilot of each aircraft shall alter course to the right.
- (f) Overtaking. Each aircraft that is being overtaken has the right-of-way and each pilot of an overtaking aircraft shall alter course to the right to pass well clear.
- (g) Landing. Aircraft, while on final approach to land or while landing, have the right-of-way over other aircraft in flight or operating on the surface, except that they shall not take advantage of this rule to force an aircraft off the runway surface which has already landed and is attempting to make way for an aircraft on final approach. When two or more aircraft are approaching an airport for the purpose of landing, the aircraft at the lower altitude has the right-of-way, but it shall not take advantage of this rule to cut in front of another which is on final approach to land or to overtake that aircraft.

#### **Section 91.155 Basic VFR Weather Minimums**

- (a) Except as provided in paragraph (b) of this section and section 91.157, no person may operate an aircraft under VFR when the flight visibility is less, or at a distance from



clouds that is less, than that prescribed for the corresponding altitude and class of airspace in the following table:

Table 1 – Basic VFR Weather Minimums

Airspace	Flight visibility	Distance from clouds
Class A	Not Applicable	Not Applicable.
Class B	3 statute miles	Clear of Clouds.
Class C	3 statute miles	500 feet below. 1,000 feet above. 2,000 feet horizontal.
Class D	3 statute miles	500 feet below. 1,000 feet above. 2,000 feet horizontal.
Class E:		
Less than 10,000 feet MSL	3 statute miles	500 feet below. 1,000 feet above. 2,000 feet horizontal
At or above 10,000 feet MSL	5 statute miles	1,000 feet below. 1,000 feet above. 1 statute mile horizontal.
Class G:		
1,200 feet or less above the surface (regardless of MSL altitude)		
Day, except as provided in § 91.155(b)	1 statute mile	Clear of clouds.
Night, except as provided in § 91.155(b)	3 statute miles	500 feet below. 1,000 feet above. 2,000 feet horizontal.
More than 1,200 feet above the surface but less than 10,000 feet MSL		
Day	1 statute mile	500 feet below. 1,000 feet above. 2,000 feet horizontal.
Night	3 statute miles	500 feet below. 1,000 feet above. 2,000 feet horizontal.
More than 1,200 feet above the surface and at or above 10,000 feet MSL	5 statute miles	1,000 feet below. 1,000 feet above. 1 statute mile horizontal.

- (g) Class G Airspace. Notwithstanding the provisions of paragraph (a) of this section, the following operations may be conducted in Class G airspace below 1,200 feet above the surface:
- (1) Helicopter. A helicopter may be operated clear of clouds if operated at a speed that allows the pilot adequate opportunity to see any air traffic or obstruction in time to avoid a collision.
  - (2) Airplane, powered parachute, or weight-shift-control aircraft. If the visibility is less than 3 statute miles but not less than 1 statute mile during night hours and you are operating in an airport traffic pattern within 1/2 mile of the runway, you may operate an airplane, powered parachute, or weight-shift-control aircraft clear of clouds.
- (h) Except as provided in § 91.157, no person may operate an aircraft beneath the ceiling under VFR within the lateral boundaries of controlled airspace designated to the surface for an airport when the ceiling is less than 1,000 feet.
- (i) Except as provided in § 91.157 of this part, no person may take off or land an aircraft, or enter the traffic pattern of an airport, under VFR, within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport—
- (1) Unless ground visibility at that airport is at least 3 statute miles; or
  - (2) If ground visibility is not reported at that airport, unless flight visibility during landing or takeoff, or while operating in the traffic pattern is at least 3 statute miles.
- (j) For the purpose of this section, an aircraft operating at the base altitude of a Class E airspace area is considered to be within the airspace directly below that area.<sup>776</sup>

§ 91.185 IFR operations: Two-Way Radio Communications Failure<sup>777</sup>

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<sup>776</sup> 14 C.F.R. § 91.155 (2014).

<sup>777</sup> The Pilot/Controller Glossary defines “lost communications” as “[l]oss of the ability to communicate by radio. Aircraft are sometimes referred to as NORDO (No Radio). Standard pilot procedures are specified in 14 C.F.R. Part 91. . . .” See *Pilot/Controller Glossary*, FAA.gov, [http://www.faa.gov/air\\_traffic/publications/atpubs/pcg/L.htm](http://www.faa.gov/air_traffic/publications/atpubs/pcg/L.htm) (last visited Nov. 3, 2014).

- (a) General. Unless otherwise authorized by ATC, each pilot who has two-way radio communications failure when operating under IFR shall comply with the rules of this section.
- (b) VFR Conditions. *If the failure occurs in VFR conditions, or if VFR conditions are encountered after the failure, each pilot shall continue the flight under VFR and land as soon as practicable.*
- (c) IFR Conditions. If the failure occurs in IFR conditions, or if paragraph (b) of this section cannot be complied with, each pilot shall continue the flight according to the following:
  - (1) Route.
    - (i) By the route assigned in the last ATC clearance received;
    - (ii) If being radar vectored, by the direct route from the point of radio failure to the fix, route, or airway specified in the vector clearance;
    - (iii) In the absence of an assigned route, by the route that ATC has advised may be expected in a further clearance; or
    - (iv) In the absence of an assigned route or a route that ATC has advised may be expected in a further clearance, by the route filed in the flight plan.
  - (2) Altitude. At the highest of the following altitudes or flight levels for the route segment being flown:
    - (i) The altitude or flight level assigned in the last ATC clearance received;
    - (ii) The minimum altitude (converted, if appropriate, to minimum flight level as prescribed in § 91.121(c)) for IFR operations; or
    - (iii) The altitude or flight level ATC has advised may be expected in a further clearance.
  - (3) Leave Clearance Limit.
    - (i) When the clearance limit is a fix from which an approach begins, commence descent or descent and approach as close as possible to the expect-further-clearance time if one has been received, or if one has not been received, as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.

- (ii) If the clearance limit is not a fix from which an approach begins, leave the clearance limit at the expect-further-clearance time if one has been received, or if none has been received, upon arrival over the clearance limit, and proceed to a fix from which an approach begins and commence descent or descent and approach as close as possible to the estimated time of arrival as calculated from the filed or amended (with ATC) estimated time en route.<sup>778</sup>

§ 91.105 Flight Crewmembers at Stations.

- (a) During takeoff and landing, and while en route, each required flight crewmember shall—
  - (1) *Be at the crewmember station unless the absence is necessary to perform duties in connection with the operation of the aircraft or in connection with physiological needs; and*
  - (2) Keep the safety belt fastened while at the crewmember station.
- (b) Each required flight crewmember of a U.S.-registered civil aircraft shall, during takeoff and landing, keep his or her shoulder harness fastened while at his or her assigned duty station. This paragraph does not apply if—
  - (1) The seat at the crewmember’s station is not equipped with a shoulder harness; or
  - (2) The crewmember would be unable to perform required duties with the shoulder harness fastened.<sup>779</sup>

§ 91.117 Aircraft Speed.

- (a) Unless otherwise authorized by the Administrator, no person may operate an aircraft below 10,000 feet MSL at an indicated airspeed of more than 250 knots (288 m.p.h.).
- (b) Unless otherwise authorized or required by ATC, no person may operate an aircraft at or below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class C or Class D airspace area at an indicated airspeed of more than 200 knots (230 mph.). This paragraph (b) does not apply to any operations within a Class B airspace area. Such operations shall comply with paragraph (a) of this section.

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<sup>778</sup> 14 C.F.R. § 91.185 (1989) (emphasis added).

<sup>779</sup> 14 C.F.R. § 91.105 (2013) (emphasis added).

- (c) No person may operate an aircraft in the airspace underlying a Class B airspace area designated for an airport or in a VFR corridor designated through such a Class B airspace area, at an indicated airspeed of more than 200 knots (230 mph).
- (d) If the minimum safe airspeed for any particular operation is greater than the maximum speed prescribed in this section, the aircraft may be operated at that minimum speed.<sup>780</sup>

§ 60.18 Operation on and in the Vicinity of an Airport.

- (f) High density air traffic zone. In any area not above 3,000 feet above the surface in which the Administrator finds that the volume of traffic is such as to adversely affect safety, he shall designate such airspace as a high density air traffic zone in which the following rules shall apply:
  - (1) Speed. No person shall operate an aircraft within a high density air traffic zone at a speed in excess of 180 mph or 160 knots indicated airspeed unless operational limitations for a particular aircraft required greater airspeeds, in which case the aircraft shall not be flown in excess of the minimum speed consistent with the safe operational limitations of the aircraft.<sup>781</sup>

Unless otherwise authorized by ATC, no person may operate an aircraft within controlled airspace under IFR except as follows:

- (a) On an ATS route, along the centerline of that airway.

On any other route, along the direct course between the navigational aids or fixes defining that route. However, this section does not prohibit maneuvering the aircraft to pass well clear of other air traffic or the maneuvering of the aircraft in VFR conditions to clear the intended flight path both before and during climb or descent.<sup>782</sup>

§ 91.209 Aircraft lights

No person may:

- (a) During the period from sunset to sunrise (or, in Alaska, during the period a prominent unlighted object cannot be seen from a distance of 3 statute miles or the sun is more than 6 degrees below the horizon)—

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<sup>780</sup> 14 C.F.R. § 91.117 (2013).

<sup>781</sup> Civil Air Regulations, Air Traffic Rules, 14 C.F.R. § 60.18 (1960).

<sup>782</sup> 14 C.F.R. § 91.181 (2012).

- (1) Operate an aircraft unless it has lighted position lights;
- (2) Park or move an aircraft in, or in dangerous proximity to, a night flight operations area of an airport unless the aircraft—
  - (i) Is clearly illuminated;
  - (ii) Has lighted position lights; or
  - (iii) Is in an area that is marked by obstruction lights;
- (3) Anchor an aircraft unless the aircraft—
  - (iv) Has lighted anchor lights; or
  - (v) Is in an area where anchor lights are not required on vessels; or

Operate an aircraft that is equipped with an anticollision light system, unless it has lighted anticollision lights. However, the anticollision lights need not be lighted when the pilot-in-command determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.<sup>783</sup>

Lighting requirements were:

§ 30 Carrying Passengers at Night.

Licensed aircraft when engaged in carrying passengers for hire any time between one-half hour after sunset and one-half hour before sunrise must be equipped with electric landing lights and navigation lights.

§ 76 Lights.

- (A) Angular Limits. The angular limits laid down in these rules will be determined as when the aircraft is in a normal flying position.
- (B) Airplane Lights. Between one-half hour after sunset and one-half hour before sunrise airplanes in flight must show the following lights:
  - (1) On the right side a green light and on the left side a red light, showing unbroken light between two vertical planes whose dihedral angle is  $110^\circ$  when measure to the right and left, respectively, from dead ahead. These lights shall be visible at least 2 miles.
  - (2) At the rear and as far aft as possible a white light shining rearward visible in a dihedral angle of  $140^\circ$  bisected by a vertical plane through the line of flight and visible at least 3 miles.

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<sup>783</sup> 14 C.F.R. § 91.209 (2013).

- (C) Airship Lights. Between one-half hour after sunset and one-half hour before sunrise airships shall carry and display the same lights that are prescribed for airplanes, excepting the side lights shall be doubled horizontally in a fore-and-aft position, and the rear light shall be doubled vertically. Lights in a pair shall be at least 7 feet apart.
- (D) Balloon Lights. A free balloon, between one-half hour after sunset and one-half hour before sunrise, shall display one white light not less than 20 feet below the car, visible for at least 2 miles. A fixed balloon, or airship, shall carry three lights—red, white, and red—in a vertical line, one over the other, visible at least 2 miles. The top red light shall be not less than 20 feet below the car, and the lights shall be not less than 7 nor more than 10 feet apart.
- (E) Lights When Stationary—Between one-half hour after sunset and one-half hour before sunrise all aircraft which are on the surface of water and not under control, or which are moored or anchored in navigation lanes, shall show a white light visible for at least 2 miles in all directions.
  - (2) Balloon or airship mooring cables between one-half hour after sunset and one-half hour before sunrise shall show groups of three red lights at intervals of at least every 100 feet measured from the basket, the first light in the first group to be approximately 20 feet from the lower red balloon light. The object to which the balloon or airship is moored on the ground shall have a similar group of lights to mark its position.<sup>784</sup>

§ 91.221 Traffic Alert and Collision Avoidance System Equipment and Use

- (a) All airspace: U.S.-registered civil aircraft. Any traffic alert and collision avoidance system installed in a U.S.-registered civil aircraft must be approved by the Administrator.

Traffic alert and collision avoidance system, operation required. Each person operating an aircraft equipped with an op-

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<sup>784</sup> AIR COMMERCE REGULATIONS, *supra* note 236.

erable traffic alert and collision avoidance system shall have that system on and operating.<sup>785</sup>

§ 91.225 Automatic Dependent Surveillance-Broadcast (ADS-B) Out Equipment and Use

- (a) After January 1, 2020, and unless otherwise authorized by ATC, no person may operate an aircraft in Class A airspace unless the aircraft has equipment installed that—
  - (1) Meets the requirements in TSO-C166b, Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Service-Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz); and
  - (2) Meets the requirements of § 91.227.
- (b) After January 1, 2020, and unless otherwise authorized by ATC, no person may operate an aircraft below 18,000 feet MSL and in airspace described in paragraph (d) of this section unless the aircraft has equipment installed that—
  - (1) Meets the requirements in—
    - (i) TSO-C166b; or
    - (ii) TSO-C154c, Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz;
  - (2) Meets the requirements of § 91.227.
- (c) Operators with equipment installed with an approved deviation under § 21.618 of this chapter also are in compliance with this section.
- (d) After January 1, 2020, and unless otherwise authorized by ATC, no person may operate an aircraft in the following airspace unless the aircraft has equipment installed that meets the requirements in paragraph (b) of this section:
  - (1) Class B and Class C airspace areas;
  - (2) Except as provided for in paragraph (e) of this section, within 30 nautical miles of an airport listed in appendix D, section 1 to this part from the surface upward to 10,000 feet MSL;
  - (3) Above the ceiling and within the lateral boundaries of a Class B or Class C airspace area designated for an airport upward to 10,000 feet MSL;
  - (4) Except as provided in paragraph (e) of this section, Class E airspace within the 48 contiguous states and

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<sup>785</sup> 14 C.F.R. § 91.221 (2013).



the District of Columbia at and above 10,000 feet MSL, excluding the airspace at and below 2,500 feet above the surface; and

- (5) Class E airspace at and above 3,000 feet MSL over the Gulf of Mexico from the coastline of the United States out to 12 nautical miles.
- (e) The requirements of paragraph (b) of this section do not apply to any aircraft that was not originally certificated with an electrical system, or that has not subsequently been certified with such a system installed, including balloons and gliders. These aircraft may conduct operations without ADS-B Out in the airspace specified in paragraphs (d)(2) and (d)(4) of this section. Operations authorized by this section must be conducted—
  - (1) Outside any Class B or Class C airspace area; and
  - (2) Below the altitude of the ceiling of a Class B or Class C airspace area designated for an airport, or 10,000 feet MSL, whichever is lower.
- (f) Each person operating an aircraft equipped with ADS-B Out must operate this equipment in the transmit mode at all times.
- (g) Requests for ATC authorized deviations from the requirements of this section must be made to the ATC facility having jurisdiction over the concerned airspace within the time periods specified as follows:
  - (1) For operation of an aircraft with an inoperative ADS-B Out, to the airport of ultimate destination, including any intermediate stops, or to proceed to a place where suitable repairs can be made or both, the request may be made at any time.
  - (2) For operation of an aircraft that is not equipped with ADS-B Out, the request must be made at least 1 hour before the proposed operation.
- (h) The standards required in this section are incorporated by reference with the approval of the Director of the Office of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. All approved materials are available for inspection at the FAA's Office of Rulemaking (ARM-1), 800 Independence Avenue, SW., Washington, DC 20590 (telephone 202-267-9677), or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to [http://www.archives.gov/federal\\_register/](http://www.archives.gov/federal_register/)

code\_of\_federal\_regulations/ibr\_locations.html. This material is also available from the sources indicated in paragraphs (h)(1) and (h)(2) of this section.

- (1) Copies of Technical Standard Order (TSO)-C166b, Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Service-Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz (MHz) (December 2, 2009) and TSO-C154c, Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B) Equipment Operating on the Frequency of 978 MHz (December 2, 2009) may be obtained from the U.S. Department of Transportation, Subsequent Distribution Office, DOT Warehouse M30, Ardmore East Business Center, 3341 Q 75th Avenue, Landover, MD 20785; telephone (301) 322-5377. Copies of TSO-C166B and TSO-C154c are also available on the FAA’s Web site, at [http://www.faa.gov/aircraft/air\\_cert/design\\_approvals/tso/](http://www.faa.gov/aircraft/air_cert/design_approvals/tso/). Select the link “Search Technical Standard Orders.”
- (2) Copies of Section 2, Equipment Performance Requirements and Test Procedures, of RTCA DO-260B, Minimum Operational Performance Standards for 1090 MHz Extended Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information Services-Broadcast (TIS-B), December 2, 2009 (referenced in TSO-C166b) and Section 2, Equipment Performance Requirements and Test Procedures, of RTCA DO-282B, Minimum Operational Performance Standards for Universal Access Transceiver (UAT) Automatic Dependent Surveillance-Broadcast (ADS-B), December 2, 2009 (referenced in TSO C-154c) may be obtained from RTCA, Inc., 1828 L Street, NW., Suite 805, Washington, DC 20036-5133, telephone 202-833-9339. Copies of RTCA DO-260B and RTCA DO-282B are also available on RTCA Inc.’s Web site, at <http://www.rtca.org/onlinecart/allproducts.cfm>.<sup>786</sup>

## NAVIGATION RULES

### PART A—GENERAL

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<sup>786</sup> 14 C.F.R. § 91.225 (2014).

**Rule 1—Application**

- (a) These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels. . . .

**Rule 2—Responsibility**

- (a) Nothing in these Rules shall exonerate any vessel, or the owner, master, or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.
- (b) In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

**PART B—STEERING AND SAILING RULES****Section/Subpart I—Conduct of Vessels in Any Condition of Visibility.****Rule 4—Application**

Rules in this section apply to *any condition of visibility*.

**Rule 5—Lookout**

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

**Rule 6—Safe Speed**

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

In determining a safe speed the following factors shall be among those taken into account:

- (a) By all vessels:
  - (i) The state of visibility;
  - (ii) The traffic density including concentrations of fishing vessels or any other vessels;
  - (iii) The manageability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions;
  - (iv) At night, the presence of background light such as from shore lights or from back scatter from her own lights;

- (v) The state of wind, sea and current, and the proximity of navigational hazards;
- (vi) The draft in relation to the available depth of water.
- (b) Additionally, by vessels with operational radar:
  - (i) The characteristics, efficiency and limitations of the radar equipment;
  - (ii) Any constraints imposed by the radar range scale in use;
  - (iii) The effect on radar detection of the sea state, weather and other sources of interference;
  - (iv) The possibility that small vessels, ice and other floating objects may not be detected by radar at an adequate range;
  - (v) The number, location and movement of vessels detected by radar;
  - (vi) The more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

#### Rule 7—Risk of Collision

- (a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. *If there is any doubt such risk shall be deemed to exist.*
- (b) Proper use *shall be made of radar equipment if fitted and operational*, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.
- (c) Assumptions shall not be made on the basis of scanty information, especially scanty radar information.
- (d) In determining if risk of collision exists the following considerations shall be among those taken into account:
  - (i) Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change.
  - (ii) Such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.

#### Rule 8—Action to Avoid Collision

- (a) Any action shall be taken in accordance with the Rules of this Part and, if the circumstances of the case admit, be

positive, made in ample time and with due regard to the observance of good seamanship.

- (b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed should be avoided.
- (c) If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.
- (d) Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.
- (e) If necessary to avoid collision or allow more time to assess the situation, a vessel may slacken her speed or take all way off by stopping or reversing her means of propulsion.
- (f) (i) A vessel which, by any of these rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel. (ii) A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the rules of this part. (iii) A vessel, the passage of which is not to be impeded remains fully obliged to comply with the rules of this part when the two vessels are approaching one another so as to involve risk of collision.

#### Section/Subpart II—Conduct of Vessels in Sight of One Another

##### Rule 11—Application

Rules 11–18 apply to vessels in sight of one another.

##### Rule 13—Overtaking

- (a) Notwithstanding anything contained in the Rules, any vessel overtaking any other shall keep out of the way of the vessel being overtaken.
- (b) A vessel shall be deemed to be overtaking when coming up with a another vessel from a direction more than 22.5 degrees abaft her beam, that is, in such a position with

reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.

- (c) When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.
- (d) Any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

#### Rule 14—Head-on Situation

- (a) *Unless otherwise agreed* [using onboard communications] when two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.
- (b) Such a situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights of the other in a line or nearly in a line or both sidelights and by day she observes the corresponding aspect of the other vessel.
- (c) When a vessel is in any doubt as to whether such a situation exists she shall assume that it does exist and act accordingly. . . .

#### Rule 15—Crossing Situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel. . . .

#### Rule 16—Action by Give-way Vessel

Every vessel which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to *keep well clear*.

#### Rule 17—Action by Stand-on Vessel

- (a) (i) Where one of two vessels is to keep out of the way, the other shall keep her course and speed.
  - (ii) *The latter vessel may however take action to avoid collision by her maneuver alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.*

- (b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.
- (c) A power-driven vessel which takes action in a crossing situation in accordance with subparagraph (a)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side.
- (d) This Rule does not relieve the give-way vessel of her obligation to keep out of the way.

**Rule 18—Responsibilities Between Vessels**

Except where Rules 9, 10, and 13 otherwise require:

- (a) A power-driven vessel underway shall keep out of the way of:
  - (ii) a vessel not under command;
  - (iii) a vessel restricted in her ability to maneuver;
  - (iv) a vessel engaged in fishing;
  - (v) a sailing vessel.

\* \* \*

- (e) A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the Rules of this Part.
- (f) (i) A WIG [wing in ground-effect] craft shall, when taking off, landing and in flight near the surface, keep well clear of all other vessels and avoid impeding their navigation;
  - (ii) a WIG craft operating on the water surface shall comply with the Rules of this Part as a power-driven vessel.

**Section/Subpart III—Conduct of Vessels in Restricted Visibility**

**Rule 19—Conduct of Vessels in Restricted Visibility**

- (a) This Rule applies to vessels *not in sight of one another* when navigating in or near an area of restricted visibility.
- (b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate maneuver.
- (c) Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when

complying with the Rules [of Section I of this Part, Rules 4 through 10].

- (d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration in course, so far as possible the following shall be avoided:
  - (i) An alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken;
  - (ii) An alteration of course toward a vessel abeam or abaft the beam.<sup>787</sup>

§ 91.3 Responsibility and authority of the pilot in command.

- (a) The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.
- (b) In an in-flight emergency requiring immediate action, the pilot in command may deviate from any rule of this part to the extent required to meet that emergency.
- (c) Each pilot in command who deviates from a rule under paragraph (b) of this section shall, upon the request of the Administrator, send a written report of that deviation to the Administrator.

C. APPENDIX C: REGULATORY GUIDANCE

6-4-1. Two-way Radio Communications Failure

- a. It is virtually impossible to provide regulations and procedures applicable to all possible situations associated with two-way radio communications failure. During two-way radio communications failure, when confronted by a situation not covered in the regulation, pilots are expected to exercise good judgment in whatever action they elect to take. Should the situation so dictate they should not be reluctant to use the emergency action contained in 14 CFR Section 91.3(b).
- b. Whether two-way communications failure constitutes an emergency depends on the circumstances, and in any event, it is a determination made by the pilot. 14 CFR Section 91.3(b) authorizes a pilot to deviate from any rule in

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<sup>787</sup> 14 C.F.R. § 91.3 (2012).



Subparts A and B to the extent required to meet an emergency.

- c. In the event of two-way radio communications failure, ATC service will be provided on the basis that the pilot is operating in accordance with 14 CFR.

Section 91.185. A pilot experiencing two-way communications failure should (unless emergency authority is exercised) comply with 14 CFR Section 91.185. . . .<sup>788</sup>

6-1-2. Emergency Condition—Request Assistance Immediately

- a. An emergency can be either a *distress* or *urgency* condition as defined in the Pilot/Controller Glossary. Pilots do not hesitate to declare an emergency when they are faced with *distress* conditions such as fire, mechanical failure, or structural damage. However, some are reluctant to report an *urgency* condition when they encounter situations which may not be immediately perilous, but are potentially catastrophic. An aircraft is in at least an *urgency* condition the moment the pilot becomes doubtful about position, fuel endurance, weather, or any other condition that could adversely affect flight safety. This is the time to ask for help, not after the situation has developed into a *distress* condition.
- b. Pilots who become apprehensive for their safety for any reason should *request assistance immediately*. Ready and willing help is available in the form of radio, radar, direction finding stations and other aircraft. Delay has caused accidents and cost lives. *Safety is not a luxury! Take action!*

AIM 7-6-3 Near Midair Collision Reporting

- a. Purpose and Data Uses. The primary purpose of the Near Midair Collision (NMAC) Reporting Program is to provide information for use in enhancing the safety and efficiency of the National Airspace System. Data obtained from NMAC reports are used by the FAA to improve the quality of FAA services to users and to develop programs, policies, and procedures aimed at the reduction of NMAC occurrences. All NMAC reports are thoroughly investigated by Flight Standards Facilities in coordination with Air Traffic Facilities. Data from these investigations are transmitted to FAA Headquarters in Washington, DC, where they are compiled and analyzed, and where safety programs and recommendations are developed.

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<sup>788</sup> AIM, *supra* note 15, at ch. 10.

- b. Definition. A near midair collision is defined as an incident associated with the operation of an aircraft in which a possibility of collision occurs as a result of proximity of less than 500 feet to another aircraft, or a report is received from a pilot or a flight crew member stating that a collision hazard existed between two or more aircraft.
- c. Reporting Responsibility. It is the responsibility of the pilot and/or flight crew to determine whether a near midair collision did actually occur and, if so, to initiate a NMAC report. Be specific, as ATC will not interpret a casual remark to mean that a NMAC is being reported. The pilot should state 'I wish to report a near midair collision.'
- d. Where to File Reports. Pilots and/or flight crew members involved in NMAC occurrences are urged to report each incident immediately:
  - 1. By radio or telephone to the nearest FAA ATC facility or FSS.
  - 2. In writing, in lieu of the above, to the nearest Flight Standards District Office (FSDO).
- e. Items to be Reported.
  - 1. Date and time (UTC) of incident.
  - 2. Location of incident and altitude.
  - 3. Identification and type of reporting aircraft, aircrew destination, name and home base of pilot.
  - 4. Identification and type of other aircraft, aircrew destination, name and home base of pilot.
  - 5. Type of flight plans; station altimeter setting used.
  - 6. Detailed weather conditions at altitude or flight level.
  - 7. Approximate courses of both aircraft; indicate if one or both aircraft were climbing or descending.
  - 8. Reported separation in distance at first sighting, proximity at closest point horizontally and vertically, and length of time in sight prior to evasive action.
  - 9. Degree of evasive action taken, if any (from both aircraft, if possible).
  - 10. Injuries, if any.
- f. Investigation. The FSDO in whose area the incident occurred is responsible for the investigation and reporting of NMACs.
- g. Existing radar, communication, and weather data will be examined in the conduct of the investigation. When possible, all cockpit crew members will be interviewed regarding factors involving the NMAC incident. Air traffic controllers

will be interviewed in cases where one or more of the involved aircraft was provided ATC service. Both flight and ATC procedures will be evaluated. When the investigation reveals a violation of an FAA regulation, enforcement action will be pursued.

Aeronautical Information Manual (AIM):

8-1-6. Vision in Flight

c. Scanning for Other Aircraft

1. Scanning the sky for other aircraft is a key factor in collision avoidance. It should be used continuously by the pilot and copilot (or right seat passenger) to cover all areas of the sky visible from the cockpit. Although pilots must meet specific visual acuity requirements, the ability to read an eye chart does not ensure that one will be able to efficiently spot other aircraft. Pilots must develop an effective scanning technique which maximizes one's visual capabilities. The probability of spotting a potential collision threat obviously increases with the time spent looking outside the cockpit. Thus, one must use timesharing techniques to efficiently scan the surrounding airspace while monitoring instruments as well.
2. While the eyes can observe an approximate 200 degree arc of the horizon at one glance, only a very small center area called the fovea, in the rear of the eye, has the ability to send clear, sharply focused messages to the brain. All other visual information that is not processed directly through the fovea will be of less detail. An aircraft at a distance of 7 miles which appears in sharp focus within the foveal center of vision would have to be as close as 7/10 of a mile in order to be recognized if it were outside of foveal vision. Because the eyes can focus only on this narrow viewing area, effective scanning is accomplished with a series of short, regularly spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed 10 degrees, and each area should be observed for at least 1 second to enable detection. Although horizontal back-and-forth eye movements seem preferred by most pilots, each pilot should develop a scanning pattern that is most comfortable and then adhere to it to assure optimum scanning.
3. Studies show that the time a pilot spends on visual tasks inside the cabin should represent no more than 1/4 to 1/3 of the scan time outside, or no more than 4 to 5 seconds

on the instrument panel for every 16 seconds outside. Since the brain is already trained to process sight information that is presented from left to right, one may find it easier to start scanning over the left shoulder and proceed across the windshield to the right.

4. Pilots should realize that their eyes may require several seconds to refocus when switching views between items in the cockpit and distant objects. The eyes will also tire more quickly when forced to adjust to distances immediately after close-up focus, as required for scanning the instrument panel. Eye fatigue can be reduced by looking from the instrument panel to the left wing past the wing tip to the center of the first scan quadrant when beginning the exterior scan. After having scanned from left to right, allow the eyes to return to the cabin along the right wing from its tip inward. Once back inside, one should automatically commence the panel scan.
5. Effective scanning also helps avoid “empty-field myopia.” This condition usually occurs when flying above the clouds or in a haze layer that provides nothing specific to focus on outside the aircraft. This causes the eyes to relax and seek a comfortable focal distance which may range from 10 to 30 feet. For the pilot, this means looking without seeing, which is dangerous.

#### 8-1-8. Judgment Aspects of Collision Avoidance

- a. Introduction. The most important aspects of vision and the techniques to scan for other aircraft are described in paragraph 8-1-6, Vision in Flight. Pilots should also be familiar with the following information to reduce the possibility of mid-air collisions.
- b. Determining Relative Altitude. Use the horizon as a reference point. If the other aircraft is above the horizon, it is probably on a higher flight path. If the aircraft appears to be below the horizon, it is probably flying at a lower altitude.
- c. Taking Appropriate Action. Pilots should be familiar with rules on right-of-way, so if an aircraft is on an obvious collision course, one can take immediate evasive action, preferably in compliance with applicable Federal Aviation Regulations.
- d. Consider Multiple Threats. The decision to climb, descend, or turn is a matter of personal judgment, but one should anticipate that the other pilot may also be making a

quick maneuver. Watch the other aircraft during the maneuver and begin your scanning again immediately since there may be other aircraft in the area.

- e. Collision Course Targets. Any aircraft that appears to have no relative motion and stays in one scan quadrant is likely to be on a collision course. Also, if a target shows no lateral or vertical motion, but increases in size, *take evasive action*.
- f. Recognize High Hazard Areas.
  - 1. Airways, especially near VORs, and Class B, Class C, Class D, and Class E surface areas are places where aircraft tend to cluster.
  - 2. Remember, most collisions occur during days when the weather is good. Being in a "radar environment" still requires vigilance to avoid collisions.
- g. Cockpit Management. Studying maps, checklists, and manuals before flight, with other proper preflight planning; e.g., noting necessary radio frequencies and organizing cockpit materials, can reduce the amount of time required to look at these items during flight, permitting more scan time.
- h. Windshield Conditions. Dirty or bug-smeared windshields can greatly reduce the ability of pilots to see other aircraft. Keep a clean windshield.
- i. Visibility Conditions. Smoke, haze, dust, rain, and flying towards the sun can also greatly reduce the ability to detect targets.
- j. Visual Obstructions in the Cockpit.
  - 1. Pilots need to move their heads to see around blind spots caused by fixed aircraft structures, such as doorposts, wings, etc. It will be necessary at times to maneuver the aircraft; e.g., lift a wing, to facilitate seeing.
  - 2. Pilots must ensure curtains and other cockpit objects; e.g., maps on glare shield, are removed and stowed during flight.
- k. Lights On.
  - 1. Day or night, use of exterior lights can greatly increase the conspicuity of any aircraft.
  - 2. Keep interior lights low at night.
- l. ATC Support. ATC facilities often provide radar traffic advisories on a workload-permitting basis. Flight through Class C and Class D airspace requires communication with ATC. Use this support whenever possible or when required.

## 4-4-15. Use of Visual Clearing Procedures

- a. Before Takeoff. Prior to taxiing onto a runway or landing area in preparation for takeoff, pilots should scan the approach areas for possible landing traffic and execute the appropriate clearing maneuvers to provide them a clear view of the approach areas.
- b. Climbs and Descents. During climbs and descents in flight conditions which permit visual detection of other traffic, pilots should execute gentle banks, left and right at a frequency which permits continuous visual scanning of the airspace about them.
- c. Straight and Level. Sustained periods of straight and level flight in conditions which permit visual detection of other traffic should be broken at intervals with appropriate clearing procedures to provide effective visual scanning.
- d. Traffic Pattern. Entries into traffic patterns while descending create specific collision hazards and should be avoided.
- e. Traffic at VOR Sites. All operators should emphasize the need for sustained vigilance in the vicinity of VORs and airway intersections due to the convergence of traffic.
- f. Training Operations. Operators of pilot training programs are urged to adopt the following practices:
  1. Pilots undergoing flight instruction at all levels should be requested to verbalize clearing procedures (call out “clear” left, right, above, or below) to instill and sustain the habit of vigilance during maneuvering.
  2. High-wing airplane. Momentarily raise the wing in the direction of the intended turn and look.
  3. Low-wing airplane. Momentarily lower the wing in the direction of the intended turn and look.
  4. Appropriate clearing procedures should precede the execution of all turns including chandelles, lazy eights, stalls, slow flight, climbs, straight and level, spins, and other combination maneuvers.<sup>789</sup>

## Advisory Circular 90-48C, “Pilots’ Role in Collision Avoidance”

1. PURPOSE. This advisory circular is issued for the purpose of alerting all pilots to the potential hazards of midair collision and near midair collision, and to emphasize those basic problem areas related to the human causal factors where improvements in pilot education, operating practices, procedures, and improved scanning techniques are needed to reduce midair conflicts.

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<sup>789</sup> AIM, *supra* note 15, at 4-4-15.

a. "See and Avoid" Concept

- (1) The flight rules prescribed in Part 91 of the Federal Aviation Regulations (FAR) set forth the concept of "See and Avoid." This concept requires that vigilance shall be maintained at all times, by each person operating an aircraft, regardless of whether the operation is conducted under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR).
- (2) Pilots should also keep in mind their responsibility for continuously maintaining a vigilant lookout regardless of the type of aircraft being flown. Remember that most MAC [midair collision] accidents and reported NMAC [near midair collision] incidents occurred during good VFR weather conditions and during the hours of daylight.

b. Visual Scanning

- (1) Pilots should remain constantly alert to all traffic movement within their field of vision as well as periodically scanning the entire visual field outside of their aircraft to ensure detection of conflicting traffic. Remember that the performance capabilities of many aircraft, in both speed and rates of climb/descent, result in high closure rates limiting the time available for detection, decision, and evasive action. (See the "Distance-Speed-Time" chart in Appendix 1.)
- (2) The probability of spotting a potential collision threat increases with the time spent looking outside, but certain techniques may be used to increase the effectiveness of the scan time. The human eyes tend to focus somewhere, even in a featureless sky. In order to be most effective, the pilot should shift glances and refocus at intervals. Most pilots do this in the process of scanning the instrument panel, but it is also important to focus outside to set up the visual system for effective target acquisition.
- (3) Pilots should also realize that their eyes may require several seconds to refocus when switching views between items in the cockpit and distant objects. Proper scanning requires the constant sharing of attention with other piloting tasks, thus it is easily degraded by such psychophysiological conditions such as fatigue, boredom, illness, anxiety, or preoccupation.

- (4) Effective scanning is accomplished with a series of short, regularly-spaced eye movements that bring successive areas of the sky into the central visual field. Each movement should not exceed 10 degrees, and each area should be observed for at least 1 second to enable detection. Although horizontal back-and-forth eye movements seem preferred by most pilots, each pilot should develop a scanning pattern that is most comfortable and then adhere to it to assure optimum scanning.
  - (5) Peripheral vision can be most useful in spotting collision threats from other aircraft. Each time a scan is stopped and the eyes are refocused, the peripheral vision takes on more importance because it is through this element that movement is detected. Apparent movement is almost always the first perception of a collision threat and probably the most important, because it is the discovery of a threat that triggers the events leading to proper evasive action. It is essential to remember, however, that if another aircraft appears to have no relative motion, it is likely to be on a collision course with you. If the other aircraft shows no lateral or vertical motion, but is increasing in size, take immediate evasive action.
  - (6) Visual search at night depends almost entirely on peripheral vision. In order to perceive a very dim lighted object in a certain direction, the pilot should not look directly at the object, but scan the area adjacent to it. Short stops, of a few seconds, in each scan will help to detect the light and its movement.
  - (7) Lack of brightness and color contrast in daytime and conflicting ground lights at night increase the difficulty of detecting other aircraft.
  - (8) Pilots are reminded of the requirement to move one's head in order to search around the physical obstructions, such as door and window posts. The doorpost can cover a considerable amount of sky, but a small head movement may uncover an area which might be concealing a threat.
- c. Clearing Procedures.
- (1) Pilots should:
    - (i) Prior to taxiing onto a runway or landing area for takeoff, scan the approach areas for possible land-



ing traffic by maneuvering the aircraft to provide a clear view of such areas. It is important that this be accomplished even though a taxi or takeoff clearance has been received.

(ii) During climbs and descents in flight conditions which permit visual detection of other traffic, execute gentle banks left and right at a frequency which permits continuous visual scanning of the airspace about them.

(iii) Execute appropriate clearing procedures before all turns, abnormal maneuvers, or acrobatics.

d. Airspace, Flight Rules, and Operational Environment.

(1) Pilots should be aware of the type of airspace in which they intend to operate in order to comply with the flight rules applicable to that airspace. Aeronautical information concerning the National Airspace System is disseminated by three methods: aeronautical charts (primary); the Airman's Information Manual (AIM); and the Notices to Airmen (NOTAM) system. The general operating and flight rules governing the operation of aircraft within the United States are contained in Part 91 of the FAR.

(2) Pilots should:

(i) Use currently effective aeronautical charts for the route or area in which they intend to operate.

(ii) Note and understand the aeronautical legend and chart symbols related to airspace information depicted on aeronautical charts.

(iii) Develop a working knowledge of the various airspace segments, including the vertical and horizontal boundaries.

(iv) Develop a working knowledge of the specific flight rules (FAR 91) governing operation of aircraft within the various airspace segments.

(v) Use the AIM. The Basic Flight Information and ATC Procedures describe the airspace segments and the basic pilot responsibilities for operating in such airspace.

(vi) Contact the nearest FAA Flight Service Station for any pertinent NOTAMS pertaining to their area of operation.

(3) Pilots should also be familiar with, and exercise caution, in those operational environments where they

may expect to find a high volume of traffic or special types of aircraft operation. These areas include Terminal Radar Service Areas (TRSA's), airport traffic patterns, particularly at airports without a control tower; airport traffic areas (below 3,000 feet above the surface within five statute miles of an airport with an operating control tower); terminal control areas; control zones, including any extensions; Federal airways; vicinity of VOR's; restricted areas; warning areas; alert areas; Military Operating Areas (MOA); intensive student jet training areas; military low-level high-speed training routes; instrument approach areas; and areas of high density jet arrival/departure routings, especially in the vicinity of major terminals and military bases.

- e. Use of Communications Equipment and Air Traffic Advisory Services.
  - (1) One of the major factors contributing to the likelihood of NMAC incidents in terminal areas that have an operating air traffic control (ATC) system has been the mix of *known* arriving and departing aircraft with *unknown* traffic. The known aircraft are generally in radio contact with the controlling facility (local, approach, or departure control) and the other aircraft are neither in two-way radio contact nor identified by ATC at the time of the NMAC. This precludes ATC from issuing traffic advisory information to either aircraft.
  - (2) Although pilots should adhere to the necessary communications requirements when operating VFR, they are also urged to take advantage of the air traffic advisory services available to VFR aircraft.
  - (3) Pilots should:
    - (i) Use the AIM.
      - a. The basic AIM contains a section dealing with services available to pilots, including information on VFR advisory services, radar traffic information services for VFR pilots, and recommended traffic advisory practices at nontower airports.
      - b. The airport/facility directory contains a list of all major airports showing the services available

to pilots and the applicable communication frequencies.

- (ii) Develop a working knowledge of those facilities providing traffic advisory services and the area in which they give these services.
- (iii) Initiate radio contact with the appropriate terminal radar or nonradar facility when operating within the perimeters of the advertised service areas or within 15 miles of the facility when no service area is specified.
- (iv) When it is not practical to initiate radio contact for traffic information, at least monitor the appropriate facility communication frequency, particularly when operating in or through arrival/departure routes and instrument approach areas.
- (v) Remember that controller observation of aircraft in the terminal area is often limited by distance, depth perception, aircraft conspicuity, and other normal visual acuity problems. Limitations of radar (when available), traffic volume, controller workload, unknown traffic, etc., may prevent the controller from providing timely traffic advisory information. Traffic advisories are secondary to the controllers' primary duties (which are separating aircraft under their control and issuing safety advisories when aware of safety conflicts). Therefore, the pilot is responsible for seeing and avoiding other traffic. Traffic advisories should be requested and used when available to assist the pilot to see and avoid other traffic by assisting, but not substituting in any way, the pilot's own visual scanning. It is important to remember that advisories which air traffic control may provide are not intended to lessen in any manner the pilot's obligation to properly scan to see and avoid traffic.

f. Airport Traffic Patterns.

- (1) A significant number of midair collisions, as well as near midair collisions, have occurred within the traffic pattern environment.
- (2) Pilots should:
  - (i) When operating at tower-controlled airports, maintain two-way radio contact with the tower while within the airport traffic area. Make every

effort to see and properly avoid any aircraft pointed out by the tower, or any other aircraft which may be in the area and unknown to the tower.

- (ii) When entering a known traffic pattern at a nontower airport, keep a sharp lookout for other aircraft in the pattern. Enter the pattern in level flight and allow plenty of spacing to avoid overtaking or cutting any aircraft out of the pattern.
- (iii) When approaching an unfamiliar airport fly over or circle the airport at least 500 feet above traffic pattern altitude (usually at 2,000 feet or more above the surface) to observe the airport layout, any local traffic in the area, and the wind and traffic direction indicators. Never descend into the traffic pattern from directly above the airport.
- (iv) Be particularly alert before turning to the base leg, final approach course, and during the final approach to landing. At nontower airports, avoid entering the traffic pattern on the base leg or from a straight-in approach to the landing runway.
- (v) Compensate for blind spots due to aircraft design and flight attitude by moving your head or maneuvering the aircraft.

g. Flying In Formation.

- (1) Several midair collisions have occurred which involved aircraft on the same mission, with each pilot aware of the other's presence.
- (2) Pilots who are required, by the nature of their operations, to fly in pairs or in formation are cautioned to:
  - (i) Recognize the high statistical probability of their involvement in midair collisions.
  - (ii) Make sure that adequate preflight preparations are made and the procedures to be followed are understood by all pilots intending to participate in the mission.
  - (iii) Always keep the other aircraft in sight despite possible distraction and preoccupation with other mission requirements.

- (iv) Avoid attempting formation flight without having obtained instruction and attained the skill necessary for conducting such operations.<sup>790</sup>

Appendix 1 to Advisory Circular 90-48C<sup>791</sup>

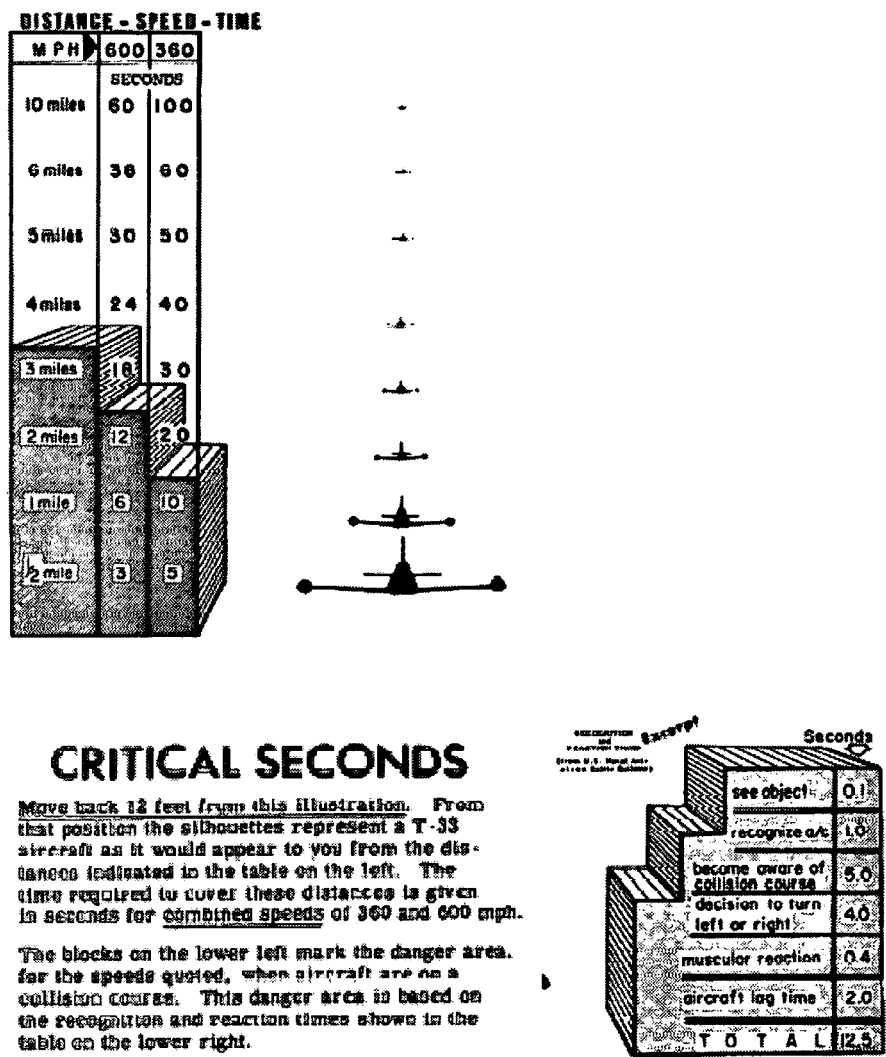


FIGURE 1: CRITICAL SECONDS CHART

<sup>790</sup> See FED. AVIATION ADMIN., ADVISORY CIRCULAR NO. 90-48C, PILOTS' ROLE IN COLLISION AVOIDANCE (1983) [hereinafter A.C. 90-48C].

<sup>791</sup> A human being needs about ten seconds from the sighting of a target to initiating avoiding action. The other two seconds in the table are aircraft response time. The ten seconds is a minimum to avoid collision and does not guarantee a passage that is "well clear."

## AERONAUTICAL INFORMATION MANUAL (AIM) 2013

## SECTION 2. CONTROLLED AIRSPACE

## 3-2-3 Class B Airspace

- e. ATC Clearance and Separation. An ATC clearance is required to enter and operate within Class B airspace. VFR pilots are provided sequencing and separation from other aircraft while operating within Class B airspace.

- 3. This program is not to be interpreted as relieving pilots of their responsibilities to see and avoid other traffic operating in basic VFR weather conditions, to adjust their operations and flight path as necessary to preclude serious wake encounters, to maintain appropriate terrain and obstruction clearance or to remain in weather conditions equal to or better than the minimums required by 14 C.F.R. section 91.155. Approach control should be advised and a revised clearance or instruction obtained when compliance with an assigned route, heading and/or altitude is likely to compromise pilot responsibility with respect to terrain and obstruction clearance, vortex exposure, and weather minimums.<sup>792</sup>

## 3-2-4 Class C Airspace

## (k) Secondary Airports

[Subsections 1–3 note that secondary airports may underlie class C airspace. These subsections discuss under what conditions aircraft operating to or from these secondary airports will be provided Class C Airspace services].

- 4. This program is not to be interpreted as relieving pilots of their responsibilities to see and avoid other traffic operating in basic VFR weather conditions, to adjust their operations and flight path as necessary to preclude serious wake encounters, to maintain appropriate terrain and obstruction clearance or to remain in weather conditions equal to or better than the minimums required by 14 C.F.R. Section 91.155. Approach control should be advised and a revised clearance or instruction obtained when compliance with an assigned route, heading and/or altitude is likely to compromise pilot responsibility with respect to terrain and

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<sup>792</sup> AIM, *supra* note 15, at 3-2-3(e)(3).

obstruction clearance, vortex exposure, and weather minimums.<sup>793</sup>

## SECTION 3 CLASS G AIRSPACE

### 3-3-1 General

Class G airspace (uncontrolled) is that portion of airspace that has not been designated as Class A, Class B, Class C, Class D, or Class E airspace.

### 3-3-2. VFR Requirements

Rules governing VFR flight have been adopted to assist the pilot in meeting the responsibility to see and avoid other aircraft. Minimum flight visibility and distance from clouds required for VFR flight are contained in 14 CFR Section 91.155.<sup>794</sup>

## CHAPTER 4. AIR TRAFFIC CONTROL

### Section 1. Services Available to Pilots

#### 4-1-18. Terminal Radar Services for VFR Aircraft

[Subsections (a)–(d) describe radar sequencing and separation service provided VFR aircraft operating in a TRSA]

- e. PILOT RESPONSIBILITY. THESE SERVICES ARE NOT TO BE INTERPRETED AS RELIEVING PILOTS OF THEIR RESPONSIBILITIES TO SEE AND AVOID OTHER TRAFFIC OPERATING IN BASIC VFR WEATHER CONDITIONS, TO ADJUST THEIR OPERATIONS AND FLIGHT PATH AS NECESSARY TO PRECLUDE SERIOUS WAKE ENCOUNTERS, TO MAINTAIN APPROPRIATE TERRAIN AND OBSTRUCTION CLEARANCE, OR TO REMAIN IN WEATHER CONDITIONS EQUAL TO OR BETTER THAN THE MINIMUMS REQUIRED BY 14 CFR SECTION 91.155. WHENEVER COMPLIANCE WITH AN ASSIGNED ROUTE, HEADING AND/OR ALTITUDE IS LIKELY TO COMPROMISE PILOT RESPONSIBILITY RESPECTING TERRAIN AND OBSTRUCTION CLEARANCE, VORTEX EXPOSURE, AND WEATHER MINIMUMS, APPROACH CONTROL SHOULD BE SO ADVISED AND A REVISED CLEARANCE OR INSTRUCTION OBTAINED (emphasis omitted).

## CHAPTER 7. VISUAL<sup>795</sup>

### Section 3. VFR-ON-TOP

#### 7-3-1. VFR-ON-TOP

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<sup>793</sup> *Id.* at 3-2-4(f) (4).

<sup>794</sup> *Id.* at 3-3-2.

<sup>795</sup> FAA ORDER No. JO 7110.65U, *supra* note 66.

- a. You may clear an aircraft to maintain “VFR-on-top” if the pilot of an aircraft on an IFR flight plan requests the clearance.

PHRASEOLOGY- MAINTAIN VFR-ON-TOP.

NOTE-

1. When an aircraft has been cleared to maintain “VFR-on-top,” the pilot is responsible to fly at an appropriate VFR altitude, comply with VFR visibility and distance from cloud criteria, and to be vigilant so as to see and avoid other aircraft. The pilot is also responsible to comply with instrument flight rules applicable to the flight (e.g., adherence to ATC clearances).<sup>796</sup>

6-1-1. Pilot Responsibility and Authority

- a. The pilot-in-command of an aircraft is directly responsible for and is the final authority as to the operation of that aircraft. In an emergency requiring *immediate* action, the pilot-in-command may deviate from any rule in 14 C.F.R. Part 91, Subpart A, General, and Subpart B, Flight Rules, to the extent required to meet that emergency.
- b. If the emergency authority of 14 CFR Section 91.3(b) is used to deviate from the provisions of an ATC clearance, the pilot-in-command must notify ATC as soon as possible and obtain an amended clearance.
- c. *Unless deviation is necessary under the emergency authority of 14 CFR Section 91.3, pilots of IFR flights experiencing two-way radio communications failure are expected to adhere to the procedures prescribed under [FAR 91.185] “IFR operations, two-way radio communications failure.”*<sup>797</sup>

6-4-1. Two-way Radio Communications Failure

- a. It is virtually impossible to provide regulations and procedures applicable to all possible situations associated with two-way radio communications failure. During two-way radio communications failure, when confronted by a situation not covered in the regulation, pilots are expected to exercise good judgment in whatever action they elect to take. Should the situation so dictate they should not be reluctant to use the emergency action contained in 14 CFR Section 91.3(b).
- b. *Whether two-way communications failure constitutes an emergency depends on the circumstances, and in any event, it is a determi-*

<sup>796</sup> *Id.* at 7-3-1.

<sup>797</sup> AIM, *supra* note 15, at 6-6-1(a)–(c) (emphasis added).



nation made by the pilot. 14 C.F.R. Section 91.3(b) authorizes a pilot to deviate from any rule in Subparts A and B to the extent required to meet an emergency.

- c. In the event of two-way radio communications failure, *ATC service will be provided on the basis that the pilot is operating in accordance with 14 CFR Section 91.185. A pilot experiencing two-way communications failure should (unless emergency authority is exercised) comply with 14 CFR Section 91.185[.]*<sup>798</sup>

**NOTE** [on 91.185(b) VFR Conditions]

The primary objective of this provision in 14 CFR Section 91.185 [to maintain VFR and land] is to preclude extended IFR operation by these aircraft within the ATC system. Pilots should recognize that operation under these conditions may unnecessarily as well as adversely affect other users of the airspace, since ATC may be required to reroute or delay other users in order to protect the failure aircraft. However, it is not intended that the requirement to “land as soon as practicable” be construed to mean “as soon as possible.” Pilots retain the prerogative of exercising their best judgment and are not required to land at an unauthorized airport, at an airport unsuitable for the type of aircraft flown, or to land only minutes short of their intended destination. . . .<sup>799</sup>

**6-4-2. Transponder Operation During Two-way Communications Failure**

- a. If an aircraft with a coded radar beacon transponder experiences a loss of two-way radio capability, the pilot should adjust the transponder to reply on Mode A/3, Code 7600.
- b. The pilot should understand that the aircraft may not be in an area of radar coverage.<sup>800</sup>

**b. Aeronautical Information Manual**

**5-5-9. Speed Adjustments**

- a. Pilot.
  - 1. Advises ATC any time cruising airspeed varies plus or minus 5 percent or 10 knots, whichever is greater, from that given in the flight plan.
  - 2. Complies with speed adjustments from ATC unless:
    - (a) The minimum or maximum safe airspeed for any particular operation is greater or less than the requested airspeed. In such cases, advises ATC.

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<sup>798</sup> *Id.*

<sup>799</sup> *Id.*

<sup>800</sup> *Id.* at 6-4-2(a)–(b) (emphasis added).

*NOTE-*

*It is the pilot's responsibility and prerogative to refuse speed adjustments considered excessive or contrary to the aircraft's operating specifications.*

- (b) Operating at or above 10,000 feet MSL on an ATC assigned SPEED ADJUSTMENT of more than 250 knots IAS and subsequent clearance is received for descent below 10,000 feet MSL. In such cases, pilots are expected to comply with 14 C.F.R. Section 91.117(a).
- 3. When complying with speed adjustment assignments, maintains an indicated airspeed within plus or minus 10 knots or 0.02 Mach number of the specified speed.
- b. Controller.
  - 1. Assigns speed adjustments to aircraft when necessary but not as a substitute for good vectoring technique.
  - 2. Adheres to the restrictions published in the FAAO JO 7110.65, Air Traffic Control, as to when speed adjustment procedures may be applied.
  - 3. Avoids speed adjustments requiring alternate decreases and increases.
  - 4. Assigns speed adjustments to a specified IAS (KNOTS)/Mach number or to increase or decrease speed using increments of 10 knots or multiples thereof.
  - 5. Terminates ATC-assigned speed adjustments when no longer required by issuing further instructions to pilots in the following manner:
    - (a) Advises pilots to “resume normal speed” when the aircraft is on a heading, random routing, charted procedure, or route without published speed restrictions

[. . .]

- 6. Gives due consideration to aircraft capabilities to reduce speed while descending.
- 7. Does not assign speed adjustments to aircraft at or above FL390 without pilots consent.<sup>801</sup>

FAA AIR TRAFFIC CONTROL Order JO 7110.65V<sup>802</sup>

#### 5-7-1. APPLICATION

Keep speed adjustments to the minimum necessary to achieve or maintain required or desired spacing. Avoid adjustments re-

<sup>801</sup> *Id.* at 5-5-9.

<sup>802</sup> FAA ORDER NO. JO 7110.65U, *supra* note 66 (incorporating chg. 3 (2013)).

quiring alternate decreases and increases. Terminate speed adjustments when no longer needed.

**NOTE—**

*It is the pilot's responsibility and prerogative to refuse speed adjustment that he/she considers excessive or contrary to the aircraft's operating specifications.*

**5-7-4. TERMINATION**

Advise aircraft when speed adjustment is no longer needed.

**PHRASEOLOGY—**

**RESUME NORMAL SPEED.**

**NOTE—**

*"Resume normal speed" is only used where there is not underlying published speed restriction. It does not delete speed restrictions on upcoming segments of flight and does not relieve the pilot of those speed restrictions which are applicable to 14 C.F.R. Section 91.117.<sup>803</sup>*

**5-3-5. Airway or Route Course Changes**

- a. Pilots of aircraft are required to adhere to airways or routes being flown. Special attention must be given to this requirement during course changes. Each course change consists of variables that make the technique applicable in each case a matter only the pilot can resolve. Some variables which must be considered are turn radius, wind effect, airspeed, degree of turn, and cockpit instrumentation. An early turn, as illustrated below, is one method of adhering to airways or routes. The use of any available cockpit instrumentation, such as Distance Measuring Equipment, may be used by the pilot to lead the turn when making course changes. *This is consistent with the intent of 14 C.F.R. Section 91.181, which requires pilots to operate along the centerline of an airway and along the direct course between navigational aids or fixes.*
- b. Turns which begin at or after fix passage may exceed airway or route boundaries. FIG. 5-3-1 contains an example flight track depicting this, together with an example of an early turn.
- c. Without such actions as leading a turn, aircraft operating in excess of 290 knots true air speed (TAS) can exceed the normal airway or route boundaries depending on the amount of course change required, wind direction and velocity, the character of the turn fix (DME, overhead navigation aid, or intersection), and the pilot's technique in

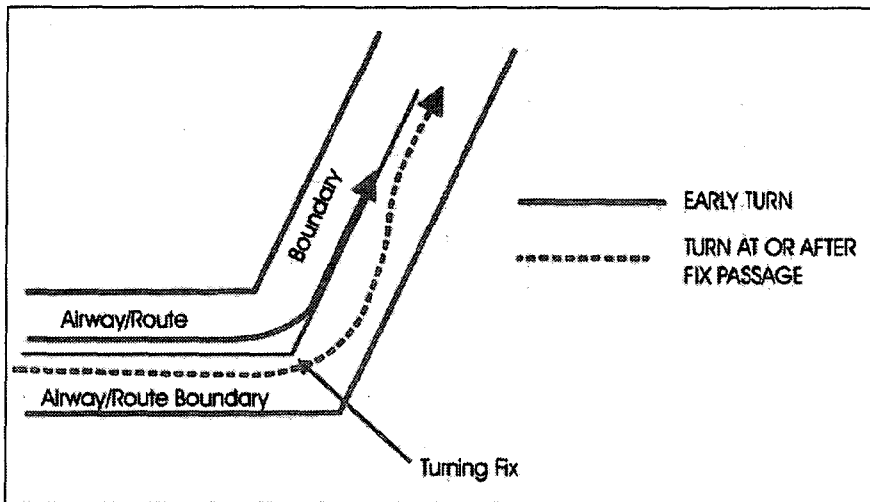
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<sup>803</sup> *Id.*

making a course change. For example, a flight operating at 17,000 feet MSL with a TAS of 400 knots, a 25 degree bank, and a course change of more than 40 degrees would exceed the width of the airway or route; i.e., 4 nautical miles each side of centerline. However, in the airspace below 18,000 feet MSL, operations in excess of 290 knots TAS are not prevalent and the provision of additional IFR separation in all course change situations for the occasional aircraft making a turn in excess of 290 knots TAS creates an unacceptable waste of airspace and imposes a penalty upon the preponderance of traffic which operate at low speeds. Consequently, the FAA expects pilots to lead turns and take other actions they consider necessary during course changes to adhere as closely as possible to the airways or route being flown.<sup>804</sup>

FIGURE 2

FIG 5-3-1  
Adhering to Airways or Routes



#### FAA ADVISORY CIRCULARS

A.C. 20-30B, Aircraft Position Light and Anticollision Light Installations

1. PURPOSE. This circular sets forth acceptable means, but not the only means, of showing compliance with the Federal Avi-

<sup>804</sup> AIM, *supra* note 15, at 5-3-5(a)-(c) (emphasis added).

ation Regulations (FAR) applicable to installed position lights and anticollision lights.<sup>805</sup>

4. *Aeronautics Information Manual, Chapter 4-4-16 (2014)*

4-4-16. Traffic Alert and Collision Avoidance System (TCAS I & II)

- a. TCAS I provides proximity warning only, to assist the pilot in the visual acquisition of intruder aircraft. No recommended avoidance maneuvers are provided nor authorized as a direct result of a TCAS I warning. It is intended for use by smaller commuter aircraft holding 10 to 30 passenger seats, and general aviation aircraft.
- b. TCAS II provides traffic advisories (TAs) and resolution advisories (RAs). Resolution advisories provide recommended maneuvers in a vertical direction (climb or descend only) to avoid conflicting traffic. Airline aircraft, and larger commuter and business aircraft holding 31 passenger seats or more, use TCAS II equipment.
  1. Each pilot who deviates from an ATC clearance in response to a TCAS II RA must notify ATC of that deviation as soon as practicable and expeditiously return to the current ATC clearance when the traffic conflict is resolved.
  2. Deviations from rules, policies, or clearances should be kept to the minimum necessary to satisfy a TCAS II RA.
  3. The serving IFR air traffic facility is not responsible to provide approved standard IFR separation to an aircraft after a TCAS II RA maneuver until one of the following conditions exists:
    - (a) The aircraft has returned to its assigned altitude and course.
    - (b) Alternate ATC instructions have been issued.
- c. TCAS does not alter or diminish the pilot's basic authority and responsibility to ensure safe flight. Since TCAS does not respond to aircraft which are not transponder equipped or aircraft with a transponder failure, TCAS alone does not ensure safe separation in every case.
- d. At this time, no air traffic service nor handling is predicated on the availability of TCAS equipment in the aircraft.<sup>806</sup>

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<sup>805</sup> FED. AVIATION ADMIN., ADVISORY CIRCULAR 20-30B(1), AIRCRAFT POSITION LIGHT AND ANTICOLLISION LIGHT INSTALLATIONS (1981).

<sup>806</sup> AIM, *supra* note 15, at 4-4-16.

## 12. TCAS OPERATIONAL USE.

- a. General. Each operator electing to use TCAS II should follow and implement those skills addressed and the guidance provided on TCAS training in paragraph 9 [above in AC].

NOTE: In no case should a pilot maneuver opposite to a TCAS RA.

- b. Pilot Responsibilities. *The intent of a TCAS is to serve as a backup to visual collision avoidance, application of right-of-way rules, and air traffic separation service.* For TCAS to work as designed, immediate and correct crew response to TCAS advisories is essential. Delayed crew response or reluctance of a flight crew to adjust the aircraft's flight path as advised by TCAS due to air traffic control (ATC) clearance provisions, fear of later FAA scrutiny, or other factors could significantly decrease or negate the protection afforded by TCAS. Flight crews should respond to a TCAS in accordance with the following guidelines when responding to alerts:

- (1) Respond to TAs by attempting to establish visual contact with the intruder aircraft and other aircraft which may be in the vicinity. Coordinate to the degree possible with other crewmembers to assist in searching for traffic. Do not deviate from an assigned clearance based only on TA information. For any traffic acquired visually, continue to maintain safe separation in accordance with current regulations and good operating practices.
- (2) When an RA occurs, *the PF should respond immediately* by directing attention to RA displays and maneuver as indicated, unless doing so would jeopardize the safe operation of the flight or the flightcrew can ensure separation with the help of definitive visual acquisition of the aircraft causing the RA. By not responding to an RA, the flightcrew effectively takes responsibility for achieving safe separation. In so choosing, consider the following cautions:
  - (a) The traffic may also be equipped with TCAS and it may maneuver in response to an RA coordinated with your own TCAS.
  - (b) The traffic acquired visually may not be the same traffic causing the RA.
  - (c) Visual perception of the encounter may be misleading. Unless it is unequivocally clear that the

target acquired visually is the one generating the RA and there are no complicating circumstances, the pilot's instinctive reaction should always be to respond to RAs in the direction and to the degree displayed.

- (3) Satisfy RAs by disconnecting the autopilot (AP) (if necessary) and auto throttle system (when required by the airframe manufacturer's procedures), and using prompt positive control inputs in the direction and with the magnitude the TCAS advises. To achieve the required vertical rate (normally 1,500 feet per minute (fpm) climb or descent), first adjust the aircraft's pitch using the suggested guidelines shown in the table below. Then refer to the vertical speed indicator (VSI) and make all necessary pitch adjustments to place the VSI in the green arc.

SPEED PITCH ADJUSTMENT

SPEED	PITCH ADJUSTMENT
.80 MACH	2°
250 knots indicated airspeed (KIAS) below 10,000 feet	4°
APPROACH below 200 KIAS	5° to 7°

- (a) On aircraft with pitch guidance for TCAS RA displays, follow the RA pitch command for initial, increase, reversal, and weakening RAs.
  - (b) For the TCAS to provide safe vertical separation, initial Vertical Speed (VS) response is required within 5 seconds of when the RA is first displayed. Excursions from assigned altitude, when responding to an RA, typically should be no more than 300 to 500 feet to satisfy the conflict. VS responses should be made to avoid red arcs or outlined pitch avoidance areas and, if applicable, to accurately fly to the green arc or outlined pitch guidance area.
- (4) Respond immediately to any increase or reversal RA maneuver advisories. Initial VS response to an increase or reversal RA is expected by the TCAS within 2 1/2 seconds after issuance of the advisory. Again, avoid red arcs or outlined pitch avoidance areas and fly to the green arc or outlined pitch guidance area.
- (5) The PM should advise the PF on the progress of achieving the vertical rates commanded by the TCAS.

The PM and any onboard observers will assist in the visual search for the intruder and continue to cross-check the TCAS displayed information with other available traffic information to ensure the RA response is being flown correctly.

- (6) If an initial corrective RA is downgraded or weakened, such as a “CLIMB” RA downgraded to a “DO NOT DESCEND” RA, pilots should respond to the weakening RA and adjust the aircraft’s VS to the rate depicted by the green (fly to) arc or line on the instantaneous vertical speed indicator (IVSI) or other suitable indicator, while keeping the needle or pitch guidance symbol out of the red arc or outlined pitch avoidance area. Pilots should remember that attention to the RA display and prompt reaction to the weakened RA will minimize altitude excursions and potential disruptions to ATC. This will allow for proper resolution of encounters and reduce the probability of additional RAs against the intruder or other traffic.
- (7) Evasive maneuvering must be limited to the minimum required to comply with the RA. Excessive responses to RAs are not desirable or appropriate because of other potential traffic and ATC consequences. From level flight, proper response to an RA typically results in an overall altitude deviation of 300 to 500 ft in order to successfully resolve a traffic conflict.
- (8) In some instances it may not be possible to respond to a TCAS RA and continue to satisfy a clearance at the same time. Even if a TCAS RA maneuver is inconsistent with the current clearance, respond appropriately to the RA. Since TCAS tracks all transponder-equipped aircraft in the vicinity, responding to an RA for an intruder assures a safe avoidance maneuver from that intruder and from other Mode C-equipped aircraft. Guidance in this paragraph does not conflict with that in subparagraph 12b(2).
- (9) If a TCAS RA requires maneuvering contrary to right-of-way rules, cloud clearance rules for visual flight rules (VFR), instrument flight rules (IFR), or other such criteria, pilots should follow the TCAS RAs to resolve the immediate traffic conflict. Pilots should keep deviations from rules or clearances to the minimum necessary to satisfy a TCAS RA.



- (10) If a TCAS RA response requires deviation from an ATC clearance, expeditiously return to the current ATC clearance when the traffic conflict is resolved, the TCAS "CLEAR OF CONFLICT" message is heard, or follow any subsequent change to clearance as advised by ATC. In responding to a TCAS RA that directs a deviation from assigned altitude, communicate with ATC as soon as practicable after responding to the RA. When the RA is cleared, the flightcrew should advise ATC that they are returning to their previously assigned clearance or should acknowledge any amended clearance issued. In addition, the flightcrew's discretionary use of other types of reports may be desired. See Appendix 4 for suggested phraseology.
- (11) If a TCAS RA maneuver is contrary to other critical cockpit warnings, pilots should respect those other critical warnings as defined by TCAS certification and training (that is, responses to stall warning, wind-shear, and ground proximity warning system (GPWS) take precedence over a TCAS RA, particularly when the aircraft is less than 2,500 feet above ground level (AGL)).
- (12) Pilots should use TCAS traffic information displays to increase their awareness of nearby traffic and to assist in establishing visual contact with other aircraft. Certain electronic flight information system (EFIS) TCAS installations operating in conjunction with 'track up' mode may require the pilot to make allowances for the difference between the aircraft heading and track when visually sighting nearby aircraft.
- (13) Unless approved by the Administrator, pilots should operate TCAS while in flight in all airspace, including oceanic, international, and foreign airspace.
- (14) When feasible, flightcrews should use the same altitude data source used by the PF to provide altitude information to TCAS and the ATC transponders. Using a common altitude source precludes unnecessary RAs due to differences between altitude data sources.
- (15) Note and accurately report TCAS encounters and system anomalies in accordance with operator policies

in order to make remedial improvements to TCAS or the National Airspace System (NAS).

NOTE: ARINC operates a Web-based data collection scheme on behalf of the FAA. The Web site can be found at [www.tcasreport.com](http://www.tcasreport.com).

- (16) The TCAS alone does not ensure safe separation in every case, nor diminish the pilot's basic authority and responsibility to ensure safe flight. TCAS does not respond to aircraft which are not transponder-equipped or to aircraft with a transponder failure, and can display erroneous indications when a transponder malfunctions. TCAS RAs may, in some cases, conflict with flightpath requirements due to terrain, such as an obstacle-limited climb segment or an approach to rising terrain. Since the basis for many approved instrument procedures and IFR clearances is avoiding high terrain or obstacles, it is particularly important that pilots maintain situational awareness (SA) and continue to use good operating practices and judgment when following TCAS RAs. Pilots should make frequent outside visual scans while using see-and-avoid techniques. Communication with ATC should be initiated as necessary.

c. Examples of Potential Consequences of Disregarding RA Information.

- (1) An aircraft seen visually may not necessarily be the aircraft causing the RA or may not be the only aircraft to which TCAS is responding.
- (2) It is difficult to visually determine the vertical displacement of other aircraft, especially when ground reference information is unreliable or at cruise altitudes where the Earth's horizon is obscured. Therefore, disregarding RA information and maneuvering vertically based solely on visual acquisition may result in a loss of safe separation.
- (3) ATC may not know when TCAS issues RAs. It is possible for ATC to unknowingly issue instructions that are contrary to the TCAS RA indications. Safe vertical separation may be lost during TCAS coordination when one aircraft maneuvers opposite the vertical direction indicated by TCAS and the other aircraft maneuvers as indicated by TCAS. As a result, both aircraft may experience excessive altitude excursions in vertical chase

scenarios due to the aircraft maneuvering in the same vertical direction. Accordingly, during an RA, do not maneuver contrary to the RA based solely upon ATC instructions. ATC may not be providing separation service or be communicating with the aircraft causing the RA.

- (4) Disregarding RA during a coordinated encounter with another TCAS II-equipped aircraft can result in loss of safe separation.
- d. TCAS Good Operating Practices. The following are identified TCAS good operating practices:
  - (1) To preclude unnecessary transponder interrogations and possible interference with ground radar surveillance systems, do not activate TCAS ("TA-ONLY" or "TA/RA") until taking the active runway for departure. A transponder selected to "XPNDR" or "ON" is adequate for ATC and nearby Automatic Dependent Surveillance-Broadcast (ADS-B)-equipped aircraft to "see" the aircraft while taxiing on the airport surface.
  - (2) Following landing and clearing of the runway, de-select TCAS from "TA-ONLY" or "TA/RA". Select "XPNDR" or "ON" while taxiing to the ramp area. Upon shutdown, select "STBY" on the transponder.
  - (3) During flight, use TCAS displays to enhance SA. Use displays which have a range selection capability in an appropriate range setting for the phase of flight. For example, use minimum range settings in the terminal and longer ranges for climb/descent and cruise as appropriate.
  - (4) Note that TCAS RAs can occur while aircraft are legally separated.
  - (5) It is appropriate to operate the TCAS in "TA-ONLY" in circumstances where unnecessary RAs frequently occur and where such RAs are disruptive to the operation of the aircraft. These circumstances may include:
    - (a) During takeoff towards known nearby traffic that is in visual contact and which could cause an unwanted RA during initial climb, such as a visually identified helicopter passing near the departure end of the runway. Select "TA/RA" after the potential for an unwanted RA ceases to exist, such as after climbing above a known VFR corridor.

- (b) In instrument or visual conditions during approaches to closely spaced parallel runways (CSPR).
  - (c) In visual conditions, when flying in close proximity to other aircraft.
  - (d) At certain airports, during particular procedures, or in circumstances identified by the operator as having a significant potential for unwanted or inappropriate RAs.
  - (e) In the event of particular in-flight failures, such as engine failure, as specified by the Aircraft Flight Manual (AFM) or operator.
  - (f) During takeoffs or landings outside of the nominal TCAS reference performance envelope for RAs, as designated by the AFM or operator. TCAS reference performance for RAs is typically attainable during takeoffs and landings at airports within the envelope of ISA  $\pm 50$  °F sea level to 5,300 feet MSL. When takeoffs or landings are outside of this envelope, use of “TA-ONLY” may be appropriate during the limited time period when TCAS reference performance cannot be achieved. This typically occurs when the aircraft is at low speed in specified limiting configurations during takeoff or landing at hot day, high-altitude airports, such as Mexico City or La Paz.
- (6) When safe, practical, and in accordance with the air carrier’s approved operating procedures, pilots should limit VS to 1,500 fpm or less when within 1,000 feet of assigned altitudes. This procedure will reduce the frequency of unnecessary RAs and be in conformance with the Aeronautical Information Manual (AIM) and ICAO guidance.
- e. Operator Responsibilities. Operators have the following general responsibilities regarding the TCAS:
    - (1) Ensure followup and evaluation of unusual TCAS events; and
    - (2) Periodically assess TCAS training, checking, and maintenance programs to ensure their correctness, pertinence, timeliness, and effectiveness.
  - f. ATC Responsibilities. Highlighted below are ATC responsibilities relating to TCAS.

- (1) Controllers will not knowingly issue instructions that are contrary to RA guidance when they are aware that a TCAS maneuver is in progress. When an aircraft deviates from its clearance in response to an RA, ATC is still responsible for providing assistance to the deviating aircraft as requested until:
  - The pilot informs ATC that the RA conflict is clear; and the aircraft has returned to the previously assigned altitude; or
  - Alternate ATC instructions have been issued and the pilot has acknowledged them.

NOTE: See Appendix 4 for suggested phraseology.

- (2) Workload permitting, controllers may continue to provide pertinent traffic information in accordance with the current edition of FAA Order JO 7110.65, Air Traffic Control.
- (3) Maintain awareness of TCAS programs and program changes.
- (4) Train ATC specialists on TCAS and expected flightcrew responses to TCAS advisories and provide familiarization flights for specialists on TCAS-equipped aircraft to the extent possible.
- (5) When requested by the flightcrew, and if appropriate, provide separation from TCAS-observed traffic and assistance in returning to the assigned clearance. Issue additional clearance instructions when the situation so requires.
- (6) Advise pertinent FAA offices, such as a FSDO, via TCAS questionnaires about airspace or airports where excessive numbers of RAs occur. This facilitates initiation of corrective actions related to TCAS enhancements, TCAS procedures, and airspace adjustments. Forward the information to *www.tcasreport.com*.

### 13. TCAS EVENT REPORTING.

NOTE: ARINC operates a Web-based data collection scheme on behalf of the FAA. The Web site can be found at *www.tcasreport.com*.

- a. General. Operators and manufacturers are encouraged to develop procedures to ensure effective identification, tracking, and followup of significant TCAS-related events, as appropriate. Such procedures should focus on providing useful information to:
  - (1) Properly assess the importance of TCAS events.

- (2) Follow up on information related to specific TCAS events, as necessary.
  - (3) Keep the industry and the FAA informed of the performance of TCAS in the NAS and in international operations.
- (b) Pilot Reports.
- (1) **Mandatory Report.** As of March 8, 2010, a new National Transportation Safety Board (NTSB) immediate notification rule (§ 830.5) added the following to the list of reportable events that require immediate notification of the NTSB ACAS RAs issued either:
    - When an aircraft is being operated on an IFR flight plan and compliance with the advisory is necessary to avert a substantial risk of collision between two or more aircraft; or
    - To an aircraft operating in Class A airspace.
  - (2) **Other Reports.**
    - (a) **TCAS-Specific Reports.** Pilots should make the following reports for TCAS RAs, as necessary.
      1. Upon query from ATC, or after a deviation from an ATC clearance, make radio communications as appropriate to report a response to a TCAS advisory. Refer to AIM Chapter 4, Section 4, ATC Clearances and Aircraft Separation, for guidance, and Appendix 4 for recommended phraseology.
      2. Reports, as specified by the operator, concerning TCAS anomalies, procedural difficulties, or system failures are typically made by pilots through one or more of the following methods:
        - Pilot/observer questionnaire;
        - Logbook entry and Aircraft Communications Addressing and Reporting System (ACARS); or
        - Other records used by that operator, such as a captain’s report.
- NOTE:** An example of a typical reporting form for TCAS event information is shown in Appendix 2.
- (b) **Near Midair Collision (NMAC) Reports.** Flightcrews should continue to submit NMAC reports in accordance with existing policies and procedures. Crews should be aware that there is no requirement to submit an NMAC report solely due to a TCAS

event and that a TCAS report does not constitute an NMAC report.

- (c) ATC Clearances and Instructions Reports. Unless required due to other circumstances, reports in compliance with § 91.123, compliance with ATC clearances and instructions reports, or regarding emergency deviation from an ATC clearance are not necessary solely as a result of a TCAS maneuver.
  - (d) Aviation Safety Reporting System (ASRS) Reports. The flightcrew may file ASRS reports at their discretion.
  - c. Maintenance Personnel Reports. Maintenance personnel should report TCAS problems that relate to system performance, manufacturers, and/or vendors to the appropriate principal avionics inspector (PAI).
  - d. TCAS Manufacturer Reports. TCAS avionics manufacturers report problems found with specific TCAS systems in accordance with established Service Difficulty Report (SDR) procedures. Report generic problems, such as those that may relate to the definition of collision avoidance system algorithms as defined by RTCA/DO-185, to the Aircraft Engineering Division (AIR-100) in Washington, DC.
14. FAA RESPONSE TO TCAS EVENTS. Regarding regulatory compliance issues, the FAA will not initiate enforcement action solely on the basis of a TCAS event. Letters of investigation will not be sent to pilots involved in a TCAS-related deviation, provided:
- The aircraft was equipped with a TCAS, the system was operable, and the equipment was turned on at the time of the event;
  - The pilots have properly operated their aircraft in compliance with ATC clearances prior to the TCAS-related deviation;
  - The pilots have successfully completed their air carrier's FAA-approved TCAS training program; and
  - The pilots have otherwise complied with the requirements of § 91.123.<sup>807</sup>
- The Air Traffic Controller's Manual, Order JO 7110.65V states:
- 2-1-27. TCAS RESOLUTION ADVISORIES

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<sup>807</sup> A.C. 120-55C, *supra* note 665.

- a. When an aircraft under your control jurisdiction informs you that it is responding to a TCAS Resolution Advisory (RA), do not issue control instructions that are contrary to the RA procedure that a crew member has advised you that they are executing. Provide safety alerts regarding terrain or obstructions and traffic advisories for the aircraft responding to the RA and all other aircraft under your control jurisdiction, as appropriate.
- b. Unless advised by other aircraft that they are also responding to a TCAS RA, do not assume that other aircraft in the proximity of the responding aircraft are involved in the RA maneuver or are aware of the responding aircraft's intended maneuvers. Continue to provide control instructions, safety alerts, and traffic advisories as appropriate to such aircraft.
- c. Once the responding aircraft has begun a maneuver in response to an RA, the controller is not responsible for providing standard separation between the aircraft that is responding to an RA and any other aircraft, airspace, terrain or obstructions. Responsibility for standard separation resumes when one of the following conditions are met:
  1. The responding aircraft has returned to its assigned altitude, or
  2. A crew member informs you that the TCAS maneuver is completed and you observe that standard separation has been reestablished, or
  3. The responding aircraft has executed an alternate clearance and you observe that standard separation has been reestablished.

**NOTE-**

1. AC 120-55A, *Air Carrier Operational Approval and Use of TCAS II*, suggests pilots use the following phraseology to notify controllers during TCAS events. When a TCAS RA may affect an ATC clearance, inform ATC when beginning the maneuver, or as soon as workload permits.

**EXAMPLE-**

1. “New York Center, United 321, TCAS climb.”

**NOTE-**

2. When the RA has been resolved, the flight crew should advise ATC they are returning to their previously assigned clearance or subsequent amended clearance.



## EXAMPLE-

3. "New York Center, United 321, clear of conflict, returning to assigned altitude."<sup>808</sup>

## AC 90-48C

4. ACTION. The following areas warrant special attention and continuing action of all pilots to avoid the possibility of becoming involved in a midair conflict.

- a. "See and Avoid" Concept.

- (1) The flight rules prescribed in Part 91 of the Federal Aviation Regulations (FAR) set forth the concept of "See and Avoid." This concept requires that vigilance shall be maintained at all times, by each person operating an aircraft, *regardless of whether the operation is conducted under Instrument Flight Rules (IFR) or Visual Flight Rules (VFR).*

- (2) Pilots should also keep in mind their responsibility for continuously maintaining a vigilant lookout regardless of the type of aircraft being flown. Remember that at most MAC accidents and reported NMAC incidents occurred during good VFR weather conditions and during the hours of daylight."<sup>809</sup>

## 10-1-1 EMERGENCY DETERMINATIONS

- a. An emergency can be either a *Distress* or an *Urgency* condition as defined in the "Pilot/Controller Glossary."
- b. A pilot who encounters a *Distress* condition should declare an emergency by beginning the initial communication with the word "Mayday," preferably repeated three times. For an *Urgency* condition, the word "Pan-Pan" should be used in the same manner.
- c. If the words "Mayday" or "Pan-Pan" are not used and you are in doubt that a situation constitutes an emergency or potential emergency, handle it as though it were an emergency.
- d. Because of the infinite variety of possible emergency situations, specific procedures cannot be prescribed. However, when you believe an emergency exists or is imminent, select and pursue a course of action which appears to be most appropriate under the circumstances and which most nearly conforms to the instructions in this manual.

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<sup>808</sup> FAA ORDER NO. JO 7110.65U, *supra* note 66.

<sup>809</sup> A.C. 90-48C, *supra* note 790.

## D. APPENDIX D: ACRONYMS AND LIST OF REGULATIONS

AC	Advisory Circular
ADS-B	Automatic Dependent Surveillance-Broadcast
AGC	Office of the Chief Counsel, Federal Aviation Administration
AIM	Aeronautical Information Manual
AIS	Automatic Identification System
ALJ	Administrative Law Judge, National Transportation Safety board
ATC	Air Traffic Control
CAB	Civil Aeronautics board
CAR	Civil Aviation Regulations
CBDR	Constant Bearing – Decreasing Range
CFR	Code of Federal Regulations
CPA	Closest Point of Approach
FAR	Federal Aviation Regulations, (Title 14, Code of Federal Regulations)
FSDO	Flight Standards District Office
GA	General Aviation
GPS	Global Positioning System
IAS	Indicated Air Speed
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IMD	International Maritime Organization
MOA	Military Operations Area
MSL	Mean Sea Level
NAS	National Airspace System
NMAC	Near Midair Collision
NOTAM	Notice to Airmen
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
TAS	True Air Speed
TCAS	Traffic Alert and Collision Avoidance System
TCAS RA	Traffic Alert and Collision Avoidance System Resolution Advisory
UND	University of North Dakota
USC	United States Code
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omni-directional Range
VTs	Vessel Traffic Service

- (a) The Administrator may issue a certificate of waiver authorizing the operation of aircraft in deviation from any

rule listed in this subpart if the Administrator finds that the proposed operation can be safely conducted under the terms of that certificate of waiver.

- (b) An application for a certificate of waiver under this part is made on a form and in a manner prescribed by the Administrator and may be submitted to any FAA office.
- (c) A certificate of waiver is effective as specified in that certificate of waiver.<sup>810</sup>
- (d) Section 91.905 provides a list of regulations subject to waiver. The majority of the regulations contained in this report are found on this list, shown in Appendix D as italicized.<sup>811</sup>

#### **Section 91.905: List of Rules Subject to Waivers**

<i>Section</i>	<i>Title</i>
91.107	Use of Safety Belts
<i>91.111</i>	<i>Operating Near Other Aircraft</i>
<i>91.113</i>	<i>Right-of-Way Rules: Except Water Operations</i>
91.115	Right-of-Way Rules: Water Operations
<i>91.117</i>	<i>Aircraft Speed</i>
91.119	Minimum Safe Altitudes: General
91.121	Altimeter Settings
91.123	Compliance with ATC Clearances and Instructions
91.125	ATC light signals
91.126	Operating on or in the Vicinity of an Airport in Class G Airspace
91.127	Operating on or in the Vicinity of an Airport in Class E Airspace
<i>91.129</i>	<i>Operations in Class D Airspace</i>
<i>91.130</i>	<i>Operations in Class C Airspace</i>
<i>91.131</i>	<i>Operations in Class B Airspace</i>
91.133	Restricted and Prohibited Areas
<i>91.135</i>	<i>Operations in Class A airspace</i>
91.137	Temporary Flight Restrictions
91.141	Flight Restrictions in the Proximity of Presidential and Other Parties
91.143	Flight Limitation in the Proximity of Space Flight Operations
91.153	VFR Flight Plan: Information Required
<i>91.155</i>	<i>Basic VFR Weather Minimums</i>

<sup>810</sup> 14 C.F.R. § 91.903 (2013).

<sup>811</sup> *Id.* § 91.905.

- 91.157 Special VFR Weather Minimums
- 91.159 VFR Cruising Altitude or Flight Level
- 91.169 IFR Flight Plan: Information Required
- 91.173 ATC Clearance and Flight Plan Required
- 91.175 Takeoff and Landing Under IFR
- 91.177 Minimum Altitudes for IFR Operations
- 91.179 IFR Cruising Altitude or Flight Level
- 91.181 *Course to be Flown*
- 91.183 IFR Radio Communications
- 91.185 *IFR Operations: Two-Way Radio Communications Failure*
- 91.187 Operation Under IFR in Controlled Airspace:  
Malfunction Reports
- 91.209 *Aircraft Lights*
- 91.303 Aerobatic Flights
- 91.305 Flight Test Areas
- 91.311 Towing: Other than Under Section 91.309
- 91.313(e) Restricted Category Civil Aircraft: Operating Limitations
- 91.515 Flight Altitude Rules
- 91.705 Operations within the North Atlantic Minimum  
Navigation Performance Specifications Airspace
- 91.707 Flights Between Mexico or Canada and the  
United States
- 91.713 Operation of Civil Aircraft of Cuban Registry



# **Case Notes**

