The Age 60 Rule: Age Discrimination in Commercial Aviation

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Background: The Federal Aviation Administration's Age 60 Rule, promulgated in 1959, prohibits airline pilots from working in Part 121 operations once they have reached the age of 60. The Age 60 Rule remains a most contentious and politically sensitive topic, with challenges to the Rule currently mounted in both legislative and legal arenas. ***Methods:*** An extensive review of the medical literature was accomplished using MEDLINE. Pertinent Federal Regulations were examined. Legal proceedings and public domain documents were noted. Letters and personal communication were solicited where necessary information could not be ascertained by other means. ***Results:*** The Age 60 Rule was not based on any scientific data showing that airline pilots aged 60 and older were any less safe than younger pilots, and there is evidence to indicate that the choice of age 60 was actually based on economic rather than safety considerations. Airline pilots consistently exceed general population norms for longevity, physical health, and mental abilities. Fear of an adverse pilot health event causing a crash in standard multi-crew operations is not justified. For decades, airline pilots under age 60 have been granted the means to demonstrate their fitness for flying by taking medical, cognitive, and performance evaluations that are denied to airline pilots when they reach age 60. Actual flight experience demonstrates that older pilots are as safe as younger pilots. International aviation experience indicates that abolishing the Age 60 Rule will not compromise aviation safety. ***Conclusion:*** There appears to be no medical, scientific, or safety justification for the Age 60 Rule. As such, perpetuation of the Age 60 Rule, where age alone is used as the single criterion of older pilot fitness, represents age discrimination in commercial aviation.

Keywords: pilot age, age discrimination, accident rates.

FOR MORE THAN 40 YEARS, the Federal Aviation Administration (FAA) has maintained that commercial airline pilots over the age of 60 pose an unacceptable risk to air travelers. An FAA regulation promulgated in 1959 prohibits any air carrier operating aircraft with more than 10 passenger seats from using the services of any person as a pilot after his or her 60th birthday, and prohibits any such person from serving as a pilot in air carrier operations if that person has reached his or her 60th birthday (1). This "Age 60 Rule" has been vigorously challenged since its inception, and though the aviation community remains divided over its appropriateness, opposition to the Rule continues unabated. Promulgated as an operational regulation ostensibly designed to increase passenger safety, the FAA chose to justify the Rule solely on medical grounds, implying that the chronological age of 60 heralds the inevitable, unpredictable, and accelerated decline in an airline pilot's health. The selection of a fixed chronological age of 60 was based on the supposition that older aviators would be more vulnerable to sudden cardiovascular incapacitation and mental deterioration with advancing age, even though the FAA acknowledged it "[was] not yet possible to establish a retirement age for civil airline pilots based on scientifically determined facts" (7). Some 40 yr of medical and safety data have failed to support the FAA's position that the chronological age of 60 represents a valid passenger safety concern. This paper will describe the history of the Age 60 Rule, delineate the medical issues involved, cite the literature acknowledging the safety record of over-60 pilots, and show that there is no scientific basis for the continuation of what is, and has been, age discrimination in commercial aviation.

Background

The origin of the Age 60 Rule has no foundation in either medicine or safety. Historical review strongly suggests that the Age 60 Rule was enacted to further the ambition of C. R. Smith, CEO of American Airlines, to replace his older captains with younger, military-trained pilots to coincide with the introduction of jet aircraft into American's fleet, thus enabling American to more effectively manage transition training costs. In early 1958, American Airlines Captains Rentz, Cutrell, and Burns won the right, through neutral arbitration, to remain actively employed as pilots-in-command despite their employer's mandatory retirement age of 60. Despite losing this grievance, Smith refused to reinstate the three captains. On December 20, 1958, American's pilots began a 20-d strike in which they won virtually all their demands, including agreement to reinstate the three "retired" captains (50). In a February 5, 1959 letter, Smith communicated his displeasure to retired Lieutenant General Elwood "Pete" Quesada, recently appointed head of the newly created FAA, suggesting

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that it might be ". . . necessary for the regulatory agency to fix some suitable age for retirement (34)." In April of that year, Smith engaged Clarence N. Sayen, president of the Air Line Pilots Association (ALPA), in an effort to effect the departure of the three captains by suggesting that American and ALPA could join together in asking the FAA to establish a mandatory retirement age for pilots (35)*. Sayen refused, though he acknowledged that it was Smith's prerogative to contact the Administrator (36)*.

To bolster his position with the FAA, Smith produced his own data showing that, compared with American's older captains, his younger pilots, "especially selected for intelligence," required less training time (thus less cost to the airline) in order to make the transition from propeller to jet aircraft (37)*. Administrator Quesada responded promptly with two proposals: 1) establishment of a maximum age of 55 for transition into jet aircraft; and 2) mandatory retirement of all pilots at age 60 (2). To garner independent support, Quesada convened an "expert panel" to review the proposals. Presented with Smith's pilot transition training data, the panel initially supported both proposals (43)* though it eventually abandoned the age-55 jet transition recommendation. But when this same data was later presented to the FAA's legal counsel for their review it was considered insufficient to support either. The legal department suggested that Smith's data be abandoned and recommended that, in the future, the FAA focus on "such medical data as is available concerning deteriorations in specific functions such as reaction time, glare tolerance, night visual acuity, learning times, accuracy of learning, etc." (44).* Thus, not only was the Age 60 Rule proposed as an operational regulation at the request of, and to further the economic goals of, American Airlines, it was, on the FAA lawyers' advice, justified solely by medical criteria. To this day the FAA continues to defend the operationally restrictive Age 60 Rule using exclusively medical arguments, a situation unique in the realm of the FAA regulations.

The Rule was published in the Federal Register on December 5, 1959 (3), becoming effective on March 15, 1960, thereby forcing into retirement C. R. Smith's three captains, as well as additional legions of pilots in the 40 yr since. A year later, Pete Quesada retired from the FAA and moved immediately to a seat on the Board of Directors of American Airlines. The Age 60 Rule began its prolonged entrenchment in aviation policy, firmly enshrined as an FAA "safety standard" despite the arbitrary nature of its selection.

Implications of the Age 60 Rule as an Operational Regulation

The Age 60 Rule is codified in the FAA's regulations as 14 CFR 121.383(c). The "121" identifies it as residing in Part 121 of these regulations where certification criteria and operating rules for major air carriers are set forth. This authority derives from Section 601 of the Federal Aviation Act of 1958 (FAAct), the Agency's "enabling legislation" (24). Section 601 empowers the Administrator to set minimum standards and establish operating rules and regulations to promote the safety of flight in air commerce. By contrast, regulations governing pilot certification appear within 14 CFR 61 ("Part 61") and medical certification within 14 CFR 67 ("Part 67"), both of which are enacted under Section 602 of the FAAct. Section 602 empowers the Administrator to issue airman certificates (both pilot licenses and medical certificates) specifying the capacity in which holders thereof are authorized to serve. This difference—enactment under Section 601 vs. Section 602—is significant and deserves further emphasis in terms of the legal implications of operational vs. medical or certification regulations.

Any rule or order of the Administrator, except those enacted pursuant to Section 602, is reviewable only in the United States Court of Appeals. In these appeals (including those enacted under Section 601, as is the Age 60 Rule) the burden of proof rests with the petitioner/appellant. Moreover, under Section 1006(a) of the FAAct, "findings of fact by the Administrator, if supported by substantial evidence, shall be conclusive." Under these deferential standards the courts will reverse an agency determination only on showing that the agency's action was arbitrary, capricious, an abuse of discretion, or otherwise in violation of law.

In contrast, petitioners challenging orders, rules, or regulations under Section 602 of the FAAct (dealing with issuance or renewal of airman certificates where medical opinions of pilot health and fitness are pertinent) appeal not to the courts but rather to the National Transportation Safety Board (NTSB). In these appeals, unlike those in the courts, the burden of proof rests with the FAA rather than with the petitioner/appellant, and none of the FAA's prior rulings and/or findings are binding on the Board.

In proposing, enacting, and later defending the Age 60 Rule, the FAA cited its authority under Section 601 to set "reasonable rules and regulations governing, in the interest of safety, the maximum hours or periods of service of airmen . . . of air carriers" and "such reasonable rules and regulations or minimum standards . . . necessary to provide adequately for . . . safety in air commerce." By justifying the Age 60 Rule using Section 601, rather than Section 602 where medical considerations bearing on the capacity of pilots to serve would logically belong, Administrator Quesada made certain that the Rule would be forever subject to deferential review in the circuit courts whose judgments would favor the previous "findings of fact" of the FAA, rather than subject only to NTSB evaluation where medical waivers and exemptions are frequently granted. By this mechanism alone, and affirmed by 40 yr of struggle, Elwood Quesada and the FAA rendered the Age 60 Rule virtually unassailable by the thousands of airline pilots who have since sought to maintain gainful employment on reaching their 60th birthday.

* From the personal files of former Federal Air Surgeon Homer L. Reighard, MD. These files became public information during a civil suit under the Freedom of Information Act, Civil Action Number 85–1943 (D.C., 1985).

Pilot Positions on the Age 60 Rule

Aside from the FAA, ALPA currently provides the single largest base of support for retaining the Age 60 Rule unchanged. Though publicly espousing the Rule as a mechanism that serves the public interest, ALPA's support of the Rule is, and always has been, economic. Initially, for economic reasons, ALPA championed the right of senior pilots to remain employed. The union's membership in the late 1950's included only pilots—captains and first officers—with captains historically dominating union administration and policy. The desire of captains for career longevity spurred ALPA to file seven major lawsuits between 1960 and 1979 designed either to overturn the Rule or exempt pilots from the Rule (7,20). Changes in member demographics in the late 1960's and 1970's, however, brought about a significant change in the union's position on the Age 60 Rule. During this time period, new pilots were hired to fill the second officer seats on large commercial airliners, positions formerly held by non-pilot aircraft mechanics. These new, younger pilots increased the non-captain representation of the union, reducing the considerable influence of ALPA's previous, older leaders. ALPA was now increasingly responsive to a younger constituency of pilots who recognized that the imposition of an absolute retirement date on each of its senior members guaranteed quicker advancements for less senior flight crew depending on the aircraft types and staffing requirements of any given airline (40). In the late 1970's, ALPA's position on the Age 60 Rule changed to facilitate career advancement for its more junior members, becoming one of staunch support of mandatory retirement at 60.

Pilots who wish to preserve the Age 60 Rule can be categorized in two ways: older pilots who are nearing the end of profitable, uninterrupted careers with one successful airline, and younger pilots who are just beginning what they hope will be profitable, uninterrupted careers with one successful airline. Despite the variance in age and number, these two groups are united by a common goal aptly summarized by an ALPA member: "In general, the 35-year veterans do not want a single ripple to spoil the calm of their placid retirement plans . . . and the new hires do not want their upgrade to the more lucrative captain's chair to be delayed by even one day" (Jacques SG. Personal communication, March 2000). Senior pilots on the cusp of a financially rewarding retirement may see repeal of the Age 60 Rule as raising the unwelcome vision of a working life extended by additional years. Younger pilots, having recently secured a second or first officer's position with a major carrier, with their sights fixed on the coveted captain's seat, may view senior pilots as career impediments.

There are as many reasons for those not ready to retire as there are older pilots. Some simply love their work and wish to keep flying. On the other hand, many find themselves not adequately prepared financially for reasons based on both personal and professional circumstances. A career interrupted by furloughs can easily render a pilot—as any other worker—incapable of amassing sufficient retirement funds by the age of 60. The list of failed airlines is long, and includes the names of such trusted aviation pioneers as Pan American, Eastern, and Braniff. Pilots released from one carrier start at the bottom of the seniority ladder with a new employer, losing retirement benefits in addition to salary in the transition. Other pilots work for regional carriers where compensation packages are relatively poor, and some carriers simply do not have retirement plans.

Medical Issues

Despite its establishment as an operational regulation, the FAA has consistently attempted to justify the Age 60 Rule by employing medical arguments. In an August 5, 1959 letter to then-ALPA President Clarence Sayen, Elwood Quesada listed 41 "publications which constituted a reference source in the study and preparation of [the Age 60 Rule]" (38).* Examination of those references still available reveals them to constitute a highly questionable body of literature on which to base a regulation of such significance as the Age 60 Rule. In addition to the very general, non-aviation, and non-pilot population focus of the vast majority of these studies, none had been conducted specifically to compare the fitness or capability of pilots over age 60 to pilots in younger age groups.

Since 1960, the Age 60 Rule has been the subject of many medical studies. Among the major efforts to examine the question was the landmark 1981 Report of the National Institute of Aging Panel on the Experienced Pilot Study (48). After conducting an extensive review of the existing literature as well as reviewing public comments, the Panel stated that "the Age 60 Rule appears indefensible on medical grounds" and noted that "age 60 represents no medical 'breakpoint' in the progressive deterioration that comes with age." In addition, the Panel concluded that "there is no convincing medical evidence to support age 60, or any other specific age, for mandatory pilot retirement." However, the Panel recommended that the Age 60 Rule be retained for pilots-in-command and for first officers in both Part 121 and Part 135 operations. These recommendations were based on 1976 morbidity and mortality data from the general white male population of the United States showing an increase in cardiovascular disease and mortality after the sixth decade, on studies indicating increasing risk of adverse health outcomes with increasing age, and on data from one study suggesting an increase in general aviation accidents among pilots after age 60 (17). However, this last study erroneously calculated age-based accident rates by including large numbers of extremely safe commercial air carrier flight hours in the denominator of the rate calculation. Due to the Age 60 Rule, the effect of this simple data error severely depressed the apparent risk for all pilots under age 60, leaving those for ages 60 and above unaffected. This error thus resulted in the misleading appearance of an immediate and dramatic increase in accidents exactly at age 60.

Noting a significant shortfall in data directly relevant to the Age 60 Rule, the Panel strongly recommended that "the FAA engage in a systematic program to collect

the medical and performance data necessary to consider relaxation of the current age 60 rule." To that end, the Panel set forth a proposed "rational program for ongoing surveillance of older pilots while always keeping in mind the need to insure the highest level of safety . . . [providing] data that could serve as the basis for a decision on modification of the age 60 rule." The FAA tentatively proposed a program as recommended (5), but withdrew it less than 2 yr later declaring that such a program would compromise safety (6), though no unsafe conditions were ever documented.

Though a systematic program as recommended by the Panel was never enacted, many studies have been performed to evaluate the older pilot population. Historically, there have been three major hypotheses of interest in the medical arena regarding the employment of older pilots: 1) older pilots could have a greater likelihood of experiencing incapacitation, either sudden or subtle, which would place the aircraft and passengers at risk; 2) older pilots could experience decrements in cognitive abilities resulting in dangerous judgment errors that could compromise safety; and 3) medical and psychological testing procedures may not identify older pilots at risk for adverse health events.

Incapacitation

Sudden (obvious) incapacitation and subtle (insidious) incapacitation, as well as concern that older pilots are at greater risk for these events, and fear that accidents could result, have been matters of interest for decades. The risk of sudden death secondary to underlying cardiovascular disease was the stated reason that age 60 was chosen. That original justification for the Rule implied, incorrectly, that the characteristics of the general population of white males in the United States applied also to the population of air carrier pilots, and it remains incorrect to assume the same today. Cohorts of professional airline pilots repeatedly exceed national norms for longevity generally and cardiovascular health specifically. Even in the 1960's, air carrier pilots were recognized as a "highly select group . . . more free of serious pathology than a sample of the general population of similar age," and that they "represented less of an attrition or drop-out problem in a protracted study than almost any other adult group in the normal population with a comparably wide age range (28)." In the United States, Kulak et al. demonstrated a significantly lower age-specific incidence of coronary heart disease in the airline pilot population compared with that estimated by Framingham data (33). Besco, et al., exploring the longevity of American Airlines pilots, found that retired pilots in that cohort had a life expectancy more than 5 yr greater than the general population of white males for 1980 (12). Investigators from Portugal, where TAP-Air Portugal pilots were studied routinely during and after employment, found that fully 64% of their pilots over the age of 60 were absolutely fit for flight duties (19). Similar studies from England, Japan, and the province of British Columbia all demonstrate quite convincingly that pilots enjoy significantly lower rates of heart disease, and thus the risk of sudden incapacitation from that cause, than do their countrymen (29,31,51). In addition to significantly lower rates of death from atherosclerotic disease, Air Canada pilots were found to have significantly lower proportional mortality rates from all causes (10). Moreover, despite extensive searching, the author has found no studies showing the opposite. It is clear that airline pilots worldwide live longer and are healthier than the general populations from which they come, and that it is incorrect to extrapolate general population morbidity or mortality data to the professional pilot subgroup.

The most common cause for sudden incapacitation is actually not cardiovascular disease at all, but rather acute gastrointestinal illness, a constellation of signs and symptoms completely unrelated to age. According to pilot surveys, acute gastroenteritis accounts for approximately 60% of cases, with other causes related to sinus conditions, headaches and faintness, and generalized weakness (18,30). Non-cardiovascular incapacitation has never been reported as the cause of a commercial aviation accident.

The issue of commercial airline pilot cardiovascular incapacitation involves not only the risk to the pilot of that event but also, and importantly, the risk to the passengers of that event. Buley's wide-ranging analysis of International Air Transport Association data from the years 1961–1968 revealed that cardiovascular incapacitation and/or inflight pilot deaths occurred once in every 1.3 million international commercial aviation flight hours. Further, he determined that the deaths in that period of 12 pilots (8 of whom were pilots-in-command) resulted in no accidents, and that the inflight deaths of 5 other pilots, flying both scheduled and unscheduled air carrier service worldwide, resulted in accidents claiming a total of 148 lives (18). Of these 5 fatal accidents, 2 occurred in the United States. Both accidents occurred in the 1960's (Burbank, CA, on December 14, 1962, and Ardmore, OK, on April 22, 1966), both involved passenger loss of life, and both involved pilots less than 60 yr of age. The critical common denominator determining the outcome of these two events was actually not the dramatic manifestation of cardiac disease in each captain, but rather the inability of each co-pilot to recover the stability of the aircraft and thus prevent the accident. Following these events, a landmark study of simulated incapacitation by United Airlines revealed that sudden or subtle incapacitation creates three tasks for the flight crew: 1) maintain control of the aircraft; 2) provide care for the incapacitated crewmember; and 3) reorganize the cockpit crew and land the airplane. Recognition that crewmember detection of subtle incapacitation in the pilot flying the aircraft can be very difficult, resulting in seconds and even minutes where the aircraft is suboptimally controlled, led these researchers to establish the two-communication rule: "Flight crew members should have a high index of suspicion of a subtle incapacitation any time a crew member does not respond appropriately to two verbal communications, or any time he does not respond appropriately to any verbal communication associated with a significant deviation from a standard operating procedure or a standard flight profile." Proven effective in preventing simulated accidents due

to subtle incapacitation, the two-communication rule was adopted throughout the airline industry, demonstrating "that operational handling of incidents of subtle incapacitation has been satisfactorily demonstrated" and that "there is little question that the period of critical exposure can be significantly reduced if not virtually eliminated" (26,27).

Since then, further simulator studies have estimated that the risk of cardiac incapacitation occurring at a critical point in flight is less than 1 event in more than 20 million flight hours, with a calculated probability of an accident occurring as a result of that cardiac incapacitation of less than 1 accident every 8,307,082,800 flight hours or, stated another way, 1 accident every 400 yr (21).

Further evaluation by Bennett documents that between 1972 and 1988 the world's airlines flew more than 190 million jet-hours without any incapacitation-related accident, and that U.S. airlines routinely flew in excess of 7 million jet-hours annually, once again without a single incapacitation-related accident (11). Subsequent to the institution of the two-communication rule in the early 1970's, there have been no airline accidents secondary to pilot incapacitation. Some 30 yr of accident-free air carrier experience demonstrate convincingly and in very real terms that no justification exists for maintaining the Age 60 Rule based on the fear that a pilot of a multicrew aircraft will compromise passenger safety due to his or her sudden or subtle incapacitation, regardless of age.

Cognitive Impairment

For the past 40 yr, the FAA has maintained that the potential for the older pilot to experience the cognitive decline "known" to accompany old age could predispose to potentially dangerous errors in judgment, and that cognitive decrements cannot be reliably predicted. Indeed, research on aging has shown that the normal, healthy, successful aging process is accompanied by decreases in cognitive function over time in all population groups, though pilots consistently demonstrate superior task performance across all age groups when compared with age-matched non-pilots (55). Two important concepts, however, invalidate the government's concern regarding the potential for and recognition of mental debility of the over-60 pilot.

First, research has documented that, even in non-pilot populations, decreased mental acuity is rarely manifest prior to the age of 70, and it is well established that high levels of education and training and sustained good health—characteristics of the commercial airline pilot population—significantly enhance the retention of mental abilities (53,54). Moreover, much of any cognitive decline noted in the middle years of life and formerly thought to be intrinsic to aging has been shown, rather, to be due to factors such as diabetes, cardiovascular disease, medication use, and other acute and chronic health problems (49). Airline pilots, selected for good health at the start of their careers and subjected to comprehensive medical examinations every 6 mo thereafter, are among the most monitored and health-conscious of all employed individuals. Medical conditions that might lead to cognitive decline are subject to early detection and correction, or the pilot is removed from the work force (22).

Second, every airline pilot undergoes mandatory simulator testing at least on an annual basis. Consisting of 1 d or more of intense exposure to every programmable aviation scenario, simulator testing provides the ideal opportunity for exacting evaluation of the cognitive performance abilities of the pilot-in-command. The FAA considers its advanced simulators to be so complete and realistic that when an air carrier pilot transitions into a new aircraft (one in which he or she has never flown before) every aspect of the training flights can be conducted in the simulator, with the pilot's actual first flight in that aircraft being in actual commercial operations with passengers on board (4). Further, in routine, day-to-day flight operations the behavior and capabilities of the pilot-in-command are under constant scrutiny by other flight officers, flight attendants, dispatchers, loadmasters, mechanics, and air traffic controllers, making it quite unlikely that cognitive impairment would go unnoticed. In addition, all pilots are subject to unannounced flight checks conducted by both FAA certified company check pilots and/or an FAA examiner. All of these examinations test and certify the ability of the commercial air carrier pilot to perform those tasks essential for piloting at the levels of competence and safety demanded by the FAA's own regulations, and all are denied to pilots aged 60 and older based on age alone.

The FAA has determined that there are conditions under which it is essential to go beyond its normal testing of piloting skills and evaluate an airline pilot's mental "reserve capacity," the ability to handle unfamiliar situations where novel types of complex data must be processed rapidly. These conditions include such conditions as head injury, alcoholism, and infection with human immunodeficiency virus (HIV) (8,39). When a pilot with one of these conditions is tested using a laboratory-based cognitive screening instrument, it is not known prospectively by the examiner whether any actual loss of mental functioning has occurred. Documentation of the level of cognitive ability (rather than diagnosis of specific disease) is the purpose of the test. The testing regimen examines whether the pilot's present level of mental functioning is sufficient, within the FAA's regulatory standards, to allow a return to flying status. Pilots under age 60 who have the possibility of brain injury secondary to trauma, alcohol abuse, or HIV infection are permitted not only to prove their ability through simulator and actual flight testing but also by valid and reliable laboratory-based cognitive screening tests. Healthy pilots age 60 are not permitted either option, simply because they are 60 yr old. Research has shown that decrements in performance measures presented by older test subjects are revealed in the same manner as decrements resulting from trauma or disease in younger subjects (56). There is no theoretical difference between testing a pilot who is 60 yr or older and testing a pilot who has sustained possible cognitive impairment from head injury, is alcoholic, or has HIV infection. The FAA thus discriminates

against otherwise healthy over-60 pilots by denying them access to performance and cognitive testing simply because they are 60, while allowing the routine testing and return to flying status of potentially brain-injured or brain-diseased pilots under age 60.

Discrimination in Medical Testing

The FAA also discriminates against over-60 pilots in terms of medical testing, as opposed to performance or cognitive testing, procedures. The 1981 NIH/NIA study asserting that no special medical significance could be attached to age 60 as a mandatory retirement age for airline pilots concluded also that no adequate appraisal system existed that would differentiate safe from unsafe pilots. In the 20 yr since this study, however, significant advances in diagnostic technology have rendered the panel's concerns moot. Sophisticated yet commonly available diagnostic tests can, along with regularly scheduled aviation medical evaluations, adequately identify airmen either at risk for catastrophic events (16) or who have subtle decrements in cognitive performance (54). In fact, since the early 1980's, medical tests have been used routinely to justify the return to flying of thousands of pilots under age 60 who have coronary artery disease, valvular heart disease, hypertension, alcoholism, psychological and neurological impairments, sensory perception deficits, and other conditions (23,46,57). Despite the common use of these diagnostic measures on behalf of arguably unhealthy younger pilots these same procedures are denied to healthy 60 yr olds.

Flight Safety Data

The FAA's discrimination against over-60 pilots is remarkable when juxtaposed against its mission as guardian of aviation safety. Actual flight performance data, the measure of greatest significance to public safety, demonstrate the highly satisfactory safety record of older pilots. The FAA's own 1993 Hilton Study (32) concluded that there was "no support for the hypothesis that the pilots of scheduled air carriers had increased accident rates as they neared the [mandatory retirement age] of 60." In addition, the Hilton study's analysis of pilots with Class II medical certificates showed that the accident rate for pilots aged 60–64 did not differ significantly from pilots aged 55–59. These findings were echoed in their similar analysis of pilots holding Class III medical certificates. In a further arm of that study, accident rates were examined year-by-year, rather than in 5-yr groups, for pilots age 50–69. An apparent linear trend between the ages of 63 and 69 (not significant in the post-hoc analysis) gave "a hint, and a hint only, of an increase in accident rate for Class III pilots older than 63 yr of age."

Rebok et al. demonstrated that in general aviation crashes involving pilots aged 40–63, the percentage of accidents caused by pilot error was smallest in the age group 56–63 (47).

FAA data appearing in the *Chicago Tribune* in 1999 (52) indicated that pilot age was not a significant factor in airline incidents. Airline pilots in the 60 and older group had the lowest incident rate of any age group except for those pilots 20–24. Of note, this particular analysis included only air transport pilots, and included an important subset of commuter pilots aged 60 and over, some in their early 70s, who were granted exemption from the Age 60 Rule and who were permitted to fly beyond age 60 until December 1999.

In Report Two of a 4-part study released in 2000, the FAA reanalyzed the data presented in the *Chicago Tribune* (13); however, they specifically excluded those pilots aged 60 and older from their analysis and focused only on pilots aged 20–59, aggregated by 10-yr age groups. They found that there were no statistically significant differences in the accident/incident rates by age group. In addition, the proportion of 50–59 yr old air transport pilots involved in accidents or incidents was significantly lower than the proportion for the 40–49 yr old age group. As did the Hilton Study years before, this study affirmed that there was no increase in accident rates as pilots reached the mandatory retirement age of 60, and is consistent with McFadden's regression analysis model indicating that airline pilots are less likely to have pilot-error incidents as their experience and age increase (41).

Report Three of the 2000 FAA study evaluated pilots aged 23–63 with an Air Transport rating and a Class I medical certificate who flew in Part 121 or Part 135 operations between the years 1988 and 1997. Specifically directed by the United States Senate to study pilots aged 60–63 and compare their accident rates with the accident rates of younger pilot groups, the investigators found no statistically significant difference in mean accident rates between any age group (14). This finding is all the more remarkable because the age 60–63 pilot cohort, not eligible for safe Part 121 operations because of the Age 60 Rule, flew in relatively less-safe Part 135 (commuter) operations during this time.

The literature is not without studies purporting to show an increase in accident rate among pilots aged 60 and over. These studies, however, are uniformly flawed by the lack of availability of appropriate data. The same error in accident rate calculation that invalidates the conclusion of the 1977 Booze study (17) also nullifies the 1983 FAA Flight-Time Study by Golaszewski (25), wherein the author not only used different numerators and denominators for pilots under and over age 60 (thus comparing two entirely different pilot populations), but also failed to subject his data to standard statistical analysis. Though the FAA later acknowledged the "major data deficiencies" of the study (letter from Mr. Kenneth Chin, Executive Officer, Office of Aviation Safety, FAA, to Mr. Samuel Woolsey, February 4, 1991), the data and the spurious conclusions, without any correction or further analysis, were given wide distribution by the FAA, being cited to the 7th Circuit Court of Appeals in defense of its rejection of petitions for exemption from the Rule, where it's conclusions were found to be "not credible" (9) and appearing as the foundation of the 1990 Office of Technology Assessment report (42).

Report Four of the FAA's 2000 analysis expanded the study population to include pilots with a Commercial

rating and a Class II medical certificate in addition to pilots with an ATP rating and a Class I medical certificate. The investigators found that a statistically significant increase in the accident rate existed for pilots in the 60–63 yr old group (15). However, as in the 1983 FAA Flight-Time Study, these analyses are flawed because appropriate denominator data for calculating rates are not available. Pilots do not report their flight time separately for airline, commuter, and general aviation. Commercial crash rates, therefore, combine Part 121 and Part 135 crashes in the numerator and combine all categories of flight time in the denominator. Prior to age 60, Part 121 flight time dominates the denominator. After age 60, commercial crashes for the time period studied are limited to Part 135 operations. The much safer Part 121 flight hours are absent from the denominator, leading to artificially higher crash rates. Only for general aviation pilots can crash rates be calculated with flight time denominators that match the numerators, and general aviation crash rates do not increase at age 60 (32). In addition, as the examination requirements for the issuance of a Class I or Class II medical certificate differ, the pilots in these populations may not be comparable in terms of health and fitness, and it is not be appropriate to merge them into a single study group.

International Aviation

Most nations that have abolished 60 as a mandatory retirement age for commercial airline pilots have done so relatively recently, and international data is therefore sparse. Japanese investigators, reporting on their 3-yr longitudinal study of over-60 pilots, found that none had been involved in any of the 101 crashes that occurred during the study period. They concluded that their medical evaluation procedures adequately identified those pilots no longer fit to fly and that healthy pilots aged 60–63 were "eligible for professional flying (45)." They have since raised their retirement age to 65. In 1990, in accordance with the regulations of the Israeli Civil Aviation Authority, El Al Israel Airlines initiated a program whereby pilots aged 60–65 could continue flying. Initially, pilots aged 60–65 were permitted to fly only as first officers. In January 1995, the regulations were changed to allow pilots aged 60–65 to fly as "Cruise Captains," a designation indicating that these pilots were qualified to take command above 20,000 ft. Cruise Captains were utilized on long-haul routes from Israel to North America and the Far East. In May 1999, based on the excellent safety record and medical fitness of these older pilots, the regulations were changed to allow pilots 60–65 to fly as full pilots-in-command (letter from Captain Reuven Harel, Manager of Planning and Coordination of Operations, El Al, to Mr. Alan Serwer, November 15, 2000).

Of the 33 countries that comprise the regular and candidate membership of the Joint Aviation Authorities (JAA), 31 allow pilots to fly until 65 (http://www.jaa.nl). France requires the retirement of its airline pilots at 60, while the Czech Republic allows its pilots to fly until 62. Airline pilot retirement ages of the 187 Contracting States of the International Civil Aviation Organization (ICAO) vary. According to the ICAO Supplement to Annex 1–Eighth Edition (June 2000), 22 Contracting States allow pilots to fly beyond the age of 60. Of these, Thailand and the Islamic Republic of Iran permit pilots to fly to 61 (Iran requiring crew pairing). Panama allows pilots to fly until 62. Bahrain, Denmark, Finland, Iceland, Israel, Malta, South Africa, Sweden, and the United Kingdom permit pilots to fly until age 65 with crew pairing. The German Order on the Operation of Aircraft "merely recommends that aircraft operators not employ crew members who have attained their 60th birthday." Peruvian pilots can fly to age 65 in operations where the airplane has 30 or fewer seats or weighs 3400 kg or less. Sudan allows pilots to fly to age 65 "under certain conditions." Argentina permits pilots to "continue flying after attaining their 60th birthday" subject to "strict operational, physical, and mental vigilance." Brazil allows over-60 pilots to fly in domestic operations, and in international operations where other Contracting States allow pilots over 60 to fly. Australia, Belarus, New Zealand, the Russian Federation, and the Ukraine have no age restrictions at all for airline pilots.

Though the June 2000 Supplement does not show that Canada has filed a difference with ICAO regarding age 60, the Canadian Air Regulations indicate that Canada has no upper age limit for airline pilots (CAR Part IV, Division III, Section 421.34). All of the member and candidate countries of the JAA are Contracting States of ICAO. However, of the JAA countries that allow airline pilots to fly beyond age 60, only Denmark, Finland, Germany, Iceland, Malta, Spain, Sweden, Ukraine, and the United Kingdom are noted as having filed official differences with ICAO concerning pilot age, indicating that the Supplement to Annex I does not depict the full scope of Contracting State licensing practices in terms of the age 60 issue.

As of October 18, 2000, 37 countries allowed El Al pilots over age 60 to fly without restriction in foreign airspace (letter from Captain Reuven Harel, Manager of Planning and Coordination of Operations, El Al, to Mr. Alan Serwer, November 15, 2000), illustrating a practice in international aviation of the execution of bilateral agreements between air carriers and sovereign nations.

If Not the Age 60 Rule . . . Then What?

Even while recognizing that the age of 60 is arbitrary, there are some people who equate the Age 60 Rule with aviation safety, and who are uncomfortable with abandoning the Rule suddenly and entirely. These individuals feel it reasonable to ask the question: "If not the Age 60 Rule . . . then what?"

Current measures under consideration in the United States Congress would impose other arbitrary age restrictions on airline pilot employment. Senate Bill 361, passed by the Senate Committee for Commerce, Science, and Transportation on March 15, 2001, would prohibit the FAA from imposing an age limitation less than 63, and would impose additional restrictions, including crew pairing and more frequent medical examinations for airline pilots. House Resolution 448 seeks to increase the retirement age to 65 without additional restrictions. This stepwise progression away from age

60 is consistent with the approach taken by other countries (i.e., Japan, Israel) that have successfully broken through the age 60 barrier and maintained aviation safety. It would benefit the United States if the FAA would consider it as a first, and not as a final, step. An incremental approach, while a noteworthy advance, does not satisfactorily address the preferred method of assessment—non-age-related, performance-based evaluations—other than providing the framework for an essential database on the health and fitness of pilots between ages 60 and 63 or 60 and 65. The history of FAA with regard to the Age 60 Rule would suggest that timely progression is unlikely to occur.

The subject of increased medical scrutiny for the older pilot is also a subject of controversy. There is no single international standard for the frequency and detail of aviation medical examinations for the issuance of a Class I-equivalent medical certificate for airline pilots aged 60 and older. Some countries have used the standard examinations given to their pilots, using specialized testing on a case-by-case basis, as is currently done for under-60 pilots in the United States. Other countries impose a schedule of more frequent evaluations. Israel, for example, requires medical examinations and simulator checks every 4 mo for its pilots over age 60 and has found, in the 10 yr since allowing over-60 pilots to continue flying, that not one pilot in that group had to be grounded for medical reasons (letter from Captain Reuven Harel, Manager of Planning and Coordination of Operations, El Al, to Mr. Alan Serwer, November 15, 2000). The medical literature is currently without documentation that shorter intervals detect more effectively any of the health deteriorations of interest, or that more frequent examinations are better predictive of sudden onset pathologies.

The issue of adding cognitive screening tests to the routine examination protocol is controversial. As these tests are presently compared with and validated by pilot performance in advanced simulators, it could be argued that the FAA-mandated simulator checks—practical tests of piloting skills—are all that should be required of any airline pilot as a baseline performance measure. As there is no single industry standard for the timing of simulator testing, the frequency of simulator checks would likely require standardization coinciding with the required Class 1 aviation medical examination every 6 mo, for example. As the result of an aviation medical examination can point to the need for further specialized medical testing for an airline pilot, so could the result of a standard simulator check lead to the use of specialized cognitive testing to evaluate the pilot's reserve mental capacity, as is currently available exclusively to pilots under age 60.

Summary

The Age 60 Rule was an inappropriate regulation prompted by one airline's desire to replace older pilots with younger ones. Some 40 yr of scientific research refute the notion that the chronological age of 60 heralds a universal, inevitable, and precipitous decline in commercial airline pilots' physical health and mental proficiency, or even an age beyond which health and proficiency cannot be either measured or monitored. Some 40 yr of pilot performance data underscore the excellent safety record of older, more experienced pilots. Still, the United States government, represented by the FAA, clings to the notion that age of 60 *alone* represents an appropriate single standard for the evaluation of older pilot fitness. Characterized by Senior District Judge Will, dissenting in *Baker v FAA* " . . . the rule is simply an arbitrary, overly broad and outmoded presumption, smelling of age discrimination . . . moreover, in light of the agency's policy of never granting age 60 exemptions, its present regulations are a fraud."

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