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## **THE JOURNAL**

The *Journal of Air Transportation (JAT)* mission is to provide the global community immediate key resource information in all areas of air transportation. Our goal is to be recognized as the preeminent scholarly journal in the aeronautical aspects of transportation. As an international and interdisciplinary journal, the *JAT* provides a forum for peer-reviewed articles in all areas of aviation and space transportation research, policy, theory, case study, practice, and issues. While maintaining a broad scope, a key focal point of the journal is in the area of aviation administration and policy.



## Development

The *JAT* was conceptualized to fulfill an international void of scholarly publications in this area as identified by the primary organizers. It is envisioned that aviation leaders will utilize the *JAT* as a key decision-making tool. Scholarly rigor and standards will be uncompromised with regular evaluation by the Editorial Board and Panel of Reviewers.

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- Airports and Air Traffic Control
- Air Transportation Systems: Domestic, International, Comparative
- Aviation/Aerospace Psychology, Human Factors, Safety, and Human Resources
- Avionics, Computing, and Simulation
- Space Transportation Safety, Communication, and the Future
- Other areas of air and space transportation research, policy, theory, case study, practice, and issues

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Dr. Brent Bowen is Director and Distinguished Professor, Aviation Institute, School of Public Administration, University of Nebraska at Omaha, and the University's Director of Aviation and Transportation Policy and Research. Bowen attained his doctorate in Higher Education and Aviation from Oklahoma State University and a Master of Business Administration degree from Oklahoma City University. His Federal Aviation Administration certifications include Airline Transport Pilot, Certified Flight Instructor (Gold Seal), Advanced Instrument Ground Instructor, Aviation Safety Counselor, and Aerospace Education Counselor. Dr. Bowen's research on the development of the national Airline Quality Rating is regularly featured in numerous national and international media, as well as refereed academic publications. Dr. Bowen has in excess of 250 publications, papers, and program appearances to his credit. His research interests focus on aviation applications of public productivity enhancement and marketing in the areas of service quality evaluation, forecasting, and student recruitment/retention in collegiate aviation programs. He is also well published in areas related to effective teaching and has pioneered new pedagogical techniques. Dr. Bowen has been recognized with awards of achievement and commendation from the American Marketing Association, American Institute of Aeronautics and Astronautics, Federal Aviation Administration, Embry-Riddle Aeronautical University, W. Frank Barton School of Business, Travel and Transportation Research Association, World Aerospace Education Association, and others.

### **Igor Kabashkin**

Dr. Igor Kabashkin is Vice Rector of the Transport and Telecommunications Institute, Latvia, and a Professor in the Aviation Maintenance Department and member of the Technical Committee on Transport of the European Commission for Cooperation in the Field of Scientific and Technical Research. Kabashkin received his Doctor Degree in Aviation from Moscow Civil Engineering Institute, a High Doctor Degree in Aviation from Moscow Aviation Institute, and a Doctor Habilitus Degree in Engineering from Riga Aviation University and Latvian Academy of Science. His research interests include analysis and modeling of complex technical systems, information technology applications, reliability of technical systems, radio and telecommunication systems, and information and quality control systems. Dr. Kabashkin has published over 274 scientific papers, 19 scientific and teaching books, and holds 67 patents and certificates of invention.

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# JOURNAL OF AIR TRANSPORTATION WORLD WIDE



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# THE NEW U.S.—JAPAN BILATERAL AVIATION AGREEMENT: AIRLINE COMPETITION THROUGH THE POLITICAL PROCESS

**Robert Matthews**  
**FAA, Washington, D.C.**

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## ABSTRACT

International aviation is still dominated by the remnants of a 1950s regulatory regime. A mosaic of bilateral treaties continues to control supply, price, and market share as well as other aspects of aviation. The U.S.-Japan airline market was previously defined by the U.S.-Japan Bilateral Agreement of 1952, as amended. This paper offers a glimpse in how the aviation industry participates in the political process to advance its own interests. The result of years of debate and political maneuvering resulted in a new bilateral agreement between the U.S. and Japan with all sides gaining some improvement over the prior 1952 agreement.

## INTRODUCTION

In the midst of rapid change in the airline industry, recent negotiations between Japan and the U.S. on a new bilateral aviation agreement remind us of some basic principles of corporate political behavior in a regulatory world. The most prominent lessons from these negotiations include the following.

1. Each regulatory issue affects different firms differently. As a result, each firm participates in the political process to advance its own corporate interests. Such behavior is legitimate, but it means that corporate political behavior is seldom guided by broad values, such as the sanctity of competition or free markets, and that notions of a singular “industry position” seldom apply.
2. Firms must connect their interests to broad public interests or well established policies. The result is a rash of common references to the benefits of competition, lower prices, economic development, etc.

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3. Regulatory politics involve firms with similar interests who coalesce to contend with opposing coalitions. Each actor competes for the economic value that regulatory outcomes create, such as structuring U.S.–Japan air commerce to fit its circumstances.

**Background: Bilateral Agreements**

International aviation is undergoing such rapid structural change that observers have difficulty keeping pace. Japan has recently deregulated its domestic market and entire regional markets have been deregulated by the European Union and South America's Mercosur countries. New carriers are popping up everywhere. At the same time, open-skies agreements between countries are becoming commonplace and trans-border alliances between carriers, which were almost unknown a few years ago, have divided much of the world's traffic among just a handful of large airline groupings. Now U.S. carriers have taken the next step with same-country alliances among the world's six largest air carriers.

Yet, as this vibrant change unfolds and aviation rushes into a brave new world, international aviation is still dominated by the remnants of a 1950's regulatory regime. In international aviation, a mosaic of bilateral treaties continues to control supply, price, market share, etc.

Before the recent agreement, the U.S.–Japan airline market was defined by the U.S.–Japan Bilateral Agreement of 1952, as amended. The 1952 Agreement entrenched Northwest, Pan Am and Japan Air Lines (JAL) as incumbents for so-called Third- and Fourth-Freedom Rights.<sup>1</sup> Third and Fourth Freedoms essentially authorize a carrier to operate round trip flights between the carrier's home country and another country. Fifth-Freedoms (beyond rights) authorize a carrier to operate a flight between the two countries, then continue the flight to another destination.

United Airlines replaced Pan Am as an incumbent when United bought Pan Am's Pacific routes. FedEx became an incumbent cargo operator in the same way. Other carriers secured limited rights over the years. These carriers are identified synonymously as nonincumbents or MOU carriers, as their rights were not rooted in the original agreement, but were granted under subsequent Memoranda of Understanding (MOU). MOU carriers included American; Continental, its subsidiary, Continental Micronesia; Delta; UPS; All Nippon Airways (ANA); and Japan Air Systems (JAS).

Given the political environment after World War II and the existence of only one Japanese carrier at the time, U.S. carriers got the better of the 1952 agreement. Even today, U.S. carriers control a third of all slots at congested Tokyo Narita and account for just over half of all international operations there. The remaining international service at Narita is divided among carriers from Japan and all other countries. Similarly, U.S. carriers received more Fifth Freedom rights than did Japanese carriers under the 1952 Agreement. U.S. carriers operated to eight destinations beyond Japan. Japanese carriers operated

just one beyond flight twice a week—JAL to Brazil through Los Angeles.

New beyond rights or the extension of expiring beyond rights for United and Northwest were a central issue in the negotiations. This was especially true of Northwest, as Japan had denied separate requests for beyond service from Seattle through Osaka and onto Kuala Lumpur and Jakarta. Northwest and the U.S. Department of Transportation (DOT) argued that these rights were guaranteed under the 1952 bilateral, as Northwest was an incumbent. However, Japan argued that these particular beyond points were not incumbent and therefore constituted new authority. Beyond rights also proved critical to FedEx.

### Early Terms of The Debate

The initial debate placed Japan's preference for equalization against the U.S. preference for open skies.<sup>2</sup> The U.S. term of "open skies" might imply straightforward competition—let the best airline win. In fact, the term has always meant less than that, though it indeed means major liberalization. The U.S. uses the term to mean unlimited Third and Fourth Freedoms and, often, the expansion of Fifth Freedoms. However, moving freely within someone else's domestic market is decidedly not part of open skies for the U.S., despite the connotation of wide open competition. Japan generously noted this point in the negotiations, as a brief item in the *Aviation Daily* illustrated in June 1996:

Rejecting open skies, Japan says U.S. policy would open the international market without any safeguards while keeping [the] U.S. domestic market for U.S. airlines exclusively.... This policy... is pregnant with the risk of further concentration in the international market by mega-carriers.<sup>3</sup>

The sheer size of the U.S. airline industry is often lost on Americans. For example, measured by flights operated, the U.S. is home to the world's eight largest airlines, including FedEx. Measured by jets operated, the U.S. is home to the world's seven top carriers; British Airways nudges into eighth place, just three jets ahead of Southwest (265 jets versus 262 as of May 1998). The domestic market alone in the U.S. still accounts for a third of world airline demand. Simply put, U.S. allusions to the virtues of competition stuck in the throats of Japan's aviation officials when they were excluded from a third of the world market.

However, opening up the internal U.S. market just was not part of the conversation for DOT or for U.S. carriers, whether the carriers operate internationally or only domestically. The same, of course, is true in other regions of the world that have substantial domestic markets, including Japan and the now single European Union. Nevertheless, this irritant was real, given the size of the U.S. market.

**The Genuine Appeal of Open Skies.** Despite its qualified meaning, open skies has real intellectual appeal. It is a major liberalization of international aviation. DOT has persistently pursued open skies as its core policy in aviation since

the Bush Administration signed the first open skies agreement with the Netherlands. The Clinton Administration has also successfully pursued open skies in all its aviation negotiations. While inheriting open skies with the Netherlands and a trans-border agreement with Canada, the Clinton Administration has since driven new open-skies agreements in Central America, the Caribbean, Western Europe, Asia, and most of South America.

DOT's interest in open skies is related to, but goes beyond, the normative value of markets versus command-and-control regulation. Deregulation and liberalization have become the primary direction of economic policy around the world in most industries, including major domestic and regional aviation markets. Whatever its historical justifications, extensive economic regulation of international airline service no longer has a meaningful point in DOT's view. Open skies now is a goal in its own right.

**Japan's View.** In contrast to DOT's reference to principles of competition and ending an outdated regulatory regime, Japan strongly resisted what it characterized as "U.S.-style open skies." By qualifying the term with "U.S.-style," Japan noted its exclusion from the huge airline market in the U.S. interior. Japan saw open skies" as offering nothing meaningful in exchange for more access to Japan and unlimited beyond rights into other parts of Asia.

Instead, Japan spoke of equalization. Japan bristled at having just one beyond-flight through the U.S. and sought to equalize beyond rights and its market share between the two countries. Real issues of national pride were involved—Japan wanted to move beyond what it saw as an aviation treaty that reflected Japan's status as a conquered nation in 1952. Equalization meant equal status as a sovereign nation.

However, equalization also involved a few issues other than national pride. First, Japan was coping with the volatility of domestic deregulation. For 50 years, Japan had just three air carriers: JAL; ANA; and JAS. Deregulation in Japan's domestic market could add six or more new carriers within a year. As the U.S. learned after 1978 and as Europe is learning today, a newly deregulated industry can be volatile and is not without losers.

Japan had little interest in adding to the volatility of deregulation by introducing open competition with U.S. carriers on international routes. Simply put, U.S. carriers beat Japanese carriers badly on cost and productivity. On average, unit costs for Japanese carriers exceed those of U.S. carriers by two-thirds or more. JAS is especially hard pressed to reduce its costs, which have long been more than double world averages. Such enormous cost differentials made competition with U.S. carriers a tough issue for Japan.

Japan also had advantages to protect in beyond rights. If Japan were to secure a major increase in beyond-U.S. rights, Japan would have to reciprocate. However, Japanese carriers, especially JAL, were far better established elsewhere in Asia than were U.S. carriers. Japan's airlines carried substantial traffic from other Asian cities to Tokyo or Osaka, then to the U.S. on other

flights. Under the bilateral, such traffic originated in Japan, since these were not through flights. Therefore, Japan already enjoyed extensive de facto beyond rights. Japan had little to gain by conceding more beyond rights to U.S. carriers.

Finally, Japan argued that the U.S. simply ignored self-evident physical constraints at Tokyo's congested Narita, where no new slots would be available for anyone until a new runway was built. Consequently, Japan held that open skies simply was impossible. In addition, airlines from all over the world had applied for new or expanded access to Narita. Japan argued that U.S. carriers, who already controlled over half the international slots at Narita, could not expect special treatment in order to jump the queue.

DOT countered the runway argument with three points. First, Japan had talked about a new runway at Narita for several years. The time had come to get on with it. Second, DOT noted that many disputes involved rights to and beyond Osaka, not Narita. Therefore, the issue was about more than Narita, with or without a new runway at Narita. Third, DOT said much of the congestion at Narita was self-imposed by the absence of high-speed taxiways that are commonplace at other single-runway airports, such as London Gatwick, San Diego, etc., where aircraft exit quickly after touchdown. Japan's conservative ATC requirement on aircraft spacing restricts capacity even further. As a result, Narita's single runway handles a maximum of about 25 operations an hour; a comparable runway in the U.S. or Britain would handle twice that.

**Japan's Counter Offer.** Instead of open skies, Japan sought "dynamic liberalization," or "controlled expansion," in which Third- and Fourth-Freedoms would increase, but would remain regulated. The question for U.S. carriers and DOT was how many new flights Japan would accept. DOT implied that an increase of 150 to 200 weekly flights could be—could be—acceptable. Japan did not commit itself publicly to a number, but dismissed DOT's numbers as preposterous. Speculation commonly identified 90 new slots as the absolute maximum, or an increase of 36 percent.

Japan began outlining to negotiators in the summer of 1996 just what controlled expansion and equalization would mean. Japan allowed that it would accept an unlimited number of U.S.–Japan points for two carriers from each country (presumably Northwest, United, JAL and ANA), with an orderly expansion of beyond-rights for U.S. incumbents, plus some new beyond authority for non-incumbent U.S. carriers. In addition, nonincumbents would be offered a substantial increase in frequencies and two new nonincumbents could be designated. In exchange, Japan would expect ANA to be designated an incumbent, and beyond rights and unlimited points would have to be equalized for Japan's two incumbents.

Though DOT continued to claim that open skies remained its goal, the debate shifted to whether controlled expansion would offer enough new slots to keep U.S. carriers happy, or whether it was only a negotiating ploy by Japan to delay open skies indefinitely. U.S. negotiators and many U.S. carriers added that, if

Narita really precluded new slots, controlled expansion would not be worth the trouble. Based largely on this reasoning, Northwest and its allies continued to insist on open skies, lest the U.S. trade away real growth in exchange for a phony deal.

Yet, expansion, controlled or not, could advance the interests of many U.S. carriers. Clearly, Japan was not interested in open skies. As a practical matter, DOT's challenge was to move Japan as close as possible to open skies while still accepting some regulatory limits. Though the question of how many remained for U.S. carriers and DOT, Japan's offer of expansion split the U.S. industry's insistence on open skies.

### **Positions Taken by U.S. Carriers And Others**

**Incumbent U.S. Carriers.** From the start, U.S. carriers had different interests in the negotiations. United and Northwest, as incumbents, had dominated the U.S.-Japan market and were well established in Japan, with hangars, gates, sales operations, and regional maintenance facilities. As of summer 1997, United operated 87 round trips per week to and from Japan, while Northwest operated 154. Nonincumbent U.S. carriers shared 30 weekly round trips, for a U.S. total of 271 round trip slots per week. Japanese carriers had a total of 134, or just 31 percent of the total.<sup>4</sup>

At a minimum, United and Northwest sought to protect their positions and their capital investments. United and Northwest first sought nothing short of open skies. Northwest was especially vocal in its demand for open skies. On its face, Northwest's 154 weekly flights versus United's 87 would indicate Northwest had more at stake than United. In fact, this understated the relative importance of Japan to Northwest.

First, Northwest was ready to expand its presence in the region and sought beyond authority into East Asia through Japan. Beyond-authority would enable Northwest to build on its base in Japan before other U.S. carriers could do so. Consequently, beyond-authority was important to Northwest, who, like DOT, contended that Japan's rejection of Northwest's requests violated authority included in the existing bilateral from 1952.

A related and more general concern for Northwest was its perceived need to protect its base of 154 flights and its dominant position in the Japan-U.S. market. This base was more important to Northwest than it was to United, important though it was to United. By any measure, United was at least a third larger than Northwest. United also had a few more options via its wider range of alliances with foreign carriers. United's Star Alliance included Air Canada, Lufthansa, SAS, Thai Airways, and Varig. At the same time, ANA had entered agreements with several Star Alliance partners, and was talking to United about a possible agreement (which it later completed). Meanwhile, JAL and American were talking about expanding a limited frequent flyer agreement into a broader alliance, including codesharing, common services, etc.

In contrast, if Japan could convince United that the increase in total slots under controlled expansion would be adequate not only to protect its base but to build on it, United likely would be happy to accept something short of open skies, as would the three nonincumbent U.S. carriers. However, Northwest could not easily afford to be so flexible. Depending on the details, controlled expansion might not provide enough net growth to assure Northwest that it could expand to or through Japan, or that it could protect its position against United, or against alliances like JAL–American or ANA–United, or against the sum of new frequencies operated directly by JAL, ANA, the existing U.S. MOU carriers and any newly designated MOU carriers. Consequently, Northwest continued pressing for open skies.

United, in fact, was satisfied that expansion and a deal with ANA would suit it well enough. United suddenly softened its position and thereafter portrayed Japan's offer as something that was valuable and within reach. United added that the proposed increase would offer satisfactory growth for all. Meanwhile, Northwest continued to play hardball.

**Nonincumbent U.S. Carriers.** Nonincumbent U.S. carriers (American, Continental and Delta) recognized that controlled expansion would enable them in practice to expand as much as open skies would, given the relatively weak base from which each would need to build. Consequently, those carriers lobbied hard for DOT to accept what they characterized as meaningful change in the right direction. In short, forget open skies and take a useful deal.

TWA put everyone on notice that it would apply for U.S.–Japan authority when negotiations were completed, whether they led to open skies or expansion. TWA still preferred open skies as a matter of principle, but access was access. U.S. Airways and Hawaiian Airlines later added their names to the list of carriers who likely would apply for new authority.

However, other carriers also had interests consistent with those of Northwest. Alaska Airlines, for example, had entered several codesharing and frequent flyer agreements with Northwest. Though Alaska was unlikely to seek authority to operate to Japan, it supported its new ally, Northwest.

America West also supported open skies. Though the carrier no longer operated to Japan, it had done so in the past and might want to do so again. However, expansion likely would mean benefits for incumbents and MOU carriers. Even with one or two new U.S. MOU carriers, America West was unlikely to be one of those new designees. Therefore, controlled expansion might permanently exclude America West from the U.S.–Japan market. America West sought open skies to keep its options open.

More significantly, FedEx had a strong interest in the issue of beyond rights. FedEx had been involved in bitter negotiations with Japan since at least 1993 over Fifth-Freedom services through Japan. FedEx's plans called for the use of 747s on the trunk lines to North America, with a fleet of smaller aircraft, such as 737s, to provide collector and distribution operations throughout East Asia.

FedEx and DOT both argued publicly that FedEx was entitled to these approvals under the 1952 bilateral. Japan, however, saw it differently and said flatly that this de facto cargo hub was outside the incumbent Fifth-Freedoms under the 1952 bilateral.

FedEx could get approval only for new Third- and Fourth-Freedom flights or straightforward Fifth-Freedom rights, neither of which fit the carrier's plans. In fact, FedEx had not used many of its allotted Third- and Fourth-Freedom slots under the bilateral agreement, because they did not advance FedEx's long-term strategic objectives. These unused slots later would become the source of a bilateral compromise.

Yet, FedEx was not especially concerned about open skies, though open skies would yield what FedEx sought. Instead, FedEx's primary concern centered on its Fifth-Freedom requests, with or without open skies.

The air carrier lineup eventually put incumbent United on the same side of the issue as American, as well as Continental and Delta. Hawaiian, U.S. Airways and TWA also came down on that side of the issue, as controlled expansion likely would accommodate any realistic plans they might have. On the other side, Northwest held firm in its demand for open skies and more beyond rights, with support from Alaska and America West, and an angry FedEx in the corner.

#### **Domestic Politics in The U.S.: Non-airline Stakeholders**

Open skies advocates enjoyed the early advantage of being on the side of a well-established government policy that was consistent with basic American assumptions about the virtues of markets. The appeal of the open skies label was reflected in early and vocal support from Capital Hill, especially from the Senate. Up to 20 Senators went on record, either in letters to the White House or in public statements, to urge the Administration to hold firm on open skies. Many of those Senators took the extra step of warning the Administration several times against settling for anything short of that objective.

Those Senators included Chairmen of seven committees, the Minority Leader, and several members of the Appropriations Committee, plus Jesse Helms, Chairman of the Senate Foreign Relations Committee. This was no small base from which to build support for open skies. Senator Helms, in fact, went to the wire, with strong statements and threatening last-minute hearings on the issue.

Besides benefitting from the connotations of open skies, Northwest successfully linked its position to larger trade issues, arguing that open skies with Japan was a test case demonstrating U.S. resolve in all trade issues with Japan. Northwest got vocal support on this tact from Chrysler, General Motors and the Automobile Manufacturers Association. Northwest lobbied Congress hard with this argument and undertook an aggressive advertising campaign in the *Washington Post*, with full-page ads that were complete with Japan bashing, bureaucrat bashing, and references to Asia's financial crisis. The ads regularly included a half-page comic strip that portrayed President Clinton

aboard a JAL jet being duped by his own staff into giving away the U.S. market. Northwest's ads used large, bold print to emphasize selected points. The ads and their cartoons told readers the following.

Anything less than open skies is a surrender to Japan's bureaucracy.

For decades, Japan has protected its industries from foreign competition in Japan while orchestrating their expansion into the U.S. Other Asian countries followed the Japan Inc. model. It hurt us, but it worked for them, **until now!** (Original in bold.)

The Asian economic crisis is a direct result of these protectionist policies. The remedy is the U.S. model—open markets and free competition. ...Unfortunately, Japan's bureaucrats still haven't gotten the message.... Japan is still insisting on an aviation deal that follows the old 'Japan Inc.' model. It will allow them to control ticket prices, keeping them high, and restrict U.S. landing slots to Tokyo, protecting their inefficient airlines, all the while doubling Japan's access to the lucrative U.S. market.... That's why U.S. negotiators must insist on our policy of deregulation in international aviation.

On the other side, advocates for controlled expansion included more than a few cities and airport authorities who, for their own reasons, agreed that expansion was valuable and within reach. Those airport authorities included Chicago O'Hare (United and American hubs), Dallas/Fort Worth (an American hub), Honolulu (to ensure continued arrival of Japanese tourists on U.S. or Japanese carriers), Los Angeles (a likely destination for new JAL and ANA flights), San Francisco (United's Pacific hub) and others. Congressional support for expansion included three Senate chairmen, most of the Illinois delegation from both parties, the Governors of California, Hawaii and Illinois, and the cities of Chicago, Los Angeles, New York, and San Francisco. In addition, organizations known as the Midwest Coalition and Access U.S.–Japan (each of whom represented a group of airlines, including American and Delta, airport authorities, and state and local governments) added their weight and ran their own advertising campaign.

The U.S. side essentially moved to two coalitions of carriers and related interests. Each side claimed the high road and accused the other of pursuing narrow self interests.

Besides its hard ball advertising and congressional lobbying, Northwest formally opposed every interim petition that JAL and ANA submitted to DOT. FedEx did much the same and with rhetoric that became increasingly harsh and targeted.

The message from FedEx and Northwest was consistent: the petitions by JAL and ANA usually were within the existing bilateral, but until Japan was willing to extend beyond rights to Northwest that it (and DOT) believed were within the same existing bilateral, DOT should no longer try to cooperate with Japan. *Aviation Daily* provided a good example of this tactic when it summarized Northwest's filing to DOT in opposition to an application by JAL to increase its flights from three weekly to seven weekly between Tokyo and Kona, Hawaii. JAL contended that the existing bilateral authorized that expansion. Northwest did not disagree with this contention, but added:

Northwest does not dispute that JAL's requests are consistent with the U.S.-Japan Air Transport agreement, but Japan's refusal to allow Northwest—despite bilateral entitlement—to operate Seattle-Osaka-Jakarta service, including Fifth-Freedom Osaka-Jakarta traffic, should prompt DOT to deny JAL's bid... Japan's actions seriously injured Northwest by limiting its ability to serve Asia and precluding altogether Northwest's participation in the U.S.-Indonesia market.<sup>5</sup>

FedEx and JAL then exchanged public insults when FedEx opposed a routine JAL filing to DOT to renew JAL's Third and Fourth Freedoms to operate cargo service from Tokyo to Atlanta. FedEx, like Northwest, insisted that it was being denied the use of existing authority for beyond service through Tokyo, so DOT should not provide any unnecessary concessions. JAL retorted flatly that the authority sought by FedEx was not part of the existing authority, and that Third and Fourth Freedoms should not be held hostage to a dispute over the interpretation of Fifth Freedoms.

FedEx publicly described JAL's comments as "astonishingly inappropriate, misleading and arrogant." FedEx maintained that the bilateral permitted new beyond service from Tokyo—a position publicly taken by DOT in its approval of Northwest's beyond-rights complaint. JAL said it did not, and third/fourth freedoms should not be held hostage to Fifth-Freedom battles. JAL added that "Moreover, the latest filing [by FedEx to DOT] is ... almost unalloyed invective of the sort that has no place in an administrative proceeding, [and is] full of offensive representations." FedEx shot back that there was "no polite phrase for the deliberate and prolonged breach of a clear and valid bilateral commitment." Patience was wearing thin on both sides.<sup>6</sup>

Other U.S. carriers were more conciliatory. United supported JAL's Kona application as long as [DOT] concludes that the government of Japan is prepared to grant comparable approval to changes in U.S. carrier third/fourth freedom schedules. United added that sanctions against Japan and its carriers would only disrupt productive U.S.-Japan negotiations on which Japan, according to United, was showing signs of greater flexibility.<sup>7</sup> A month later, United added that "It is not always reasonable to say 'no.' We had better explore or study what we can do." Delta took the conciliatory tone a step further on several occasions to praise DOT for its persistence and skill.

DOT then sharpened its own messages to Japan. In mid-February 1997, DOT simultaneously approved for 180 days the JAL application at Kona, but then issued an order in which DOT agreed with Northwest's July 1996 complaint: by failing to approve Northwest's request for beyond rights, Japan had committed a most serious violation of the existing bilateral by blocking Northwest's beyond service to Jakarta. DOT chose not to impose sanctions just yet, expressing hope that negotiations would settle the issue. However, the message was clear: DOT had only so many options under U.S. law, and if delays continued, DOT would be forced to take more aggressive action.

Within days of this order, DOT's Deputy Assistant Secretary for International Aviation Policy, Patrick Murphy, told the Institute for International Economics that the U.S. "is no longer prepared to sign a small deal satisfying the short-term needs of a few U.S. and Japanese carriers while...restricting future U.S. rights." Additional short-term needs for Japanese carriers will just have to remain unresolved until there is a breakthrough in our aviation relations. In short, JAL could forget another extension, as could ANA unless they and their government showed some movement.<sup>8</sup>

**The European Union Enters the Equation.** At this point in the negotiations, the key issue was whether Japan could sell its alternative of controlled competition by offering enough new slots at Narita and Osaka to appease U.S. carriers and DOT. Doing so would, to say the least, be diplomatically awkward. Japan had rejected applications for more Narita frequencies from carriers around the world because Narita was said to be operating at capacity. If so, how would the rest of the world react if Japan suddenly found slots for U.S. carriers?

The European Union (EU) made its position clear. If Japan offered new slots to U.S. carriers and let them jump the queue, the EU said Japan would be discriminating against European carriers, who were prominent in the queue into Narita. Competition Minister, Karl Van Miert, and Transport Minister, Neil Kinnock, reminded Japan that EU law authorized the European Commission (the EU's executive branch) to take retaliatory action against Japan's carriers, who were busy increasing their access to Europe.

**Summary of the Line Up.** Northwest continued to play hard ball and had managed to keep the congressional debate at least partly focused on broader issues, such as free markets. In addition, Northwest had found allies in Detroit, where U.S. auto manufacturers responded to general trade issues. However, Northwest was beginning to find itself alone among U.S. passenger carriers, with strong support only from Alaska Airlines, plus more distant support from America West. Even the position of FedEx was a bit ambivalent toward open skies; its focus was on beyond rights, under any label.

On the other side were the remaining large U.S. carriers for whom controlled expansion would be just fine in practice. Though some of those carriers preferred open skies in principle, controlled expansion likely would

accommodate any growth that they could realistically manage in Japan. Those carriers found allies in several major airport authorities, city and state governments, congressional delegations and trade organizations, for who controlled expansion would be adequate in practice.

DOT was somewhat caught in the middle. It had sought open skies as a general principle for a decade anywhere the opportunity presented itself. DOT saw little value in maintaining a regulatory structure that its career and political leadership under both Republican and Democratic Administrations had long felt was obsolete. Yet, DOT recognized that Japan would not accept full open skies. Instead, DOT needed to get what it could get. The challenge was to continue pushing as hard as possible for concessions but, at some point, not too hard.

Japan's Ministry of Transport also was caught in the middle. It needed to erase what it and its carriers had long perceived as second-class status under the 1952 bilateral. However, the Ministry could not seek the full equalization implied by open skies because its carriers, already bracing for the volatility that accompanies domestic deregulation, simply were not ready for it. In addition, the Ministry had to offer something in return for its qualified equalization; the U.S. would demand something substantial, even if it were short of open skies.

That "something" would require concessions on beyond rights for incumbents, plus enough new slots to satisfy all three groups of U.S. carriers with interests in the issue: incumbents; MOU carriers; and carriers seeking new entry in the U.S.–Japan market. However, the catch was that any new slots at Narita would create diplomatic issues for Japan elsewhere.

Finally, Japan faced a major long-term strategic threat if it offered too little or held out too long. U.S. carriers were entering codesharing agreements and the U.S. government was entering open skies agreements rapidly in the region. If Japan waited much longer, it might find it had forfeited its role as the hub between North America and East Asia; some U.S. carriers already were bypassing Narita en route to other destinations.

### **New Slots Are Found at Narita — Agreement**

After nearly two years of debate and maneuvering, DOT proposed a compromise: take the unused slots allocated to U.S. cargo operators and let DOT or Japan allocate them to U.S. passenger carriers. FedEx, who agreed to let this proposal stand, accounted for nearly 40 such slots alone, while UPS and ABX added more slots. The difficulty, though, was threefold.

First, Japan would have to choose between the U.S. and the EU. Both the Transport and Competition Commissioners of the EU noted that the long-established practice required that any forfeited slots were to be placed in a truly international pool and, in this case, reallocated by Japan to those carriers already in line for new slots. The U.S. had no special claim to slots that its cargo carriers were not using.

Second, U.S. carriers complained that, since the slots at issue were designed for cargo carriers, they offered arrival and departure times that were simply

brutal for passenger traffic. “Too bad” was Japan’s basic response—U.S. carriers and DOT could sort that out among themselves. Third, with a total of 50 slots, the unused cargo slots at Narita would not do the job.

In the end, Japan chose to risk angering the EU; Japan took the offer **and** actually improved its earlier offer:

An unlimited number of U.S.–Japan points for two incumbent carriers from each country, which meant ANA would become an incumbent along with JAL, Northwest and United;

An orderly expansion of beyond rights for U.S. incumbents in exchange for more beyond points for Japanese carriers;

New beyond authority for non-incumbent U.S. carriers;

A substantial increase in frequencies for nonincumbents;

The U.S. could designate two new MOU carriers immediately and could add a third MOU carrier in two years;

Expansion would include some price flexibility to enhance competition; and

U.S. MOU carriers would get a total of 150 new round trips a week, in addition to unlimited expansion for incumbents.

Any number of factors could explain why Japan seemingly agreed rather suddenly after two years of back-and-forth. First, DOT made clear that its patience was running out—a major advance would be required, and soon. More importantly, the environment was beginning to bypass the negotiating chips enjoyed by Japan’s Ministry of Transport. Japan had to defend its role as a regional hub. In addition, U.S. and Japanese carriers were already negotiating alliances that made carriers on each side of the Pacific, but especially in Japan, reassess their position.

Finally, Northwest and Continental had announced a domestic alliance, in which the fourth and fifth largest carriers in the world would coordinate routes, ticketing, etc., complete with Northwest taking a 14-percent equity stake in Continental. This predated the American-U.S. Airways and United-Delta alliances, which emerged only after the negotiations. Northwest could live with expansion, given the improvement in its own position and the new prospects enjoyed by Continental, provided that Japan accepted this new same-country codeshare without penalizing either carrier’s slots. Japan later did so.

**OK, Who Won?**

Who won and who lost is not the most diplomatic question to ask, but the honest answer is almost diplomatic: everyone—well, nearly everyone. Japan won in that it held off open skies and unlimited competition between U.S. and Japanese carriers. Japan also won by equalizing beyond rights and by adding an incumbent carrier. In addition, Japan secured a codeshare with Northwest for the weakest of its three established carriers (JAS). These were no small achievements by the government on behalf of its national carriers; Japan enhanced its position as an equal in a relationship between sovereigns.

The U.S. also won. DOT had brought home far more new slots than any observers had thought possible throughout most of the negotiations. DOT also had won unlimited Third and Fourth Freedoms for United and Northwest, while adding substantial beyond rights for each. In addition, DOT added two new incumbents immediately and a third after two years, with new slots and some Fifth-Freedom rights for good measure.

Among the Japanese carriers, ANA clearly was a winner, with new incumbent status, unlimited Third and Fourth Freedoms to and from the U.S., and assurances of new Fifth-Freedom rights. Meantime, ANA had added itself to the Star Alliance.

United also was a winner. Besides securing an important alliance partner in ANA, United also had won unlimited Third and Fourth Freedoms, and was assured of new Fifth-Freedom rights. In the end, United could use its established position in Japan to pursue any level of realistic growth that it might entertain. In the meantime, by playing a rather moderate role during the negotiations, United had avoided making enemies in Japan and may even have made a few friends.

Similarly, all three U.S. MOU carriers had clearly won. They were assured of a significant number of new slots to accommodate any realistic growth. In addition, American was about to close a deal with JAL, while Continental could expand in its own right and piggyback on its new alliance with Northwest. Similarly, Delta could expand in its own right and could piggyback on its yet-to-be-announced alliance with United. In addition, like United, Delta's low-keyed but conciliatory statements during negotiations had avoided making enemies in Japan.

Other U.S. carriers also won, such as TWA and Hawaiian. They were virtually assured of gaining new MOU status, especially after U.S. Airways chose to stop pursuing MOU designation. Alaska, too, came out well. Its partner, Northwest, already was dominant in the U.S.–Japan market, and Northwest had gained unlimited Third and Fourth Freedoms, plus expanded Fifth-Freedom rights. Alaska could sell tickets throughout its market not only to Japan but to a growing number of Fifth-Freedom destinations in Asia via Northwest.

Finally, even Northwest won. It had played hard ball but had helped push Japan to make important concessions, such as unlimited Third and Fourth Freedoms and expanded Fifth Freedoms. Northwest could build on its dominant

position in the U.S.-Japan market. However, Northwest had three worrisome outcomes. First, even if its insistence on open skies were only a negotiating position, Northwest had come up short of its stated goal and thereby appeared to have lost. Second, Northwest also had some fences to mend, both in Japan and in the U.S. Even after negotiations were concluded, Northwest's public statements remained negative and aggressive. Given Northwest's tactics and its shrill voice during the negotiations, Japan's Ministry of Transport and even DOT might hesitate before doing Northwest any favors for some time.

Third, the agreement adds unlimited flights for four incumbents, including ANA, plus expansion for three U.S. MOU carriers and three new U.S. MOU carriers. The sum of these flights should at least double capacity. If demand cannot support this supply, expansion may create enough new capacity to force some future market shakeout. This is not what Northwest had in mind.

If so, the American-JAL and United-ANA alliances could cut into Northwest's market share in a glutted market. However, the same risk faces existing and new MOU carriers and Northwest starts from a strong position, given its existing infrastructure in Japan. On balance, Northwest emerged in good shape.

Finally, major airport authorities and their allies clearly won, with new flights to and from Japan. Similarly, the Midwest Aviation Coalition and Access Japan also won by establishing themselves as effective lobby groups in major trade issues.

## CONCLUSIONS

The core issues of expansion versus open skies, plus the issue of beyond rights, affected different carriers differently. Modest expansion would have accommodated growth plans for the three MOU carriers from the U.S., while talk of adding ANA as an incumbent and adding three MOU carriers from the U.S. satisfied another block of carriers. The incumbent U.S. carriers, especially Northwest, had other interests to protect, and each acted accordingly. Constituent airport authorities and local and state governments also lined up according to their interests.

This produced two opposing coalitions on the Japan-U.S. negotiations. Each coalition was a temporary marriage of convenience among airlines, airport authorities and governments whose interests were comparable or at least compatible. However, because each issue can affect each organization differently, members of each coalition are likely to oppose each other on tomorrow's issue. The guiding principle is not some high-level normative value, such as the sanctity of open markets. Instead, like firms in other fields, airlines compete in the politics of regulation to acquire the economic value and competitive advantages that regulatory outcomes can create.

### ENDNOTES

1. Five Freedoms of the Air:
  1. First freedom rights grant a foreign carrier the right of innocent passage to fly over another country without landing.
  2. Second freedom rights grant a foreign carrier the right to land in another country for purposes of refueling and maintenance without offering commercial service to or from that point.
  3. Third freedom rights allow a foreign carrier to pick up traffic outside its home country to be disembarked in its own country of registry.
  4. Fourth freedom rights allow a foreign carrier to pick up originating traffic from its own country for transport into another country.
  5. Fifth freedom rights allow a carrier to pick up or disembark traffic enroute.
2. Open Skies agreement.

An agreement between two or more national governments that leads to freer trade in aviation services through the elimination of entry barriers and/or the prohibition of government regulation of routes and capacity.
3. *Aviation Daily*, June 27, 1996.
4. *Aviation Daily*, August 4, 1997.
5. *Aviation Daily*, January 8, 1998.
6. *Aviation Daily*, February 18, 1997; February 19, 1997; March 28, 1998.
7. *Aviation Daily*, January 9, 1997.
8. *Aviation Daily*, February 18, 1997.



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# **IDENTIFYING CHARACTERISTICS OF AIRLINE FREQUENT-FLIERS IN AUSTRALIA: IMPLICATIONS FOR MARKET SEGMENTATION, TARGET MARKETING, AND PRODUCT DIFFERENTIATION**

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## **ABSTRACT**

This paper examines the frequent-flier membership profiles of airline travelers in Australia, their demographic characteristics, behavioral discriminants, and attitudinal differences using standard statistical techniques and stepwise canonical multiple discriminant analysis, and then advances the implications for market segmentation, targeting, and product differentiation. It concludes by noting that the same methodology can be used for many service-oriented industries characterized by strong customer loyalty engendered by repeat patronage reward programs.

## **INTRODUCTION**

When American Airlines first launched its AAdvantage Frequent-Flier Program in May 1981, patterning it after the Green Stamps idea, it soon became the biggest and most successful marketing tool in the airline industry, replacing toasters as the most sought after reward. Members of frequent-flier programs earn points when they fly on the sponsoring airline and its affiliates, when they rent cars or stay at hotels owned by its designated partners, or when they use

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airline-affiliated credit cards or other services. They can then cash in their earned points mostly for free flights or upgrades. The airlines, on the other hand, can cultivate new business, enjoy repeat patronage through progressively attractive awards given directly to the fliers, deter emerging airlines from entering established markets, and compile the demographic profiles and travel characteristics of their members through sign-up procedures and computerized flight logs.

Today, both of the two largest airlines operating domestic routes in Australia (Qantas/Australian and Ansett) have their own frequent-flier programs that are growing very rapidly. In fact, a Qantas spokesperson was quoted as saying, "The program is growing like a wildfire... not only do you have to manage the program, but you have to manage the *growth* of the program itself".<sup>1</sup> *The modus operandi* of frequent-flier programs has been outlined (Toh & Hu 1988), their impact on airline operations examined (Hu, Toh, & Strand 1988), the problem of abuses documented (Toh, Fleenor, & Arnesen, 1993; Arnesen, Fleenor, & Toh, 1997), their impact on corporations and the concomitant corporate responses analyzed (Stephenson & Fox, 1987/1992), and the profiles of frequent-flier program members described for the United States (Toh & Hu, 1990) and in Australia (Browne, Toh, & Hu, 1995; Ford, 1993). This study uses standard statistical techniques and stepwise canonical multiple discriminant analysis to identify characteristics of airline frequent-fliers in Australia, and then examines the implications for market segmentation, target marketing, and product differentiation.

## SURVEY DESIGN

We conducted a survey of airline passengers at Sydney Airport over a period of seven consecutive days, covering each day of the week at different times to neutralize daily variations in passenger profiles. Also, on the recommendation of the Airport Duty Manager, our field workers spent equal amounts of time at the departing Qantas/Australian, Ansett, and international terminals to reflect his best estimate of the traffic breakdown. Departing airline passengers were asked to respond to a two-page form consisting of 24 questions. We were fortunate in achieving an 85 percent response rate among those approached, resulting in a total of 377 completed and usable questionnaires filled out by Australian residents.

### Frequent-flier Program Membership Profile

Altogether, 25 percent of the respondents identified themselves as members of frequent-flier programs, representing 3.65 million out of the 14.6 million air travelers in Australia who fly each year.<sup>2</sup> Among the frequent-fliers, 75 percent considered themselves as primarily business travelers, whereas only 25 percent flew primarily for pleasure. As 48 percent of all travelers considered themselves as primarily business travelers, this means that among them, 39 percent were

members of frequent-flier programs. Conversely, as 52 percent of all air travelers flew primarily for pleasure, this means that among them, only 12 percent were program members.<sup>3</sup> For the moment, note that the proportion of frequent-fliers are more than three times higher among business travelers than among pleasure travelers.

### Demographic Profile of Frequent-fliers

Demographic differences between members and nonmembers of frequent-flier programs were significant. In total, 74 percent of all members were men, whereas only 26 percent of all members were women, with the male/female ratio of members at 2.85 compared with only 1.35 for nonmembers, suggesting that men are vastly over-represented among frequent-fliers. In terms of income, 47 percent of the members earn more than A\$60,000 a year, compared with only 17 percent for the nonmembers. The observation that a larger proportion of the members are wealthy can in turn be partly explained by the fact that, whereas 74 percent of the members are above 30 years of age, only 59 percent of the nonmembers belong to this mature group.

Finally, when nonmembers were asked for the *primary* reason they did not belong to frequent-flier programs, 95 percent said they made too few trips. The results of statistical tests suggest that nonmembers who claim they fly too infrequently to justify joining, do indeed fly less frequently ( $p = 0$ ), usually travel for pleasure ( $p = 0.002$ ), and tend to be poorer ( $p = 0$ ).

### Behavioral Discriminants of Frequent-fliers

Discriminant analysis was used to distinguish between members and nonmembers. The predictor variables that provided the greatest group separation were regarded as significant descriptor variables associated with each market segment. Throughout, stepwise canonical multiple discriminant analysis was used with SAS default values of  $\alpha = 0.15$  to enter and stay in the discriminant function, based on a training sample of  $n = 165$ . Note that a holdout sample of  $n = 159$  was reserved for validating the discriminant function, necessary because the classification matrices are compiled on the analysis data used to compute the discriminant function, creating an upward bias on the hit ratio of correct classifications of the criterion variable (Hair, Anderson, & Tatham, 1987).

Behavioral characteristics (decision criteria) were then measured by asking respondents to rate, on a five-point scale (where 1 = very important and 5 = not at all important), the following variables in choosing an airline:

- $X_1$  = Convenience of schedules
- $X_2$  = Cabin service
- $X_3$  = Meal quality
- $X_4$  = On-time departure and arrival
- $X_5$  = Frequent-flier programs

$X_6$  = Low or discount fares

$X_7$  = Recommendation's of a travel agent

$X_8$  = Recommendation's of a corporate travel planner

To correctly interpret the standardized canonical multiple discriminant coefficients, note that for the two-group multiple discriminant function members = 1 and nonmembers = 2.

Results from the stepwise canonical multiple discriminant analyses based on the training sample with membership category as the criterion variable and the eight behavioral characteristics as the predictor variables are shown in Table 1.

**Table 1**  
**Multiple Discriminant Analysis on Behavioral Characteristics: Membership Status**

Step	Variable Entered	Stand. Disc. Coef.	Partial R <sup>2</sup>	F-stat	p-value
1	$X_5$ (Frequent-flier program)	1.06	1.04	26.57	0.0001
2	$X_3$ (Meal quality)	-0.45	0.12	21.90	0.0001
3	$X_7$ (Agent recommendation)	-0.41	0.05	7.78	0.0059
4	$X_2$ (Cabin service)	-0.35	0.03	4.17	0.0429

Wilk's Lambda = 0.70,  $p = 0.0001$

Averaged squared canonical correlation = 0.30

Members' group centroid = -1.09

Nonmembers' group centroid = 0.40

Hit ratio = 123/165 = 75 percent

Proportional chance criterion =  $(0.27)^2 + (0.73)^2 = 61$  percent

At the 15 percent level of significance, the following behavioral characteristics were found to discriminate between members and nonmembers, in descending order of the partial coefficients of determination (partial  $R^2$ ): frequent-flier programs ( $X_5$ ), meal quality ( $X_3$ ), agent recommendation ( $X_7$ ) and cabin service ( $X_2$ ). These four significant predictor variables generated an average squared canonical correlation of 30 percent within the multiple discriminant function, which was very significant (Wilk's Lambda = 0.70,  $p = 0.0001$ ). Furthermore, the hit ratio (measuring the proportion of members and nonmembers correctly classified) was 75 percent, comparing favorably with the proportional chance criterion (representing the prediction one would expect with pure chance) of 61 percent. More impressively, when the multiple discriminant function was applied to the holdback sample, the hit ratio was 96 percent.

Given a critical cutting score of zero (since the canonical multiple discriminant function coefficients were all standardized), and a coding protocol where members = 1 and nonmembers = 2, all negative standardized coefficients are directly associated with membership (group centroid = -1.09) while all positive standardized coefficients are associated with nonmembership (group centroid = 0.40). But since the scale is reversed (where 1 = very important and 5 = not at all important), compared with nonmembers, members are more likely to consider frequent-flier programs as more important, and regard meal quality, agent

recommendation, and cabin service as less important in choosing an airline. The reverse is concomitantly true for nonmembers.

Note that low or discount fares ( $X_6$ ) were left out of the multiple discriminant function because of some multicollinearity ( $R^2 = 0.23$ ) with agent recommendation ( $X_7$ ). However, by itself, a two independent samples t-test showed that for low or discount fares, the difference in the importance rating between the means for members (2.44) and for nonmembers (1.74) is significant at  $p = 0.0024$ , suggesting that compared with members, nonmembers place importance on low or discount fares.

Furthermore, compared with nonmembers, members of frequent-flier programs tend on average to travel twice as often (10 trips versus five trips per year). A comparison of the frequency distributions for members and nonmembers shows that whereas 70 percent of members travel alone, the corresponding figure for nonmembers is 60 percent, again reflecting the fact that frequent-fliers are usually business travelers on work related travel. This notion is supported by the observation that 68 percent of the members were traveling on tickets paid for by corporations or the government, versus only 42 percent for nonmembers.

#### Attitudinal Differences

Attitudinal characteristics were measured by asking respondents to rate, on a five-point scale (where 1 = agree strongly and 5 = disagree strongly) five different statements concerning frequent-flier programs. Results of two independent samples t-tests on attitudinal differences by membership category are shown in Table 2.

Results from Table 2 show that compared with nonmembers, members are more likely to agree that frequent-flier programs influence the choice of an airline, are less deterred by taxes, are more likely to believe in concentrating on one program to get best results, and are less afraid that the frequent-flier program will go bankrupt.

Furthermore, when respondents were asked how important frequent-flier programs would be in choosing an airline if the bonuses were considered free employee benefits versus if they were company property, a match paired t-test indicated a very significant difference in attitude ( $p = 0.0001$ ) under the separate ownership scenarios. The *difference* in the ratings given by each respondent to the importance of the programs under the two ownership scenarios was then treated as a dependent variable in a multiple regression model. Treating members and nonmembers as a dummy independent variable, the *difference* in ratings was significantly larger for the members than for the nonmembers ( $p = 0.70$ ), indicating, not surprisingly, that compared with nonmembers, members place greater importance on the *individual* ownership of travel bonuses.

When the importance of frequent-flier benefits owned by a corporation was treated as a dependent variable in a multiple regression framework, the partial regression coefficients for taxes, convenience of schedules, and the quality of

**Table 2**  
**Attitudinal Differences Between Members and Nonmembers**  
**(Average Agreement Ratings)**

<i>Attitude</i>	<i>Members</i>	<i>Nonmembers Variances Based on F-tests at <math>\alpha = 0.05</math></i>	<i>Assumption on Group</i>	<i>p-value</i>
$X_A$ = Membership in a mileage program often influences my choice of an airline.	1.95	2.47	Equal	0.0056
$X_B$ = If I had known my prizes might be taxed, I wouldn't have joined the program.	2.79	2.49	Equal	0.1134
$X_C$ = It is wisest to belong to all the different programs to get maximum flight flexibility.	3.00	3.00	Equal	1.0000
$X_D$ = Concentration on one program yields the best results.	2.17	2.51	Equal	0.0500
$X_E$ = I am afraid that the frequent-flier program I am enrolled in will go bankrupt.	3.77	3.23	Unequal	0.0125

meals were all negative ( $p = 0.10$ ,  $p = 0.70$ ,  $p = 0.24$ , respectively), suggesting the self-serving attitude that those who worry most about taxes, convenience of schedules, and meal quality are the very ones who are least interested in accruing benefits for their corporations.

### Market Segmentation And Targeting

One of the most important objectives of market segmentation and target marketing is to increase efficiency by focusing marketing effort toward the target segment in a manner consistent with its associated characteristics (Boote, 1981). The twin ideas of market segmentation and target marketing require an adjustment of marketing effort to cater to differences in consumer characteristics and needs, resulting in a differentiation of product or service so that they are perceived by the consumer to differ from the competition (Dickson & Ginter, 1987). This presupposes the possibility of "actionability" (Wind, 1978), which in our study relates to an airline's ability to tailor its marketing mix to its target market's characteristics. The marketing process is therefore threefold: (a) divide the market into homogeneous and distinct segments, (b) select the target market according to appropriate criteria, (c) design the appropriate marketing mix of the right product, place, promotion, and price conforming to the target segment's demographic, behavioral, and attitudinal characteristics.

For purposes of market segmentation and targeting, we recognize two categories of air carriers in Australia. The following are categorized as large carriers characterized by interconnected national route networks: Qantas/Australian

with approximately 44 percent of the domestic air travel market, Ansett with 36 percent, and Air New Zealand that after November 1993 could operate domestic services in Australia under the terms of the Closer Economic Relationship Agreement creating a Single Aviation Market. The small airlines consist of the regional and commuter airlines that often feed into the trunk networks plus new upstarts such as the now-defunct Compass.

The large airlines should target the frequent-flier segment of the market for the following reasons. First, it is a substantial and *growing* market. As we have shown, one-quarter (3.6 million) of all air travelers in Australia (14.6 million) belong to *at least* one frequent-flier program with some (24 percent) belonging to more than one to get maximum flight flexibility without sacrificing travel bonus points. Second, since they have been shown to exhibit distinct or significantly different demographic, behavioral, and attitudinal characteristics, they can be reached and attracted through a carefully conceived promotional campaign and appropriate product differentiation. Third, frequent-flier members are an attractive market segment in that generally they are heavy users of air travel services, fly all year round on business, and often fly on premium or full fare tickets. Fourth, frequent-flier programs allow the sponsoring airlines to compile and track the demographic profile and travel patterns of their members through sign-up procedures and computerized log-ins, providing useful longitudinal information over time.

The small airlines with limited network structures cannot have viable or attractive frequent-flier programs, since we have shown that members show a strong preference for concentrating on one bonus program rather than belonging to all of them (see Table 2). The dismal experience of Compass Airlines is particularly instructive in this respect. Soon after airline deregulation in October 1990, Compass was launched in December of the same year. With a substantial cost advantage over Australian and Ansett,<sup>4</sup> it was able to offer economy fares 20 percent below the unrestricted fares of Australian and Ansett so that by September 1991, Compass had captured more than 20 percent of the share of the markets in which it competed.<sup>5</sup>

In the absence of U.S. style hub-and-spoke systems providing dominance in scheduling and interconnections, the two domestic incumbents struck back in the same manner in which the major airlines in the United States have attempted to keep the new low-cost, no-frills, smaller airlines from entering the established markets - launch or improve frequent-flier programs to retain customer loyalty.<sup>6</sup> Partly because of this, Compass went bankrupt in December 1991, was resuscitated in August 1992, launched its own limited frequent-flier program, and went bankrupt again soon after. It is clear that the only way the small airlines can operate successful bonus programs is to link with the large airlines as participating affiliates, an arrangement that will be resisted by the large airlines on their established routes. Therefore, it is probably incumbent upon the small airlines to target the nonmember segment of the airline market and differentiate their product accordingly.

### Product Differentiation

Once the target market has been identified, the marketing mix must be customized to conform to the characteristics of the chosen segment so that the product offering is perceived by the consumer to be different from and superior to the competition. Frequent-fliers (the target segment of the large airlines) tend to be older, higher income, *business people* who fly regularly all year round on premium or full fares at corporate expense. Compared with nonmembers, members place more importance on frequent-flier programs in choosing an airline, and believe in concentrating on one (the importance rating is positively and significantly correlated with the need to concentrate on one bonus program with  $r = 0.17$  and  $p = 0.06$ ). It has also been shown that members will play the frequent-flier game only if the travel bonuses accrue to them individually rather than to the corporations paying for the tickets.

Given these demographic, behavioral, and attitudinal correlates, it is important that the large airlines have the most attractive frequent-flier programs to generate business and retain brand loyalty. The effectiveness of these programs as a marketing tool in Australia is underscored by the fact that soon after the merger of the Qantas and Australian frequent-flier programs, business travelers preferred Australian to Ansett by 46 percent to 38 percent, reversing the previous preference pattern.<sup>7</sup> To overcome the disadvantage of size and lack of an international route network, Ansett has affiliated itself with many international carriers, including heavyweights such as United and Singapore Airlines. It is also imperative that the large airlines in Australia continue not to allow corporations to join their programs<sup>8</sup> to prevent them from using the travel awards for future business travel, because members have indicated that they consider the *individual* ownership of the awards as very important.

In operating these frequent-flier programs, it should be noted that airlines in Australia have almost solely targeted frequent business travelers who account for more than 64 percent of all domestic travel<sup>9</sup> by charging an initial fee instead of following the example of airlines in the United States that enticed new members with bonus points, and by severely restricting the shelf life of the points and the travel awards. Furthermore, to reward repeat frequent-fliers who make frequent short trips on popular short hauls such as Melbourne–Sydney, Qantas/Australian has 10 bands or redemption zones (specifying the number of earned points needed for free travel) while Ansett has four, whereas in the continental United States there is only one.

Note that in Australia, unlike in the United States, frequent-flier benefits are taxable under Tax Ruling TR93/02 effective July 1, 1992. Under this ruling, even if the travel awards are earned through privately funded trips, they are taxable if transferred to other family members.<sup>10</sup> Qantas/Australian has wisely responded by creating the Personal Flight Rewards Division where frequent-flier program members can choose to sign a document agreeing that their points will be redeemed only for their exclusive use.

While going for the premium or full-fare frequent-flier business market, it is imperative that the large airlines in Australia do not suffer the same problems that plague the airlines in the United States over promoting their frequent-flier programs. The large airlines in Australia have wisely avoided the problem of owing excessively large amounts of points or unused travel awards on their balance sheets by declaring that points will expire unless redeemed within two years, and by making travel awards good for only one year. Furthermore, members can nominate only five family members within the Family Flight Rewards Division redemption group so travel awards have limited transferability, and certainly cannot be sold to coupon brokers, a practice that was rampant in the United States. To further reduce yield dilution or displacement of premium fares, the large airlines in Australia have wisely placed many time and place restrictions on flight upgrades. They also do not allow free travel during peak hour travel to avoid displacing paying passengers. In this regard, the large airlines in Australia have done a much better job of yield management than their American counterparts (Toh, Browne, & Hu, 1996).

In targeting the repeat premium or full-fare business travel market consisting of high income frequent-fliers, the fare elasticities of demand can be expected to be relatively low. Although to our knowledge no measurements have been made on Australian routes, based on a sample of 200 intra-U.S. routes, Oum, Gillen, & Nobel (1986) discovered that the fare elasticities of demand for first class service is between  $-0.60$  and  $-0.80$ . Significantly, they noted that the fare inelastic demand conforms with the observation that a majority of the first class passengers are business travelers flying on corporate accounts. Given these empirical findings, it is likely that business travelers who travel at corporate expense have inelastic demands for air travel. Working on Cascade Airways data, Toh, Kelly, & Hu (1986) have shown that in all six flight sectors investigated, the optimal fares were invariably inversely related to the point elasticities. Thus the large airlines going for the frequent business fliers should keep fares relatively high.

When asked to rank the eight factors that affect airline service, frequent fliers indicated that on-time performance and convenience of schedules were the most important. Thus it is essential that the large airlines match their higher fares with schedule convenience achieved by offering more flights on smaller aircraft as was successfully implemented by Pacific Southwest Airlines (Toh & Higgins, 1985), and improve their on-time performance so essential to the business traveler.

Finally, compared with nonmembers, frequent-flier program members (the target market) are more concerned with collecting bonus points and maximizing them by concentrating on one program. But members are less concerned with cabin service, meal quality, and the recommendation of travel agents (see Table 1). Thus, the implication on promotional strategy is that the large airlines should emphasize superior frequent-flier programs and the large number of flights they offer for schedule flexibility, so that members can fly at convenient times on the

same airline to quickly accumulate enough points for travel awards. In this regard, note that, whereas members in the United States belong to an average of 4.0 programs, in Australia the figure is only 1.28, and only 24 percent of the members are enrolled in multiple programs.

The small airlines in Australia should not try to compete with Qantas/Australian and Ansett<sup>11</sup> for the established frequent business travel market, as the dismal experience of the twice bankrupt Compass Airlines demonstrates. As long as the above-mentioned domestic incumbents are in healthy competition with one another on the established routes, the government will not intervene, a de facto continuation of the Two Airline Policy.<sup>12</sup> But the Australian aviation market is very concentrated with 80 percent of the airline passengers flying in the top 20 markets (Grimm & Milloy, 1993) located mostly in the southeastern corner of the continent where the established incumbents are entrenched. This leaves the small airlines with three alternatives. They can target the other 20 percent of the market where the large airlines have not established a dominant presence (for example providing nonstop service between Alice Springs and Darwin), offer commuter services feeding into the larger airlines' route networks and affiliate with their frequent-flier programs as subsidiaries, or compete with the established incumbents for the nonbusiness travel market offering cheap no-frills airline service.

Should the small airlines target the infrequent fliers traveling mainly for pleasure, and how should the product offering be differentiated? To be sure, the small airlines cannot compete with the large airlines based on superior service. Not only do the large airlines have greater flight frequency and bigger and better frequent-flier programs, many frequent-fliers belong to Qantas/Australian's Flight Deck and Ansett's Golden Wing, paying up to A\$200 for what have been described as two of the best lounge clubs in the world. But deregulation since October 1990 allows the small airlines to compete on the basis of fares.

In this regard, recall that non-frequent-fliers are generally younger and poorer and usually fly for pleasure. They are more likely to choose an airline based on price. To capture this segment of the market, the small airlines should offer lower discounted fares to attract the economy minded pleasure travelers. This is because Oum, Gillen, & Noble (1986) found that the fare elasticities of demand for discounted tickets range from  $-1.50$  to  $-2.00$  while Straszheim (1978) reported a figure of  $-2.74$  for the discounted fares on the North Atlantic route.

But these discounted fares must not be applied indiscriminately. To keep the full fare and discount fare markets separate within the price discrimination framework, fences in the form of travel restrictions should be imposed, including capacity control with limited availability of discounted seats on flights with high load factors, maximum and minimum stay requirements, advance purchase of tickets with cancellation penalties, departure time restrictions, standby arrangements, and no-frills service, very much like what Shuttle by United has done on the west coast of the United States. In fact, it has been

claimed that one reason Compass went bankrupt the first time in December 1991 is that, among other things, this low-cost, no-frills carrier did not have a coherent yield management strategy (Nyathi, Hooper, & Henser, 1993). Thus, through the careful process of price discrimination and market separation, the fare-sensitive and more flexible pleasure travelers will be enticed to fly on reduced rates to fill otherwise empty seats, while businesspeople traveling on corporate expense and requiring schedule flexibility and comfort remain captive to full-fare ticketing. Those who are interested in a more thorough discussion of the price discrimination model in the airline industry should see Toh (1979).

Finally, given our survey findings, compared with the large airlines, the small airlines should spend proportionally more on sales promotion and less on advertising. The sales promotion should be targeted primarily toward travel agents upon whom non-frequent-fliers have been shown to rely. The promotional messages should emphasize low fares.

### SUMMARY AND CONCLUSION

Australia is a very large country with a small population of 18 million people located mainly in concentrated pockets around the coastal fringes of the continent. This makes air travel an essential means of transportation, with 35 percent of all passenger trips over 1,000 kilometers made by air.<sup>13</sup> The market for air travel can be segmented into frequent-fliers and non-frequent-fliers. Given their demographic, behavioral, and attitudinal characteristics, we have suggested that large airlines with frequent services on interconnected route networks should target the frequent-flier business market with attractive travel bonus programs to cultivate new business and engender brand loyalty. The large airlines should differentiate their product by offering frequent and superior on-time service and charge relatively high fares commensurate with low price elasticities of demand associated with high income passengers and business travelers flying at corporate expense, especially on the short haul Adelaide-Melbourne-Canberra-Sydney-Brisbane business corridor.

On the other hand, the small airlines with limited route networks and small frequent-flier programs ought to target the younger, lower income, non-frequent fliers with discounted fares, coupled with heavy travel restrictions to attract the price-sensitive pleasure travelers without substantial diversion from the otherwise full-fare passengers. Also, because this target segment has been shown to rely more on travel agents, the small airlines should spend proportionally more of their promotional budget on sales promotion targeted specifically toward ticket brokers.

In conclusion, we would like to point out that our methodology for customer identification, market segmentation, target marketing, and product differentiation can be used for many service oriented industries characterized by strong customer loyalty engendered by repeat patronage reward programs. This would include the airline industry that we have examined as well as the hotel and

resorts sector. First, one may use discriminant analysis to separate, for example, the characteristics of airline frequent-flier members or hotel frequent-stayer members (see Toh, Hu, & Withiam, 1993) from the nonmembers, and then identify their demographic, behavioral, and attitudinal characteristics. Second, one then needs to select a target market in which one has a comparative advantage. Third, the product or service offering consisting of the marketing mix must then be tailored toward the differential needs of the selected target market.

### ENDNOTES

1 See, Grimm & Milloy (1993). 266.

2 Licklin, L., (1994, January 11). Have points, won't travel. *The Bulletin*, 44.

3 The computations are as follows:  $(.75) (.25) / (.48) = .39$  and  $(.25) (.25) / (.52) = .12$ .

4 Total cost per available seat kilometer for Compass was found to be about 8 cents compared to about 14 cents for the two domestic incumbents. See BTCE, (1991). Deregulation of domestic aviation: The first year. Australian Government Publishing Service: Canberra.

5 See, Grimm & Milloy (1993). 266.

6 See, Thorpe, J. (1992, February). New times down under. *Transport World*. 97.

7 See, Ford. (1993).

8 Note that several major international airlines such as KLM, Air India, Japan Airlines, and Lufthansa have started corporate frequent-flier programs.

9 See, Ryan, K. (1989, May). Deregulation in Australia: Time travel or timed travel. *Australian Aviation*. 97.

10 For a discussion of the taxation of frequent-flier benefits, see Roberts, R. (1993, March). The importance of accounting standards in tax law. *Australian Accountant*. 57; and Lyons, M. (1993, December 3). FTB: Frequent benefits tax. *Business Review Weekly*. 74.

11 To date, Air New Zealand is not a factor, although the Closer Economic Relationship Agreement creating a Single Aviation Market gives it cabotage rights to operate domestic services within Australia.

12 For a discussion of the Two Airline Policy see Forsyth, P. (1991). The regulation and deregulation of Australia's domestic airline industry in airline deregulation: The international experiences. New York: University Press.

13 See, Ryan, K. (1989). *op. cit.*

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# THE FUTURE OF AFRICAN CIVIL AVIATION

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## ABSTRACT

The African Civil Aviation Commission (AFCAC) held its Fifteenth Plenary Session in Abuja, Nigeria from 20-24 April 1998. The meeting was held at a critical period in the global history of civil aviation when the winds of change and liberalization in air transport were sweeping the air transport industry, calling for fierce competition among carriers to set up viable airlines, whether singularly or collectively. Africa is all too conscious of the rapidly evolving face of commercial aviation which has recently brought on titanic profiles of merged carriers and crafty but legal commercial tools such as outsourcing and franchising in the airline industry. The AFCAC meeting focused on the need to implement its own regional plans expeditiously and to infuse new life to its aviation entities by making them autonomous and competitive. There was also heavy emphasis on the need to focus on safety and training of personnel.

So far, African civil aviation has been courageous amidst competition and energetic in its collectivity. However, it now needs a boost in the arm and a much needed blood transfusion to stand up to its competition in other parts of the world and run with the portentous winds of change that are rapidly blowing towards the next millennium. This paper discusses ways and means available to African civil aviation to achieve this goal.

## INTRODUCTION

Regulatory responsibility for civil aviation in Africa falls generally under the broad umbrella of the International Civil Aviation Organization (ICAO)<sup>1</sup> which is charged with global regulatory responsibility in the field of civil aviation. At the regional level, and through cooperation with ICAO, the African Civil Aviation Commission (AFCAC)—the regional specialized agency of the Organization of African Unity (OAU)<sup>2</sup> which is charged with the responsibility for development of civil aviation in Africa—takes responsibility in assisting member African States in their endeavour towards developing civil aviation in their territories. At its Fifteenth Plenary Session held in Abuja in April 1998, AFCAC sought to face reality squarely in the eye, by addressing the key issues

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which may affect the African States in the next millennium in attaining success as a competitive force in the world of civil aviation.

At the meeting, AFCAC addressed in limine the cornerstone of African civil aviation—the Yamoussoukro Declaration—which is the fundamental postulate containing the strategies considered by the Africans as inherent in their aviation philosophy. As its commitment towards the development of African civil aviation, AFCAC resolved to play a more prominent role in the implementation of the Declaration together with such other organizations as the African Airlines Association (AFRAA).

This article will analyse the microcosm of the issues which AFCAC, AFRAA and other concerned African civil aviation bodies would need to address in order to attain their objectives and goals.

### **The History of Civil Aviation in Africa**

One of the watershed events of African civil aviation history occurred in 1961 when 10 African nations<sup>3</sup> signed the Treaty on Air Transport in Africa.<sup>4</sup> Popularly known as the Yaoundé Treaty, it has its roots in Articles 77 and 79 of the Chicago Convention of 1944<sup>5</sup> which provides for the setting up by two or more States of joint or international operating organizations and for the participation of the States in these organizations. Based on these principles, the Yaoundé Treaty established perhaps the oldest surviving jointly owned airline—Air Afrique—to operate on behalf of its contracting States international services between their territories and from their territories to non-contracting States' territories<sup>6</sup> and also domestic air services within the territories of the contracting States.<sup>7</sup> These services are now operated by the airline consequent to the negotiations between contracting States carried out through a body named Comité Multinational de Négociation des États Signataires du Traité de Yaoundé (CMN). At the present time, contracting States to the Yaoundé Treaty include States of Western and Central African sub-regions.

The second major event in African civil aviation history occurred in 1988 when African civil aviation ministers gathered in Yamoussoukro in the Republic of Côte d'Ivoire on 6 and 7 October and signed the Yamoussoukro Declaration on a New African Air Transport Policy.<sup>8</sup> This declaration was the result of a collective consensus in Africa that African nations must, *inter alia*, prepare for the effects of deregulation in the United States on other countries and the potential adverse effects on African airlines of the air transport liberalization policies of Western Europe, especially the application by EEC of the Treaty of Rome to air transport services and the creation of a single internal European market by 1993. The Declaration also responds to the fact that many aircraft owned by African airlines are obsolete and thus in need of replacement at great cost, particularly with regard to the need for African airlines to comply with Chapters 2 and 3 of the Annex 16 to the Chicago Convention concerning aircraft noise. Another compelling issue addressed at Yamoussoukro and incorporated into the Declaration concerned the liberal exchange of air traffic rights by African States and the

need for African airlines to market their product competitively through an unbiased computer reservation system.

The Yamoussoukro Declaration committed African States, both individually and collectively, to achieve the total integration of their airlines under the above policies within a period of eight years. The eight years was divided into three phases of two years, three years, and three years, respectively. A review of the Declaration, conducted by African experts at a meeting held in Mauritius in September 1994, resulted in a series of recommended solutions for achieving the implementation of the Yamoussoukro Declaration.<sup>9</sup> The overall recommendation of the experts was to incorporate the Declaration as an integral part of national air transport policy in each African State.<sup>10</sup> The incorporation was to be provisionally effective immediately after the Mauritius meeting.

Later in April 1997, the Banjul Accord for an Accelerated Implementation of the Yamoussoukro Declaration, adopted by Ghana, Sierra Leone and the Gambia, Cape Verde, Guinea Bissau and Nigeria, recognized the region representing these States as a single geographical commercial air transport operations zone for the purpose of implementing the Yamoussoukro Declaration. The Accord, through a joint Secretariat established for the purposes of aeronautical co-operation within these States, offered specialized services in air traffic services; safety oversight; market access; engineering and maintenance; communications; aeronautical information services and meteorology.

Since the Yamoussoukro Declaration in 1988 some progress has been made in the aeropolitical scene in Africa. For example, there is increasing cooperation among airlines of the Southern African Development Community (SADC) countries. These airlines and the countries concerned have already discussed possibilities of operating air transport services by SADC—country airlines under a common logo. At the time of writing, a protocol was being considered for the establishing of a Southern Africa Regional Air Transport Authority (SARATA) which is a new entity that would formulate and co-ordinate air transport policies within the SADC region and cope with emergent changes in the air transport industry in the region.

Another recent initiative has been the Air CEDEAO project which would set up a joint airline to serve the western sub-region of Africa. The Northern African States have made their own contemporary contribution to the evolving air transport scene in Africa in the form of Air Maghreb—a consortium for consolidating and operating air transport services in Northern Africa more efficiently. Separately, in the western sub-region, three States have initiated the establishment of Air Mano—a multinational airline.

States in the African continent have made significant strides in the field of computer reservation systems (CRSs) by joining together to develop GETS—the Gabriel Extended Travel Service—a CRS launched by the Société Internationale de Telecommunications Aéronautique (SITA).

Another great stride by African civil aviation has been made towards facilitating the implementation of the Yamoussoukro Declaration has been the

opening up of South Africa to intra-African aviation. Now, the developed aviation infrastructure of South Africa is made available to African States, particularly in areas such as leasing of aircraft, engineering and maintenance services and the training of personnel.

In the area of air navigation services and the provision of air navigation facilities to aircraft, ASECNA (Agence pour la Sécurité de la Navigation Aérienne en Afrique et Madagascar), the agency for the safety of air navigation in Africa and Madagascar,<sup>11</sup> has created ASECNA services, a subsidiary agency which explores and facilitates numerous concomitant activities related to air transport and air navigation in Africa. Some of the significant areas in which ASECNA services are involved are fleet financing and management under leasing and sale agreements.<sup>12</sup> This activity could well give rise to the formation of an African aircraft leasing company, in conformity with the objectives stipulated in the Yamoussoukro Declaration.

The Air Tariff Coordination Forum of Africa (ATCOF)—a new forum—has been charged with assisting the air transport industry of Africa in coping with and adapting to the vicissitudes and vacillations of international air tariff policy on fares and rates. This is yet another area where the African air transport and civil aviation scene is showing signs of conforming to the objectives of the Yamoussoukro Declaration.

In spite of the many strides made by the African nations, there are still challenges ahead with regard to the proper implementation of the Yamoussoukro Declaration in full. These challenges are mostly in the economic field, which are seemingly being addressed. The involvement of non-African investors in civil aviation in Africa both from the public and private sectors, is an example of the positive approach so far adopted in this regard.

In the legal field, considerable work has been accomplished towards bringing about the implementation of the Yamoussoukro Declaration, particularly after the Mauritius meeting of 1994. This article will address some of the more critical legal issues that should be addressed by African States in seeking the full implementation of the provisions of the Yamoussoukro Declaration, as they approach the next millennium.

### **Legal and Economic Issues**

Simply stated, the Yamoussoukro Declaration is anchored upon the fundamental postulate of cooperation in air transport brought about by the integration of African airlines. Toward this end, the first phase of implementation of the Declaration—which is given a life of two years—carries the objective *inter alia* of carrying out studies and research on air transport issues in order to integrate African airlines harmoniously with the rest of the world air transport industry to ensure fair competition at market access. The second phase, which is given three years, is dedicated to commercial aspects of air transport such as the integration of CRS, joint purchase of spare parts, maintenance and overhauling of equipment, training of personnel, etc. The third phase, which is also allotted a

span of three years, concerns the actual implementation of the overall integration of African airlines into a consortium of competitive commercial entities that would bring about sustained progress in air transport in Africa that would be capable of withstanding rapidly evolving world trends in aviation.

The Yamoussoukro Declaration brings to bear the inexorable fact that economic and legal issues in African civil aviation are inextricably linked together and cannot be addressed in isolation. The primary consideration and concern facing civil aviation in Africa is uncontrovertibly the economic factor. However, the legal infrastructure which is needed to place economic issues in their right order follows inevitably, making it essential that the two areas of interest are addressed together.

Although some of the objectives of the Yamoussoukro Declaration have already been achieved at least partially—such as by the participation by most African airlines in the GETS CRS system—the most critical areas involving overall airline management and the use of modern commercial tools—such as the merger of airlines and effective fleet financing—have yet to be addressed in a comprehensive way. Although not specifically mentioned in the Declaration, safety oversight is a factor of critical interest to African civil aviation, and has to be addressed realistically, along with other issues raised by the Yamoussoukro Declaration.

**The Need for New Aircraft Fleets in Africa.** There are two types of megatrends affecting the airline industry today. They are country mergers and airline mergers. Both these trends affect the airline industry profoundly. Of these, the unification of Europe is the largest single influence on international airlines. From 1 January 1993, 12 European countries commenced sharing their air traffic rights and strengthening their airlines' marketing potential. There is also a possibility that Australia and New Zealand will form a more crystallised and intensified joint aviation market. At the intra-regional level, the most ominous merger in recent years was the one proposed by British Airways–KLM. If this merger materializes, the two mega carriers, who would ordinarily benefit from the economic unification of their two countries in the European Community, will further consolidate their positions in the aviation world by joining forces. This can only mean more aggressive competition by them using the usual cost cutting synergy of joint purchasing of equipment, elimination of management duplication and the sharing of resources. Each will also mutually eliminate a strong competitor in the other and share access to new markets more effectively. The proposed British Airways–KLM merger is, however, not the only significant regional one. SAS, Sabena, Austrian Airlines and Swissair were also involved in grouping together in Europe to form a strategic alliance called the "European Quality Alliance". The threats posed, even at inter-regional level with current commercial arrangements between British Airways and American Airlines, and KLM and Northwest, are real issues that affect the commercial viability of African airlines adversely.

Within the two megatrends are smaller trends that individual airlines have to follow just to remain competitive. They are privatization, the use of information technology, removing infrastructure constraints and governmental restraints and, most importantly, changing travel patterns. These trends have given rise to the new phenomenon in the global aviation scene that survival (if not success) of airlines is now dependent not on pricing but on service. This new phenomenon calls for the airline product to be similar to the one from the entertainment industry, bearing in mind that a passenger spends 70 percent of his total travel time in the aircraft on long-distance flights. To counter strong alliances between countries and airlines, the smaller carriers (as well as the big ones) are now going in more for glamour and in-flight luxury to score on the 70 percent in-flight time. Personal video screens for every seat, satellite assisted telephone facilities and teleconference services are some of the luxuries offered. Indeed, as David Shoenfeld, International Marketing Vice President of Federal Express said, "if you view your services as flying between terminals, you miss the point."

The view that marketing is determined from the view of the customer is becoming more valuable now more than ever before. To survive, airlines have to build brand recognition. There are 12 important factors influencing passenger choice. They are: flight punctuality; excellence of in-flight service; superiority of aircraft; comfortable seats; clean cabins, seats, and washrooms; good food and beverages; superior first class; superior business class; efficient reservations systems; pricing; good check-in service; and attractive frequent flyer programmes. At least seven of these factors are entirely dependent on the quality of the aircraft. The foremost important factor—punctuality—cannot indeed be achieved with aged aircraft. The matter becomes more crucial to a relatively small airline, running a small fleet of aircraft, where, if one aircraft is grounded for reasons of repair or maintenance, the entire flight schedule of the airline would be in disarray, leading to delays down the line. Connecting services would be disrupted and passengers stranded. It is needless to envisage the effect this catastrophe would have on the airline's good name. No amount of superior in-flight service would atone for a six-hour delay where a connecting passenger has to sit inside an unknown airport terminal. It is therefore necessary for any airline to seriously consider removing one of its most burdensome infrastructural constraints—its ageing aircraft.

Another compelling reason for airlines to modernize their fleets is that ageing aircraft do not conform to noise restrictions imposed by many countries and thus face being barred from certain airports. The noise issue has become a crucial environment issue in the world aviation community. At the 27th Session of the Assembly of the International Civil Aviation Organization (ICAO) held in Montreal in 1989, when the matter of possible noise restrictions on subsonic jet aircraft was taken up, the main concern of the Assembly was to achieve a balance between the desire to protect the environment around airports against unnecessary noise and the desire to avoid excessive costs associated with accelerated replacement of noisier aircraft, particularly where these aircraft were reg-

istered in countries which did not themselves intend to introduce noise-related operating instructions. In one of their past Sessional discussions, Airport Council International (ACI) noted that aircraft noise represents a major constraint upon the future viability and capacity of the aviation system. Unless concerted international action was taken, there would be a proliferation of various local legislation banning noisy aircraft from their airports—a measure that would have a devastating effect on air commerce. The International Air Transport Association (IATA) representing the airlines at the Session noted that the airline industry recognized the need in many States to address political and other concerns relating to the environment and the fact that the noise climate in areas adjacent to airports is linked to the ability of airports to provide expanded travel facilities to meet the growing demand of air travel. The ICAO Assembly ultimately decided that further time was necessary for consultation and analysis with a view to reaching consensus, and deferred the issue to the 28th Session (Extraordinary) of the Assembly which was held in Montreal in October 1990.

At its 28th Session (Extraordinary), the ICAO Assembly, by its Resolution A28-3 resolved to urge States not to commence phasing out noisy aircraft until 1 April 1995, and to spread out the phasing in period over seven years from 1 April 1995, so that airlines would have time to renew their aircraft fleets or hush-kit (silence the engines of aircraft) them to conform to prescribed noise levels. ICAO further urged States not to restrict before the end of the phase-in period the operations of any aircraft less than 25 years of age from the date the aircraft was issued its first certificate of airworthiness and to assist aircraft operators in their efforts to accelerate fleet modernization.

The standards of the international community on ageing aircraft are now clear. States have been given the right by the international civil aviation community to start phasing out aircraft from 1 April 1995 until the year 2002. This means that airlines that have ageing aircraft in their fleets would have to commence modernizing their fleets soon. If they fail to modernize their fleet their ageing aircraft would not be admitted to countries which have phased them out by legislation. The need for modernizing ageing aircraft fleets has become more compelling than ever, and is amply reflected by the recommendations made by the Fourth Meeting of ICAO's Committee on Aviation Environmental Protection (CAEP) which was held from 6 to 8 April 1998. CAEP has recommended the reduction by an average of about 16 per cent levels of nitrogen oxides that aircraft engines are currently allowed to emit under Annex 16 to the Chicago Convention.<sup>13</sup> CAEP has also recommended that States implement ICAO's new Communications, Navigation, Surveillance and Air Traffic Management systems (CNS/ATM), thereby implicitly requiring aircraft to be equipped with the modern facilities onboard to comply with the satellite navigation systems introduced by the CNS/ATM systems.

Another commitment made by CAEP at its Fourth Meeting is to carry out more work in the future to establish new noise standards for jet aeroplanes that would be more stringent than the present Chapter 3 standards in Annex 16.<sup>14</sup>

This seriously impacts African airlines, requiring them to consider the modernization of their fleets.

Despite a Gulf war in 1990, and the recession in the early nineties, industry growth has remained strong throughout the decade. European traffic growth is estimated at five percent and growth forecasts for the Asia-Pacific are 8.6 percent per annum. Macdonnell Douglas in its *Outlook for Commercial Aircraft 1988-2002*, forecasts a sustained growth rate of worldwide commercial passenger traffic at 5.7 percent per annum. Worldwide cargo capacity demand has been forecast at a six percent annual rate through the year 2002. During the next 15 years, worldwide generic demand for new passenger aircraft is forecast at 5,888 units with an estimated value of U.S.\$302 billion, and a total generic demand at 413 full cargo freighters through the year 2002.

Apart from the compelling marketing reasons and environmental factors discussed above, a modernized fleet in an African airline would succeed in sweeping the airline to success if the acquisition of aircraft is managed prudently. For example, the new aircraft would have to be placed in the fleet just before the airline reaches peak utilization of its aircraft. New air traffic rights of the airlines would have to be negotiated beforehand and existing ones reviewed for maximum utilization. The fixed costs of the new aircraft would have to be analysed well beforehand to maximise profits. The resale value of the aircraft, when they are ultimately phased out in order that newer aircraft are brought in, should also be given serious consideration. Engineering and maintenance facilities and costs thereof of new aircraft also have to be carefully thought out.

To capitalize on changes in their competitive environment, competent airline managers now need to know that in the foreseeable future there will be a few mega-carriers operating in America, Europe, Asia and the Pacific Rim and that these carriers probably will be composites of strong strategic alliances between powerful airlines and powerful regional States. They would be well equipped to offer the quality of service and punctuality that modern glamour requires of air travel. To compete with these carriers for a fair share of the market, a smaller African airline would have to offer a comparable product. In order to offer this type of product airline managers in Africa have to consider the global issues now facing the world of civil aviation and, above all, the ways and means to adapt to the sweeping trends of the rest of the world in aviation.

Although the standards of management in African airlines are currently of a high standard, these airlines need to constantly update their management profile to adapt to the rapidly changing global aviation scene as envisaged by the Yamoussoukro Declaration. For this purpose, airline managers have to be constantly trained in such issues as market access and benefits that could be derived through Africa's strategic position in the world, market resources available, the efficient use of commercial torts such as outsourcing<sup>15</sup> and franchising<sup>16</sup> and the ensuring of aviation safety within Africa. With the trend of liberalization sweeping the world, African airline managers have to be particularly mindful of the various arrangements between mega-countries which now admit to open skies.

**Market Access.** At the time of writing, the United States and the United Kingdom were discussing deregulating air transport between the countries. The talks were aimed at replacing the U.K.–U.S. bilateral air services agreement with an open skies agreement, which would allow the market to determine prices, routes and scheduling. The United States already has signed open skies agreements with the Netherlands and Germany, although an agreement for open skies with the United Kingdom could be at a much larger scale considering the frequency of air services between the two countries. One of the problem areas that were being ironed out at the discussions was the reported apprehension of the United Kingdom authorities that an open skies policy between the United Kingdom and the United States, if fully implemented, would give American carriers access to countries beyond the United Kingdom with full commercial traffic rights (i.e. the right to carry passengers between the United Kingdom and third countries) whereas British carriers had no rights to fly between destinations in the United States.<sup>17</sup>

According to a study carried out in the United States, a liberalized open skies agreement with the United Kingdom will provide a five year, \$108 billion boost to the United States economy and create 152,000 new jobs. The study projects a five-year period of steady growth and an estimated 9.4 million new passengers a year who would take advantage of the 86 percent increase in air services between the two countries if an open skies policy is implemented<sup>18</sup> and help introduce U.S.–U.K. air services from 12 new U.S. cities.<sup>19</sup> American Airlines chairman Robert Crandall sums up the view of the US carriers on an open skies policy between the two countries:

This study confirms what we have been saying for some time — open skies with the UK will be good for passengers, shippers and communities across the country by providing new service, more competition and lower fares in the transatlantic market.<sup>20</sup>

Earlier, in June 1996, Japan rejected a proposal by the United States for an open skies agreement on somewhat similar grounds as the British, that U.S. carriers have unlimited rights to fly beyond Japan under the current bilateral air services agreement which was signed in 1952 by the two countries. In return, Japan Airlines, the only Japanese airline at that time, has no comparable benefit.<sup>21</sup> Japan has openly claimed that it does not support the U.S. version of open skies for two reasons: (1) Japan would not have access to the large U.S. domestic market and; (2) open skies does not take into account inconsistencies created by capacity constraints in airports such as Narita and Kansai.<sup>22</sup> The United States, on the other hand, maintains that Japanese authorities seem more intent on protecting intra-Asian air service markets for Japanese carriers by blocking out U.S. carrier competitors than they are in opening the U.S.–Japan aviation market.<sup>23</sup>

The United States carriers have, to their favour, consistently advocated an open skies policy throughout the world. In May 1996, Delta Airlines' Chief

Executive Ronald Allen called upon the European Union to enter into an open skies agreement with the United States. Allen contended that open skies are useful because they remove government restrictions on every aspect of aviation except for safety and predatory market behaviour and concluded that an open skies policy would result in a more vibrant market place where consumers are allowed to select among the best, most efficient and most competitive operators.<sup>24</sup>

The United States has also sought open skies agreements with some Asian countries. In September 1995, U.S. authorities signed a Memorandum of Understanding with the authorities of Hong Kong which liberalized to a large extent existing arrangements for the carriage of cargo by air between the two countries.<sup>25</sup> Singapore Airlines has been a staunch supporter of the open skies policy and has openly called for its implementation between Asia and the United States. According to Singapore Airlines' Chairman Cheong Choong Kong:

The U.S. and Singapore agree that liberalizing aviation is in the best interests not only of the consumers but of the economy generally through the stimulation of trade... I hope therefore that the U.S. will extend its open skies to cover the Asia-Pacific region, which, based on traffic forecasts is going to be the largest aviation market within 15 years.<sup>26</sup>

Later, in December 1996, Cheong was critical of the stance taken by the United States in response to the offer of open skies by Singapore and Malaysia. He said:

it was no secret that open skies bilaterals with Singapore and Malaysia were attainable right away... but unfortunately it was all or nothing with them [U.S.]; they insisted on a critical mass of willing countries before they would proceed. Apparently, Malaysia and Singapore did not constitute such a critical mass.<sup>27</sup>

He has also extended his comments on liberalization to Australia and New Zealand, claiming that those countries should open their markets so that tourists can fly in and out of, and, more importantly within their territories more conveniently<sup>28</sup> thus suggesting that such markets should not be protected and preserved only for the national carriers of Australia and New Zealand.

On the subject of critical mass in Asia, the suggestion made by the Prime Minister of Malaysia in October 1995, that Asia-Pacific nations must adopt a common stand in talks with the United States, is significant. The key contention of Asian countries against most developed countries in the west is that the latter's enthusiasm for open skies is tainted by their refusal to lay open their domestic markets within the open skies package. This refusal, it is claimed, only reflects a cosmetic balance between countries which do not have extensive domestic markets and those—such as the United States—which do. Prime Minister Mohamad articulated:

Asia-Pacific nations must be prepared to act in concert and adopt a coordinated stance in negotiating with the E.U. and the U.S.... the consequence of not doing so

will likely be the domination of the aviation industry by the mega carriers from the U.S. and Europe.<sup>29</sup>

In January 1997, officials from the United States and Singapore reached an open skies aviation deal, making Singapore the first Asian country to sign an open skies deal with the United States.<sup>30</sup> The U.S.–Singapore deal followed a preliminary meeting in October 1996 which included South Korea, Taiwan, Malaysia and Brunei. On 10 January 1997 the United States also re-opened its negotiations with Japan and is expected to seek progress towards an open skies agreement in 1997.

In the above context, it cannot be claimed incontrovertibly that an open skies policy, as advocated by the various proponents is not totally lacking in overprotectiveness. Most nations still give an unusually high priority to the marketing policies of their airlines, which are naturally geared to world protectionism and exploitation. An ideal open skies policy should be such as the one practised by Dubai, where, irrespective of reciprocity, unlimited access to air traffic rights is given to any who wish to operate air services. Maurice Flanagan, Group Managing Director of Emirates (the airline of Dubai) writes:

Open skies describes the situation in which a country allows unlimited traffic rights to the airlines of other countries, almost always on a reciprocal basis and is not all common. Open skies usually results from bilateral negotiation. Singapore, however, places open skies on the table immediately, and, if the other side reciprocates, there the negotiations end. Holland is much the same. But Dubai grants open skies unconditionally, i.e. without requesting reciprocity, which is unique for a place which has its own airline.<sup>31</sup>

Whichever way the open skies policy is interpreted, and whatever is the nature of the practice, it is inevitable that liberalization would impact market forces and affect airlines differently. With free market competition expanding around the globe in the recent past and the emergence of free trade agreements such as NAFTA (North American Free Trade Agreement), EFTA (European Free Trade Agreement), and free market forces within the European Union, the collapse of the communist economy in most countries including the former U.S.S.R. and increasingly new consumer demands in Japan, it is a necessary corollary that protectionism in commercial aviation should give way to some degree of liberalization in the least.

African airlines are therefore faced with the imminent prospect of the future realm of commercial aviation being controlled by a group of air carriers which may serve whole global regions and operated by a network of commercial and trade agreements. Regional carriers will be predominant, easing out niche carriers and small national carriers whose economics would be inadequate to compare their costs with the lower unit costs and joint ventures of a larger carrier. It is arguable that a perceived justification for open skies or unlimited liberalization exists even today in the bilateral air services agreement between two countries, where, *fair and equal opportunity to operate* air services is a *sine*

*qua non* for both national carriers concerned. This has been re-interpreted to mean *fair and equal opportunity to compete* and later still, *fair and equal opportunity to effectively participate* in the international air transportation as agreed.<sup>32</sup> Of course, there has been no universal acceptance of this evolution in interpretation.

ICAO has suggested the following preferential measures for the consideration and possible use of its member States who are at a competitive disadvantage when faced with the mega trends of commercial aviation and market access:

- a) the asymmetric liberalization of market access in a bilateral air transport relationship to give an air carrier of a developing country: more cities to serve; fifth freedom traffic rights<sup>33</sup> on sectors which are otherwise not normally granted; flexibility to operate unilateral services on a given route for a certain period of time; and the right to serve greater capacity for an agreed period of time;
- b) more flexibility for air carriers of developing countries (than their counterparts in developed countries) in changing capacity between routes in a bilateral agreement situation; code-sharing to markets of interest to them; and changing gauge (aircraft types) without restrictions;
- c) the allowance of trial periods for carriers of developing countries to operate on liberal air service arrangements for an agreed time;
- d) gradual introduction by developing countries (in order to ensure participation by their carriers) to more liberal market access agreements for longer periods of time than developed countries' air carriers;
- e) use of liberalized arrangements at a quick pace by developing countries' carriers;
- f) waiver of nationality requirement for ownership of carriers of developing countries on a subjective basis;
- g) allowance for carriers of developing countries to use more modern aircraft through the use of liberal leasing agreements;
- h) preferential treatment in regard to slot allocations at airports; and
- i) more liberal forms for carriers of developing countries in arrangements for ground handling at airports, conversion of currency at their foreign offices and employment of foreign personnel with specialized skills.<sup>34</sup>

These proposed preferential measures are calculated to give air carriers of developing countries a head start which would effectively ensure their continued participation in competition with other carriers for the operation of international air services. Furthermore, improved market access and operational flexibility are two benefits which are considered as direct corollaries to the measures proposed.

While the open skies policy sounds economically expedient, its implementation would undoubtedly phase out smaller carriers who are now offering competition in air transport and a larger spectrum of air transport to the consumer. Lower fares, different types of services and varied in-flight service profiles are some of the features of the present system. It is desirable that a higher level of competitiveness prevails in the air transport industry, and to achieve this objective, preferential measures for carriers of developing countries would play a major role.

In addition, to addressing the preferential measures proposed by ICAO, which would be of immense assistance to carriers of developing countries if implemented, it would be prudent for the international aviation and trading community to consider the larger issue of funding, whereby long-term low-interest loans could be made available to carriers of developing countries through such institutions as the World Bank and the International Monetary Fund. Some consideration could also be given to a balanced distribution of aircraft throughout the world, whereby developing countries could have access to aircraft which have been discarded by their more affluent counterparts. An equitable system of leasing these aircraft is a possibility that could be considered.

The exemption of aircraft operated by carriers of developing countries from technological standards (to the extent possible) which may apply to modern aircraft is another useful tool which could be addressed under the umbrella of preferential measures. Aircraft engine emission standards and noise regulations are some examples which could be examined.<sup>35</sup>

Preferential measures may also be considered on a collective basis whereby air traffic rights could be used by a carrier of one country on behalf of another carrier representing another country. This would help, particularly in the event of a developing country not being able to launch its own airline or is unable to allocate its national carrier on a particular route due to economic reasons. This principle could also be extended to cover instances where airlines from developing countries could combine their operations by using their collective air traffic rights. For example, airlines of countries A and B who have been granted air traffic rights to operate air services from their countries to countries C and D, respectively, would be able to operate one joint service to countries C and D in one flight, using their collective traffic rights under this scheme.

It could be argued on behalf of the African airlines that as far as possible, developing countries should be released from the obligation to own and control their air carriers or to have their carriers substantially owned and controlled by their nationals. It is only then that countries which cannot fully finance their carriers could maintain them and provide well-rounded competition in the air transport industry.

**Aviation Safety.** Safety is the primary concern of the world aviation community at the present time. It is not only because the fundamental postulates

of the Chicago Convention<sup>36</sup> call for the safe and orderly development of international civil aviation<sup>37</sup> and mandate ICAO to insure the safe and orderly growth of international civil aviation throughout the world<sup>38</sup> but also because the aviation world faces a critical era where, in the words of Dr. Assad Kotaite, President of the ICAO Council:

the international aviation community cannot afford to relax its vigilance...ICAO would continue to take timely action to ensure safety and security standards are in effect, and that deficiencies are properly and efficiently addressed.<sup>39</sup>

The compelling need for higher standards in aviation safety was formally recognized when the ICAO Council adopted ICAO's Strategic Action Plan on 7 February 1997. The basic strategic objective of the Plan is to further the safety, security and efficiency of international civil aviation. ICAO plans to accomplish this task by assisting States in identifying deficiencies in the implementation of Annexes to the Chicago Convention.

One of the core elements of ICAO activity on safety, according to its Strategic Action Plan, is to carry out assessments by teams of experts of the capacity of participating States to control effectively the level of safety for which they have responsibility. ICAO's Safety Oversight Programme, which would implement this activity, extends to personnel licensing, operation of aircraft and aircraft airworthiness. ICAO may, in the foreseeable future, extend ICAO's Safety Oversight Programme to cover areas such as air traffic control and the operation of airports.

Taking a cue from ICAO, several regional aviation organizations have formally incorporated safety provisions in their documentation. The African Civil Aviation Commission (AFCAC), at its Thirteenth Plenary Session (Abuja, 11-18 May 1995) discussed the matter of safety oversight in Africa, which led to the Commission adopting Decision S13-3<sup>40</sup> on Safety Oversight. This decision recognizes that States must take appropriate means to ensure compliance with international safety standards contained in the relevant Annexes to the Chicago Convention and that most African States may not have the necessary infrastructure to fully implement such standards. The Commission refers to the ICAO Safety Oversight Programme in Decision S13-3 and instructs the AFCAC Bureau to improve safety oversight in AFCAC activities and promote co-operation among African States in the field of safety oversight. Through the Decision, AFCAC has also requested ICAO's assistance for African States in order that they could effectively introduce the Safety Oversight Programme in Africa.

The European Civil Aviation Conference (ECAC) at its 100th Meeting of Directors General of Civil Aviation (Paris, 14-15 May 1997) discussed an ECAC Recommendation on Safety of Foreign Aircraft<sup>41</sup> which calls for increased ramp checks on aircraft and rigid adherence, on a bilateral basis, by States of the provisions of the Chicago Convention on licensing of personnel and certification of aircraft.<sup>42</sup>

The ECAC bilateral safety clause calls *in limine* for consultations to be called for at any stage where such consultations would relate to safety standards of aircrew, aircraft or the operation of aircraft. The provision allows for the revocation of the clause if one party to the agreement finds that the other does not maintain minimum ICAO Standards. The clause also admits of the need to conduct random ramp checks in order for one party to determine whether aircraft conform to Article 33 of the Chicago Convention—which relates to certification of airworthiness. At the same meeting, ECAC also discussed a recommendation<sup>43</sup> on leasing of aircraft and safety, which calls for Standards as prescribed in Annex 6 (Operation of Aircraft) to the Chicago Convention and minimum conditions on the use of leased aircraft, to ensure that they are maintained in accordance with ICAO Standards of Safety. It must be noted that safety regulations of the European Community are generally stringent, on product liability<sup>44</sup> which stipulate that any person who imports into the community a product for leasing is considered a manufacturer of that product for purposes of product liability.

Another regional civil aviation organization which has recognized the compelling need for the implementation of safety oversight in its region is the Latin American Civil Aviation Commission (LACAC). At LACAC's Eleventh Assembly (Manaus, 7-10 November 1994) some LACAC member States adopted the "Manaus Declaration" which expressed its support of the role of the ICAO Council to establish a safety oversight programme and requested ICAO to implement the programme as quickly as possible.<sup>45</sup>

Both ICAO and the regional aviation organization have focussed their attention on the air navigational aspects of safety oversight. This is understandably so, since safety of civil aviation primarily depends on safe air navigation. However, safety of civil aviation does not stop at air navigation. There are other extraneous factors which may impact aviation safety, such as human conduct in the aircraft and air traffic controller liability. The management of these areas of activity are as crucial to African civil aviation as the overall ensuring of aviation safety through satellite communication systems.

Taking the above analogies into consideration, the African States should, in the final analysis, consider that one of the most important management issues for Africa concerns the safety of civil aviation. Regulation in Africa on this subject should be introduced on the fundamental basis that air transport is now a high technology intensive industry and any regulation promulgated must be focussed on a proactive and not reactive approach. Aviation management must target through regulation such aspects as cross culture communications in the cockpit and cabin, enhanced automation in the cockpit, and a common policy on crew conduct based on available statistics on disruptive passenger conduct. For the last measure to attain fruition, a unified system of collecting information on disruptive behaviour must be implemented. The most important step, at this juncture, is for the African aviation community to support studies which may be initiated by ICAO in the necessary and relevant areas related to the overall issue of aviation safety.<sup>46</sup>

## CONCLUSION

The principal instrumentality of airline cooperation in Africa is the African Airlines' Association (AFRAA), which is the only such organ in the region that enables African airlines to collaborate in their air services and the services provided by any air transport enterprise within Africa, in the pursuit of the airline integration envisaged by the Yamoussoukro Declaration.<sup>47</sup> On the regulatory side, the African Civil Aviation Commission (AFCAC) coordinates policy, technical and coordination issues with ICAO and IATA without actually involving itself with airline issues directly. This two-pronged modality has somehow to converge at the focal point of the Yamoussoukro Declaration's airline integration policy, if a meaningful adaptation by the African airlines to the global trends in aviation is to attain fruition.

The fact that such an integration is possible is amply evidenced by the 1961 Yaoundé Treaty and the later African Joint Air Services (AJAS) accord signed by and between Tanzania, Uganda and Zambia. The latter provided for the establishment of an independent air transport operating agency within Article 77 of the Chicago Convention to operate air services in intercontinental routes on behalf of Air Tanzania, Uganda Airlines and Zambia Airways, together with Air Maghreb (which is actually a combination of the airlines of Algeria, Libyan Arab Jamahiriya, Mauritania, Morocco and Tunisia) and Air Mano, consisting of the carriers Air Guinea, Air Liberia and Sierra Leone Airways.

In addition to this airline integration, it is encouraging to note that the restructuring and commercialization which started in Africa in 1992 has yielded positive results. More African airlines are veering from the flag carrier notion and going to for self reliance, privatization and delinking themselves from governmental control. The privatization of Kenya Airways and the turnaround of Air Tanzania and Uganda Airlines are good examples of a progressive African air transport industry.

However, considered wholly, African civil aviation, with the exception of the few airlines already mentioned, has failed to show that it could contribute positively to national economic integration and development. Moreover, African airlines in general have shown over the past few years the need for a management approach that could cope with global trends in civil aviation.

Nonetheless, the prognosis for the future of African air transport is far from gloomy. Although African airlines do not yet contribute to the regional economy, it is encouraging that over the 1985-1995 period, the scheduled airlines of the African region showed an annual increase in operating revenues in U.S. dollars at the rate of 5.4 percent<sup>48</sup> compared with a world annual average of 9.1 percent and positive overall operating results have been achieved by these airlines since 1992.<sup>49</sup>

During 1996 ten airlines in the world showed progress towards privatization, five of which were from Africa.<sup>50</sup>

Obviously, the potential for achieving full maturity within the global challenges faced by Africa remains within the African States and their airlines themselves. Autonomy in civil aviation authorities, the aggressive development of infrastructure, and personnel training is the key that could open the door to strategic African airline management within the Yamoussoukro Declaration.

### ENDNOTES

1. The International Civil Aviation Organization is the United Nations' specialized agency responsible for the regulation of international civil aviation. ICAO has a membership of 185 States.

2. The Organization of African Unity was set up as the regional organ for Africa primarily for the purpose of promoting peace and security in the African region. OAU is set up under Article 52 (1) of the United Nations Charter which states: "Nothing in the present Charter precludes the existence of regional arrangements of agencies for dealing with such matters relating to the maintenance of international peace and security as are appropriate for regional action, provided that such arrangements or agencies and their activities are consistent with the purposes and principles of the United Nations."

3. Central African Republic, Republic of the Congo, Republic of the Ivory Coast, Republic of Gabon, Republic of Dahomey, Republic of Upper Volta, Islamic Republic of Mauritania, Republic of Niger, Republic of Senegal and the Republic of Chad.

4. See, ICAO Circular 98-AT/19, 1970, for text of the Treaty.

5. See, Convention on International Civil Aviation, signed at Chicago on 7 December 1944. See ICAO Doc 7300/7, Seventh Edition 1997 for text of the Convention.

6. Yaoundé Treaty, *supra note 2*, Article 2.

7. *Id.* Article 3.

8. See, Report of the African Civil Aviation Commission, Eleventh Plenary Session (AFCAC/11), Blantyre, 22-31 May 1989, Dakar: 1990, Appendix, for the text of the Yamoussoukro Declaration.

9. See, United Nations Economic Commission for Africa, TRANS/EXP/94-07 Annex 1.

10. *Id.* para 2.1.

11. ASECNA was created by the convention of St. Louis de Senegal which was signed on 12 December 1959. ASECNA's objective is to provide services that are designed to guarantee the regularity and safety of flights in the designated territories. The Agency manages the en-route and air navigation installations and services pooled by the signatory States. The Convention establishing ASECNA was signed by Chad, Cameroon, Central African Republic, the Congo, Dahomey, Gabon, Ivory Coast, Malagasy Republic, Mauritania, Niger, Sénégal and Upper Volta. Mali and Togo were later signatories.

12. ASECNA services collaborate in fleet financing with the Banque Ouest Africaine de Developement (BOAD) and the Caisse Francaise de Developement (LFD).

13. See, ICAO Environmental Experts Recommend Stricter Noise and Emissions Standards, ICAO News Release, PIO 02/98 at p. 1.

14. *Id.* at p. 2.

15. For a detailed discussion on this subject, see R.I.R. Abeyratne, Outsourcing and the Virtual Airline—Legal Implications, *Air and Space Law*, Vol. XXII Number 4/5 October 1997, pp. 182-193.
16. See, R.I.R. Abeyratne, Franchising in the Airline Industry, Some Implications at Common Law, *Air and Space Law*, volume XXII, Number 6, December 1997, pp. 284-290.
17. See, U.S., U.K. to Restart Open Skies Talks in London, *The Air Letter*, Monday 2 December 1996, page 2, No. 13, 633.
18. The current bilateral air services agreement between the two countries, known as the Bermuda 2 Agreement, permits only two US carriers, American and United, to serve London's Heathrow Airport from a limited number of cities.
19. See, U.S.-U.K. Open Skies to add \$108 bn to Economy, *The Air Letter*, Thursday 14 November 1996 at p. 3, No. 13, 621.
20. *Ibid.*
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32. Henri Wassenbergh, De-Regulation of Competition in International Air Transport, *Air and Space Law*, Vol XII, November 2, 1996 at p. 80.
33. The right to uplift or discharge passengers, mail and cargo in a country other than the grantor State.
34. See, Study on Preferential Measures for Developing Countries, ICAO Doc AT-WP/1789, 22/8/96 at A-7 - A-9.
35. For a detailed discussion of regulations on aircraft noise and engine emissions, see R.I.R. Abeyratne, Legal and Regulatory Issues in International Aviation (Transnational Publishers: New York, 1996) at chapter 3, pp. 271-313.

36. Chicago Convention, *supra note 3*.
37. *Id.* Preamble at p. 1.
38. *Id.* Article 44 (a).
39. ITA Press , 284, 01-05 April 1997 at p. 10.
40. Decision S13-3: Safety Oversight. See African Civil Aviation Commission, Thirteenth Plenary Session, Abuja 11-18 May 1995, AFCAC/13 Report at p. 25.
41. DGCA/100-DP/7, 21/4/97, Appendix.
42. Article 31 provides that every aircraft engaged in international navigation shall be provided with a certificate of airworthiness issued or rendered valid by the State in which it is registered. Article 32 provides for the issuance of certificate of competency to technical crew of aircraft and prescribes minimum standards. Article 33 stipulates that certificates of airworthiness issued to aircraft by one State should be acceptable by another, provided certain minimum standards are followed.
43. DGCA/100-DP/8, 28/4/97, Appendix.
44. EU Council Directive 85/374/EEC of 25 July 1985.
45. ICAO Doc 9637, Annual Report of the Council 1994, ICAO: Montreal, Chapter III at pp. 45-46.
46. See, R.I.R. Abeyratne, International Obligations as regards Safety in International Civil Aviation, *The Aeronautical Journal*, December 1997, volume 101, Number 1010 at p. 457 at 461-466.
47. African Airlines' Association, Articles of Association, at Article 4B.
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## NEEDS ASSESSMENT OF A MAJOR METROPOLITAN RELIEVER AIRPORT

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### ABSTRACT

In November and December of 1994, investigators from Southern Illinois University, Carbondale, conducted a survey of based-users and transient-users of Palwaukee Municipal Airport of Wheeling, Illinois. Palwaukee is designated as a reliever airport by the Federal Aviation Administration and thereby eligible for federal funding. The purpose of the study was to determine user satisfaction with the airport, its services, and its facilities. The study appraised among other areas, whether or not and to what degree users were satisfied with Palwaukee and if they were considering a move to another location. The survey detailed user rationale for satisfaction and/or dissatisfaction with Palwaukee and the potential for relocation. The survey takes a comprehensive approach to identifying based-user and transient-user levels of satisfaction at Palwaukee. The full range of aircraft operators permanently based there as well as transient aircraft operators passing through were considered in the survey.

Generally the survey determined that based-users were satisfied with Palwaukee's facilities, services, and management. Responses were distinguished by types of aircraft operated. And, although not a majority in each area, significant numbers of based-users were found to be considering relocation.

Transient-users expressed satisfaction with the quality of fixed based operator services, facilities, and air traffic control. They expressed dissatisfaction with airport pavement, availability of parallel runways, and costs of fuel.

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## INTRODUCTION

Customer satisfaction is an increasingly important aspect of any service-oriented business. Due to serious questions being raised by airport users and by airport commission members, a survey of customer satisfaction at a general aviation airport was conducted in Illinois in 1994.

The Palwaukee Municipal Airport Commission (PMAC) contracted with Southern Illinois University, Carbondale (SIUC), to conduct a study of customer satisfaction at Palwaukee Municipal Airport, Wheeling-Prospect Heights, Illinois (PWK). Seven large general aviation airports in the Chicago region; Aurora, Dupage, Lake-in-the-Hills, Lansing, Lewis, Palwaukee, and Waukegan are Federal Aviation Administration (FAA) designated reliever airports. Each of these airports accommodate piston and jet aircraft for business and personal use. Of the seven, PWK is the closest to Chicago, just 18 miles to the northwest of downtown and only about seven miles north of O'Hare International Airport.

The purpose of this paper is to present the results of the customer satisfaction survey conducted by SIUC in late 1994. Thought to be the first of its kind, the survey covers both based-users and transient-users, and provides insights into the needs and wants of customers served by a large general aviation reliever airport. The survey itself was designed to assess the satisfaction of based-users and transient-users with PWK's services, facilities, and management. Future needs, from a service perspective, were also evaluated. In particular, the report gauges the extent to which airport clients were considering basing their aircraft at other regional airports and analyzes client rationale in considering relocation. The report first discusses study design and reports the major findings of two survey instruments. It then addresses issues upon which PWK customers exhibited strong satisfaction and those for which they shared much concern. Survey questions and responses are provided in Appendix A for based-users and Appendix B for transient-users. The report concludes by suggesting options for PMAC to consider in light of the findings.

### **General Aviation in the Reliever Airport Role**

General aviation, basically every other type of aviation endeavor excluding scheduled passenger transportation, does not always fit cohesively with large commercial airport operations. The myriad services provided by general aviation operators, which is not totally inclusive of aerial photography, sky diving, air evacuation, corporate/executive transportation, air taxi, and charter, illustrate the need to separate commercial carriers and general aviation. Even though large corporate aircraft fit easily into the commercial carrier environment, their flexible schedules may cause perturbations to commercial airports' operations. Add in the full range of general aviation aircraft, single and multi-engine piston aircraft, single and multi-engine turbo-prop aircraft, corporate aircraft, and rotorcraft, and the scene becomes more complicated and far more

difficult to manage efficiently and effectively. Since general aviation does not share any interdependent relationship with the major carriers or the regional/commuter airlines there is little justification to mix these incompatible operations. Safety is a paramount issue that must be taken into consideration as well. On June 23, 1998, a student pilot crashed and died on final approach to John Wayne International Airport in Orange County, California. Probable cause of the accident was wake turbulence generated by a Boeing 757 landing at the airport ahead of the student pilot (NTSB, 1998). Probably the worst example of mixing general aviation with major carrier operations occurred on September 25, 1978, at San Diego's Lindbergh Airport. A Pacific Southwest Airlines Boeing 727 collided with a Cessna 172. The crash killed the student pilot, his instructor, and everyone aboard the Pacific Southwest airliner (NTSB, 1979). Reliever airports are intended to resolve these operationally incompatible and potentially unsafe aircraft operations by providing a place for general aviation users to operate away from commercially serviced airports, but still have access to major metropolitan areas.

The United States Congress defines a reliever airport as one which relieves congestion at a commercial airport and provides general aviation access to the community (United States General Accounting Office [GAO], 1994). According to this GAO report, funding was allocated through the FAA's Airport Improvement Plan (AIP) to reliever airports meeting the following criteria.

The airport should have at least 50 aircraft based at the airport or a minimum 35,000 annual operations (take-offs and landings). FAA may also name an airport a reliever if it determines that the airport is in a desirable location for instrument training activity. With FAA's concurrence, state and local planning authorities can designate an airport as a reliever even if it does not meet the above criteria. (1994, p. 3)

In 1994 there were 329 reliever airports designated by the FAA with 246 of these linked with a major commercial airport (GAO, 1994). Typically, linked relievers are located near a major metropolitan area's primary air carrier airport, are capable of handling corporate jets, have an instrument landing system (ILS) for all-weather operations, sell jet fuel, and have comprehensive general aviation services available for their customers (GAO, 1994). As is indicated by the GAO report the designation of a reliever can be quite broad and open to interpretation by the FAA, state, and local governments. Data suggests a moderate correlation among the criteria used to designate an airport as a reliever. With the exception of having an ILS, no more than two relievers illustrated have more than two qualifiers which are comparable. For example, VanNuys, California, and Deer Valley, Arizona, have similar runway lengths, comparable numbers of based aircraft, however annual operations and number of Fixed Base Operators (FBOs) vary widely. Hooks, Texas, and Teterboro, New Jersey, also have similar runway lengths and comparable numbers of based aircraft, here again annual operations and numbers of FBOs vary. Palwaukee, Illinois, with the shortest runway, rates fourth in annual operations, registers third in number of based aircraft, with the only comparable qualifier being the number of FBOs (see

Table 1). An indication that even nationally reliever airport size and facilities are just as diverse as the aircraft they service.

**Table 1**  
**Selected Reliever Airport Data - 1997**

<i>Reliever Airport</i>	<i>Longest Runway</i>	<i>NAV Aides</i>	<i>Number of Annual Operations</i>	<i>Number of Based Aircraft</i>	<i>Number of FBOs</i>
Van Nuys, California (VNY)	8,000 x 150	ILS	583,170	715	5
Hooks, TX (DWH)	7000 x 100	ILS	146,870	291	1
Deer Valley, AZ (DVT)	8200 x 100	ILS	216,026	748	2
Teterboro, NJ (TEB)	7000 x 150	ILS	209,667	289	4
Palwaukee, IL (PWK)	5001 x 100	ILS	188,193	347	2

Note. Data were compiled from Santos, (1997, Airport Information).

Palwaukee Airport is an FAA designated reliever airport which serves a wide range of general aviation needs. Palwaukee is considered to be linked with Chicago's O'Hare International Airport. The diversity of services provided at PWK are directly proportional to the diversity of aircraft and operations conducted there. Fuel needs vary from MOGAS (automobile gasoline), to 100 Low Lead, to Jet A/B. Some aircraft owners/operators are satisfied with a simple tie-down, others require that their aircraft be hangared. Some owners/operators perform a majority of their own maintenance while others have a local FBO perform all of their maintenance.

According to Illinois Department of Transportation (IDOT) documentation Northeastern Illinois airport utilization has been stable from 1981 through 1994. There was virtually no change from 1981 through 1991. However, in 1992 PWK's share dropped from 22.8 percent to 18.5 percent, declining further in 1993 to 15.9 percent, and then increasing to about 17 percent in 1994 (IDOT, 1994). Figure 1 represents this data for the 10 year period 1985 through 1994. Additional IDOT data (by type of based aircraft) corroborated this trend. Since 1988, and particularly since 1991, based-user aircraft totals were down for single-engine, multi-engine, and jet aircraft at PWK (1994).

A comparison between IDOT official airport inventory data and inventory numbers reported by survey respondents draws a similar profile of the based-user population at PWK. Respondent and IDOT data indicate, when compared, that the majority of aircraft at PWK are single-engine, that multi-engine aircraft data deviates by five aircraft, jet aircraft data deviates by three aircraft, with rotorcraft data deviating by one aircraft (see Table 2). For the sake of comparison "jet" includes turbo-prop and turbo-jet/turbo-fan aircraft types.

Figure 1. Northeastern Illinois Airport Utilization.

%

Source: IDOT, 1994

**Table 2**  
**Number of Aircraft Based at PWK by Customers Responding to Based-user Survey**  
**Compared to 1994 IDOT Inventory**

<i>Type of Aircraft</i>	<i>1994 Based-user Survey Results</i>	<i>1994 IDOT Inventory</i>
Single-engine	120	239
Multi-engine	34	39
Jet	54	57
Rotorcraft	3	2
Total	210	337

Note. Some respondents operate more than one aircraft. For the purposes of comparison jet is inclusive of turbo-prop, turbo-jet and turbo-fan aircraft.

## METHODOLOGY

Between August and early November of 1994, SIUC investigators worked closely with PMAC in developing two survey instruments to study customer satisfaction with PWK facilities, services, and management. Each survey instrument addressed different perspectives from which based-user and transient-user customers utilized airport facilities and services. Survey instruments also accounted for types and numbers of aircraft operated by PWK based-users and transient-users (i.e., single-engine piston, multi-engine piston, turbo-prop, turbo-jet/turbo-fan, and rotorcraft) who responded to the surveys. It must be noted that Rotorcraft responses were included within turbo-jet/turbo-fan types of aircraft by their owner/operators.

Investigators mailed the based-user survey instrument to all PWK customers basing one or more aircraft at PWK as of November 14, 1994. The listing of based-users was supplied to investigators by PMAC. Investigators then mailed additional surveys on December 12, 1994 to customers not returning the initial survey. Over 160 based-user surveys were ultimately returned for a response rate of approximately 58 percent.

Three hundred transient-user survey instruments were mailed to customers selected at random from listings provided by Priester Aviation and Service Aviation, PWK's two FBO's (a total of 150 customers were selected from each of the two FBOs). The initial and follow-up mailings of the transient-user surveys took place in November and December 1994, respectively. Of three hundred transient-user customers surveyed, 121 of these (40 percent) responded.

The survey instruments solicited factual data about PWK's customers and their airport utilization such as what type of aircraft were flown, for what purpose, frequency of operations, and amount of fuel purchased at PWK and at other airports annually. The surveys also assessed current satisfaction with services, facilities, and management at PWK. Moreover, the survey asked customers about future needs at PWK.

Most survey questions assessed attitudes and perceptions of customers regarding suitability of current facilities, services, and management and what they think the future holds for PWK. Consequently, questions were mostly close-ended and required based-users to relate the degree to which they were either satisfied or in agreement with statements about PWK facilities, services, and management. A five-point scale of 1 to 5 (where 1 is totally dissatisfied and 5 is extremely satisfied) identifies degree of respondent satisfaction or agreement. The surveys also included a few open-ended questions that let respondents volunteer additional comments about PWK facilities, services, and management in their own words. Appendix A and B include survey questions and responses. Responses are indicated by bold print. Responses for open-ended questions are not provided due to their variety and number.

### **Based-user Survey Results**

The factual data, such as the type of aircraft flown, was not only useful for profiling customers based at PWK, but was extremely helpful in deciphering and pinning down assessments of facilities and services. For instance about 33 percent of based-user respondents used their aircraft for business, another 40 percent mostly for pleasure, and about 27 percent for business and pleasure. When these percentages are broken down by the types of aircraft based at PWK it was determined that 92 percent of customers basing turbo-jet aircraft at PWK flew mostly for business purposes, none of which flew mostly for pleasure, and only about 8 percent flew for business and pleasure. This contrasts sharply with single-engine, and multi-engine aircraft use. Of these two types of aircraft only about 13 percent of single-engine and 33 percent of multi-engine aircraft were flown mostly for business, while 56 percent of single-engine aircraft and 32 percent of multi-engine aircraft flew mostly for pleasure, and 30 percent and 33 percent flew mostly for business and pleasure, respectfully.

Different types of aircraft have different operational needs and serve different purposes. Survey results for aircraft utilization and fuel consumption indicated that turbo-prop, turbo-jet, and turbo-fan aircraft logged considerably more flight hours, consumed more fuel, and were far more likely to anticipate increasing their use of PWK over the next five years.

### **Satisfaction With Facilities**

The survey asked based-users to respond to a series of close-ended questions concerning current availability and condition of runways/taxiways, storage and parking, and FBO' services.

**Runways and Taxiways.** Generally, based-user customers did not agree about the suitability of PWK's facilities. For instance, many respondents were satisfied, or extremely satisfied with runway width, availability of parallel taxiways, and condition of aviation pavements. However, just as many were less satisfied, neutral, or dissatisfied. Overall, based-users were satisfied with runway

length. Over 56 percent indicated they were either satisfied with or extremely satisfied with current runway lengths at PWK.

Evaluations of runway length, width, and to a lesser extent, pavement condition differed by types of aircraft based at PWK. For instance, whereas over 70 percent of single-engine and 65 percent of multi-engine aircraft operators reported they were satisfied or extremely satisfied with length of runways, only 33 percent of the turbo-prop and 8 percent of turbo-jet/turbo-fan aircraft operators said they were satisfied.

**Storage and Parking.** There was a general lack of consensus about parking and storage availability. Responses were fairly evenly spread across all five types of aircraft owned/operated even though the answer most often given concerning parking availability was dissatisfied. Turbo-prop and turbo-jet customers were noticeably more satisfied with parking and storage space availability. About 66 percent of customers basing these types of aircraft said they were satisfied or extremely satisfied. Single and multi-engine customer responses of satisfaction were 31 percent and 39 percent, respectively. Turbo-prop and turbo-jet operators also tended to be more satisfied with the condition of parking and storage facilities than were customers operating other types of aircraft.

A clearer consensus existed among based-users in regard to parking and storage facility costs. Almost 64 percent said they were dissatisfied or totally dissatisfied with current prices. And, unlike previous concerns, type of aircraft made little difference in how customers responded.

**Fixed Base Operators.** The survey concluded by asking based-users about FBOs. Most were satisfied with facilities and services offered by both FBOs and all respondents disagreed that PWK needs more than two full-service FBOs.

### **Satisfaction With Services**

There was considerably stronger consensus among based-user customers concerning their satisfaction with services at PWK than was the case with facilities. Based-users responses to questions related to fuel services, maintenance services, flight instruction, and management were solicited by the survey.

**Fuel Services.** Almost 75 percent of based-users said they were satisfied with availability and quality of ramp and fuel services. Only 26 percent were satisfied with fuel prices. However, fuel costs was considerably more a point of contention among those basing turbo-jet/turbo-fan aircraft at PWK. Only four percent of turbo-jet/turbo-fan aircraft operators responded that they were either satisfied or extremely satisfied with fuel prices. In contrast, almost 30 percent of single-engine and multi-engine based-users reported satisfaction with fuel prices.

**Maintenance Services.** Generally, based-users reported satisfaction with availability (46 percent) and quality (45 percent) of maintenance services at PWK. Again, cost was a major issue with 42 percent voicing dissatisfaction. However, turbo-prop customers (66 percent) and turbo-jet/turbo-fan customers (50 percent) were much more likely to be satisfied or extremely satisfied with

maintenance services than based-user owners/operators of single-engine and multi-engine aircraft at PWK. In total numbers of based-users only 20 percent expressed satisfaction or extreme satisfaction with maintenance services at PWK.

**Flight Instruction.** Based-user customers were largely supportive of the availability, quality, and cost of flight instruction at PWK. About half the respondents said they were satisfied or extremely satisfied and another 30 percent report neutrality. Although it was recognized that turbo-prop and turbo-jet/turbo-fan users reported neutrality about flight instruction, the strong satisfaction of single-engine and multi-engine customers was clear.

**Management.** A series of questions were asked to see how customers felt they were treated by management at PWK. Nearly 40 percent of based-users believed they were valued customers. Furthermore, almost 70 percent said that airport staff treat them with a great deal of respect. Also, 41 percent agreed they were listened to when voicing concerns to airport staff.

### **Airport Utilization**

Respondents were asked to state how they used PWK and other major regional reliever airports in Northeastern Illinois. In general 41 percent reported they flew mostly for both business and pleasure. When asked why they based their aircraft at PWK the overwhelming response was PWK's convenient location. Frequently mentioned was quality of facilities and services.

A vast majority of based-users (76 percent) fly 250 or less operations at PWK annually although a few (4 percent) fly 1000 or more. Of the total number of these based-users 58 percent thought their airport utilization will remain the same over the next five years while 29 percent thought it would increase, and 9 percent predicted decreasing their utilization.

The survey also asked respondents to relate their use of other airports and their reasons for doing so. Waukegan Memorial was the most frequently used by 30 percent of respondents, followed by Dupage County Airport at 17 percent. Less than 10 percent of respondents mentioned Aurora Municipal Airport or Lake-in-the-Hills. Based-user respondents reported utilization of one of these locations almost four times a month on average. Based-users frequently mentioned better facilities, better services, less congested approach patterns, and convenient passenger pickup as rationale for using other airports. However, the greatest motivation for using other airports was less expensive fuel.

**Changes and Improvements Desired by Based-users.** After asking based-users about their current satisfaction with services, facilities, and management at PWK, they were asked to look ahead. Specifically, information was sought about the future at PWK and any related changes they thought ought to be made there. Again, close-ended questions were used that asked based-users to choose, from a 5-point scale, how much they agreed or disagreed with statements about changes that ought to be made at PWK. The survey was concluded with a few open-ended questions allowing respondents to offer comments about PWK

facilities, services, and management in their own words. It should be noted that those responding to open-ended questions did not represent a majority of survey respondents as a whole. Responses were provided merely to help readers gain a feeling for the tone of responses.

**Facilities.** Clearly the most strongly felt need for PWK's future, among based-users, revolves around aircraft storage facilities. A little over 50 percent of based-users said they believed PWK needs more community and corporate hangars. Over 75 percent saw the need for more T-hangars and individual aircraft facilities as an integral factor to the future success of PWK. Of customers basing turbo-jet/turbo-fan aircraft most, over 75 percent, strongly feel the need for more corporate facilities. Based-user customers disagree that PWK ought to provide more tie-downs, obtain better highway access, or place a limit on numbers of aircraft based at the airport.

A total of 29 based-user customers volunteered additional comments about PWK facilities. The following quotes characterized their comments about taxiway conditions and runway characteristics. These quotes were typical of what customers who choose to respond to the open-ended questions related: "Need better taxiways", "Better taxiway surface conditions", "Better pavement on secondary runways used as taxiways", "A full length parallel taxiway for runway 16/24", and "Taxiways and ramps are tight in places." These comments were not necessarily representative of based-user customers and were largely critical. The same was true for the following quotations regarding storage and parking needs: "Covered tie-downs and T-Hangars", "New T-Hangars are BADLY needed", "More T-Hangars", and "More Hangars."

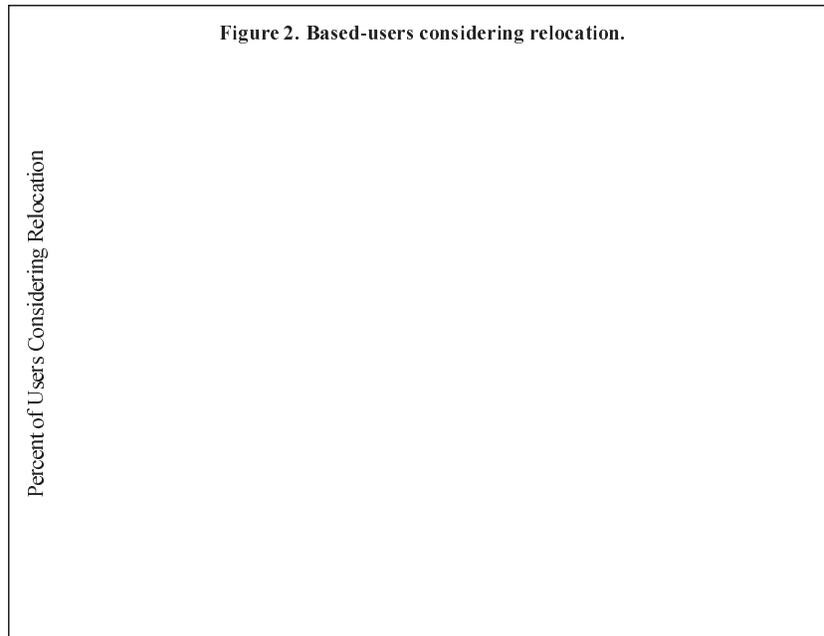
**Services.** There was general agreement among based-users that PWK does not need more than two full-service FBOs. Customers basing single-engine and multi-engine aircraft were much more in agreement on this issue than were turbo-prop and turbo-jet/turbo-fan operators. For instance, about 66 percent of customers basing turbo-prop aircraft and 50 percent of customers basing turbo-jet/turbo-fan aircraft agreed or strongly agreed that more FBO service was needed. Finally there was some agreement that PWK needs to provide better snow removal and security to protect aircraft. Customers basing turbo-jet/turbo-fan aircraft at PWK feel more strongly about these needs.

**Management.** Some customers choosing to respond to the open-ended questions also commented about management. The following quotations were typical of those remarks: "Management is too bureaucratic," "Management needs to LISTEN to their clients," and "Management needs to be more flexible."

**Desirability of Other Regional Airports.** The survey asked based-user customers about their use of other major regional airports in Northeastern Illinois and their rationale for doing so. Generally, based-users most often mentioned that they flew to Waukegan Memorial (30 percent), followed by Dupage County (17 percent). However, turbo-prop and turbo-jet/turbo-fan operators most frequently flew to Chicago Midway (42 and 67 percent respectively). Almost 40 percent of multi-engine operators said they flew most frequently to Dupage

County. Customers gave numerous reasons for using these other airports including passenger pickup, less expensive fuel, less congested air space, and better facilities and services. Based-users utilized other airports about four times a month on average.

The survey concluded by asking based-users to indicate whether they were considering moving their aircraft to another regional airport. Fifty based-users (33 percent) said they were considering relocation. Based-users operating turbo-jet/turbo-fan aircraft were those most likely to be considering a move; 44 percent of the 25 turbo-jet/turbo-fan respondents were considering relocation (see Figure 2 and Table 3).



**Table 3  
Based-users Considering Relocation (by type of aircraft)**

<i>Type of Aircraft</i>	<i>Number of Respondents</i>	<i>Number of Respondents Considering Relocation</i>	<i>Percentage of Respondents Considering Relocation</i>
Single-engine	93	28	30
Multi-engine	32	11	35
Turbo-prop	0	0	0
Turbo-jet/Turbo-fan	25	11	44
Total	150	50	33

The survey asked those who were considering a move to explain in their own words why they were considering relocation. The following quotes were characteristic of their reasons: "Lower fuel costs", "Better maintenance prices, fuel costs", "Hangar facilities", "Better hangars at lower cost", and "Less expensive fuel and tie-down costs."

### TRANSIENT-USER SURVEY RESULTS

Like the based-user survey instrument, the transient-user survey instrument was designed to gauge customer satisfaction with facilities, services, and management at PWK. In this instrument questions were specifically crafted to assess transient-user satisfaction with airport facilities and FBO services, as well as to generally learn how transients utilize PWK.

**Facilities, Services, and Management.** Similar to based-user operators at PWK, satisfaction of transient-user customers with availability, condition, or cost of PWK facilities and services varied. What did stand out was that neutrality was the answer most often given. For instance, transient-users lacked conviction one way or another about PWK's prices for fuel, parking, and storage. The majority of responses regarding PWK's facilities and services, on balance, were more positive than negative. For instance, 43 percent of transient-users said they were either satisfied or extremely satisfied with length of runways. Almost 35 percent responded the same about width of runways. Transient-users also indicated that they were satisfied with Air Traffic Control (ATC) services and snow removal.

In contrast to the mostly positive responses by transient-users, airport pavement conditions and availability of parallel taxiways stood out as notable exceptions. Transient-users reported dissatisfaction with pavement conditions (42 percent) and dissatisfaction or extreme dissatisfaction with parallel taxiway availability (47 percent).

Transient-user satisfaction with FBOs' facilities, services, and management was overwhelmingly positive. Over 70 percent of transient-users said they were satisfied, or extremely satisfied, with the quality and courtesy of FBOs' services. Practically all transient-users responding to the survey said they would use the same FBO next time they flew into PWK.

**Airport Utilization.** The study identifies aircraft type and total number of aircraft operated by transient-users applying the same categories as the based-user survey. The 121 transient-user respondents flew a total of 307 operations per month into PWK (see Table 4). In contrast to based-users, the greatest percentage of transient-users flew mostly for business, followed by business and pleasure, and lastly pleasure alone.

A little more than half of the respondents said they conduct 25 or fewer annual operations while 16 percent said they conduct over 50 operations per year. About 68 percent said they expected to use PWK about as much over the next five years as they had this year. Another 25 percent said their utilization will

**Table 4**  
**Transient-user Operations at PWK (by Type of Aircraft)**

<i>Type of Aircraft</i>	<i>Operations per Month</i>
Single-engine	103
Multi-engine	68
Turbo-prop	34
Turbo-jet & Turbo-fan	97
Rotorcraft	5
Total	307

increase, and less than 8 percent indicated a decrease in their utilization in the future.

### CONCLUSION

Overall, conducting a customer satisfaction survey such as the one done for the PMAC is helpful in providing customer based input to the airport operator about a number of issues including:

1. Future capital investment needs,
2. Current airfield operational concerns,
3. Fuel costs,
4. Aircraft storage costs, and
5. Maintenance requirements.

Based on analysis of 160 based-user responses and 121 transient-user responses, customer satisfaction with Palwaukee Airport can be described as follows.

#### Based-users

Generally, based-users were most likely to express satisfaction about ATC services; length of runways, availability, quality, and cost of flight instruction; airport accessibility; availability of fuel; quality of ramp service; availability and quality of maintenance; and FBOs' customer service.

Most were likely to express dissatisfaction regarding costs of aircraft parking/storage; costs of maintenance, parts, and services; costs of aviation fuel; availability of hangars of all types; capacity for additional based-users; and security of aircraft.

Evaluation of data gathered from 50 based-users considering relocation categorized by aircraft type enables PMAC to focus on individual user-needs. Single-engine operators considering relocation expressed concern over matters of costs, availability, and condition of parking/storage; the availability of hangars of all types; the cost of maintenance, parts and service; and security of aircraft. Multi-engine operators considering relocation expressed concern over

matters of cost and availability of parking/storage; availability of hangars of all types; costs of aviation fuel; costs of maintenance, parts, and service; and security of aircraft.

There were no turbo-prop operators considering relocation. And finally, turbo-jet/turbo-fan operators considering relocation expressed concern over costs, availability, and condition of parking/storage; availability of community/corporate hangars; availability of taxiways suitable to aircraft operated; costs of fuel; snow removal; and security of aircraft.

Among those operators not considering relocation, single-engine operators expressed concern over costs of parking/storage, availability of T-hangars, and security of aircraft. Multi-engine operators not considering relocation were dissatisfied with costs of parking/storage and availability of hangars of all types. Turbo-prop operators, none of which indicated they were considering relocation, expressed concerns related to costs of parking/storage and numbers of full-service FBOs. Turbo-jet/turbo-fan operators not considering relocation were concerned with length of runways; availability of community/corporate hangars; costs of aviation fuel; and security.

#### **Transient-users**

The transient-user survey was constructed so as to provide data for PMAC to evaluate customer satisfaction by aircraft type. Those transient-users responding were most likely to express satisfaction with the quality of FBOs' services, facilities, and ATC services. They were most likely to express dissatisfaction with the condition of airport pavements, availability of parallel taxiways, and costs of aviation fuel obtained from FBOs.

### **RECOMMENDATIONS**

Costs for storage and parking facilities was the major issue. It became clear in many situations that aircraft operators were concerned with the availability of hangar space. Investigators found that costs and availability of hangars was the primary reason that 33 percent of PWK's based-users were considering relocation.

Investigators recommend that PMAC determine the cost of comparable parking, storage, and hangar facilities at other airports and competitively adjust costs at PWK. Also, PMAC should study the feasibility of building more hangar facilities and find out the type most needed (i.e., T-hangar, corporate, etc.) based upon requirements of based-users considering relocation. An additional recommendation is that a forecast of future parking, storage, and hangar requirements be developed in the interest of attracting additional based-users.

Survey results indicated that customers at PWK were generally satisfied with the availability of FBOs' services, but costs related to fuel and maintenance were a concern. Investigators recommend that PMAC undertake a study of fuel and maintenance costs at the other airports in the Northeastern Illinois region

and determine how adjustments could make PWK more competitive and help increase user satisfaction.

With the impact of the General Aviation Revitalization Act of 1994 not fully being realized at this time the investigators further recommend that this study be expanded to include a random sample of reliever airports nationally. If what was found at PWK holds true for other relievers, in terms of the need for capital improvements (runways, taxiways, ramps as specified by AIP) there may be a better argument made for additional funding of reliever airport needs nationwide.

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**APPENDIX A  
Based Aircraft User Survey Questions**

1. How many of each type of aircraft do you base at PWK?

Type	Number
Single Engine Piston	120
Multi Engine Piston	34
Turbo prop	8
Turbo jet/turbo fan	46
Rotor craft	3
Other (please specify)	0

2. How do you use your aircraft (Check one)?

32.3% Mostly Business  
 40.5% Mostly Pleasure  
 27.2% Business and Pleasure

3. Why did you choose to base your aircraft at PWK (please rank with 1 being the most important and 4 least important consideration)?

(raw scores)	1st	2nd	3rd	4th
1. Convenient location of PWK	69%	1%	1%	1%
2. Quality of PWK facilities	1%	21%	22%	6%
3. Quality of PWK services	1%	17%	22%	11%
4. Other, specify	1%	6%	1%	8%

4. How many annual operations (counting take-offs and landings separately) do you conduct at PWK?

38% 1 to 100      15% 251 to 500      1% 1001 to 2500  
 38% 101 to 250      4% 501 to 1000      3% 2501 or more

5. How many flight hours do you conduct per year in the aircraft you base at PWK (per aircraft)?

Mean = 278; Median = 150.

6. a. Estimate how many gallons of fuel you purchase annually at Palwaukee?

Mean = 16,475; Median = 1,200.

- b. How many gallons of fuel a year do you purchase at other local airports?

Mean = 7,960; Median = 500.

7. Are you expecting your use of PWK over the next five years to (check one):

Increase 29%      Decrease 9%      Stay the same 58%

Next, we would like to begin by asking you to tell us how satisfied you are with PWK facilities and services.

8. Please indicate on a scale of 1 to 5 (where 1 is totally dissatisfied and 5 is extremely satisfied) how satisfied you are with the:

(Modal Choice <i>Italicized</i> )	1	2	3	4	5
Length of runways	7.6	14.0	22.3	20.4	<b>35.7</b>
Width of runways	12.8	17.9	25.0	17.9	<b>26.3</b>
Availability of parallel taxiways	11.0	20.8	<b>32.5</b>	20.1	15.6
Condition of aviation pavements	18.5	17.2	<b>29.3</b>	25.5	9.6
FAA ATC services	5.2	7.1	14.9	<b>39.0</b>	33.8
Availability of aircraft parking/storage	<b>23.0</b>	21.1	17.1	19.7	19.1
Condition of aircraft parking/storage	19.9	14.7	<b>29.5</b>	19.9	16.0
Cost of aircraft parking/storage	<b>37.0</b>	26.6	18.2	11.7	6.5
Availability of flight instruction services	7.8	7.8	<b>30.0</b>	26.7	27.8
Quality of flight instruction services	5.7	8.0	<b>30.7</b>	28.4	27.3
Cost of flight instruction services	9.4	14.1	<b>38.8</b>	25.9	10.6
Pilot lounges	9.4	11.8	<b>33.9</b>	27.6	17.3
Airport restaurants	9.2	12.8	<b>36.2</b>	34.0	7.8
Lodging, Personal Security, & Safety	10.8	10.8	28.0	<b>30.1</b>	20.4
Airport accessibility by air	5.3	11.2	23.7	<b>30.9</b>	28.9
Airport accessibility by land	4.6	5.9	21.1	<b>38.8</b>	29.6
Fuel Availability	6.0	6.7	13.3	28.7	<b>45.3</b>
Quality of Ramp and Fuel Service	4.1	11.5	16.2	32.4	<b>35.8</b>

*Continued*— (Modal Choice ***Italicized***)

	1	2	3	4	5
Cost of fuel	26.8	19.7	<b>27.4</b>	15.9	10.2
Availability of Aircraft					
Maintenance & Parts Service	6.8	11.5	<b>35.8</b>	29.7	16.2
Quality of Aircraft Maintenance & Parts Service	10.3	13.8	31.0	<b>31.7</b>	13.1
Cost of Aircraft Maintenance & Parts Service	22.6	19.2	<b>34.9</b>	15.8	7.5

9. We want to know if you are satisfied with the business and administrative practices at PWK. Please respond to the following statements (SD indicates you strongly disagree, D disagree, N no opinion, A agree and SA strongly agree).

(Modal Choice <b><i>Italicized</i></b> )	SD	D	N	A	SA
I am valued as a customer at Palwaukee	12.7	22.2	25.9	<b>35.4</b>	3.8
Airport staff treats me with respect	3.8	8.9	17.8	<b>58.0</b>	11.5
Airport staff shares my concerns about issues that I have brought to their attention	13.0	13.6	32.5	<b>36.4</b>	4.5

We are very interested in finding out what changes you think ought to be made in PWK airport facilities and services in the upcoming years.

10. Please respond to the following statements (SD indicates you strongly disagree, D disagree, N no opinion, A agree and SA strongly agree).

(Modal Choice <b><i>Italicized</i></b> )	SD	D	N	A	SA
PWK needs more community/ corporate hangars	1.3	7.8	<b>35.7</b>	33.8	21.4
PWK needs more T-hangars and/or single aircraft storage	1.3	5.1	17.9	28.8	<b>46.8</b>
PWK needs more than two full-service FBOs	12.2	<b>26.9</b>	21.8	18.6	20.5
PWK needs more tiedowns	3.3	19.0	<b>48.4</b>	19.6	9.8
PWK should place a limit on the number of based aircraft	<b>44.3</b>	31.0	18.4	5.7	0.6
PWK needs highway access	11.0	<b>43.5</b>	26.6	13.0	5.8
PWK needs better snow removal	5.3	28.3	26.3	<b>31.6</b>	8.6
PWK needs to provide better security measures to protect aircraft	1.3	21.4	20.8	<b>39.0</b>	17.5

11. What, if any, airport facilities and/or services do you think need improvement at PWK (use additional sheets as necessary)?

Finally, we would also like to ask you about your use of other airports.

12. Other than PWK, which airport in Northeastern Illinois do you use most often (check one):

- |                               |                         |
|-------------------------------|-------------------------|
| 4.5% Aurora Municipal Airport | 16.9% DuPage County     |
| 8.4% Campbell Airport         | 8.4% Lake-in-the-Hills  |
| 9.1% Chicago Midway           | 29.9% Waukegan Memorial |
| Other (Please specify)        | 22.7% <b>Kenosha</b>    |

13. Please rank the following reasons for using this other facility (where 1 is the most important reason, 2 the second most important, and so on).

(raw scores)	1st	2nd	3rd	4th	5th	6th
Better facilities	15	13	4	5	3	1
Better Services	14	15	5	4	5	1
Ground facilities less crowded	2	9	10	9	9	0
Air approach less congested	15	7	6	5	6	2
Fuel is less expensive	21	12	9	4	2	4
Passenger Pickup	10	10	4	3	8	1
Other (please specify)	5	3	1	0	0	0

14. How frequently do you use this other airport (times per month)?

Mean = 3.7;    Median = 0

15. Are you actively considering moving your aircraft to another area facility?

Yes 32.3%    No 67.7%

15a. If considering a move, which airport are you planning to move to?

15b. Please tell us why you are considering this other airport:

**APPENDIX B**  
**Transient Aircraft User Survey Questions**

We would like to find out more about your use of PWK.

1. How many of each type of aircraft do you operate?

Type	Number
Single-Engine Piston	103
Multi-Engine Piston	68
Turbo-prop	34
Turbo-jet/turbo fan	97
Rotorcraft	5
Other (please specify)	0

2. How do you use your aircraft (Check one)?

75.2% Mostly Business  
11.1% Mostly Pleasure  
13.7% Business and Pleasure

3. Why did you choose to use PWK (please rank with 1 being the most important and 4 least important consideration)?

(raw scores)	1st	2nd	3rd	4th
1. Convenient location of PWK	68%	2%	0%	0%
2. Quality of PWK facilities	2%	16%	31%	6%
3. Quality of PWK services	2%	33%	18%	3%
4. Other, specify	4%	6%	9%	7%

4. How many annual operations (counting take-offs and landings separately) do you conduct at PWK?

55.8% 1 to 25  
28.3% 26 to 50  
15.8% 51 or more

5. a. Estimate how many gallons of fuel you purchase annually at Palwaukee?

Mean = 5041; Median = 525.

- b. How many gallons of fuel a year do you purchase at other elsewhere?

Mean = 69,658; Median = 8050.

6. Are you expecting your use of PWK over the next five years to (check one):

Increase 25.0%      Decrease 7.5%      Stay the same 67.5%

7. On a scale of 1 to 5 (where 1 is totally dissatisfied, 3 is neutral, and 5 is extremely satisfied) how satisfied are you with the:

(Modal Choice <i>Italicized</i> )	1	2	3	4	5
Length of runways	12.6	18.5	<b>26.1</b>	22.7	20.2
Width of runways	16.8	21.8	<b>26.9</b>	21.8	12.6
Availability of parallel taxiways	19.7	27.4	<b>30.8</b>	15.4	6.8
Condition of aviation pavements	13.4	28.6	<b>40.3</b>	13.4	4.2
FAA ATC services	4.2	13.4	30.3	<b>40.3</b>	11.8
Snow Removal	0.0	11.9	<b>47.5</b>	29.7	10.9
Cost of FBO Fuel	8.5	24.6	<b>44.1</b>	19.5	3.4
Quality of FBO lounge facilities	5.9	11.0	31.4	<b>39.8</b>	11.9
Quality of FBO pilot briefing facilities	2.6	9.5	38.8	<b>39.7</b>	9.5
Quality of FBO restroom facilities	3.4	6.8	<b>39.8</b>	36.4	13.6
Quality of catering services	2.2	5.5	<b>51.6</b>	34.1	6.6
Availability of transient aircraft parking/storage	11.4	21.9	<b>33.3</b>	29.8	3.5
Condition of aircraft parking/storage	13.7	20.5	<b>37.6</b>	24.8	3.4
Cost of aircraft parking/storage facilities	11.1	18.8	<b>49.6</b>	16.2	4.3
Ease of access to aircraft parking/storage facilities	11.2	20.7	<b>33.6</b>	29.3	5.2
Quality of FBO service	2.6	6.0	20.5	<b>46.2</b>	24.8
Courtesy of FBO service	4.3	6.9	9.5	38.8	<b>40.5</b>

8. What changes, if any, would you like to see made in FBO services at PWK?

9. When you return to PWK, will you consider using the same FBO as last time?

Yes 97.5%      No 2.5%

If not, why not?



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# USING TQM AND ISO 9000 PRINCIPLES IN ASSURING EDUCATION SERVICE QUALITY

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## ABSTRACT

This paper describes Riga Aviation University's movement from a strongly regulated and controlled professional education program to a system of contract relations with students as Education Service customers. This period demanded, first, a study of students' demands, requirements and issues, and the development of interrelation methods based on Total Quality Management, and, second, the building of a University Quality Assurance System according to ISO 9000 standards.<sup>1, 2</sup>

## INTRODUCTION

Today two main factors determine the quality of aviation graduates in Riga Aviation University (RAU): governmental accreditation of academic study programs (B.Sc., M.Sc.), and individual certification of the aviation graduates by the Latvian Civil Aviation Administration. Competition in the Education Service (ES) market is one of the new objectives for the University in the modern market economy. To address this challenge, RAU is developing an internal University quality management system based on Total Quality Management (TQM) principles and ISO 9000 standards. There are two main stages of this process: a

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study of ES customers' requirements and the development of an ES Quality Assurance System.

### **STUDY OF ES CUSTOMERS' DEMANDS, REQUIREMENTS AND ISSUES**

#### **Research Purposes**

The present research was oriented on the following purposes:

- Develop a list of the characteristics of ES customers,
- Develop a list of the specialties and accreditation needs of ES customers,
- Define a set of ES quality guarantees acceptable to the ES customers, and
- Establish quality guarantees to address the concerns of ES customers.

At first a model of Education Services at RAU was designed. The model had two levels: service preparation and service supply. The first level consisted of the following activities:

- Establish new specialty offerings—including creating specialty status and qualification criteria,
- Estimate demands and resources,
- Develop study programs and quality plan,
- Prepare staff,
- Advertise,
- Prepare methodological base, and
- Prepare library and laboratory.

The second level consisted of the following activities:

- Implement application process and conduct entrance examinations,
- Register students and distribute information about RAU regulations,
- Assign schedules,
- Conduct classes, laboratories and practices,
- Assure security,
- Complete the reporting, consultation, and testing processes,
- Perform a qualifications check, and
- Award diplomas.

#### **Problem Investigation Method**

The data for the present research was obtained through student surveys, individual interviews with applications, and meetings and discussions with students and secondary school graduates. The data were categorized by topic and grouped into whether related to ES customer demands or concerns. The data

were then summarized and used to develop the RAU Quality Assurance System.

### **Findings**

The needs of the ES customers fall into four categories.

Opportunity to get a job—includes diploma recognition by employers (in Latvia and abroad).

Period of study—includes a desire for short-term programs of study.

Information about specialty—includes attractiveness of profession based on the job market and expected salaries. Currently, accounting and computer specialties are considered attractive and science, rare and new specialties are not. Overall, those pursuing aviation specialties have low prospects considering the lack of development in the Latvian aviation industry.

Degree of subject complexity—includes the desire for simple programs of study.

The concerns of ES customers fall into four categories:

Insufficient and untrustworthy information about the specialty,

Insufficient information about university accreditation,

Unreliability in continuation of specialty offerings, and

Lack of guarantees of employment opportunities. Unfortunately, most of these concerns are related to the current difficult social-economic conditions of Latvia.

### **Implications of Research Findings**

The summarized data lead to the following conclusions:

It is necessary to establish a permanent university marketing research plan. The research must include information on the current and prospective employment trends in Latvia. The results of this market research must be disseminated and incorporated into ES customer recruitment materials.

Guarantees must be formulated as a RAU Quality Policy approved by the Rector and incorporated into the agreements between the University and ES customers. These guarantees must include (1) confirmation of accreditation of the university, the specialty and the diploma, (2) assurance that accurate information has been provided to the ES customer, and (3) the conditions of University liability.

Documentation of the Quality Assurance System must be developed to assure consistent and complete implementation and to prevent ES cus-

tomers claims. This documentation system should have four levels:

RAU Policy regarding ES Quality Assurance,  
 Quality Assurance Manual (i.e. instructions on ES quality controls),  
 Quality Assurance Handbooks for teaching and support personnel,  
 including standard contracts and work instructions, and  
 Incorporation of ES Quality Assurance policy into curriculums, study  
 plans and programs, educational standards, qualification's criteria,  
 quality plans, reviews, remarks, etc.

## **ES QUALITY ASSURANCE SYSTEM DEVELOPMENT**

### **Development Goals**

There are two development goals of the ES Quality Assurance System: ES customers and University executives will be confident that (1) educational services are implemented according to stated requirements, and (2) educational services will be accredited by the appropriate governmental and international agencies according to stated requirements.

### **Development Tasks**

The tasks necessary to meet the development goals include the following activities:

- Develop and regulate ES specification, service supplement processes specifications and ES Quality Assurance control methods specifications,
- Build ES process structure including ES design and supplement (see Research Purposes section),
- Adapt Quality Assurance System according to ISO 9001 (see Table 1),
- Define University Quality Assurance System scales and structure—quality assurance systems must cover all life circles of ES and include teaching and support services activities (e.g. administrative support, library services, etc.),
- Develop ES inspection plans for different stages including testing properties, methods, testing tools, responsible personnel, data registration forms, etc.,
- Develop methodological instructions for Quality Assurance System regulation procedures and use to create RAU Quality Assurance Manual,
- Develop job descriptions for personnel responsible for Quality Assurance System,
- Educate and train University personnel in the implementation of the ES Quality Assurance system procedures, including those of internal

audits at the faculty, specialty, department and university levels, and Create University Quality Assurance Management Service which will organize the collection and analyses of all ES Quality Assurance related information.

### RAU'S QUALITY ASSURANCE SYSTEM

Table 1 details RAU's Quality Assurance System procedures in terms of the corresponding ISO 9001 Procedures.

**Table 1**  
**RAU's Quality Assurance System Procedures, in terms of ISO 9001 Procedures**

<i>ISO 9001 Procedures</i>	<i>Corresponding ES Quality Assurance System Procedures</i>
1. Management's Commitment	Establish Administration's responsibility to students and personnel to assure ES Quality
2. Quality System	Establish ES Quality Assurance System documentation structure and guidelines and ES Quality Assurance management planning
3. Contract Review	Estimate University's capacity to run a specific specialty and establish contingency plan with ES customers in case of changes in contract conditions
4. Design and Development	Develop specialty qualification criteria, curricula and subject programs
5. Control of Documents	Entrust Document Management Service to administration
6. Purchasing	Establish relations with subcontractors which will provide ES supplies and purchase literature, computer and laboratory equipment
7. Control of Customer Supplied Product	Maintain confidentiality of ES customer documentation and records
8. Product and Traceability Identification	Design ES customer registration and attendance documents (IDs, attendance journals, etc.) to document jobs performed, chairs' reports and ES customer reports
9. Process Control	Establish ES quality testing and controls and reporting requirements (to dean's office and chair's work organization)
10. Testing and Inspection	Establish ES Quality objectives, means and testing methods
11. Controls of Testing Equipment	Develop, test, improve and maintain documentation of ES Quality testing, including examiners' tickets, tests and programs used
12. Inspection and Test Status	Establish diploma awarding procedures and diploma status
13. Control of Nonconforming Product	Establish means of detecting activity by Executive's and mandate means of reporting by officials in the case of discrepancies between designed and supplied ES
14. Corrective and Preventive Action	Establish method to prevent appearance of predicted nonconformities and to prevent the reappearance of previously discovered nonconformities

15. Delivery	Not actual
16. Control of Quality Records	Establish rules of ES Quality management recording, including ES customer's books, examination records, certificates, diplomas, and commission's acts
17. Internal Quality Audits	Establish Quality Audit System and a separate procedure for Self-Assessment Activity Management
18. Personnel Training	Teach staff the skills necessary for upgrading the system
19. Technical Servicing	Not actual
20. Statistics Techniques	Establish statistical methods to be used for determining important trends in the teaching processes' quality

### HIGHER EDUCATION QUALITY ASSURANCE REVIEW

Riga Aviation University's Quality System is based on published results of the experiences of other leading European Universities with Higher Education Quality Assurance.<sup>4,5</sup> For example, the University of Wolverhampton became the first university to achieve ISO 9001 registration for its Quality Management System. As a result, both academic and support staff became more sophisticated about TQM concepts such as customer orientation, internal and external client chains, and customer satisfaction. The Lancaster University's experience also showed TQM's acceptability for use in higher education institutions. They use objectives of TQM in their operations and in response to external quality assessment and audit. Publications of the university's experiences mentioned above emphasize the following Deming's principles of TQM:<sup>3</sup>

Maintain constancy of purposes and attention to the process,  
 Make the supplier a partner,  
 Make the employer a partner,  
 Vigorously institute training, education and self-improvement, and  
 Emphasize leadership of management and teamwork of employees.

### QUALITY OF POSTGRADUATE AVIATION TRAINING

Riga Aviation University has good training facilities to provide professional postgraduate education. The teaching activity has a few special features and was historically customer oriented. Our approach is that any customer is the focal point and that he or she should critically assess whether the quality criteria agreed upon with the supplier has been met. When referring to the quality criteria or the views of the customer, several quality elements must be considered.

The most important quality criteria are the achievements of the training objectives in any programs. This must also be completed within the scheduled time frame as agreed upon (see procedure 4).

Once a training schedule has been established with the customer it shall not be changed (see procedure 3).

Personnel shall have a high degree of competence to assist the customer in defining the training objectives and methods used to achieve the customer's goals (see procedure 18).

The documentation delivered by the training organization to the trainees, as well as to the contractual partners, shall be error-free and up-to-date (see procedure 12).

The training facilities shall have a modern, good and clean appearance, both inside and out. Access to the latest technology, which is taught, shall also be given (see procedures 4 and 6).

The instructors shall be competent, qualified and shall apply effective methods and up-to-date media (see procedures 9 and 18).

The core business of a training center is the performance of courses. Well-qualified instructors will apply the most appropriate methods and media to transfer knowledge, skills and attitudes (see procedure 9).

Assessment and testing are done to verify that the specified training objectives are met. Different methods must be proven before being considered (see procedures 10 and 17).

This postgraduate professional education must participate in RAU's Quality Assurance System.

### **CONCLUSION**

To strengthen its position in modern conditions the RAU must build capacity in the following TQM principles.

University administration must take a leading role in supporting quality improvement.

University management must take responsibility for ES Quality support to customers.

Personnel must cooperate with ES customers to prevent misunderstandings and assure quality improvement.

Quality improvement must be based on the requirements, specifications and demands of the ES customers.

A systems approach to quality management must include all aspects of ES design and implementation with special attention to the processes.

Personnel skills must be continually upgraded.

A quality assurance system built in accordance to ISO 9001 Standards and with personnel being responsible for ES Quality may be the base for introducing TQM principles at Riga Aviation University.

For all the processes mentioned above, flight and maintenance training organizations have to develop ideas and concepts about how an innovative qual-

ity management system can be developed. The focus must be on how a successful organization can be established. There are three major elements that need to be considered in order to achieve this objective.

First, establish a Management Committee. It is necessary to demonstrate to the entire staff that quality management is part of the University identity. To demonstrate this commitment, the management must be aware of the entrepreneurial meaning of quality management. They should explain the term quality to the University staff and determine the quality requirements for the intangible product. Furthermore, they have to understand quality documentation requirements and the relation of the quality cost elements to each other.

Second, management has to provide guidelines for the entrepreneurial processes and conduct process analyses. The individual process owner has to know the elements of process management and how to implement the processes. All staff should be aware of the required documentation, and provisions must be available to provide for their maintenance.

Third, an independent quality manager has to establish an Audit System and apply different audit procedures to provide feedback about the training organization's ability to carry out training and examinations which meet the standards of the top management. The independent quality management has to be able to conduct system, procedural, product and service audits.

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# AN OUTLOOK AT THE FUTURE OF THE AIRLINE AVIONICS INDUSTRY

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## ABSTRACT

The aviation industry is slowly but surely changing its character. As airlines restructure, what they ask of, and how they relate to their suppliers (including avionics manufacturers) will greatly change as well. The avionics industry is currently facing many challenges as a result of the reluctance of airlines to invest in new technologies and the possibility that airframe manufacturers will take over this industry. This paper analyzes the changes and performance of the avionics industry. It provides an overview of the evolution of avionics technologies and explores the impact of airline deregulation on the avionics industry. It also provides a perspective on the future outlook of the industry with implications to marketing strategies of avionics manufacturers.

## HISTORICAL PERSPECTIVE

Despite substantial research assessing the effects of deregulation on airline market structure and performance, little has been done to measure similar impacts on the avionics industry. The commercial air transport avionics industry is changing with simultaneous effects of advanced technology and airline deregulation causing shifts in airline priorities for avionics equipment.

The term avionics is derived from AVIation electrONICS. It describes an increasingly broad spectrum of aircraft equipment and functions. Avionics refers to aircraft electronic equipment that serves the primary functions of communications, navigation and automatic flight control. Many aircraft functions that were performed in the past by mechanical, hydraulic or electrical systems now are conducted as electronic systems. Aircraft electronic systems are those characterized by relatively small operating voltages, small current levels, and

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typically solid-state circuitry. Aircraft electrical systems are characterized by high voltages and current levels, such as those associated with primary electrical power systems. Once an aircraft system becomes electronic, it is often regarded as an avionics system.

Following World War II, the U.S. airline industry blossomed, carrying passengers, freight and mail. In the mid-1940s, the Aeronautical Radio, Inc. (ARINC) (a not-for-profit corporation owned by airlines) was created.<sup>1</sup> ARINC committees and sub-committees were formed by airline personnel and ARINC administrative support staff to develop technical standards for the avionics industry.<sup>2</sup> Because commercial airframe business was dominated by the United States, ARINC standards also were applied equally to foreign airlines.

From the 1940s to the mid-1980s the avionics industry was dominated almost totally by two U.S. firms, Collins Avionics and Bendix Avionics, which supplied complete lines of communication and navigation equipment to virtually all the world's airlines.<sup>3</sup> Foreign avionics firms, mostly in Western Europe, addressed primarily the avionics needs of their militaries.<sup>4</sup> Other U.S. firms served niches in the commercial marketplace. Formation of the Airbus consortium in Europe led ultimately to entry of European avionics firms into the commercial market (beginning with the introduction of the A300B in 1972. By the mid-1980s, European avionics firms began to make their first advances into the U.S. commercial avionics market. These attempts were, however, met with limited success.

### EVOLUTION OF THE AVIONICS TECHNOLOGY

Technological advances in commercial aviation from the late 1940s to the late 1960s focused almost exclusively on airframes (aerodynamics, structures and materials), and propulsion (the transition from propeller to jet thrust and fuel efficiency). The period from the late 1960s to the late 1970s witnessed significant developments in the avionics field. Research and development costs were high, while the size of the market remained relatively unchanged. The selling price of avionics systems multiplied. Prices were camouflaged by the significant economies brought to airlines by phenomenal advancements in airframe and propulsion technology. In addition, the pricing policies of the Civil Aeronautics Board (CAB) allowed airlines to set up airfares to recover the costs of acquiring these sophisticated systems.<sup>5</sup>

The period from the late 1970s to the present has seen the introduction of a truly astounding level of avionics technology. Flight management systems contain entire flight plans in software, along with airplane configuration and performance databases. Flight plan progress and information is displayed graphically and in real-time on CRT (Cathode Ray Tube) and LCD (Liquid Crystal Display) display systems. Primary flight instrument display systems integrate numerous flight and air data instrument indications on a single display. Distance measuring equipment (DMEs), which previously displayed a simple

slant-range to a selected ground station, now can scan multiple stations, select optimum stations on the basis of positional geometry and signal quality, and supply the resultant data to the flight management system for navigational support.

Weather radar systems, which in the past only displayed areas of detectable precipitation, now can announce several levels of precipitation (digitally calibrated to more than 300 NM), display turbulence in precipitation and automatically eliminate ground clutter from the display. Windshear detection systems announce the presence of low-level atmospheric windshear. Autopilot systems routinely perform fully automatic climb, enroute, descent, landing and rollout operations. Collision avoidance systems display surrounding aircraft, calculate, predict and announce conflicting flight paths. Satellite-based communication and navigation systems provide worldwide data link and telephone quality voice contact, and highly accurate four-dimensional position data. On-board maintenance computer systems continually diagnose the condition of networked avionics, identify faults and downlink maintenance requirements to the destination station.<sup>6</sup>

Advances in avionics have brought significant improvements in safety to airline operations. Flight management systems have reduced pilot workload, allowing for improved alertness and concentration in handling abnormal procedures. Integrated display systems have reduced the instrument scan. New weather radar features have made it possible for flight crews to avoid precipitation-related turbulence and to interpret the radar display more accurately. Autoland systems allow airplanes to land in poor visibility with far greater accuracy and reliability than is possible with human control. Collision avoidance and windshear detection systems have successfully addressed two of the leading and most insidious hazards in aviation.

Among the most significant contributions to airline economics brought about by modern avionics is elimination of the third flightcrew member (the flight engineer. This was possible as a result of automated data acquisition and display systems such as the B767's engine indicating and crew alerting system (EICAS). Improved fuel economy also was possible due to, in conjunction with improved airframe designs, introduction of electronic engine controls (EEC) and the full authority digital engine control (FADEC) system. Working in combination with advanced aerodynamics and engine design, precise engine control made available by avionics EEC systems has resulted in substantially improved engine reliability and specific fuel consumption (SFC). As a result, some modern airplanes can move the same number of passengers over comparable flight profiles for less than half the fuel required by earlier models. Automatic maintenance downlinks have made significant improvements to airline on-time operating performance.

### AIRLINE DEREGULATION AND THE AVIONICS INDUSTRY

Over the past few decades, avionics manufacturers and airframe manufacturers have worked hand-in-hand from one airplane project to the next. Some products grew from military research and development (R&D) as technologies were declassified. When airframe manufacturers announced the cost of a new airplane, airlines simply lined up to pay the price. This was possible in a regulated environment.

Following airline deregulation in 1978, the U.S. domestic airline industry has witnessed much more drastic changes than could have been predicted by analysts. Deregulation resulted in concentration of the airline industry into a small number of large carriers operating under cost-control pressures. Smaller carriers survived only when they followed the most efficient and low-cost operating measures. In this radically new environment, airlines had to lower their costs to be competitive. This operating philosophy has been the cornerstone of many strategic decisions on reducing manpower, negotiating new labor contracts and outsourcing many functions to outside contractors. Costs associated with airplane acquisition and operations also had to be reduced. Many avionics manufacturers had to reorient their thinking from being technology-driven to market-driven. The new marketing strategy was to focus on essential avionics functions to reduce the costs to the users.<sup>7</sup>

The following example demonstrates how the new cost-cutting philosophy of airlines has affected the avionics industry. The development of satellite communications (SATCOM) systems is expected to make available to passengers such services as oceanic telephones, fax machines, computer modem hook-ups, television and others. Despite the many years spent in developing these systems, they are now being met with caution from airlines reluctant to incur their substantial cost (about \$500,000 per shipset).<sup>8</sup>

Another example is Boeing's attempt to introduce an electronic library system on the new B777 airplane. The system would provide hyper-linked graphical presentations of aircraft maintenance manuals, diagnostic procedures, wiring diagrams, minimum equipment lists and instrument approach charts, and memory to operate advanced graphical cabin entertainment systems as well as a host of additional features and benefits. Because of the high cost of the system (some \$1 million per shipset), it is not likely to be installed on any aircraft soon.<sup>9</sup>

Finally, the ultimate technical advance for low-visibility approach operations (enhanced or synthetic vision systems for operations at runways not certificated for Category III operations) remain completely outside airlines' budgets and financial plans. Systems of this type would make diversions virtually obsolete, while saving billions of dollars in airport infrastructure improvements. Yet, airlines have demonstrated very little interest in these systems because of their prohibitive costs.

Throughout the early 1990s, airlines pushed back deliveries of most new airplanes on order, and canceled others.<sup>10</sup> Avionics manufacturers, who often rely

on sales related directly to purchase of new airframes for as much as 80 percent of their business, have experienced serious economic downturns as a result of delayed deliveries. Airlines also have begun delaying the purchase of capital items not required for basic operations, and have set new standards for selection of aircraft equipment, including avionics. It appears that airlines will invest in avionics equipment only if it will help fly passengers more safely, faster, on time, and, at the same time, is cost-effective.

On the other hand, the cost-cutting strategies of airlines can offer some new opportunities for avionics manufacturers to provide maintenance service. Assuming an airline elects to maintain B767 avionics systems (for example, up to twenty airplanes), an additional investment of \$2 million is required for test equipment, \$3 million for a service parts inventory and additional funds are needed for training technical personnel.<sup>11</sup> Given the high reliability of modern avionics equipment expressed in mean time between failures (MTBF), it appears more advantageous for airlines to contract this service to avionics suppliers. Amortization of high capital costs associated with acquisition of test equipment and parts is poor. And, airline technicians are generally unable to maintain technical competency on units they see only rarely; so the costs of training increase while the productivity that results from good training remains low.

#### **THE CHANGING MARKET STRUCTURE OF THE AVIONICS INDUSTRY**

Just as profit-starved airlines sought shelter through a strategy of buy-outs and mergers, avionics manufacturers, who have found themselves without adequate capital to advance their product lines, have followed the same path. In 1973, the North American Rockwell conglomerate purchased the Collins Avionics Company, and became Rockwell International. Collins retained its identity as the Collins Avionics Division of Rockwell International. The acquisition at that time supplied Collins with the capital needed to enter the highly competitive airframe systems/seller furnished equipment (SFE) market.

Allied Chemical purchased Bendix in 1982 and in 1984, Allied-Bendix purchased the King Radio Company. AlliedSignal was formed as a result of a merger with Signal Corporation in 1985.<sup>12</sup> In 1992 Bendix formed a team with Dassault of France, in which Dassault offered a high gain SATCOM antenna subsystem and Bendix, not a SATCOM supplier, primarily offered domestic U.S. marketing contacts. The Bendix name officially disappeared in 1993.

Throughout the late 1980s and early 1990s, Collins, with 70 percent market share, struggled with a bleak financial outlook, due to a projected downturn in new airplane orders. Collins teamed with Ball Aerospace to provide the directional antenna, a key element in its traffic alert and collision avoidance product (TCAS). Later, Collins again teamed with Ball Aerospace to provide high-gain and low-gain antenna subsystems, and a Class A high-power amplifier for its SATCOM system.

In the 1970s, Sperry Flight Systems purchased the division of RCA that manufactured air transport weather radar systems. Honeywell purchased Sperry Flight Systems in 1986 and, in 1992, Westinghouse, looking for market opportunities and applications for its military avionics products, teamed with Honeywell to jointly offer a commercial version of the Westinghouse military weather radar system, modified to perform the predictive windshear detection function. Alliances and teaming arrangements of this type were intended to save investment dollars by combining areas of complementary expertise among manufacturers. On balance, these arrangements have not worked due primarily to a lack of control and coordination among the participants. Different program priorities have produced schedule interruptions and occasional failure to meet airline schedule requirements. Different levels of funding and commitment have often led to inconsistent after-sale support.

In the meantime, dominance of the avionics industry by U.S. firms started to lessen. The success of the Airbus consortium led inevitably to European public support for avionics system development. A consortium of European avionics firms, which previously addressed only military needs, organized to produce supplier-furnished equipment (SFE) for the Airbus line of airplanes. These firms included Thompson CSF, Sfen, EAS, and Crouzet. They merged to form Sextant Avionique and placed 50 percent of their shares with Aerospatiale. Sextant began producing buyer-furnished equipment (BFE) for the avionics markets in the mid-1980s, and is expected to increase its market share in the late 1990s. In 1993, Northwest Airlines announced a joint development program with Sextant to develop an integrated optical system for low visibility approaches. If such a program achieved even moderate success, the entire Northwest fleet would be outfitted with these advanced European avionics.

### **AN OUTLOOK OF THE AVIONICS INDUSTRY**

Reductions in military R&D budgets, combined with cost-cutting strategies of airlines will likely impact the technological development and innovations in avionics. Products may be somewhat more mundane, and new technologies will be implemented at a much slower pace. New operating systems such as the Future Air Navigation System (FANS), Communication-Navigation-Surveillance/Air Traffic Management (CNS/ATM), Automatic Dependent Surveillance-Broadcast (ADS-B), and Free Flight are not being implemented smoothly, activation estimates varying from one period to the next. Future developments in avionics technology include low-visibility approaches to replace existing instrument landing system; satellite-based area navigation (point-to-point) systems to replace existing enroute navigation facilities; and reducing oceanic lane dimensions to increase the availability of economical routings in oceanic regions, particularly the North Atlantic.<sup>13</sup> The U.S. Global Positioning System (GPS) and the Russian GLONASS satellite constellations offer broad foundations for these systems. The Global Navigation Satellite Systems (GNSS)

provide the geometry for four-dimensional navigation: position (latitude and longitude), altitude, and speed. GNSS provides extremely accurate area navigation over land or water. Airborne receivers are becoming available at prices that are kept low by aggressive competition, while multi-mode receivers (MMRs) are being installed to accommodate both gradual implementation of GPS domestically, and European-specific landing systems (MLS) simultaneously.

GNSS also is potentially accurate enough for uses in instrument approaches.<sup>14</sup> Potential accuracy refers to codes that once were available only to the military and now are being made available for commercial use, as well as "differential" geometry applications. GNSS, combined with autoland and an enhanced or synthetic vision system (e.g., multi-modal radar), could be the all-weather landing system of the future. It also would reduce or eliminate the need for extremely expensive capital investments in airport infrastructure, obviating the need to build Category III runways and higher quality ground-based radio beacon systems. Finally, GNSS accuracy can allow linking back satellite coordinates via SATCOM data to coastal air traffic control facilities, where the information can be displayed on pseudo-radar (a display system based on vector coordinates derived from GPS position). This will result in reducing oceanic lane dimensions from the current 60 nautical miles to five miles horizontally and from 2,000 feet to 1,000 feet vertically. These requirements are manifest in new standards for Required Navigation Performance (RNP) and Reduced Vertical Separation Minima (RVSM).

In the area of communications, it is expected that much routine voice traffic between air traffic control and air transport flight crews will be replaced by digital data link messages generated by ground-side and on-board airborne computers. Canned messages will be uplinked to the airplane or downlinked from the airplane in the data link service, processed on the receiving side and displayed to the recipient. It is as yet undecided whether this technology will be in the L-band or conventional VHF range.

All new technologies will have to be introduced in a cost-effective manner. No matter how critical or desirable a new capability may appear, it will not be accepted by airlines unless the price of acquiring it is justified by cost-savings. It is estimated that the investment needed to continue and complete the technology applications described above could exceed \$1 billion. Avionics manufacturers do not have the capital available, and do not expect to in the near future.

One conjecture foresees the takeover of avionics firms by airframe manufacturers, which may draw little objection from the antitrust community. Should it occur, it would constitute one of the most significant changes ever to take place in the U.S. commercial aviation industry. Freedom of choice of avionics, a long established and coveted principle among airlines, will likely disappear. More highly integrated systems may be produced by airframe manufacturers at a lower cost than today's more discrete units. ARINC standards probably will cease to exist under such an arrangement, as an airframe manufacturer will design avionics with less concern for interchangeability with a competitor's airplane.

The first sign that the industry is moving in this direction already has appeared in the form of the Boeing 777's AIMS Cabinet architecture developed by Boeing. Taking advantage of continued component-level miniaturization and circuit-level integration, the B777 avionics systems architecture is built around an avionics integrated management system: AIMS Cabinet. It contains a number of avionics functions in the form of plug-in modules; previously these were built as individual boxes. These functions include the flight management system (FMS), display generation, airline communications addressing and reporting system (ACARS—a VHF data link system), the central maintenance computer (CMC), the thrust management computer (TMC), and the data acquisition functions performed by the digital flight data acquisition unit (DFDAU). Airlines who purchase the B777 are acquiring plug-in modules instead of discrete units as spares for these systems.

This architecture signals a dramatic change in the way avionics maintenance will be performed at the line and depot levels. It raises new questions regarding how such units are to be certified, updated and configuration-controlled. As avionics functions become less discrete and are represented more by generic modules plugged into a cabinet designed as SFE hardware, avionics will become commodity-like in the marketplace. As barriers to entry are lowered, traditional avionics suppliers may have to continue downsizing, or, as suggested earlier, may become targets for acquisition by the airframe manufacturers. This may signal the end of an industry dominated by the United States throughout the history of aviation.

### CONCLUSIONS

The aviation industry is slowly but surely changing its character. As airlines restructure, what they ask of, and how they relate to their suppliers (including avionics manufacturers) will greatly change as well. In particular, the avionics industry is facing many challenges as a result of airlines' reluctance to invest in new technologies and the possibility that airframe manufacturers will take over this industry. To survive and thrive, avionics manufacturers will need (1) a comprehensive understanding of their customers (especially their economics and underlying needs), (2) an objective capability assessment—measured against the emerging set of customer requirements, and (3) a thorough appraisal of partnerships and alliances to assess their impacts on cost and non-economic factors like quality and flexibility. A careful assessment of risk and overall strategic ramifications is also essential.<sup>15</sup>

In order to survive in the 1990s and beyond, avionics firms will have to develop innovative marketing strategies. They will need a complete understanding of how each airline customer operates (e.g., customer's priorities, desires and requirements.) AlliedSignal, for example, has developed a new custom display development system which supports fast and cost-effective design of primary (EFIS) flight displays customized to customer requirements.<sup>16</sup> Avionics firms will need to provide complete service packages to airlines, including spares leas-

ing and contract maintenance. They also can exploit the new market opportunities for technically upgraded retrofit equipment to extend the lives of older airplanes for several more years. An example is Northwest Airlines program to modernize its DC-9 fleet by retrofitting Stage III noise kits, FAA-required aging aircraft modifications, new interiors, and updated avionics systems.

Avionics manufacturers also can seek and develop meaningful strategic alliances with other U.S. and foreign firms. Manufacturers must base strategic alliances on what they bring to the market, not solely on what they bring to each participating firm. These emerging trends will change the business environment of the avionics industry from a strongly autonomous operation to one of complex interdependence.

### GLOSSARY OF ACRONYMS

AVIONICS	Aviation electronics
ARINC	Aeronautical Radio, Inc.
CRT	Cathode Ray Tube
LCD	Liquid Crystal Display
CAB	Civil Aeronautics Board
FAA	Federal Aviation Administration
DME	Distance Measuring Equipment
FMS	Flight Management System
NM	Nautical Miles
EICAS	Engine Indication and Crew Alerting System
EEC	Electronic Engine Control
FADEC	Fuel Authority Digital Engine Control
SFC	Specific Fuel Consumption
R&D	Research and Development
IFR	Instrument Flight Rules
SATCOM	Satellite Communications
MTBF	Mean Time Between Failure
SFE	Seller Furnished Equipment
TCAS	Traffic Alert and Collision Avoidance System
ACARS	ARINC Communications Addressing and Reporting System
DFDAMU	Digital Flight Data Acquisition and Management Unit
BFE	Buyer Furnished Equipment
GPS	Global Positioning System (U.S.)
GLONASS	Global Navigation Satellite System (Russian)
GNSS	Global Navigation Satellite System (Generic)
AIMS	Avionics Integrated Management System
CMC	Central Maintenance Computer
TMC	Thrust Management Computer
DFDAU	Digital Flight Data Acquisition Unit
EFIS	Electronic Flight Instrument System

### ENDNOTES

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## Book Review

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Kern, T. (1997). *Redefining Airmanship*. New York: McGraw-Hill. 463 pages. ISBN 0-07-034284-9. U.S.\$29.95, hardcover.

Reviewed by Frederick Hansen, University of Nebraska at Omaha

*Redefining Airmanship* by Tony Kern is written by an aviator for aviators—whether they have just soloed for the first time or they are senior captains flying for a major airline. Don't be mistaken. It is not just another how-to-fly book. It is a serious work supported by numerous case studies. The author's stated purpose is to challenge all pilots to undertake a lifetime of learning by constantly striving for personal and professional improvement in their airmanship skills. As with other authors who have attempted to write about airmanship, Dr. Kern relies on both personal experience and the experiences of others. Much of this information is a result of lessons learned from accident reports and from the stories of those lucky enough to walk away from an accident or close call. The strength of this book lies in the advice and recommendations for self improvement that are equally pertinent to the novice private pilot, the military fighter pilot, and the seasoned commercial pilot.

Why is it necessary to write such a book about airmanship? After all, no pilot deliberately climbs into an airplane with the express intent of crashing. The answer lies in the wealth of case studies provided in this book. Failures in good airmanship all too often lead to tragedy and unnecessary deaths for both the pilot in command and innocent victims. Those who fly for a living and especially those who teach new pilots have a moral obligation to not talk the talk about good airmanship but to walk the walk and provide the standards for others to emulate. Airmanship requires that every pilot personally accept the responsibility and determination to strive for perfection on every flight. The skills and professionalism we demonstrate during check rides should be our minimum standards and not the occasion for super effort.

Dr. Kern certainly has the qualifications to discuss this subject. He is an assistant professor of history at the U.S. Air Force Academy and an instructor pilot. He holds a doctorate in higher education and master's degrees in public administration and military history. Previous assignments included service as aircrew commander, instructor pilot, and flight examiner for the B-1 bomber; human factors training; and Chief of Cockpit Resource Management Plans and Programs.

*Redefining Airmanship* is divided into five main sections. The first section introduces the concept of airmanship. Most pilots I have known would have a

difficult time trying to define good airmanship. Common answers would include words such as common sense, good judgement, situational awareness, and being prepared. Whatever the definition, almost every pilot can readily identify those who demonstrate good airmanship and those who don't.

In the next three sections, the author lays out his airmanship model. This model uses an analogy of a building with a foundation, support pillars and dual capstones. Section two begins with a description of the model and expands into the specific "foundation stones of discipline, skill, and proficiency." Section three moves onto the pillars. These pillars are knowledge of self, the aircraft, the team, the environment, and risk. Section four discusses the two capstones of airmanship. These capstones are situational awareness and judgement.

The final section of the book deals with associated topics affecting airmanship. Among these topics are the role of human error in learning, techniques for teaching and evaluating, and common inhibitors to good airmanship. The book concludes with ten common principles of airmanship and a six-month planning calendar involving three hours-per-week of study and a regular schedule of flying. This plan relies predominately on self-instruction, self-assessment, and total honesty.

Each chapter of this book is designed to build on the last in the same manner that a building is erected by starting with a sound foundation and adding additional parts of the structure until reaching the capstone. Each chapter is organized around several case studies that allow the reader to reflect on the information as it pertains to their own aviation skills. Although the author is speaking from years of experience in how the Air Force operates, he presents adequate examples from general aviation and commercial aviation as well. In those instances when he is describing military procedures or military accidents, he has attempted to decipher the military language in terms that civilian pilots will understand.

The three bedrock principles that form the foundation for good airmanship are discipline, skill, and proficiency. Kern defines flight discipline as "the ability and willpower to safely employ an aircraft within operational, regulatory, organizational, and common sense guidelines—unless emergency or combat mission demands dictate otherwise" (p. 29). Violations of good flight discipline when uncorrected tend to reinforce poor decisions leading to additional violations. For pilots who serve as role models for others, poor discipline sends a very clear signal that rules only apply to the tame and inexperienced. A strong argument is made that this type of behavior, sometimes known as the rogue aviator, can only occur when that behavior is repeatedly ignored or condoned by others.

Chapter 3 presents the next two bedrock principles for a two edged sword—skill and proficiency. An introduction to this chapter, written by Chuck Yeager, makes three comments: complacency kills, knowledge of your aircraft is critical, and the best pilots constantly strive for personal improvement. This chapter was the most interesting to me because it reinforced everything I believe as a pilot myself. This is also the first book I have read that discusses the importance

of armchair flying—a technique I not only practiced but taught to my flight students. Skill is not something that is taught once and retained forever. Skill is developed over time and will deteriorate over time unless practiced.

The author presents four levels of skill for pilots. Level one is safety, for example when a new pilot first solos they have demonstrated enough skill to takeoff and land under routine conditions. The second level is effectiveness in which the pilot has demonstrated they have all the skills necessary to perform the duties of flying. For private pilots this may mean the ability to fly cross-country, obtain flight clearances, check weather conditions, and land in a crosswind. The third skill level is efficiency in which the pilot learns how to optimize the flight environment such as choosing an altitude based on a comparison of winds versus fuel consumption. The fourth skill level is reached by very few aviators. It has the goal of precision and continuous improvement. If a 100 foot altitude deviation is the accepted standard, these pilots will strive for a 50 foot deviation and then 25 feet.

The other side of the skill sword is proficiency. Pilots with fewer than 10 hours per month are at greater risk than those with more hours as are those with too many hours who may suffer from fatigue. Proficiency is also more than just hours in the logbook. Those hours must be used to hone specific skills. The author points out that studies have shown that “important safety-of-flight items such as landings, unusual attitude recoveries, and crosswind takeoffs” deteriorate quickly (p. 62). These foundations are critical to the individual pilot since the other elements of the airmanship model cannot compensate for poor skill, proficiency, or discipline.

Once the foundation has been established, the pilot is ready to progress on to the pillars of knowledge—self, aircraft, team, environment, and risk. Each pillar is covered in a separate chapter in the book. It goes without saying that it is extremely important for pilots to be physically and mentally fit before attempting to fly. The book delves into the numerous physical problems of concern to pilots. Some may only be a problem at altitude or under stress while others impact the basic ability of pilots to function effectively under any circumstances. Alcohol, drugs, medications, and any other inhibitors to the health of the pilot cannot be tolerated. The FAA provides numerous guidelines on what constitutes a physically capable pilot but only a mature pilot can make the judgment about whether to attempt a flight.

Knowing the aircraft seems like another obvious pillar to good airmanship but the author points out that it means more than just knowing emergency procedures, cross wind limitations, stall speeds, and switch locations. It also includes awareness of cockpit design problems, cautions and warnings, detailed knowledge of aircraft systems, and the maintenance history of the aircraft. The pilot needs to know this before climbing into the aircraft. Although the author presents good case studies, I am personally familiar with a case in which a pilot took off in a Navy Corsair II with his wings folded. How this happened is a separate discussion but the pilot realized his mistake after becoming airborne. No proce-

dures were published for this emergency even though there had been at least one fatal accident due to this problem prior to this incident. The pilot knew both the flight implications of folded wings in flight and that the hydraulic system should permit lowering and locking the outer wings. He was able to save the aircraft and his own life by thoroughly understanding the aircraft.

In the chapter six, the author introduces much of the latest knowledge about teamwork and crew resource management. Emphasis is placed on leadership, communication, and importantly on followership. Kern uses Kelly's model of follower behavior to discuss how this impacts on teamwork. The five types of followers are sheep, yes people, alienated followers, effective followers, and survivors (Kelly, 1988). Of this group, only the effective followers demonstrate the combination of independent critical thinking and active participation that contribute to good teamwork.

The next two chapters covers the importance of knowing the environment and risk taking. The environment includes the physical, regulatory, and organizational elements while risk taking involves the decision making process involved in deciding both what constitutes a risk and when to accept the risk. Get-home-itis is the classic example of accepting unnecessary risk. These two chapters seemed more firmly founded in the military environment than other chapters and also more difficult to deal with from the perspective of personal improvement. Risk taking in particular is a very insidious problem for pilots because it leaves little room for unexpected changes. Changes in forecast weather, enroute winds, fuel consumption, or emergencies can turn a previously acceptable risk into a very bad risk. Risk taking is always a gamble that the mission requires the risk and that the risk was properly evaluated and prepared for.

The capstones to Kern's model of airmanship are situational awareness and judgement. The second most important chapter I found in this book was on situational awareness (SA). Even the most professional pilot will be challenged to maintain situational awareness. If situational awareness is lost at the wrong moment, it can have disastrous results. The author presents a thorough discussion of SA including levels of SA, how to recognize it, how to recover from lost situational awareness, and keys to prevent losing SA. The only error I found in this chapter was the five keys to improving SA that turned out to present six keys.

In chapter 10, the author begins with a quote from Charles Gow. "Judgement is not the knowledge of fundamental laws; it is knowing how to apply a knowledge of them" (p. 253). Judgement errors dominate aircraft accident reports under its other common name—pilot error. Judgement is a matter of choosing alternatives which becomes increasingly difficult when the decision maker has inaccurate or incomplete information.

The book ends with chapters on obstacles to good airmanship, the key role of instructing and evaluating airmanship, and understanding pilot error. These chapters bring together the previous discussions in an attempt to recap the important issues and introduce the last chapter of the book about developing a

personal program of improvement. The six month program the author offers is well thought out and worth reading. Unfortunately, I doubt that anyone will complete the program as outlined. Some pilots already have a personal commitment to being the best pilot possible and work very hard to do those things outlined in the book. As mentioned in the book, the study plan requires time, resources, self-assessment, self-instruction, and honesty. None of these are easy for private, recreational pilots in particular. In fact, my personal experience would indicate that the only group who might be able to tackle this program would be military pilots. Even with this limitation, there are components of this program that would benefit most pilots.

*Redefining Airmanship* provides a holistic approach to the subject. It is very well written and uses case studies from general aviation, the military, and commercial world to emphasize each topic. I would suggest that this book be required reading for all flight instructors and evaluators. I also can think of no aviator, regardless of experience, who would not greatly benefit by reading the book. It is not the final definition of airmanship but a book designed to point out to every pilot the areas where improvement can be made.

### **Reference**

- Kelly, R.E. (1988). A two-dimensional model of follower behavior. *Leadership: Enhancing the Lessons of Experience*. Hughes, R., Ginnett, R., & Curphy, G. (Eds.). Homewood, IL: Irwin Press.





# Submission Guidelines

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# Book Reviews

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Books chosen for review by the *Journal of Air Transportation* will focus on areas of interest to its readership. These subjects include topics related to aviation and/or space transportation, both technical and non-technical. An article should be written in a concise and sufficiently non-technical language to be intelligible to both aeronautics generalists and to specialists in other fields.

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# Review Procedures

Book reviews should present both a summary and critical evaluation of significant investigations and provide suggestions for further inquiry. A good review will include both a subjective and an objective account of the work. Provide proof to substantiate your position.

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## Criteria

In reviewing the book, include a combination of the following elements:

- personal impression
- analysis of objective
- presentation interpretative capability
- a generalization of main statements
- subject orientation
- overall valuation

Articles accepted for publication will not undergo the standard JAT blind review process, but will be reviewed by the editorial staff for relevance and compliance with the following criteria:

- Does the book present a topic of interest to readers of JAT?
- Does the review portray a clear idea of the contents of the book?
- Does the review depict a fair and accurate presentation of the book?
- Does the review maintain a balance between content and critique?
- Does the submission fit within the specified format and length requirement?

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## Format

All review articles must be submitted in electronic format on an IBM formatted 3.5 diskette and must be in a standard word-processing format such as WordPerfect or Microsoft Word.

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## Author Description

Reviews should include a brief description of the author's institutional affiliation, highest degree earned, and areas of research/teaching interest.

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## Bibliographic Citation

Every review article should begin by citing the book(s) to be reviewed with full bibliographic information including author(s), copyright date, full title, place of publication, publisher, number of pages, ISBN number, and price if available in U.S. dollars.

The following are examples of bibliographic citation:

Kern, T. (1997). Redefining airmanship. New York: Mc-Graw-Hill. Pp. xi + 463. ISBN 0- 07-034284-9. U.S. \$29.95 hard cover.

Findlay, C., Sien, C.L., & Singh, K (Eds.). (1997). Asia Pacific air transport: Challenges and policy reforms. Singapore: Institute of Southeast Asian Studies. Pp. xix + 208. ISBN 981-230-002-3. U.S. \$39.90 soft cover.

Horonjeff, R., & McKelvey, F.X. (1994). Planning and design of airports (4th Ed.). New York: McGraw-Hill. Pp. x + 829. ISBN 0-07-045345-4. U.S. \$54.95 hard cover.

Length

Review articles should be between 750-1500 words. Reviews outside these limits may be considered at the Editor's discretion. Comparative reviews of two books may be somewhat longer, but should not exceed 3000 words. Comparative reviews of more than two books are discouraged.

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Reviews written by the book's author(s), publisher, distributor, or by colleagues at the same institution or organization will not be considered. Also, duplicate reviews (previously published) will not be accepted. All authors of book reviews are required to include with their submission the following statement signed and dated. I, author's name, do not have any commercial interest in the main topic of the book under review, nor am I associated with a company or other organization with commercial interest in the main topic of the book.

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# Format

All papers must be written in the English language. Use a 12 point font and allow for a 1" margin on all sides. Double-space all material including quotations, the abstract, notes, and references. All figures and tables should be on a separate page at the end of the text. Include the figure name and filename on the bottom of the page. Please proofread all article submissions for punctuation, spelling, and format errors.

The cover page should include the title of the manuscript, the author's name(s), shipping and email addresses, telephone number, and a short biographical statement summarizing the author's education and current affiliation. Please note the primary contact person. The second page should contain an abstract of the manuscript. The abstract should include a concise description of the contents of the paper, the research method used, and the results. Abstracts should generally be kept to about 100 words.

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## Figures and Tables

Figures and tables should appear at the end of the paper with each item on a separate page. Indicate in the text the approximate location where each figure and table should be placed. Figures, tables, and the text should each be saved as separate files. Do not embed tables and figures in the text files. Include the appropriate file name at the bottom of the page for each figure and table. Figures and tables must be camera-ready, printed in black ink only and must fit within a 4 inch by 7 inch area.

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## Reference Style

Due to the international participation, rigid referencing style criteria are not mandated. Acceptable reference styles of the author's country will apply. For the U.S.A., the most recent edition of the American Psychological Association (APA) Manual of Style is preferred. Ensure all references are cited and all citations are referenced.

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## Review Process

A rigorous double-blind review will be conducted by the *JAT* Panel of Reviewers. Additionally, a member of the Editorial board will conduct a third review. If revisions are necessary, the editor will determine when a revised manuscript is in compliance with reviewer recommendations. Authors must make revisions to original documents and resubmit them to *JAT* on disk in Word or Word Perfect format. All revisions must be completed within two weeks after return to the author. Manuscripts must be original, not previously published, nor under consideration for another journal while undergoing review by the *JAT*.

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