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Will Very Light Jets Replace King Air Turboprops for Business Travel?

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WILL VERY LIGHT JETS REPLACE KING AIR TURBOPROPS FOR BUSINESS
TRAVEL?

by

Vince Jean-Paul Pujalte

A Graduate Capstone Project
Submitted to the Extended Campus
In Partial Fulfillment of the Requirements of the Degree of
Master of Aeronautical Science

Embry-Riddle Aeronautical University
Extended Campus
Tucson Center
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This Graduate Capstone Project
was prepared under the direction of the candidate's Project Review Committee Member,
Mr. Nolan Davidson, Adjunct Assistant Professor, Extended Campus,
and the candidate's Project Review Committee Chair,
Dr. Mary Lou Collins, Associate Professor, Extended Campus, and has been
approved by the Project Review Committee. It was submitted
to the Extended Campus in partial fulfillment of
the requirements for the degree of
Master of Aeronautical Science.

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ABSTRACT

Researcher: Vince Jean-Paul Pujalte

Title: Will Very Light Jets Replace King Air Turboprops For Business Travel?

Institution: Embry-Riddle Aeronautical University

Degree: Master of Aeronautical Science

Year: 2010

The purpose of this research was to determine if Very Light Jets (VLJs) such as the Eclipse 500 might replace the Beechcraft King Air Turboprop as the preferred aircraft for short regional flights. There are often significant distances from the location of a given company to the nearest customer. Traveling these distances requires travel time, significant funding, and inconvenience. The research method utilized developed and distributed a survey to present owners of Beechcraft King Air Turboprops used for regional business travel. After careful analysis of the data, the researcher concluded that the present owners of King Air Turboprops were very reluctant to part with what they view as an extremely flexible business aircraft.

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CHAPTER I

INTRODUCTION

Background of the Research Problem

For small businesses, there is a long-term historic precedent establishing the difficulty of accessing timely and affordable regional air travel. Since the 1960s, the Beechcraft King Air Turboprop has filled this niche. The research instrument addressed whether or not today's business owners might be better served by investing in the use of a Very Light Jet (VLJ), part of a new generation of aircraft incorporating disruptive technologies that may offer faster and less expensive regional business Air Travel options.

Researcher's Work Setting and Role

The researcher is a long-time student of aviation and flight. Beginning in 1980, he served in the United States Army as a Helicopter Turbine Engine Technician. During his training for this role, he finished at the top of his class. His further education and practice in Aviation has been conducted both as a Federal Aviation Administration (FAA) Certificated Private Pilot and as an FAA Certificated Airframe and Powerplant Mechanic. He is also an FAA Certificated Advanced Ground Instructor. He has worked for the last five plus years as an Unmanned Aircraft Systems (UAS) Instructor Pilot, Team Lead, and Unmanned Ground School Classroom Instructor at the U.S Army National Unmanned Aircraft System Center at Ft. Huachuca, Arizona.

Statement of the Problem

Due to the development of emerging technologies such as new high-output small diameter turbo-fan engines adapted from Cruise Missile Technology and Friction-Stir Welding, a new generation of aircraft termed Very Light Jets (VLJs) was projected to

become astonishingly affordable. This represents a significant paradigm shift in lowered costs. These are truly disruptive new technologies. These are developments which prompt the statement of a research hypothesis.

Statement of the Research Hypothesis

The researcher hypothesized that Very Light Jets will replace Beechcraft King Air Turboprops for business travel.

Significance of the Problem

For companies competing in today's global economy, even a small reduction in business costs represent additional profit for the economic *bottom line*. These saved funds can be used to improve product quality, enhance employee benefits, or simply supply the funding to weather economic difficulties. Given that aircraft usage can be a major expense proportionally for companies of any size, saving scarce resources here can add up very quickly to enhance profitability. If the financial calculations make sense, any company would be wise to consider investing in a different method of air travel. Conversely, business aviation expenses can quickly spiral out of control if these company assets are not used as judiciously as possible.

Purpose

The research explored whether or not it is anticipated that VLJs will fulfill their promise of replacing King Air Turboprops for business air travel.

Assumptions

It was assumed that the availability of more economical jet travel from local airports have enticed some small businesses to abandon their present use of company-owned King Air Turboprop Aircraft. It was further assumed that business travelers have preferred to

simply take their company's VLJ or lease the services of a VLJ. The sudden availability of local airport departures with what are marketed as faster and more fuel efficient aircraft should represent significant cost savings in both productive time and financial resources for the business traveler.

Limitations

Among the limitations discovered in the researcher's research were the following:

- 1) A lack of long term historical data regarding business acceptance of the use of the new VLJs or VLJ-based Air Taxi services and,
- 2) A lack of long-term published research beyond the researcher's survey instrument.
- 3) The researcher also experienced limitations due to his personal finances and discretionary time available outside of his work and home commitments.

Delimitations

This work addresses the specific subject area of the impact of VLJs only on present owners of King Air Turboprop Aircraft for regional business travel. No further research was inferred or intended.

Definition of Terms

Friction-Stir Welding (FSW): A new type of welding that utilizes a rod or mandrel rotated at extremely high speed and pressed under high pressure to join together two pieces of overlapping metal. The friction created by the pressure and rotation of the mandrel causes the metal joint to enter a unique *plastic* state rather than the normally expected *liquid* state of traditional welding. FSW can replace the labor intensive old technology of manually drilling followed by hand riveting thousands of rivets. This reduces construction time and labor costs by over 90%

(“Friction Stir Welding at TWI”, n.d.).

Turbo-Fan: A type of turbine engine that creates thrust largely by dependence upon a mass of highly accelerated air driven by a fan that bypasses the engine core (Benson, 2008).

Very Light Jets (VLJs): A new series of small jets able to land in smaller airports and at much lower operating costs than were previously available. These jets typically weigh less than 10,000 lbs and carry four to eight people including the pilot.

CHAPTER II

REVIEW OF RELEVANT LITERATURE AND RESEARCH

Research Overview

The researcher performed research in a new and very specific area; therefore, the primary and secondary data were scarce. While a relatively small body of general research was available to him in the public sector, the majority of specific research at this point appears to be his own. This new data was generated by the researcher's survey instrument. However, this chapter does contain some general industry history and characteristics of both aircraft.

King Air Turboprops.

King Air Turboprops appeared significantly in the aviation industry in the 1960s. They became extremely popular for their reliability; consequently, not only corporation executives purchased them, but they were sought after by governments for air force capability (Air & Space Magazine Online, January, 2010).

Beechcraft Aircraft as a company generally has a sterling reputation among those who operate them. In much that same way that a Ferrari, or perhaps a Lamborghini, automobile is regarded as the pinnacle of the automotive arts, Beechcraft is held in similar high regard. From design through execution, the products of Beechcraft are touted as a step above the ordinary. The owner or prospective purchaser of a Beechcraft typically values quality, dependability, and long term value.

The Beechcraft King Air is the most popular twin-engine business turboprop aircraft ever built ("Royal refinement: a timeline of the Beechcraft King Air", n.d.). As of 2010, more than 6,000 King Airs have been sold worldwide. Users range from businesses using

them for regional business travel to U.S. branches of the military and the militaries of many foreign nations.

This aircraft was first test-flown on May 15, 1963. The initial *test-bed* was referred to as the Model 87. It was a modified Queen Air, which was a twin engine piston-powered aircraft that Beechcraft also manufactured. While the Queen Air was a good solid airframe, the two Lycoming IGSO-480 or IGSO-540 engines it was fitted with left something to be desired. This was due in large part to an earlier practice of supercharging undersized engines to gain more horsepower. This resulted in engines that were overworked and consequently ran hot. Predictably, these engines did not last as long as the aircraft owners had hoped, and the maintenance costs were far greater than they should have been. The correct approach would have been to install two more powerful engines during the aircraft's construction at the factory. Appropriately-sized engines would not have to resort to working in the overheated environment in which the -480 and -540 engines struggled and often prematurely succumbed. The -480 and -540 Lycoming engines were rated at only 320 and 360 horsepower respectively (Erickson, 2003).

The appropriate engineering approach was achieved in the PT6 turboprop re-engineing of the basic Queen Air airframe to become the King Air. This modification of the Queen Air was due to the pressing business market demand in the early 1960s for a faster twin engine business aircraft. Ideally, the new engines installed would have extremely high reliability. The engines selected for the King Air development program were Pratt and Whitney Canada's (PWC) then-new PT6A-6 turboprops rated at 650 Shaft Horsepower (SHP) each ("Royal refinement: a timeline of the Beechcraft King Air", n.d.).

This engine selection more than doubled the horsepower of the previous Lycoming IGSO-480 engine and almost doubled the output of the Lycoming ISGO-540 engine. Performance was greatly improved with these new PWC PT6 turboprop engines. PT6s are a reverse flow, free turbine engine. The reverse flow combustion path redirects the flow of air 180 degrees as it passes through the engine, which allows the engines to fit into a shorter engine housing or nacelle. The free power turbine design allows the propeller to free wheel and produces less drag should the engine fail in use. PT6s have proven to be an extremely dependable and fuel efficient engine and are today in constant use in 170 countries worldwide (“Present use of PT6s today”, n.d.).

Returning to the application of the PT6 in the King Air, in August of 1963, Beech announced that the newly named King Air would be available for delivery in the fall of the same year. This first iteration of King Air was called the Model 90. The new aircraft was not just a twin business-class turboprop aircraft, but it also offered a pressurized cabin, seating for six to eight passengers and a cruising speed of 270 Miles Per Hour. These were great benefits to business travelers. In addition to the benefits previously enumerated, the new and improved aircraft could also fly above the weather at altitudes that the Queen Air could never hope to fly above.

Further benefits included the ability to land at lower speeds than a jet, which meant that shorter runways could be used. There are many more short runways across America and the world than there are long runways. This short runway capability alone greatly expanded the utility envelope of the King Air for business users worldwide. Also, the induction of Foreign Object Debris (FOD) from a contaminated runway is a constant concern for operators of jets. FOD that can quickly and catastrophically destroy a jet

engine can range from small rocks on the runway to any small items of typical trash, not to mention the ingestion of birds. Turboprop engines typically are less vulnerable to FOD because they do not have the large, external and unfiltered air intake sections that are found on jet engines. PT6s are better designed than most turboprop engines to address these hazards. The PT6 engine air intake is guarded from easy FOD entry by its location deep in the rear of the engine nacelle.

Additionally, this shielded intake has a heavily constructed screen to arrest the ingress of any larger objects. These larger objects might include any forgotten mechanic's tools that could remain in close proximity to the intake section. One other positive attribute of the PT6 is its ability to undergo major routine maintenance like a combustor or *hot end* inspection while on-wing of the aircraft. Most other turboprop engines must be removed from the aircraft for maintenance of even a much less intensive sort. Aircraft engine removal typically takes many hours of precious time. For the busy executives who depend upon the King Air for short notice travel, that maintenance time and inconvenience is an expense best avoided.

Another advantage of the King Air lies in its fuselage design. The King Air cabin was touted by the survey respondents as a marvel of efficient and spacious design. The unique vertical *squared oval* fuselage design is said to maximize precious working space for busy executives ("Squared Oval Fuselage Design", n.d.). A typical benefit of the squared oval profile is more usable headroom, as the cabin wall rises above the typical seated occupant's head, before transitioning into the ceiling portion. The traditional round or tubular architecture of a typical jet's fuselage results in a steep curve from side wall to ceiling. This results in less usable headroom. A more cramped flying and working

environment is the end result. The flexibility of interior configuration was mentioned several times by the surveyed King Air owners. They said that the ease of reconfiguration was just one of the reasons that they prefer the King Air above all other business aircraft.

The utility of worldwide access to a much greater number of runways shorter than a jet can use was also revealed in conversations with the respondents. All of these facts serve as a logical background for the affection that business operators, past and present, have for the Beechcraft King Air series of aircraft.

Additionally, the fuel efficiency of a turboprop engine is far superior to that of the thirstier jet for relatively short regional flights. These differences favor use of the more economical Turboprop by 10% to 60 % in fuel savings, depending upon the mission profile (Babikian, 2001). This is due to the fact that jets are most efficient at cruising speeds, which are higher than turboprops cruising speeds. These higher speeds are accomplished economically only at higher altitudes than the altitudes at which turboprops typically cruise. Jets typically cruise at altitudes of 25,000 to 41,000 feet above Mean Sea Level (MSL). Jets also need to climb to these cruising altitudes as quickly as possible. This quick ascent minimizes the duration of the fuel-hungry climbing phase of flight. Once at cruise altitude, jets maximize their most fuel economical flight time enroute to their destination.

In contrast to this, turboprops are limited by design efficiencies to speeds of less than 0.7 Mach and altitudes of 25,000 feet MSL or less (Babikian, 2001).

Since it takes great volumes of precious fuel to climb to the higher jet cruising altitudes, King Air owners enjoy the fact that their turboprop aircraft perform much more efficiently by climbing to their lower cruise altitudes in less time than jets take to climb to

their higher cruising altitudes. The turboprops use less fuel to do so than the turbojets (Babikian, 2001). So, in summary, jets are a wonderful mode of travel for longer trips where their efficient high altitude flight is used to its best advantage. For shorter flights, the jets suffer by comparison.

There remains one more enticement to attract a company's interest. Because some executives prefer to fly the company aircraft themselves, it is more affordable regarding insurance costs for these executives to transition from a piston aircraft to a turboprop. Pilots transitioning from piston aircraft to a jet often find aircraft insurance costs are suddenly prohibitively expensive. This is especially true for those pilots who do not fly as a vocation, but rather as an avocation. Flying can be a very demanding, expensive, and hazardous hobby for those pilots whose primary *métier* is not the piloting of a high performance business jet.

Very Light Jets

Very Light Jets (VLJs) created a significant stir in commercial aviation in the late 1990s and 2000s. Spearheaded by Vern Raburn, a very successful entrepreneur involved with Microsoft Corporation, VLJs were believed to revolutionize regional business travel. As Raburn envisioned it, VLJs would use the extremely dependable and high fuel economy engines used in the American military's Tomahawk Cruise Missiles. These engines manufactured by Williams International were revolutionary.

In Dr. Sam Williams, Founder of Williams International, Raburn discovered a kindred spirit. Both men were innovative and driven. Both had an eye for products that were "unique and different" ("History of Williams International", n.d.). Raburn had this from his experience with Microsoft, a company which developed its own worldwide

market for a product no one knew that they needed. Likewise, Williams envisioned a world-wide market for small gas turbine engines where others saw only a continued application for conventional piston engines.

Ultimately, Sam Williams' dogged vision led to the creation of his highly fuel efficient Williams F107 turbofan. Now, an aircraft could fly much farther on less fuel than was previously possible. Williams won the coveted Collier Trophy in 1979 for its creation. This engine made possible the genesis of American military Cruise Missiles. Williams sold 6500 of the engines to the U.S. Navy and U.S. Air Force over 30 years as a result (Noland, 2005).

Vern Raburn had helped create a paradigm shift in industries which previously had not considered the use of a small computer. As Raburn saw it, another breakthrough was in the offing. Affordable jet business flight could soon be available to every company, as the skyways of the world teemed with swarms of economical VLJs. Alas, it was not to be. Vern Raburn was a victim of his own success at Microsoft. Raburn believed that he had the Midas Touch. He did, at Microsoft. It is said that the easiest way to make a small fortune in the aviation industry is to start with a large one. With no experience in the aircraft construction business, Raburn learned a long and painful lesson. The aircraft industry was a much different industry from that which he helped to pioneer at Microsoft.

Heavily advertised as the wave of the New Millennium, VLJs were projected to experience considerable cost savings both in initial purchase and on a continuing basis in business travel. These cost savings were to be realized, not only due to their much lower construction costs, secondary to the revolutionary Friction Stir Welding (FSW) techniques, but also due to more fuel efficient engines and their anticipated much higher

cruise speeds. The lower initial purchase cost was a way for many more companies to access the allure of jet travel. The companies could now join the storied jet set. VLJs were sexy.

The accountants back home could feel good about it, too. The savings in ongoing fuel costs produced less expensive flight hours. The higher speeds resulted in additional time savings over propeller aircraft traditionally used by business executives. It was projected to be a win/win situation. This translated into potentially more time each business day available to conduct business, rather than simply burning time enroute to the desired flight destination. These benefits, along with their touted lower maintenance requirements would change business travel forever. Unfortunately, it was all a projection. There were construction and supplier problems. Raburn's team suffered setback after setback. The Williams engines couldn't deliver the thrust figures that Williams promised. The cockpit avionics vendor failed to deliver on their certification dates and performance figures. These were normal events in the certification of a new aircraft. Raburn did not have the experience to expect them.

When the Eclipse 500 was finally certified and in small scale production, Raburn had spent almost one Billion American Dollars. He had to sell a significant share of his American VLJ enterprise to foreign investors in order to secure what he anticipated to be the final stretch of funding. They wanted to build the American VLJ in Russia. Raburn grudgingly agreed. He had brought the company so far. He had the Midas Touch, but it all fell apart. Ultimately, Vern Raburn was forced out of Eclipse, and his role as the Father of the VLJ was all history ("On the move: Vern Raburn", 2007).

Role of Publicity and Propaganda in VLJ Debut

Publicists of the new industry hit the tarmac hard with a blitz of information about the new sensational aircraft. However, as the recession began to cast shadows on the commercial aviation industry, several small companies either fell, declared bankruptcy, or merged with larger manufacturers. Eclipse of Albuquerque, New Mexico was one such example of the companies declaring bankruptcy. They folded in 2007.

Despite the presence on the Eclipse Board of Directors of such business luminaries as Vern Raburn and the financial backing of Bill Gates of Microsoft, timing is very important. The failing economy caught the VLJ manufacturers in a financial tsunami of worldwide proportion. This especially impacted the start-up VLJ manufacturers. Most of these failed VLJ companies had at least an interesting approach to the concept of a VLJ. Unfortunately, the downward spiraling economy claimed them as it's victims as well.

Some of these start-up VLJ casualties of the retreating economy were Safire Aircraft, Century Aerospace, and Adam Aircraft, but this is by no means an exhaustive list. Avocet Aircraft of Westport, Connecticut, hopeful manufacturers of the Projet was a typical case. Avocet Founder, Carey Wolchok, stated, "It just wasn't the right time to be going forward with the program. If I had to do it all over again, I wouldn't do it any differently" (Trautvetter, 2006). The Avocet Projet, announced to great fanfare in 2003, was to be a joint collaboration with Israel Aircraft Industries (Trautvetter, 2006).

Nevertheless, the researcher's industry contacts continued to point to interest in the smaller, less expensive aircraft as the recession of 2008 brought changes in business travel. This pilot study confirmed the researcher's hunch that executive management might be interested to make changes in commercial travel to save money, but need for

efficient, reliable, no-hassle executive travel remained. Executives continued to want workspace at 35,000 feet. Hence, the researcher continued his research.

The researcher found a group of companies to use as his target survey population from an examination of the FAA Registry Database. Each of the companies surveyed had registered one or more Beechcraft King Air Turboprop aircraft. The researcher made initial contact with each company by telephone. The survey was completed both via email and telephone. The companies typically required one additional telephone contact for completion of the sent survey instruments.

Summary

This research reflected a comprehensive overview of what is available via the Hunt Library and through the researcher's personal contact with the Travel Management departments of the companies that own or lease Beechcraft King Air aircraft.

CHAPTER III

RESEARCH METHODOLOGY

Research Design

Business travel is difficult. The genesis for this research was to consider the potential benefit to businesses of utilizing a new paradigm of business travel. VLJs are touted to provide the mystique and glamour of jet travel at a fraction of the initial investment of traditional smaller jet aircraft. Their allure has further been enhanced by the marketing promise of very high engine fuel efficiency and lower maintenance costs. That is a very seductive promise to companies that depend heavily upon their own corporate aviation departments for business travel.

Research and the distribution of survey instruments for this project was conducted on the Internet as well as via telephone. Due to the ease of access to the Internet and email, research time frames were able to be considerably shortened by employing these methods.

Initial VLJ efforts were based on false assumptions. Vern Raburn, a very successful software entrepreneur with Microsoft, pioneered Eclipse Aviation of Albuquerque, New Mexico. This was the first VLJ manufacturer to open shop in the United States. Eclipse performance and economy promises were based on Raburn's belief that the reliable and highly efficient cruise missile engines manufactured by Williams International, a subcontractor thought to be trustworthy, could be slightly scaled up to deliver more thrust with the same high fuel efficiency of their engines used in cruise missiles. This assumption has proven to be unviable, as the Williams engine later proved to be, "The little engine that couldn't" (Noland, 2005).

Since the researcher could find no existing research that had been conducted regarding the susceptibility of present business owners of Beechcraft King Air aircraft to consider investing in a VLJ Aircraft, he had to conduct original research in this area. To accomplish this goal, the researcher crafted a survey instrument which he initially distributed to the Public Relations (PR) Department of what was then Eclipse Aircraft in Albuquerque, NM. This distribution was conducted in an effort to *pre-test* the survey instrument and secure some constructive feedback. The PR Department liked the instrument as it was; however, shortly after approving the instrument, Eclipse went bankrupt. Since the researcher now had a good survey instrument, he decided to distribute it to the Travel Managers of the companies he had found who were present owners of the Beechcraft King Air aircraft. These were companies who were prospective clients of the VLJ manufacturers. The researcher's intent was to gauge these potential clients's acceptance and interest in the VLJ product's benefits.

Research Model

The research study model was created to winnow out the reasons why businesses would consider a new solution to their regional business travel challenges.

Survey Population

The population for this study was drawn from the Travel Managers of companies that owned or leased Beechcraft King Air Turboprop Aircraft. The researcher discovered these companies by examining the FAA Aircraft Registry for Beechcraft King Air Sales for the final three months of 2008. These companies were primarily, but not exclusively, located in the western United States.

Sources of Data—Demographics

The demographics of the survey pool were as follows: eight of the thirty respondents were female. This was twenty seven percent of the total respondent base. Twenty two of the thirty respondents were male. This was seventy three percent of the total respondent population. The specific levels of professional position held by the respondents were distributed as follows: Five individuals or sixteen point five percent were owners of the companies surveyed, twenty of the individuals or sixty seven percent of those surveyed served in a managerial capacity. The remaining five surveyees or sixteen point five percent of the total surveyed were on company staff.

The collected data was populated in a survey. The collected data was then validated. The survey instrument was sent to thirty Travel Managers for companies, which the FAA Aircraft Registry showed owned or leased Beechcraft King Air Turboprop aircraft.

The Data Collection Device

The data collection device employed was a twenty two question regional business travel survey. The questions incorporated fifteen Likert Scale format questions along with six Yes/No questions, one fill in the blank question, and a solicitation for additional comments. The survey outlined and addressed the research hypothesis through the individual survey questions. In the solicitation for additional comments section, the researcher provided an area for the respondents to discuss any additional issues that they felt were important but that were not otherwise addressed.

Pilot Study

Although some market research has already been conducted by the VLJ manufacturers and the National Business Aviation Association, none of it was specific to exploring

whether King Air owners would be a rich market for the incipient VLJs. It is possible that this study will be regarded as a Pilot Study. This could result in a larger funded survey to follow.

Instrument Pretest

A pretest version of the survey instrument was distributed to the Public Relations (PR) Department at the former Eclipse Aviation in an effort to gauge the validity of the data gathering device. Eclipse's PR Department returned the survey instrument to the researcher with praise for its content and structure. Eclipse felt that the survey instrument addressed the issues relevant to their prospective customer base. The researcher then submitted the approved survey to his 30 travel managers of companies, which owned King Airs.

Distribution Method

The regional business travel survey was distributed via email to the 30 companies of his survey population. The researcher first made an introductory telephone call, which established his credibility and purpose in contacting the responsible parties at each company. This initial communication was immediately followed by the emailing of the Survey Instrument to the point of contact he had established. The researcher felt that it was critical to send the survey instruments as soon as possible, both to maintain a sense of the urgency of his request and so that the contact person would remember what the survey was for. If they didn't return the completed survey within two business days, the researcher called them back and refreshed their memory of the prior conversation. The researcher then asked if they would mind taking a few minutes to complete the survey. They generally agreed to complete it right then and there over the telephone. This

avoided the possibility of having to call them again, which the researcher sincerely appreciated.

Instrument Reliability

Instrument reliability is defined by experts as “a characteristic of measurement concerned with accuracy, precision, and consistency; a necessary but not sufficient condition for validity (if the measure is not reliable, it cannot be valid” (Cooper & Schindler, 2006, p. 716).

It is believed that the research results were rendered more reliable because the responses were consistent and represented the same target population: the survey instruments were sent specifically to the Travel Managers at each company surveyed. As mentioned, a brief telephone contact preceded each emailed survey. The researcher sent out thirty surveys to the specific King Air Turboprop ownership population. Of those surveys, all were filled out and returned with help through researcher follow-up calls. These follow-up calls account for the 100% response-return rate or a very high reliability.

Instrument Validity

Instrument validity is “a characteristic of measurement concerned with the extent that a test measures what the researcher actually wishes to measure; and that differences found with a measurement tool reflect true differences among participants drawn from a population” (Cooper & Schindler, 2006, p. 720).

Survey validity is considered high because the questionnaire supplied the answer to my research question and did what it was intended to do according to the criteria for validity supplied by Cooper & Schindler. All persons surveyed were knowledgeable as to the specific travel requirements of their personnel. Of the twenty two survey questions, all were responded to. Demographic diversity is well represented in the survey, as both

male and female respondents were polled. Objectivity of the data is rationally assumed, as none of the respondents have any vested interest in the subject.

Procedures

Each survey recipient completed the short twenty-two question survey. The questions incorporated fifteen Likert Scale format questions along with six Yes/No questions, one fill in the blank type question, and one additional Solicitation for Comments. User input was simplified to the greatest degree possible. This aided in ensuring that the busy professionals polled were able to respond quickly and accurately. It was intended that a brief and uncluttered survey would significantly reduce any reluctance on the part of those surveyed to answer all of the questions.

Treatment of Data

The results of the thirty company surveys were combined, grouped, and averaged according to the number of scheduled annual employee trips for each company. Complete analysis of each respondent's flight operations was performed and is displayed in bar graphs. This analysis included number of trips per year, average distances, number of personnel traveling, and the related professional status of the traveler. Percentages were assigned to each of these variables, based on the survey responses.

The first half of the survey defined these demographic factors. The second half of the survey addressed specific aircraft use and preferences. Evaluation was performed in the same manner as indicated above.

CHAPTER IV
RESULTS

In this section, the researcher is presenting the raw data from his questionnaires without interpretation. Below, please find each question and response for each question as presented in the questionnaire in APPENDIX B.

Table 1

Demographics of Respondent's Gender

Gender	Frequency	Percentage
Male	22	73%
Female	8	27%
Total	30	100%

The data showed that 22 persons or 73% of the total survey population of 30 were male, and eight (8) or 27% of the total survey population were female.

Table 2

Demographics of Professional Position

<u>Professional position</u>	<u>Frequency</u>	<u>Percentage</u>
Business Owners	5	17%
Management	20	67%
Staff	5	17%
Total	30	100%

The data showed that while owners represent a minor part of the total survey population at five or 17%, management represents 20 people or 67% of the population, and staff measures five or 17% of the population.

Figure 1, entitled Question #1: Number of employees in your company, showed the data relating to number of persons in the polled organization. This data is important in establishing the influence of the organization in relation to the industry and whether or not the organization is typical of the industry.

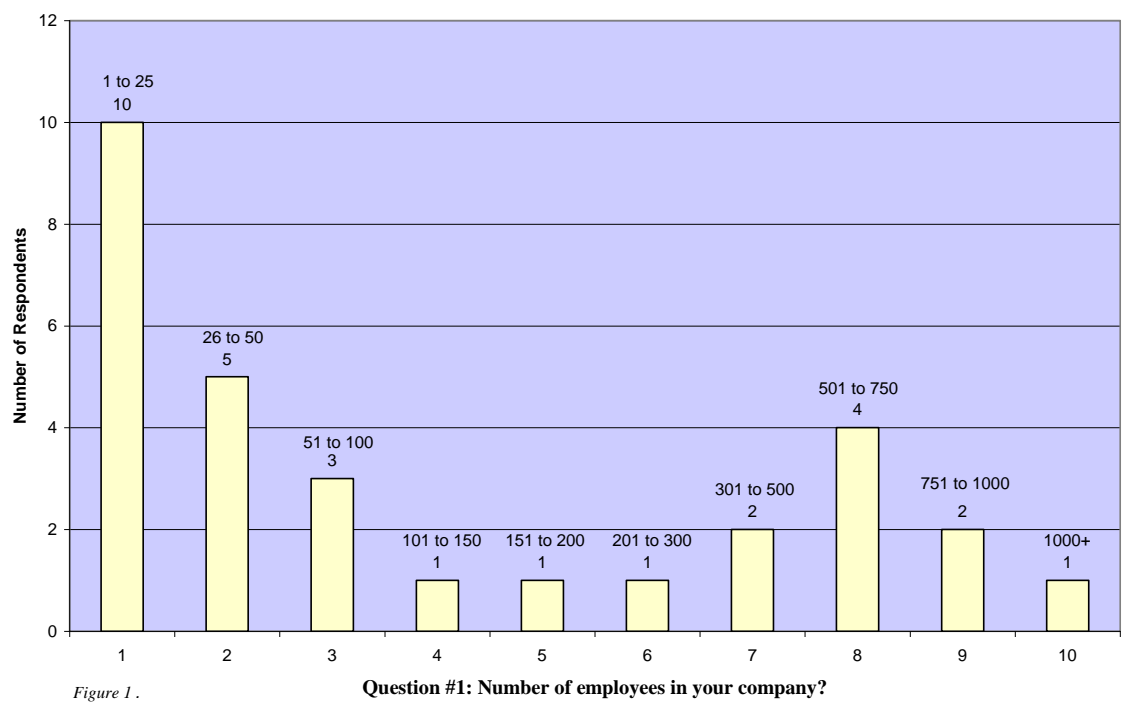


Figure 1.

The data above showed that the population represents primarily small business. However, one might conclude that the respondents represent a large variety of business sizes but would all be concerned with the same aircraft, King Air Turboprop. The companies may not necessarily represent manufacturers but the distributor or sales level medium.

Figure 2, entitled Question #2: Number of employees for which you typically manage travel itineraries, showed the number of employees per company that fly per month. A majority of the companies surveyed (23 of 30) had between one and 25 employees flying each month. Because of this, it is reasonable to conclude that, for most of these companies, their aircraft are being actively used on a regular basis by a relatively small number of employees.

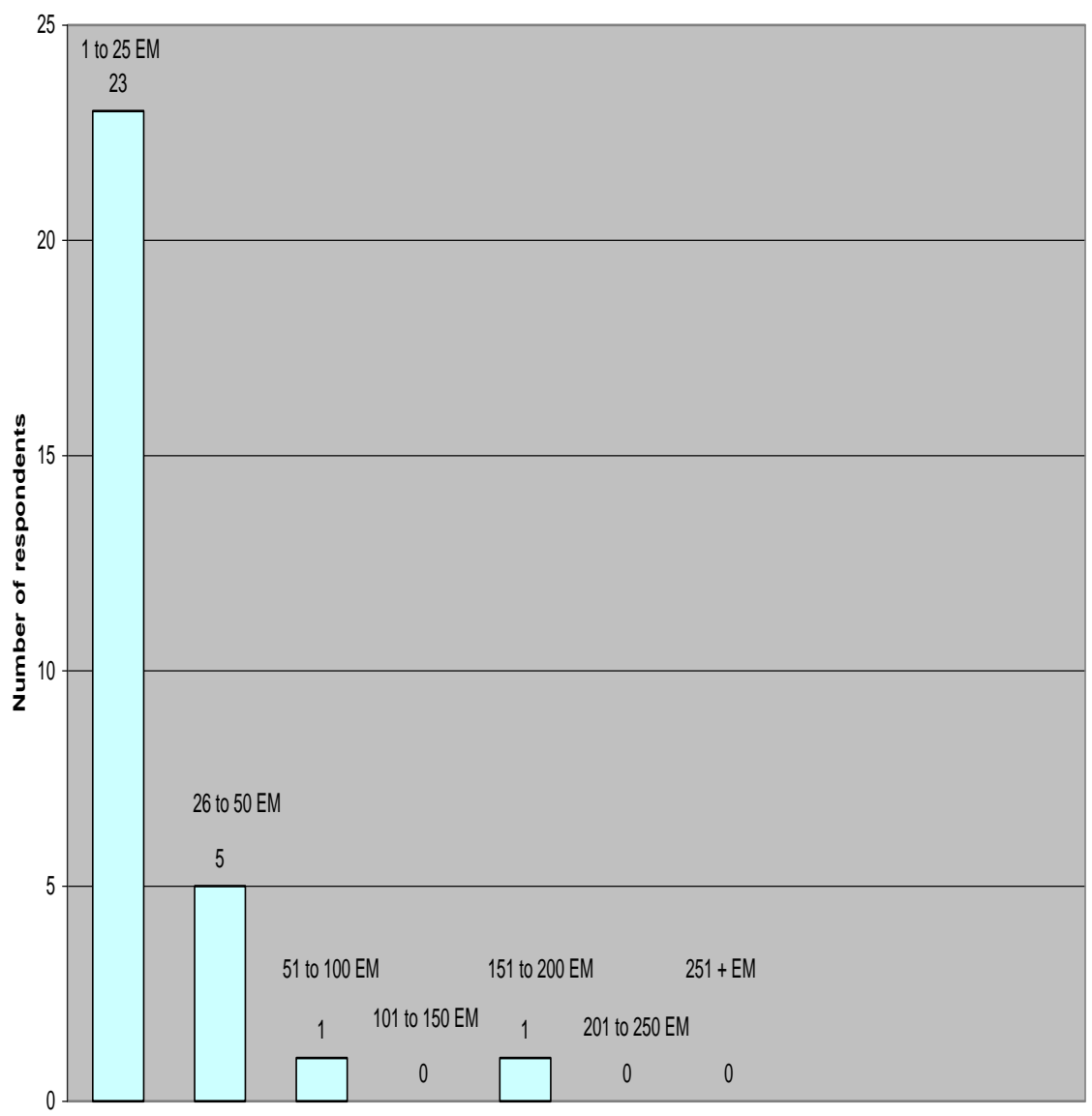


Figure 2. Question #2: Number of employees (EM) for which you typically manage travel itineraries?

Figure 3, entitled Question #3: Average number of flights planned monthly for employees, showed numeric trends of aircraft use for the surveyed companies. One can see that the usage clustered around flight frequencies of 2 to 3 flights per month for 10 out of 30 surveyees or 33.3% of the surveyed population. One can also see a second cluster of flights having a frequency of 5 to 20 flights per month for an additional 10 out of the 30 or 33.3% of the companies surveyed. This represents a total of 20 out of the 30 companies or 66.6% in the aggregate of those companies surveyed who are routinely engaging in a consistent monthly high usage pattern for their company aircraft.

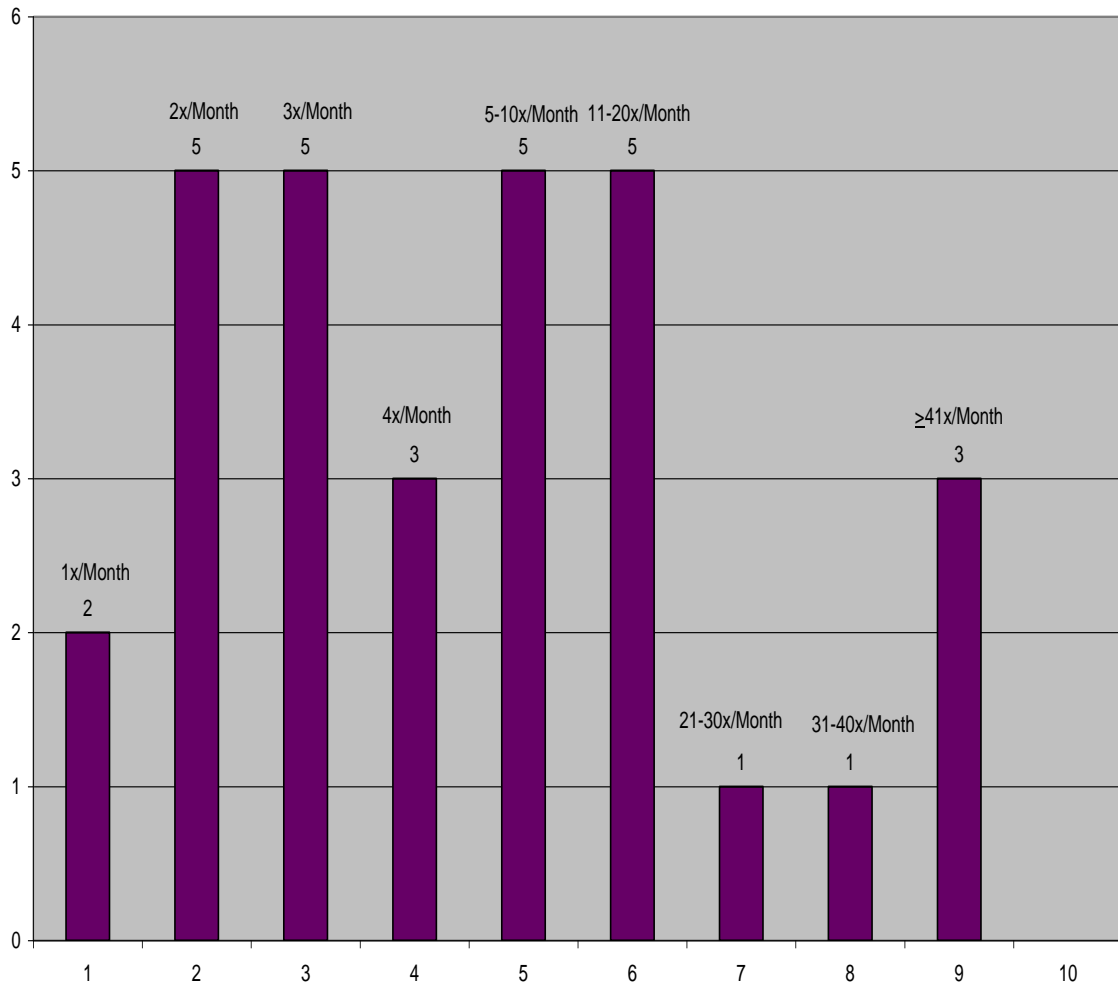


Figure 3. Question #3: Average number of flights planned monthly for employees?

Figure 4, entitled Question #4: Total number of travel itineraries planned company-wide per year, is a simple extrapolation of the monthly flight itinerary values found in Figure 3. One can simply multiply the monthly values in Figure 3 by the twelve months in a year to yield the sums for this figure. Over the course of a year, many flights are seen being conducted by these firms.

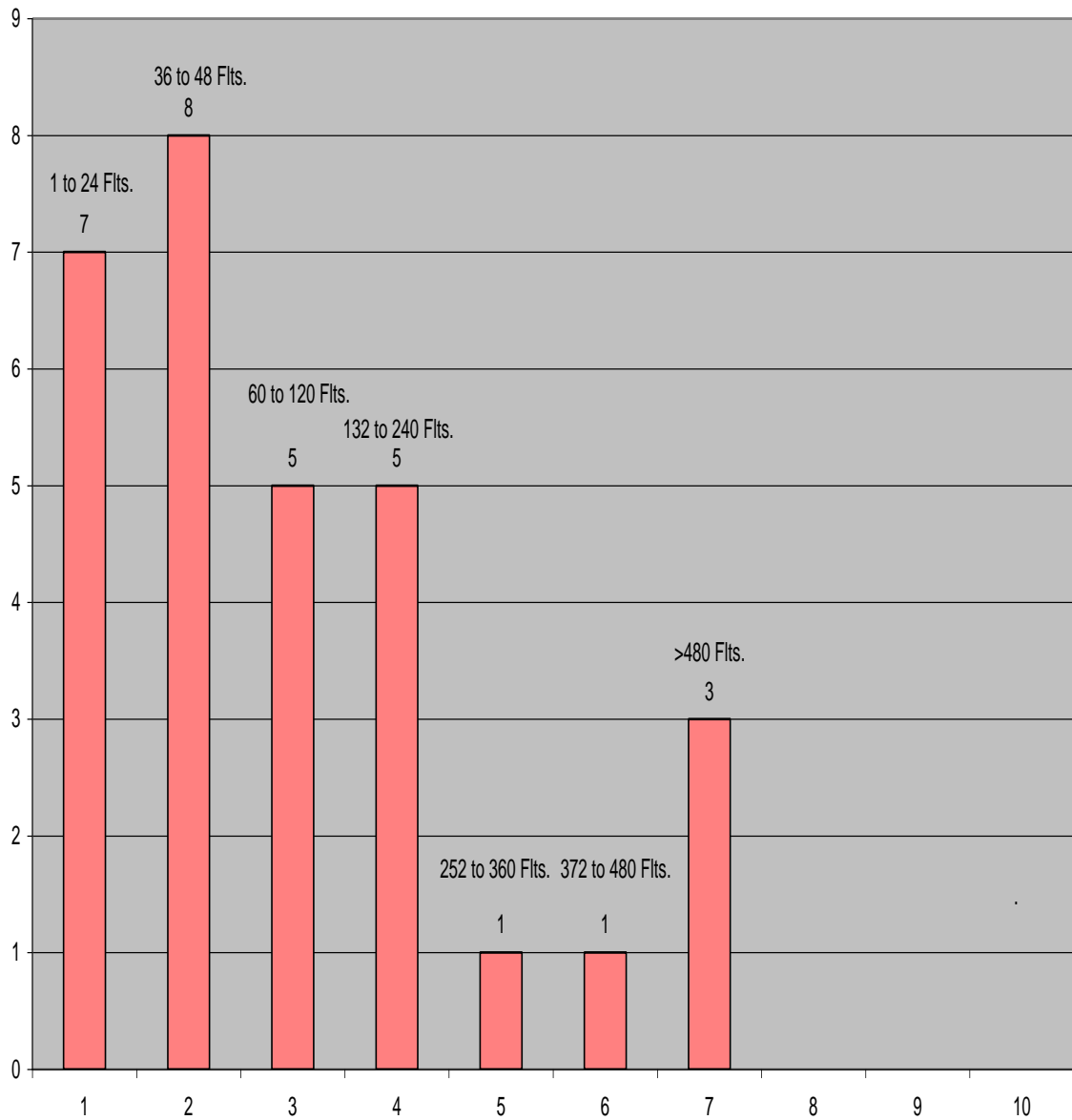


Figure 4. Question #4 Total number of travel itineraries planned company-wide per year?

Figure 5, entitled Question #5: Percentage of yearly itineraries when two or more employees travel together using the same itinerary, showed the financial economies to be leveraged by having two or more company employees' travel together. Since the interiors of the King Air can be configured to hold more than ten people, this is a productive exploitation of the aircraft. Here one can see that 17 out of our 30 surveyed companies or 56.7 % of our surveyed company populations realized the benefits of this simple but profoundly effective practice more than half of the time that their company aircraft are in use.

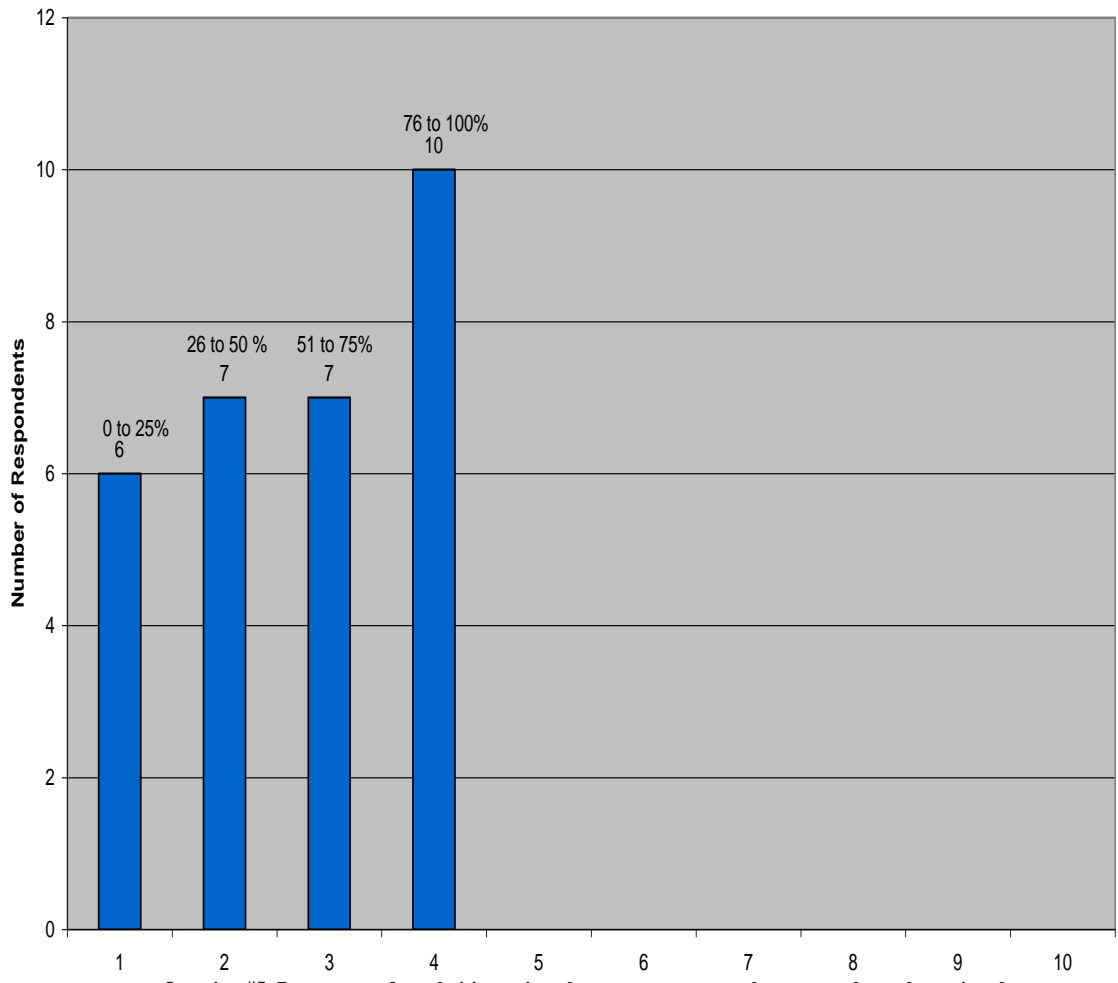


Figure 5. Question #5: Percentage of yearly itineraries when two or more employees travel together using the same itinerary?

Question #6 has several different employee levels of responses; consequently, there are four corresponding charts, presented as *Figure 6 for V*, *Figure 7 for K*, *Figure 8 for D*, and *Figure 10 for D (other mode of travel)*. [See APPENDIX B for questionnaire.]

Figure 6, entitled Question #6: Number of employees who typically travel via VLJ, clearly showed that VLJ flight is not a common activity for any of the 30 companies surveyed. Not one of our 30 surveyees responded that their companies travel via VLJs on a typical basis at all. This may be due to a variety of factors. One can explore the reasons for this in greater depth in the later figures of this survey.

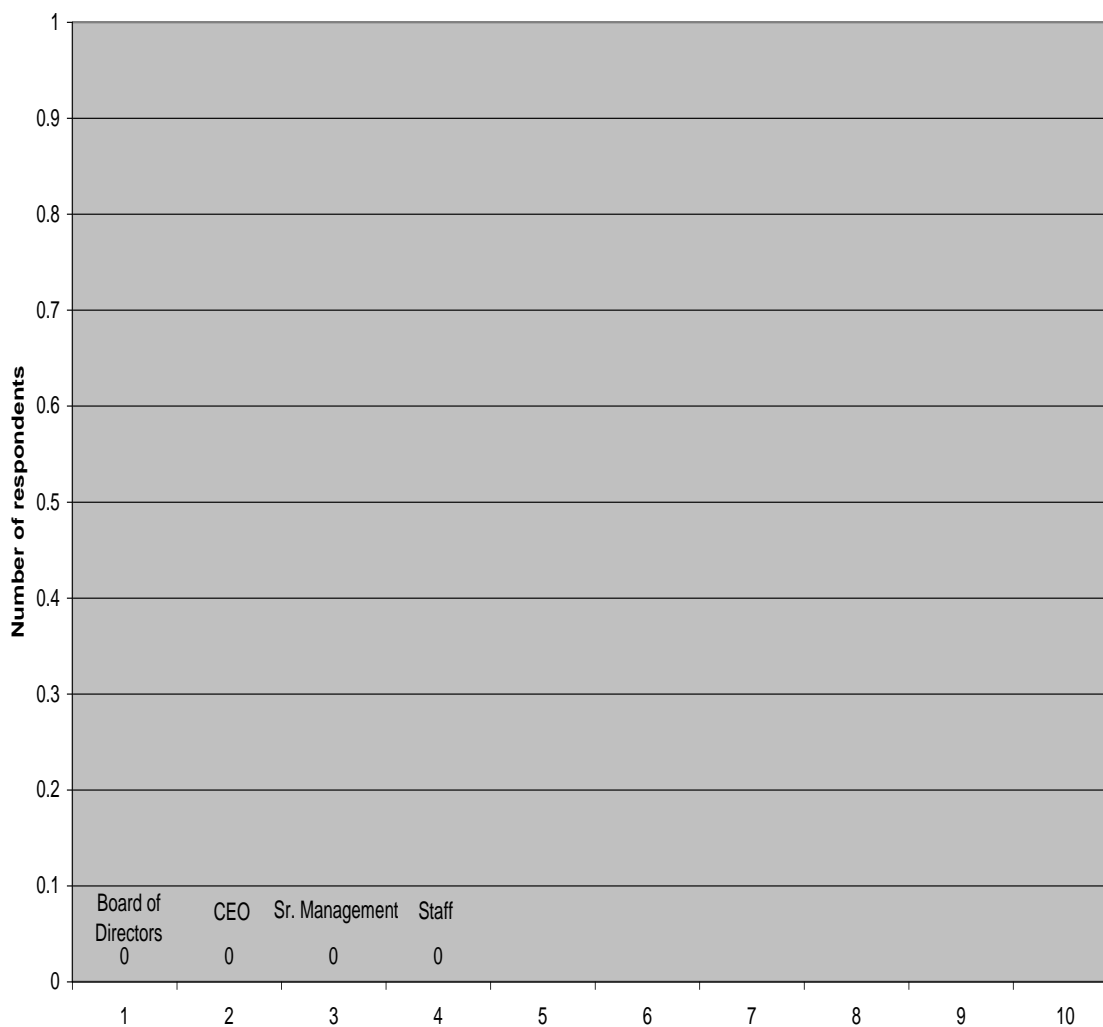


Figure 6.

Question #6: Number of employees who typically travel via VLJ?

Figure 7, entitled Question #6: Number of employees who typically travel via King Air, showed that the Chief Executive Officer (CEO) of a company is the most frequent user of the company King Air(s). Twenty of the 30 companies surveyed, a full 66.6 % of the respondent base stated that the CEO was the most likely passenger of their company's King Air. Members of the Board of Directors (BOD) and company Staff are represented equally in second place, with both categories represented at seven out of 30 or 23.3% each, 46.6% in the aggregate.

Somewhat surprisingly, the total number of Senior Managers who flew on the company King Air were ranked in third place. These Senior Management employees only flew routinely for 6 of the 30 companies surveyed, for an average of only 20% of the total of company King Air usage.

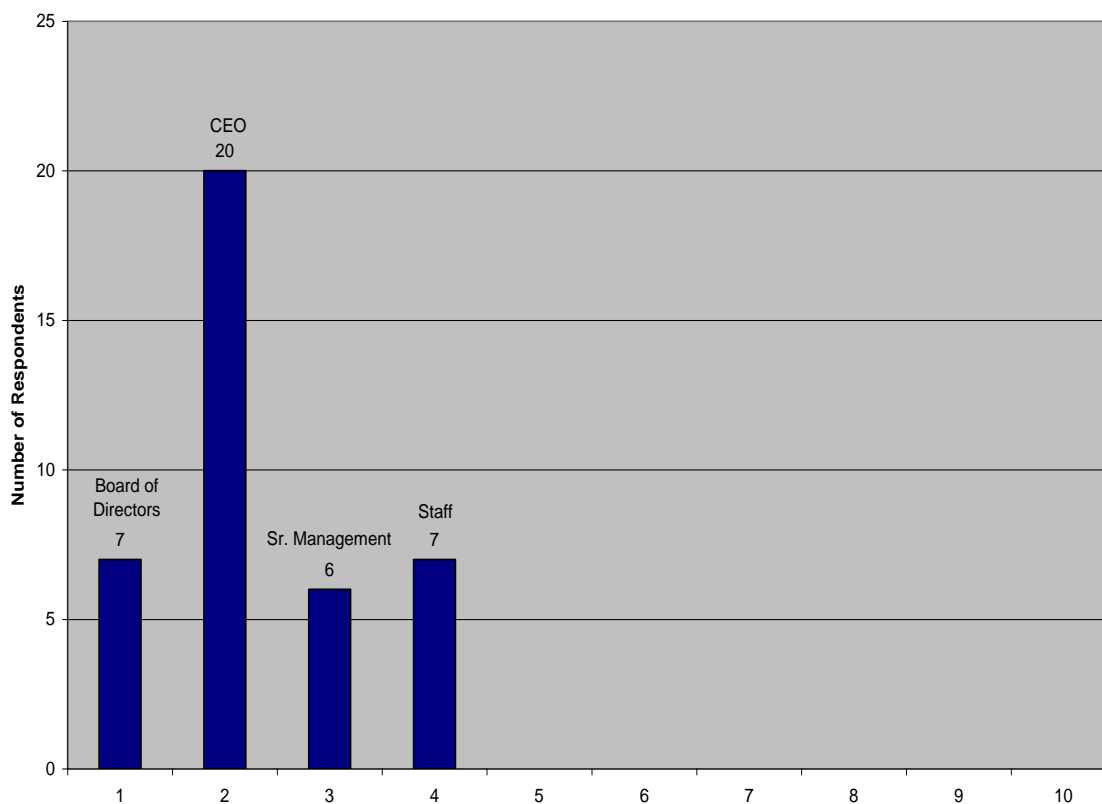


Figure 7.

Question #6: Number of employees who typically travel via King Air?

Figure 8, entitled Question #6: Number of employees who typically travel via commercial airliner, showed that most of the employees who fly by commercial airliner are company Staff. Six out of the 30 surveyees or 20% responded that their staffs fly commercially for business. Company CEOs and Senior Management both flew an equal percentage at 3 out of 30 or 10% of the companies surveyed, and only 2 out of 30 or 6.6% of surveyed company Boards of Directors flew commercially on business.

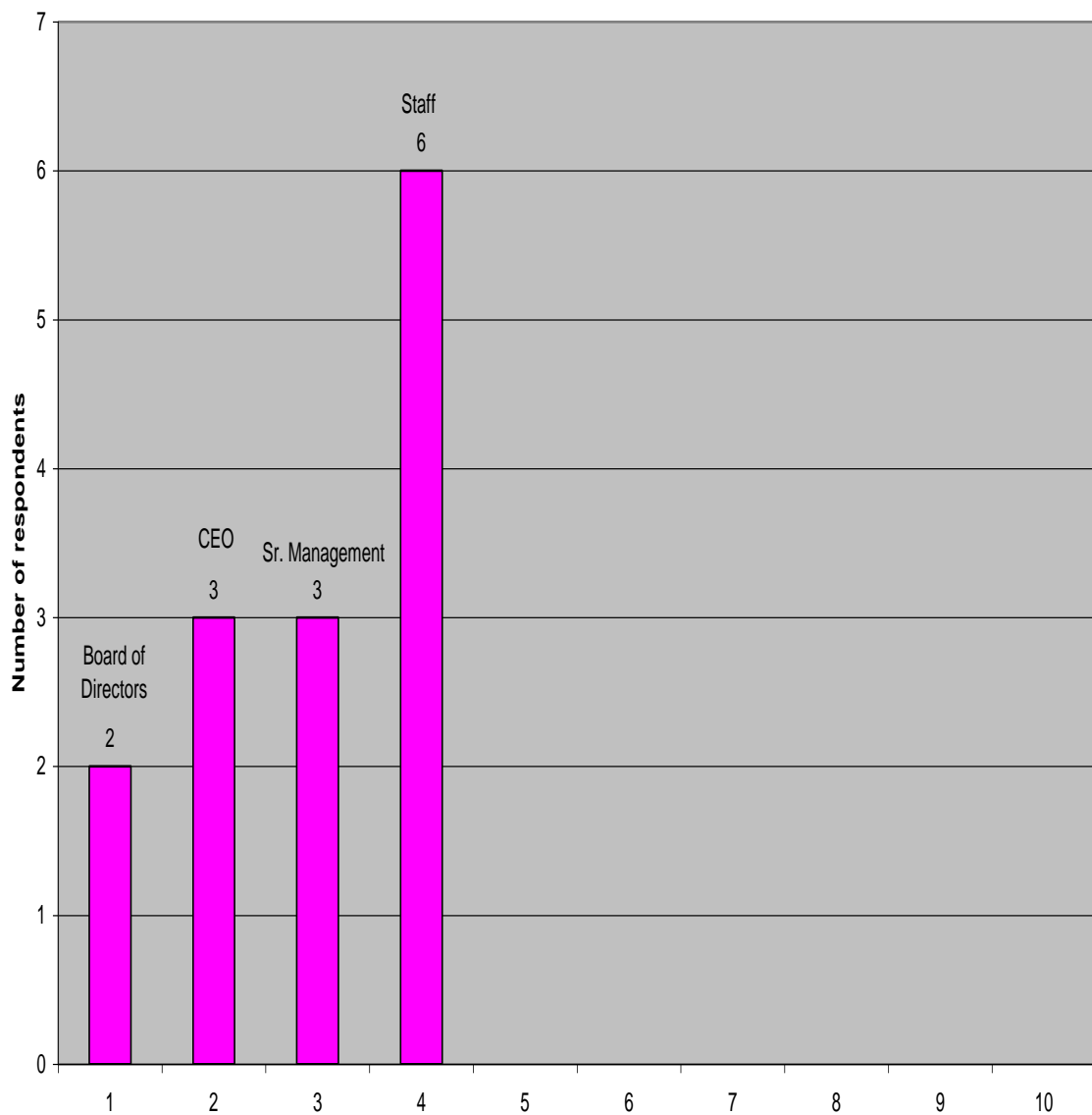


Figure 8.

Question #6: Number of employees who typically travel via commercial airliner?

Figure 9, entitled Question #6: Category of employees who typically travel via personal car, showed that only one out of our 30 companies or 3.3% had a CEO who traveled on company business via personal car. Similarly, one out of our 30 companies or 3.3% had Senior Management that would travel by personal car. An identical one out of the 30 companies or 3.3% of those surveyed had a member of Staff that would travel in a personal car for business. There were no members of Boards of Directors that traveled via personal car. [See APPENDIX B for questionnaire.]

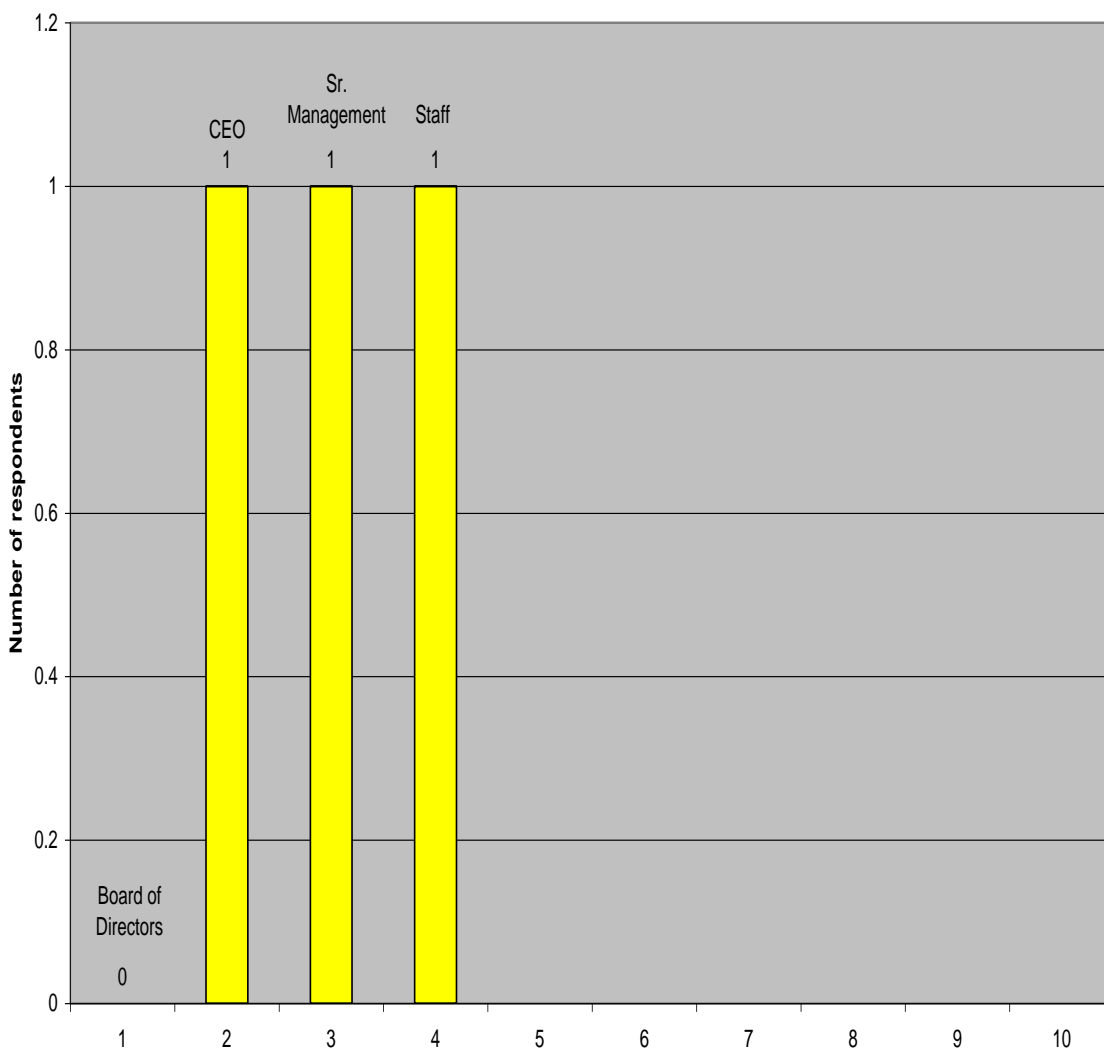


Figure 9. Question #6: Category of employees who typically travel via personal car?

Figure 10, entitled Question #7: Have you experienced a change in the number of employees for which you planned regional business travel in the last two years, revealed trends over the last two years regarding an increase or decrease of the number of company employees who travel on business for their companies. 20 out of the 30 companies surveyed or 66.6% reported no change in the number of employees who traveled on business. Six out of the 30 or 20% reported a reduction in employee business travel. Four out of the 30 companies surveyed or 13.3% reported an increase in employee business travel over the last two years.

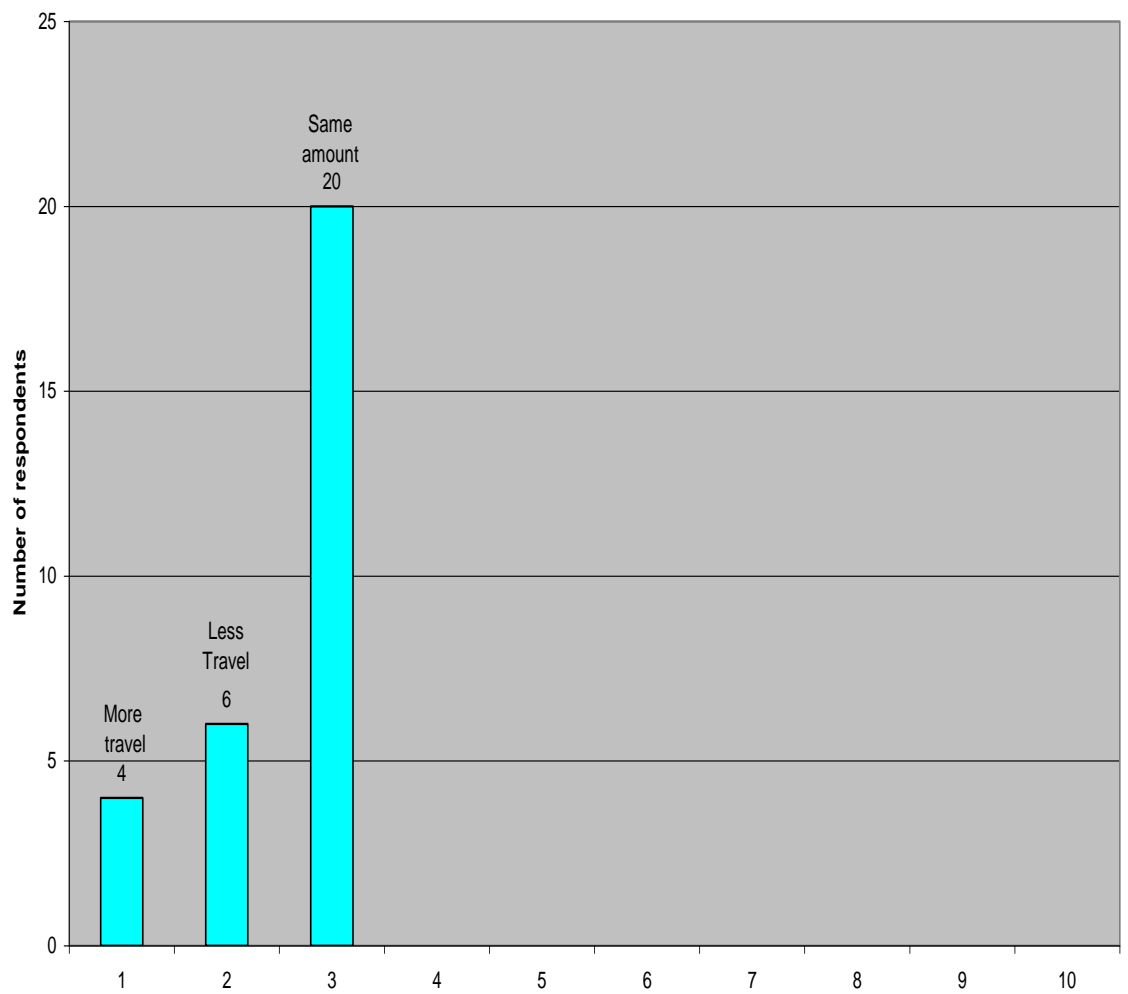


Figure 10. Question #7: Have you experienced a change in the number of employees for which you planned regional business travel in the last two years?

Figure 11, entitled Question #8: Have you experienced a change in the mileage traveled for these employees in the past two years? This figure revealed trends over the last two years in the increase or decrease of the number of miles traveled by employees on business for their companies. Twenty out of the 30 companies surveyed or 66.6% reported no change in the number of miles traveled on business. Six out of the 30 or 20% reported more miles for employee business travel. Four out of the 30 companies surveyed or 13.3% reported a decrease in employee business miles traveled over the last two years.

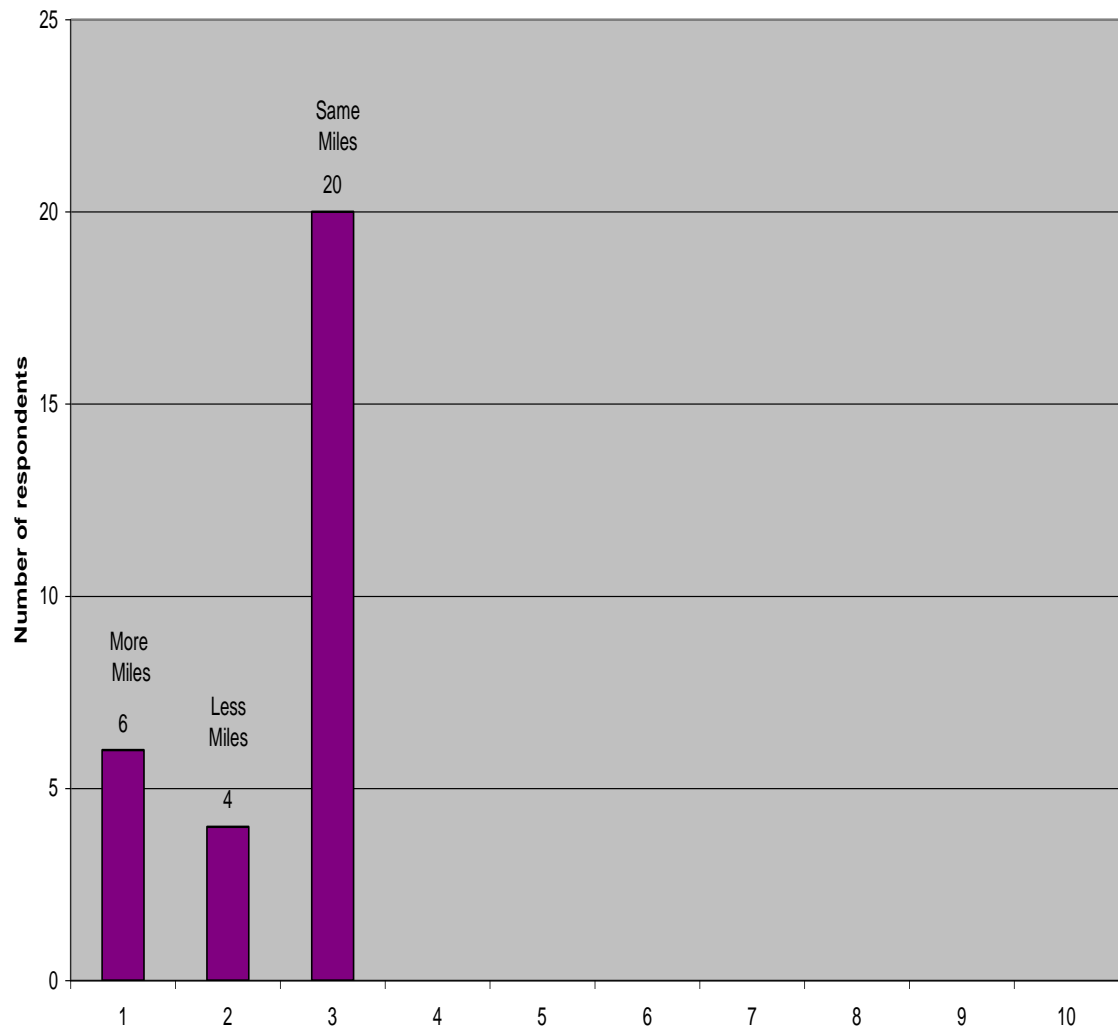


Figure 11. Question #8: Have you experienced a change in the mileage traveled for these employees in the past two years?

Figure 12 is entitled Question #9: How many weeks before the travel date are most of your company's business travel itineraries planned? This figure addressed how much planning lead time a company typically has before actually flying their company aircraft. The overwhelming majority, 19 out of our 30 companies or 63.3% had one week or less to actually plan the flight. Six out of the 30 companies or 20% had one to two weeks lead time to prepare. Four out of the 30 or 13.3% had two to three weeks advance notice. None of the 30 companies expressed a lead time of three to four weeks. Finally, one company of the 30 answered that they typically experienced a greater than four week lead time.

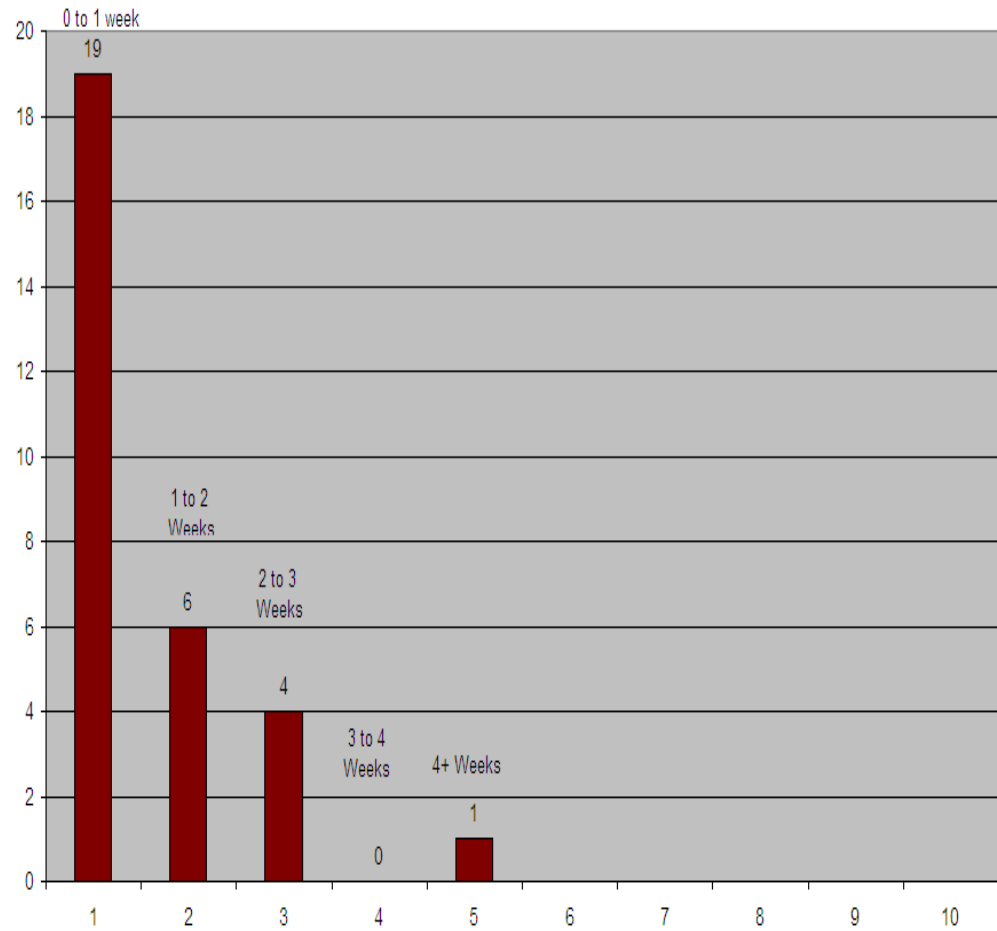


Figure 12. Question #9: How many weeks before the travel date are most of your company's business travel itineraries planned?

Figure 13 is entitled Question #10: Would your company consider tele-conferencing as an alternative to traditional business travel? This figure addressed the true utility of owning a company aircraft. Twenty-three out of our 30 or 76.6% of the surveyed companies responded that they would not consider teleconferencing. Typically, they told the researcher that their business required either having their customers see them in person or that the company employees needed to see exactly what the needs of their customers were. The remaining seven out of 30 or 23.3% of companies stated that they could potentially conduct business over the telephone and would consider doing so on a case by case basis.

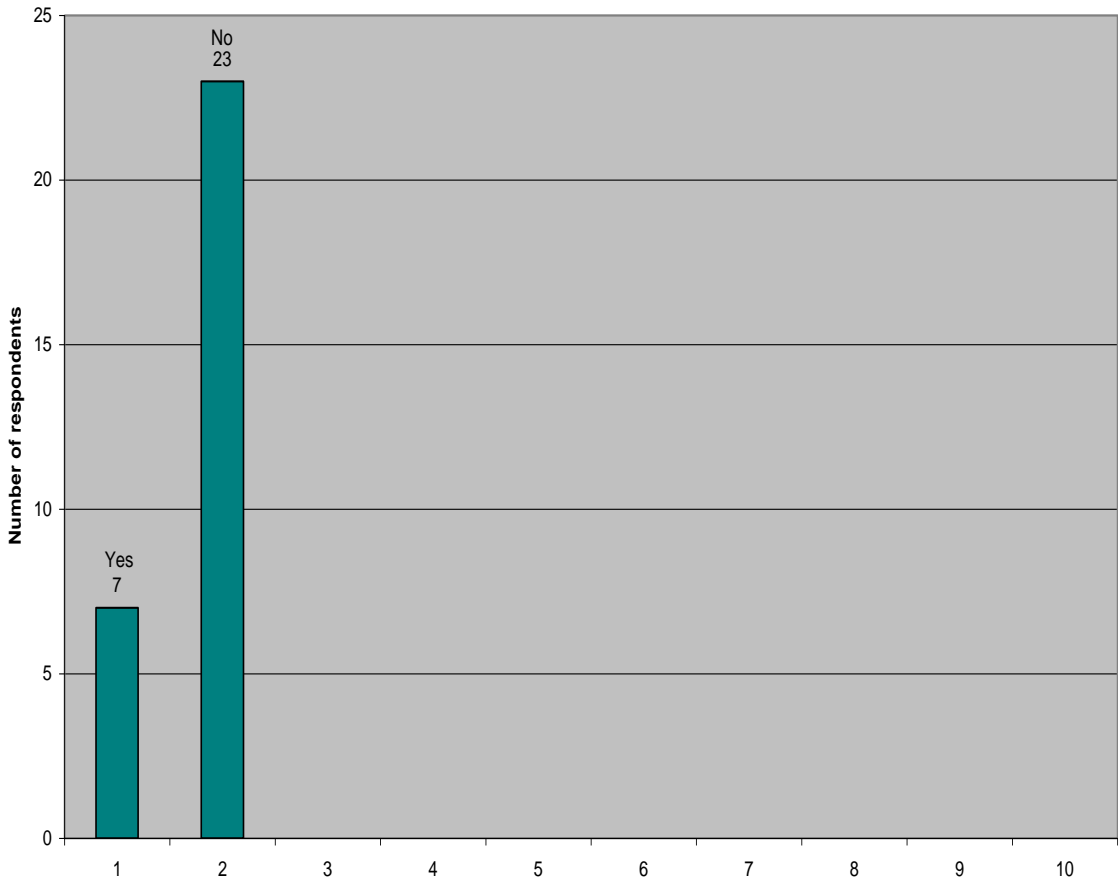


Figure 13. Question # 10: Would your company consider tele-conferencing as an alternative to traditional business travel?

Figure 14, entitled Question #11: Has your company ever chartered a business aircraft beyond your present King Air(s) for business travel purposes, showed the aircraft chartering history of the surveyed companies. Twelve of the 30 surveyed companies or 40% of the total company populations have chartered additional aircraft in the past. This left 18 out of 30 or 60% who have not historically chartered aircraft. Because what is past is prologue, this figure can have relevance in predicting the potential future aircraft chartering needs of the 30 companies surveyed.

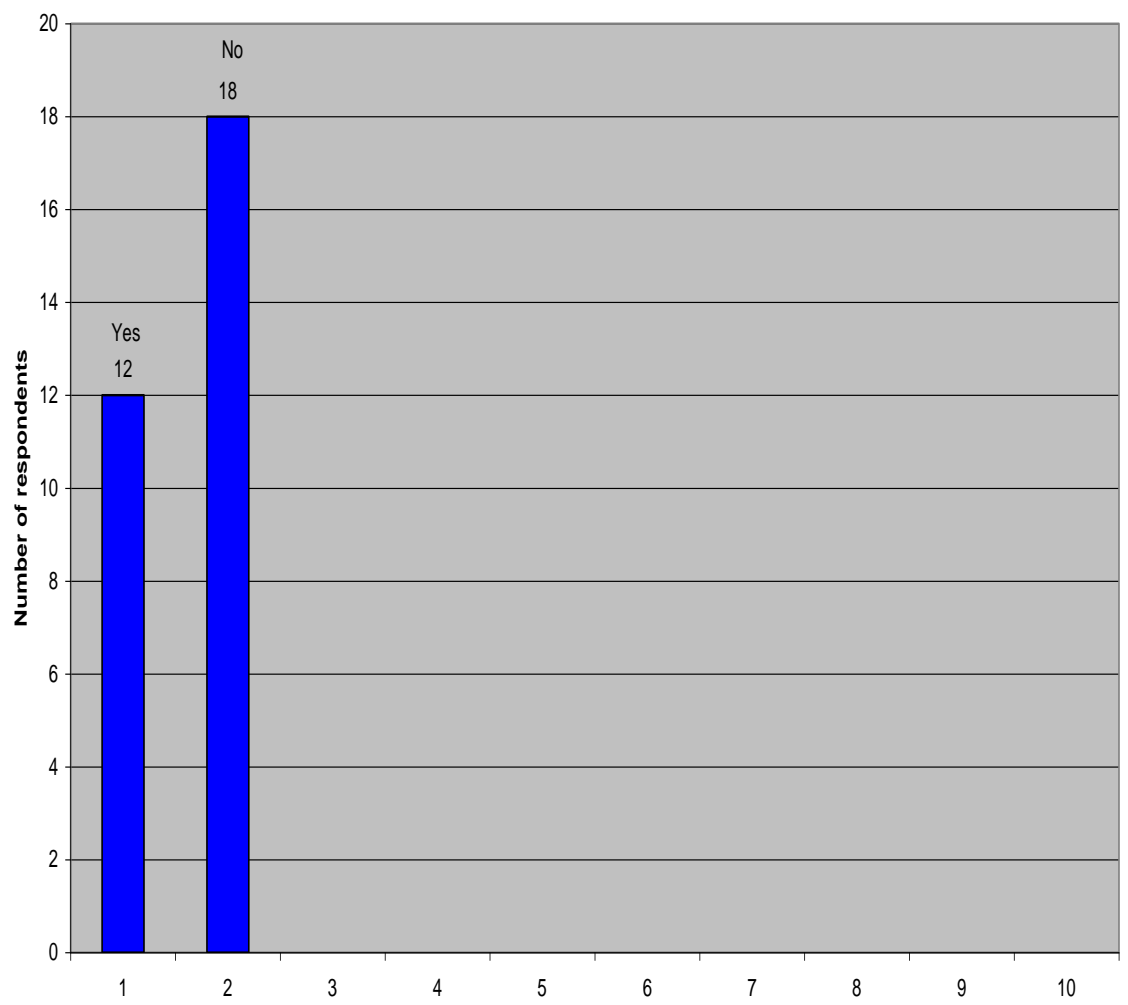


Figure 14. Question 11: Has your company ever chartered a business aircraft beyond your present King Air(s) for business travel purposes?

Figure 15, entitled Question #12: If yes to Question 11, how frequently do you charter additional business aircraft? This figure is a metric for projecting the number of potential charters that can be expected in the future among the 30 companies surveyed. In descending numeric order of charter frequency: three out of the 30 companies or 10% of the 30 companies surveyed charter additional aircraft six times per year. One company out of 30 or 3.3% of the population total chartered five times per year. None of the responding surveyees reported a frequency of four charter flights per year. Two of the 30 or 6.6% of the companies chartered three times per year, two companies or 6.6% reported chartering two times per year, two companies or 6.6% reported chartering one time per year, two companies or 6.6% reported chartering less than one time per year. This left 18 out of the 30 companies or 60% reporting that they did not historically charter additional aircraft.

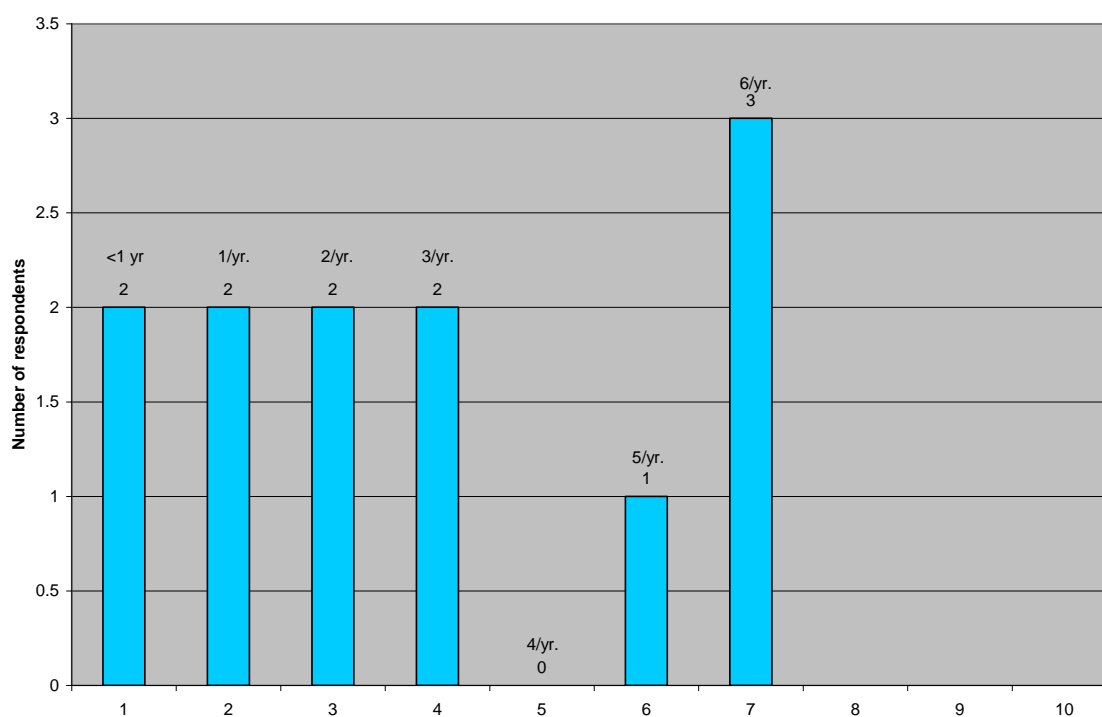


Figure 15. Question 12: If yes to question 11, how frequently do you charter additional business aircraft?

Figure 16, entitled Question #13: If applicable, what type of additional chartered aircraft does your company typically use? This figure addressed the likelihood of present King Air operators to consider using another type of aircraft on an experimental basis. If these present King Air owners are presently happy with the King Air, it is reasonable to expect that they would simply charter more King Airs to assist them with an increase in work load. Seven out of the 12 or 58.3% of King Air operators who charter additional aircraft did simply charter more King Airs.

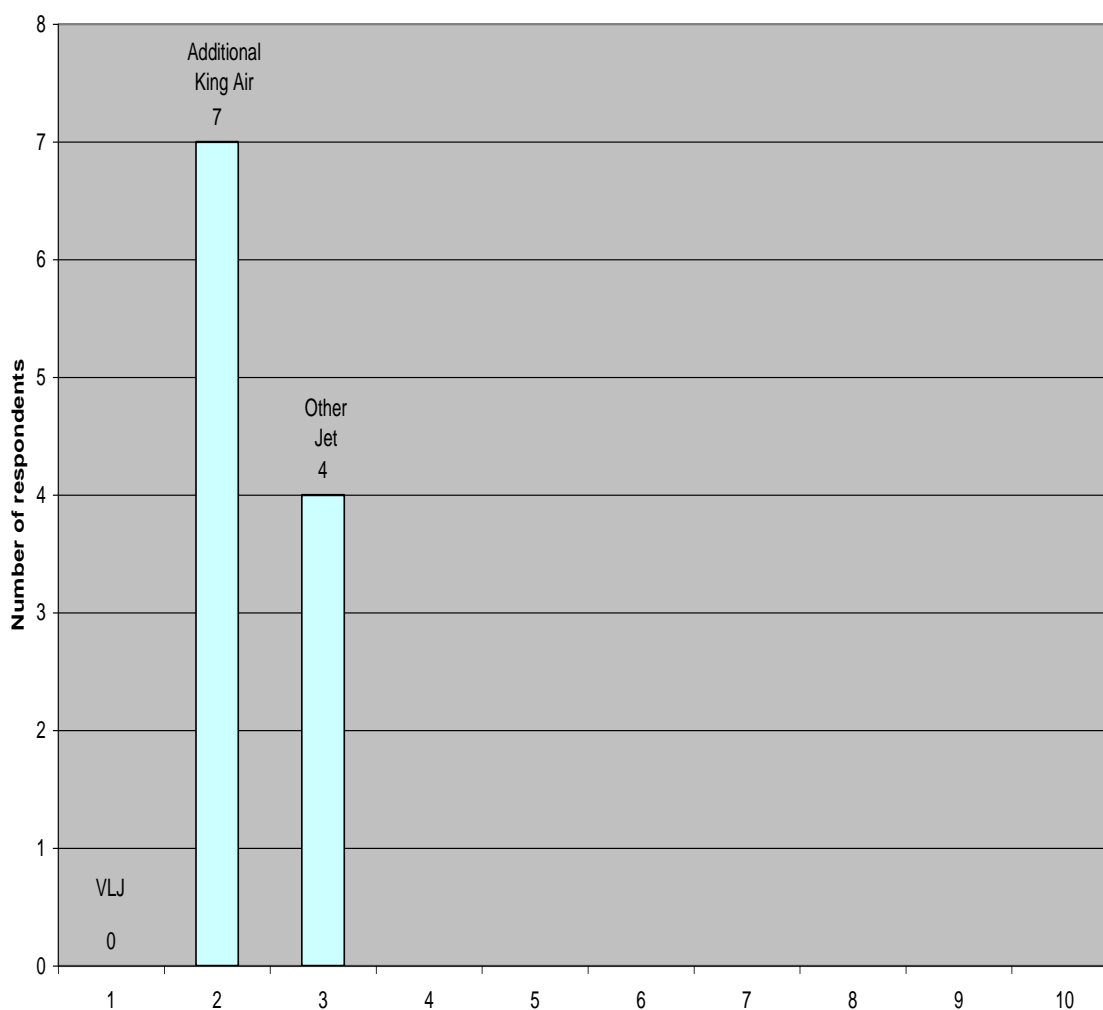


Figure 16. Question 13: If applicable, what type of additional chartered aircraft does your company typically use?

Figure 17, entitled Question #14: Has your company ever used a VLJ in the past? This would include Eclipse 500/ Citation Mustang/ Embraer Phenom 100. These aircraft typically seat four to eight people. The intent of this question was to gauge the present awareness of VLJs and the incipient VLJ market penetration. Twenty-six out of 30 or 86.6% of our surveyed population had never used a VLJ prior to completing the survey instrument.

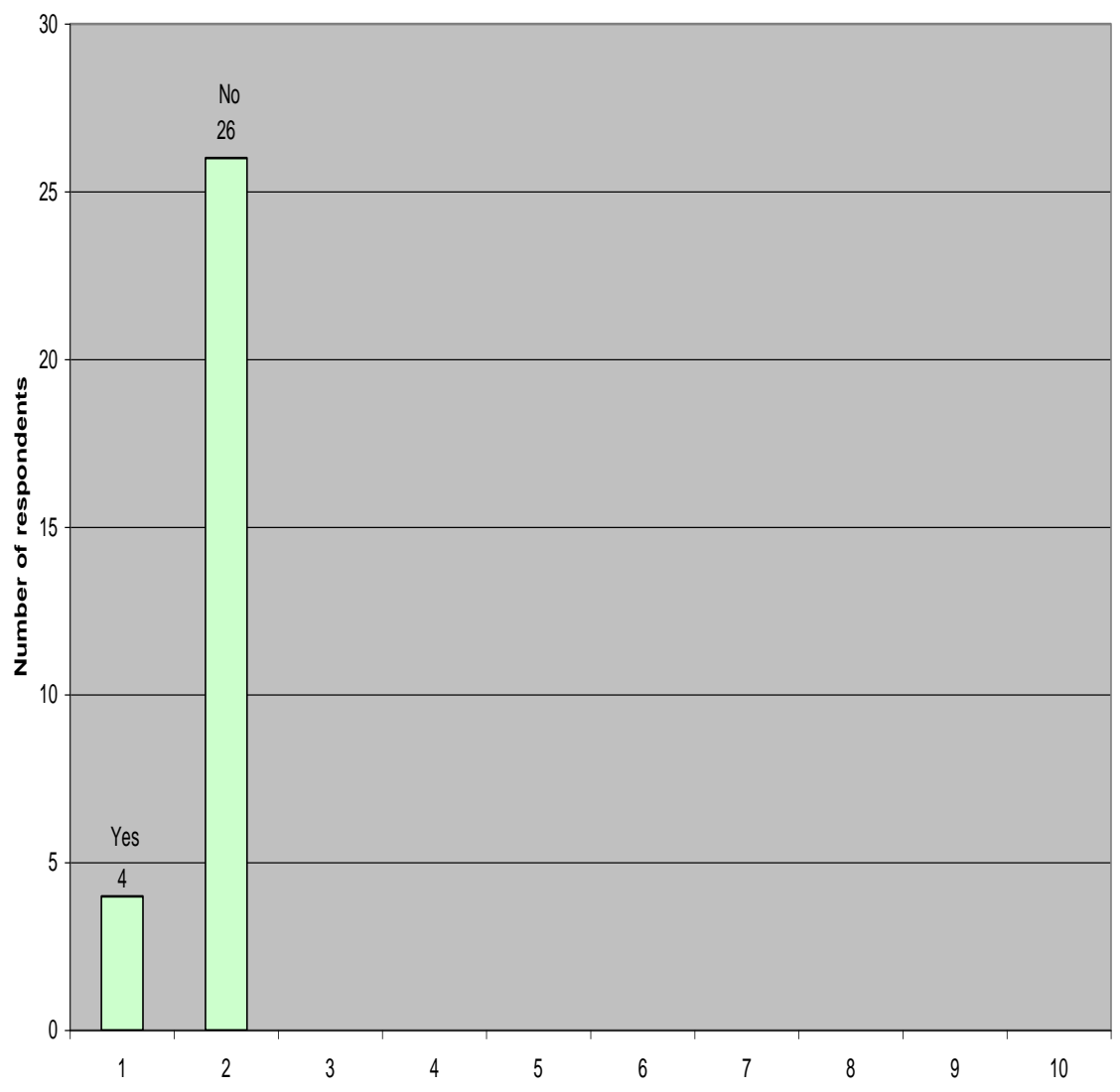


Figure 17. Question 14: Has your company ever used a Very Light Jet (VLJ) in the past? (This would include Eclipse 500/Citation Mustang/ Embraer Phenom 100. These aircraft typically seat four to eight people.)

Figure 18, entitled Question #15: If yes to question 14, how many times per year? Again, the researcher is discovering the depth of market penetration by the VLJ manufacturers. Examined in order of decreasing numerical frequency of use, one of the 30 companies or 3.3% stated that they used a VLJ 36-48 times per year. One out of the 30 companies or 3.3% reported use of a VLJ 6 times per year. One out of the 30 companies or 3.3% reported use of a VLJ two times per year.

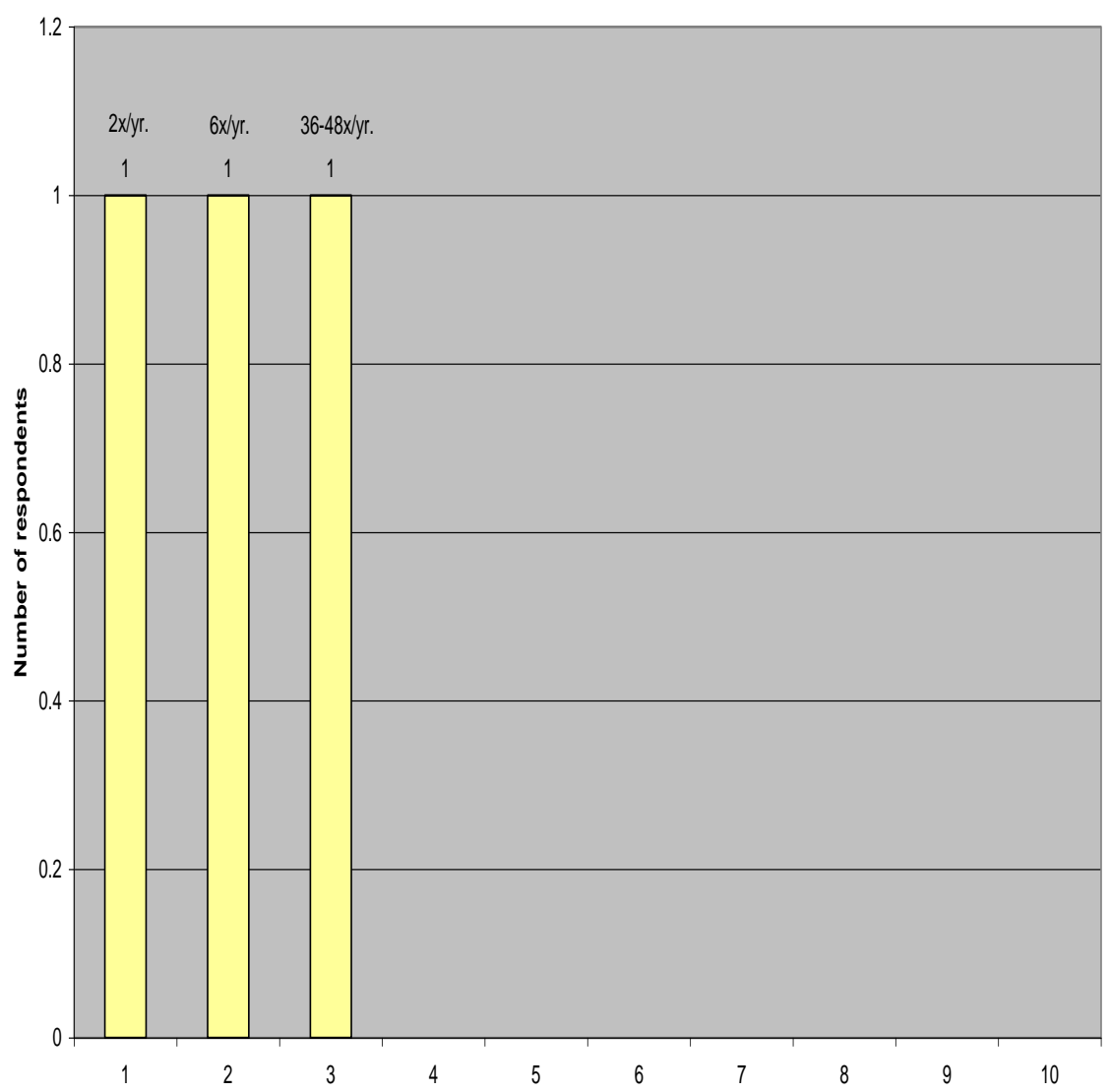


Figure 18. Question 15: If yes to question 14, how many times per year?

Figure 19, entitled Question #16: If no to question 14, would your company consider chartering a VLJ aircraft? This question explored the potential susceptibility of King Air owners to the advertised advantages of the VLJ. These advantages are generally considered to be a lower initial purchase cost versus King Air, greater speed than the King Air, the intangible perceived prestige of jet travel and the VLJs putative potentially lower maintenance costs. Since the act of *chartering* a VLJ requires a *much* lower level of commitment than *purchasing* a VLJ, this question acts as a barometer for future potential purchase of a VLJ. 27 of our 30 companies or 90% responded that they were not interested in even chartering a VLJ. The remaining three of our 30 surveyees were potentially open to the idea. The reasons given by the surveyees for rejecting the concept of chartering a VLJ are examined in a later graph in this presentation.

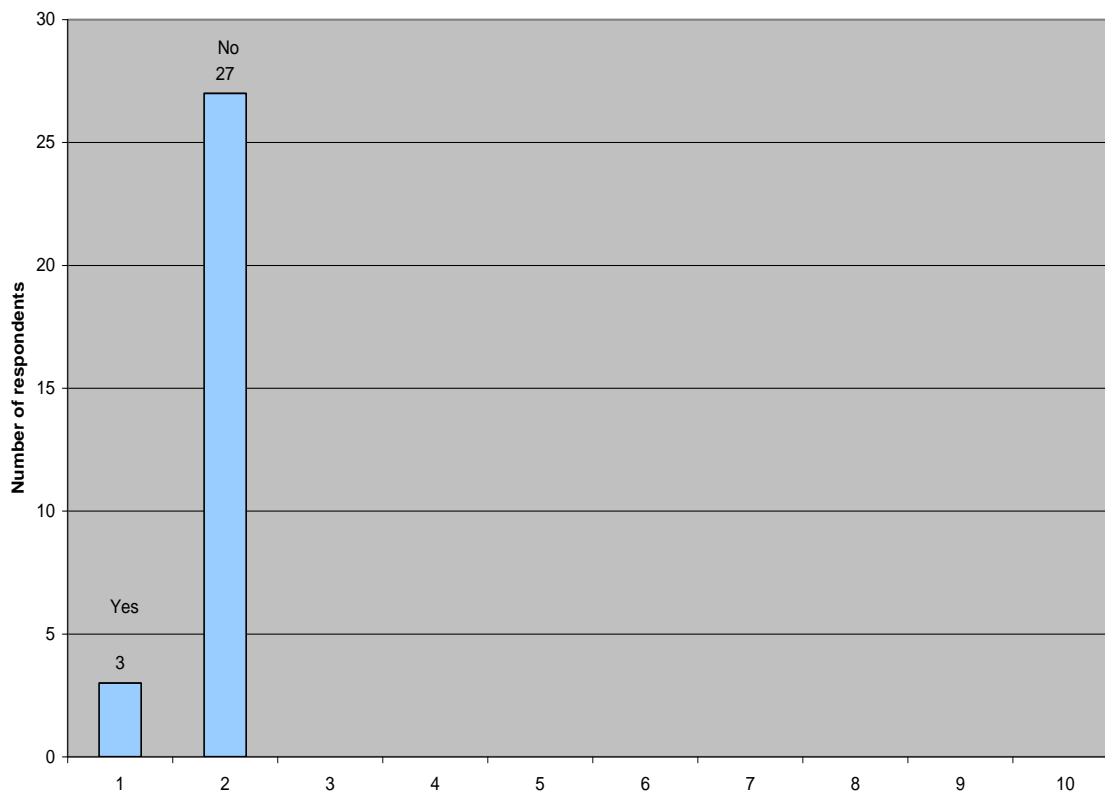


Figure 19. Question 16: If no to question 14, would your company consider chartering a VLJ aircraft?

Figure 20, entitled Question #17: Would your company consider purchasing a VLJ aircraft? As anticipated, here the survey responses revealed equally strong resistance by companies to the idea of purchasing a VLJ replacement for the venerable Beechcraft King Air. Twenty-seven out of the 30 companies responding or 90% of the population surveyed stated that they would not consider replacing their present King Air(s) with a VLJ. That left three out of 30 or 10% of the population to remain susceptible to the allure of the VLJs perceived benefits. Among this 10%, the VLJ manufacturers did have one triumph. One of the three potential VLJ purchasers or 3.3% of the total surveyed population has a Citation Mustang on order. Some of the reasons given for this resistance to VLJ purchase are stated in the remaining graphs of this study.

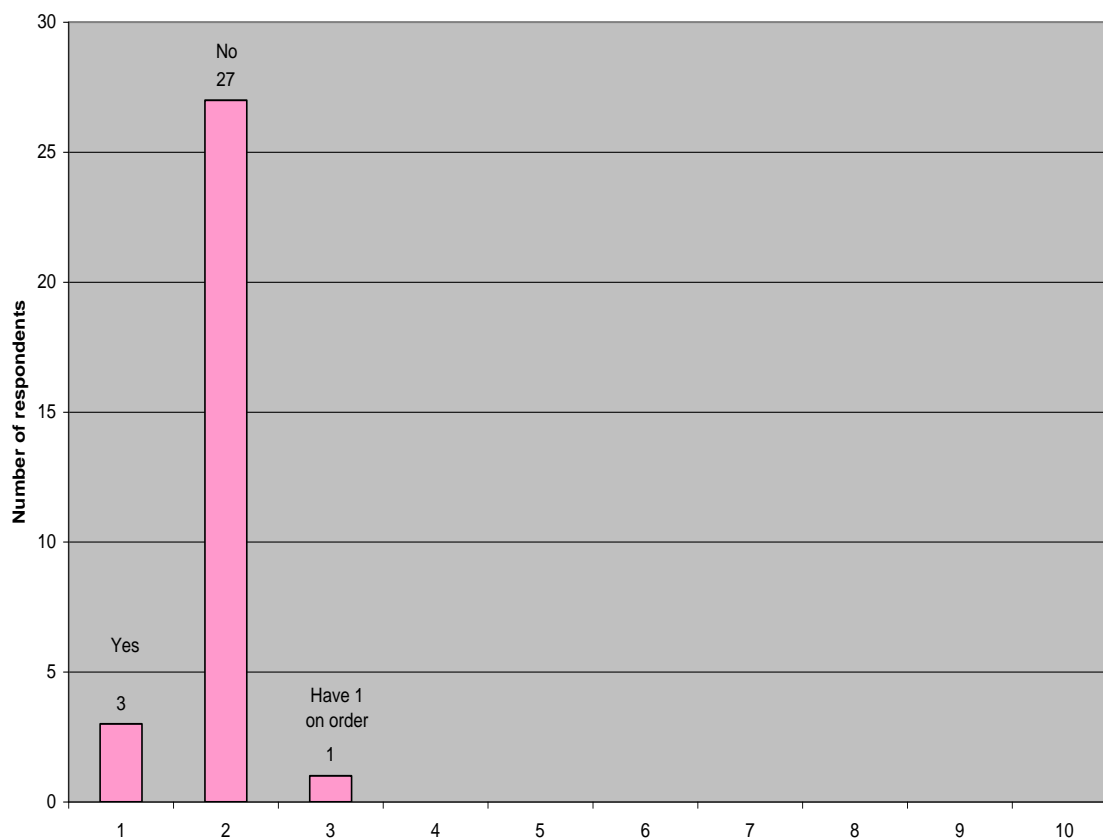


Figure 20.

Question 17: Would your company consider purchasing a VLJ aircraft?

Figure 21, entitled Question #18: Does your company presently own or lease a Beech King Air turboprop aircraft? This question tracked the simple demographic of the ratio of business King Air owners versus those companies who prefer to lease in the survey population. 28 of our 30 companies or 93.3% stated that they owned their King Air(s). Two out of 30 or 6.6% stated that they leased their King Airs.

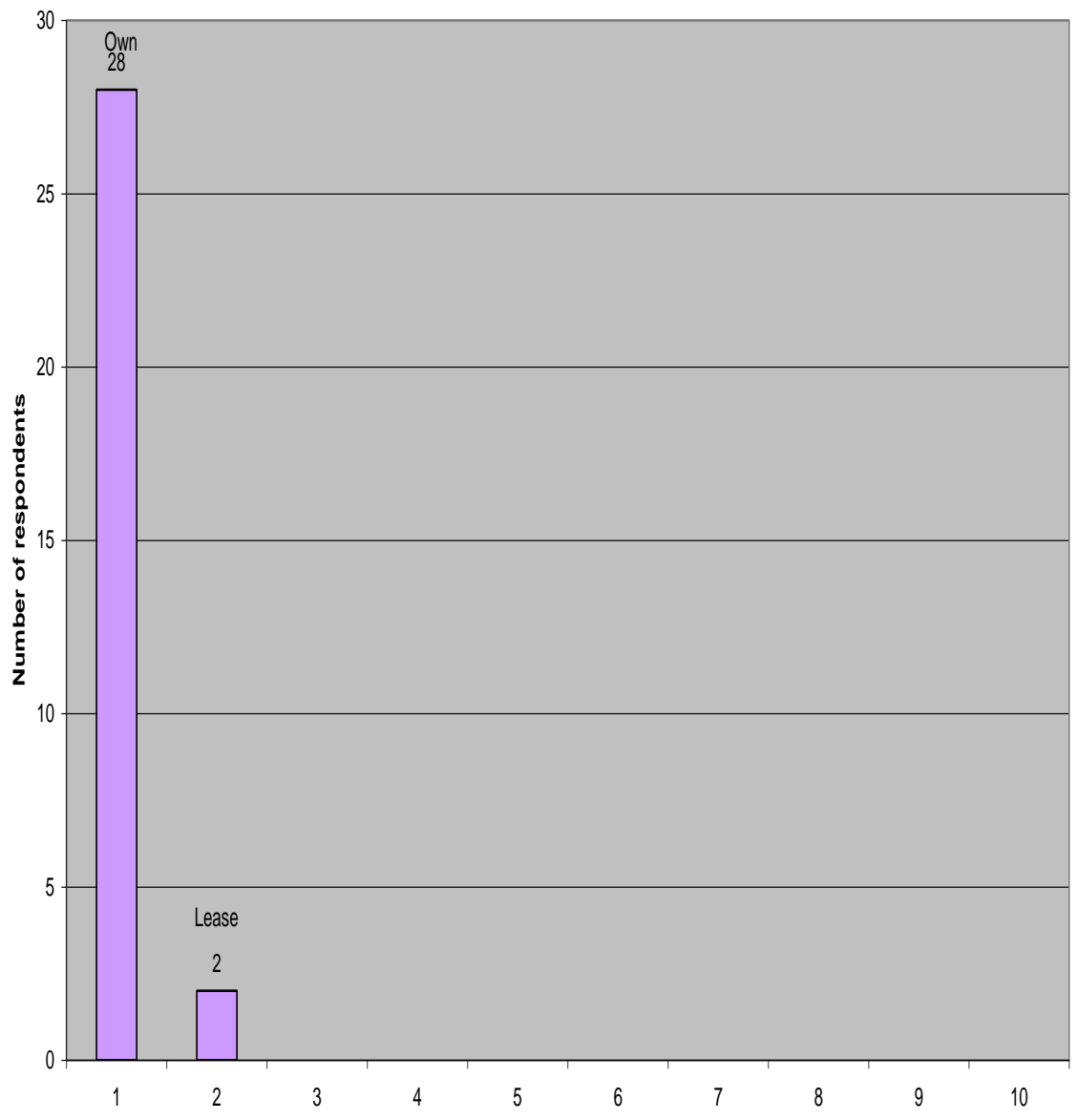


Figure 21. Question 18: Does your company presently own or lease a Beech King Air turboprop aircraft?

Figure 22, entitled Question #19: Which type of business aircraft does your company prefer? Twenty-eight of our 30 companies or 93.3% of those surveyed preferred the King Air over the VLJ. One of the 30 or 3.3% of the population preferred the VLJ. Not surprisingly, this was the one company that had a Citation Mustang on order. There remained one outlier, again at 3.3%, that refused to respond within the confines of our two response choices and said that they preferred an unspecified model of Citation.

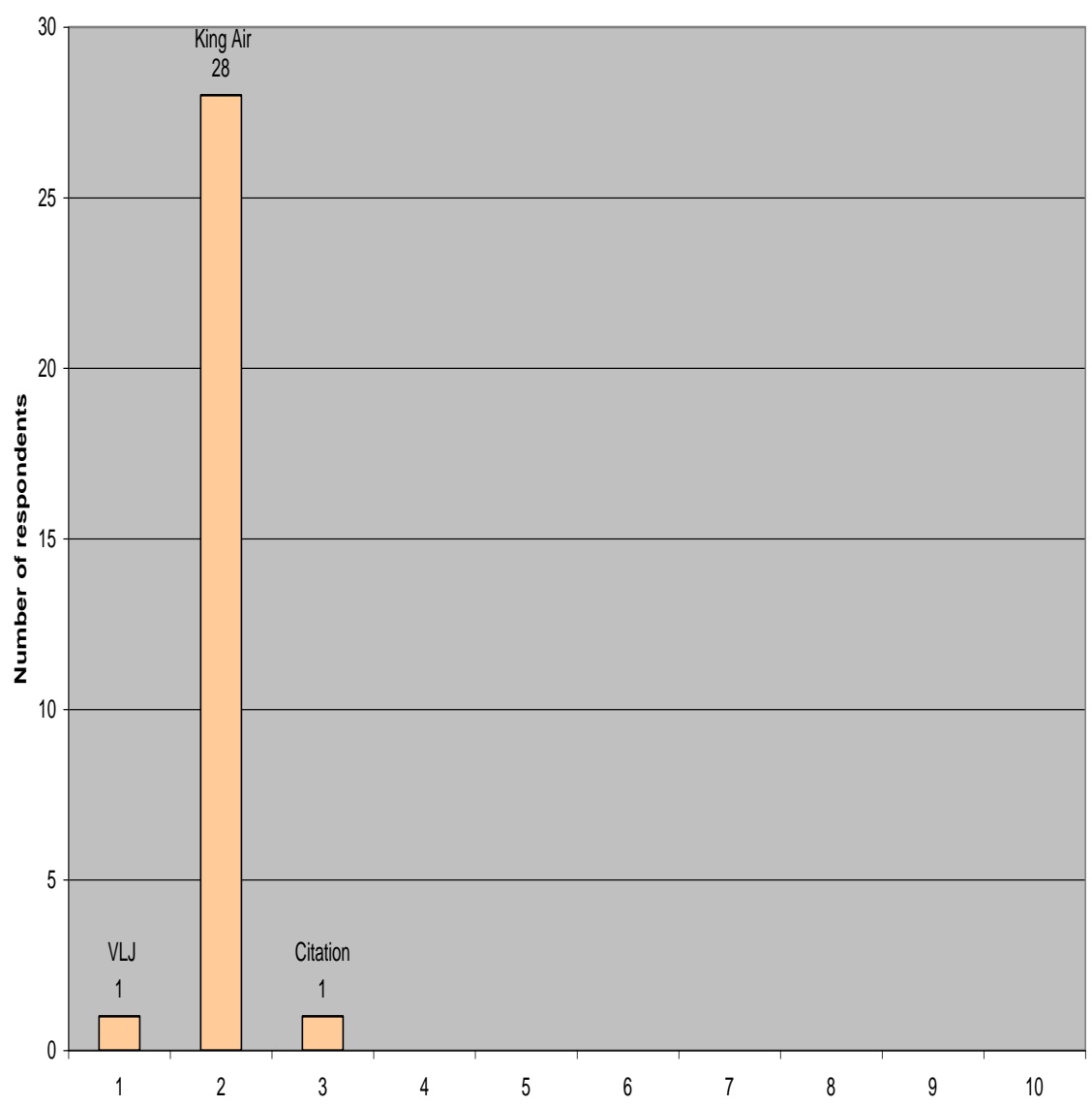


Figure 22. Question 19: Which type of business aircraft does your company prefer?

Figure 23, entitled Question #20: You chose your answer above in question 19 due to: greater perceived comfort/greater perceived value for the investment dollar/or other? Because there were some respondents who insisted upon choosing more than one response in selecting reasons for preferring the King Air, the total on this graph does not round evenly to 100%. In descending percentage order, our surveyees responded as follows: 18 out of the 30 or 60% of the survey population responded that the King Air provided greater value for the dollars invested than the VLJ. 13 out of 30 or 43.3% responded that the King Air delivered greater perceived comfort than the VLJ. Seven out of the 30 companies surveyed or 23.3% responded that the King Air was superior for some other unspecified reason.

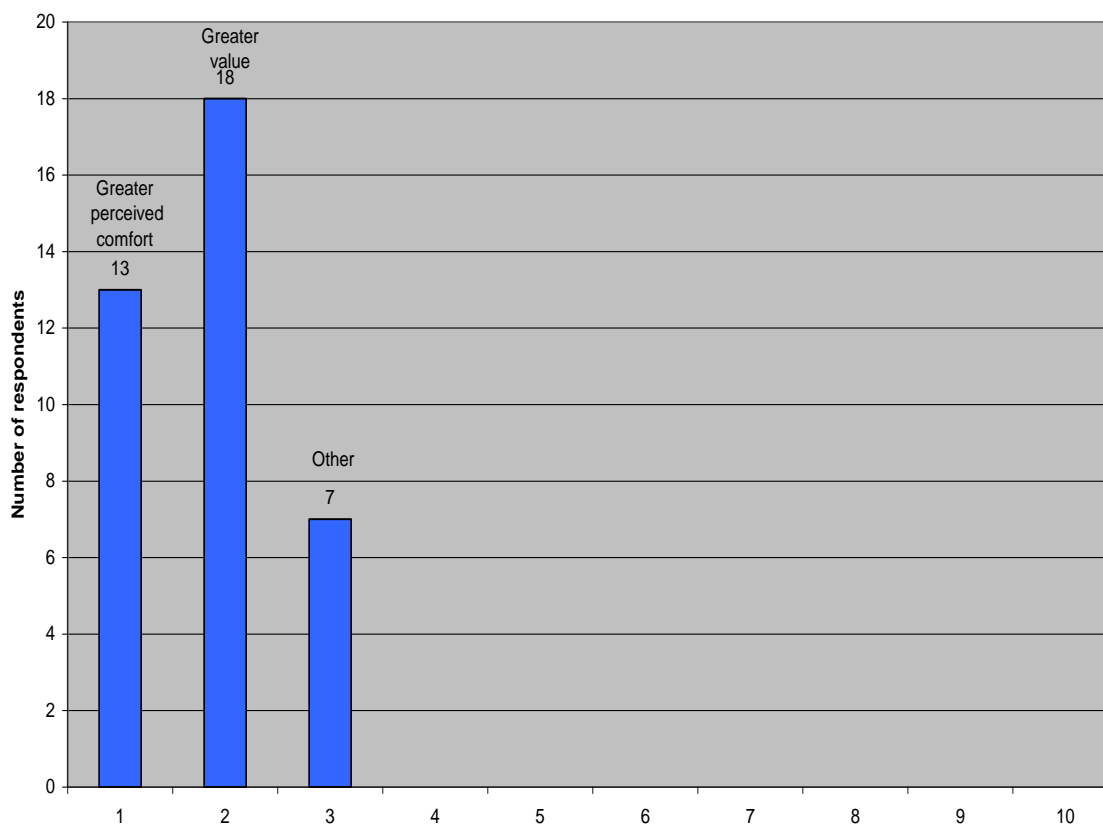


Figure 23. Question 20: You chose your answer above in question 19 due to: greater perceived comfort/greater perceived value for the investment dollar/other?

Figure 24, entitled Question #21: If the use of a VLJ were less expensive than your present business aircraft, would your company consider it for business travel? In descending numeric order, 13 of our 30 companies or 43.3% indicated that they would *Definitely Not* consider a VLJ for business travel. Eight out of 30 or 26.6% indicated that they would *Probably Not* consider a VLJ. Five out of the 30 companies or 16.6% indicated that they were *Neutral* regarding the purchase of a VLJ. Two out of 30 or 6.6% selected *Probably Yes* regarding a VLJ for business travel. Finally, two out of 30 or 6.6% of the surveyees selected *Definitely Yes* regarding their consideration of a VLJ for business travel. In summary, 70% of those polled responded negatively when queried regarding using a VLJ at less cost than their present King Air for business travel.

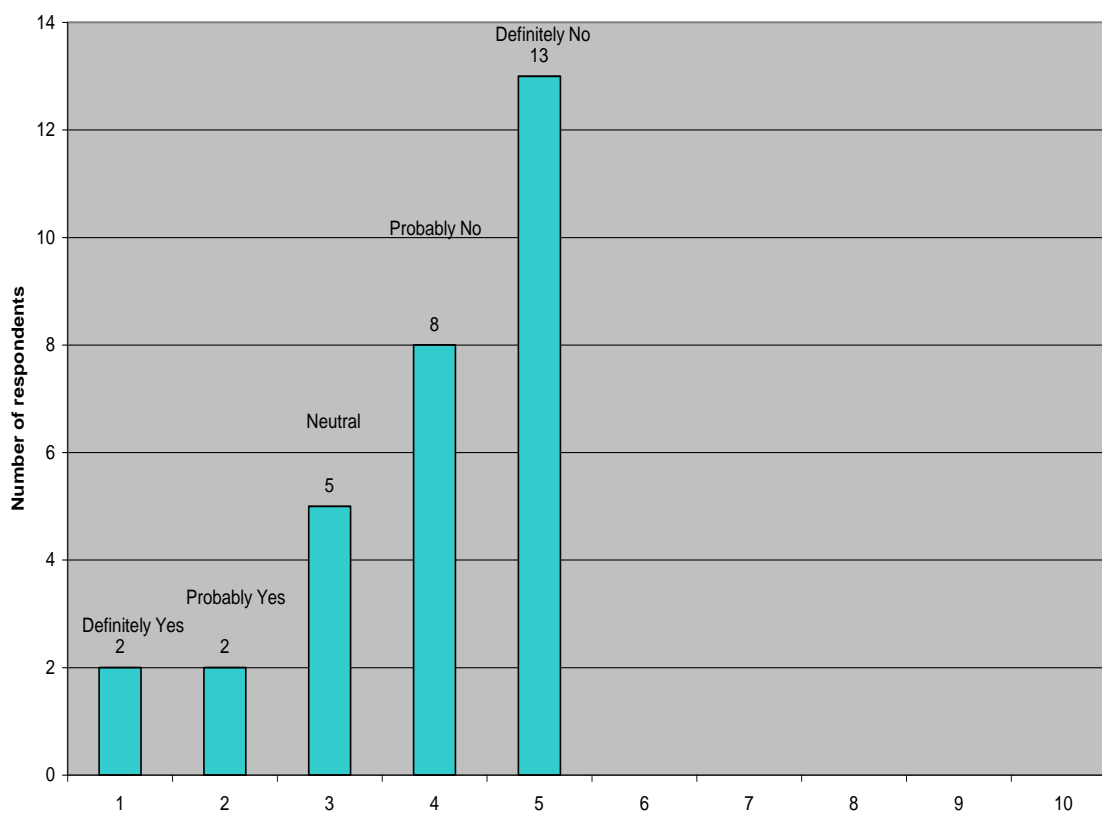


Figure 24. Question 21: If the use of a VLJ were less expensive than your present business aircraft, would your company consider it for business travel?

Figure 25, entitled Question #22: If the use of a VLJ took less time than your present business aircraft, would your company consider it for business travel? In descending numeric order, 12 of the 30 respondents or 40% responded *Definitely No* to the question. Nine of the 30 or 30% responded *Probably No* to the question. Six out of 30 or 20% responded *Neutral* to the question. One out of 30 or 3.3% responded *Probably Yes* to the question. Two out of 30 or 6.6% responded *Definitely Yes* to the question. In Summary, 21 out of 30 or 70% of those polled responded negatively to the concept of using a VLJ for the purpose of using less flight time than their present King Air business aircraft.

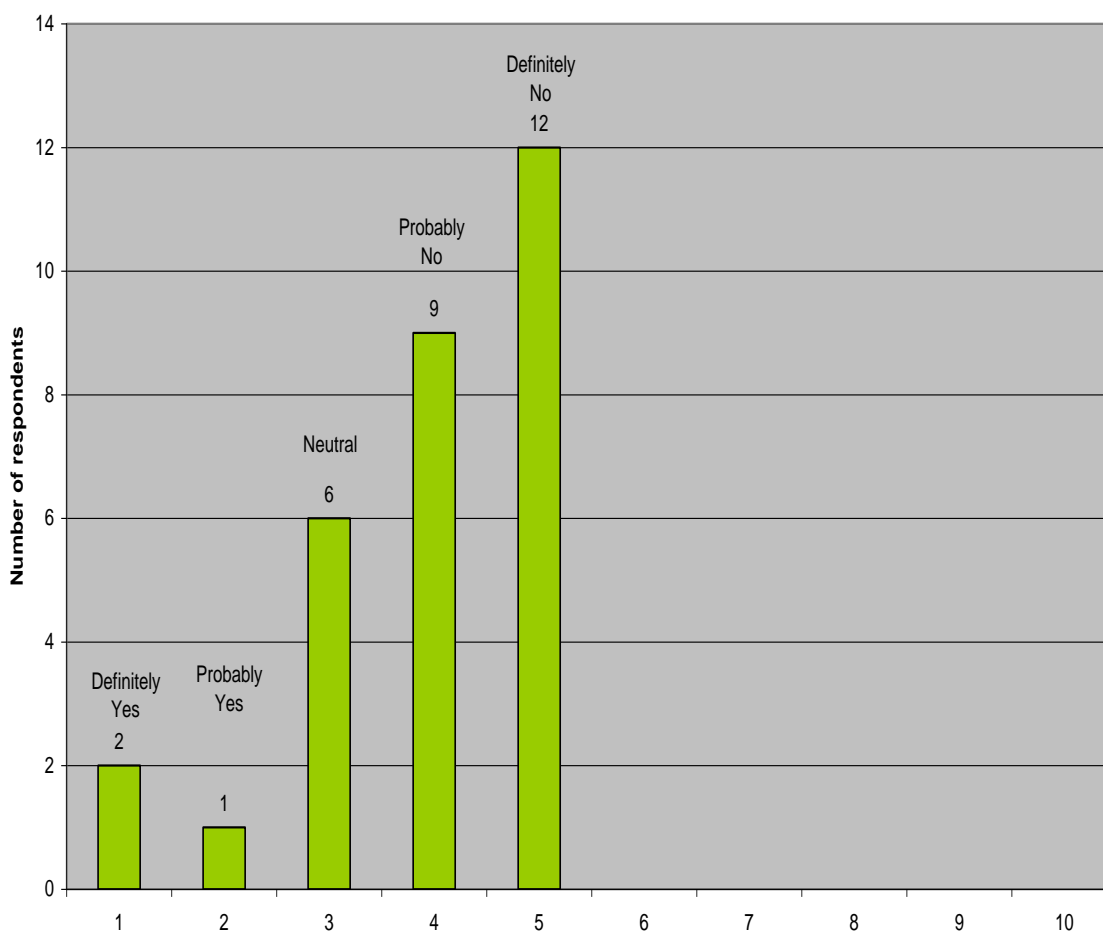


Figure 25. Question 22: If the use of a VLJ took less time than your present business aircraft, would your company consider it for business travel?

CHAPTER V

DISCUSSION

The data for this section was obtained in August of 2009. It remains current and will project into the future. The data measures opinion regarding the susceptibility or likelihood of present business owners of King Air aircraft to consider exchanging their present King Air(s) for the highly touted VLJs offered initially by a wide spectrum of manufacturers. Many of these VLJ manufacturers have since gone out of business. Those that remain have either undergone re-structuring or, in the case of Cessna and Embraer, continued on with business as usual due to a conservative approach to the perceived hype of the VLJ Phenomenon.

What follows here is a question by question discussion of the various elements that in total comprise the commercial viability of the new VLJ technology. It is not enough to discover a potentially more efficient method of business travel. If market conditions are not such that they will nurture the emergence of the new technology, then the development may be still born. Such appears to be the case with the VLJ phenomenon.

Demographically, seventy three percent or twenty two of the thirty travel managers polled were male. The balance of twenty seven percent or eight travel managers were, therefore, female. This finding in itself is not necessarily significant, but it may inform the tenor of the mindset of the responses received. A study outside the scope of this one may find a correlation between gender and some other aspect of management worldview.

The professional position of the travel managers contacted was also tracked in the survey instrument. The majority of the travel managers at sixty seven percent or twenty of the thirty travel managers held a position specifically in Company Management. This

group stands in contrast to the ten remaining travel managers who made up the thirty three percent balance of the personnel surveyed. These remaining managers were evenly divided into two groups at five individuals each. There were five individuals in the Staff grouping of the companies polled and five individuals in the Business Owners group. These two remaining groups of five travel managers thus comprised sixteen point five percent each to complete a one hundred percent representation of the travel managers surveyed.

The companies surveyed were primarily smaller firms. In descending numerical order, the largest individual group of the surveyees was a group of ten firms that employed from one to twenty five employees. This group represented thirty three percent of the survey population. The next largest group was comprised of five companies which employed twenty six to fifty employees each. This group accounted for seventeen percent of the survey population. The next position was held by four of the thirty surveyees. These four companies each employed five hundred one to seven hundred fifty employees. This group commanded thirteen percent of the survey population. One group of three companies averaged fifty one to one hundred employees. This group oversaw travel itineraries for companies employing ten percent of the survey populace. There were two separate groups with mean employee numbers of three hundred one to five hundred and seven hundred fifty one to one thousand respectively. A final quartet of company population groups boasted employee populations ranging from one hundred one to one hundred fifty, one hundred fifty one to two hundred, two hundred one to five hundred and a single remaining group exceeding 1000 employees.

In terms of active aircraft use by the same employee or employees per month, twenty three of the thirty surveyed companies or seventy six point six percent are actively using their King Airs to fly one to twenty five different employees each month. The data does not break out for the researcher how many of the flights are taken specifically by the same individual. Most of the respondents stated that the actual number of different employees who flew per month was less than five, and they were typically the same employees each time. While this question does not directly address the specific number of flights per employee per month, it does address the quantity of different employees that use the company aircraft. This speaks to the regular use of the company aircraft necessary to justify the acquisition and maintenance costs associated with King Air ownership. In second place, five of the surveyees or sixteen point six percent are flying twenty six to fifty employees per month. Two companies tied at third place. One of the two routinely conducts flights with fifty one to one hundred employees per month. The remaining company flew an average of one hundred fifty one to two hundred employees per month. With this quantity of monthly flight itineraries, it is easy to see the economies of scale achieved by constant aircraft usage.

The average number of flights planned monthly for employees also acts as a metric for aircraft use trends. There were two peaks of identical value for responses to this question. Flight frequencies maximized at two to three flights per month for ten companies or thirty three point three percent of the companies polled. An additional ten companies or thirty three percent expressed usage trends of five to twenty flights per month. In the aggregate, one can see that these two groups form a bloc comprising sixty six point six percent of

the entire respondent population. Clearly, these King Air owners are consistently using their aircraft on a monthly basis.

By simple multiplication of these high monthly values, the reader can see that over the course of one year, enormous use of the King Air was made.

An elementary change in a company's flight itineraries can sometimes yield synergistic benefits. Such is the case when a company travel manager notices that the flight itineraries of two or more employees can be planned to coincide on the same aircraft. Seventeen out of the thirty companies surveyed or fifty six point seven percent benefited from this profoundly powerful itinerary planning tool. Given the significant costs incurred in the many facets of flight operations, every additional employee on board the aircraft incurs an incremental cost but can provide benefits to a company, which is far out of proportion to these costs. This potential return on investment is especially true of the King Air due to its easily re-configurable interior. No VLJ can compete with the cabin size, ten passenger carrying capability, and the tangible benefits of the Squared Oval Fuselage cross section provided by the Beechcraft King Air. The King Air is truly in a class by itself when it comes to these unique characteristics.

None of the thirty companies polled used a VLJ for typical business travel. In comparison, use of the company King Air appears to be a benefit that CEOs take advantage of more than any other mode of transportation. Of the thirty companies surveyed, twenty or sixty six point six percent stated that the CEO was the most likely passenger for a business flight. Staff and members of the Board of Directors placed second in the flight hierarchy. These groups accounted for seven each out of the thirty respondents for a ranking of twenty three point three percent individually and forty six

point six in summation. The Senior Management cadre ranked third in quantity of flight itineraries. Only six of the thirty respondents or twenty percent named Senior Managers as routinely availing themselves of company flight privileges.

Commercial airliners were most frequently used by company Staff. The respondents reported that company Staff numbering six or twenty percent of the total were routine airline passengers for business. These values were followed by three companies or ten percent reporting that their CEOs traveled by commercial airliner on business. An equal share at three companies or ten percent also reported that their Senior Management flew commercially. Uniquely, only two companies or six point six percent reported that their Boards of Directors flew on commercial airliners.

Personal cars had a relatively poor showing in their business travel usage. Only one of the thirty companies or three point three percent reported that their CEO traveled routinely by personal car to conduct business. One of the respondent companies for an additional three point three percent detailed that their Senior Management traveled by personal car on business. An identical fraction of just one company, also at three point three percent, reported that their company staff often traveled by car in the conduct of company business. There were no companies reporting travel by car for their Boards of Directors.

Changes anticipated due to the downturn in the world economy might have included a reduction in the number of employees who travel on business over the last two years. In contrast, the majority of our companies at twenty or sixty six point six percent reported no change in the number of employees traveling for them over the last two years. Six out of the thirty or twenty percent reported a reduction in the number of employees who

traveled. A small percentage at thirteen point three percent or four respondents indicated an increase in travel over the last two years. The majority hewed to the status quo. There was, therefore, a small reduction in the overall numbers of travelers for the prior two year period.

Business mileage traveled over the last two years was another data point worthy of exploration. Again, twenty out of the thirty companies or sixty six point six percent reported no change in the mileage traveled by employees on business. Companies numbering six or twenty percent of the pool claimed more miles were traveled during the last two years than previously. A quartet of companies summing to thirteen point three percent stated that a decrease in business mileage travel had occurred. Overall, the trend for business mileage traveled over the last two years had evinced a mild upward movement for our survey population.

Many answers are given by corporate flight departments to justify their existence. One of the reflexive replies given by business travelers who fly on company aircraft is the wonderful flexibility of their flight planning. Our companies were queried as to what typical lead time they enjoyed before flight. Of the thirty, nineteen or sixty three point three percent said that they typically knew less than one week in advance that a particular mission needed to be planned. This is strong evidence for the dynamic nature of the business arena. It is also strong evidence for the irreplaceable advantage of having a capable, all-weather business aircraft at a company's disposal. The following ranking position at six of our companies which represented twenty percent of the respondents typically had from one to two weeks to prepare for the mission. Thirteen point three percent of the total or four companies expressed a typical preparation time of two to three

weeks in advance. No company conveyed a lead time of three to four weeks. Finally, one unique company, for three point three percent of the total, stated that they typically experienced a greater than four week lead time for flight. The single greatest advantage of the preparation time of less than one week reported by the majority of our respondents was the ability to avoid last minute exorbitant airfares. Companies typically described these airfares as financially predatory and unsustainable in cost to any company paying them. A further consideration was the convenience provided by the King Air due its ability to land at many smaller or less well maintained airports that could not safely land turbojet aircraft. This saved the companies considerable time and inconvenience commonly encountered in servicing customers located in small towns, which are often a significant distance from a commercial airport.

Teleconferencing was also explored as an alternative to business travel with the survey population. Tabulating the results revealed that twenty three or seventy six point six percent of the respondents reported that they would not consider teleconferencing. This was commonly explained by saying that their business required face to face contact with the customer or that the company needed to send representatives who could see firsthand what the concerns of their customers were. The remaining seven companies or twenty three point three percent reported that teleconferencing could potentially accomplish their business goals. They further stated that teleconferencing would be considered on a case-by-case basis.

A history of chartering varying types of aircraft can serve as an introduction to the benefits of a specific aircraft type that a company might be considering. A dozen of the companies surveyed or forty percent indicated that they had chartered aircraft in the past.

However, the majority of our respondents at eighteen companies or sixty percent of the total had never previously chartered aircraft. This would seem to indicate that the forty percent of the companies that had chartered aircraft had experienced temporary increases in their flight needs that could only be addressed by chartering additional aircraft.

The researcher felt that it was also important to discern the frequency with which additional aircraft were chartered. He discovered that three of the companies or ten percent of the total respondent population chartered additional aircraft six times per year. A single company or three point three percent of those surveyed chartered additional aircraft five times per year. There were no companies that chartered aircraft four times per year. A pair of companies for a percentage of six point six percent chartered aircraft three times per year. An additional pair of companies or six point six percent chartered additional aircraft twice per year. Two companies or six point six percent chartered aircraft once per year. An additional two companies for six point six percent chartered less than one aircraft per year. This left eighteen companies or sixty percent of the respondents reporting that they did not charter additional aircraft. The final majority of tallied companies who did not historically charter aircraft would be a more difficult market for the VLJ manufacturers to access. They simply had no experience with resourcing aircraft beyond their own King Airs.

Further examination of the chartering practices of our respondents took a look at the types of aircraft that they typically chartered. This examination profiled the average type of chartered aircraft. Somewhat surprisingly, seven out of the twelve companies or fifty eight point three percent of those who chartered additional aircraft chose to simply charter more King Airs. This seemed to imply that King Air owners who charter

additional aircraft enjoy high satisfaction with their present aircraft. None of the companies had chartered a VLJ of any description for employee transportation. Only four companies or thirteen point three percent chartered a turbojet aircraft for any of these chartered flights.

The previous use of VLJs was considered to be a reliable indicator of future VLJ use. Companies were queried as to whether they had ever used a VLJ in the past. A definition was given naming several VLJs by manufacturer. This information was further clarified by naming the specific model of aircraft from each of these manufacturers that constituted a VLJ. Twenty six out of the thirty polled companies or eighty six point six percent had never used a VLJ prior to this survey. The remaining four companies claimed to have used a VLJ as described by the researcher at least once. It is reasonable to presume that this prior VLJ experience would seem to create the conditions necessary for considering the future use or purchase of VLJs for these companies.

It was believed that market penetration was reliably predicted as a function of the number of times that a VLJ had been chartered by companies in the previous year. None of the charters were for employee transport. One of the companies or three point three percent of those queried stated that they had chartered a VLJ thirty six to forty eight times in the previous year. Another company, for three point three percent of the total, reported chartering a VLJ six times in the previous year. Yet, another company for three point three percent of the total reported VLJ usage at two times per year. Given the relatively small total number of companies that responded that they had used a VLJ at all in the past year, who comprised only three or ten percent of the entire polled population, it is

difficult to form an historically vetted profile of the average user. It is equally difficult to project what an average user might look like in the future.

Typical future uses of the VLJ are of significant importance to the VLJ manufacturers. They have banked their present designs on the appeal of a lower than traditionally expected initial purchase cost. They have also relied upon the allure of greater cruising speeds than turboprop aircraft, the intangible perceived prestige of jet travel and the anticipated lower maintenance costs than turboprop aircraft. In light of this, the researcher's survey made inquiry to his polled travel managers regarding the possibility of their chartering a VLJ. The majority of the travel managers, a full twenty seven out of the thirty or ninety percent responded that they would not even consider chartering a VLJ. Three of the respondents or ten percent stated that they remained open to the idea. The reasons for this are given later in this study below.

As a reasonable follow-on question, travel managers were asked if their companies would consider purchasing a VLJ to replace their present King Air Aircraft. Again, twenty seven of the thirty or ninety percent again responded that they would not consider it. That left three companies or ten percent of the companies that remained open to the potential purchase of a VLJ. Of these three companies, only one or three point three percent had in fact placed an order for a Cessna Mustang. This was the only positive action taken by any of the thirty companies to actually take possession of any elements of the VLJ market.

Present ownership of a Beechcraft King Air stands supreme as a measure of belief in the King Air product. Accordingly, the thirty companies were queried as to whether they owned, leased or chartered their company's King Air(s). Keep in mind that all of the

thirty companies contacted were listed on the third quarter of the 2008 Federal Aviation Administration Registry as being owners of at least one King Air. In reply, twenty eight of the contacted companies or ninety three point three percent stated that they owned their King Air aircraft. Two out of the thirty stated that they leased their company aircraft. Again, if ownership can be construed as the greatest measure of belief in a given product, the Beechcraft King Air has earned that praise.

When asked which type of aircraft their companies preferred over all others, twenty eight of the thirty or ninety three point three percent chose the Beechcraft King Air. Not surprisingly, the one company, for three point three percent of the total, that had ordered a Cessna Mustang preferred it over the King Air. Curiously, one company, for three point three percent of the total, stated that they preferred an unspecified model of Cessna Citation.

The reasons provided by our surveyees for selecting the King Air over other aircraft were many. The three categories of responses provided to them for justifying their preference for the aircraft most suitable to them were: greater perceived comfort, greater perceived value for the investment dollar and a catch-all category of *other*. The respondents were asked to choose the one best category of the three listed for their response. Some respondents insisted upon selecting more than one response category. This resulted in a greater than one hundred percent response rate, but when dealing with humans, some flexibility for individuation must be expected. In descending numerical order, eighteen of the thirty or sixty percent of the respondents said that the Beechcraft King Air provided greater value for the investment dollar than VLJs. A group of thirteen out of the thirty or forty three point three percent held that the King Air delivered greater

perceived comfort than VLJs. This could be seen as a testament to the greater head and shoulder room comfort of the King Air Squared Oval fuselage design. A group numbering seven out of the thirty or twenty three point three percent of those surveyed contended that the King Air was superior to VLJs for some *other* unspecified reason.

When asked what their preference for business travel would be if the cost of a VLJ were less than their King Air(s), thirteen of our cohort or forty three percent stated that they would *Definitely Not* consider a lower cost VLJ for business travel. Eight of the thirty or twenty six point six indicated that they would *Probably Not* consider a lower cost VLJ favorably versus the King Air. A component numbering five out of the thirty or sixteen point six percent indicated a *Neutral* mindset regarding VLJ cost over King Air. A pair of companies for six point six percent of the total selected *Probably Yes* regarding factoring in a lower cost as a reason to consider a VLJ. Last, two companies for six point six percent of the total selected *Definitely Yes* as their position on considering the purchase of a VLJ that was priced below their present King Air(s). In summary, seventy percent of those polled answered negatively to strongly negatively regarding considering the purchase of a VLJ that was priced below their present King Air.

The final question of the survey instrument addressed the potential time saved by use of a VLJ. If the use of a VLJ took less time than your present business aircraft, would your company consider it for business travel? In descending numeric order, twelve of the thirty or forty percent responded *Definitely No*. These companies valued other elements of the utility of their King Airs more than just a strict accounting of time. For regional business travel of flights of less than three to four hundred miles, there is little time difference anyway. This might be as little as fifteen minutes in duration. A group

numbering nine out of the total cohort or thirty percent selected *Probably No* to this question which placed pre-eminence on the value of time alone when purchasing an aircraft. A half dozen of the cohort or twenty percent chose *Neutral* as the descriptor best describing their thoughts on the time issue. A single company of the thirty for three point three percent held *Probably Yes* as their response. Time held some sway in their intellectual calculus. A pair of like-minded companies for six point six percent chose *Definitely Yes* as a consideration of time's role in the conduct of their aircraft purchases. To summarize, twenty one out the thirty or seventy percent again responded negatively to the concept of using a VLJ for the specific reason of decreasing their present flight time on routine trips.

What now appears to potentially have been more of a fad than a solid business opportunity drove many investors in the VLJs to financial ruin. Many lost hundreds of thousands of dollars in deposits on the VLJ aircraft themselves. Others lost it by investing in the VLJ companies. Some have described the trend as “Mini Jet Revolution or Dot-Com with Wings?” (Noland, 2009).

In the end, it was not just the developing technology that proved untenable. The effects of the 2007-2010 recession in America had a significant role to play in private commercial jet travel and the VLJ industry in particular. Economics continue to influence business travel choices.

When one examines the phenomenon of the VLJ from the remove of just a few years, one can see that what was promised was just too much, too inexpensively and too fast. Experienced aircraft industry veterans like Flying Magazine Editor-in-Chief J. Mac MacClennan and other aircraft industry insiders thought that VLJs sounded too good to

be true and stated so in print (MacClellan, 2009). These public statements did little to endear them to the VLJ entrepreneurs or their advertising departments. MacClennan held that Eclipse refused to advertise with Flying Magazine after his first editorial regarding Eclipse failed to paint the company in a good light. In this, Mac was right. To negatively re-phrase the Statement of the Research Hypothesis:

The promises of lower operating costs and higher speed have proved insufficient to cause companies that presently own King Air Turboprops to replace them with one of the new VLJs.

CHAPTER VI

CONCLUSIONS

The promises of lower operating costs and higher speed have proved insufficient to cause companies that presently own King Air Turboprops to replace them with one of the new VLJs. Despite the hopeful intentions of the many VLJ manufacturers' marketing departments, their intended customers want more than just speed and low potential operating costs from their corporate aircraft.

The VLJs seem to have met a significant amount of sales resistance in our surveyed companies view because they failed to consider that what appealed to the VLJ manufacturers as potential needs for business aviation didn't match the market. Many of the businesses surveyed in this study mentioned the need for an aircraft that could land at short or unimproved runways. VLJs are incapable of doing that. The surveyed prospective VLJ-flying businesses mentioned the importance of the King Air's *squared oval* fuselage configuration with its vertical fuselage walls. These walls lend themselves to greater interior head and shoulder room yielding a more comfortable workspace. This interior design can also be relatively easily re-configured to meet the changing parameters of a company's needs. Yet, most VLJs are configured like the traditional round executive mailing tube. The traditional tubular design allows higher speed in flight, but at the expense of a more comfortable work environment while enroute.

A further consideration for companies is the storied reliability of the King Air platform. The variants of the PWC PT6 turboprop engine used in King Airs are proven workhorses requiring little maintenance and providing excellent reliability. The King Air airframe is equally rugged and robust. If one departs in a King Air, one will probably

arrive in a King Air. It appears that the VLJ manufacturers just did not do their market research thoroughly. When the world economy turned down, there was not enough of a practical feature base left in the VLJ products to entice the anticipated market to invest in them.

Beyond the inherent allure of its newness, relative low price, good fuel efficiency and the application of Cruise Missile and other modern technologies, it needed to work for the customer. Businesses tend to be conservative in their outlook for a large financial investment. The Beechcraft King Air has a 40-plus-year track record of worldwide on-time dispatch readiness and rugged performance. For conservative companies struggling against a downward economy and concerned with making every flight reliably and safely, the VLJs just did not have the track record to usurp the King Air.

As was discussed earlier, this unwillingness to change was due to a variety of factors. These factors include the much greater number of landing fields available to a turboprop aircraft. This benefit is due to the turboprop aircraft's increased tolerance for rough field conditions. In contrast, a jet simply cannot operate on an airfield potentially laden with foreign objects that could easily destroy its engines. For companies that depend upon an aircraft that can be repeatedly dispatched to virtually any airport within its operating radius, this rough field ability is greatly valued. A jet of any description, limited by present engine design, simply cannot risk landing at these unimproved fields.

An additional factor mentioned by the respondents in explaining their loyalty to the King Air was the *value for the dollar invested*. This category included the benefit of the *squared oval* fuselage design. Business travelers appreciate the working comfort provided by a fuselage interior with greater head and shoulder room. It is impossible for

VLJ manufacturers to offer this greater comfort within the small diameter of a traditional tubular fuselage.

Finally, King Air users remarked upon the versatility of an end-user configurable aircraft interior. While a possibility for jet manufacturers to consider, there are at present no VLJ manufacturers offering the capability for end-users to easily reconfigure their aircraft interior. This capability allows King Air owners to enjoy executive seating and have an effective cargo transport using the aircraft within the same day.

In summary, VLJ manufacturers are at a present disadvantage in trying to penetrate the King Air market. King Airs can be used on more airports than VLJs. King Air users enjoy the proven reliability of the PT6 engines. This is in contrast to the short tenure of fairly new, or in some cases brand new, VLJ engine designs. King Air owners enjoy the ruggedness of a tested airframe. They also have a larger and more comfortable cabin interior than the typical VLJ. This benefit is coupled with the ease of interior re-configuration that is a King Air hallmark.

The outcome of this research did not support the researcher's research hypothesis. With the conspicuous exception of one of the 30 companies surveyed, the King Air business aviation community was not, at this time, yet ready to embrace the VLJ as a replacement for the venerable King Air turboprop for business travel.

CHAPTER VII

RECOMMENDATIONS

In light of the limits of present jet engine technology, the easiest of these concerns for the VLJ manufacturers to address will be the aircraft cabin interiors. This will probably require a re-design of the fuselage cross section. Comfort is a legitimate concern for business travelers. This is especially true for those business travelers who need to be productively working while aloft, which is most of them. Designing the interiors to also be easily reconfigured will complete addressing these cabin design needs. When jet engines are more tolerant of the foreign debris found at unimproved airports, that improvement should finally open doors that are presently closed to VLJ manufacturers.

Manufacturers for VLJs will need to continuously survey the market for specific travel needs and interests to be able to design an aircraft that makes the switch from the King Air turboprop to a product that buyers cannot refuse.

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APPENDIX A
BIBLIOGRAPHY

APPENDIX A

BIBLIOGRAPHY

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APPENDIX B
DATA COLLECTION DEVICE

APPENDIX B

DATA COLLECTION DEVICE

Will Very Light Jets Replace King Air Turboprops For Business Travel?

Business Travel Questionnaire

Gender: Male ___ Female ___

Job Title: _____

Your responses to this survey are a very important part of my Master's Program.

Please mark the appropriate response.

QUESTION 1: *Number of employees in your company?*

0-25 ___ 26-50 ___ 51-100 ___ 101-150 ___ 151-200 ___ 201-300 ___ 301-500 ___
501-750 ___ 751-1000 ___ 1001+ ___

QUESTION 2: *Number of employees for which you typically manage travel itineraries?*

1-25 ___ 26-50 ___ 51-100 ___ 101-150 ___ 151-200 ___ 201-250 ___ 251+ ___

QUESTION 3: *Average number of flights planned monthly for employees?*

0-1 ___ 2 ___ 3 ___ 4 ___ 5-10 ___ 11-20 ___ 21-30 ___ 31-40 ___ 41+ ___

QUESTION 4: *Total number of travel itineraries planned company-wide per year?*

1-25 ___ 26-50 ___ 51-100 ___ 101-150 ___ 151-200 ___ 201-300 ___ 301-500 ___
501-750 ___ 751-1000 ___ 1001+ ___

QUESTION 5: *Percentage of yearly itineraries when two or more employees travel*

together using the same itinerary? 0-25% ___ 26-50% ___ 51-75% ___ 76-100% ___

QUESTION 6: *What is your company's most typical mode of business travel? Please place the letter representing business travel modes with each corporate employee level:*

V for Very Light Jet

K for King Air Turboprop

C for Commercial Airlines

D for other mode of Travel (Please specify: _____).

Board of Directors ___ CEO ___ Senior Management ___ Staff ___

QUESTION 7: *Have you experienced a change in the **number** of employees for which you planned regional business travel in the last two years?*

More Employees fly now ___ Less Employees fly now ___ No Change in number ___

QUESTION 8: *Have you experienced a change in the **mileage** traveled for these employees in the past two years?*

More Miles flown now ___ Less Miles flown now ___ No Change in Mileage ___

QUESTION 9: *How many weeks before the travel date are most of your company's business travel itineraries planned?*

0-1 Week ___ 1-2 Weeks ___ 2-3Weeks ___ 3-4 Weeks ___ 4+ Weeks ___

QUESTION 10: *Would your company consider Tele-Conferencing as an alternative to traditional business travel? Yes ___ No ___*

QUESTION 11: *Has your company ever chartered a business aircraft beyond your present King Air(s) for business travel purposes? Yes ___ No ___*

QUESTION 12: *If Yes to Question 11, how frequently do you charter additional business aircraft? <1 Time per year ___ 1 Time per year ___ 2-4 Times per year ___ 5-10 Times per year ___ 10 or more Times per year ___*

QUESTION 13: *If applicable, what type of additional aircraft does your company typically use? VLJ ___ Another King Air ___ Other, Please specify _____.*

QUESTION 14: *Has your company ever used a Very Light Jet (VLJ) in the past? (This would include Eclipse 500, Cessna Citation Mustang, and Embraer Phenom 100. These aircraft typically seat four to eight people). Yes ___ No ___*

QUESTION 15: *If Yes to Question 14, How many times per year? _____*

QUESTION 16: *If No to Question 14, Would your company consider chartering a VLJ Aircraft? Yes ___ No ___*

QUESTION 17: *Would your company consider purchasing a VLJ Aircraft?
Yes ___ No ___*

QUESTION 18: *Does your company presently own or lease a Beech King Air Turboprop Aircraft? We own ___ We lease ___ We charter as needed ___*

QUESTION 19: *Which type of business aircraft does your company prefer?
VLJ ___ King Air Turboprop ___*

QUESTION 20: *You chose your answer above in question 19 due to:*

*Greater Perceived Comfort ___ Greater perceived value for the investment dollar ___
Other (Please explain)_____.*

QUESTION 21: *If the use of a VLJ were **less expensive** than your present business aircraft, would your company consider it for business travel?*

Definitely yes ___ Probably yes ___ Neutral ___ Probably No ___ Definitely No ___

QUESTION 22: *If the use of a VLJ took **less time** than your present business aircraft, would your company consider it for business travel?*

Definitely yes ___ Probably Yes ___ Neutral ___ Probably No ___ Definitely No ___

Thank You VERY much for your time in helping me. - Vince Pujalte

Solicitation for comments: Please feel free to elaborate on any of your answers or comment freely on related issues or questions: