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Utilizing a Product Rejuvenation Framework to Investigate University Aviation Association Members' Perceptions of the Cessna 172 as a Single Engine Trainer

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by

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This thesis was prepared under the direction of the candidate's thesis committee chair, Dr. Blaise P. Waguespack Jr., Department of Business Administration, and has been approved by the members of his thesis committee. It was submitted to the Department of Business Administration and was accepted in partial fulfillment of the requirements for the degree of Master of Business Administration in Aviation.

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ABSTRACT

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The purpose of this research was to utilize a product rejuvenation framework to investigate if sufficient market demand exists for Cessna in relaunching the 172 in the collegiate trainer market. The Collegiate Aviation Guide, a publication of the University Aviation Association listing UAA members and their respective aviation offerings, was used to establish the initial population for the research. The UAA members located within the 50 United States which 1) had a flight training program, and 2) owned and operated their own fleet of aircraft, represented the survey population. A total of 64 schools met the established criteria, with 55 of the 64 schools participating in the survey. A profile of the responding schools was established including the average age, size, and composition of the primary trainer fleet, as well as the average student enrollment. Respondent perceptions of the 172 were investigated and analyzed within a product rejuvenation framework. The perceived importance of price was measured, but an investigation into the issue of price was beyond the scope of this research and identified as an area requiring future research.

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Introduction

The general aviation aircraft industry in the United States was crippled over the past fifteen years by product liability law suits and soaring insurance rates. The damages awarded to the families of aircraft accident victims, and the costs associated with defending against these cases have been very damaging to aircraft manufacturers. The aircraft and power plants involved in these class action suits were in many cases more than twenty years old (Barnard, 1985). Prior to the General Aviation Revitalization Act of 1994, there were no federal limitations on the manufacturers' liability for the aging general aviation fleet. The General Aviation Revitalization Act of 1994 was signed into law on August 17, 1994 by President Clinton with the hope of saving the ailing general aviation aircraft industry.

As a result of product liability reform in aviation, the industry is once again ready to move forward. Cessna has recently reentered the single engine, piston-powered aircraft market nearly eleven years after abandoning the market. Piper is also positioning itself for a comeback.

In this research project, the relationship between product liability law before reform and the state of the U.S. domestic aircraft industry by 1988 is reviewed. Product liability litigation was the most pronounced environmental factor linked to general aviation's problems in the late 1970s and throughout the 1980s (Horn, 1989). This

relationship is important in understanding the foreseeable impact of the General Aviation Revitalization Act (GARA) on the industry.

Product Liability Law

Prior to the product liability reform of 1994, there were no federal limitations on aircraft manufacturers' liability. There are several degrees of liability under which product liability cases fall. The three main types are (Barnard, 1985):

1.) *Liability resulting from negligence* - The manufacturer is liable if negligence on the part of the manufacturer is shown during the design or manufacturing stage.

2.) *Strict liability* - The manufacturer is liable if it is proven that a defect exists or that something malfunctioned regardless of whether a specific fault on the part of the manufacturer is shown.

3.) *Absolute liability* - As the name implies, the manufacturer is liable for any injury caused by the use of the manufacturer's product.

The majority of aviation related product liability cases fall under strict liability (Barnard, 1985). The next section will discuss strict liability and specifically how strict liability differs from liability resulting from negligence. Aviation related cases generally do not fall under absolute liability. Therefore, it is important to note that absolute liability exists, but it will not be discussed any further for lack of relevance to the topic at hand.

Strict liability

The difference between strict liability and negligence is that a manufacturer can be found liable under strict liability even if no fault on the part of the manufacturer can be

proven by the plaintiff (Eichenberger, 1990). The burden of proof is much less when all that has to be proven is that a defect exists, something malfunctioned or something failed. In the case of negligence, a specific fault on the part of the manufacturer needs to be proven in the area of design or manufacture.

Liability due to negligence and strict liability are often not distinguishable from each other. Many times, the distinction arises after the age of the product becomes excessive which, in the case of aircraft, is over ten years (Barnard, 1985). The easiest way to describe this is with an example. Cessna was involved in a case where a latchpin, the single seat attachment mechanism in a 172 failed during a go-around maneuver; the pilot lost control, and the plane stalled and crashed (Barnard, 1985). The seat attachment was designed to have a steel bushing and a steel pin placed in an aluminum hole. The reason was to prevent wear in a critical area; such was the industry standard at the time of design and manufacture. However, galvanic corrosion due to the dissimilar metals would eventually cause the part to fail. This was not a case of negligence because the design practice used was the standard of the time for metallurgical engineering. The product was defective however because the seat attachment mechanism did not meet the foreseeable uses for it, including repetitive landings and takeoffs over a span of many years (Barnard, 1985). Cessna was found liable under the strict liability law and paid damages of $29.3 million.

The defenses available to the manufacturer also differ between a negligence case and one of strict liability. The following four factors are affirmative defenses that are often used in negligence cases in civil law (Eichenberger, 1990).

1.) *Assumption of the risk* - a defense where the manufacturer claims the plaintiff knew of the risk involved in the activity and accepted that risk. The key is convincing the jury that the activity carries an inherent risk of harm and that the plaintiff knew and accepted it.

2.) *Contributory negligence* - a defense where the manufacturer tries to show that the pilot was negligent in some manner; in essence, show that he/she did not perform some crucial task or in some way contributed to the harm that followed.

3.) *Comparative negligence* - a defense where the jury is instructed to assign a percentage of negligence to both the plaintiff and the defendant. The resulting compensation will be based on the percentage of negligence of the defendant.

4.) *Last clear chance* - a defense where the plaintiff has proven negligence but the defendant shows that the plaintiff had a last chance to avoid the situation that lead to the accident but did not.

There are fewer defense options available in a strict liability case when compared to a negligence case. For example, the defense cannot claim that the pilot was negligent. The defense can, however, try to show that the pilot knew of the defect ahead of time and decided to ignore the problem and proceed with the flight (Eichenberger, 1990).

Correlation to Safety

Craig (1991) investigated the relationship between general aviation safety and product liability. His research showed that the fatality accident rate of 1.67 deaths per 100,000 hours of flight time remained approximately constant between 1979 and 1988.

However, the average cost of product liability litigation per fatality increased from $17,000 to $223,600 over the years investigated. The conclusion drawn based on these numbers is that the increase in product liability litigation has not increased the overall safety of the industry (Craig, 1991).

Correlation to Price

The increase in product liability litigation and rising insurance rates have taken their toll on the general aviation aircraft industry. In 1985, approximately $70,000 of the "sticker price" on general aviation aircraft was a result of the cost of liability insurance and damages paid (Barnard, 1985). This fact indicates that the costs associated with liability insurance and litigation were transferred directly to the consumer in the form of high prices. Unfortunately for the manufacturers, fewer and fewer people could afford these prices. One result was that Cessna stopped production of its piston-powered planes in 1985; Piper was forced into bankruptcy.

The main problems facing companies like Cessna and Piper were the age and number of aircraft in the air. Cessna was estimated to have 110,000 planes in the air in 1994 and Piper 65,000, with the average age of these aircraft approaching thirty years (Stern, 1994). Commander Aircraft Co. had much newer aircraft, with only 1,000 planes in the air as of 1994. The fact that Commander has newer and fewer aircraft in the air than Cessna and Piper is one reason why no damages have been paid out to Commander litigants in nearly a decade; as a result, liability insurance only adds about $10,000 to the total price of Commander airplanes (Stern, 1994). Note that this is prior to the product

liability reform of August 1994 and, as such, is an indicator that age of aircraft does play an important role in product liability.

Correlation to Technological Improvements

The high costs associated with product liability cases monopolized the time and resources of the three largest U.S. general aviation aircraft manufacturers beginning in the early 1970's.

> "By 1977 Beech, Cessna, and Piper had hundreds of lawsuits pending against them asserting claims for compensatory and punitive damages that, in total, far exceeded the net worth of all three companies combined. Increasingly, and to an extent that interfered with the performance of their primary responsibility of designing and building airplanes, engineers and managers for the three companies found themselves directly involved with the efforts of lawyers and insurers to defend product liability lawsuits." (Martin, 1991, p.482)

Product liability litigation has significantly hurt the development of the general aviation aircraft industry, suppressed R & D spending, and prevented new technologies from being implemented. Peter Huber, an editor of the book *The Liability Maze*, made the following statement.

> "When the sun never sets on the possibility of litigation, each improvement in method, material, or design can establish a new standard against which all of your earlier undertakings, of no matter what vintage, will be judged. Finding a way to do better today immediately invites an indictment of what you did less well yesterday or twenty years ago." (Martin, 1991, p.492)

One important thing to note, however, is that not all product liability cases brought to court were awarded compensation. Data suggests that in more than 80% of the general aviation product liability cases brought to trial, manufacturers were successful in defending their products (Martin, 1991). Also, a study done by Beech Aircraft Corporation in the

mid 1970's stated that only 16 and 2/3 percent of the amount Beech spent on product liability litigation (nearly $18 million over a 58 month period) was paid to claimants (Martin, 1991). The remainder was spent on the various costs associated with defending the cases, including the investment of time and resources made by the companies' engineers and managers. Considering that only about 20% of the claimants actually received damages, the people that prospered most from the no-fault strict liability cases were liability lawyers (Martin, 1991).

State of the Industry by 1988

The piston powered single and twin engine aircraft industry was nearly nonexistent by 1988. Cessna had stopped production of its piston powered aircraft in 1986. Beech continued to manufacture just one single and one twin engine model in the piston power class. Moreover, the single engine aircraft was a high-performance airplane and not suitable for beginner flight training. Piper, on the other hand, was sold in 1987 to private investor Stuart Millar. Millar decided to restart production of nine of Piper's models as well as begin development of a new trainer in 1987 (Horn, 1989). Millar decided that Piper would not carry any product liability insurance and that any liability claims would be handled internally out of revenues (Horn, 1989). By 1991, Piper Aircraft was under Chapter 11 protection (Gottschalk, 1995).

Russell Meyer, the president of Cessna, basically summed up the situation with the following statements. "I can tell you without equivocation that the sole reason Cessna suspended production of piston aircraft indefinitely was the cost of product liability. I can

say with similar candor that Cessna will not build another piston aircraft unless we can somehow reduce the horrendous ongoing cost of product liability." (Horn, 1989, p.2)

Researchers (Truitt and Tarry, 1995) identified additional environmental factors which contributed to the almost total abandonment of the piston-powered market by aircraft manufacturers. These included high inflation rates (late 1970s), high interest rates (early 1980s), and the oil crisis (resulting in higher fuel prices). Other possible explanations included the increased longevity of existing aircraft, increasing prices for aircraft which were largely a result of liability problems, and poor overall economic conditions (Truitt and Tarry, 1995).

Product Liability Reform

The General Aviation Revitalization Act of 1994 was passed by Congress and signed into law by President Clinton on August 17th, 1994. The law established an 18 year statute of repose forbidding any civil lawsuits against manufacturers of aircraft or equipment which are more than 18 years old. In the case of components such as engines, the eighteen year limit is measured from the date of installation in the airplane. The impact of this law is suggested by noting that more than 74% of all general aviation aircraft are over 18 years old (Shapiro, 1995). A copy of the General Aviation Revitalization Act is attached in Appendix 2.

The objective of the new law was to "revitalize" the ailing general aviation aircraft industry. Russell Meyer was instrumental in getting product liability reform passed, and the result of the reform was evident when he announced Cessna's intentions to reenter the

piston-powered aircraft market. The first planes are scheduled for delivery in 1997 with a span of just over eleven years between production runs (Stewart, 1995b).

Sources associated with Piper say that over 80% of the aircraft built by Piper which are still in the air, are over 18 years old and therefore safe from the threat of litigation (Shapiro, 1995). This reduction in potential liability has reportedly increased the value of Piper by a factor of three; Piper has hopes to soon pull out of Chapter 11 bankruptcy (Shapiro, 1995). Glenn Parr, general counsel for Piper, states that the increase in the value of Piper stems from returning

> "a level of predictability to the aviation product liability risk. ... When it's predictable, it becomes insurable, then you can attract investment. People don't mind investing in an industry if they know they're not going to get wiped out with one lawsuit from one plane crash." (Shapiro, 1995, p. 3,15)

One thing to keep in mind, according to Arthur E. Wegner, Chief Executive for Beech Aircraft, is that there is still a backlog of liability cases and that the costs associated with them will linger for some time (Banks, 1994).

Forecast for the Future

Now, with product liability reform, the forecast for the general aviation industry is a period of growth. A "Survey of Potential Pilots" by Frederick/Schneiders, Inc. (1995) for the General Aviation Manufacturers Association (GAMA) projected that 1.2 million individuals are "very interested" in learning to fly. About 50% said they will likely start flying within five years and about 25% will likely buy an airplane within five years of getting their license (GAMA Piston Engine Aircraft Revitalization Committee, 1996).

The age of the current general aviation aircraft fleet is high, with an average age of 28 years, and with 25% being over 35 years old (GAMA Piston Engine Aircraft Revitalization Committee, 1996). The FAA (1996) has forecasted a decrease in the single engine piston fleet from 123,332 aircraft in 1995 to 117,800 aircraft in 1997. This expected decrease is the result of a large number of aircraft being retired from service. However, the forecast from 1997 through 2007 shows a steady increase in single engine piston aircraft of almost 1200 aircraft annually.

The ratio of pilots per plane in the U.S. is relatively stable at about 3:1 (GAMA Piston Engine Aircraft Revitalization Committee, 1996). One conclusion which might be drawn from this is that an increase in the number of pilots will increase the number of new aircraft sales. GAMA (1996) proposes that 10,000 new pilots will result in 2,500 to 4,000 new aircraft sales. The goal of GAMA is to train 100,000 new pilots annually by the year 2000 and to retain them for the long term.

The previous section suggested relatively high demand for single engine piston aircraft over the next ten years. The average age of the current fleet is becoming excessive, and aircraft are beginning to be retired from service and will need to be replaced with new aircraft. Also, the high forecast of new student pilots will increase the demand for primary trainers. These students, upon receiving their licenses, will potentially be in the market to buy new aircraft of their own.

Cessna is currently engaged in a "new" product launch with the first planes to be ready for delivery in early 1997. Cessna is going back into production of its 172, 182, and 206 models. The 172, before production was halted in 1986, was referred to as the

"World's Most Popular Airplane" (Stewart, 1995a; 1995b). A generally accepted assumption is that almost every pilot has spent at least a couple of hours in a 172 at one point or another. The 172 became the most prolific airplane in the history of the world when it surpassed the German fighter, the Messerschmitt Bf-109, with 36,010 172's having been built over a 31 year period (Stewart, 1995b).

The planes rolling off Cessna's production line in the near future will be new, but the basic designs are more than forty years old. The changes to be incorporated in the "new" aircraft will basically be limited to the powerplant, the interior decor, and the avionics package. The explanation for the limited modifications is simple. First, the aircraft were very popular and the designs have stood the test of time. Second, and more importantly, it is simply too expensive and time-consuming to go through the process of certifying a new airplane with the FAA. Russell Meyer, the chairman and CEO of Cessna, explained that the cost from design to certification of a new small single or twin engine airplane would be around $25 million and could take more than 3 and 1/2 years to accomplish (Banks, 1994). An important thing to add is that these numbers are for a "conventional" design and that any new design incorporating composite structures or "state of the art" materials or ideas would be much more costly and time consuming.

Opportunity in the Primary Trainer Market

Companies such as Cessna, Piper, and Beech once dominated the primary trainer marketplace. Cessna produced the popular 150/152 and 172 model trainers; Piper manufactured the Warrior and Cadet models in the trainer class; and Beech produced the Sundowner and Skipper models also in the trainer category. The state of the industry,

prior to GARA, including the fact that Cessna stopped production of piston-powered aircraft in 1986, Piper Aircraft was in Chapter 11 in 1991, and that Beech had significantly scaled back production, was discussed previously. One result is that flight training schools have been forced to either turn to foreign manufacturers for training aircraft, such as the Tampico TB9 or the Diamond DA20 Katana, or continue to operate an aging fleet. Another option was to turn to new manufacturers of trainer aircraft, such as American General, makers of the AG-5B Tiger; however, American General is no longer producing aircraft.

Global Aircraft Corporation (GAC), a Mississippi based firm, is in the process of certifying a new single engine aircraft with the FAA (Hirschman, 1995). The airplane, designated GT3, is a fully composite design and is being designed and marketed exclusively as a trainer. GAC president, Mike Smith, justified developing and marketing a new single engine airplane solely as a trainer with the following statements. "Twenty-five years ago, the military trained thousands of pilots annually. Last year, the Air Force trained a few hundred. That's not nearly enough to satisfy future demand from the airlines." (Hirschman, 1995) Smith believes the reduction in pilots trained by the military will make it necessary for the airlines to hire more civilian trained pilots; professional flight schools, which are currently operating aging fleets of Cessna and Piper aircraft, are the market Smith is pursuing (Hirschman, 1995).

Ed Stimpson, the vice chairman of GAMA, is heading up GA Team 2000; GA Team 2000 is an industry coalition with the objective of introducing people to flying (Cox, 1997). Financial support is being provided by over 100 companies with aviation interests,

including Cessna and Piper (Cox, 1997). Stimpson made the following remarks about the need to promote flying. "I think Cessna would agree, and Piper too, that new students are essential to the future. We haven't done anything since the late 1980s to promote flying." (Cox, 1997)

GAMA (1996) projects that there are approximately 1.2 million individuals who are "very interested" in learning to fly; most of the prospects in this category were found to earn over $50,000 per year in household income. GAMA has set a goal of training 100,000 new pilots annually and to be able to reach that rate by the year 2000 (GAMA Piston Engine Aircraft Revitalization Committee, 1996).

It would be beyond the scope of this paper to attempt to address the general aviation aircraft marketplace as a whole. Therefore the segment of the market to be studied is the general aviation trainer market. GAMA, and the collective industry as a whole, believes the future of general aviation lies in training new pilots. The number of people holding pilot licenses has dropped from 827,000 in 1980 to 640,000 in 1995; the FAA and GAMA estimate that about 1/3 of the individuals holding a private pilot's license in 1995 were 50 years old or older, and that approximately 13% were less than 30 years old (Cox, 1997). The pilot population is aging and the number of pilots is dwindling. The goal of industry coalitions, such as GA Team 2000, is to reverse this trend in order to insure a marketplace for aircraft manufacturers in the future (Cox, 1997). Therefore, one of the largest growth segments in general aviation in the near future will be in the training of new pilots. This will result in the need for additional primary training aircraft as well as the replacement of older training aircraft.

Purpose of the Research

The purpose of this paper is to apply a product rejuvenation model to the general aviation aircraft industry and to investigate if market demand exists for Cessna in relaunching the 172 into the aviation training marketplace. Product rejuvenation, simply stated, is the process of reintroducing existing products which are in decline or have been abandoned (Berenson and Mohr-Jackson, 1994; Lazer et al., 1984). Product rejuvenation strategies available to the general aviation industry are explored, and the advantages of a product rejuvenation strategy over one of true innovation are discussed. Also, the unique environment within which the U.S. domestic aircraft manufacturers must operate is discussed establishing product rejuvenation as a viable and quite possibly the only course of action.

The basic research question is whether utilizing a product rejuvenation model demonstrates a market demand for Cessna in the primary trainer market. The population for the research is the colleges and universities which are members of the University Aviation Association (UAA) and located within the 50 United States. A survey of those members which 1) offer flight training and 2) own and operate their own fleet of aircraft was conducted. A more detailed description of the survey instrument and the data collection process in general is provided in Chapter 3. The next chapter presents product rejuvenation theory, product rejuvenation strategies, and discusses how the theory and strategies relate to the general aviation aircraft market.

Chapter References

Banks, Howard, Cleared for Takeoff. *Forbes* (September 12, 1994): 116-122.

Barnard, Thomas, Courts and Crashes: Why $70,000 of an Aircraft's cost is for Product Liability Insurance. *Canadian Aviation* (July 1985): 33-35.

Berenson, Conrad, and Mohr-Jackson, Iris, Product Rejuvenation: A Less Risky Alternative to Product Innovation. *Business Horizons* 37 (November-December 1994): 51-57.

Cox, Bob, Single-Engine Airplanes Roll Off Independence, Kans.., Cessna Assembly Line. *The Wichita Eagle* (April 28, 1997).

Craig, Andrew, Product Liability and Safety in General Aviation, in *The Liability Maze.* Peter W. Huber and Robert E. Litan, eds., The Brookings Institute, Washington, D.C., 1991.

Eichenberger, Jerry A., *General Aviation Law*, Tab Books, PA. 1990.

FAA Aviation Forecasts - Fiscal Year 1996-2007. Federal Aviation Administration, Office of Aviation Policy and Plans, Department of Transportation (March 1996).

Final Report of the GAMA Piston Engine Aircraft Revitalization Committee, Piston Engine Aircraft Revitalization Committee, General Aviation Manufacturers Association, (March 26, 1996).

Gottschalk, Mark A., General Aviation Experiences a Rebirth. *Design News* 50 (September 11, 1995): 27-28.

Hirschman, Dave, Aviation - Miss. Firm Plans to Build Trainer Plane of the Future. *The Commercial Appeal* (August 23, 1995): B5.

Horn, Julia, The General Aviation Industry from 1983 to 1988. *Harvard Business School;* 9-389-096 (1989): 1-9.

Lazer, William, Luqmani, Mushtaq, and Quraeshi, Zahir, Product Rejuvenation Strategies. *Business Horizons* (November-December 1984): 21-28.

Martin, Robert, General Aviation Manufacturing: An Industry under Siege, in *The Liability Maze.* Peter W. Huber and Robert E. Litan, eds., The Brookings Institute, Washington, D.C., 1991.

Shapiro, Stacy, Product Liability Reform Revitalizes General Aviation. *Business Insurance* (May 15, 1995): 3, 15.

Stern, William M., A Wing and a Prayer. *Forbes* (April 25, 1994): 42-43.

Stewart, Chuck, Restart 172. *Air Progress* 57 (July 1995a): 12-13.

Stewart, Chuck, Affordable Classic. *Air Progress* 57 (October 1995b): 30-38+.

Truitt, Lawrence J., and Tarry, Scott E., The Rise and Fall of General Aviation: Product Liability, Market Structure, and Technological Innovation. *Transportation Journal* 34 (Summer 1995): 52-70.

Chapter 2

Product liability law, the major environmental factor which crippled small aircraft manufacturers in the 1980s, has been reformed. The general aviation industry is poised to move forward after more than a decade of turmoil and strife. Cessna announced its decision to reenter the small single engine piston market immediately after the passage of GARA.

Cessna will reenter the piston powered market with three models, each of which were abandoned more than a decade ago as a result of the rising cost of product liability. The three models being reintroduced are the classic C-172, C-182, and the C-206. The main reason Cessna is relaunching existing aircraft models is to avoid the astronomical cost, in terms of time and money, of certifying a new design with the FAA. Russell Meyer, the chairman and CEO of Cessna, explains that the total production startup cost of these three models combined will be less than certifying one new single engine model with the FAA (AW&ST, June, 1995).

Therefore, a "new" plane from the point of view of Cessna is a simple product line extension (Stewart, 1995a; 1995b), which is the lowest level of newness (Berkowitz et al., 1994). The aircraft to be produced are virtually identical to those of the previous generation which were last produced in 1986. From the point of view of the consumer, the "new" aircraft will be classified as continuous innovation, or one that does not require any new learning or changes in the consumer's behavior (Berkowitz et al., 1994).

Based on empirical research conducted by Robert G. Cooper and E. J. Kleinschmidt (1987), there are several key factors that are necessary for the success of a new product. The number one success factor with the strongest correlation and largest support in their research was *Product Advantage* (Cooper and Kleinschmidt, 1987). "Product superiority separated winners from losers more often than any other single factor." (Cooper, 1990, p.30). Product superiority was based on the following six items (Cooper and Kleinschmidt, 1987) :

1.) Unique benefits for the customer;

2.) Product quality;

3.) Reduced customers' costs;

4.) Product innovativeness;

5.) Product superiority in the eyes of the customer; and

6.) Solution to a customer's problem.

As previously mentioned, the cost to certify a new design with the FAA is prohibitive to launching a new model aircraft. The FAA considers any structural change, regardless how small, a change in the design which requires a new certification. This seriously limits the degree to which new innovations can be brought to market while also reducing customers' costs. To counter these forces, manufacturers are turning to designs of the past, updated with today's avionics, to offer quality products that produce superiority in the eyes of the consumer.

Product Rejuvenation

The strategies pursued by the domestic U.S. aircraft industry today are product rejuvenation strategies. The basic idea behind product rejuvenation is reintroducing existing products which are in decline or have been abandoned in the past for one reason or another (Berenson and Mohr-Jackson, 1994; Lazer et al., 1984). The primary reason offered by the manufacturers for the abandonment of small piston powered aircraft was product liability.

One factor which is increasing interest in previously abandoned products is the recognition that significant value already exists in old brand names, and that it is becoming very risky and expensive to try to create this value with a new brand (Berenson and Mohr-Jackson, 1994). Also, abandoned products may have some form of nostalgic value. "Perhaps they evoke pleasant memories of the 'good old days,' providing vicarious enjoyment of an earlier decade." (Berenson and Mohr-Jackson, 1994) This type of behavior exists in the aviation community. For example, many older pilots still enjoy flying WWI vintage, tail dragger aircraft for the reason identified above.

Product rejuvenation is less risky and less expensive than product innovation. The risk associated with product innovation is high; there exists a high degree of uncertainty in entering new, unfamiliar markets and the odds for success are low (Berenson and Mohr-Jackson, 1994). Another feature is a savings in time. For example, Cessna already possesses the knowledge, machinery, and equipment to begin production of it's existing designs immediately. As the saying goes, "time is money"; reductions in time will lead to cost reductions. "New products are created from old products at a fraction of the cost

incurred in developing new ones from scratch." (Berenson and Mohr-Jackson, 1994, p.51). Product rejuvenation creates value at reduced costs, and some of the additional cost reductions available are (Berenson and Mohr-Jackson, 1994):

1.) Promotional costs, because of product familiarity;

2.) Product development costs;

3.) Channel cooperation and relationship costs; and

4.) Production and technology costs.

The Cessna 172 is known as the "World's Most Popular Airplane" and is in fact the most prolifically produced airplane in history (Stewart, 1995a; 1995b). This should impact the promotional costs Cessna will incur, simply due to product familiarity. Cessna already possesses the knowledge, tools, and technology to build the 172, 182, and 206 models. Therefore, Cessna will not need to make a large investment in new technologies, R&D, or new certifications which would be necessary in the case of a new design or a completely new product. Also, Cessna has maintained a reputation of good product support even though they were not manufacturing new airplanes; as a result, Cessna has retained a strong distribution network and has strong channel support.

There are four different product rejuvenation strategies possible, which differ according to the target market and whether or not the product is modified (Lazer et al., 1984; Michell et al., 1991). The four strategies are not mutually exclusive, recognizing that a rejuvenated product may appeal to both old and new users. The four strategies are (Lazer et al., 1984; Michell et al., 1991):

> *Recapture*: the manufacturer markets abandoned products to previous users without making product alterations.

Redesign: marketing a modified version of a product in decline or that has been abandoned to previous users.

Refocus: marketing the abandoned product to users who have little, if any, experience with the product.

Recast: marketing a modified product to a new customer who has little experience with the product.

Lazer, Luqmani, and Quraeshi (1984) identify a process for implementing a product rejuvenation program. The four steps or phases of the process are identifying prospects, performing an environmental scan, a product / market screen, and selecting a strategy or strategies. Figure 1 illustrates the implementation process.

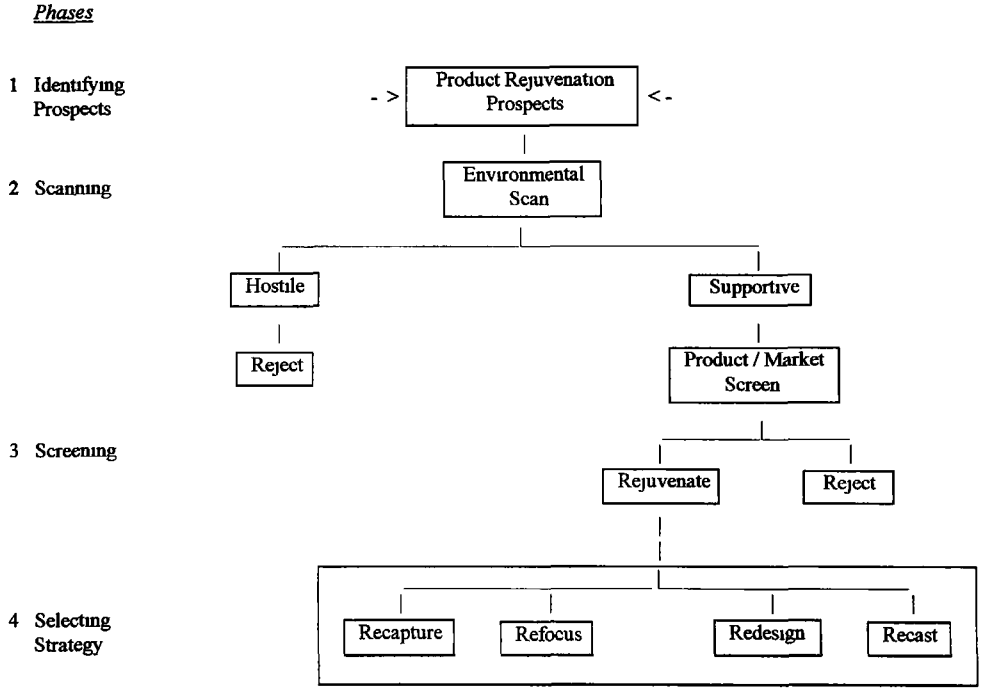

Figure 1. Implementing a Product Rejuvenation Program

Source Lazer, William, Luqmani, Mushtaq, and Quraeshi, Zahir, Product Rejuvenation Strategies *Business Horizons* (November-December 1984) 21-28

Identifying Prospects

One way to identify prospects for rejuvenation is to analyze declining and abandoned products from the past and present. An appeal to one of the following five interests is likely to increase the chances of successful rejuvenation (Lazer et al., 1984).

1.) *Utilitarian*: older products viewed as more practical than current ones by customers.

2.) *Fashions*: clothing, furniture, and hair styles are common rejuvenation candidates.

3.) *Recreational*: value or benefits of older activities once again become popular.

4.) *Nostalgic*: evoke memories of the past / a return to a previous era.

5.) *Antique orientation*: replicas of originals or a return to craftsmanlike quality.

The three interests identified above which have the most relevance to the general aviation aircraft industry are utilitarian, recreational, and nostalgic. For example, the Cessna 172 has been a very successful airplane and has stood the test of time (Stewart, 1995a; 1995b). The 172 is not a high performance airplane but is a solid, consistent, and practical airplane and a very good primary trainer. This indicates a potential appeal from a utilitarian standpoint. Considering that the 172 has been a staple of general aviation for the past five decades, the 172 may also invoke a nostalgic interest. Also, a recent GAMA survey projected that 1.2 million individuals are "very interested" in learning to fly (GAMA Piston Engine Aircraft Revitalization Committee, 1996). From a recreational viewpoint, learning to fly is once again becoming popular after a period of stagnation and decline.

Environmental Scan

A scan of the environment for trends which will be supportive of or a hindrance to the rejuvenated product follows the identification process. An environmental scan can be broken down into the following two steps (Lazer et al., 1984).

1.) Identify the environmental conditions which led to the abandonment of the product originally.

2.) Determine the present or future conditions which might lead to an environment which is once again supportive.

An environmental scan is designed to make management sensitive to problems which may reappear during relaunch as well as to recognize new opportunities as they appear (Lazer et al., 1984). The following subsections investigate the two-step process of conducting an environmental scan, relating them specifically to the general aviation aircraft industry.

Environmental conditions which led to abandonment

The reason given by the manufacturers for the abandonment of the small plane market, that the rising cost of product liability drove them from it, was discussed in detail in Chapter 1. In addition, researchers (Truitt and Tarry, 1995) have identified other environmental factors which caused difficulty in the marketplace. Environmental effects such as high inflation rates (late 1970s), high interest rates (early 1980s), and the oil crisis and its effect on fuel prices impacted the small plane market. Truitt and Tarry (1995) identified other possible explanations for the almost total abandonment of the small plane market. These explanations include the increased longevity of existing aircraft, increasing prices for aircraft, and poor economic conditions in general. Additionally, government

actions such as tightening the GI Bill benefits for pilot training (mid 1970s) and changing tax policies greatly impacted the market structure.

Overall though, the product liability problem was the most severe and had a substantial impact on the market. Product liability insurance premiums increased significantly throughout the 1980s; the industry average for annual liability insurance was about $24 million in 1978 and $210 million in 1985 (Truitt and Tarry, 1995). The result by 1987 was that $70,000 to $100,000 of the unit price of a small Cessna, Piper, or Beech was directly attributed to the cost of product liability (Truitt and Tarry, 1995). Due to these added costs, a large number of pilots as well as flight schools were priced out of the new piston-powered aircraft market. Demand for aircraft fell as the cost of ownership increased; return on investment of new piston-powered aircraft fell from 18.2% in 1976 to a -10.3% in 1995 (GAMA Piston Engine Aircraft Revitalization Committee, 1996). Additionally, insurance underwriters stopped offering product liability coverage to aircraft manufacturers in the 1980s as a result of the number of claims against the industry (Truitt and Tarry, 1995). Piper attempted to insure itself and, as previously stated, ended up in bankruptcy.

Examining the Macroenvironmental Factors Favoring Rejuvenation

Product liability reform is the major environmental factor that makes rejuvenation of the small aircraft industry possible (Cook, 1995; Gottschalk, 1995; Stewart, 1995a). With the passage of this law, a "positive outlook" has returned to the manufacturers in the industry and this optimism is fueling manufacturers desire to reenter the market (Eichenberger, 1994; Swanda, 1996).

Other macroenvironmental trends have also recently shown signs that suggest rejuvenation strategies. New financing plans, lowering down payments and extending lengths of payback, in combination with lower interest rates, are among the improving economic conditions for small plane purchases (Swanda, 1996). Low inflation rates are not expected to significantly impact fuel and operating costs for smaller planes (FAA Forecast, 1996). Additionally, new marketing efforts by various industry groups and pilot associations are expected to increase the number of student pilots, which was found to have a major impact on future small plane demand (GAMA Piston Engine Aircraft Revitalization Committee, 1996; Swanda, 1996).

Product / Market Screen

The screening phase establishes potential in the marketplace. "Screening identifies and rates product-specific and market-specific factors which might enhance or impede acceptance." (Lazer et al., 1984) Rejuvenation is generally unsuccessful when abandoned products have been replaced with something technologically superior. However, a product which appears technologically outdated can be rejuvenated in new environments or when changes in the environment make them viable alternatives again (Lazer et al., 1984).

Selecting a Strategy

The decision to revive an abandoned product is based on some of the same considerations as introducing a new product. Some of these considerations are resource requirements, expected contribution to sales and profits, and compatibility to current

capabilities in marketing and production (Lazer et al., 1984). The strategy or strategies chosen should be based on customer expectations (Lazer et al., 1984).

The product rejuvenation strategies that the piston powered aircraft companies are pursuing are the *Redesign* and *Recast* strategies. The large numbers of aging piston powered aircraft are helping the companies to pursue a Redesign strategy. With so many aircraft aging, and many of these beyond the 18 year limit of GARA, a large number of current owners, both individuals and flight schools, may be looking to purchase new aircraft making the Redesign strategy a viable alternative for the manufacturers. Helping the companies pursue a Recast strategy are plans by the manufacturers to keep prices relative to those of the mid 1980s, adjusted for inflation, and by appealing to the older "baby boomers" who have the discretionary income to fly (Cook, 1995).

Berenson and Mohr-Jackson (1994) identified five steps which can be followed to determine opportunities for rejuvenation and increase the probability of product rejuvenation success. These five steps are:

1.) Determine the reasons for the products abandonment.

2.) Examine whether the forces in the macroenvironment support a rejuvenation strategy.

3.) Examine what the product name communicates to consumers.

4.) Explore whether there is a potential segment to be reached, as well as competitors' strengths and weaknesses in that potential segment.

5.) Examine the possibilities of creating value for customers.

The reasons for the product's abandonment as well as the examination of environmental forces which support rejuvenation have been discussed in detail. The

following discussion investigates the last three of these factors and how the three are shaping rejuvenation strategies being pursued by the general aviation manufacturers in the small plane market.

Examine What the Product Name Communicates to Consumers

Brand name recognition plays a major role in favoring a product rejuvenation strategy. Reflecting this fact upon its emergence from bankruptcy, Piper renamed itself "The New Piper Aircraft" to take advantage of its positive name recognition and to inform old customers of the new start.

Cessna is recognized as having the strongest brand name recognition in the field (AW&ST, June 5, 1995). The Cessna model C-172 is known as the "World's Most Popular Airplane" and most pilots have spent at least some time in a 172 (Banks, 1994; Stewart, 1995a; 1995b). Further evidence of the popularity of the brand and model is found in the willingness of pilots to put down payments on the planes without knowing either what the final price of the revised 172 will be or the exact delivery date (Charles, 1996).

Is There a Potential Segment; Competitors' Strengths/Weaknesses in that Segment

Recent research found a potential market of 1.2 million individuals who are very interested in learning to fly. The demographics of those identified show a potential student population that has the income to fly (over $50,000 per year household income), are motivated to learn, and have the time to devote to training and flying (GAMA Piston Engine Aircraft Revitalization Committee, 1996). Additionally, recently launched industry initiatives are directed at increasing the student pilot population to 100,000 pilots annually

and returning the active pilot population to 800,000 by the year 2000 (GAMA Piston Engine Aircraft Revitalization Committee, 1996). The steady pilot to plane ratio of 3:1 is an indicator that increasing the pilot population will assure that a potential segment is available for the increased production.

Cessna is seen as the potential industry leader (Stewart, 1995a; 1995b). Even without building a small plane in 10 years, and not delivering the first model 172 until early 1997, Cessna's name recognition gives the firm a major marketplace advantage. Cessna aggressively reidentified and qualified a supplier base, and is moving to upgrade and expand its worldwide network of Cessna Pilot Centers. The small plane market may add up to $300 million a year to Cessna's sales figures by 1998 with good returns and minimal risk due to the passage of GARA (AW&ST, June 5, 1995). The New Piper Aircraft is also gearing up production from 177 planes in 1995 to a target of 500 planes in 2000. All manufacturers are expected to benefit from the increase in demand and improved balance sheets freed from liability costs (Swanda, 1996).

The Possibilities of Creating Value for Customers

In addition to the activities of firms discussed earlier, kit plane manufacturers are also moving to have their planes certified to the same strict standards as Cessna and Piper. These planes are bringing design innovations and the use of new composites in manufacturing to produce planes that bring lower prices and higher performance to the market than those of the leading manufacturers (Cook, 1995).

GAMA recognizes the need to improve the perceived value of new aircraft by closing the perceived price-performance gap between new aircraft and experimental

aircraft (GAMA Piston Engine Aircraft Revitalization Committee, 1996). GAMA is stressing the need for manufacturers to work with the FAA to simplify and provide uniform interpretations of FAA regulations concerning aircraft certification, to keep costs down. The main reason behind the regulations regarding certification is safety. Regulations where the costs exceed the benefits should be eliminated and many of the certification responsibilities currently being handled by the FAA could be delegated out without adversely impacting safety (GAMA Piston Engine Aircraft Revitalization Committee, 1996).

Relating Product Rejuvenation to Product Life Cycle

Some research (Ennis, 1975) suggests that product rejuvenation is an additional cycle in the traditional product life cycle of introduction, growth, maturity, and decline. The rejuvenation cycle may consist of product improvement, repositioning the perception of the product, new distribution outlets, and or establishing new uses for the product. Michell, Quinn, and Percival (1991) suggest that product rejuvenation is one of six strategies which can be employed to extend the product life cycle. Rejuvenation strategies of recapture, redesign, refocus, and recast are offered.

Chapter Summary

Product rejuvenation is the process of reintroducing existing products which have been abandoned. The four rejuvenation strategies available are recapture, redesign, refocus, and recast, and the two currently being pursued by the general aviation aircraft manufacturers are redesign and recast. Some of the factors favoring a rejuvenation strategy over one of true innovation are existing brand recognition, popularity and success

of past models, and most importantly the high cost of certifying a new design with the FAA.

Chapter References

Banks, Howard, Cleared for Takeoff. *Forbes* (September 12, 1994): 116-122.

Berenson, Conrad, and Mohr-Jackson, Iris, Product Rejuvenation: A Less Risky Alternative to Product Innovation. *Business Horizons* 37 (November-December 1994): 51-57.

Berkowitz, Eric N., Kerin, Roger A., Hartley, Steven W., and Rudelius, William, *Marketing*, 4th ed., Richard D. Irwin, Inc., Boston, MA. 1994.

Charles, Bob, Something's Coming. *Air Progress Affordable Flying* (January 1996): 14.

Cook, William J., The Takeoff in the Small Plane Market. *U.S. News & World Report* 119 (August 21, 1995): 50.

Cooper, Robert G., and Kleinschmidt, E. J., New Products: What Separates Winners from Losers? *Journal of Product Innovation Management* 4 (September 1987): 169-184.

Cooper, Robert G., New Products: What Distinguishes the Winners? *Research-Technology Management* 33 (November-December 1990): 27-31.

Eichenberger, Jerry A., The Day After. *The Aviation Consumer* (October 1, 1994): 16-17.

Ennis, F. B., Finding the Golden Ages of a Product's Life Cycle. *Product Management* (November 1975): 36-41.

FAA Aviation Forecasts - Fiscal Year 1996-2007. Federal Aviation Administration, Office of Aviation Policy and Plans, Department of Transportation (March 1996).

Final Report of the GAMA Piston Engine Aircraft Revitalization Committee, Piston Engine Aircraft Revitalization Committee, General Aviation Manufacturers Association, (March 26, 1996).

First "New" C-172s To Fly In Late 1996. *Aviation Week & Space Technology* 142 (June 5, 1995): 64-65.

Gottschalk, Mark A., General Aviation Experiences a Rebirth. *Design News* 50 (September 11, 1995): 27-28.

Lazer, William, Luqmani, Mushtaq, and Quraeshi, Zahir, Product Rejuvenation Strategies. *Business Horizons* (November-December 1984): 21-28.

Michell, Paul C. N., Quinn, Peter, and Percival, Edward, Marketing Strategies for Mature Industrial Products. *Industrial Marketing Management* 20 (August 1991): 201-206.

Stewart, Chuck, Restart 172. *Air Progress* 57 (July 1995a): 12-13.

Stewart, Chuck, Affordable Classic. *Air Progress* 57 (October 1995b): 30-38+.

Swanda, Ronald L., Light General and Personal Aviation. *Transportation Research Circular* 454 (February 1996): 65-70.

Truitt, Lawrence J., and Tarry, Scott E., The Rise and Fall of General Aviation: Product Liability, Market Structure, and Technological Innovation. *Transportation Journal* 34 (Summer 1995): 52-70.

Chapter 3

The objective of this exploratory study is to investigate the existence of market demand for the Cessna 172 in the collegiate aviation primary trainer market, within a product rejuvenation framework. Cessna has been a leader in the piston-powered aircraft market, and the notoriety and longevity of the Cessna 172 has been discussed. With this in mind, the return of Cessna to the piston powered market, and the reintroduction of the 172 in particular, was central to the research and data collection conducted.

The scope of the research was the colleges and universities who are members of the University Aviation Association (UAA). Each member was contacted and those who 1) had a flight training program; and 2) owned and operated their own fleet of aircraft was surveyed. The remaining schools who did not meet these criteria were removed from the list as they were not relevant to this study. The schools were surveyed with the goal of accomplishing three general items: 1) a verification of the demand for new single engine trainer aircraft; 2) the determination of whether significant brand recognition and brand loyalty still exists; and 3) perceptions of UAA members of the Cessna 172. Other objectives of the survey included establishing the process used in buying new aircraft, a profile of the UAA member schools, and a profile of the respondents, which in this case were the decision makers. Cessna and the 172 in particular were used predominately in the survey primarily due to the timing of Cessna's relaunch of the 172 and the significant brand recognition that once existed.

Survey Method

The data collection method employed was a telephone survey. A telephone survey was chosen over other techniques for several reasons. The main reason was that it was initially unclear who the person relevant to the study was at each school. The individual who is relevant to this study is the person who influences the decision to buy aircraft and specifically influences which aircraft to buy. Research discovered that position titles and job responsibilities vary from school to school depending on the size of the school as well as other factors. This makes it difficult to mail or fax surveys and have them completed by the appropriate individuals. Another important reason was that a screening phone call was necessary to establish whether the school fit the criteria to determine whether or not the school should be surveyed. Considering that the survey was relatively short with only 16 questions, the uncertainty of who the appropriate person was, and the fact that a screening call to each school was necessary anyway, it was decided that a telephone survey would be the most feasible, save the most time, and produce the most accurate results.

Survey Population

The Collegiate Aviation Guide, a publication of the UAA, was used to establish the initial population. Each school represented in the Collegiate Aviation Guide was a member of the UAA at the date of publication in 1994. The UAA is the largest association of schools with aviation offerings and therefore, offers the most comprehensive list of schools with aviation related degree programs. The members which were located within the 50 U.S. states were contacted. The members which 1) had a flight training program and 2) owned and operated their own fleet of aircraft came to represent

the survey population. The UAA members which did not meet these criteria were not considered because they were no longer relevant to this study.

There were 275 UAA members within the 50 United States listed in the guide. Embry-Riddle Aeronautical University was listed twice due to the fact that Embry-Riddle has campuses in Prescott, Arizona as well as Daytona Beach, Florida. Coinciding with the data collection process was the announcement of Embry-Riddle's partnership with Cessna. In light of the fact that Embry-Riddle is already in the process of purchasing new 172s, the school was not included in this survey. Piedmont Bible College, a UAA member listed in the guide, was unable to be contacted. Directory assistance had no listing for a Piedmont Bible College and the school was consequently discarded from the list. Finally, after removing Embry-Riddle Aeronautical University and Piedmont Bible College from the list for the reasons mentioned above, 272 members of the UAA within the 50 United States remained.

Each of the 272 members were contacted. Of the 272, 208 were eliminated because they did not meet the criteria of having a flight training program, owning their own fleet of aircraft, or both. Therefore, the remaining 64 schools constituted the survey population. Each of the 64 schools were contacted by phone at least once. Of the 64, 50 surveys were completed. There were 13 schools where the person to be surveyed could not be reached by phone; therefore, surveys with an attached cover letter explaining the project were faxed to the appropriate contact people at these schools. One school was contacted by phone and the person relevant to the survey decided not to participate.

Surveys were completed and returned by 5 of the 13 schools which had been sent surveys by fax; therefore, the final response rate was 55 out of 64 or approximately 86%.

Survey Instrument

The survey itself was relatively straightforward with only sixteen questions. The main objectives of the survey were:

1.) Establish demand for new single engine trainers.

2.) Establish a purchase pattern for acquiring new aircraft.

3.) Investigate UAA members' perceptions of the 172 in an attempt to establish whether significant brand loyalty and brand recognition still exist.

4.) Establish the awareness of UAA members of alternative trainers in the market.

5.) Establish a profile of the UAA member schools keying in on the size of existing fleets, age of existing fleets, current fleet composition, and average student enrollment.

6.) Establish a profile of the decision makers.

Ten of the sixteen questions used a nominal scale, five questions used an interval scale, and one question used an ordinal scale. A copy of the survey is attached in Appendix 1.

Data to be Collected

The profile of the surveyed schools will be established including the average age, size, and composition of the primary, single engine trainer fleet. The average size of each program and a percentage of those schools anticipating growth in the near future will be calculated. Demand for new single engine trainer aircraft will be established and the percentage of schools needing aircraft within the next one to two years will be calculated. Another point of interest are purchase patterns with respect to aircraft; the process flight

schools go through in buying new aircraft will be investigated. The profile of the decision makers will also be established including whether or not they are pilots, flight instructors, and if they have flight time in the Cessna 172.

The next area to be investigated are the rejuvenation factors which support Cessna. The perceived importance of the following seven factors with respect to Cessna and the 172 will be analyzed.

1.) Brand name;

2.) Past experience;

3.) Manufactured in the U.S.;

4.) Flight characteristics;

5.) Ability to do "spin" training;

6.) Reputation; and

7.) Price.

The ability to do "spin" training was included because the 172 is rated to do "spin" training, whereas, not all trainers are. Therefore, it is of interest to know the relative perceived importance of this factor. Also, the awareness of other primary flight trainers in the market will be established. These data will be discussed in the context of product rejuvenation theory and the factors which support product rejuvenation. Complete data analysis and a discussion of results is conducted in Chapter 4.

Chapter Summary

This chapter identified the chosen survey method to be a telephone survey and provided justification for the choice. The survey population was discussed, and the

appropriateness of using the UAA membership was addressed. There were 272 UAA members initially contacted, but 208 were eliminated for not meeting the criteria established for this study. Of the remaining 64, 55 surveys were completed which calculates to a response rate of approximately 86%. Lastly, the survey instrument was discussed, listing the main objectives of the survey. A preview of data to be collected was offered in this chapter, but Chapter 4 presents the detailed data analysis and a discussion of results

Chapter 4

The purpose of this research is to apply a product rejuvenation framework to the general aviation market to investigate if sufficient market demand exists for Cessna in reintroducing the model 172. The segment of the market which was studied was the collegiate primary flight trainer market. Cessna's model 152, a small two-seat tricycle gear airplane, was a very popular trainer with flight schools. Cessna does not intend to bring the 152 back into production; therefore, the 152's role as a trainer is intended to be filled by the larger, four-seat 172 (Simpson, 1995).

The primary data collection technique was a telephone interview. The questionnaire focused, to a large extent, on Cessna and the model 172. Respondent perceptions of the 172 and its role as a trainer were investigated. The demographics of the flight schools and of the decision makers at each school was established. Also, the factors which are proposed to increase the chance of product rejuvenation success, discussed in detail in Chapter 2, were investigated and related to Cessna's relaunch of the 172. A copy of the survey is attached in Appendix 1.

The population for the research were the members of the University Aviation Association (UAA). The Collegiate Aviation Guide, a publication of the UAA listing members and their respective aviation offerings, was used to establish the population. There were 275 members listed in the guide which were located within the 50 United States; however, the two Embry-Riddle Aeronautical University campuses as well as

Piedmont Bible College were removed from the list for the reasons mentioned in Chapter 3. Therefore, the final list consisted of 272 schools. Initially, all 272 members were contacted, but 208 members were eliminated because the members did not meet the criteria of 1) operating a flight school, or 2) owning and operating their own fleet of aircraft or both. The survey population remaining consisted of 64 UAA member schools. Of the 64 schools, 55 surveys were completed. Therefore, the response rate was approximately 86%. Table 1 lists the respondents alphabetically by state. The 55 respondents were spread out over a wide geographic area and 31 of the 50 states were represented.

Demographics of the Schools

One of the objectives of the survey was to establish a profile of the member schools. The main points of interest were 1) the average size of the primary trainer fleet, 2) the average age of the primary trainer fleet, 3) the average number of students enrolled in each program and whether or not members anticipate an increase in student enrollment in the near future and, 4) the composition of the current fleet. Each of the main points identified above are subsequently discussed. The numbers presented are aggregate numbers as the objective is to identify the profile of the fleet as a whole and not individual schools.

Size of the Primary Trainer Fleet

To establish the size of the trainer fleet, each respondent was asked to provide the number of primary, single engine trainer aircraft currently in their respective fleet. These numbers were totaled and an average number of planes per school calculated. Table 2

Table 1
List of Respondents

Alabama Aviation and Technical College (AL)	Winona State University (MN)
Auburn University (AL)	Delta State University (MS)
Cochise Community College (AZ)	Central Missouri State University (MO)
Henderson State University (AR)	College of the Ozarks (MO)
Christian Heritage College (CA)	Mercer County Community College (NJ)
Aims Community College (CO)	SUNY College of Technology at Farmingdale (NY)
Colorado Northwestern Community College (CO)	University of North Dakota (ND)
Emery Aviation College (CO)	Bowling Green State University (OH)
University of New Haven (CT)	Davis College (OH)
Delaware State College (DE)	Kent State University (OH)
Florida Institute of Technology (FL)	The Ohio State University (OH)
Lewis University (IL)	Ohio University (OH)
Parks College of St. Louis University (IL)	Oklahoma State University (OK)
Southern Illinois University at Carbondale (IL)	Southeastern Oklahoma State University (OK)
University of Illinois (IL)	Spartan School of Aeronautics (OK)
Vincennes University (IN)	University of Oklahoma (OK)
University of Dubuque (IA)	Lane Community College (OR)
Hesston College (KS)	South Dakota State University (SD)
Kansas State University at Salina (KS)	Middle Tennessee State University (TN)
Louisiana Tech University (LA)	Central Texas College (TX)
Northwestern State University of Louisiana (LA)	Texas State Tech. College at Waco (TX)
Andrews University (MI)	Utah Valley State College (UT)
Jackson Community College (MI)	Averett College (VA)
Lansing Community College (MI)	Big Bend Community College (WA)
Northwestern Michigan College (MI)	Walla Walla College (WA)
Western Michigan University (MI)	College of West Virginia (WV)
Inver Hills Community College (MN)	Gateway Technical College (WI)
St. Cloud State University (MN)	

presents fleet size data including the mean number of primary trainers per school, the total number of trainers, and a range showing the smallest to largest number of trainers.

Table 2

Primary Trainer Fleet Size

n=55

Mean (# of trainers)	Minimum (# of trainers)	Maximum (# of trainers)	Median (# of trainers)	Total (# of trainers)
13.49	1	59	10	742

As table 2 shows, there are a total of 742 primary, single engine trainers operating within the 55 responding schools. The range in the number of trainers per school was a minimum of 1 and a maximum of 59. The mean number of primary trainers per school computed to 13.49.

Age of the Primary Trainer Fleet

In order to investigate the approximate age of the primary trainer fleet, each respondent was asked to provide the average age of the primary, single engine trainer fleet at their respective school. A weighted average age for the aggregate fleet was calculated using the number of planes at each school and the corresponding age. Table 3 contains the summary data for the age of the fleet. The range in the age of the fleet is wide, with 3 years old being the newest individual fleet and 25 years old being the oldest individual fleet. The weighted average age, taking into account the number of planes and the average age of each of the respondent's fleets, is 14.33 years.

Table 3

Average Age of the Primary Trainer Fleet

n=52

Weighted Average Age (years)	Minimum Age (years)	Maximum Age (years)
14.33	3	25

Student Enrollment

Each respondent was asked to provide the approximate number of students currently in their respective program. As Table 4 shows, enrollment ranges from a minimum of 12 students to a maximum of 1,200. The mean number of students per program is approximately 146.

Table 4

Student Enrollment

n=55

Mean (# of students)	Minimum (# of students)	Maximum (# of students)	Total (# of students)
146.07	12	1,200	8,034

Each respondent was also asked if the school anticipates an increase in enrollment over the next two years. Table 5 presents the frequency of response to the issue of an increase in enrollment. As is indicated by Table 5, 47 of 54 respondents anticipate an increase in enrollment which equates to 87%. Of the seven schools which responded no, several commented that the programs are capped, and that the schools do not allow the programs to grow.

Table 5

Increased Enrollment Over the Next Two Years

n=54

Response	Frequency (#)	Percent (%)
Yes, anticipate increase	47	87
No, don't anticipate increase	7	13

Fleet Composition

In order to establish the composition of the current fleet, respondents were asked to provide the number of primary trainers in their fleet and to break them down by manufacturer. Table 6 indicates that 44 of 53 responding schools operate Cessna products, primarily the 150/152 and 172 models, and that the primary trainer fleet of 31 of those 44 schools is comprised solely of Cessna products. Table 6 provides the breakdown by manufacturer and lists the total number of aircraft from each manufacturer in operation.

Table 6

Primary Trainer Fleet Composition

n=53

Manufacturer	Minimum (#)	Maximum (#)	Total (#)	Number of Schools
Cessna	1	50	469	44
Piper	1	46	117	13
Katana	5	5	5	1
Maule	0	0	0	0
Tampico	17	17	17	1
Beech	2	20	53	5
Other	1	14	57	9

Process Utilized in Buying New Aircraft

The process which flight schools go through when purchasing new aircraft was investigated. Table 7 lists the various processes and the frequency of response for each. Nearly 1/3 of the responding schools said that the school primarily purchases aircraft which are of the same type as the established fleet. As Table 7 indicates, an additional 27.3% said that staying within the established fleet was at least one consideration by indicating the use of a combination of processes represented by response numbers 6,7, and 8. Therefore, a total of 60% identified purchasing aircraft which are of the same type as the established fleet as an important aspect in deciding which aircraft to purchase.

Table 7

Process Used in Buying New Aircraft

n=55

Response	Frequency of Response (#)	Percent (%)
1.) Solicit outside bids from manufacturers	6	10.9
2.) Do own research on aircraft	10	18.2
3.) Purchase within existing fleet	18	32.7
4.) Other	2	3.6
5.) Solicit outside bids & do own research	4	7.3
6.) Solicit outside bids & purchase within fleet	3	5.5
7.) Do own research & purchase within fleet	6	10.9
8.) Solicit bids, do research, & purchase within fleet	6	10.9

Demographics of the Respondents

Another stated objective of the research was to establish a profile of the respondents. The respondents have already been established as the individuals who influence and or makes the decision to buy aircraft at their respective schools. The main point of interest was whether or not the respondent was a pilot. If the respondent was a pilot, other points of interest included whether the respondent owned his/her own airplane, was qualified as a flight instructor, had flight time in a 172, and how the respondent rates the 172 as a trainer.

Table 8 shows that 52 of the 55 respondents, or 94.5%, were pilots. The respondents who were not pilots were not asked to answer the remaining demographic questions as the questions were oriented toward pilots. Table 9 indicates that 7 of the 52

Table 8

Percent of Respondents Who are Pilots

n=55

Response	Frequency (#)	Percent (%)
Pilot	52	94.5
Not a pilot	3	5.5

pilots own their own airplane. As Table 10 indicates, 47 of the 52 pilots, or 90.4%, are qualified as flight instructors, and Table 11 indicates that all 52 pilots have flight time in the Cessna 172.

Table 9

Percent of Respondents which Own an Airplane

n=52

Response	Frequency (#)	Percent (%)
Own an airplane	7	13.5
Do not own an airplane	45	86.5

Table 10

Percent of Respondents Qualified as Flight Instructors

n=52

Response	Frequency (#)	Percent (%)
Qualified as an instructor	47	90.4
Not qualified as an instructor	5	9.6

Table 11

Percent of Respondents with Flight Time in the 172

n=52

Response	Frequency (#)	Percent (%)
Have flight time in the 172	52	100
Do not have time in the 172	0	0

Each of the respondents with flight time in the 172, were asked to rate the 172 as a trainer. 49 of the 52 pilots responded to the question. The question was based on a 7 point numeric scale, with endpoints of 1 (poor) and 7 (very good). Table 12 lists the frequency of response and the equivalent percent. As Table 12 indicates, nearly 1/2 of the

respondents rate the 172 as a "very good" trainer. Furthermore, 95.9% of the respondents rate the 172 within the upper third of the scale. Figure 2 shows the distribution of the responses.

Table 12

How the 172 Rates as a Trainer

n=49

Response	Frequency (#)	Percent (%)
1 (Poor)	0	0
2	0	0
3	0	0
4	2	4.1
5	6	12.2
6	17	34.7
7 (Very Good)	24	49

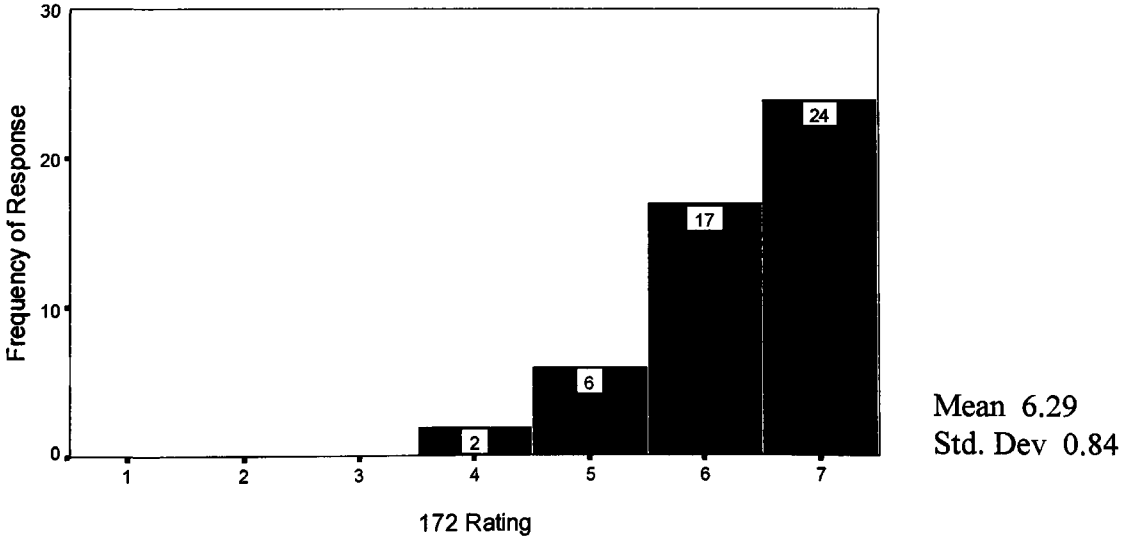

Figure 2. Distribution of Responses Rating the 172 as a Trainer

Factors Favoring Rejuvenation

Berenson and Mohr-Jackson (1994) identified five steps which can be followed to increase the probability of product rejuvenation success. These steps were identified and discussed in Chapter 2. The first two steps, identifying the reason for the products abandonment and examining the environmental forces favoring rejuvenation, have been discussed and documented in Chapter 2. The remaining three steps identified in Chapter 2 were investigated further. The three steps investigated were:

1.) Examine what the product name communicates to customers;

2.) Explore whether there is a potential segment to be reached; and

3.) Examine the possibilities of creating value for customers.

Examine What the Product Name Communicates to Customers

In order to investigate what the product name communicates to customers, respondents were asked to indicate the level of importance of a list of factors when deciding upon Cessna 172s. Each factor was rated on a 7 point numeric scale, with endpoints of 1 (Not Important) and 7 (Very Important). The 7 factors were 1) Cessna's brand name, 2) past experience with the Cessna 152/172, 3) Cessna aircraft are made in the U.S., 4) the flight characteristics of Cessna aircraft, 5) the ability to do "spin" training, 6) the reputation of the Cessna 152/172, and 7) price.

The first factor investigated was the importance of Cessna's brand name. Table 13 lists the frequency of response and the accompanying percent. Figure 3 is the distribution of responses to the importance of Cessna's brand name. As Table 13 indicates, 18.4% rate

Cessna's brand name as "very important", and a total of 61.2% rate brand name within the upper third of the scale.

Table 13

Importance of Cessna's Brand Name

n=49

Response	Frequency (#)	Percent (%)
1 (Not Important)	4	8.2
2	1	2
3	7	14.3
4	7	14.3
5	15	30.6
6	6	12.2
7 (Very Important)	9	18.4

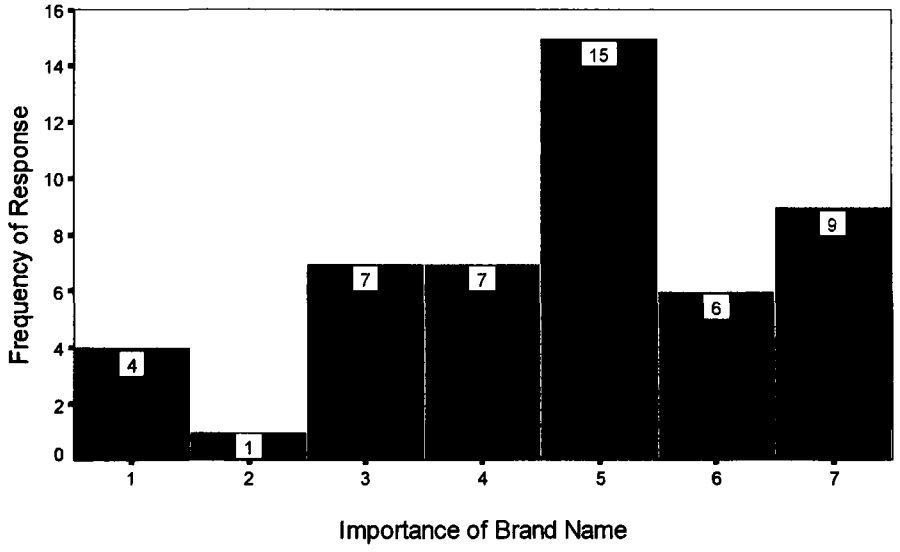

Figure 3. Distribution of the Importance of Cessna's Brand Name

Table 14 lists the frequency of response to the importance of past experience with the Cessna 152/172 product. As Table 14 indicates, approximately 48% of the

respondents rated the importance of their past experience with Cessna as "very important". An additional 35.4% rated the importance of past experience a 6 on the 7 point scale. The mean response was 6.23 with a standard deviation of 0.95. Figure 4 is the distribution of the importance of past experience with Cessna.

Table 14

Importance of Past Experience with Cessna

n=48

Response		Frequency (#)	Percent (%)
1	(Not Important)	0	0
2		0	0
3		1	2.1
4		2	4.2
5		5	10.4
6		17	35.4
7	(Very Important)	23	47.9

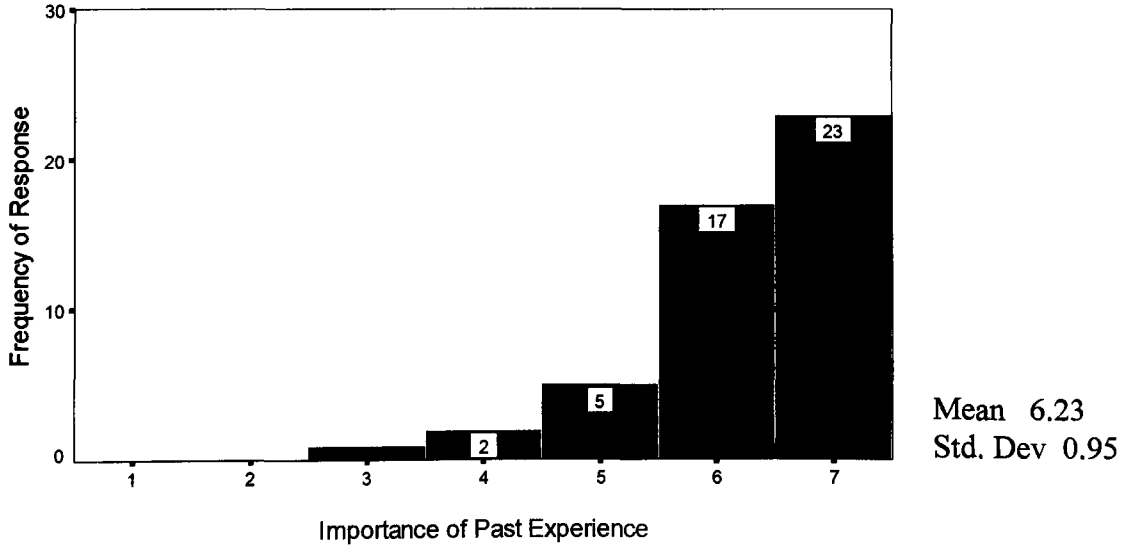

Figure 4. Distribution of the Importance of Past Experience with Cessna

The next factor was the importance of Cessna aircraft being manufactured in the U.S. Table 15 indicates that 20.4% of the respondents rate being made in the U.S. as "very important". Figure 5 shows the distribution of the importance of Cessna aircraft being made in the U.S. The mean was 4.49 with a standard deviation of 1.82.

Table 15

Importance of Cessna Aircraft being Made in the U.S.

n=49

Response		Frequency (#)	Percent (%)
1	(Not Important)	3	6.1
2		4	8.2
3		8	16.3
4		10	20.4
5		9	18.4
6		5	10.2
7	(Very Important)	10	20.4

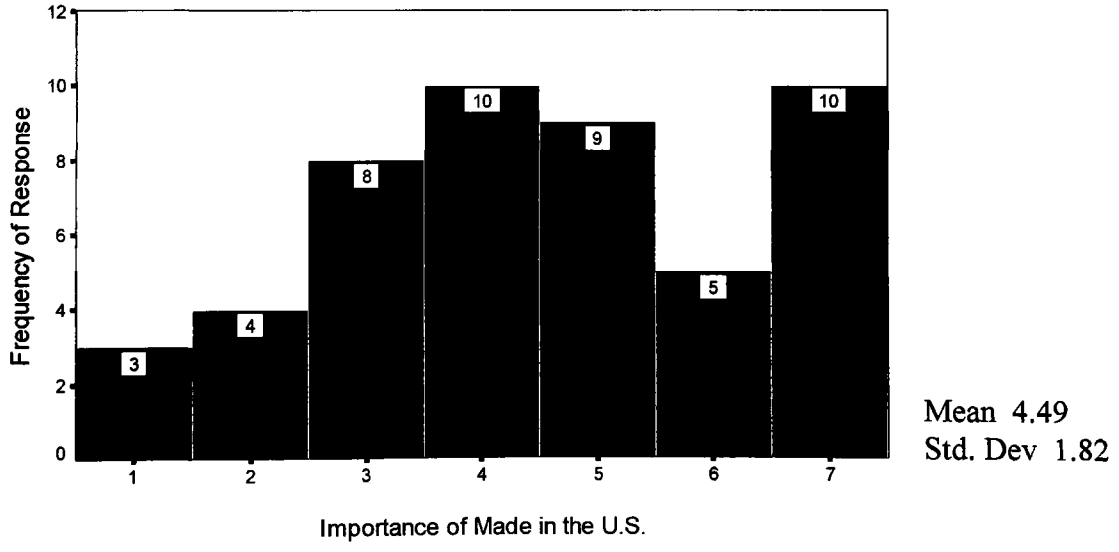

Figure 5. Distribution of the Importance of Cessna Aircraft being Made in the U.S.

The respondents were asked to rate the importance of the flight characteristics of Cessna aircraft. Table 16 shows that 51% of the respondents indicated that the flight characteristics of Cessna aircraft are "very important" to their decision to buy Cessna 172s. An additional 28.6% rated the importance of the flight characteristics of Cessna aircraft with a 6 on the 7 point scale. Figure 6 shows the distribution of the importance of the flight characteristics of Cessna aircraft, revealing a mean response of 6.14.

Table 16

Importance of the Flight Characteristics of Cessna Aircraft

n=49

Response		Frequency (#)	Percent (%)
1	(Not Important)	0	0
2		0	0
3		2	4.1
4		4	8.2
5		4	8.2
6		14	28.6
7	(Very Important)	25	51

The next factor investigated was the importance of the ability to do "spin" training. Table 17 lists the frequency of response and indicates that over 1/3 of the respondents rated the ability to do "spin" training in the 172 as "very important". A total of 2/3 of the respondents rate the ability to do "spin" training within the upper third of the scale. Figure 7 provides the distribution of responses and indicates the mean to be 5.04 with a standard deviation of 2.06.

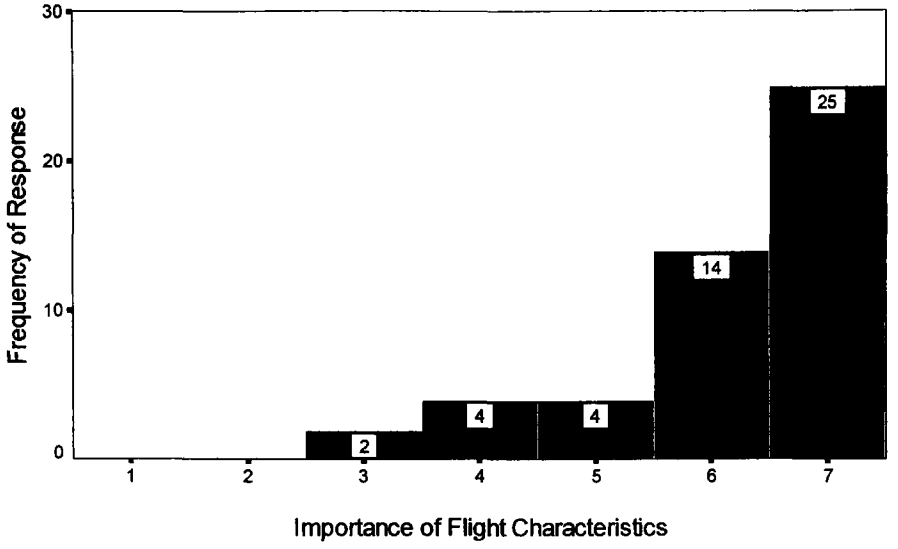

Figure 6. Distribution of the Importance of the Flight Characteristics of Cessna Aircraft

Table 17

Importance of the Ability to do Spin Training

n=48

Response		Frequency (#)	Percent (%)
1	(Not Important)	5	10.4
2		3	6.3
3		3	6.3
4		5	10.4
5		7	14.6
6		8	16.7
7	(Very Important)	17	35.4

The respondents were also asked to rate the importance of the reputation of Cessna's 152 and or 172 products. Table 18 indicates that 36.7% of the respondents said that the reputation of Cessna aircraft is "very important" to their decision to buy 172s. A

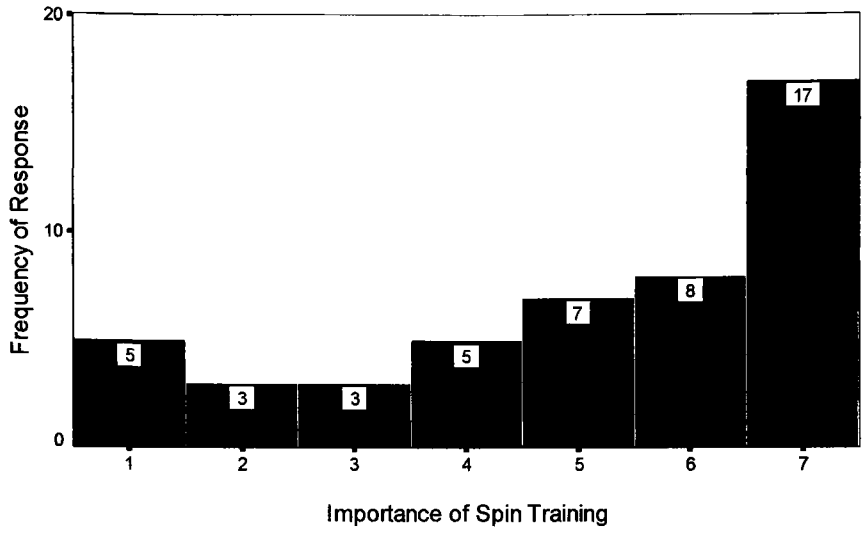

Figure 7. Distribution of the Importance of the Ability to do Spin Training

total of 85.7% rate the importance of the reputation of Cessna aircraft within the upper third of the scale. Figure 8 is the distribution of responses to the importance of the reputation of Cessna aircraft; Figure 8 reveals a mean response of 5.65 and a standard deviation of 1.36.

Table 18

Importance of the Reputation of Cessna Aircraft

n=49

Response	Frequency (#)	Percent (%)
1 (Not Important)	0	0
2	2	4.1
3	2	4.1
4	3	6.1
5	15	30.6
6	9	18.4
7 (Very Important)	18	36.7

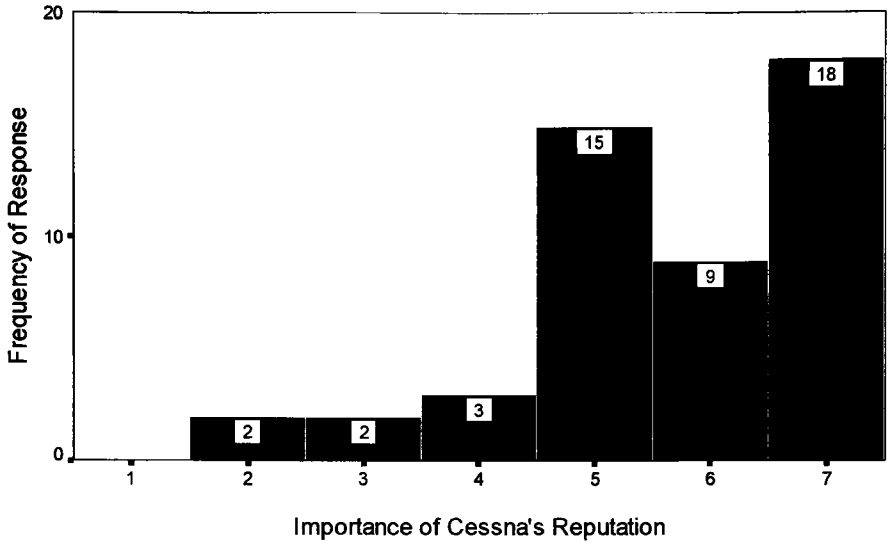

Figure 8. Distribution of the Importance of the Reputation of Cessna Aircraft

The last factor investigated was the importance of price. Table 19 indicates that 59.2% of the respondents said that price is "very important". Only 1 respondent indicated that price was below a 4 on the 7 point scale. Figure 9 shows the distribution of the importance of price and indicates the mean to be 6.20 with a standard deviation of 1.24.

Table 19

Importance of Price

n=49

Response	Frequency (#)	Percent (%)
1 (Not Important)	1	2
2	0	0
3	0	0
4	4	8.2
5	6	12.2
6	9	18.4
7 (Very Important)	29	59.2

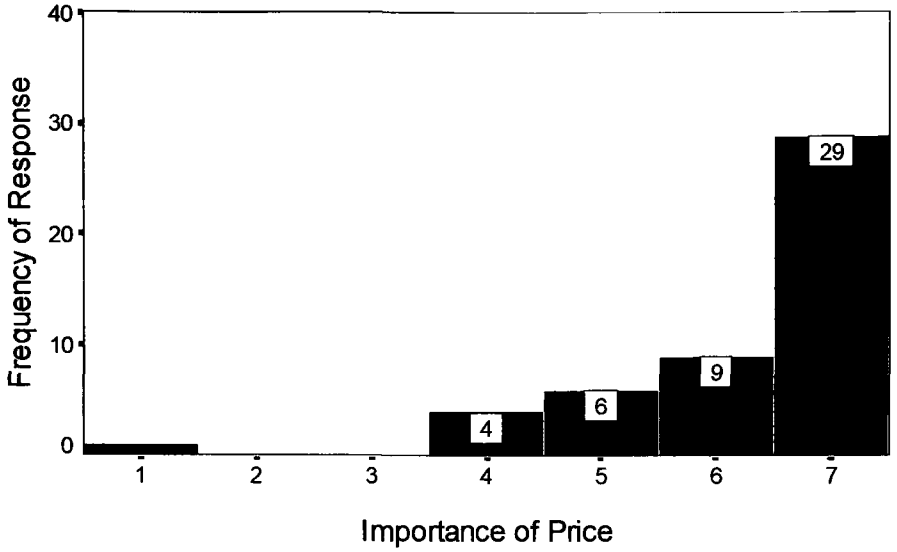

Figure 9. Distribution of the Importance of Price

Explore Whether there is a Potential Segment to be Reached

To investigate whether there is a potential segment to be reached, demand for new primary, single engine trainer aircraft was established. Respondents were asked to select the time frame which most closely represented the time frame in which their respective schools would be in the market to purchase new aircraft. Table 20 lists the time frames and the number of responses for each time frame. As Table 20 indicates, 45.5% of the respondents foresee the "need to purchase" new primary trainer aircraft within the next 1 to 2 years, with a total of 71% indicating the "need to purchase" new aircraft within the next 3 to 4 years.

To investigate the demand for Cessna aircraft, respondents were asked to list the schools top three choices in terms of primary, single engine trainer aircraft. Tables 21 and

Table 20

Time Frame to Purchase New Aircraft

n=55

Response	Frequency of Response (#)	Percent (%)
Within 1 to 2 years	25	45.5
Within 3 to 4 years	14	25.5
Within 5 to 6 years	6	10.9
Beyond 6 years	10	18.2

22 list the aircraft choices, frequency of response, and the accompanying percent for the respondents' first and second choices, respectfully. Nearly half of the respondents did not identify a third choice; therefore, due to lack of data, the third choice was not tabulated. Table 21 indicates that 76.6% of the respondents identified Cessna as the school's number 1 choice compared to 12.8% for Piper. Table 22 shows that 36.6% of the respondents identified Cessna as the schools second choice compared to 39% for Piper. There was some overlap as several respondents identified Cessna as both the school's number 1 and number 2 choices.

Examine the Possibilities of Creating Value for Customers

Another of the factors which increases the probability of product rejuvenation success is creating value for customers. Referring back to Tables 13 through 19, the tables indicate the level of importance of seven factors pertaining to Cessna and the 172. Table 14 shows that nearly 50% of the respondents said that past experience was "very important" in deciding to purchase 172s; Table 16 shows that 51% of the respondents

Table 21

Respondents' First Choice in Terms of New Primary Trainer Aircraft

n=47

Aircraft	Frequency (#)	Percent (%)
Cessna	36	76.6
Piper	6	12.8
Diamond Katana	2	4.3
Maule	1	2.1
Tampico	0	0
Other	2	4.3

Table 22

Respondents' Second Choice in Terms of New Primary Trainer Aircraft

n=41

Aircraft	Frequency (#)	Percent (%)
Cessna	15	36.6
Piper	16	39
Diamond Katana	3	7.3
Maule	2	4.9
Tampico	3	7.3
Other	2	4.9

said that the flight characteristics of Cessna aircraft are "very important", and approximately 37% said that the reputation of Cessna aircraft is "very important". Table 13 indicates that 61.2% of the respondents rate the importance of Cessna's brand name within the upper third of the scale. Out of 50 respondents, 12 identified Cessna's strong product support as an important additional factor to the decision to buy Cessna 172s. The

positive response to the factors just mentioned are indicators that Cessna has established significant brand equity and brand loyalty. The high scores Cessna received support the idea that Cessna has provided value in the past. Furthermore, the research supports the idea that customers expect a high level of value to continue when 76.6% of the respondents (Table 21) identified Cessna as their respective school's top choice in terms of new primary trainer aircraft.

Respondent Awareness of Other Trainers

Another objective of the research was to identify the respondents' awareness of other primary trainers which are currently on the market or have been in the recent past. The four aircraft which were investigated are the Diamond DA20 Katana, Tampico TB9, American General AG-5B Tiger, and the P.Z.L. Koliber II. All four aircraft were being manufactured during Cessna's absence from the market. However, the American General Tiger is no longer in production. Respondent awareness was measured using a 7 point numeric scale, with endpoints of 1 (Not Aware) and 7 (Very Aware).

Diamond DA20 Katana

Table 23 lists the frequency of the level of respondent awareness of the Diamond DA20 Katana. Table 23 indicates that 32% of the respondents are "very aware" of the Diamond DA20 Katana, while 10% are "not aware" of the aircraft. The mean response was 4.86 with a standard deviation of 2.06.

Tampico TB9

Table 24 lists the frequency of the level of respondent awareness of the Tampico TB9. As Table 24 indicates, 18% of the respondents are "very aware" of the Tampico

Table 23

Respondent Awareness of the Diamond DA20 Katana

n=50

	Level of Awareness	Frequency (#)	Percent (%)
1	(Not Aware)	5	10
2		3	6
3		7	14
4		3	6
5		9	18
6		7	14
7	(Very Aware)	16	32

TB9, while 12% are "not aware" of the aircraft. The mean response was 4.14 with a standard deviation of 2.07.

Table 24

Respondent Awareness of the Tampico TB9

n=50

	Level of Awareness	Frequency (#)	Percent (%)
1	(Not Aware)	6	12
2		9	18
3		6	12
4		4	8
5		10	20
6		6	12
7	(Very Aware)	9	18

American General AG-5B Tiger

Table 25 lists the frequency of the level of respondent awareness of the American General AG-5B Tiger. As Table 25 indicates, 20% of the respondents are "very aware" of the aircraft, while 12% are "not aware". The mean response was 4.56 and the standard deviation was 1.92.

Table 25

Respondent Awareness of the American General AG-5B Tiger

n=50

Level of Awareness	Frequency (#)	Percent (%)
1 (Not Aware)	6	12
2	1	2
3	8	16
4	6	12
5	12	24
6	7	14
7 (Very Aware)	10	20

P.Z.L. Koliber II

Table 26 lists the frequency of the level of respondent awareness of the P.Z.L. Koliber II. Table 26 shows that 58% of the respondents are "not aware" of the aircraft compared to only 8% who are "very aware". The mean response was 2.20 with a standard deviation of 1.87.

Table 26

Respondent Awareness of the P.Z.L. Koliber II

n=50

Level of Awareness		Frequency (#)	Percent (%)
1	(Not Aware)	29	58
2		6	12
3		7	14
4		1	2
5		2	4
6		1	2
7	(Very Aware)	4	8

Likeliness to Purchase New Cessna 172s

The likelihood of respondents purchasing new 172s was investigated. The issue was broken down into two questions. The first question dealt with whether the respondents would consider the new Cessna 172. The follow-up question dealt with the likeliness of the respondents to buy new Cessna 172s. Both questions utilized a 7 point numeric scale, with endpoints of 1 (Never / Not at All) and 7 (Definitely) for consider and buy, respectfully.

Consider

Table 27 lists the frequency of the level of respondent willingness to consider the new Cessna 172. As Table 27 indicates, 34.5% of the respondents said that they would "definitely" consider the new 172. Only 5 respondents, or 9.1%, said they would not even consider the 172. The mean was 4.73 with a standard deviation of 2.05.

Table 27

Level of Respondent Willingness to Consider the New 172

n=55

Willingness to consider		Frequency (#)	Percent (%)
1	(Never)	5	9.1
2		6	10.9
3		2	3.6
4		12	21.8
5		10	18.2
6		1	1.8
7	(Definitely)	19	34.5

Likeliness to Buy

Table 28 lists the frequency of the level of respondents' likeliness to buy new Cessna 172s. Table 28 shows that 4 respondents, or 8.2%, say that they are "definitely" likely to buy new Cessna 172s. Also, 4 respondents say that they are "not at all" likely to buy new 172s. The mean response was 3.78 with a standard deviation of 1.79.

Table 28

Level of Respondents' likeliness to Buy the New 172

n=49

Likeliness to Buy		Frequency (#)	Percent (%)
1	(Not at all)	4	8.2
2		12	24.5
3		6	12.2
4		10	20.4
5		7	14.3
6		6	12.2
7	(Definitely)	4	8.2

Respondents were also asked to rate the importance of the return of Cessna and Piper to the piston-powered market on their respective schools decision to purchase new aircraft. The level of importance was measured using a 7 point numeric scale, with endpoints of 1 (Not Important) and 7 (Very Important). Table 28 shows that 46% of the respondents indicated that the return of Cessna and Piper to the piston-powered market is "very important" to their decision to buy new aircraft. Figure 10 is the distribution of the responses indicating a mean of 5.52 and a standard deviation of 1.67.

Table 29

Importance of the Return of Cessna and Piper to the GA Market

n=50

Response		Frequency (#)	Percent (%)
1	(Not Important)	0	0
2		3	6
3		5	10
4		6	12
5		8	16
6		5	10
7	(Very Important)	23	46

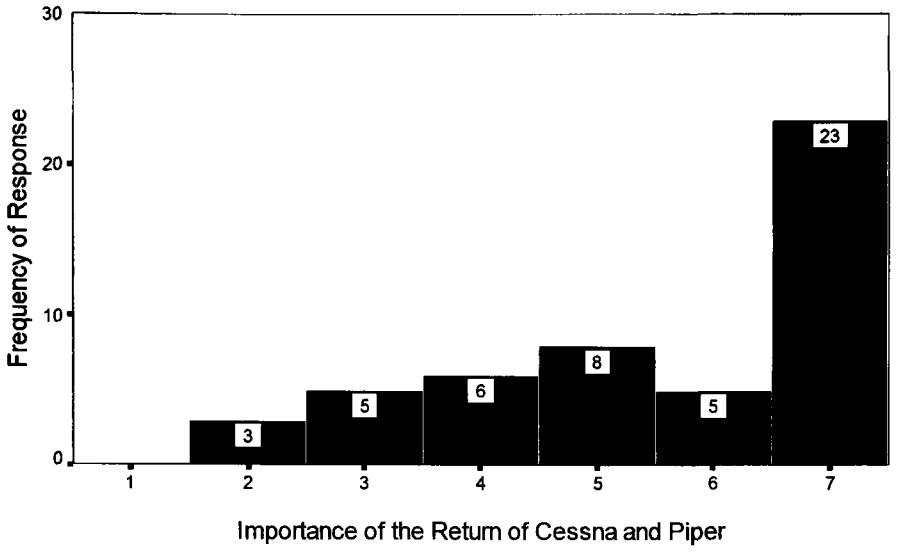

Figure 10. Distribution of the Importance of the Return of Cessna and Piper to the GA Aircraft Market

Discussion of Results

Investigation into the demographics of the schools demonstrated that the training fleet is aging with a weighted average age for the fleet of 14.33 years (Table 3). The age ranged from an average age of 3 years for the newest fleets to 25 years for the oldest fleets. The total number of primary trainers (Table 2) was found to be 742; this indicates that a sizable market already exists, as many of these aircraft are beyond 20 years old and will soon need to be replaced. Also, 87% of the respondents (Table 5) indicated that their respective schools are expecting an increase in enrollment over the next two years.

A combination of aircraft being retired from service and anticipated increases in enrollment are factors leading to the need for additional new and or used primary trainers. As indicated in Table 20, 45.5% of the respondents foresee the need to purchase new

primary trainer aircraft within the next 1 to 2 years, with a total of 71% of the respondents expecting to be in the market for new aircraft within the next 3 to 4 years.

When investigating the demographics of the decision makers, the research discovered that 94.5% of the respondents are pilots, 90.4% of those pilots are flight instructors, and that every responding pilot has flight time in the 172. Nearly 50% of the respondents rated the 172 as a "very good" trainer. The finding that the decision makers at these schools are primarily pilots and flight instructors having past experience with the 172, with many of them holding a high opinion of the 172 as a trainer, is a positive indicator of product rejuvenation success. While marketing texts focus on economic issues, research shows that the existence of established buyer-seller relationships and communication networks reduces the amount of perceived risk associated with a particular purchase decision (Johnston and Lewin, 1996). Several respondents made comments to the effect that there would be no transition time related to integrating new 172s into existing fleets and that training programs and syllabi would not need to be updated. Furthermore, respondents commented that Cessna has maintained a strong product support and service network even during the period of time when Cessna was not manufacturing piston-powered aircraft. The research supports the idea that strong buyer-seller relationships and lines of communication still exist indicating that the risk associated with purchasing new 172s should be greatly reduced.

The results show (Table 6) that 44 of 53 schools operate Cessna aircraft and that the primary trainer fleets of 31 of those 44 schools are comprised solely of Cessna products. There are a total of 469 Cessna aircraft in operation compared to 117 Piper

aircraft, with Piper being the second most common trainer currently in use. Also, nearly 1/3 of the respondents identified purchasing aircraft which are of the same type as the established fleet as the main decision process when considering new aircraft. A total of 60% identified purchasing aircraft which are of the same type of the established fleet as at least one factor in deciding which aircraft to purchase (Table 7). Considering that the current fleet is primarily comprised of Cessna aircraft, and that 60% of the respondents identify staying within the current fleet as a main concern when purchasing new aircraft, product rejuvenation in this sense seems viable.

Another important indicator of product rejuvenation success lies in the fact that 76.6% of the respondents identified Cessna as their respective schools' number 1 choice in terms of new, primary trainer aircraft. Cessna was identified as the second choice by 36.6% of the respondents, with several respondents identifying Cessna as both their first and second choices.

Seven factors with respect to Cessna and the 172 were investigated to determine what the product name communicates to customers (Tables 13 - 19). The two factors with the highest positive ratings were past experience with Cessna aircraft and the flight characteristics of Cessna aircraft, and the mean responses on a 7 point scale were 6.23 and 6.14, respectfully. Approximately 48% of the respondents indicated that past experience was "very important" and 51% of the respondents indicated that the flight characteristics of Cessna aircraft are "very important". This indicates that respondents have had a very positive past experience with Cessna, and that the product performs well; therefore, these two factors are very important to the respondents' decision to buy new 172s.

The other factors which were investigated were also found to be important to the respondents' decision to buy new 172s. The importance of the reputation of Cessna aircraft had a mean response of 5.65, with nearly 37% of the respondents indicating the factor was "very important". The mean response to the importance of the ability to do spin training was also relatively high at 5.04. Again, over 35% of the respondents rated the factor as "very important". The importance of Cessna's brand name and the fact that Cessna aircraft are made in the U.S. had mean responses of 4.67 and 4.49, respectfully.

The high level of importance perceived by the respondents of these factors points out the respondents' familiarity with the product and the positive brand equity Cessna has acquired. The research supports the inference that flight schools have had a positive past experience with Cessna, rate the performance of the product highly, and rate the importance of Cessna's brand name and reputation highly. Also, through unsolicited comments, many respondents identified additional factors as being important such as product support and service, parts availability, and public recognition of the Cessna name, as a marketing tool to attract students.

Research suggests that a product rejuvenation strategy is a viable alternative to product innovation for Cessna with the 172. However, caution should be exercised in deciding on the time frame of solely pursuing a rejuvenation strategy. Product rejuvenation provides a relatively low risk, inexpensive way for Cessna to get back into the GA market. However, new aircraft manufacturers such as Katana and the new Global Aircraft Corporation are designing new, "state of the art" composite designs; if Cessna is not careful, Cessna will appear to be standing still next to these other companies and

technologically obsolete. A recommended course of action for Cessna would be to use a product rejuvenation strategy to reenter the GA market, using the 172 as a cash cow, but reinvest the profits gained on sales of the 172 into the development of a new, technologically superior design.

An additional factor investigated was the importance of price. As expected, the results showed that price is important. Over 59% of the respondents indicated that price is "very important". At this point in time, the details of pricing and financing options have not been disclosed in the flight training market. Even the recently announced Embry-Riddle Aeronautical University - Cessna deal did not disclose pricing information. The price of a new 172 to an individual has been estimated to start at around $125,000. However, this is not the price one would expect a flight school, who may be buying in bulk, to pay. Cessna will more than likely deal with the issue of pricing and financing options with flight schools on a per case basis, and therefore any further investigation into the issue of price would be beyond the scope of this paper.

The mean responses of the willingness to consider purchasing new 172s and the likeliness to buy new 172s were relatively low, compared to the means of previous measures, at 4.73 and 3.78, respectfully. An investigation into respondent comments provided some insight into this result. Each of the 5 respondents who indicated they would never "consider" the 172 made comments to the effect of Cessna pricing themselves out of the market, identifying price as the main reason the 172 would not be considered. Furthermore, 20% of the respondents identified price as a major concern through unsolicited comments. The research shows that even though respondent opinions of the

172 as a trainer are high and that Cessna and the 172 received high marks in other measures, the likeliness to purchase new 172s is lower than would be anticipated, with the issue of price a recurring theme. The primary trainer market is a price sensitive market suggesting further research into the area of price is needed.

Limitations of the Research

The scope of this paper was the UAA membership. Collegiate aviation only represents one segment of the general aviation (GA) training market, as the majority of GA pilots are trained through FBOs. Another limitation is the fact that most students enrolled in programs offering college degrees are career-minded pilots. However, one of the main reasons students choose to be a pilot for a career is their enjoyment of flying. Therefore, a large number of these pilots may be in the market to buy a plane of their own in the future.

In the research, the theoretical mean for the numeric scales was implied to be 4, suggesting most of the results were significantly above the theoretical mean. However, it is unclear what the theoretical mean actually is after accounting for known biases, and no attempt was made to show that the test means were significantly different from the theoretical mean or random chance, as this was beyond the scope of the research. Furthermore, no tests were performed to examine the apparent skew of data to the right, as the theoretical mean and the form that the distribution should take are unknown. Also, the group of measures evaluating respondent awareness of other trainers yielded ambiguous results and provided no confident insights into the issue.

Recommendations for Future Research

Price is an issue which is important and needs to be investigated further. GAMA and other industry coalitions suggest that reversing the trend of the aging and dwindling pilot population is the only way of ensuring that there is a market for aircraft manufacturers in the future. Cessna, along with many other companies with aviation interests, have contributed financial support to GA Team 2000, with hopes of introducing people to flying in order to increase the pilot population. One option Cessna might consider is to offer new 172s to flight schools at significant discounts, possibly at or slightly above cost. This pricing tactic could lead to the trainer fleet being upgraded relatively quickly and primarily with Cessna products. GAMA believes that it is easier to entice students to start flight training on new aircraft as opposed to trainers which have been used and abused for more than two decades. The possible benefit for Cessna would be in creating a market for themselves in the future. With the pilot population increasing, and a large number training on Cessna aircraft, Cessna stands to be the manufacturer of choice for pilots when deciding to buy their own aircraft. Cessna would forgo large profits in the short term in the trainer market, to ensure a significant market in the future.

Conclusion

The results of this research have shown that there is significant reason to believe that product rejuvenation, and the rejuvenation of the 172, will be successful in the primary trainer market. The five steps identified by Berenson and Mohr-Jackson (1994) to increase the probability of product rejuvenation success have been investigated. Table 30 lists the five steps and offers supporting statements for each.

Table 30
Support of the Steps to Improve the Probability of Product Rejuvenation Success

Steps to Improve the Probability of Product Rejuvenation Success	Supporting Statements
1.) Identify the reasons for the product's abandonment.	The primary reason for the product's abandonment was the costs associated with product liability.
2.) Examine whether environmental forces support a rejuvenation strategy.	GARA was signed into law in 1994 establishing an 18 year statute of repose, protecting manufacturers of aircraft and equipment which are beyond 18 years old.
3.) Examine what the product name communicates to customers.	Research showed that flight schools have had a positive past experience with Cessna products and rate the 172 as a trainer very highly. Cessna's brand name and the reputation of the 172 were also found to have high levels of importance among respondents. Respondent comments on the 172 included mention of the durability and maintainability of the airplane, the availability of parts and service, and the positive name recognition with the public.
4.) Explore whether there is a potential segment to be reached.	Research showed that 45.5% of the respondents foresee the "need to purchase" new trainer aircraft within the next 1 to 2 years, with a total of 71% expecting to purchase within the next 3 to 4 years. Furthermore, 76.6% of the respondents identified Cessna as their respective schools' top choice in terms of new trainer aircraft.
5.) Examine the possibilities of creating value for customers.	Research showed that product support and service is an added value Cessna brings to the marketplace. Cessna maintained a high level of product support even through the years when Cessna was not manufacturing new piston-powered aircraft. The high scores Cessna received in the research supports the idea that Cessna provided value in the past, and considering that 76.6% of the respondents identified Cessna as their schools' top choice in new trainers, that value is expected to continue.

One issue which remains to be resolved is the issue of price. Only five schools indicated they would "never" consider purchasing new 172s, but those five were due to pricing issues. Additionally, a large number of schools are still operating old Cessna 152s and indicate that the price of the new 172 may prevent them from upgrading to new 172s, forcing them to look elsewhere for used aircraft or more reasonably priced new aircraft.

References

Banks, Howard, Cleared for Takeoff. *Forbes* (September 12, 1994): 116-122.

Barnard, Thomas, Courts and Crashes: Why $70,000 of an Aircraft's cost is for Product Liability Insurance. *Canadian Aviation* (July 1985): 33-35.

Berenson, Conrad, and Mohr-Jackson, Iris, Product Rejuvenation: A Less Risky Alternative to Product Innovation. *Business Horizons* 37 (November-December 1994): 51-57.

Berkowitz, Eric N., Kerin, Roger A., Hartley, Steven W., and Rudelius, William, *Marketing*, 4th ed., Richard D. Irwin, Inc., Boston, MA. 1994.

Charles, Bob, Something's Coming. *Air Progress Affordable Flying* (January 1996): 14.

Collegiate Aviation Guide: Reference Guide of Collegiate Aviation Programs. Carolyn Williamson, ed. *University Aviation Association* (1994).

Cook, William J., The Takeoff in the Small Plane Market. *U.S. News & World Report* 119 (August 21, 1995): 50.

Cooper, Robert G., and Kleinschmidt, E. J., New Products: What Separates Winners from Losers? *Journal of Product Innovation Management* 4 (September 1987): 169-184.

Cooper, Robert G., New Products: What Distinguishes the Winners? *Research-Technology Management* 33 (November-December 1990): 27-31.

Cox, Bob, Single-Engine Airplanes Roll Off Independence, Kans.., Cessna Assembly Line. *The Wichita Eagle* (April 28, 1997).

Craig, Andrew, Product Liability and Safety in General Aviation, in *The Liability Maze.* Peter W. Huber and Robert E. Litan, eds., The Brookings Institute, Washington, D.C., 1991.

Eichenberger, Jerry A., *General Aviation Law*, Tab Books, PA. 1990.

Eichenberger, Jerry A., The Day After. *The Aviation Consumer* (October 1, 1994): 16-17.

Ennis, F. B., Finding the Golden Ages of a Product's Life Cycle. *Product Management* (November 1975): 36-41.

FAA Aviation Forecasts Fiscal Year 1996-2007. Federal Aviation Administration, Office of Aviation Policy and Plans, Department of Transportation (March 1996).

Final Report of the GAMA Piston Engine Aircraft Revitalization Committee, Piston Engine Aircraft Revitalization Committee, General Aviation Manufacturers Association, (March 26, 1996).

First "New" C-172s To Fly In Late 1996. *Aviation Week & Space Technology* 142 (June 5, 1995): 64-65.

Gottschalk, Mark A., General Aviation Experiences a Rebirth. *Design News* 50 (September 11, 1995): 27-28.

Hirschman, Dave, Aviation - Miss. Firm Plans to Build Trainer Plane of the Future. *The Commercial Appeal* (August 23, 1995): B5.

Horn, Julia, The General Aviation Industry from 1983 to 1988. *Harvard Business School;* 9-389-096 (1989): 1-9.

Johnston, Wesley J., and Lewin, Jeffrey E., Organizational Buying Behavior: Toward an Integrative Framework. *Journal of Business Research* 35 (January 1996): 1-15.

Lazer, William, Luqmani, Mushtaq, and Quraeshi, Zahir, Product Rejuvenation Strategies. *Business Horizons* (November-December 1984): 21-28.

Martin, Robert, General Aviation Manufacturing: An Industry under Siege, in *The Liability Maze.* Peter W. Huber and Robert E. Litan, eds., The Brookings Institute, Washington, D.C., 1991.

Michell, Paul C. N., Quinn, Peter, and Percival, Edward, Marketing Strategies for Mature Industrial Products. *Industrial Marketing Management* 20 (August 1991): 201-206.

Shapiro, Stacy, Product Liability Reform Revitalizes General Aviation. *Business Insurance* (May 15, 1995): 3, 15.

Simpson, Rod, From Beagles to Beechjets - General Aviation Defined. *Air International* 49 (October 1995): 205-209.

Stern, William M., A Wing and a Prayer. *Forbes* (April 25, 1994): 42-43.

Stewart, Chuck, Restart 172. *Air Progress* 57 (July 1995a): 12-13.

Stewart, Chuck, Affordable Classic. *Air Progress* 57 (October 1995b): 30-38+.

Swanda, Ronald L., Light General and Personal Aviation. *Transportation Research Circular* 454 (February 1996): 65-70.

Truitt, Lawrence J., and Tarry, Scott E., The Rise and Fall of General Aviation: Product Liability, Market Structure, and Technological Innovation. *Transportation Journal* 34 (Summer 1995): 52-70.

APPENDIX A

Survey

Survey

Thank you for taking the time to answer the questions below. Please return the survey to the address on the cover letter or fax to (904) 226-6696; Attention Dr. Waguespack.

Section One

1. In buying new aircraft, would you say the process used is (Please check one)

   solicit outside bids from aircraft manufacturers. _____

   do your own research on applicable aircraft in the market. _____

   purchase aircraft which are of the same type as the established fleet. _____

   other _____ explain _____

   _____

2. Do you foresee the need to purchase new primary, single-engine, fixed gear trainer aircraft within the next (Please check one)

   1 - 2 years _____ 3 - 4 years _____

   5 - 6 years _____ Beyond 6 years _____

3. Now that Cessna has reentered the piston powered market, would you *consider* buying new Cessna 172's?

   1 2 3 4 5 6 7
   Never Definitely

   (If the response is 1, then got to *section two*.)

4. How likely are you to *buy* new Cessna 172's?

   1 2 3 4 5 6 7
   Not at All Definitely

5. Please indicate the level of importance of the following factors in deciding upon Cessna 172's.

1	2	3	4	5	6	7
Not Important						Very Important

____ Cessna's brand name.

____ Past experience with the Cessna 152/172.

____ Cessna aircraft are made in America.

____ The flight characteristics of the aircraft.

____ Capacity to do spin training.

____ The reputation of the Cessna 152/172.

____ The price of the aircraft.

What other factors may be important in considering 172's? _____

_____

6. Please indicate your level of awareness of the following primary, single-engine trainer aircraft?

1	2	3	4	5	6	7
Not at All						Very Aware

____ Diamond DA20 Katana

____ Tampico TB9

____ American General AG-5B Tiger

____ P.Z. L. Koliber II

7. Please list the school's top three choices in terms of primary, single-engine trainer aircraft.

(1.) _____ (2.) _____

(3.) _____

8. With the passage of the General Aviation Revitalization Act, Cessna is reentering the piston powered market and The New Piper Aircraft Co. is stepping up production. How important would you say the return of Cessna and Piper is to your decision to buy new aircraft?

1	2	3	4	5	6	7
Not Important						Very Important

Section Two

9. Currently, how many primary, single-engine trainer aircraft are in your fleet? _____

   What make and model aircraft are they? (Please list the make, model and how many of each type.)

   _____

   _____

10. What is the average age of your primary, single-engine trainer fleet? _____

11. What is the approximate number of students currently in your flight program? ____

12. Do you anticipate an increase in enrollment in your flight program over the next two years?

    Yes _____ No _____

Section Three

13. Are you a pilot?

    Yes _____ If yes, please answer the remaining questions.

    No _____ Thank you and this concludes the survey.

14. Do you own your own airplane? Yes _____ No _____

    If yes, what is the make and model? _____

15. Are you qualified as a flight instructor? Yes _____ No _____

16. Do you have flight time in a Cessna 172? Yes _____ No _____

If yes, how would you rate the Cessna 172 as a trainer?

1	2	3	4	5	6	7
Poor						Very Good

APPENDIX B

General Aviation Revitalization Act of 1994

GENERAL AVIATION REVITALIZATION ACT OF 1994

[¶ 2960]

Act of August 17, 1994 (Public Law 103-298, 103d Congress, 2d Session, 108 Stat. 1552, 49 U.S. Code 40101 note).

AN ACT to amend the Federal Aviation Act of 1958 to establish time limitations on certain civil actions against aircraft manufacturers, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

[¶ 2961]

Sec. 1. [49 U.S. Code 40101 note] **Short Title.** This Act may be cited as the "General Aviation Revitalization Act of 1994".

[¶ 2962]

Sec. 2. [49 U.S. Code 40101 note] **Time Limitations on Civil Actions Against Aircraft Manufacturers.** (a) **In General.**—Except as provided in subsection (b), no civil action for damages for death or injury to persons or damage to property arising out of an accident involving a general aviation aircraft may be brought against the manufacturer of the aircraft or the manufacturer of any new component, system, subassembly, or other part of the aircraft, in its capacity as a manufacturer if the accident occurred—

(1) after the applicable limitation period beginning on—

(A) the date of delivery of the aircraft to its first purchaser or lessee, if delivered directly from the manufacturer; or

(B) the date of first delivery of the aircraft to a person engaged in the business of selling or leasing such aircraft, or

(2) with respect to any new component, system, subassembly, or other part which replaced another component, system, subassembly, or other part originally in, or which was added to, the aircraft, and which is alleged to have caused such death, injury, or damage, after the applicable limitation period beginning on the date of completion of the replacement or addition.

(b) **Exceptions.**—Subsection (a) does not apply—

(1) if the claimant pleads with specificity the facts necessary to prove, and proves, that the manufacturer with respect to a type certificate or airworthiness certificate for, or obligations with respect to continuing airworthiness of, an aircraft or a component, system, subassembly, or other part of an aircraft knowingly misrepresented to the Federal Aviation Administration, or concealed or withheld from the Federal Aviation Administration, required information that is material and relevant to the performance or the maintenance or operation of such aircraft, or the component, system, subassembly, or other part, that is causally related to the harm which the claimant allegedly suffered,

(2) if the person for whose injury or death the claim is being made is a passenger for purposes of receiving treatment for a medical or other emergency;

(3) if the person for whose injury or death the claim is being made was not aboard the aircraft at the time of the accident, or

(4) to an action brought under a written warranty enforceable under law but for the operation of this Act.

(c) **General Aviation Aircraft Defined.**—For the purposes of this Act, the term "general aviation aircraft" means any aircraft for which a type certificate or an airworthiness certificate has been issued by the Administrator of the Federal Aviation Administration, which, at the time such certificate was originally issued, had a maximum seating capacity of fewer than 20 passengers, and which was not, at the time of the accident, engaged in scheduled passenger-carrying operations as defined under regulations in effect under the Federal Aviation Act of 1958 (49 U.S.C. App. 1301 et seq.) at the time of the accident.

(d) **Relationship to Other Laws.**—This section supersedes any State law to the extent that such law permits a civil action described in subsection (a) to be brought after the applicable limitation period for such civil action established by subsection (a)

[¶ 2963]

Sec. 3. [49 U S Code 40101 note] **Other Definitions** For purposes of this Act—

(1) the term "aircraft" has the meaning given such term in section 101(5) of the Federal Aviation Act of 1958 (49 U S.C. 1301(5));

(2) the term "airworthiness certificate" means an airworthiness certificate issued under section 603(c) of the Federal Aviation Act of 1958 (49 U S C 1423(c)) or under any predecessor Federal statute;

(3) the term "limitation period" means 18 years with respect to general aviation aircraft and the components, systems, subassemblies, and other parts of such aircraft, and

(4) the term "type certificate" means a type certificate issued under section 603(a) of the Federal Aviation Act of 1958 (49 U S.C. 1423(a)) or under any predecessor Federal statute

[¶ 2964]

Sec. 4. [49 U S Code 40101 note] **Effective Date; Application of Act** (a) **Effective Date.**—Except as provided in subsection (b), this Act shall take effect on the date of the enactment of this Act

(b) **Application of Act**—This Act shall not apply with respect to civil actions commenced before the date of the enactment of this Act.

[The next page is 2321.]