



Personal Air Travel

Tencia Lee, Scott Jordan, Tommy Morphet, John Kochalka

BEM 106 Winter 2007

1 Introduction

Personal air travel is currently a luxury afforded only by the wealthy. However, with recent advances in aeronautical technology leading to the advent of very light jets (VLJs), along with the expansion of the airport network, chartering an airplane for individual flights has moved into the realm of possibility for the middle class and small businesses. As the technology matures, the availability of VLJs and flights at reasonable prices, continue to become more feasible. Personal air travel has significant advantages over major airline travel on large jets, including accommodations for individual schedules, avoidance of airport delays and inconveniences, and a wider variety of available destinations.

There is a strong possibility that in the near future air taxi service will become price competitive with major airline travel. Because of this, traditional air travel will face a major threat as air taxis take an increasing share of the leisure travel market. Major airlines will face two main options as air taxis mature: namely, to enter the market themselves or to improve the current model of traditional air travel to compete with emergent air taxi services. We propose that for large airlines the superior option is to enter the air taxi business themselves, drawing on their experience and resources to successfully branch out and operate in the new area.

2 Six Forces Analysis

2.1 Product

Air taxi companies currently provide chartered use of small jets for groups of up to seven or eight passengers. Air taxi services offer the option to purchase a seat on a pre-scheduled small flight, or to customize a flight to accommodate a customer's individual or business needs [1].

2.2 Substitutes

For short trips, substitutes include travel by automobile, train, bus, or other ground transportation. For longer trips, traditional air travel and purchase or charter of a private jet substitute for air taxi service.

2.3 Competitors and Degree of Rivalry

Currently air taxis compete with first-class air travel on traditional airlines for the business of wealthier clients and businessmen. Rivalry between the two types of air travel is minimal due to the large difference in service provided; air taxis all but eliminate the hassle associated with traveling through major airports. This is a significant advantage from the perspective of the customer.

Rivalry between air taxi providers is very much a factor in price-setting. Because service between companies is very similar, price is the only differentiator. Therefore, most customers would pick the less expensive option given two companies to choose from. In the future, when air taxi service is made available to the middle-class, price rivalry will become even fiercer, as middle-class customers tend to be much more price-conscious than businesses and will price shop to find the cheapest option. These customers will often choose less comfortable options, such as flying coach on a traditional jumbo jet, if the price is not appropriate.

However, currently brand recognition in the air taxi industry is minimal, as available service and business are both limited. If and when the industry experiences an initial rush of business, a few providers may gain recognition for purportedly superior service or reliability and thus be able to charge a brand premium.

2.4 Potential Entrants and Barriers to Entry

One initial barrier to entry is startup cost. A fleet of several thousand multi-million dollar jets(See Figure 2) requires a lot of capital. However, due to the high demand for VLJs [2], most invested capital can be recouped in case of failure simply by re-selling the jets to successful companies or other buyers. This notion reduces the risk to investors.

A much larger problem once an air taxi service has begun operations is securing slots at major airports.[3] While a significant portion of air taxi use in the future would connect on at least one end to smaller airports with plenty of operating space, many flights will have to travel either to or from a major airport. These airports are currently at maximum or near maximum capacity, filled mainly with larger flights belonging to major airlines. It would thus be easier for an established airline such as United, to purchase a fleet of air taxis and enter the market than it would be for a new company. United and other large airlines already hold bargaining power at major airports. It would be very difficult for a

smaller VLJ company to purchase time slots and facility use at a major airport without any resistance from larger airlines.

2.5 Buyers

The current market for air taxi services lies mostly with executives of large companies and their clients. The cost of a personal flight or a seat on a shared air taxi is currently too high to be economical for the middle-class to use for leisure travel. However, when costs are low enough that air taxis become an attractive option to vacationers, buyers will include families and small businesses as well. Additionally regular airfares have been rising over their past values which will serve to make an air taxi relatively more affordable(See Chart on ATPI) At this point, the product may split into the luxury and economy models, with the former still used by wealthy businessmen and the latter by the new customer base. Neither group holds much bargaining power individually, but if a large corporation were to try and negotiate a contract for a specific air taxi service to provide travel to all their clients, then some bargaining power could be obtained. Similarly, individual travelers or families would not enjoy significant bargaining power, but aggregate buyers such as tour groups or organizations may be able to negotiate discounts.

2.6 Suppliers

The three main suppliers of VLJs are Cessna Aircraft Company, Eclipse Aviation, and Adam Aircraft [4]. Currently these three companies have over 3,000 VLJs on order, the bulk of which are Eclipse's Eclipse 500. These suppliers hold significant bargaining power because few VLJ manufacturing firms exist, and demand for the aircraft is high.

2.7 Complements

Air taxi services have several complements, including the need to travel and airports themselves. A destination without an airport cannot be accessed by air taxis, and thus a network of airports is an extremely valuable complement to the air taxi service. Fear of terrorism and other threats to traditional planes are also a complement. The inconvenience associated with increased airport security on traditional airline travel is also a

complement to air taxis. These inconveniences increase the incentive to avoid traditional air travel and fly via air taxi service.

3 Issues in Air Taxi Expansion

The driving force behind the possible emergence of air taxis as common transportation is the advancement of several new technologies. Among these are general improvements in avionics and glass cockpit technology. These have acted to lower the production cost of the aircraft themselves sufficiently to allow firms to purchase VLJs and charter them for private flights at prices affordable to the middle class.

However, several major differences between air taxi travel and major airline travel will still exist. Whereas with traditional large jets, the cost of the pilot was not a significant portion of operating cost, hiring one pilot per flight of seven or fewer passengers increases the cost of the pilot relative to the total fares paid by all the passengers. Because lowering costs is the main reason why air taxis would become a viable option for middle-class travel, costs due to hiring pilots must also be kept as low as possible. One resolution to this problem may be to higher less qualified or less experienced pilots. These pilots however, must still have good enough track records to minimize the risk of air travel and the cost associated with it. These pilots, due to their reduced experience or qualifications, would be willing to work for wages lower than that of highly experienced professional pilots.

Additionally, omitting security screenings at airports for private flights dramatically increases the risk to pilots, as unsafe objects and weapons may be brought on board without detection. This would necessitate increased pay for pilots of VLJs and result in increased airfare. This difficulty could be overcome though by implementing security features now common on major carrier's planes such as reinforced cockpit doors or allowing pilots to carry weapons to protect themselves and the cockpit [5].

Another solution to the security problem would be to implement security screenings for VLJ flights as well. Though the omission of security screenings is one of the original advantages air taxi travel holds over traditional air travel. On the other hand, air taxi screenings would not need to be as thorough or as inconvenient as those encountered on major airline travel. This is because the capital at risk per VLJ flight as well as the potential damage a hijacked VLJ could cause is significantly less that of jumbo jets.

Additionally, small groups would be screened at one time, as opposed to the hundreds screened for each commercial flight.

Air taxi services should seek to minimize the security hassle as much as possible though as this is their largest advantage over the traditional airlines. An internal Skyjet study found businessmen willing to pay up to a \$1800 premium per trip for the added benefits of a private flight[6]. Air taxi services should keep this in mind when they consider any added inconvenience to their flights as that will erode much of the added value of the air taxi service.

3.1 Safety

Since VLJs have had very few flights thus far, skepticism may initially exist regarding their safety, but the planes have received FAA approval for flight even into icy or dangerous conditions [7]. With FAA approval, most of the public's safety concerns will be alleviated. Every new technology that is developed that can potentially increase risk or perception of risk has to find some way to gain public trust. By getting FAA approval VLJs have gone a long way towards ensuring the public will view them as a safe method of transportation.

4 Recent Technology Developments

VLJs have made a name for themselves as the air travel of the future because of their hybrid design, taking on many of the individual advantages of a variety of aircraft from small prop-planes to large jumbo jets. VLJs have also received a lot of attention for their slim price tag of roughly \$2 million a piece [8].

The Eclipse 500, carrying 6 passengers, weighs roughly 2 to 3 tons, a micro version of the Boeing 747 which weighs in at 200 tons. VLJs utilize the latest technology in smaller turbofan jets which are stronger and more fuel efficient than their predecessors, allowing for flight at the smoother altitudes as high as 41,000 feet and at cruising speeds of 430 miles per hour. Considering the Boeing 747's speed of 600 miles per hour, these VLJs are able to deliver very comparable speeds for their compact design. Upon reaching their destination, VLJs only need a 900 m runway to land, as opposed to a 747's 2,300 m runway [9].

The Spectrum 33, another highly anticipated VLJ, uses a graphite-epoxy construction process to cut the weight of previous small jets by one-third. This significant cut in mass has a ripple effect through all aspects of the design. A lighter jet requires less lift and thrust, allowing for smaller engines and less fuel. In turn, smaller engines and less fuel reduce weight even further.

Combining this drastic improvement in weight, along with the recently developed turbo jets by Williams International, Pratt and Whitney Canada, and GE Aircraft Engines [10], one can see how such impressive numbers by new VLJs were developed. A typical small jet currently in use, for example the eight-passenger LearJet 60, weighs almost 12 tons, requires more than a full mile of runway length, and costs roughly \$10 million dollars. VLJs are making aircraft like the LearJet obsolete.

5 Network Externality

Any air travel service must create a network of flights it can offer. This creates a network externality for air travel services. If a company only provides flights between two destinations it has very little value, because it will only cater to a specific subset of customers regularly moving between those two destinations. The more destinations an airline offers the larger the network externality it garners. Many large airlines cannot fly to small destinations, because many small airports do not have runways large enough to accommodate the major carriers' planes. Air taxi services, in contrast, could land at any airport due to VLJs' small size. By being able to fly to many more destinations, air taxi services would have a further convenience advantage over large carriers. In the attached map of California's airports major carriers fly to anywhere from ten to fifteen of these. They leave the vast majority of airports out because smaller airports cannot support a large plane landing. VLJs would open up travel to literally hundreds of new destinations(See Figure 1). Often large carriers force travelers bound for remote locations to fly into large cities and then drive an hour or more to their destination. An air taxi could take customers to a smaller airport much closer to a more remote destination. Air taxis can thus create a much larger network of available stops, adding enormous value to their flights.

The flight network also presents a reasonable barrier to entry for anyone attempting

to enter the air taxi service. While many airlines entered the airline industry by starting with only a few successful routes and later expanding, air taxi service could not be successful running only one or a few routes due to the small revenue per flight. Air taxis would have to establish a network immediately. It may become a problem for future companies trying to establish these networks due to limited space at large airports. The ATO (a branch of the FAA) allows limited air traffic in a given area. Additionally all airports, especially high traffic ones, can only accommodate a given number of incoming and outgoing flights at one time. Thus if several air taxi services create large travel networks in the early stages of the industry, it may be difficult for new companies to create their own network. There simply will not be enough room for them.

6 Hotelling Line and Convenience

Currently air taxis are priced too high for the average middle class customer to afford. Thus traditional flight and air taxis lie on two different sides of the Hotelling Line. The air taxi provides its customers much more convenience over the traditional airline. With an air taxi service customers do not waste several hours at ticket counters, going through airport security, and checking baggage. Customers also travel on their own schedule as opposed to pre-set schedules established by the airlines. This service premium is currently only priced to appeal to upper class customers, but with more technological developments air taxis may be able to offer this higher-class, lower-hassle service to middle class customers as well.

One must also consider a time premium that air taxis can provide. Travel on an air taxi could save you several hours in your journey which businessmen will place a large value on. An additional two hours in the working day has an enormous value to air taxis current primary customers.

7 Options for Large Airlines

The only major competition air taxis face apart from traditional air travel is from charter airline services which provide a similar product and are more luxurious than air taxis. Even so, charter flight companies cannot compete with the last-minute convenience

of renting a VLJ due to their limited availability of planes and pilots. Also, the difference in cost between a chartered flight and an air taxi is so significant that our target customer demographic has limited overlap. The lower price and added convenience of an air taxi would very likely draw customers away from charter airline businesses and thereby invite competition from these companies; however the first-mover advantage, among other advantages discussed elsewhere, would be a considerable barrier to their entry in the market.

Large airlines have two main options to choose from with regards to the emerging air taxi industry. One is to attempt to keep coach-class customers flying on traditional carriers while allowing air taxi services to claim upper-class business. This would allow each type of service to find a “niche” in which they are the main operator. The other option is to enter the business themselves by purchasing fleets of VLJs and using their reputations, customer loyalty, and size to dominate the market.

7.1 Finding Different Niches

Currently air taxis are still too expensive to appeal to the middle class and they can only appeal to the upper-class business customer. If airlines allow air taxis to take over wealthy customers their bottom line will not be hurt significantly initially, because they will keep the vast majority of the coach-class customers.

However, this line of action has several drawbacks. As air taxi services provided by small companies such as DayJet become more feasible to offer at prices comparable to coach-class fares, they will become more attractive to major airlines’ large coach-class customer base as an alternative. To remain competitive, traditional airlines would eventually either have to slash prices or to improve their services. Because of the customer-perceived advantages intrinsic to VLJs, airlines may eventually have to lower their prices below the marginal cost per passenger of an air taxi flight to draw customers away from them. The other option would be to improve economy-class flights by adding leg room, reducing capacity of all flights to minimize crowding, and providing better food and entertainment. Both options reduce airlines’ margins on all economy-class seats sold, which are already the lowest-margin group of sales.

Additionally, the airline industry still has not fully recovered from damage dealt by the September 11 attacks. Approximately one-half of U.S. airline seat capacity is currently

operating under Chapter 11 bankruptcy provisions [11]. Though the air taxi industry is not yet mature enough to necessitate any drastic action, it is unlikely that the situation for major airlines would have improved enough in this time frame to make cutting profit margins nondestructive for many large firms.

7.2 Entering the Air Taxi Industry

Major airlines could also begin purchasing their own VLJs to operate an air taxi service as a separate branch of services. Airlines already have an established flight network to draw on and experience in air travel as an advantage. If airlines find there is a high enough demand for air taxi services, it would be relatively easy to offer their own air taxi flights. Airlines could also use the base of loyal customers to jump-start their air taxi service, possibly with promotions and advertising. By allowing customers to redeem their frequent flier miles on an air taxi flight, airlines could encourage existing customers to switch to the new service before moving to an emerging air taxi company.

8 Conclusion

Air taxis represent the next step in air travel, providing a more comfortable, hassle free travel environment. Currently air taxis still remain too expensive to replace traditional air travel as a whole, but as further research is conducted and technological improvements are made it becomes a possibility that the air taxi may replace traditional flights on all but the longest journeys. Soon major air lines will find that they are competing with upstart air taxi services, and they will be forced to decide how to respond to these upstarts. . Airlines must respond to the entry of air taxi services, because a failure to do so could lead to a forced exit from the industry for many of them. An airlines best response to the air taxi industry is to begin running their own air taxi service to compete with the start ups. Airlines have the advantage of already having an established network of airports that they service which would help them overcome the issue of network externalities. They also have experience in airline operations (booking, security, etc) that will transfer easily into the airline taxi industry. If airlines fail to respond to air taxis they will lose their highest revenue customers. The business customer places the highest premium on convenience and comfort which air taxis can provide at a higher level and at a similar

cost in the coming years. The improving technology of VLJs will only further drop the costs of an air taxi service, so while airlines will find themselves battling air taxis for first class customers in the coming years they may even have to fight to keep coach customers. Airlines have only one real option to respond to start up air taxi services. They must begin their own air taxi services to compete, eventually reserving jumbo jets for only the longest of flights. Eventually airlines could create a service whereby you have scheduled major routes for large jets, flights between LA and New York for example, but for flights between smaller destinations you have a rolling schedule. Customers or travel agents could log onto the airline's website a week before the trip and enter destinations. The airline would then group customers together for this flight on an air taxi. If a customer wanted the convenience of his own plane he could of course pay for all the seats on the plane, but many middle-class customers would simply be grouped with other individuals who wished to travel to the same destination much in the same way individuals can share a traditional taxi cab. Airlines must start moving towards a new strategy in which they employ the use of air taxis as a means to attract first class customers. As technology improves and costs decrease air taxis will even be able to serve coach customers and airlines will have to move to a model where all of their low-medium range travel is done by VLJs.

	ATPI	Change
1995	101.12	
1996	97.83	-3.3
1997	103.49	5.7
1998	100.00	-3.5
1999	102.06	2.1
2000	108.18	6.1
2001	111.77	3.6
2002	106.39	-5.4
2003	105.79	-0.6
2004	106.24	0.4
2005	108.20	2.0
2006	120.61	12.4

http://www.bts.gov/press_releases/2006/bts050_06/html/bts050_06.html#table_02



Figure 1: California Airports

Design	Manufacturer	Seats	Engines	Max. Cruise	Max. Range	Cost	Orders	Certification
Delivered production aircraft to first customer								
Citation Mustang	Cessna	6	2x PW615F	340 knots (630 knt/h)	1,300 nm	\$2.62m	250	September 8, 2006
Eclipse 500	Eclipse Aviation	6	2x PW610F	370 knots (695 knt/h) ^[12]	1,125 nm ^[12]	\$1.52m	2,500 ^[8]	September 30, 2006
Prototypes built and undergoing flight testing								
Adam A700 AdamJet	Adam Aircraft Industries	5-7	2x Williams FJ33	340 knots (630 knt/h)	1,200 nm	\$2.28m	262 ^[1]	2007
Diamond D-Jet	Diamond Aircraft	5	1x Williams FJ33-4	315 knots (583 knt/h)	1,350 nm	\$1.38m	125	early 2008
ATG Javelin	ATG & IAI	2	2x Williams FJ33	530 knots (982 knt/h)	1,200 nm	\$2.80m	-100 ^[13]	early 2008
Spectrum S-33 Independence	Spectrum Aeronautical [1] ↗	9	2x Williams FJ33-4	415 knots (770 knt/h)	2,000 nm	\$3.65m		early 2008
Excel-Jet Sport-Jet	Excel-Jet [2] ↗	5	1x Williams FJ33-4	340 knots (630 knt/h)	1,000 nm	\$1.00m		early 2008
Honda HA-420 HondaJet	Honda Aircraft Company	6-8	2x GE Honda HF120	420 knots (778 knt/h)	1,100 nm	\$3.65m	130+ ^[14]	2009
Currently under development								
EV-20 Vantage Jet	Eviation Jets [3] ↗	10	2x Williams FJ44-1	424 knots (785 knt/h)	1,300 nm	\$3.00m		mid 2007
Epic Jet	Epic Aircraft [4] ↗	7	2x Williams FJ33-4	390 knots (722 knt/h)	1,600 nm	\$2.10m		early 2008
Embraer Phenom 100	Embraer	6-8	2x PW617F	380 knots (704 knt/h)	1,320 nm	\$2.85m	50+	mid 2008
PiperJet	Piper Aircraft	6	1x light turbofan	360 knots (667 knt/h)	1,300 nm	\$2.199m	-180 ^[15]	early 2010?
Cirrus Jet	Cirrus Design	4	1x Williams FJ33-4	?	?	?	?	2010
Spectrum S-40 Freedom	Spectrum Aeronautical, LLC	17-9	2x GE Honda HF120	435 knots (805 knt/h)	2,200 nm	\$6.2M		2010

Figure 2: VLJs

References

- [1] DayJet Corporation
<http://www.dayjet.com/>
- [2] "Eclipse targets hefty initial production run," Mark Huber, Oct. 2006
http://www.ainonline.com/Publications/nbaa/NBAA_06/Eclipse1_d1.htm
- [3] "2004 FAA Report on Airport Capacity"
<http://www.faa.gov/events/benchmarks/2004download.htm>
- [4] "Very light jet," 2007
http://en.wikipedia.org/wiki/Very_Light_Jet
- [5] "More Pilots bring Guns on Flights," Ken Kaye, Feb. 2007
<http://www.kansascity.com/mld/kansascity/news/nation/16686543.htm>
- [6] "Skyjet Airfare Study"
<http://www.skyjet.com/StreamFile.aspx?ID=236>
- [7] "Cessna Citation Mustang Cleared for Flight Into Known Icing Conditions," Nov. 2006

<http://www.cessna.com/news/article.chnl?ID=OkyZWtgijxhOLUYbsDyGikkPGeGJ5pvxB2bQ5dSrEokZusIQpN>

[8] "Micro Jets Debut in U.S. Airspace," Aug. 2006

http://www.pbs.org/newshour/extra/features/july-dec06/smalljets_8-07.html

[9] ANA SKY WEB

<http://www.ana.co.jp/eng/aboutana/corporate/galleryclassi/1983/744.html>

[10] "Very Light Jets Creating A Demand for Composites," Jan. 2006

<http://www.compositesworld.com/hpc/issues/2006/January/1157>

[11] "Airline," 2007

<http://en.wikipedia.org/wiki/Airline>