Chapter 13 BUSINESS AND COMMERCIAL AVIATION

This category of general aviation is one of the largest in terms of hours flown. Business aviation is the use of a private- or company-owned general aviation aircraft for business purposes. Business aviation is usually divided into two groups according to who is flying the aircraft. If an individual personally pilots an aircraft used by a business in which he or she is engaged, it is classified as a business aircraft. If on the other hand, a professional pilot flies a company or corporate aircraft to transport employees and/or property, the airplane is classed as an executive aircraft.

The executive aircraft is usually larger and more luxurious than the business aircraft. The majority are multi-engine and one-third are jet powered. In general, they are used to carry very important people over medium-length distances in comfort and at relatively high speeds. To these people, time means money and getting them to their destination in the minimum amount of time is very important.

There are over 55,000 aircraft in the business aviation category. The vast majorities of the business aircraft are single-engine piston aircraft. About 33 percent of the executive aircraft are either turboprop or turbojet powered. In the business aircraft category, only about one percent are turbine powered.

Looking at these figures, there are some generalizations that can be made. A typical executive transport is a twin-engine aircraft and is almost as likely to be turbine powered as piston powered. These types of aircraft are in areas where the pilot must have special training, a multi-engine rating and at least a commercial license. If the aircraft is turbine powered, another rating is required.

These executive aircraft are also very expensive, as we shall see later. On the other hand, the typical business aircraft is almost certain to be piston powered and is three times as likely to have a single engine as twin engines.

The typical business aircraft is similar to the typical personal aircraft in that it is a single-engine, four-place airplane. However, the business aircraft is probably better equipped. Because it is important in some businesses to be able to fly even in bad weather, the typical business airplane is well-equipped with instruments. Almost all business aircraft pilots are instrument rated.

There are three areas of concern in aviation today, and they play an important part in the decision of which aircraft to buy for use in a business. These three areas are (1) fuel efficiency, (2) noise and (3) cost effectiveness.

Raytheon *Premier I* and *Hawker Horizon* *(Courtesy of Raytheon)*

Objectives

Define business aviation.
Describe the two categories of business aviation.
Describe a typical business aircraft and a typical executive aircraft.
State the importance of fuel efficiency, noise and cost effectiveness as they apply to business aviation.
Identify at least two business aircraft.
Identify at least two executive aircraft that are piston powered, two that are turboprop powered and two that are turbojet powered.
Define commercial aviation.
Describe the two subdivisions of commercial aviation.
Differentiate between air taxis and rental aircraft.
Discuss six different non-transportation areas of commercial aviation.

Fuel Efficiency

The cost of aviation fuel has increased by 700 percent since 1973. It is possible that it will become necessary to cut petroleum use to avoid a major shortage in future years. The increase in fuel costs and possible fuel shortages have forced businesses to buy the most fuel-efficient aircraft available. These restrictions have also forced the aircraft industry to build more economical engines and more efficient wings and airframes to get more mileage out of each drop of fuel. Beech Aircraft Company has also looked at alternative fuels for general aviation aircraft. In 1982, they converted a *Sundowner* to burn liquefied natural gas as a fuel.

In determining fuel efficiency, it is necessary to look at airplanes a little differently than automobiles. With the family car, the only figure we are concerned with is miles per gallon. The Federal Government is forcing the automobile manufacturers to increase the miles per gallon their automobiles achieve. They are looking at 27 miles per gallon as a good average for the family car.

Of course, many small cars, both foreign and domestic, get much better mileage than this. Many small cars claim more than 40 miles per gallon. This is possible because the cars weigh less and have smaller engines. Weight and size (horsepower) affect mileage. We also know that speed affects mileage in automobiles. The faster we drive, the more fuel we burn.

All of these things, weight, engine size and speed also affect the fuel efficiency of the airplane. The main reason for using an airplane for business is to save time. If a business airplane can get executives to a business meeting faster than the commercial airlines, the money saved in terms of salaries justifies the travel.

In figuring the fuel efficiency of an airplane, the distance, number of passengers and amount of fuel used are all considered. For example, if an airplane carrying four people (pilot plus three passengers) flew 250 miles and burned 30 gallons of fuel, the mileage would be 33.3 passenger miles per gallon (250 x 4/30 = 33.3).

Noise

The Federal Government placed limitations on the amount of engine noise an aircraft can produce. Many communities close their airports to jets at night. These restrictions are for environmental reasons and are getting more severe. The aircraft manufacturers are building quieter jets, and many businesses are turning to these quiet aircraft.

Cost Effectiveness

In the past, many businesses bought aircraft based on speed plus the length of the longest trip their employees traveled. This led to aircraft that were underutilized. For example, if a company makes only one 2,000-mile trip a year and all the rest are only 300 miles, that company really doesn't need an airplane with a 2,000-mile range. It would be better to buy an airplane with a 500-mile range (which would be cheaper) and use the airlines for the 2,000-mile trip. For instance, a twin-engine turboprop aircraft can make a 500-mile flight in 2 hours 15 minutes, while a turbojet can make the same flight in 1 hour 50 minutes. The turbojet saves 25 minutes on the flight. However, it costs a great deal more to buy and it burns 600 gallons more fuel on the trip. Is the saving of 25 minutes worth the additional cost? Many businesses are starting to look more closely at these things.

Let's compare some of the aircraft used in business aviation. For our discussion, we will look at executive aircraft and business aircraft separately.

Executive Aircraft

The executive aircraft market is a very competitive business. Many manufacturers, both US and foreign, are building high-quality aircraft to meet the needs of today's corporations. To get some idea of the importance of airplanes in business today, let's look at some figures compiled by the National Business Aircraft Association (NBAA) in 1996.

Of the Fortune 500 companies in the United States, 335 had at least one aircraft. That's twice as many as those without aircraft. Sales of all Fortune 500 aircraft operators were $4.1 trillion, while sales of non-operators totaled $0.9 trillion. Operators collectively had over $8.4 trillion in assets, non-operators' assets only totaled $3.2 trillion. The net income of all operators was $261 billion, non-operators' total income was $40 billion.

The results of this survey were obvious. The largest and most successful of the US corporations own and operate a sizable fleet of very expensive aircraft. Since these companies are very cost conscious, they must have determined that business aviation helps them make money.

Earlier, we said that the typical executive aircraft is a twin-engine aircraft and nearly as many are turbine powered as are piston powered. In our discussion here, we will cover the larger, multi-engine piston aircraft. We will discuss the twins that are turbocharged and pressurized, as well as the turboprop aircraft and turbojet executive aircraft. The single-engine aircraft and smaller twins will be covered under the business aircraft section.

Multi-engine Piston Aircraft. The two largest aircraft in this category are the Beechcraft *Duke B*-60 and the Cessna 421*C Golden Eagle* III. Both of these aircraft are out of production, but several thousand were built. Both carry six passengers in addition to the pilot. The performance of the two aircraft is very similar. Two 380-horsepower engines power the *Duke*, while the *Golden Eagle* III's

Cessna 421 *Golden Eagle*

***Cessna* 340**

engines are rated at 375 horsepower each. The *Golden Eagle* III will takeoff a little quicker than the *Duke* and has about a 100-mile-longer range.

To fly a 500-mile flight under identical conditions, both of these aircraft would burn about 75 gallons of fuel each. With a pilot and five passengers on board, this figures out to be 40 passenger miles per gallon. Some of the other pressurized, turbocharged twins are the *Beech Baron* 58, the *Aerostar* 602P, and the Cessna 414, 340*A* and *T*337*G Skymaster.*

All of these aircraft carry a pilot and five passengers except the *Skymaster*, which carries one less passenger. Each aircraft differs slightly from the others, and each will suit the needs of certain customers.

There are many fine turbocharged-, twin-, and piston-engine aircraft that are not pressurized. The only disadvantages to these unpressurized aircraft are in passenger comfort and speed. The unpressurized aircraft cannot fly as high as pressurized ones and this means a bumpier ride. Also, the unpressurized aircraft causes more ear discomfort when climbing and descending

Cessna produced three aircraft (303*T*, 402*C* and 404) in this class, Piper built six (*Turbo Seminole*, *Seneca* III *Aerostar* 600*S*, *Navajo C/R*, *Chieftain T*-10 commuter), and Beech had one (*Baron* 58*TC*).

Within this class of twins, the Piper *Commuter* is the largest, carrying a pilot and 10 passengers. The Cessna *Titan* and Piper *Chieftain* both carry nine passengers in addition to the pilot, and the *Navajo C/R* and 402*C* both carry a pilot and seven passengers. The remainders, except for the *Turbo Seminole*, are designed to carry a pilot and five passengers.

Beech *Baron* 58

The *Turbo Seminole* carries four passengers including the pilot. We should mention that these are maximum passenger loads and if this many passengers are carried, the baggage and fuel loads are limited. Care must be taken with all these twins not to overload them because they will not carry a full load of passengers, plus baggage and/or fuel. Of course, the manufacturer will customize the interior of the aircraft to meet the customers' needs. Many only have two seats and a couch for seating, but may also have a galley and a lavatory.

Turboprops. The next step above the largest piston twin is the turboprop twin. The big difference between them is in the power plants. The largest piston twins have engines of about 375 to 400 horsepower. The turboprops have engines rated as high as 850 horsepower. This increase in horsepower offers two advantages, the aircraft can be larger and fly faster. This is the major selling point for the turboprop executive aircraft.

It isn't until you get beyond the range of the piston-engine twins that the turboprops begin cutting time off trips. It will actually take a turboprop a little longer to make a 500-mile trip than a piston-engine twin. This is because it takes longer to climb to the higher cruising altitude of the turboprop. However, on a trip of 1,000 miles the turboprop will save a lot of time because the piston-engine twin will have to stop for refueling.

On the other hand, the price of a turboprop is much higher; in most cases, nearly three times as much as the most expensive pressurized twin. They will have to decide if there are enough long trips with several passengers to justify the additional expense of a turboprop.

Some of the twin-engine turboprop aircraft are large enough that they are widely used by the commuter airlines. We have already discussed them in the chapter dealing with air carriers. Here, we will be dealing only with those twin turboprop aircraft that carry 15 or fewer passengers. The following chart shows a comparison of several turboprop executive aircraft as to size, engines and range.

The *Swearingen Merlin* IV*A* is the largest of the turboprop executive aircraft, closely followed by the *Beech King Air BE*300. Both of these are available with either commuter-type seating or in executive versions with plush interiors. The Piper Cheyenne also fits into this class and claims to be quieter and smoother than other turboprops.

Some of the less expensive turboprops, such as the *Piper Cheyenne* II or the *Beech King Air C*-90*A*, are not as plush inside. They are almost as fast and cost hundreds of thousands dollars less.

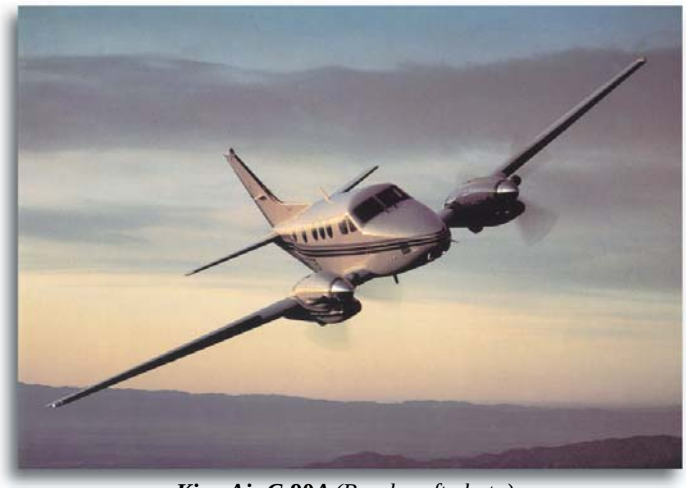
The newest and the most radical of the turboprop executive aircraft is the Beechcraft *Starship* 1. It is built entirely of composite materials using a design by Mr. Burt Rutan (builder of the *Voyager* aircraft). Its twin, turboprop pusher engines are mounted at the rear of the wings, and the aircraft is equipped with a canard on the nose. The *Starship* will carry 8 to 11 passengers, fly at more than 300 mph and has a range of about 1,500 miles. In addition to being constructed of composites, the *Starship* will use the latest technology in its avionics, including digital instrumentation and CRT displays.

TURBOPROP, TWIN ENGINE

NAME OF AIRCRAFT	SEATS	CRUISING SPEED (MPH)	MAX RANGE (MILES)
Beechcraft *Kingair C*-90*A*	6-10	250	1,500
Beechcraft *Kingair B*200	8-15	300	2,700
Beechcraft *Kingair BE*300	8-15	275	2,000
Piper *Cheyenne* III	9-11	315	2,330
Sweringen *Merlin IVC*	13-16	305	2,500
BAe *Jetstream* 31	9-18	260	1,600
Beechcraft *Starship* 1	8-11	330	1,500

TURBOJET, TWIN ENGINE EXCEPT (3)

NAME OF AIRCRAFT	SEATS	CRUISING SPEED (MPH)	MAX RANGE (MILES)
Canadair *Challenger*	11-28	485	4,400
Cessna *Citation* III	8-10	460	3,000
Dassault *Falcon* 200	10-12	470	3,000
Dassault *Falcon* 50 (3)	12-14	480	4,800
Gates *Learjet* 35*A*	10-12	480	3,000
Gates *Learjet* 55*A*	12	480	3,500
Gulfstream IV	22	500	5,000
BAe 800	8-14	490	3,200
Israel *Westwind* 1	7-10	460	3,000
Beechcraft *BE*-400	10	435	2,300



***King Air C*-90A** *(Beechcraft photo)*

Turbojets. These aircraft are often called bizjets, or corporate jets, and are the top-of-the-line for executive aircraft. The chart in the figure on turboprops above shows the performance and the price of the bizjets both are high. A corporate jet is expensive to buy and to operate. Even the smallest bizjet will burn over 100 gallons of fuel per hour and larger ones can burn almost 300 gallons per hour.

However, remember during that hour you may be carrying 10 people over 400 miles. In order to justify owning a corporate jet, it is usually agreed that a company would have to fly more than 135,000 miles per year. This amounts to about 300 hours of flying per year, or 25 hours per month.

Beechcraft *Starship* 1

In the turbojet area, Gates *Learjet* leads all other manufacturers in numbers of aircraft. Their production at the end of 1987 totaled nearly 1,600 aircraft. In 1981, Gates *Learjet* introduced a new series called the *Learjet* 55. The 55*B* can be recognized by the vertical winglets at the tips of the wings. These winglets reduce drag and enhance thrust, thereby improving the aircraft's performance. The 55 series has been certificated to operate at 51,000 feet, the highest altitude of any business or executive jet. Grumman has also incorporated the winglets into their *Gulfstream* III and IV, as has Israel Aircraft in its *Westwind* 2.

There is quite a bit of difference in the amount of room inside the cabin of the various business/executive jets. In most of them, the dimensions are about 5 feet wide by a little over 4 feet high. You can see that it would be very difficult to get up and walk around in a cabin this size. There are some that are considerably more roomy, and the trend seems to be toward larger cabins. The *Gulfstream* has a cabin that is over 7 feet wide and over 6 feet

Gates *Learjet*

high. The Israel *Westwind* series is also over 6 feet high and 6 feet wide, as is the *Learjet Longhorn* series. Of course, to be larger on the inside, the aircraft has to be larger on the outside, as well as heavier. This leads to larger engines and more fuel consumption. The result is that you have two classes of business/executive jets small (*Learjet, Citation*, etc.) and large (*Gulfstream, Jetstar,* etc.). The cost of the aircraft also goes up as the size increases.

Beechjet

Cessna Citation

With today's emphasis on ecology and pollution, another important feature in turbojet aircraft is noise. The FAA has established maximum noise levels, which all jet aircraft had to comply with by 1990.

Another consideration when buying a business/executive jet is the length of available runways. The shorter the takeoff and landing distance, the more airports available to you. Here again, the Cessna *Citation* leads the field. It is able to take off and land in less distance than others in its class.

There are several very fine foreign-built bizjets. These include those built in France by Dassault, in England by British Aerospace, in Israel by Israel Aircraft Industries, and in Canada by Canadair Limited.

The Canadair *Challenger* began as a project for an advanced-technology bizjet by William Lear, developer of the *Learjet.* It was then called the *Lear Star* 600. Canadair Limited purchased the production rights from Lear, renamed the aircraft the *Challenger* and began production of the prototype in 1976.

The *Challenger* was the first production aircraft to use supercritical wings. The latest high-bypass turbofan engines power it. The engines (Avco Lycoming ALF 502) produce 7,500 pounds of thrust, giving the 40,000-pound aircraft the highest thrust for its weight of any bizjet.

These innovations allow this aircraft to takeoff quicker, climb faster, fly farther and have better fuel efficiency than any aircraft in its class. The Cessna *Citation* III is the latest model of the popular *Citation* jets. It is considerably larger than earlier *Citations,* being more than 8 feet longer and weighing 7,000 pounds more than the *Citation* II. The *Citation* III has supercritical wings and a 3,650-pound-thrust turbofan engine. It is similar in size and performance to the *Learjet* 55, but it has more range, burns less fuel at normal cruise speed and costs more than $1 million less than the 55.

Beech Aircraft bought the Mitsubishi Diamond Jet Corporation. They are selling the Diamond Jet aircraft under the name of *Beechjet BE*-400.

Business Aircraft

As we mentioned earlier, 78 percent of all business aircraft are single- and piston-engine aircraft and another 21 percent are twin- and piston-engine aircraft. We mentioned many of the single-engine aircraft in the section which dealt with personal aviation and will not repeat them here. Any of the single-engine aircraft manufactured by Beech, Cessna, Piper, Mooney, Rockwell, Grumman, Bellanca, etc., can be and are used as business aircraft. In this section, we will deal with only one single-engine aircraft, the Piper *Malibu*. We mention it because it is the only single-engine aircraft built in the United States, which is pressurized. The remainder of our discussion will deal with twin- and piston-engine aircraft and will be limited to the smaller, unpressurized and non-turbocharged twins.

The New Piper *Malibu Mirage*

The Piper *Malibu* is powered by a turbocharged, 310-horsepower piston engine. It can cruise at 248 mph at an altitude of 20,000 feet using 75 percent power. This altitude places the pressurized *Malibu* above most weather.

Business Twins. The light twin aircraft offers two advantages to the business person. First is the peace of

mind the second engine adds to the reliability of the aircraft. However, the pilot must be aware of the single-engine capability of the aircraft and not overload the aircraft. Second, the light twin will carry more payload at only a slightly higher cost than the heavy single-engine aircraft. The fuel efficiency of the twin will be almost the same as a single when all seats are full.

Remember, in most business aircraft, the business person is also the pilot. So, if the aircraft is listed as a six-place aircraft, this includes the pilot. Many times, a business person may not want to carry this many passengers. He or she may want to carry cargo instead. In this case, he or she can remove the seats and carry as much as 1,000 pounds of payload, or in some cases more.

Helicopters. Although there are several different types in service, most are Bell 206 *Jet Rangers* and McDonnell-Douglas 500*D*s. Business and executive helicopters have the same advantages as helicopters in general. They can takeoff and land from a small area rather than from a large airport. This is attractive to some companies, particularly if they have several plants within a few hundred miles of each other. The range and speed of a helicopter are very limited when compared to other executive aircraft, and if the helicopter has to land at a regular airport, it loses its advantage over conventional aircraft. However, if a helicopter pad is available at both the origin and the destination, a helicopter will save time over any conventional aircraft built on flights up to 250 miles.

Commercial Aviation

This is another term that causes a lot of confusion. Many people immediately think of the air carriers (airlines) when they hear the term commercial aviation. This is because the air carriers have been called commercial airlines for years. Remember, air carriers (commercial airlines) carry passengers or cargo for hire on a scheduled basis. Commercial aviation is a segment of general aviation, which deals with using general aviation aircraft for hire as a commercial (money making) business. The secret words here are “for hire.”

Commercial aviation is subdivided into two groups. Aircraft that produce income by transporting people or cargo on demand (air taxi/charter) and those that generate income with no transportation function involved.

Transportation

Air taxis and charter services provide transportation on a nonscheduled or demand basis. People needing to travel to a city not served by an air carrier and needing to get there in a hurry can go to the local airport and hire an aircraft and a pilot to fly them there. Most of the air taxi customers are business people who cannot afford to own their own aircraft, but need to get somewhere in a hurry. There is also some emergency transportation.

A company may need to get a part to one of its plants in a hurry or a medical patient may need to get to a hospital, so time is an important factor. These would be considered air taxi or charter operations. There are special FAA regulations which govern these operations. The pilot must have at least a

commercial pilot certificate and an instrument rating. The aircraft must have special instrumentation to allow it to fly in bad weather. The aircraft must also comply with special safety regulations.

Depending on the distance to be flown, the size of the load, the time factor and weather conditions, an air taxi may be as small and as simple as a Piper *Cherokee* or as large and as complex as a Gates *Learjet*. Helicopters are also used as air taxis. Many of these helicopters are used to transfer people and supplies to and from the offshore oil-drilling platforms. Before helicopters were available, this transportation was done by boat and many hours were required for each trip. Now it only takes a few minutes. This becomes very important during hurricane season when it is necessary to evacuate the platforms quickly.

Rental aircraft are sometimes included in the commercial aviation category and, at other times, they are included with the instructional aircraft. In this case, an individual hires an aircraft, but he or she also serves as the pilot rather than to hire one. Rental aircraft are also required to meet very strict safety and maintenance requirements.

A rental aircraft can be as plain or as fancy as the renter wants or can afford. Depending on the aircraft, a rental may cost from $50 per hour to over $2,000 per hour.

Nontransportation

In the nontransportation area of commercial aviation, we find agricultural application, aerial advertising, aerial photography, construction, fire fighting, pipeline/power line surveillance, fish and wildlife conservation, and logging.

In many of these areas, the use of aircraft is the only way to accomplish the task economically. This is particularly true in the use of helicopters. The helicopter is expensive to buy and very expensive to operate, but it is so versatile that it is often the least expensive way to accomplish the task.

Agricultural Application. Agricultural aircraft include both fixed-wing and rotary-wing aircraft. They seed, fertilize and apply pesticides to almost 200 million acres of farmland annually. Ninety percent of the US rice crop is seeded by air. One airplane can seed more acreage in an hour than a tractor can in a whole day. It also will use only one-ninth the amount of fuel that the tractor uses.

Cessna *Ag Husky* and *Ag Truck*

Agricultural aircraft face some very special requirements and they have developed into a special type of aircraft. Let's look at a couple of the most common agricultural aircraft.

The Cessna *Ag Husky* and the Schweizer *Super Ag-Cat* are manufactured specifically for agricultural applications. They all carry heavy payloads (1,900 to 5,000 pounds), have powerful (300- to 600-horsepower) engines and

have high-lift wings. The *Ag-Cat* is a biwing aircraft, while the *Ag Husky* is a monoplane. Both are very maneuverable and are noted for their ruggedness and reliability. They fly long hours under rough conditions. They are very expensive.

Helicopters are being used more and more in agricultural applications. They can get into smaller fields and can cover the ends and corners of fields with obstructions better than fixed-wing aircraft. Also, the downwash of the rotor blade causes the spray to be distributed more evenly and on the undersides of the leaves. Helicopters are more expensive to buy and to operate than fixed-wing aircraft, and they do not carry as large a payload. They do have one advantage in that they can be loaded with spray right in the field without being flown back to a landing strip like the fixed-wing airplane.

Two spray helicopters often seen are the Bell *Model* 47*G* and the Bell *Model* 206*B Jet Ranger.* Another, which is seen occasionally, is the Branbly-Hynes *B*-2. The 47G and the *B*-2 are both piston-engine helicopters, while the 206*B* is turbine-powered. The 206*B* has the largest payload, about 1,500 pounds. The 206*B* is also the fastest. But helicopters seldom spray at a speed of over 60 to 75 mph, so speed is not an important factor.

Helicopters, like this *Hughes* 500 *C*, play a vital role in both civilian and military aviation. *(EAA)*

Aerial Advertising. The public seldom sees most other uses of aircraft in the nontransportation commercial field. An exception is aerial advertising, which is specifically designed to be seen. Most of you have seen an aircraft towing a banner over a sports stadium or at a county fair. Another example of this use, which most of you have seen, is a Goodyear blimp. There are three of these large *dirigibles* in service across the United States; the *America*, the *Columbia* and the *Enterprise.* They are often leased by one of the television networks to give an aerial view of a major sporting event. Two of the blimps are equipped with a large, lighted display area on the side of the gasbag. This display area is used for advertising at large sporting events. Another method of aerial advertising, which is seen less often, is the skywriter. An acrobatic aircraft is equipped to inject oil into the engine. This oil burns causing dense smoke. The

The Budweiser Blimp, *A*-60 *Plus Lightship*, is 132 feet long, 44 feet high and cruises at 32 mph. It contains 70,000 cu. ft. of helium and features special internal illumination that makes it glow at night. *(EAA)*

specially trained pilot then uses his aircraft to write a message with this smoke hundreds of feet high in the sky.

Aerial Photography. This use of aviation has developed from taking simple pictures from the air to highly specialized photography using special films. The big advantage of aerial photography is that a single picture can cover a large area (often hundreds of square miles). Using infrared film and special filters, aerial photography can be used to spot and map crop damages due to disease or insects. Healthy plants appear red in these pictures and the diseased ones are dark. These types of pictures are valuable to foresters and farmers in stopping the spread of disease. This technique has been extended to space where satellites are taking these same types of pictures.

Fire Fighting. Many of you have seen television news broadcasts showing airplanes being used to help battle forest fires. These aircraft are used to deliver people and equipment into remote areas and to drop fire-retardant chemicals on the blaze. Many ex-World War II aircraft, such as the *TBM* torpedo bomber, the *B*-17 and the *PBY Catalina* are used for these missions. All of them are very stable, can fly very slowly and carry large payloads.

Fish and Wildlife. For many years, fish and wildlife people have been using aircraft to assist them. Airplanes stock many remote, high mountain lakes. The small fish are placed in water-filled plastic bags. As the airplane flies over the lake, at quite a low altitude, the bags are dropped. The plastic bags burst upon striking the surface of the lake, but most of the fish are uninjured.

In the mountainous areas of the Pacific Northwest, aircraft are used to manage wildlife such as deer and elk. Not only do the rangers take a census of the animals from aircraft but they also herd them from one area to another to prevent overgrazing of the range. Occasionally, during a severe winter, aircraft are used to drop feed to the herds.

Patrol Aircraft. Many utility companies hire pilots to fly along their pipelines or power lines to inspect them. These pilots fly at low altitudes looking for broken insulators, faulty transformers or downed power lines. Using aircraft, a pilot can patrol more distance in a day than can be patrolled in a week by a land vehicle. Often the areas are so remote that the only other way the patrol can be made on land is either on foot or horseback.

Industrial Uses. Another area, which has grown in the past few years, is the use of helicopters in many types of construction and in logging. It is in these jobs that the versatility of the helicopter is really shown.

In construction of power lines, helicopters often are used to carry preassembled towers to the location where they are to be erected. The helicopter can hold the tower in place, while a ground crew fastens it to the foundation. Helicopters have been used to place air conditioners on the roofs of high buildings and to place the antenna at the top of television towers, which are several thousand feet high.

Helicopters are also being regularly used around oil fields. They carry and place large loads, transport people and cargo. This is particularly true for offshore oil rigs.

The logging operations in Washington and Oregon provide one of the most fascinating uses of helicopters. Converted *Sikorsky S*64 *Skycranes* and *Vertol CH*-47 *Chinooks* are used to transport huge loads of logs. Many of these areas were so inaccessible that trucks could not he brought in to carry out the logs. Now, they are being harvested, and the logs are carried out by helicopter. The *S*64 is the largest helicopter in the United States and can carry payloads as heavy as 20 tons. The *CH*-47can lift about 11,000 pounds, but can be operated much cheaper than the *S*64. In the past, these helicopters

have been available only as military surplus. Now, however, the market has grown significantly and Boeing Vertol has built a commercial version of the *Chinook*.

Key Terms and Concepts

- commercial aviation
- air taxis
- rental aircraft
- STOL
- VTOL
- UAV
- business aviation
- business aircraft
- executive aircraft
- corporate jet
- charter services
- agricultural applications
- aerial advertising
- aerial photography

? Test Your Knowledge ?

FILL IN THE BLANKS

1. *_____ involve hiring a _____ and an _____ to fly you to your destination while _____ allow you to be the pilot if you are qualified.*
2. *The light, twin aircraft offers the advantages of _____ _____ _____ and _____ to the business person.*
3. *The _____ is the only single-engine aircraft built in the US that is pressurized.*
4. *Commercial aviation is divided into two categories—_____ /_____ that produce income by transporting people or cargo on demand, and those that generate income with no _____ _____ involved.*

5. *Fill in the blanks with nontransportation areas of commercial aviation:*

   _____ *Fixed- and rotary-wing aircraft seed, fertilize and apply pesticides*
   _____ *Towing a banner or using the blimp to circle a stadium or county fair*
   _____ *Conducting simple picture taking or highly specialized photography*
   _____ *Deliver people and equipment to remote areas or dropping chemicals*
   _____ *Stock high mountain lakes, herd animals or drop feed in the winter*
   _____ *Inspect power- or pipe-lines for damage*
   _____ *Hauling pre-assembled units out to be bolted in by ground crews*
   _____ *Transporting huge loads from areas too remote to access by truck*

TRUE OR FALSE

6. *Nearly two thirds of the Fortune 500 companies own aircraft for business purposes.*
7. *It will actually take a turboprop longer to fly a 500-mile trip than it would a piston engine aircraft due to climbing to a higher cruising altitude.*
8. *The* Beech Starship *I is built of composite materials using a design by the builder of Voyager, Mr. Burt Rutan.*
9. *Helicopters can easily be used to haul power line towers out to the installation location.*
10. *In the past, many business aircraft were over-utilized because they let the longest trip made during the year be the guidance as to which aircraft they purchased.*

SHORT ANSWER

11. *What is the definition of business aviation?*
12. *What distinguishes between business aircraft and executive aircraft?*
13. *Describe a typical business aircraft.*
14. *Describe a typical executive aircraft.*
15. *Name the three factors important in selection of aircraft for business aviation and the reasons for them.*
16. *What does commercial aviation refer to?*