SOUTH CAROLINA

AVIATION

NEWSLETTER

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ENSTROM F-28A

South Carolina Helicopters, Inc. at Saluda has been appointed as dealer for the new Enstrom F-28A 3-place helicopter.

The F-28A, built by the R.J. Enstrom Corporation, Menominee, Michigan, has a cruising speed of 100 mph and has the lowest noise level of any of the light helicopters. The 3-bladed rotor and control system make it one of the most stable in its field.

The Enstrom Corporation is increasing production facilities at Menominee, Michigan, to triple its F-28A 3-place helicopter output capability. Improvements are being incorporated in the firm's F-28A and a T-28 version with a 240-shp. Garrett AiResearch TSE 36 turbine is being prepared for the market.

In addition to selling the Enstrom, South Carolina Helicopter, Inc. handles Hughes Helicopters and is approved for FAA and VA Flight School.

ALLENDALE AIRPORT

Henry D. Padgett has closed his field between Allendale and Fairfax and moved to the new Allendale County Airport. The new airport is located just Southeast of the Allendale VOR. The runway is 3200 feet long and is paved and lighted.

Padgett has fuel available and operates a charter service and flight training and also aerial application service.

The old Allendale Airport is now closed and the lights have been removed.

BREAKFAST CLUB NEWS

The South Carolina Breakfast Club met January 26, 1969, at Moncks Corner. The Civil Air Patrol was host to approximately 150 members who were warmly welcomed by Mayor Walter Williams. The Civil Air Patrol is to be complimented for the assistance they gave the pilots in parking and the program which they had planned.

The next meeting is scheduled for February 9, at Greenwood, sponsored by Homer Collom, past President of the Club for many years. Homer has made plans for an outstanding meeting. The meeting for February 22 is planned for the Hartsville Airport. We hope that everyone will make a special effort to attend.

Department of Transportation
FEDERAL AVIATION ADMINISTRATION

IFR PILOT EXAM-O-GRAM* NO. 24

THE ATTITUDE INDICATOR

An instrument pilot should have a working knowledge of the operating principles, limits, and errors of the flight instruments he is using. It is apparent from written test responses and interviews with instrument pilot examiners that many student instrument pilots are lacking in knowledge concerning the attitude indicator. Attitude indicators are either vacuum-driven or electric motor driven instruments. The principles of operation are basically the same for both types. Since the vacuum-driven instrument is still in more common use among light general aviation aircraft, it will be described in more detail in this Exam-O-Gram. The attitude indicator is a reliable and ingenious instrument. It provides an immediate, direct and corresponding indication of any change of aircraft pitch and bank attitude in relation to the natural horizon.

THE OPERATION OF THE ATTITUDE INDICATOR DEPENDS ON WHAT GYROSCOPIC PRINCIPLE?

The principle is "rigidity in space" which is based on Newton's first and second laws of motion. A universally mounted gyroscope (wheel or rotor mounted in three gimbals turning at high speed tends to remain in a constant plane of rotation regardless of the movement of its base. The rotors of both vacuum-driven and electric instruments rotate in a horizontal plane. The horizon bar is linked to the gyroscope and thus also tends to remain in a constant plane regardless of aircraft attitude (Fig. 1).

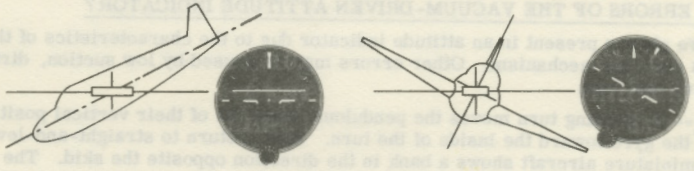
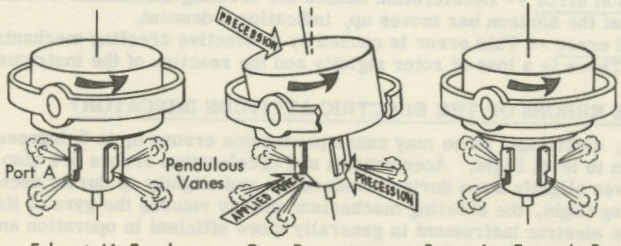


Fig. 1

WHAT IS THE EFFECT OF "PRECESSION" ON THE ATTITUDE INDICATOR?

A second principle of the gyroscope may be defined as follows: when a deflective force is applied to a rotating gyro, the resultant force will act at a point 90 degrees ahead and in the direction of rotation. Due to imperfections of the gyro mechanism and to forces applied to it, the rotor of the attitude indicator is constantly precessing from its proper plane of rotation. Without an erecting mechanism to correct for precession, the attitude indicator would be useless.

Vacuum-driven instrument -- Figure 2 is a diagrammatic view of the erecting device. Differential air flow from ports partially covered by pendulous vanes exerts a precessing force on the rotor to erect it.



Exhaust Air Equal In All Directions Erect.

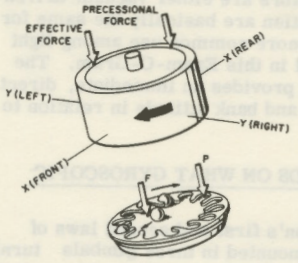
Gyro Precesses Increasing Exhaust From Port A.

Precessing Force At Port A Erects Gyro Exhaust Air Again Equal At All Ports.

Fig. 2

DISTRIBUTION: ZC-307

Electric instrument -- The erection system of a representative type is shown in Fig. 3.



POINT "F" Is The Center Of Gravity Of The Balls Where The Effective Erecting Force Is Applied.

POINT "P" Is The Precessional Force (Force "F" Rotated 90° In The Direction Of Rotation) Which Erects The Gyro.

Fig. 3

WHAT ARE THE ERRORS OF THE VACUUM-DRIVEN ATTITUDE INDICATOR?

Certain errors are always present in an attitude indicator due to the characteristics of the gyroscope and its erecting mechanism. Other errors may be caused by low suction, dirt, unbalance and worn bearings.

1. Skid error -- A skidding turn moves the pendulous vanes out of their vertical position precessing the gyro toward the inside of the turn. After return to straight-and-level flight, the miniature aircraft shows a bank in the direction opposite the skid. The maximum error is 3 to 4 degrees. When the skidding stops, the erecting mechanism soon returns the rotor to its normal plane of rotation.
2. Turn error -- During a normal coordinated turn, movement of the pendulous vanes by centrifugal force causes the gyro to precess toward the inside of the turn. The error is greatest in a steep turn. After rolling-out at the end of a 180 degree turn, the miniature aircraft shows a slight climb and a banked attitude opposite the direction of the turn. This precession error is quickly corrected by the erecting mechanism. The precession induced by a second 180 degree turn cancels the error of the first.
3. Acceleration error -- When the aircraft accelerates, the pendulous vanes of the erecting mechanism are moved out of position resulting in a precession of the gyro. The horizon bar moves down and the instrument indicates a climb.
4. Deceleration error -- Deceleration causes the erecting mechanism to react in such a manner that the horizon bar moves up, indicating a descent.
5. Haphazard error -- This error is caused by a defective erecting mechanism or low suction. There is a loss of rotor rigidity and the reaction of the instrument is unpredictable.

WHAT ARE THE ERRORS OF THE ELECTRIC ATTITUDE INDICATOR?

In normal turns, centrifugal force may cause precession errors up to 5 degrees of pitch and bank upon return to level flight. Acceleration and deceleration errors are also present. The horizon bar moves slightly down during acceleration and slightly up during deceleration. Upon return to cruising flight, the erecting mechanism quickly returns the gyro to its proper plane of rotation. The electric instrument is generally more efficient in operation and less subject to error than the vacuum-driven instrument.

WHAT ARE THE PITCH AND BANK LIMITS OF THE VACUUM-DRIVEN ATTITUDE INDICATOR?

The pitch limit is approximately 60 degrees and the bank limit is approximately 100 degrees. Rotation of the aircraft beyond these limits will cause the gyro to spill or tumble. Since these limits are beyond the attitude restrictions of "normal category" aircraft, the instrument should not tumble in normal instrument flight. An accurate and systematic cross-check of the other pitch and bank instruments will enable the pilot to recognize an "upset" attitude indicator.

WHAT ARE THE PITCH AND BANK LIMITS OF THE ELECTRIC ATTITUDE INDICATOR?

The limits depend on the design of the instrument. One type has approximately the same upset limits as the vacuum-driven instrument. Another type has full rotational freedom about both pitch and bank axes and therefore no upset limits.

DOES THE ATTITUDE INDICATOR TELL THE PILOT WHEN A TURN IS COORDINATED?

No, the pilot should always check his coordination by referring to the "ball" of the turn-and-slip indicator.

DOES THE ATTITUDE INDICATOR TELL THE PILOT HIS RATE OF TURN?

No, he determines his rate of turn by referring to the turn needle of the turn-and-slip indicator. Of course, he can establish a bank by the attitude indicator which should give him a desired rate to turn for a particular true airspeed. For example, if a turn is coordinated, a 15 degree bank will maintain a standard rate turn (3 degrees per second) at 100 knots true airspeed.

CAN THE ATTITUDE INDICATOR BE USED IN RECOVERING FROM UNUSUAL ATTITUDES?

Yes, if the instrument has not tumbled. During unusual attitude recoveries, the airspeed, altimeter, and turn needle should always be cross-checked closely to determine the accuracy of the indication given by the attitude indicator.

WHAT PRECAUTIONS SHOULD BE TAKEN WHEN CAGING AND UNCAGING THE ATTITUDE INDICATOR?

If the instrument has a caging knob and it becomes necessary to cage and uncage it in flight, be sure the aircraft is flying straight-and-level. The indications of the instrument depend on the position of a universally mounted gyro which if uncaged in an unlevel attitude tends to remain in an unlevel attitude due to rigidity. Several minutes may be required by the erecting mechanism to correct the rotor's plane of rotation. Be sure the instrument is fully uncaged otherwise the operational limits will be reduced and the gyro will tumble in otherwise safe maneuvers.

HOW IS THE ATTITUDE INDICATOR CHECKED FOR PROPER OPERATION PRIOR TO FLIGHT?

After starting the engine, make these checks: for a vacuum-driven instrument, the suction gage should read in the required range (usually between 3.75 and 5.0 inches of mercury, depending on the installation) -- for an electric instrument, check the generator and inverter for proper operation. Five minutes should be allowed for the rotor to attain normal operating speed. The horizon bar should stabilize in a horizontal position and should remain in the correct position for the attitude of the aircraft. The horizon bar should not tip more than 5 degrees during taxiing turns.

SUMMARY:

The attitude indicator is a reliable instrument. It is the single instrument that provides a direct indication of aircraft attitude. The small errors inherent in its design can readily be compensated for by an accurate cross-check with the other flight instruments and by having a knowledge of its operating principles and limits.

REFERENCES:

Instrument Flying Handbook, AC 61-27
Instrument Pilot Exam-O-Gram No. 18

* Exam-O-Grams are non-directive in nature and are issued solely as an information service to individuals interested in Airman Written Examinations.

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POWDER PUFF DERBY
July 4 - 7, 1969

The nation's greatest speed "Fly-out" will occur on July 4, 1969, when an anticipated 90 airplanes, piloted by 180 women competing in the 23rd Annual POWDER PUFF DERBY, will roar off from SAN DIEGO'S Lindbergh Field on their calculated dash to Dulles International Airport, WASHINGTON, D.C. In order to qualify, all contestants must buzz the finish line at Dulles, America's most unique airport, by sundown July 7th.

The race is open to all qualified women pilots flying stock model, fixed-wing, single or multi-engine aircraft, 145-450 horsepower. Only daylight flying in VFR (contact) weather, as defined by the Federal Aviation Administration, is permitted. Winners are determined on a handicap basis, "par speeds" having been established based on figures available from manufacturers' data for each make and model of aircraft. Since take-offs are in order of entry, winners cannot be known until all planes have crossed the finish line.

The 2515 mile route is historically fitting for a "red, white and blue" year with 9 en route stops which are officially designated for refueling and remaining overnight. Their towers will be equipped with Simplex Time Stamps so that after the fly-by of the timing lines, time will not be counted in the final scoring until the wheels start their take-off roll on the runway.

Contestants will vie for the $5,250. purse to be divided among the top five winners. Trophies will be given as well as several thousand dollars more in additional prize monies for the best scores between stops, best in each horsepower class of aircraft, and in other specialized categories.

The race is managed by an eight-woman Board of Directors, AWTAR, Inc. (a nonprofit corporation), and is endorsed by The Ninety-Nines, Inc.

FUEL MANAGEMENT

The pilot of even the smallest airplane is involved in fuel management problems. The subject of fuel management is not at all complex, in most instances, for general aviation pilots but the small details do need our attention. The following do's and don'ts represent the Nebraska Department of Aeronautics thoughts concerning certain aspects of fuel management procedures which we feel are of utmost importance to safe flight.

DON'T switch the fuel selector or selectors to a different fuel tank after engine run up and prior to take off. You have made your engine run up on a particular tank and a particular portion of your fuel system which you have found to be operating so use it for take off. Don't switch to an unknown.

DON'T switch fuel systems on final approach. In the first place, you should visually check the new positioning of the selector. This visual check then becomes a distraction and is an unnecessary distraction during the final approach. The act of switching to a different system, if necessary should be done at a higher altitude and out of the traffic pattern just in case there is a malfunction in the selected system.

DON'T assume your tanks are full simply because you requested the lineman to fill her up! So many factors can enter into the picture. The lineman can fill the wrong tank; he can even refuel the wrong airplane. The lineman can be distracted and completely forget to refuel your airplane. Visually check the quantity in the fuel cells. Use a dipstick if necessary but do it. Use the gauges only as a double check.

Do become intimately familiar with the fuel flow pattern for your engine under all operating conditions. Time your flights; then measure the remaining fuel or the amount of fuel required to fully refuel each tank. Check these findings with your fuel gauge. After following this procedure for a few times you will become familiar with both consumption and the remaining fuel quantity pattern as related to your fuel gauge. You are particularly interested in knowing the exact amount of fuel remaining when the gauge or gauges indicate in the lower registers.

SOUTH CAROLINA AERONAUTICS COMMISSION
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MARLBORO COUNTY AIRPORT

January 1 marked the official opening date of the Marlboro County Airport which is located just west of Bennettsville, South Carolina. The new airport is 4000 feet in length, paved and lighted.

Rowe Airport which has been sold to Essex International has been temporarily leased by the county for use until facilities can be completed on the new airport site. As soon as this work is completed, Rowe field will be closed. Essex International will announce plans in the near future to expand their facilities with the construction of a new plant on Rowe field.

Rowe field which served the Bennettsville area for over 30 years, was operated for most of this period by the late Buster Rowe.

Rowe Airport was built in 1931 by Douglas Woodle. The first plane to land was flown by B.P. Parrish. In 1934, W.S. Crosland purchased the airport and expanded it by building two additional runways. In 1938, Crosland sold the airport to W.S. (Buster) Rowe, and Buster operated the airport until his death when it was taken over by Cecil Boone.