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(Prepared by R.T.P.)

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Notes on the Lift and Moment of a Plane Aerofoil which Touches the Ground with its Trailing Edge. (S. Tomotika and I. Imai, Aer. Res. Inst., Tokio, Report No. 154, July, 1937.) (49/1 Japan.)

In the theoretical part of his interesting paper on the interference effect of the ground under the aerodynamical characteristics of a plane aerofoil, G. Dätwyler has calculated the lift and moment of the aerofoil when it touches the ground with its trailing edge.

It is easily seen, however, that Dätwyler's case is a limiting case of our general case treated in detail in our previous papers when the distance (s) of the trailing edge of the aerofoil from the ground becomes indefinitely small. Thus, it is expected that Dätwyler's results can be deduced from our general formulæ as their limiting forms by making $s \to o$.

In the present paper, the limiting forms of our general formulæ are obtained when the trailing edge of the aerofoil approaches indefinitely close to the boundary wall and it is shown that those limiting formulæ are in accord with Dätwyler's formulæ, as we have expected. In this connection it may be remarked, however, that although Dätwyler has obtained the expression for the moment of fluid pressure in terms of certain definite integrals and the values of those integrals have been obtained by means of a planimeter, yet those integrals can be evaluated exactly if we make use of the method of complex integration.

As an addendum, Dätwyler's results are re-obtained by applying the well-known Blasius's formulæ. Also some numerical calculations are carried out and the results are shown in table and figures.

Fuselage Drag Tests in the Variable Density Wind Tunnel: Streamline Bodies of Revolution, Fineness Ratio of 5. (I. H. Abbott, N.A.C.A. Tech. Note, No. 614, Sept., 1937.) (49/2 U.S.A.)

Results are presented of drag tests of six bodies of revolution with systematically varying shapes and with a fineness ratio of 5. The forms were derived from source-sink distributions, and formulæ are presented for the calculation of the pressure distributions of the forms. The tests were made in the N.A.C.A. variable-density tunnel over a range of values of Reynolds number from about 1,500,000 to 25,000,000. The results show that the bodies with the sharper noses and tails have the lowest drag coefficients, even when the drag coefficients are based on the two-thirds power of the volume. The data show the most important single characteristic of the body form to be the tail angle, which must be fine to obtain low drag.

The Influence of a Thin Film on the Movement of Waves. (R. Merigoux, Comp. Rend., Vol. 205, No. 2, 12/7/37, pp. 115-117.) (49/3 France.)

The author shows that in the case of a monomolecular film of oil in water, no stable surface ripples can be produced by pressure variation along the surface. The effect of surface wind is thus to produce a disturbance which passes through the film and is dissipated in the deeper water.

The effect of the oil thus causes an indirect increase in friction and this accounts for the damping effect on the waves.

Experimental Investigation of Wind Tunnel Interference on the Downwash Behind an Aerofoil. (A. Silverstein and S. Katzoff, N.A.C.A. Report No. 609, 1937.) (49/4 U.S.A.)

The interference of the wind-tunnel boundaries on the downwash behind an aerofoil has been experimentally investigated and the results have been compared with the available theoretical results for open-throat wind tunnels. As in previous studies, the simplified theoretical treatment that assumes the test section to be an infinite free jet has been shown to be satisfactory at the lifting line. The experimental results, however, show that this assumption may lead to erroneous conclusions regarding the corrections to be applied to the downwash in the region behind the aerofoil where the tail surfaces are normally located. The results of a theory based on the more accurate concept of the open-jet wind tunnel as a finite length of free jet provided with a closed exit passage are in good qualitative agreement with the experimental results.

The Suspension of Solids in a Turbulent Stream. (E. G. Richardson, Proc. Roy. Soc., Series A, Vol. 162, No. 911, 15/10/37, pp. 583-97.) (49/5 Great Britain.)

It is shown how the concept of an " austausch (or exchange) coefficient " in problems involving the diffusion of turbulence may be applied to the study of the distribution of solid material in a turbulent stream. A technique is developed by means of which the relative quantities of solid carried in suspension at different levels in a water channel having a bed of graded sand can be measured, and the results applied to predict how the " austausch " varies in the vicinity of the bed. The factor in question is found to increase in direct proportion to height at first, but rapidly reaches a constant value in the main stream. Measurements in a natural river also indicate an approximately constant value, and, making this assumption of constant " austausch," it is shown that a simple apparatus enables one to make observations of the total silt content of a river from time to time.

Note on the Interference Effect of the Walls of a Pipe upon the Moment of a Rayleigh Disc. (Proc. Phys. Math. Soc. (Japan), Vol. 19, No. 4, 1937, pp. 329-36. Phys. Berichte, Vol. 18, No. 18, 1937, p. 1631.) (49/6 Japan.)

In the case of two-dimensioned frictional flow round a plate inclined at an angle to the flow, a couple is produced tending to turn the plate at right angles to the flow. In a previous paper the author has shown that this moment is increased if the plate is situated in a finite channel with parallel walls. The theoretical conclusions are confirmed by experiment with a circular plate in a circular tube.

Air Resistance of Railroad Equipment. (A. I. Lipetz, Trans. A.S.M.E., Vol. 59, No. 7, Oct., 1937, pp. 617-40.) (49/7 U.S.A.)

After determining the air-resistance formulæ for the models used in the tests, the author expands the coefficients of the formulæ to apply to full-scale equipment, and further simplifies the formulæ for application to the prototypes of the models.

He compares air-resistance of full-scale equipment as obtained from the formulæ derived from test results and the simplified formulæ, presenting such data in tabular as well as graphical form. The author concludes his paper with a discussion of air-resistance tests of full-size equipment and savings in power affected by streamlining.

Mechanism of Disintegration of Liquid Jets. (P. H. Schweitzer, J. Applied Physics, Vol. 8, No. 8, August, 1937, pp. 513-521.) (49/8 U.S.A.)

The velocity distribution in the jet immediately after it has left the nozzle will be sensibly equal to that existing in the tube and may thus be of the laminar, semi-turbulent or completely turbulent type. In the latter case, the jet will almost immediately break up under the influence of the radial velocity components, even if injected into a vacuum. A laminar jet will maintain its shape over a considerable distance till it finally disintegrates under the combined action of air friction and surface tension. The semi-turbulent case occupies an intermediate position, depending on the thickness of the laminar protecting sheaths.

It thus appears that viscosity is the decisive factor in determining disintegration. The influence of nozzle designs is very great, long smooth walled orifices delaying disintegration considerably. On the other hand, rough projections at the nozzle or the imparting of a rotary motion to the jet at the exit reduces the stability. (17 references.)

The Measurement of Aerodynamic Qualities of Aircraft. (M. Precoul, L'Aeron., No. 211, Dec., 1936 (Suppt. L'Aerotechnique), pp. 145-154.) (49/9 France.)

Formulæ are deduced by means of which the aerodynamic qualities of aeroplanes can be calculated from given dimensions and performance figures. Formula are first obtained for fineness coefficient, minimum drag coefficient, maximum lift coefficient and maximum/minimum speed ratio for ground conditions and altitude corrections are then applied. Tables of comparative results are worked out for German, French, U.S.A., British, Dutch and Italian planes in the following six categories: Single engine transport planes >100 b.h.p., single engine transport planes <100 b.h.p., speed record planes, single engine scouts, and large and small transport planes.

The Influence of Design and Safety Appliances on the Stressing of Aircraft when Pulling Out of a Dive. (W. Kaul, L.F.F., Vol. 14, No. 4-5, 20/4/37, pp. 191-195.) (49/10 Germany.)

By simplifying the equation of longitudinal controlled motion, the author derives simple expressions for the wing and elevator loading, and determines the effect of such constructional features as span, surface loading, depth ratio of rudder, etc.

In order to reduce the stressing when pulling out of a dive and thus reduce constructional weight, the author proposes to limit the effect of the elevator to an extent compatible with other flying qualities, especially as regards perfect three-point landing with the foremost position of the C.G. The effect of the elevator can be limited by shortening (reduction of depth ratio) or the possible deflection can be controlled when diving.

The latter device can be rendered automatic by making the control a function of the dynamic head (see Abstract 49/11).

Aircraft Design and Improved Performance. (G. Bock, Luftwissen, Vol. 4, No. 4, April, 1937, pp. 104-115.) (49/11 Germany.)

The author considers in detail aerodynamic losses occurring at the propeller, the profile resistance of the wings and the drag of the fuselage and radiators.

The performance limits of aircraft of modern design are estimated and the possibilities of a saving in constructional weight are reviewed. In this connection

special reference is made to an improved form of spot welding with controlled welding current and electrode pressure.

In order to prevent ultra light structure being subjected to undue stresses during manœuvres, the D.V.L. working in conjunction with Messrs. Siemens have developed an automatic elevator control in which the maximum possible rudder deflection becomes automatically less as the dynamic head increases.

Problems Arising Out of the Vibration of Aircraft. (G. A. A.. Fiore, L'Aerotecnica, Vol. 17, No. 3, March, 1937, pp. 187-216.) (49/12 Italy.)

The author deals with various types of self-excited motion. It appears that the critical speed of wing flutter is considerably diminished at large angles of incidence (stall). The autorotation produced by unbalanced ailerons is discussed as well as reversal of aileron control due to wing twist.

Experimental wing tests are described, the wing being vibrated by rotating unbalanced weights or springs and eccentrics.

In conclusion the benefit arising from flexible engine mounts is pointed out.

Calculation of Velocity Reached in a Nose Dive. (Report of the Italian Air Ministry, L'Aerotecnica, Vol. 17, No. 3, March, 1937, pp. 217-223.) (49/13 Italy.)

The velocity increase during a power dive is calculated by means of auxiliary charts. Variation of air density is taken into account and the thrust, angle of incidence and path angle are kept constant in steps of 6,000 feet.

The same subject is treated somewhat differently in N.A.C.A. Tech. Note No. 599. (Abstract A, No. 47, item 15.)

Wind Tunnel Experiments on Combined Torsional and Bending Vibrations of Aircraft Wings. (H. Voigt, L.F.F., Vol. 14, No. 9, 20/9/37, pp. 427-33.) (49/14 Germany.)

In order to test the theory of wing oscillations with degrees of freedom in flexure and torsion, a wing was suspended in a wind tunnel between two walls in such a way that it could perform both vertical oscillations (flexural) and torsional oscillations about any transverse axis. All elasticity and mass parameters could be varied. The negligibly small natural damping of the system could be artifically increased. An enlarged photographic record of the oscillations was obtained by the use of concave mirrors. The critical velocities determined experimentally agree with those calculated from the theories of Wagner and Küssner within the range of experimental and computational accuracy. An extremely narrow wing tested without lateral walls (three-dimensional problem) showed the same oscillations as with walls (two-dimensional problem).

Researches on the Safety of Aircraft with Special Reference to Vibration Phenomena. (K. H. Ruehl, Lilienthal Society Yearbook, 1936, pp. 258-264.) (49/15 Germany.)

The author calculates the critical velocity (flutter) of a given wing by three independent methods and obtains results varying by more than 3 to 1.

In the case of a plane (two-dimensional) wing, however, all three methods were in satisfactory agreement.

This points to the urgent need of further experiments with three-dimensional models.

In the second part of the paper the author gives a critical review of the safety factors laid down in the strength specification covering those parts of an aircraft which are subject to lifting forces. It is specially emphasised that in many cases the loading is periodic and the possibility of fatigue must be kept in view.

Motion of the Two-Control Aeroplane in Rectilinear Flight after Initial Disturbances with Introduction of Controls Following an Exponential Law. (A. Klemin, N.A.C.A. Tech. Note No. 615, Sept., 1937.) (49/16 U.S.A.)

An aeroplane in steady rectilinear flight was assumed to experience an initial disturbance in rolling or yawing velocity. The equations of motion were solved to see if it were possible to hasten recovery of a stable aeroplane or to secure recovery of an unstable aeroplane by the application of a single lateral control following an exponential law.

The sample computations indicate that, for initial disturbances complex in character, it would be difficult to secure correlation with one type of exponential control. The possibility is visualised that two-control operation may seriously impair the ability to hasten recovery or counteract instability.

Characteristics of Six Propellers including the High Speed Range. (T. Theodorsen, G. W. Stickle and M. J. Brevoort, N.A.C.A. Report No. 594, 1937.) (49/17 U.S.A.)

This investigation is part of an extensive experimental study that has been carried out at full-scale in the N.A.C.A. 20-foot tunnel, the purpose of which has been to furnish information in regard to the functioning of the propeller-cowling-nacelle unit under all conditions of take-off, climbing, and normal flight.

The results show very striking differences in the aerodynamic qualities of the various propellers, particularly in the high speed range. Also of interest is the fact that the conventional propeller is shown to reach its peak efficiency in a range of 200 to 350 miles per hour and at a blade angle of approximately 35°. The inadequacy of using the propulsive efficiency unconditionally as a figure of merit is shown.

The adoption of some standard nacelle unit is therefore recommended as a basis for the comparative testing of propellers.

Two New Longitudinal Stability Constants. (A. Klemin and J. G. Beerer, J. Aeron. Sci., Vol. 4, No. 11, Sept., 1937, pp. 453-9.) (49/18 U.S.A.)

The way to define longitudinal stability quantitatively is with reference to time; duration of the period, duration of the time to damp to half amplitude, and ratio of time to damp to the period.

If it is conceded that longitudinal stability should be defined in terms of periods of oscillation and times to damp to half amplitude, then the simple use of Diehl's coefficient of static stability is not adequate, and the designer should make at least some attempt to go a little deeper into the subject.

Consideration should be given to the effects of linear dimensions, wing loading, and air density, and the practical approach in design would be to start with an aeroplane whose longitudinal stability characteristics are known, and known to be satisfactory, and to make allowance for variations in the above parameters when passing to a new design.

Wing Loading. (W. C. Nelson, J. Aeron. Sci., Vol. 4, No. 11, Sept., 1937, pp. 469-72.) (49/19 U.S.A.)

A study is made here of the proper correlation between wing loading and high altitude cruising efficiency as applied to the commercial transport field. A wide range of the major performance parameters of span loading, power loading, and drag loading is taken to make the analysis as general as possible. From a study of the charts developed it is obvious that there is a definite, desirable value of the wing loading for any specific altitude cruising condition. Cruising at a 65 per cent. power factor and with a power loading of 10lb. per b.h.p. or more, the optimum wing loading is 25lb. per sq. ft. or less at 35,000ft. altitude, and 20lb. per sq. ft. or less at 50,000ft. altitude for a conventional transport design.

Flight Test Research on a Small Bi-Motor Aeroplane. (C. L. Johnson, J. Aeron. Sci., Vol. 4, No. 11, Sept., 1937, pp. 473-7.) (49/20 U.S.A.)

The aeroplane Lockheed Model 12 bi-motor is a small, high performance ship with a gross weight of 8,400lb. and a top speed close to 230 m.p.h. The programme of testing included among other things, the determination of:—

(1) Lift and drag characteristics of the aeroplane.
(2) Effect of power on maximum lift coefficient with and without wing flaps extended.
(3) The drag of the streamlined tail wheel and strut.
(4) The effect of several servo-tab ratios in reducing the control forces.
(5) A one point measurement of the flow speed ratio over the wing flap with power on and off.
(6) Aeroplane altimeter error due to position of pitot static head.
(7) Factors affecting accuracy of engine fuel consumption tests.

The Economics of Speed. (T. P. Wright, J. Aeron. Sci., Vol. 4, No. 11, Sept., 1937, p. 478.) (Copy of complete lecture available in R.T.P.) (49/21 U.S.A.)

Great progress has been made in refining the aeroplane in the past eight years. In 1928 sixty-six per cent. of the total horse-power was wasted in overcoming unnecessary drag. This waste is now only twenty-five per cent. And whereas their speeds were but sixty-five per cent. as fast as they should have been, present-day speeds are eighty-nine per cent. as fast, very little waste in drag remaining.

As direct proof of the various factors cited, reference is made to the growth of air transport throughout the past seven years wherein during a major business depression, a constant rate of increase in passenger miles travelled of thirty per cent. each year over the previous year has maintained. It is concluded definitely that speed is sound economically.

In order to gain an additional mile per hour in cruising speed, it is worth while spending three thousand dollars on the design and construction and one thousand dollars in the building of the production article.

Pressure Distribution on a Wing Section with Slotted Flap in Free Flight. (G. Kiel, L.F.F., Vol. 14, No. 2, 20/2/37, pp. 71-84. Translation in N.A.C.A. Tech. Memo. No. 835.) (49/22 Germany.)

Pressure distribution curves were obtained in unaccelerated flight on a wing section with slotted flap at flap deflections of 0°, 19°, 32°. The flap chord was 0.296 times the over-all wing chord. With a flap deflection of 19° the pressure distribution curves show a somewhat fuller form (that is, less peaked) than is the case with flap neutral. With the flap deflected 19° there is only a relatively slight change both in the maximum pressure at the flap leading edge as well as in the general pressure distribution over the flap. Evidently the main wing diverts the flow in such a manner that the air flow direction at the flap experiences only a slight change. With a flap deflection of 32° a marked pressure rise occurs at the leading edge of the flap, considerably exceeding that at the wing leading edge at small normal force coefficients. As the normal force coefficient increases a rather steep pressure peak is built up at the nose of the wing while at the flap leading edge the pressure increases at a considerably lower rate.

The Measurement of Airspeed of Aeroplanes. (F. L. Thompson, N.A.C.A. Tech. Note, No. 616, October, 1937.) (49/23 U.S.A.)

Various methods of measuring the air speed of aeroplanes are described. Particular emphasis is placed on the procedure required to obtain precise measurements of speed by the use of the suspended pitot static head or the suspended

static head. Typical calibration curves for service installations of pitot static heads are shown and the relation between errors in air speed and corresponding errors in observed altitude for such installations is discussed. There is included a brief discussion of various speed course methods of measuring speed.

Cinematograph Study of the Stability and Manœuvrability of Aircraft. (C. Brachet, La Science et la Vie, No. 243, Sept., 1937, pp. 181-8.) (49/24 France.)

The stability and manœuvrability can only be studied satisfactorily by experiments in flight. At the French centre of Villacoublay some information on this subject is obtained in a simple manner, the pilot recording the effort and displacement of the control stick by reading a spring balance and scale. This, however, necessitates steady flight conditions. Professor Haus, of Gand University (Belgium) has perfected a photographic scheme which enables the readings of various instruments which define the conditions of the aircraft at any instant to be recorded.

The following 11 factors are registered simultaneously by the suitable grouping of 17 instrument dials:—

(1) Altitude of flight.
(2) R.p.m. of engine.
(3) Speed of aircraft along its trajectory.
(4) Angle of incidence of the wing.
(5) The slope of the trajectory with regard to the horizon.
(6) The angular velocity of the aircraft.
(7) The value of apparent gravity.
(8) The position of the principal control surfaces (elevator, rudder, ailerons).
(9) The corresponding forces required to hold the control surfaces in the position indicated.
(10) The inclination of the aircraft with regard to the horizon.
(11) The time.

The author recalls that such " flying laboratories " were suggested over 15 years ago by the French scientist Magnan and is of the opinion that France is still leading in this type of stability research.

Control Surface and Wing Stability Problems. (A. G. Pugsley, J.R. Aeron. Soc., Vol. 41, No. 323, Nov., 1937, pp. 975-96.) (49/25 Great Britain.)

This paper seeks to draw from current research work on flutter and related problems results of general design significance; and, avoiding mathematics, endeavours to set these results out in relation to past and present problems.

A preliminary section of the paper indicates the main stability and allied troubles concerned and draws attention to the general similarity between wings and tailplanes in relation to these troubles. The remainder of the paper is then devoted to a discussion of the problems involved in terms of wings and ailerons.

For this purpose a " stiffness diagram " is constructed for a typical wing, indicating the relative stiffnesses, etc., required to prevent wing aileron flutter, aileron reversal, and wing divergence. By means of this diagram the course of recent history in relation to wing aileron flutter and aileron reversal is illustrated, and attention is then given to present and future tendencies and problems. The current tendency to employ wings of high density—arising largely from high wing loadings—is making wing flutter the problem of immediate importance, and ways of avoiding the provision of increased stiffness as usually adopted to prevent this trouble, as well as to prevent aileron reversal and wing divergence, are discussed.

Appendices are given commenting on the variation of wing flutter speed with altitude and on the modern tendency to use wings of low flexural stiffness.

Incendiary Media. (C. W. van Hoogstraten, Chem. Weekblad, Vol. 34, pp. 56-9, 1937. Chem. Absts., Vol. 31, No. 19, 10/10/37, p. 7251.) (49/26 Holland.)

Incendiary bomb fillings and methods of combating the resultant fires are discussed with particular reference to P. Thermit mixtures, and electron (Al-Mg alloy) bombs.

Although intensely hot, the actual burning time of these chemical fillings is short so that bombs of at least 25 kg. weight are required, unless the target is exceptionally inflammable.

In the early stages, whilst the original filling is still burning, it is practically impossible to put out the fire. The final conflagration can however be fought by normal means. In certain cases fire-fighting bombs containing mixture of bicarbonate of soda and sand can be used, the filling being spread by a mild explosive.

The Relative Advantages of Chemical and Mechanical Time Fuses for Projectiles. (C. Weninger, W. T. M., Vol. 41, No. 1, Jan., 1937, pp. 14-18.) (49/27 Germany.)

The author is of the opinion that during the next few years the chemical fuse will retain the field for short and medium distances on the ground, but that for long distance work and especially anti-aircraft fire the mechanical time fuse will become fairly general.

By properly organised mass production the extra cost of the mechanical type is not very great and in any case cost should not be a deciding feature, but reliability and the confidence given to the troops by the knowledge that their technical equipment is the best possible.

The design of mechanical time fuses calls for the proper combination of two factors: great sensitivity and yet safety in handling. As far as operation goes, we can broadly differentiate between those fuses which are operated by springs and those which depend on the spin of the shell only. In anti-aircraft work, the setting of the fuse must occupy the least possible time and this rules out designs where the spring has to be wound through several turns. In a recent development the mechanical time fuse is " set " electrically when the shell leaves the gun (capacity effect). The use of electricity opens up interesting possibilities, such as utilising the variation of the potential gradient of the atmosphere to fire the shell at a predetermined altitude.

Considering, however, that it took 15 years to develop the mechanical time fuse to its present state, the author is of the opinion that a considerable further period must elapse before the electrical time fuse will be ready for general issue.

Gas Masks—Military and Civilian Pattern. (W. Mielenz, Z.V.D.I., Vol. 81, No. 44, 30/10/37, pp. 1273-9.) (49/28 Germany.)

The gas masks employed by various governments are described and illustrated. It is claimed that in many countries the civilian mask gives insufficient protection. To produce an efficient article at a small price requires a considerable amount of experience.

Metallurgy and the Aero Engine. (D. R. Pye, The Engineer, No. 4261, 10/9/37, p. 292-4.) (49/29 Great Britain.)

The remarkable increase of recent years in the power of aero engines has been largely due to improvements in the quality of the fuel available, but it could not have been achieved without many parallel improvements of a metallurgical character. The increase of power has involved thermal and mechanical problems, and of the former, those associated with the piston and exhaust valve are the most formidable. On the mechanical side, the problem is that of maintaining two surfaces at high temperatures rubbing without seizure. It is of importance to

consider what treatment of the metal surfaces themselves will render them less liable to seizure when the lubricant can no longer provide sufficient protection. Metal surfaces, normally crystalline in their atomic structure, can in some circumstances be rendered amorphous, and there are reasons for thinking that in this state they form more satisfactory bearing surfaces. A study of the ultimate structure of metal surfaces, such as is provided by the physicist, may be expected to afford valuable assistance in the engineer's problem of bearing surfaces.

Vibration Isolating Radial Engine Mounts. (W. E. Stitz, A.C.I.C., Vol. 8, No. 707, 1/2/37, pp. 1-25.) (49/30 U.S.A.)

This report presents the vibrating forces originating in a radial engine with propeller and a method for isolating these forces from the aeroplane structure. The nature, value, line of action, and frequency of the vibrating forces indicate that for complete isolation a mounting having 6° of freedom is necessary. With this in mind, a type of mount has been developed having 6° of freedom, with the six natural frequencies located very close together and set in the idling range of engine revolutions per minute.

Also, a method is given for calculating the required spring rates of the rubber bushings used and the six natural frequencies of the mounting.

Full-Scale Tests of N.A.C.A. Cowlings. (T. Theodorsen, M. J. Brevoort and G. W. Stickle, N.A.C.A. Report No. 592, 1937.) (49/31 U.S.A.)

A comprehensive investigation has been carried on with full-scale models in the N.A.C.A. 20-foot wind tunnel, the general purpose of which is to furnish information in regard to the physical functioning of the composite propeller-nacelle unit under all conditions of take-off, taxying, and normal flight. This report deals exclusively with the cowling characteristics under conditions of normal flight.

The optimum shape of a low drag cowling has been determined. The shape of the leading edge and the contours of the exit passage are the cause of large losses when improperly designed. The importance of providing means for regulating the quantity of cooling air to the minimum that will prevent excessive losses at high speeds has been demonstrated. The superiority of a baffled over an unbaffled engine has been verified and it has, furthermore, been shown that tightly fitting baffles are superior to the deflector type.

Cooling of a Radial Engine in Flight. (O. W. Schey and B. Pinkel, J. Aeron. Sci., Vol. 4, No. 11, Sept., 1937, pp. 448-52.) (49/32 U.S.A.)

A study of the heat transfer processes of air-cooled engine cylinders has been made at the laboratories of the National Advisory Committee for Aeronautics on single-cylinder blower-cooled test engines. Because of the difference in airflow conditions between a blower-cooled engine and a cowled engine in flight, it was considered advisable to make flight tests to correlate with the laboratory tests. The present paper gives the results of flight tests to determine the effect of indicated horse-power and mass flow of cooling air on cylinder temperatures and shows the correlation between these results and the results of the laboratory tests.

The main difficulty attending the study of engine cooling in flight is the independent control and measurement of the many engine and cooling variables so that their separate effects may be studied. In the present tests an attempt was made to obtain complete control of the test conditions. A novel feature of the tests was the method used for independently varying the velocity of the cooling air and the cylinder horse-power of the engine.

Some Effects of Ignition Timing and Rate of Burning on the Thermodynamic Performances of High Speed Compression Ignition Engines. (S. Awano, Aer. Res. Inst., Tokio, Report No. 155, Sept., 1937.) (49/33 Japan.)

A successive graphical method of estimating the cylinder pressure or the mean gas temperature for any given combustion time rate and ignition timing is presented as an application of the entropy charts of combustion gases. With this method, some general effects of important factors, such as the rate of combustion, ignition timing, and extent of combustion, on the performance of the cycle realised in high speed compression ignition engines are examined theoretically.

The results of these theoretical calculations, which show good agreement with many experiments, are sufficient to illustrate the phenomena in practice.

The N.A.C.A. Nose Slot Cowl. (Inter. Avia., No. 483, 23/10/37, pp. 1-3.) (49/34 U.S.A.)

In the case of this cowling, the exit opening of the cooling air is not, as usual, located behind the engine but at the nose of the cowl. The air enters the cowling conventionally in the central front, is guided by baffles between the cylinder and is then returned to the nose ring via the cylinder head and is discharged through a slot.

It appears that this design is specially effective at low flying speed. The pressure distribution on the cowl (on which the cooling depends) is, however, very sensitive to change in speed and propeller slipstream and it appears difficult to obtain a single design which will be superior to the orthodox cowl over large ranges of operating conditions.

Trend of Air-Cooled Aero Engines—The Next Five Years. (A. H. R. Fedden, J.S.A.E., Vol. 41, No. 4, Oct., 1937, pp. 437-454, 467.) (49/35 Great Britain.)

The author suggests the following main aircraft categories :—

Type.	Maximum Speed (m.p.h.)	Cruising Speed (m.p.h.)	Cruising Range (miles).
Civil—			
Land	275	220	1,000-1,500
Sea	250	200	1,500-2,000
Special long range ...	250	220	3,000-4,000
Military—			
Destroyers	425/450	—	1½-2 hours
Multiplace Fighters ...	400	—	1½-2 hours
Medium Bombers ...	—	300	6 ,,
Heavy Bombers ...	—	275	8 ,,
Seaplanes	270	220	10 ,,

These categories, with the exception of the smaller civil types can be covered by the following four sizes in aircraft engines :—

Horse-Power.	Weight with Standard Equipment.
750	820lb.
1,150	1,250lb.
1,550	1,550lb.
2,000	2,100lb.

In the opinion of the author, the above sizes can all be covered satisfactorily by air-cooled radial designs (twin row in the larger sizes). Installation difficulties will decrease with size of aircraft (thickness of wing).

The Torsional Critical Speed of Geared Aeroplane Engines. (J. P. Den. Hartog and J. P. Butterfield, J. Aer. Sci., Vol. 4, No. 12, Oct., 1937, pp. 487-90.) (49/36 U.S.A.)

An analysis of the effect of gears on the torsional critical speed of an engine is made and the percentage deviation caused by this effect is illustrated. For stiff engine mounts the shaft critical speed is lowered, while for very flexible mounts that critical is raised by the action of the gears. These deviations may be as much as 15 per cent. either way.

Determining the Oiliness of Mineral Oils. (T. Zhuze, Azerbaidzhanskoe Neftyanoe Khoz, 1937, No. 1, pp. 68-77. Chem. Absts., Vol. 31, No. 19, 10/10/37, p. 7235.) (49/37 Poland.)

The heats of wetting were investigated with a Russian clay (" askanit ") which served as a criteria for the determination of the adhesion properties of various refined oils. The adhesion properties of Baku lubricating oils fluctuate within a narrow range, increasing slightly with higher molecular weight. Small amounts of resin improve the wetting properties of oils. Paraffin-base oils have a lowered wetting ability. Oils made by selective solvent process are inferior in wetting ability to acid-treated oils. Oils with a high temperature viscosity index have low adhesion properties. The latter can be improved by adding small amounts of cyclohexanol. (Thirty-one references.)

Collected Results on Viscosity of Lubricants Under Pressure. Part I—Fatty Oils. (M. D. Hersey and R. F. Hopkins, J. Applied Physics, Vol. 8, No. 8, August, 1937, pp. 560-6.) (49/38 U.S.A.)

The paper gives a review of results obtained at various laboratories. The principal oils tested were: Castor, lard, rapeseed, sperm, linseed, peanut and whale. The temperature ranged from about 1°C. to 100°C. and the pressure from 600 to 9,000 atmospheres, although these ranges were not used for all the oils. The most complete results are available for castor oil for which the viscosity at 100°C. increase about ten-fold for a pressure increase of 2,800 atmospheres.

Several of the fatty oils show apparent solidification at high pressures and low temperatures and similar phenomena have been reported for certain compounded oils as well as petroleum oils containing a sufficient quantity of wax. (Nine references.)

Instruments for Measuring Rate of Climb and Fall. (H. Danielzig, Luftwissen, Vol. 4, No. 5, May, 1937, pp. 153-8.) (49/39 Germany.)

The ordinary variometer is very sluggish in its readings and is therefore unsuitable whenever co-ordination of rate of climb or fall with other instrument readings is required on a time basis.

On the other hand, the normal barograph, even if free from lag and friction, does not provide a sufficiently open scale to render differentiation possible. This is especially the case if the experiments for reasons of safety have to be carried out at a reasonable altitude.

The D.V.L. have overcome the objection by employing a differential type of barograph which records photographically both the static pressure and the difference in static pressure between the air surrounding the aircraft and the air in a four-litre capacity. By making the diaphragm of the differential instrument sufficiently weak, a very open scale for the rate of climb can be obtained at any altitude. The instrument is calibrated on the ground and provided the tests are carried out at altitudes below 1,000 m., the errors due to change in pressure of the capacity with height are less than 1 per cent.

A Simple Method of Measuring Rotational Speeds. (L. B. Snoddy and J. W. Beams, Science (U.S.A.), Vol. 85, 1937, pp. 273-4. Phys. Berichte, Vol. 18, No. 18, 1937, p. 1625.) (49/40 U.S.A.)

A permanent magnet attached to the rotating shaft generates an alternating current the frequency of which depends on the r.p.m. The resultant current is applied to a tuned bridge circuit and the induction or capacity in one arm of the bridge is altered till the indicating instrument shows that a balance has been obtained. The required r.p.s. N follows from the equation $N=\frac{1}{2}\pi\sqrt{(LC)}$ when L and C are the induction and capacity respectively in the bridge circuit. The measuring circuit will deal with a speed range from 500 to 3,000 revolutions per second.

A Mechanical Counter of Improved Resolving Power for Electrical Impulses. (J. L. Tuck, J. Sci. Inst., Vol. 13, No. 11, Nov., 1936, pp. 366-7.) (49/41 Great Britain.)

The counter essentially consists of the vibrating reed of a loudspeaker which actuates the escapement of a 1/100 sec. stop watch from which the balance wheel has been removed. The reed operates a contact breaker incorporated in a thyratron circuit and the frequency of the system can be adjusted to cover the range of 50-180 impulses per second.

The D.V.L. Neon Light Engine Indicator. (M. Schenermeyer, Archiv fur Technische Messen, No. 73, July, 1937, pp. T. 89-90.) (49/42 Germany.)

The indicator works on the pressure balance system and is in some respects similar to the R.A.E. Farnborough indicator. Instead of the floating disc valve of the latter, a pressure membrane is used, the motion of which causes a special neon point source to light up. This source is sufficiently powerful to give a photographic record in a rotating drum, the indicator diagram thus having the appearance of dark silhouettes on a white background.

The article gives examples of the types of records obtained and also describes an application of the principle to measuring the injection time in the case of Diesel engines.

Discharge Coefficient of Standard Nozzles and Pressure Drop in Pipes Under Conditions of Pulsating Flow. (E. Estel, Phys. Zeit., Vol. 38, No. 19, 1/10/37, pp. 748-58.) (49/43 Germany.)

The experiments were carried out with water, the pulsation being produced by an oscillating sector in the pipe line. In the case of nozzles and rough tubes (the roughness being produced either by sand grains or throttle plates) the effect of moderate pulsations (of the order of 15 per cent. on the velocity) on the discharge and resistance coefficients were slight compared with the values obtained under steady flow conditions.

In the case of smooth tubes, however, the resistance coefficient showed a marked variation with amplitude and frequency of the oscillations.

Stresses in Ring Frames Fitted for the Introduction of Longitudinal Forces in Cylindrical and Conical Shells. (K. Drescher and H. Gropler, L.F.F., Vol. 14, No. 2, 20/2/37, pp. 63-71.) (49/44 Germany.)

The bending moment at the frames is given in non-dimensional form in a series of diagrams for cylindrical and conical shells of circular and elliptic cross-sections. Both symmetrical and asymmetrical condition of loading are considered. In the case of the former, the frame moment for a circular section is expressed as

$$m_a = mPa_1^2/h$$

where m = a coefficient.

P = longitudinal force introduced.

a_1 = radius of circle.

h = distance between end frames in cm.

The coefficient m is plotted for various values of x/a_1 as a function of v/u, where x/a_1 and v/u determine respectively the point of application of force and the point where the bending moment is required.

Similar curves are plotted for the asymmetrical case. By the use of these charts a general idea of the ring stresses can be obtained without involved calculations.

A Machine and Method of Rolling Sheet Metal to Compound Curvature. (A. Klemin, Aero Digest, Vol. 31, No. 4, Oct., 1937, pp. 46-8 and 100-1.) (49/45 U.S.A.)

Since the sheets are preformed by controlled pressure and regular rolling process, the original strength of the material is more likely to be maintained than in processes where violent impact is employed.

If single, or at least a small number of, sheets are substituted for a large number of sheets, riveted or otherwise fastened together, there is likelihood of gain in strength and weight, with the avoidance of multiple connection.

The system should be useful for every part of the aeroplane fuselage, wings, etc., and should have particular appeal in the construction of floats or hulls, where a single sheet is much more likely to be leak-proof than a number of sheets, however well riveted together or carefully caulked they may be.

With high speed ships, a reduction in the number of rivet heads, and the increase in smoothness resulting from the use of single sheets will serve indirectly to improve performance.

Directions for the Study of Hard Composite Dielectrics (Mouldings, Sheet and the Like). (J. Inst. Elec. Engs., Vol. 41, No. 490, 21/10/37, pp. 553-64.) (49/46 Great Britain.)

As a result of experience gained it has been found desirable to modify several of the tests hitherto applied to hard composite dielectrics (mouldings and the like) and to introduce a series of " temperature grades " which, although purely arbitrary, are closely related to the different classes of composites in general use.

The tests described are not intended as acceptance tests in the purchase of such materials, but it is anticipated that the British Standards Institution will issue a series of purchasing specifications, based largely upon these recommendations, which will define appropriate limits to the specified electrical and mechanical properties for the class of materials covered by this report.

The Behaviour of Unprotected and Protected Wood in Fires. (O. Graf and F. Kaufmann, Feuerschutz, Vol. 17, 1937, p. 137. Chem. Absts., Vol. 31, No. 20, 20/10/37, p. 7650.) (49/47 Germany.)

Samples of wood fireproofed with salt solutions, water glass mixtures, oil and lacquer mixtures, chlorinated rubber paints, and organic foam formers were subjected to fire tests. Protective coatings cannot prevent the decomposition of wood when it has reached its decomposition temperature. The protective effect of these coatings is poorer on objects of large diameter than of small diameter. Fireproofing hardly extends the carrying power of weighted wooden beams. After one year's storage the protective action of fireproofing agents decreased 25 per cent.

Stability of Structural Members Under Axial Load. (E. E. Lundquist, N.A.C.A. Tech. Note No. 617, October, 1937.) (49/48 U.S.A.)

The principles of the cross method of moment distribution are used to check the stability of structural members under axial load. A brief theoretical treatment of the subject, together with an illustrative problem, is included as well as a discussion of the reduced modulus at high stresses and a set of tables to aid in the solution of practical problems.

The Relation Between Damping Capacity and Other Physical Properties. (G. R. Brophy and A. E. Parker, Trans. American Soc., Metals, Vol. 24, 1936, pp. 919-31. Phys. Berichte, Vol. 18, No. 18, 1937, p. 1636.) (49/49 U.S.A.)

The damping capacity of various steels is examined in relation to the load, the chemical composition, the heat treatment and subsequent working and the temperature of utilisation. The damping will depend on the load imposed by vibration as well as on the steady load. It appears that the damping capacity affects the resultant fatigue stresses and the authors state that the extent of creep at high temperature can be predicted if the damping at the same temperature is known.

This, however, is only possible if the steel undergoes no structural changes apart from size of grain.

The Use of Rubber in Aircraft Construction. (G. Genin, La Science et la Vie, No. 243, Sept., 1937, pp. 178-180.) (49/50 France.)

The main use of rubber on aircraft is in connection with landing wheel tyres.

Modern aircraft tyres for heavy machines are almost exclusively of the low pressure type (inflation pressure between 1 and 2 kg./cm.^{2}).

The tyres are mounted directly on the hub and the resulting small overall diameter of the wheel (of the order of 20in. for a load of nearly one ton) greatly facilitates the operation of the retractable landing gear. On the other hand, the small hub calls for very special wheel brake designs.

Other uses of rubber on aircraft are the following:—

(1) Engine mounting.
(2) Support for pipe lines.
(3) Shock absorber for the undercarriage (working either in compression or extension).
(4) Anti-ice devices, such as the Goodrich.

Abstract of Progress Report No. 3 on Heavy Helical Springs. (C. T. Edgerton, Trans. A.S.M.E., Vol. 59, No. 7, October, 1937, pp. 609-16.) (49/51 U.S.A.)

This abstract gives the principal results of static tension and torsion tests, rotating beam endurance testing in bending, and torsion endurance tests of straight pieces of plain carbon basis open hearth, plain carbon electric furnace and silicon-vanadium spring steel. These results are compared with those for other steels.

Increasing the Strength of Aluminium Alloy Columns by Pre-Stressing. (M. Holt and E. C. Hartmann, N.A.C.A. Technical Note No. 618, October, 1937.) (49/52 U.S.A.)

A series of tests was made in which the column strength of 17 S-T tubing was increased as much as 50 per cent. by prestressing the tubing to 40,000 pounds per square inch in compression under conditions of support that prevented column failure at this stress. This prestressing achieves its beneficial effects entirely by improving the compressive properties of the material, principally the proportional limit.

Variation of the Modulus of Elasticity of Duralumin. (W. L. Howland, J. Aer. Sci., Vol. 4, No. 12, Oct., 1937, pp. 507-9.) (49/53 U.S.A.)

This paper gives curves for the variation of E_σ for four light alloys (17 ST, 17 SRT, 24 ST, and 24 SRT), plotted against stress. These curves are important in that they show that the average value of E_σ has no sudden changes, so that at no particular stress can one be sure of an inelastic failure of a member. Defined yield point is an interesting method of comparing two metals, but it is of no value or help in solving many of the problems of the research student or the

stress analyst. If the stress analyst uses the defined yield point in calculations, he should use the correct values of E_s taken from the curves, whenever inelastic failures are involved.

Increase of Wind Velocity with Height. (J. Gilbert, Comp. Rend., Vol. 205, No. 6, 9/8/37, pp. 371-3.) (49/54 France.)

According to theory, the average wind velocity v near the ground increases logarithmically with the height z,

$$i.e.,\ v = a + b \log z \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The weight of hoar frost dP on an element dz of a vertical rod varies directly as v,

$$i.e.,\ dP = Kvdz \quad . \quad . \quad . \quad . \quad . \quad (2)$$

Eliminating v between (1) and (2) leads to a distribution of hoar frost with height which has been verified experimentally.

Concerning the Ice Accretion on Ailerons. (Inter. Avia., No. 487-8, 6/11/37, pp. 1-4.) (49/55 U.S.A.)

A report issued by the Goodrich Company (U.S.A.) deals with the development of the " over-shoe " de-icer from 1931 to date. Of great interest are the remarks on the accretion of ice on ailerons. It appears that this accretion is determined by the width and shape of the slot and on the area of aileron leading edge which projects below the lower surface of the wing at the aileron slot cut out. Ailerons of the constant slot width type ($\frac{1}{2}$in.) have given best results, and a strip attached to the trailing edges of the wing on the lower side to act as a closure for the aileron cut-out has led to a considerable reduction of ice formation on the leading edge of the aileron.

It is interesting to note that the appearance of small holes in the inflation elements of the wing de-icers (leading edge) has been traced to electro static effects which can be overcome by a conducting layer of graphite. The report concludes by stating that ice forming conditions are infinite variable. Not only does the ice differ in its adhesive qualities, but also the texture and shape and the formation are seldom alike.

Optical Specification of Light-Scattering Materials. (D. B. Judd, Bur. Stan. J. Res., Vol. 19, No. 3, Sept., 1937, pp. 287-317.) (49/56 U.S.A.)

In 1931 Kubelka and Munk worked out the relationship between reflectance and thickness of material for thin, homogeneous layers illuminated diffusely. In the equation expressing this relationship, the hypothetical ideal material is defined by two constants, reflectivity and coefficient of scatter. In the present paper are given data demonstrating how well several materials of commerce can be specified by these constants. These include data on vitreous enamel, dental silicate cement, cold-water paint, and paper.

Industrial Heater. (Aero Digest, Vol. 31, No. 4, Oct., 1937, p. 62.) (49/57 U.S.A.)

Heat source is a cast aluminium grid, which has been poured around a calrod heating element, thus eliminating hot wires and dead air space.

A motor driven, four-bladed aluminium fan, running on a graphite impregnated bronze bushing for quiet operation, dissipates heat from the entire surface of the circular grid and circulates the warm air. Heat can be directed wherever it is needed by moving adjustable deflectors mounted on the front of the unit.

Transmission of Radiant Energy Through the Atmosphere. (H. V. Hayes, Rev. Sci. Inst., Vol. 8, No. 9, Sept., 1937, pp. 342-345.) (49/58 U.S.A.)

Daily measurements were carried out over a period of six months over distances of 480 m. and 2,400 m. respectively with the Hayes radiometer as receiver, which is sensitive to all wave lengths from the ultra violet down to 15 micron.

The radiometer readings were amplified by means of a valve circuit and read on a milliameter, a clearly defined signal being defined as a deflection of $\frac{1}{2}$ m. amp. or more.

Two sources of radiant energy were employed. One consisted of a spiral of nichrom wire (1/200in. diameter) absorbing 25 w. The other consisted of a carbon arc, the current going up to $22\frac{1}{2}$ amp., with a maximum output of 650 w.

The sources of energy were placed at the focus of an 18in. parabolic reflector possessing a coating of rhodium. A similar reflector was used at the receiver end.

With a 25 w. source good signals could be obtained throughout over the shorter distance, and only on two days (snowing) did this source fail to give signals over the longer distance. With a more powerful source (650 w.), communication could be maintained over the longer distance of 2,400 m. under all weather conditions met with during the period.

Sound Field Due to a Vibrating Piston. (L. Gutin, Techn. Phys. U.S.S.R., Vol. 4, No. 5, 1937, pp. 404-413. Sci. Absts. A., Vol. 40, No. 478, 25/10/37, p. 1075.) (49/59 U.S.S.R.)

The sound field due to a piston oscillating in an infinite baffle is calculated and the directional characteristics determined. By combining the result with that applicable to a pair of pistons vibrating in opposite phases, the sound field due to a piston which radiates from one face only is calculable. This result is then used to study the acoustical characteristics of an exponential horn. Good agreement with experiment is obtained for the radiation factor of an exponential horn. The amplification factor of a horn used to collect sound is calculated, the special case in which the end of the horn is closed with a membrane being also considered.

Experimental Investigation of Effects of Equipment Size on Convection Heat Transfer and Flow Resistance in Cross Flow of Gases over Tube Banks. (E. C. Huge, Trans. A.S.M.E., Vol. 59, No. 7, October, 1937, pp. 573-8.) (49/60 U.S.A.)

Values of both gas-boundary conductance and friction factor for a given tube arrangement are consistent for all tube sizes from the full-scale two-inch tubes down to the Pierson model tubes of 0.31 inch, including the intermediate sizes of $\frac{1}{2}$ inch and $\frac{11}{16}$ inch tubes. This confirms the validity of the principle of similarity applied to tube banks (in spite of some departure from true geometric similarity in the ratio of length to diameter or to inter-tube space) for the range of Reynolds numbers tested, 2,000 to 70,000.

Report About the Electrical Investigations in Respect of the Hindenburg Catastrophe. (M. Dieckmann, German Research Congress, Munich, Inter. Avia., No. 482, 19/10/37, pp. 4-5.) (49/61 Germany.)

The catastrophe is attributed to the coincidence of the following five causes:—

1. Presence of explosive mixture, due to leak and faulty ventilation.
2. The external cover of the ship was wet.
3. A landing was made from a great height, *i.e.*, high electrical potential gradient.
4. The landing was carried out during the tail end of a thunderstorm which is generally accompanied by big changes of potential gradient.
5. The mooring cables absorbing more and more rain became intensified conductors.

These five causes have been reproduced in the laboratory and electrical ignition has been reproduced.

Attention is called to the Echterdingen disaster (1908) which was probably due to the same cause.

Full Automatic Blind Landing System. The Landing System Developed by the U.S. Army. (Inter. Avia., No. 484, 26/10/37, pp. 1-2.) (49/62 U.S.A.)

The U.S. Air Corps system incorporates a relay connection between the Fairchild radio compass and the Sperry automatic pilot. In addition, the engine throttle is actuated by radio and a sensitive altimeter and on touching ground the throttle is closed and the wheel brakes operated through the action of the landing gear strut. The ground installation consists of 3-5 low range non-directional radio beacons of staged frequencies within 200-400 kc.; each of these beacons is supplemented by a two-beacon (ultra short wave) vertical marker. The landing procedure is as follows:—

When flying over the two beacons, the throttle is actuated in accordance with the change in altitude required and the radio compass receiver is set to the frequency of the next radio beacon. When arriving over the last beacon but one, the aeroplane goes into a glide, the throttle being adjusted by the altimeter to give a constant downward vertical velocity. During the glide the radio compass maintains the course to the last beacon.

Sudden Disturbances of the Ionosphere. (J. H. Dellinger, Proc. Inst. Rad. Eng., Vol. 25, No. 10, Oct., 1937, pp. 1253-90.) (49/63 U.S.A.)

The radio and magnetic effects have been shown to be of a distinct type, quite different from previously known vagaries in these fields. They are of maximum intensity in that region of the earth where the sun's radiation is perpendicular.

Many of the occurrences are simultaneous with great eruptions on the sun. Such eruptions emit vast quantities of ultra violet light. These radiations are sometimes of such frequencies as to cause intense ionisation of part of the ionosphere below the E. layer. This sudden ionisation causes the radio and other perturbations. Their characteristics are explained. Study of this effect is leading to new understanding of the nature of the ionosphere, the processes of radio wave transmission, the mechanisms of terrestrial magnetism, and the phenomena occurring in the sun.

Field Strength Observations of Transatlantic Signals, 40 to 45 Megacycles. (H. O. Peterson and D. R. Goddard, Proc. Inst. Rad. Eng., Vol. 25, No. 10, Oct., 1937, pp. 1291-9.) (49/64 U.S.A.)

The results of daily observations at Riverhead, L.I., N.Y., since the middle of January, 1937, are reported. Some of the schedules of London and Berlin television transmissions are reported as being heard and measurements of field strengths are summarised. The vertical angle of arrival was measured and by means of a reversible directive antenna it was determined that the signal at times arrives from a direction other than that of the great circle path through London and Riverhead.

Some Notes on the Milan Exhibition by a French Designer. (Les Ailes, No. 854, 28/10/37, pp. 8-9.) (49/65 France.)

The following points were specially noted:—

1. The general use of light castings (both light alloy and steel) on the German machines.
2. Both Italian and German machines are designed specifically for mass production.

3. High wing loading necessitates general use of slotted flaps (special mention of Piaggio double slotted flap).
4. Messrs. Piaggio and Fiat are stated to have a monthly output of 600 engines between them. (Special mention is made of the Piaggio P.XII 18-cylinder engine, 1,600 b.h.p.)

Prizes Offered by the Lilienthal Society. (Flugsport, Vol. 29, No. 22, 27/10/37, pp. 622-624.) (49/66 Germany.)

Prizes are offered by the Society for the best articles submitted by German authors on the following subjects:—

1. Type of air flow round an aerofoil under unsymmetrical conditions (oblique attack, sideslip, rotation, etc.).
2. Vibration and distribution phenomena in induction system of carburettor engines with special reference to valve timing.
3. Critical survey of proposed methods of measuring altitude of aircraft and distance of obstacles by means of wireless waves.
4. Ballistic requirements of high speed aerial gunnery.

Prizes to the total value of RM.2,400 are offered in each subject and the latest date of entry is August 1, 1938.