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Multiplicity in Armament Types. (C. Rougeron, Rev. de l'Arm. de l'Air, No. 102, January, 1938, pp. 40-58. In course of translation.) (60/1 France.)

The author issues a powerful plea against reduction in armament types by over-standardisation. In order to be reasonably effective, the standardised equipment generally entails special materials and methods of manufacture which may lead to difficulties in case of an emergency. As an example, prior to 1914 the French authorities had standardised the single explosive " melinite " for practically all purposes. As a result there soon occurred a serious crisis in the munition supply, since the basis of melinite—toluol—was not available in sufficient quantity. The industrial resources of a country can only be utilised fully by employing a variety of armaments each carefully chosen for a specific purpose.

A case in point is the all-metal construction of aircraft. In this case production is tied down to large specialised plants extremely vulnerable to air attack. The same dangers do not apply when wood is used as an aircraft material. Another advantage of alternative types of armament lies in the fact that the method of attack can be varied and the defence rendered more difficult.

Aircraft v. Battleship. (P. Etienne, Rev. de l'Arm. de l'Air, No. 102, January, 1938, pp. 59-66.) (60/2 France.)

An interesting discussion has been going on in the French Technical Press on the possibilities of the battleship resisting successfully an aircraft attack. In his well-known book entitled " Bombing Aviation," Rougeron favours the chance of the aircraft. Naval experts, however, point out that the proposed methods of aerial attack are complicated and that if the ships are dispersed and provided with modern A.A. artillery, the chances of the aircraft are very small. Recent experiences in the Spanish war indicate, however, that ships are by no means invulnerable, and that dive bombing attacks can be carried out so quickly that even a trained crew has not sufficient time to fire its guns (attack on German battleship " Deutschland "). At the same time the frequent air raids on Spanish harbours demonstrate the extreme vulnerability of targets of this type.

From all the above we may conclude that aircraft in a future naval war will scarcely be used to bear the brunt of the first attack on an enemy fleet at sea, but will act in co-operation with surface ships, intervening effectively as soon as the enemy shows signs of disorganisation.

Coastal bases, on the other hand, will form a most promising aerial target for independent aerial attack.

The Fighting Aeroplane—Will Multi-Seater Combat Planes Challenge the "Flying Fortress?" (H. J. Alter, Army Ord., Vol. 19, No. 110, Sept.-Oct., 1938, pp. 79-84.) (60/3 U.S.A.)

The author is of the opinion that only combat planes of the type Bell XMF-1 will be able to operate against large bombers such as the Boeing XB-15.

The principal reasons for preferring the combat plane (crew of 6-7) to the single or 2-seat fighter are the following:—

(1) The combat plane is capable of sustained fighting at all times and under varied conditions.
(2) Large bore weapons can be carried without serious effects on structure or performance.
(3) Heavy concentration of fire.
(4) Capable of fighting at high altitudes.
(5) The large crew render the machine effective even if casualties occur.

4 photographs.

Aircraft Display at the Nuremberg Rally. (Les Ailes, No. 901, 22/9/38, p. 5.) (60/4 Germany.)

The following aircraft were specially noted:—

Dornier Bombers.
Messerschmitt Fighters (Me 109).
Junkers Dive Bombers Ju 87.
Messerschmitt Twin-engine Fighter (Me 110) fitted with 2 cannons and 4 machine guns.
Focke Wulf Twin Fuselage Aircraft.
Twin-engined Siebl-Halle Trainer.
Reconnaissance Aircraft of various types about which no further particulars are available.

Spanish Civil War—Franco's Claims as to Losses Inflicted on the Government Air Force. (Aeroplane, Vol. 55, No. 1,428, 5/10/38, p. 407.) (60/5 Great Britain.)

The following table gives a list of aircraft shot down, according to official figures supplied by Franco's government.

Type	Year		Total
	1937	1938	
Martin Bombers (Russian built) ...	12	80	92
Natachas (biplane)	1	28	29
Ratas (Boeing)	7	111	118
Curtiss (Mosca)	41	308	349
Potez	20	0	20
Vickers	10	0	10
Dewoitine	13	0	13
Dornier (Boat)	5	1	6
Savoia (Seaplane)	11	0	11
Breguet	25	0	25
Nieuport	33	0	33
Praga	0	4	4
Faix	0	1	1
Unidentified	180	133	313

Of interest is the rapid increase in Russian types during 1938. Apparently only few French machines can have been used by the Spanish government during the same period.

Formulation of the Resistance Laws of Projectiles. (H. Herrmann, W.T.M., Vol. 42, No. 9, Sept., 1938, pp. 397-411.) (60/6 Germany.)

The resistance laws for projectiles are suitably expressed in the forms $f(v) = C_n V^n$ or $K(v) = f(v)/V^2$, where C_n, n and k are functions of the velocity. It is convenient to express the results in terms of velocity zones over which C_n, n and k are constant. The values of these constants are chosen so that the curves are continuous (*i.e.*, $f(v)$ at end of one zone $= f(v)$ at the beginning of the next). At the point of junction, however, a change of slope necessarily occurs.

The following is an example of such a method of representation:—

Zone.	V (m./sec.).	$10^y\ C_n$	N.
I	0-240	1.4×10^{-2}	2
II	270-295	0.58×10^{-4}	3
III	295-375	0.67×10^{-9}	5
IV	375-419	0.94×10^{-4}	3
V	419-550	0.39×10^{-1}	2
VI	550-800	0.26	1.7
VII	800-1000	0.71	1.55

Only two points in each zone can agree exactly with the experimental resistance law and when integrating trajectories it may be necessary to utilise different zone sub-divisions for the beginning and end of the trajectory. The author shows how this can be done in a simple manner with the help of logarithmic plotting.

The "Oerlikon" Cannon Mounting for Aircraft. (O. B. Server, W.T.M., Vol. 42, No. 9, September, 1938, pp. 411-415.) (60/7 Germany.)

A novel form of gun ring for the Oerlikon cannon F.F.S. 20 mm. calibre is described and illustrated.

The azimuth and elevation of the cannon are controlled by oil pressure, the locking and firing of the gun being carried out by compressed air.

The oil pressure for the oil servo-motor is provided off a special oil pump driven electrically from the aircraft supply system, and the compressed air is supplied from a pressure bottle.

The gun is pointed by a single control lever possessing freedom of motion in two directions. Movement to the left or right causes a corresponding turning of the gun whilst an up and down motion of the lever changes the elevation. The two motions can obviously be combined, the maximum angular velocity in either direction being of the order of 30°/second. The control lever is fitted with a push button for series fire, but single shots can also be fired. The limits in elevation are $-10°$ to $+90°$, whilst the full 360° are available for azimuth.

The gun mounting is provided with a modern optical sight, compensated for air speeds up to 450 km./hour.

The complete weight of the mounting (without gun) is 95 kg.

French Views on the Employment of Army Co-operation Machines. (A. Ehrhardt, Luftwehr, Vol. 5, No. 8, August, 1938, pp. 312-313.) (60/8 France.)

Up to quite recently, the duties of army co-operation could be classified under the following heads:—

(1) Observation of battle front from a relatively low altitude (500-600 m.).
(2) Ground attack (bombs and machine guns).
(3) Communication with advanced posts.

Experience in Spain has shown that when exposed to modern A.A. artillery ground observation can no longer be carried out from altitudes of the order of 500 m. In future such flights have to be made at high altitude (relying on a specially trained observer) alternating with high speed dives to within a few feet of the ground. Such dives are carried out whenever detailed information is required and are very successful in spite of the high aircraft speed, provided the information required is sufficiently simple, *e.g.*, is wood Z occupied by the enemy —have our advanced forces reached X—why is regiment Y not advancing, etc. After the dive the aircraft climbs as rapidly as possible so as to get outside the effective range of the A.A. artillery.

The low flying technique, once acquired, renders wireless unnecessary, since it is quite easy to drop a message.

In the opinion of the French author, it is essential that this new form of army co-operation be thoroughly practised in peace time so that the infantry can get used to this method of warfare.

Balloon Barrages. Based on an article in Bulletin Belge des Sciences Militaires, April, 1938. (Luftwehr, Vol. 5, No. 8, August, 1938, pp. 332-336.) (60/9 Belgium.)

Balloon barrages were first employed by the Italians for the protection of Venice in 1916. The balloons were spherical and operated at very moderate altitudes (2,000 m.).

The spherical shape has no dynamic stability and can therefore only be used in the absence of wind. (The Venice region is calm for 25 days of the month.) For general use only the kite balloon (streamlined) can be considered. The author favours the type in which the envelope expands as the balloon ascends. The French " Ariel " balloon is of this kind, having a volume of 400 $m.^3$ on the ground and 700 $m.^3$ at the ceiling (app. 6,000 m.).

The balloon structure is composed of six lobes which are held together by elastic bands. On the ground the shape is roughly hexagonal, the extra volume at altitude being produced by expansion of the lobes attached to the corners of the hexagon. The article concludes with some remarks on the distribution of the balloon barrage so as to give protection to a variety of possible targets.

The Effect of Projectiles and Bombs on Concrete. (J. Ruziaka, with comments by M. Schweninger, Z.g.S.S., Vol. 33, No. 5, May, 1938, pp. 141-142.) (60/10 Czecho-Slovakia.)

The author assumes that penetration of the concrete occurs before the bomb explodes. The depth of penetration h is given by

$$h = E/(\pi D^2 \,.\, W/4)$$

where E = kinetic energy in kg.-metres.
D = diameter of bomb in cm.
W = average resistance of material in cm. kg./cm.^{3}.

In the case of ferro-concrete $W = 1{,}500 - 2{,}000$. The radius of destruction R is given by

$$R = \sqrt[3]{(N/p \,.\, t)}$$

where N = quantity of explosive in kg.
p = a material coefficient.
t = an explosion density coefficient depending on depth of penetration.

p and t are given in the form of curves.

The author concludes that only one-third of the explosive charge is effective in demolishing the concrete if the bomb does not penetrate more than two calibre lengths.

Effective protection can only be provided by high grade concrete with three dimensional iron reinforcement. Uniform strength throughout the thickness is essential to prevent the concrete peeling off in layers.

The Effect of Cavitation on the Operation of the Voith-Schneider Propeller. (H. Mueller, Z.V.D.I., 14/5/38, pp. 566-8. Eng. Absts., Vol. I, No. 8, Section 2, Aug., 1938, p. 126.) (60/11 Germany.)

In this propeller a series of suspended vertical blades of aerofoil section rotate about a vertical axis, and during the revolution each blade is caused to rotate about its own axis in such a way as to present the proper incident angle throughout the revolution. By an alteration in the blade-gear the propeller can be caused to exert a sideways " steering " force instead of the normal forward thrust. Experiments were made on a propeller 8in. diameter with blades 5in. long, in a channel 27in. wide and 10in. deep. The torque applied was measured by the reaction of the driving motor against a spring, and the thrust was measured with a spring-balance, the propeller and motor being hung on wires. The motor and measuring gear were mounted in a chamber which could be evacuated down to a head of −32.8ft. of water. The results indicate that for forward motion or steering-angles of less than 15 degrees the loss due to cavitation at high speeds does not exceed 10 per cent. With larger steering-angles the limited size of the channel influenced the results, and it was necessary to obtain the blade-forces graphically. The calculations indicated that for 90 degrees steering-angle cavitation began to influence the efficiency only at a speed of 20 knots, and that at 40 knots it caused a 50 per cent. reduction.

The Resistance of Aircraft Radiators Taking into Account the Warming Up of the Air (Comparison of Theory and Experiment). (B. Gothert, L.F.F., Vol. 15, No. 9, 10/9/38, pp. 427-44.) (60/12 Germany.)

The general question of radiator resistance is investigated theoretically for a cowled radiator both when isolated and when placed in close proximity to the aircraft (tunnel installation). The differences arising when heat transfer takes place are discussed and the results compared with practical experiments. Although theoretically the tunnel installation with heat transfer may have a negative drag (*i.e.*, exert a propulsive effort), the experiments show that so far pronounced interference effects cannot be avoided, the resistance of the cowled radiator on the aircraft being considerably greater than when working in a free air stream. Further experiments on various types of installations are urgently needed.

The Minimum Resistance of High Speed Aircraft. (H. Eick, L.F.F., Vol. 15, No. 9, September, 1938, pp. 445-62.) (60/13 Germany.)

It is important to know how far the drag of modern high speed aircraft can be reduced and estimate the possible increased performance of such an ideal aircraft. The author describes a method of determining the minimum resistance rapidly. The main dimensions of the aircraft are retained, but elliptic lift distribution is assumed, the shape is streamline, there is no break away of the flow and the surface is perfectly smooth.

In addition the author considers the effect of the thickness of the various exposed structural parts as well as the radiator resistance. The ratio of the minimum resistance to the actual resistance of the aircraft in flight is called the aerodynamic efficiency of the aircraft. This factor was calculated for a number of modern high speed aircraft (1937). It appears that an aerodynamic efficiency of 50 per cent. can be realised at the moment. If this could be raised to 75 per cent. (a value realised on complete models tested in the large D.V.L. tunnel) an increase in maximum speed of the order of 10 per cent. would result.

Calculation of the Downwash Behind Wings. (H. Multhopp, L.F.F., Vol. 15, No. 9, 10/9/38, pp. 463-7.) (60/14 Germany.)

Investigations on the rolling-up process of the vortex sheet behind the wing have shown that this process has only a slight effect on the flow at the tail surfaces.

The downwash is therefore calculated in the neighbourhood of the sheet with the help of a Taylor expansion without taking into account the break-up of the sheet.

A qualitative examination of the pertinent factors shows that for a small downwash wing taper should be avoided (the chord kept as uniform as possible).

At large angles of incidence, the downwash is controlled mainly by the break away of the flow at the wing and this renders prediction difficult. The wing roots also exert a powerful influence. An examination of swept-back wings (arrow formation) showed a complete reversal of the downwash with increase in angle of incidence.

Flight Tests and Flying Qualities of Zah I—25 Aircraft. (V. S. Vedrov, Aeronautical Engineering, U.S.S.R., No. 1, January, 1938, pp. 9-24. Translation available.) (60/15 U.S.S.R.)

The aerodynamic characteristics of the aircraft are described and some particulars of the flight tests carried out before the long distance record was attempted are given.

The main difficulty of the tests consisted in the fact that they had to be carried out at an average flying weight of 5 tons, whilst for the record the all-up weight was approximately 12 tons. The large extrapolation necessitated great accuracy in the measurements as well as a sound basis for the calculations. The article shows that under the favourable meteorological conditions existing during the polar flight the actual range was well within the capacity of this type of aircraft. The criticism published in a British Trade journal to the effect that an intermediate landing must have been made is met by pointing out an error in the British calculations. The fuel consumption depends on the weight of the aircraft and instead of basing the possible range on the starting weight (as was done in the criticism) a better estimate is obtained by taking the average weight during the flight.

Wind Tunnel Investigation of Rectangular and Tapered N.A.C.A. 23012 Wings with Plain Ailerons and Full-Span Split Flaps. (C. J. Wenzinger and M. B. Ames, N.A.C.A. Tech. Note No. 661, August, 1938.) (60/16 U.S.A.)

An investigation was made in the N.A.C.A. 7- by 10-ft wind tunnel to determine the aerodynamic properties of rectangular and tapered N.A.C.A. 23012 wings with plain ailerons and a full-span split flap, the flap retracting ahead of the ailerons. Measurements were made of lift and drag and of pitching, rolling, yawing, and hinge moments for all conditions of full-span flaps neutral and deflected at different chord locations.

The results of the tests showed that a $0.20c_w$ full-span split flap located at approximately the $0.75c_w$ point gave higher lift coefficients than had previously been obtained with a conventional $0.20c_w$ partial-span split flap of a length to permit satisfactory control with plain ailerons. Still higher lifts were obtained if the full-span flap, when deflected, was moved back to the aileron axis. Moving the flap back to the aileron axis, in general, improved the aileron characteristics over those with the flap retracted. The most promising arrangement of full-span split flap and plain aileron combination tested, both for high lift and lateral control, was the rectangular wing with $0.20c_w$ flap deflected 60° at the $0.90c_w$ location with $0.10c_w$ semispan ailerons.

The Experimental and Calculated Characteristics of 22 Tapered Wings. (R. F. Anderson, N.A.C.A. Report No. 627, 1938.) (60/17 U.S.A.)

The experimental and calculated aerodynamic characteristics of 22 tapered wings are compared, using tests made in the variable-density wind tunnel. The wings had aspect ratios from 6 to 12 and taper ratios from 1.6:1 to 5:1. The compared characteristics are the pitching moment, the aerodynamic-centre position, the lift-curve slope, the maximum lift coefficient, and the curves of drag. The method of obtaining the calculated values is based on the use of wing theory and experimentally determined aerofoil section data. In general, the experimental and calculated characteristics are in sufficiently good agreement that the method may be applied to many problems of aeroplane design.

The Present Status of Airship Construction, Especially of Airship Framing Construction. (H. Ebner, Z.F.M., Vol. 24, Nos. 11 and 12, 6 and 22/6/33. Available as Translation T.M. No. 872.) (60/18 Germany.)

The author discusses, in broad outline, the status of airship construction in the various countries, at a time when commerce over great distances might be finally opened up to the airship through the performances of the "Graf Zeppelin." After a short historical review, a survey of the most important rigid and semi-rigid airships built since 1925, their differences and special problems, is made. In more detailed treatment, the framing construction of the more recent rigid airships and some especially interesting structural questions are investigated. An extensive bibliography (39 items) is given.

The Effects of Partial-Span Plain Flaps on the Aerodynamic Characteristics of a Rectangular and a Tapered Clark Y Wing. (R. O. House, N.A.C.A. Tech. Note No. 663, Sept., 1938.) (60/19 U.S.A.)

An investigation was made in the N.A.C.A. 7- by 10-ft wind tunnel to determine the aerodynamic characteristics of tapered and rectangular wings with partial-span plain flaps. Two Clark Y aerofoils equipped with centre-section and with tip-section flaps were tested.

The results showed that the aerodynamic characteristics of partial-span plain flaps were, in general, similar to those of split flaps of the same span, but that the lift and the drag were less for the wing with plain flaps than for the wing with split flaps of comparable size. For the rectangular wing with centre-section plain flaps, the maximum lift and the lift-drag ratio at maximum lift were greater and the drag at maximum lift was less than for the wing with tip-section plain flaps of the same size. The maximum lift of the tapered wing varied in the same manner as that of the rectangular wing but the drag and the lift-drag-ratio relationships were opposite.

Analytical Comparison of Helicopter and Aeroplane in Level Flight. (M. Knight, J. Aeron. Sci., Vol. 5, No. 11, Sept., 1938, pp. 431-5.) (60/20 U.S.A.)

The general power equation is obtained for the helicopter rotor in level flight on the assumption that the circulation about the rotor blades is independent of radius and forward velocity.

The power required by the rotor is then compared with that required by a wing whose span is equal to the rotor diameter. Curves are given showing the variation of this power ratio with forward speed for three different rotor solidities and for a wing of aspect ratio 6, both for the lifting surfaces only and for the complete helicopter and aeroplane.

The analysis indicates the superiority of the helicopter rotor over the aeroplane wing at high speeds and its inferiority in the climbing range.

Range and Take-off Calculations for Plane with Continuously Controllable Pitch Propellers. (A. B. Scoles and W. A. Schoech, J. Aeron. Sci., Vol. 5, No. 11, September, 1938, pp. 436/441.) (60/21 U.S.A.)

A method is developed for evaluating the ultimate range parameter in miles per pound of fuel consumed for planes equipped with continuously controllable pitch propellers. The method is then applied to investigate the effect of several geometrical parameters of the aircraft on the range. It appears that an increase in maximum range with increased wing loading may generally be expected and in general there will be an optimum combination of aspect ratio and span for a given wing loading. The gain in range associated with increased wing loading will, however, be small for loadings in excess of 50 lb. per sq. ft.

The authors also investigated the effect of various parameters on length of take-off for land and sea planes. It appears that increasing power to gain a better take-off invariably reduces the maximum range considerably with no gain in cruising speed. If increased speed is needed for express services, the penalty must be paid in payload.

The take-off characteristics of large long range sea or land planes do not differ very much, but in some cases the sea plane will have the advantage. (Five references.)

Performance Calculations on the Koken Long-Range Monoplane. (H. Kimura, Aer. Res. Inst., Tokio, Report No. 166, August, 1938, pp. 300-85.) (60/22 Japan.)

The performance of the Koken Long-Range Monoplane, when fitted with the "SW-I" wooden propeller, was calculated over the range of total weight from 5,000 kg. to 9,500 kg. This monoplane set up the world's distance record of 11,651 km. over a closed circuit, and at the same time the international speed record of 186 km./h. over 10,000 km. in May, 1938.

The principal characteristics and the calculated performance of the monoplane are as follows:—

Number of crew	2 or 3
Span	27.93 m.
Length overall	15.06 m.
Height overall	3.84 m.
Wing area	87.3 m².
Empty weight with fixed equipment ...	4,225 kg.
Loaded weight	9,200-9,500 kg.
Total capacity of fuel tanks	7,500 l.

Performance:

Total weight (kg.)	5,000	9,500
Wing loading (kg./m.²)	57.3	108.8
Power loading (kg./H.P.)	6.25	11.9
Wing power (H.P./m.²)	9.16	9.16
Maximum speed at sea level (km./h.)	250	243
Cruising speed at 2,000 m. at 75 per cent. power (km./h.)	247	233
Economical speed at 2,000 (km./h.)	155	208
Stalling speed (km./h.)	96	132
Initial rate of climb (m./s.)	6.06	2.10
Climb to 2,000 m. (min.-sec.)	6-31	23-55
Service ceiling (m.)	7,310	2,900
Kilometres per kilogram of fuel at 2,000 m. (km.)	3.86	2.26
Range at 2,000 m. (km.)	—	13,550
Duration at 2,000 m. (h.)	—	75
Take-off run on concrete runway (m.)	250	1,250

The flight tests were in satisfactory agreement with prediction and the comparison will form the subject of the subsequent report.

Civil Aviation—Statistical and Technical Review for 1937. (The Engineer, Vol. 166, No. 4317, 7/10/38, p. 379.) (60/23 Great Britain.)

The regularly operated air routes throughout the world cover 334,000 miles, the total distance flown in 1937 being of the order of 200 million miles. One sixth of this total distance applies to traffic in the British Empire.

Compared with 1936, the number of flights carried out by British aircraft is practically unaltered, whilst the Dutch, French and German flight increased by 34 per cent., 25 per cent., and 57 per cent. respectively. During the year there were 47 accidents involving aircraft registered in the United Kingdom. (60 in 1936.)

The majority of the accidents (15 fatal and 7 serious) occurred in private flying. Racing and exhibition flying only accounted for 2 accidents.

Two-Dimensional Model Experiments on the Non-Steady Scavenging Process in Two-Stroke Engines. (F. Schultz-Grunow, Forschung, Vol. 9, No. 5, Sept.-Oct., 1938, pp. 235-241.) (60/24 Germany.)

The experiments were carried out using a rectangular water channel fitted with inlet and exit passages to correspond to the engine ports. A flat piston reciprocates in the tank and the motion of the water is recorded photographically by means of aluminium powder sprinkled on the surface. Examples of such photographs are given. Changes in the level of the water are recorded electrically by means of immersed wires.

Provided the changes in level are small, the flow of a gas follows similar laws and there exists also analogy between the propagation of a sound wave and that of a surface surge.

The necessary conditions of similarity are stated mathematically and it is shown how the results obtained can be applied to the engine under certain conditions.

Experiments are in hand to extend the method to three dimensional investigations.

Drop in Thermodynamic Efficiency Due to High Piston Speeds. (E. Justi and M. Kohler, Forschung, Vol. 9, No. 5, Sept.-Oct., 1938, pp. 242-251.) (60/25 Germany.)

The authors point out that in high speed piston engines, the pressure on the piston is not the same as that recorded by a stationary manometer.

Using the Kinetic theory the differences can be calculated in any special case, since it depends on the ratio of the molecular speed to the piston speed. As a result of the finite molecular speed, the pressure on the piston is raised during compression and lowered during expansion, the resultant drop in efficiency amounting to as much as 10 per cent. for a spark ignition engine having a maximum piston speed of the order of 20 m./sec.

Comparison of Ideal and Actual Combustion Temperatures and Pressures. (G. von Elbe and B. Lewis, Chemical Reviews, Vol. 21, December, 1937, pp. 413-420. Fuel, Vol. 17, No. 9, September, 1938, pp. 284-5.) (60/26.)

In moist hydrogen-oxygen mixtures diluted with argon, helium, or excess hydrogen, explosion pressures are found that agree with the theoretical pressures calculated from band spectroscopic data. In dry mixtures the observed pressures are lower, possibly due to heat loss by luminescence radiation. In moist mixtures diluted with nitrogen or excess oxygen the pressures are higher. This has been ascribed to the time-dependence of specific heats, called excitation lag. This excitation lag has been linked to gas vibrations which appear early in the explosion. The results with carbon monoxide-oxygen and with acetylene-oxygen mixtures can also be interpreted by heat loss and excitation lag. If a small amount of hydrogen is added to CO-O_2 mixtures the heat loss appears to be reduced considerably, probably due to the shorter duration of the explosion. Excellent agreement is found between experimental and theoretical explosion pressures in ozone-oxygen explosions. An explanation of the absence of excitation lag in the latter is proposed. Measurements of expansion ratios in soap bubble explosions of carbon monoxide-oxygen mixtures and flame temperatures by the line-reversal method of coal gas-air mixtures show a behaviour similar to explosion pressures in hydrogen-oxygen and carbon monoxide-oxygen mixtures.

Measured Feed Lubrication. (Oil Engine, Sept., 1938, pp. 158-9. Metropolitan Vickers Tech. News Bulletin, No. 627, 23/9/38, p. 8.) (60/27 Great Britain.)

For engine parts requiring a rate of oil lubrication depending on speed, such as the cylinder wall of an oil engine, some sort of mechanical lubricator becomes necessary. In this article details are given of the methods of drive and pump action of Wakefield, T and K, Delvac and Bosch lubricators. All the above makes are of the multiple unit type enabling different parts of an engine to be supplied at varying rates of oil feed with, in some cases, different grades of oil. Illustrated with three photographs and three diagrams.

Reaction Chains in the Thermal Decomposition of Hydrocarbons—A Comparison of Methane, Ethane, Propane and Hexane. (J. E. Hobbs and C. N. Hinshelwood, Proc. Roy. Soc., Series A, Vol. 167, No. 931, 23/9/38, pp. 447-55.) (60/28 Great Britain.)

A comparison has been made of the inhibition by nitric oxide of the thermal decomposition of methane, ethane, propane and hexane. The mean chain length, as defined by the ratio of the rates of the uninhibited and fully inhibited reactions, shows no marked variation as the series is ascended, has values from 2 to 15 according to conditions, and, for a given hydro-carbon, decreases as the initial pressure increases. The curves showing the decrease in rate as a function of nitric oxide concentration can be expressed in terms of a simple theory of chain breaking. The mean chain length depends upon the relative values of three activation energies, namely those of radicle formation, of decomposition by internal rearrangement, and of chain propagation. Approximate evaluation of the last shows that it tends to decrease with the higher hydrocarbons.

A Study of Chain Reaction in the Thermal Decomposition of Diethyl Ether. (J. E. Hobbs, Proc. Roy. Soc., Series A, Vol. 167, No. 931, 23/9/38, pp. 456-63.) (60/29 Great Britain.)

The course of the curves showing the rate of decomposition of diethyl ether as a function of minute additions of nitric oxide is independent of the concentration of diethyl ether. The removal of a radicle must thus be in competition with some reaction the rate of which is entirely independent of the ether concentration. This must be a unimolecular dissociation of the radicle itself. This is in contrast to the inhibition of the decomposition of ethane where the nitric oxide removes a radicle which otherwise would have reacted with an ethane molecule. A chain mechanism explaining these results is the same as that put forward by Rice and Herzfeld (1934) to explain the first order nature of the reaction. This mechanism gives an expression for the shape of the "inhibition curve" and accounts for the variation of the mean chain length with the ether pressure. From the amount of nitric oxide required for a given degree of inhibition the average life of the radicle can be calculated to be of the order of 1.2×10^{-6} sec.

Measurement of Oil Pressure in Bearings. (Forschung, Vol. 9, No. 5, Sept.-Oct., 1938, p. 256-7.) (60/30 Germany.)

The D.V.L. have developed a pressure indicator suitable for recording oil pressures in bearings. The instrument consists of a small piston (1 mm. diameter, weight .16 gm.) which is flush with the bearing surface when loaded by an external oil pressure in excess of the film pressure. If the film pressure exceeds the external load, the piston rises a fraction of a mm. and lights up a neon lamp. The length of time the lamp lights is recorded on a drum rotating at journal speed (abscissæ) whilst the back pressure controls the ordinates. As many as 22 of these recorders were distributed over the bearing, tests being run both with steady and pulsating bearing loads. In the latter case the journal undergoes periodic displacements inside the bearing with corresponding changes in the oil pressure distribution. If the load is increased so that semi fluid friction is operative, the maximum film pressure is displaced in a direction opposed to the rotation of the journal. This is because the increased bearing friction causes the journal to move in this direction, thus displacing the position of minimum clearance (maximum film pressure).

Theoretical Investigations and Experiments on Ignition Lag and Knock. (F. A. F. Schmidt, Forschungsheft, No. 392, Sept.-Oct., 1938, pp. 1-14.) (60/31 Germany.)

The paper presents an extension of previous work carried out by the author and published in L.F.F. Vol. 14 (1937) p. 640. (This paper is available as Air Ministry Translation No. 727.)

The author concludes that the characteristics of a fuel cannot be stated in terms of a single constant (such as octane or cetene number) but that at least two and generally three constants are required.

Thus no correlation between knock ratings can be expected if in one set of tests the charge temperature was varied whilst in the other the charge pressure.

For this reason the author favours knock rating being based on an equation characterising the ignition lag of the fuel as a function of temperature and pressure of the charge. (Thirty-three references.)

The Ignition Lag in Diesel Engines. (H. H. Wolfer, Forschungsheft, No. 392, September-October, 1938, pp. 15-24.) (60/32 Germany.)

The influence of various factors on the ignition lag was investigated by means of experiments carried out in bombs. Certain of the conclusions were verified by engine experiments. It appears that the ignition lag depends primarily on the temperature and pressure of the combustion air and is very little affected by:—

(1) Excess air coefficient
(3) Shape of combustion chamber
(3) Type of injection nozzle
(4) Value of injection pressure
(5) Amount of air turbulence
(6) Temperature of fuel (provided the latter does not exceed 100° C.)

The type of function connecting pressure and temperature in the expression for ignition lag indicates that the chemical reactions are of the chain type.

Electrically Welded Joints. (A. L. Hale, Welding Industry, September, 1938, pp. 269-75. Metropolitan Tech. News Bulletin, No. 626, 16/9/38, p. 5.) (60/33 Great Britain.)

Concluding a study of the direct stresses in welds which take a definite share of the external loading, the author considers welds subjected to longitudinal shear. The various factors involved are made clearer by reference to a simple analogy utilising two spiral springs. Turning to the question of residual stresses in welds and their combination with stresses produced by external loads, the writer examines the condition of stress on a plane at right angles to the direction of a butt weld. The tensile stresses in the weld and compressive stresses in the parent metal are shown to develop during cooling. Illustrated with 15 diagrams.

Damping of Torsional Vibrations by Liquid Couplings. (F. Sochting, Z.V.D.I., Vol. 82, 4/6/38, pp. 701-3. Eng. Absts., Vol. 1, No. 7, Section 3, Aug., 1938, p. 114.) (60/34 Germany.)

With the object of reducing vibrations resulting from impacts and sudden large variations in power, frictional or liquid or elastic couplings are sometimes introduced between prime movers and driven machines. In this way variations in speed are minimised. The paper discusses, from a mathematical standpoint, the effect of the liquid couplings frequently introduced between load and motors, or in association with gearing. A suitable damper can be designed for every condition of coupling and speed; only when the excited frequency in the coupling is equal to that introduced by the impact can the coupling act as though solid. In such a case vibration will continue; otherwise, and in general, it fades out. Even a small difference between the introduced and the natural frequency is sufficient, and care must be taken in designing the shaft, that the size is suitable. In practical applications the results are much more favourable than might be expected theoretically, on account of the many other damping influences present in the machine, such as bearing friction, which cannot be taken into account. An important conclusion is that liquid couplings cannot themselves excite vibrations.

An Entirely New Method of Surface Finishing. (Part II.) (W. F. Sherman, Iron Age, 8/9/38, pp. 40-5. Metropolitan Vickers Tech. News Bulletin, No. 627, 23/9/38.) (60/35 Great Britain.)

In the second part of this series, the author presents some fundamental new conceptions and definitions of terms relating to "Superfinishing." Numerous charts summarise the experience of Chrysler Corp. in the use of this technique as compared with conventional methods of finishing engine parts. The process calls for careful analysis and special machines which enable pieces such as tappets and valve stems to be "Superfinished" quickly with a low rate of stone wear. Illustrated with three photographs, six diagrams and two tables.

Bearing Metals. (K. O. Hodgson, Power Transmission, 15/9/38, pp. 471-7. Metropolitan Vickers Tech. News Bulletin, No. 627, 23/9/38, p. 7.) (60/36 Great Britain.)

It is pointed out that of the many principal properties given as being desirable in a bearing metal, the most important seem to be, high fatigue resistance, good bonding, the eutectic temperature as compared with the working temperature, lack of segregation, coefficient of expansion, and pressure resisting properties. Turning to the types of alloys used as bearing metals, the author analyses their characteristics in the light of requirements previously outlined. Illustrated with seven photo-micrographs.

Researches on the Properties of Heat Resisting Alloys Used in Internal Combustion Engines. (F. Bollenrath, H. Cornelius and W. Bungardt, L.F.F., Vol. 15, No. 9, 10/9/38.) (60/37 Germany.)

The article is mainly concerned with the blade material of single stage exhaust driven turbines.

Up to temperatures of the order of 600° C., the following austenitic alloys are available:—

Cr-Ni-Ti-Fe
Fe-Cr-Ni-Ta-Nb-Tu (or Mo).
Cr-Ni-Co-Fe-Tu-Mo
Cr-Ni-Co-Fe-Tu-Mo (with additions of Ta, Nb, Ti).
Fe-Cr-Ni-Tu-Ti

An important factor is the density of the material at high temperatures. This was calculated from the room density and the expansion coefficients.

Temperature stability was investigated by subjecting sample blades to alternate heating and cooling and noting the number of cycles before either deformation or surface cracks appeared. Tensile tests and micro structure carried out subsequently completed the investigation. It appears that no material suitable for blade temperature in excess of 700°C. is at present available.

Behaviour of a Plate Strip Under Shear and Compressive Stresses Beyond the Buckling Limit. (L.F.F., Vol. 14, No. 12, 20/12/37, pp. 627-39. Available as Translation T.M. 870.) (60/38 Germany.)

The present report is an extension of previous theoretical investigations on the elastic behaviour of a plate under compression and shear in the region above the critical. The main object is the clarification of the behaviour immediately above the buckling limit since no theoretical expressions for this range have so far been found and since experimentally, too, any degree of regularity in the behaviour of the plate in the range between the critical load and about three to four times the critical, is discernible only with difficulty. The present report thus supplements, for example, the experimental investigations of Lahde and Wagner.

The Crinkling Strength and the Bending Strength of Aircraft Tubing. (W. R. Osgood, N.A.C.A. Report No. 632, 1938.) (60/39 U.S.A.)

The upper limit of the column strength of structural members composed of thin material is the maximum axial stress such members can carry when short enough to fail locally, by crinkling. This stress is a function of the mechanical properties of the material and of the geometrical shape of the cross section. The bending strength of structural members, as measured by the modulus of rupture, is also a function of these same variables. Tests were made of round tubes of chromium-molybdenum steel and of duralumin to determine the crinkling strengths and the bending strengths in terms of the specified yield strength and the ratio of diameter to thickness. Empirical formulæ are given relating these quantities.

Flat Plates Under Pressure. (E. Moness, J. Aeron. Sci., Vol. 5, No. 11, September, 1938, pp. 421-5.) (60/40 U.S.A.)

Curves and equations are given for the maximum deflection and stress in rectangular sheets under pressures encountered in aeroplane practice. The object of this paper is to supply the designer of high altitude aeroplanes with systematic information for the design of thin sheets which have to withstand a given pressure differential. A " thick " plate resists loads only by bending; its middle surface does not stretch; its deflection is negligible compared to its thickness. A " very thin " plate has no bending strength; it resists loads entirely by tension; its middle surface stretches; its deflection under load is so large that the thickness becomes negligible compared to it. The " thin " plate resists load both by bending and tension; its deflection is of the same order as its thickness. A plate of given dimensions does not always belong to the same category. A " thick " plate will become a " thin " one if the load applied to it is sufficiently large to cause it to deflect several times the thickness; similarly, a " thin " plate will behave as a " very thin " one under large loads. For the underlying theory for the equations given, reference is made to the work of A. and L. Foppl.*

Stainless Steel in Aircraft. (H. V. Thaden, J. Aeron. Sci., Vol. 5, No. 11, September, 1938, pp. 447-454.) (60/41 U.S.A.)

Stainless steel for aircraft construction offers the following advantages:—

(1) Favourable strength—weight ratio,

(2) Superior corrosion res:stance,

* Foppl, August and Ludwig. Drang und Zwang. Vol. I, R. Oldenburg, Munchen und Berlin, 1924.

(3) Spot welding gives smooth surface and reduces cost,
(4) Lower maintenance charges. (No surface treatment required, small likelihood of surface scratches affecting performance.)

It is generally conceded that a successful aircraft must necessarily be a compromise in design and material. Although no one type of material can be the complete answer to all problems, the author is of the opinion that the use of stainless steel in aircraft construction will predominate in the future.

Damping of Forced Vibrations by Coupled Systems. (E. Lehr and A. Weigand, Forschung, Vol. 9, No. 5, September-October, 1938, pp. 219-228.) (60/42 Germany.)

Coupled inertia masses are very efficient for absorbing vibrations. So far torsional vibration dampers have only rarely been designed on this principle, probably because the necessary calculations appeared difficult. The authors describe a simple method for determining the characteristics of the coupled system required to meet certain conditions and apply the method to a worked-out example.

Modern Extensometers. (A. Thum, O. Stenson and H. Weiss, Forschung, Vol. 9, No. 5, September-October, 1938, pp. 229-234.) (60/43 Germany.)

After briefly reviewing the static and dynamic extensometers at present in use, the authors describe a new instrument which utilises an electromagnetic recording system. In this instrument (known as M.P.A.) the extension moves a diaphragm which, in its turn, controls the air gap in a balanced magnetic choke circuit. The measuring base length can be varied between .5 and 5 mm. and the complete instrument only weighs 5.5 gm.

A magnification of the order of 300,000 is easily obtained. The paper gives some examples of the effect of base length on the results.

Impulse Apparatus. (H. Hertwig, E.T.Z., 15/9/38, pp. 981-4. Metropolitan Vickers Techn. News Bulletin, No. 627, 23/9/38, p. 12.) (60/44 Germany.)

The author describes the system of connections, construction and possible applications of an apparatus (developed by the laboratory of the A.E.G. Valve Factory, Berlin) for the production of impulse voltages by means of vapour discharge devices. Variation of the impulse frequency and duration within wide limits is effected by two regulating resistances independent of each other. As an example of the applications of the apparatus, a brief description is given of its use for the speed regulation of a d.c. motor.

Illustrated with seven diagrams and one photograph.

Stroboscopic Measurement of Slip and Speed. (F. Reinhardt, E.T.Z., 8/9/38, pp. 957-60. Metropolitan Vickers Tech. News Bulletin, No. 627, 23/9/38, p. 17.) (60/45 Germany.)

The author describes a stroboscopic method of measuring slip and speed, incorporating a photo-electric cell and relay. The fundamental arrangement, the external construction, precision and ranges of measurement are explained on the basis of practical examples. Illustrated with two photographs, two diagrams and one oscillogram.

Remote Control with Siemen's Equipment Employing the Selector Process. (W. Henning, Siemen's Zeitschrift, August, 1938, pp. 402-6. Metropolitan Tech. News Bulletin, No. 627, 23/9/38, p. 18.) (60/46 Germany.)

The author considers the problem of remote regulation say of transformers, turbines, etc., from the point of view of stepwise regulation, return signalling of the position of the remote-regulated units, the transmission of theoretical values, stepless regulation and co-operation with automatic control systems. Illustrated with three photographs and two diagrams.

Gyroscopic Instruments for Instrument Flying. (W. G. Brombacher, W. C. Trent, N.A.C.A. Tech. Note No. 662, Sept., 1938.) (60/47 U.S.A.)

The gyroscopic instruments commonly used in instrument flying in the United States are the turn indicator, the directional gyro, the gyromagnetic compass, the gyroscopic horizon, and the automatic pilot. These instruments are described. Performance data and the method of testing in the laboratory are given for the turn indicator, the directional gyro, and the gyroscopic horizon. Apparatus for driving the instruments is discussed.

Dynamic Errors in the Rate of Climb Meter. (C. S. Draper and G. V. Schliestett, J. Aeron. Sci., Vol. 5, No. 11, Sept., 1938, pp. 426-30.) (60/48 U.S.A.)

Rate-of-Climb meters were first described in 1910 by Bestelmeyer,* who recognised the existence of errors due to rapidly changing conditions. However, little quantitative information is available even at the present time on the magnitude of the errors to be expected in particular manœuvres. These "dynamic errors" can be negligible or relatively large depending upon the time required for changes in the actual rate of climb as compared with a period called the "characteristic time" of a particular instrument. If the forcing changes occur in a time much less than the characteristic time, large dynamic errors will appear while slower changes have progressively less effect.

The present paper outlines the general theory of the conventional "capillary leak" rate-of-climb meter and describes a laboratory method for determining the coefficients necessary to predict performance in flight. Theoretical and laboratory results in the form of curves are compared with data taken from flight tests. Special attention is paid to the case of sinusoidal changes, and non-dimensional curves applicable to any frequency are given.

Temperature Measurements of High Speed Gas Currents. (W. Meissner, Forschung, Vol. 9, No. 5, September-October, 1938, pp. 213-218.) (60/49 Germany.)

Experiments were carried out on a whirling arm at top speeds of the order of 125 and 165 m./sec., the thermocouple being either freely exposed or contained inside a short tube facing the air stream. In the latter case measurements were made of the dynamic and static pressure inside the tube.

The reading of the thermocouple is higher than the true gas temperature, but less than the temperature corresponding to the dynamic head (gas reduced to rest adiabatically).

If

dt_1 = measured temperature difference from stationary air.
dt_2 = calculated difference (adiabatic compression).
$(dt_2 - dt_1)/dt_1 = 0.35$ for the particular conditions of these tests.

Some Remarks on the Physical Aspects of the Aircraft Icing Problem. (A. R. Stickley, J. Aeron. Sci., Vol. 5, No. 11, Sept., 1938, pp. 442-6.) (60/50 U.S.A.)

(1) As the size of the water droplets in the air decreases, the amount of aircraft icing becomes vanishingly small since the small suspended drops will fly round the wing and not be deposited. (2) Under certain conditions, it is possible for under-cooled drops to become so large that the excess liquid water

* Bestelmeyer, A., Zur Theorie des Ballonmanometers, Physikalische Zeitscrift, Vol. II, pp. 736-768, 1910.

remaining after their impact will wash away a great part of the ice formed. (3) Assuming that a plane is flying in a cloud in which the usual high humidities prevail, a consideration of certain equations set up by Schumann for the dissipation of the heat of fusion from a hailstone indicates that conduction plays a part considerably more important than that played by evaporation in dissipating the heat of fusion from the ice deposit on the plane. (4) The " icing time " concept of Bleeker offers a possible basis for explaining the peculiarities in shape of the various aircraft ice deposits. (5) No noteworthy reduction of the freezing point of droplets of the sizes which contribute to aircraft icing results from the presence of salt nuclei in them.

The Thermodynamics of Open Systems Applied to the Problem of Rain Production. (G. Van Leberghe and P. Glansdorff, Forschung, Vol. 9, No. 5, Sept.-Oct., 1938, p. 260.) (60/51 Belgium.)

In thermodynamics a closed system is defined as a number of bodies inside a real or imaginary box, the walls of which are transparent to energy but do not allow the transfer of matter.

In the case of an open system, the walls are permeable to both matter and energy.

The authors develop the thermodynamic equations applying to systems of this type, such as a cloud shedding rain or snow.

The Special Duties of a Medical Officer Attached to a Squadron. (H. V. Diringshofen, Luftwehr, Vol. 5, No. 8, August, 1938, pp. 324-326.) (60/52 Germany.)

A considerable proportion of flying accidents is attributed to so-called " errors of judgment." Such errors may be due to a breakdown of the nervous control system of the pilot (brought about by excitement or fear) or they may be definitely psychological (deliberate showing-off to overcome inferiority complex).

In both cases psycho-analytical treatment of the pilot will throw light on his mental worries and thus enable proper rest to be taken before it is too late.

The medical officer, in order to be of help, must be fully conversant with these aspects of medicine and be able to win the confidence of every member of the squadron. It is essential that he should frequently assist at their flights not only with the object of having direct evidence as to the strains involved in their duties, but also to form an opinion of the reaction of the various pilots under difficult circumstances. Modern high speed aircraft is stressing the human element to the limit and accidents can only be avoided if the physiological aspect is properly understood.

In this connection the ordinary routine medical inspection is quite insufficient and must be supplemented as soon as possible by supervision of the mental make-up of the pilot.

New Oxygen Mask Tested by North West Air Lines (U.S.A.). (American Aviation, Vol. 2, No. 6, 15/8/38, p. 15.) (60/53 U.S.A.)

Chief value of the device lies in the fact that it requires much less oxygen, as little as one-tenth as much, it is claimed, as does apparatus now in general use. This cuts down the amount of oxygen that must be carried on planes and thus reduces the weight element.

Another important feature is the design of the mask, which leaves the mouth uncovered, permitting pilots to use standard radio equipment. A new type oxygen tank is used, which is lighter than standard tanks, although retaining the same strength.

The mask is of moulded rubber, consisting of a nosepiece resembling an old-fashioned football noseguard, and a moulded rubber tube that forms a circle from each side of the nosepiece under the mouth. A flexible rubber tube leads downward from this to a valve, which mixes oxygen from the tank with air, and another tube leads from this to the oxygen supply. Below the valve is suspended a small bladder just large enough for a single breath.

A newly-developed reducing valve at the oxygen tank is so designed that it will feed the right amount of oxygen, regardless of the number of masks which it serves. It is claimed that, without affecting the amount of oxygen going to each mask, as many as 30 outlets have been connected to this valve.

Experiments on the Propagation of Ultra Short Wireless Waves. (W. Ochmann and H. Plendl, H.F.T., Vol. 52, No. 2, Aug., 1938, pp. 37-44. In course of translation.) (60/54 Germany.)

The paper deals with field strength measurements carried out with wave length 7.17 and 4.1 m. respectively. The transmitter was placed at some distance, usually of the order of 1,000 m., above normal level, whilst the receiver was placed in an aircraft. The results can be explained (at any rate qualitatively) by refraction of the rays in the lower layers of the atmosphere (reduction in dielectric constant with height). As a result of refraction, rays may enter the shadow region and be subsequently reflected upwards. This would produce the pronounced maxima and minima observed in the field strength diagrams. Variation in the refractive index with time and season would also account for the changes in this phenomenon as well as for vagaries in the possible range.

How Ultra Short Waves Overcome the Curvature of the Earth by Refraction. (G. Eckart and H. Plendl, H.F.T., Vol. 52, No. 2, Aug., 1938, pp. 44-58. In course of translation.) (60/55 Germany.)

Expressions are obtained for the variation with height of the dielectric constant of the atmosphere and with the help of these data the path of a ray originating at some point above the surface of the earth is calculated. Applying next the laws of reflection, the field strength can be calculated as a function of height and distance. The results are in satisfactory agreement with experiment and it can be considered as definitely established that range in excess of 100 km. with wave length λ of the order of 10 m. $> \lambda >$ 10 cm. are entirely due to refraction in the atmosphere.

It follows from this that the maximum possible range (*i.e.*, position of lowest minimum on vertical field diagram) is fixed by atmospheric conditions and independent of power output.

A Unique Method of Modulation for High Fidelity Television Transmitters. (W. N. Parker, Proc. Inst Rad. Eng., Vol. 26, No. 8, August, 1938, pp. 946-62.) (60/56 U.S.A.)

Present-day high fidelity 441-line television demands modulation frequencies as high as 4 megacycles. Tube capacitance and the flywheel effect of resonant circuits make such modulation difficult and inefficient when conventional methods are used.

The author describes a system called " transmission line modulation " in which modulation is effected between the radio frequency generator and the antenna by means of a variable impedance, connected across the radio-frequency transmission line. This impedance, consisting of a quarter-wave line terminating in the modulator tubes, is controlled by the voltage applied to the grids of these tubes.

At high video frequencies the plate efficiency and degree of modulation compare favourably with the conventional systems employed in sound broadcasting.

A one kilowatt experimental television transmitter employing this system, which may be modulated 80 per cent. at frequencies up to 5 megacycles, is described. For demonstration purposes a 200-megacycle oscillator, modulated at frequencies up to 20 megacycles, is shown.

Electrical Interference with Radio Reception. (A. J. Gill and S. Whitehead, J. Inst. Elec. Eng., Vol. 83, No. 501, Sept., 1938, pp. 345-94.) (60/57 Great Britain.)

The paper describes the method of assessment of the interference to radio reception from electrical equipment, and determines the level to which such interference must be reduced to permit satisfactory service.

The methods of achieving this result are described for the various classes of interfering equipment. Although mainly directed towards the protection of broadcast reception, the principles described apply equally to other radio communication services.

The Theory of Diffraction Applied to the Propagation of Ultra Short Wireless Waves. (G. Eckart, H.F.T., Vol. 52, No. 2, Aug., 1938, pp. 58-62. In course of translation.) (60/58 Germany.)

In its broad aspect the theory of diffraction deals with the propagation of wireless waves in the presence of conductors. In our case, the only conductor of importance is the earth itself and the author shows that in the case of ultra short waves (5-10 m.) the surface wave is damped out within a very short distance (few km.) of the transmitter. To obtain measurable diffraction effects at the practical ranges would imply an enormous power output of the transmitter. Refraction alone can thus account for the observed results and similar conclusions are reached by Pol-Bremmer, whose work is briefly reviewed by the author.

Twenty-five references.

Electrical Installations on Board Aircraft. (H. Vickmann, E.T.Z., Vol. 59, No. 14, 7/4/38, pp. 361-6. Available as Translation No. 725.) (60/59 Germany.)

The requirements imposed on electrical apparatus installed in aircraft are briefly enumerated and the special design feature of generators and electric circuits are described.

Considerable space is devoted to the design of automatic switches, cut-outs and navigation lights.

Ignition systems and radio shielding are briefly described, but no reference is made to radio equipment, which forms the subject of a separate report (R. Bruger, Radio Equipment on Board Commercial Aeroplanes, E.T.Z., Vol. 58, 1937, p. 915).

Measurement of Transparency of Electric Insulators to Thermal Radiations. (E. Eckert, Forschung, Vol. 9, No. 5, Sept.-Oct., 1938, pp. 251.) (60/60 Germany.)

The measurements were carried out electrically by comparing the amount of radiation received by a thermopyle when various types of insulators were placed in front of a black body radiator. The substances tested included glass, mica, paper and rocksalt. A layer 1 mm. thick of the first three materials absorbed the thermal radiations completely, whilst the rock salt, although being opaque to radiations greater that 16 μ was transparent to radiations of lower wave lengths.

According to the electro-magnetic theory of light, electric insulators should be transparent to thermal radiations. The fact that in many cases such transparency is not found in practice is now known to be due to resonance phenomena in the atomic lattice. Since this effect depends on the frequency of the radiation, transparency to light rays gives no clue as to the absorption of the longer heat waves.